

Northern Water Project

Environmental Impact Statement

September 2026

JBS&G
A Geosyntec Company

Environmental Impact Statement

Executive Summary

NORTHERN
WATER PROJECT

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EXECUTIVE SUMMARY - TABLE OF CONTENTS

INTRODUCTION 1

The Northern Water Project 1

The Project Proponent 1

Aim of the Project 2

Project benefits for South Australians 2

Project timing 2

SELECTING LOCATIONS FOR PROJECT INFRASTRUCTURE 3

Alternatives considered in the design and location of the Project 3

ENVIRONMENTAL ASSESSMENT AND APPROVALS PROCESS 5

DESCRIPTION OF THE PROJECT 7

Reference Design 7

Desalination plant 7

Desalination plant marine infrastructure 9

Transfer system 12

Electricity supply infrastructure 14

STAKEHOLDER CONSULTATION 15

Engagement to date 15

IMPACT ASSESSMENT 16

Land Use and Site Considerations 16

Use of land 16

Use of marine waters 17

Physical Environment 18

Coastal processes 18

Soils, landform and geology 18

Surface water 19

Groundwater 19

Biological Environment 20

Biosecurity 20

Marine flora and fauna 21

Terrestrial flora and fauna 24

Amenity and Environmental Quality 25

Air quality 25

Noise and vibration 26

Traffic and transport 27
Landscape character and visual amenity 29
Social and Community 29
Aboriginal cultural heritage 29
Non-Aboriginal cultural heritage 30
Social environment 31
Local Regional and State Economies 32
Economic environment 32
Climate Change and Resource Efficiency 32
Climate change adaptation 32
Greenhouse gas (GHG) emissions 33
Sustainable use of resources 33
Waste management 34
Hazards and Risks 34
Planning and Design Quality 35
Planning assessment 36
CONCLUSION 36

INTRODUCTION

The Northern Water Project

The Northern Water Project (the Project) aims to provide a secure, climate resilient water source for industry in South Australia's Upper Spencer Gulf (USG) and Far North.

Delivery of the Project will involve the construction and operation of a seawater reverse osmosis desalination plant and associated marine structures on the USG, a water transfer system connecting to the Far North and electricity supply infrastructure. The proposed desalination plant location is on the western shore of the USG at Mullaquana Station, south-west of Whyalla, and the transfer system runs generally north from the desalination plant to delivery points at the Olympic Dam and Carrapateena copper-gold mines.

Key elements of the Project

The Project comprises the following key elements:

- a 51 GL/y seawater reverse osmosis desalination plant located at Mullaquana Station, on the Upper Spencer Gulf approximately 25 km south-west of central Whyalla
- marine intake and outfall tunnels extending underneath the seabed and into the Spencer Gulf
- seawater intake with associated intake structure and pumps
- outfall pipe and diffuser structures for discharge of return water into the Spencer Gulf
- a transfer system approximately 406 km in length consisting of:
  - approximately 360 km of main transfer pipeline, largely constructed underground, from the desalination plant and terminating at the delivery point at the Olympic Dam copper-gold mine.
  - approximately 46 km of lateral branch pipeline (which may be constructed above or below ground) to a delivery point at the Carrapateena copper-gold mine
  - associated pump stations and water storage
- high voltage electricity supply including new transmission lines and network and facility substations to provide power to the desalination plant and transfer pump stations
- associated temporary construction-related infrastructure (e.g. construction camps, site offices and amenities, yards, storages and laydown areas)
- access tracks including upgrading existing tracks and establishing new tracks
- enabling roadworks and road upgrades.

The Project Proponent

The Project is being proposed by the Department for Infrastructure and Transport (DIT). In addition to being the Project proponent and progressing State and Commonwealth planning and environmental assessments, DIT is responsible for pre-delivery activities and procurement including procurement of the design, build, operate and maintain (DBOM) contract for the Project. DIT will also likely remain as the responsible agency for the purpose of the design and build phase of the contract.

Aim of the Project

A water supply project to the Far North has been on the South Australian infrastructure agenda for several decades and while several iterations of the Project have been considered previously, none have progressed to development. The Project aims to:

- support the continued development of South Australia's key mining resources to unlock globally significant deposits of strategic and critical minerals, to support economic growth and global decarbonisation efforts
- unlock sustainable growth in the key future industries which will contribute to decarbonisation initiatives, sovereign capability and enable employment / regional growth
- increase environmental sustainability by reducing reliance on environmental water sources including the Great Artesian Basin (GAB), local water aquifers and the River Murray
- preserve culturally and economically significant water sources for First Nations communities in South Australia.

Project benefits for South Australians

If approved, the Project would potentially deliver a range of benefits for South Australians including:

- Increased economic activity:
  - Unlocking mineral resources in the Gawler Craton through reliable access to Project water, and the resulting increased investment and expanded mining sector activity is expected to create employment and economic growth for the region and State
  - Between 2026 and 2062, Gross Regional Product (GRP) in Northern South Australia could be approximately $3 billion larger on average and Gross State Product (GSP) $3.3 billion larger on average
  - In average annual terms, between 2026 and 2062, an additional 2,000 Full Time Equivalent positions (FTEs) are expected to be employed across South Australia, with 1,600 in Northern South Australia
- Provision of an alternative, climate resilient water supply for industry, that may create opportunities for future reductions in reliance by industry on existing water sources, creating an opportunity to support the long-term protection of culturally significant water sources such as GAB mound springs
- Improved liveability for communities in the Whyalla and Northern South Australia regions associated with increased economic growth.

Project timing

Construction of the Project would commence subject to a final investment decision (FID) by the South Australian Government and once all necessary environmental and development approvals are received and access to land is obtained. It is anticipated that construction may commence in 2028 with first water expected to be available in 2032. The operational life of the Project is expected to be 100 years.

SELECTING LOCATIONS FOR PROJECT INFRASTRUCTURE

Key considerations when determining the location of the desalination plant included:

- proximity to the ocean for the seawater intake and outfall
- marine features that could provide the required intake water quality and where the return water can be rapidly mixed and dispersed
- accessibility and constructability of a water supply pipeline
- proximity to a power supply, roads, and telecommunications infrastructure
- existing land features and compatibility of land use
- sensitivity of terrestrial and marine environments and in particular marine parks
- community concerns.

Location of the proposed transfer system considered:

- provision of water at the required delivery points
- topography and a hydraulic engineering outcome that would result in fewer pump stations and water storage locations and lower operational energy use associated with pumping
- connection with other Project infrastructure and location in parallel with or utilising existing and previously disturbed areas where possible
- minimising interaction with existing services, to reduce potential landholder, environmental and Aboriginal cultural heritage impacts.

Alternatives considered in the design and location of the Project

Supply / capacity alternatives

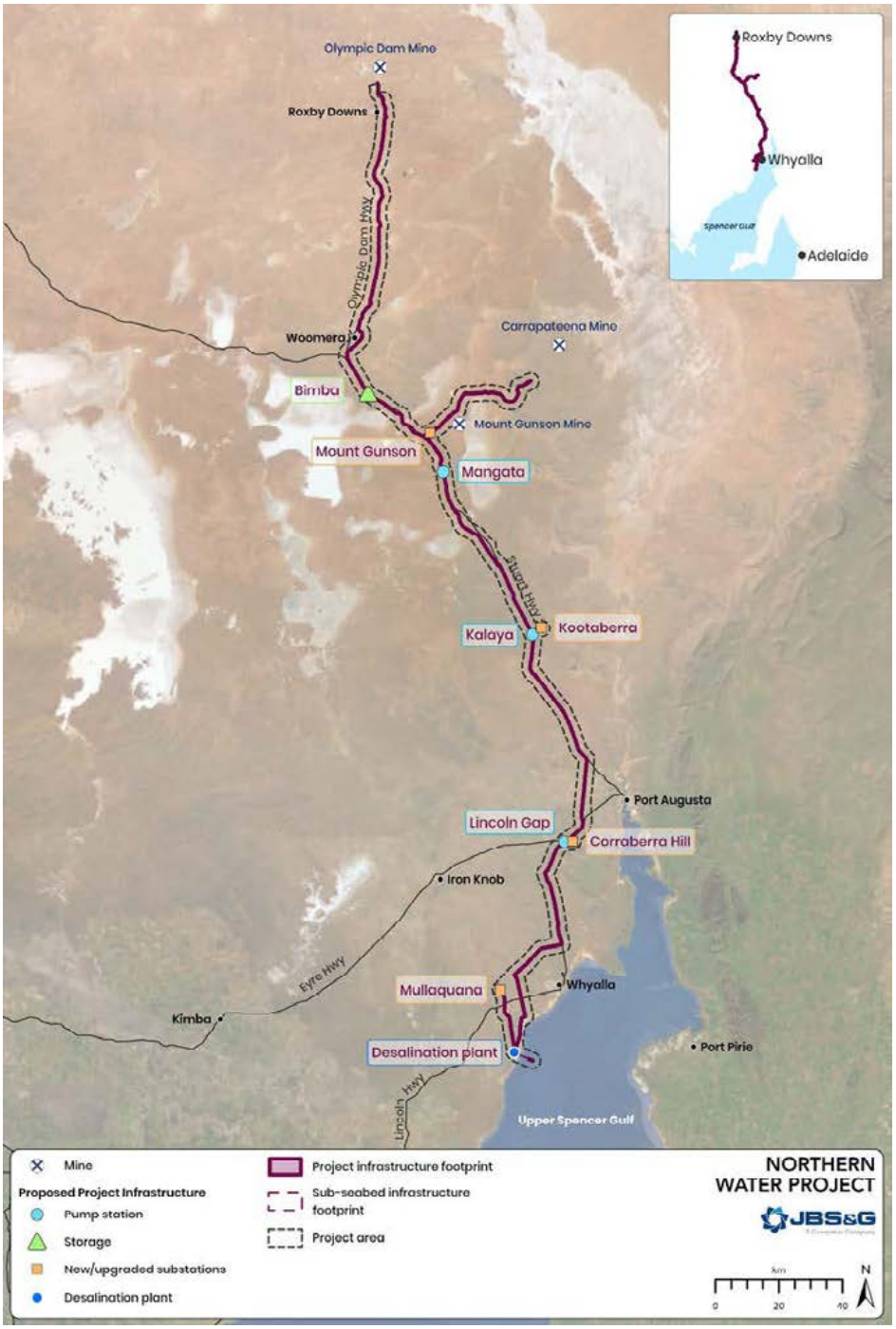
Previous studies completed since 2009 assessed multiple water supply options to meet industrial growth projections and increased water demand. Options considered were not limited to desalination and included increased or new groundwater extraction, use of River Murray allocations and sourcing water from the Adelaide Desalination Plant. Options considered also involved different scales, capacities, locations, staging approaches, pipeline alignments and water quality arrangements. These studies concluded that a coastal desalination plant was the preferred option.

Different demand scenarios and capacity options have since been considered to determine the preferred supply capacity option to be considered in the Environmental Impact Statement (EIS). The outcome of this was a desalination plant with a design capacity of 51 GL/year (with future-proofing to 73 GL/year) located on the Spencer Gulf or the Eyre Peninsula, with a transfer pipeline extending north to Olympic Dam.

Site alternatives

Once the preferred configuration was determined, ten possible desalination plant sites (which had access to seawater and proximity to potential end users) were identified on Spencer Gulf and the Eyre Peninsula for further feasibility assessment. Following multiple phases of multi-criteria analysis Mullaquana Station was ultimately selected as the confirmed site because:

- the location meets strategic Project objectives due to its proximity to demand in the Upper Spencer Gulf and the Far North
- the location is close to potential water off-takers, industry, workforce and infrastructure, aligning favourably with the State's aspirations to grow the economy of the Upper Spencer Gulf and Far North
- it will be cost effective to build and operate at the site due to proximity to the available workforce, suppliers and transport infrastructure
- the site provides favourable ground conditions for both the onshore and offshore construction environments.



Northern Water Project location

ENVIRONMENTAL ASSESSMENT AND APPROVALS PROCESS

The *Planning, Development and Infrastructure Act 2016* (PDI Act) governs the planning system in South Australia and sets out the process and pathways for granting development approvals, including approvals for major developments.

Following the submission of a Crown Development Application under the PDI Act by DIT (as the Project Proponent) on 4 December 2025, the South Australian Minister for Planning directed on 22 December 2025 that an EIS was to be prepared for the Project.

The National Environmental Protection Agency also have a role in the assessment and approvals process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A referral for the Project under the EPBC Act was submitted to the Commonwealth for a decision as to whether there was the potential for significant impacts to Matters of National Environmental Significance (MNES) on 11 December 2025. On 5 February 2026 the Project was declared to be a 'controlled action' and therefore subject to assessment under the EPBC Act. The relevant protected matters for the controlled action assessed in the EIS are listed threatened species and communities and listed migratory species.

The Commonwealth Environment Minister has accredited the South Australian environmental assessment process under the PDI Act to assess the controlled action for the Project. On this basis one EIS has been prepared, one period of public consultation is being undertaken and one Response Document and Assessment Report will be developed to satisfy the legislative requirements of each jurisdiction.

Project-specific EIS Assessment Requirements (ARs) were released by the State Planning Commission (SPC) on 30 June 2026 and are publicly available on the PlanSA Portal[1] and provided at Appendix A-1 of the EIS. The ARs set out the key issues and potential impacts associated with the proposed development that require assessment, and the level of detail and investigation that should be given to those issues in preparation of the EIS. The State and Commonwealth governments liaised on the draft ARs for the EIS to ensure they met the requirements of South Australian and Commonwealth legislation.

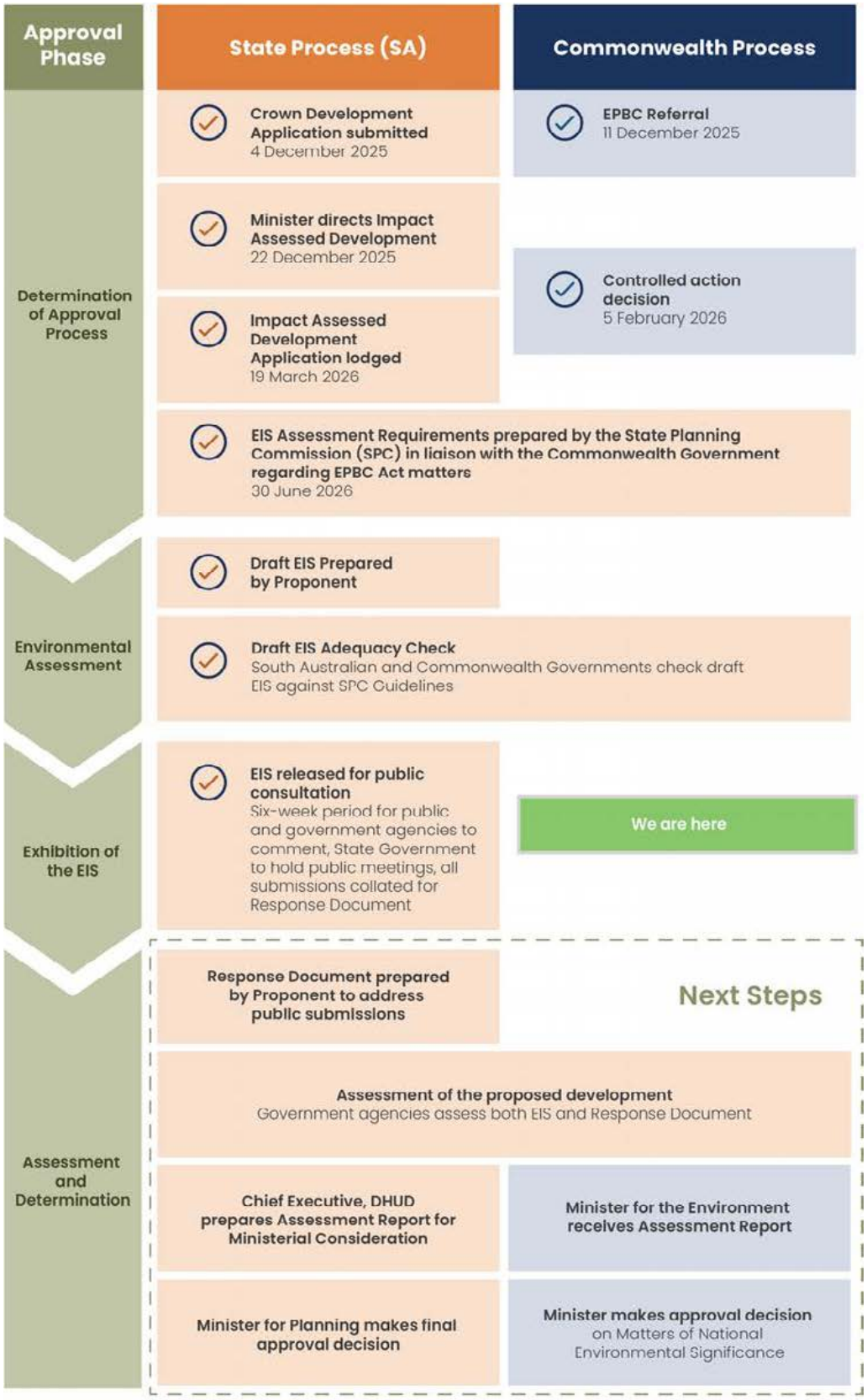
The Northern Water Project EIS will be on exhibition for public comment for a period of at least six weeks (30 business days) on the PlanSA Portal. Copies of the EIS are also available for public inspection in places which have been nominated by the Minister for Planning. Interested persons are invited to make written submissions on the EIS within the timeframe defined by the Minister for Planning.

Following public exhibition, the EIS, including the Response Document, public submissions and comments from local councils, agencies and other referral bodies will be assessed and an Assessment Report will be prepared for the Minister for Planning. The Response Document and Assessment Report will also be provided to the Commonwealth Environment Minister for consideration in accordance with the accredited assessment approach.

The Minister for Planning will make a final decision on the Project in accordance with Section 115 of the PDI Act. The EIS and Assessment Report will be used by the Commonwealth

[1] https://plan.sa.gov.au/development_applications/state_development/impact-assessed-development/majors/major_projects/majors/northern-water-mullaquana

Environment Minister to make a separate decision on whether or not to approve the proposed action under Part 9 of the EPBC Act.



Overview of the Northern Water Project application and assessment process

DESCRIPTION OF THE PROJECT

Reference Design

A Reference Design for the Project has been used for the description of the key Project components for the purposes of State and Commonwealth assessments and impact assessment presented in this EIS. The Reference Design is preliminary and is expected to change through the detailed design process, or in response to cultural heritage matters or other refinements to minimise impacts as design and technical studies continue.

The Project can be broadly divided into the following main components:

- **Desalination plant** – the facility covering pre-treatment, reverse osmosis and post-treatment and pumping of product water and return water
- **Desalination plant marine infrastructure** – including intake / outfall tunnel(s), seabed intake and diffuse structures
- **Transfer system** – comprising an approximately 360 km transfer pipeline from the desalination plant to the Olympic Dam mine delivery point, approximately 46 km lateral branch to the Carrapateena mine delivery point, transfer pump stations and water storages
- **Electricity supply** – provision of power to the desalination plant and pumping stations, including transmission lines and substations to connect to the grid, and potential solar arrays.

Desalination plant

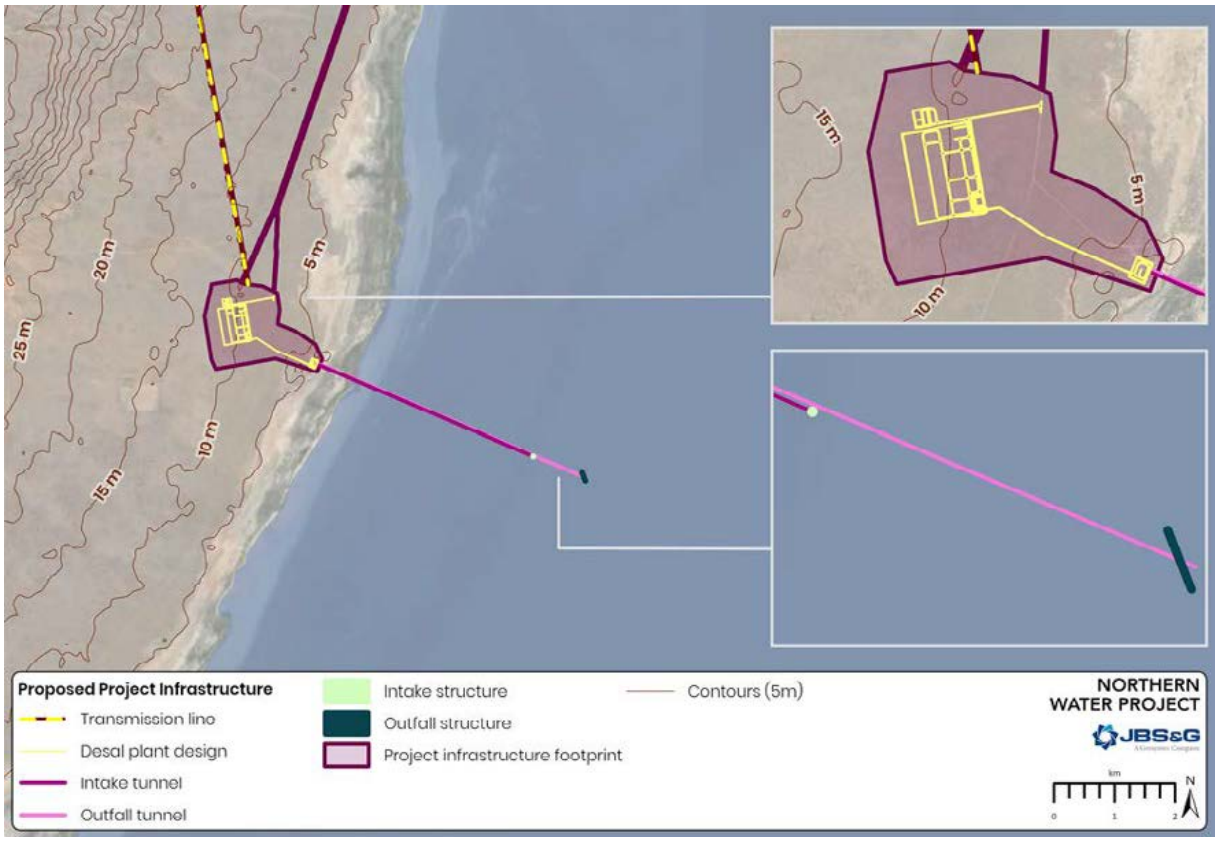
Plant location and description

The desalination plant site on Mullaquana Station is located approximately 14 km east of the Lincoln Highway and 1.5 km from Spencer Gulf coastal waters.

Approximately 200 ha of land would be required for construction of the plant. The site will be accessed via Eight Mile Creek Road from Whyalla during both the construction and operation periods. A new access is also likely to be established via a 6 km road constructed adjacent to the proposed pipeline alignment, connecting Eight Mile Creek Road to the Lincoln Highway. This access would limit the use of Horseshoe Road, Mullaquana Road and the northern section of Eight Mile Creek Road.

The site will accommodate all temporary works (i.e. works required for construction) and permanent works (i.e. the facilities). Major temporary works will include the tunnel boring machine (TBM) launch box, laydowns, construction water storage and spoil drying areas. Permanent site components include the desalination plant, product water storage, high voltage switchyard, intake and outlet pump station areas, stormwater management systems and land for the future-proofing capacity.

The final placement of the desalination plant and marine infrastructure within the proposed site will be the subject of detailed design. However, there will be no construction in the adjacent coastal dunes, mangroves or intertidal areas.



Desalination plant site location (contours in mAHD)

Plant capacity

The design capacity for the desalination plant, and the production capacity for which approval is being sought, is 51 GL/y.

Some aspects of the desalination plant and transfer system design and construction may (largely through a function of the construction method), accommodate a production capacity of greater than the proposed 51 GL/y. Any increase in production capacity to that currently proposed, however, would be subject to separate design development, assessment processes and associated approvals at that time.

Desalination process

Key desalination process infrastructure includes:

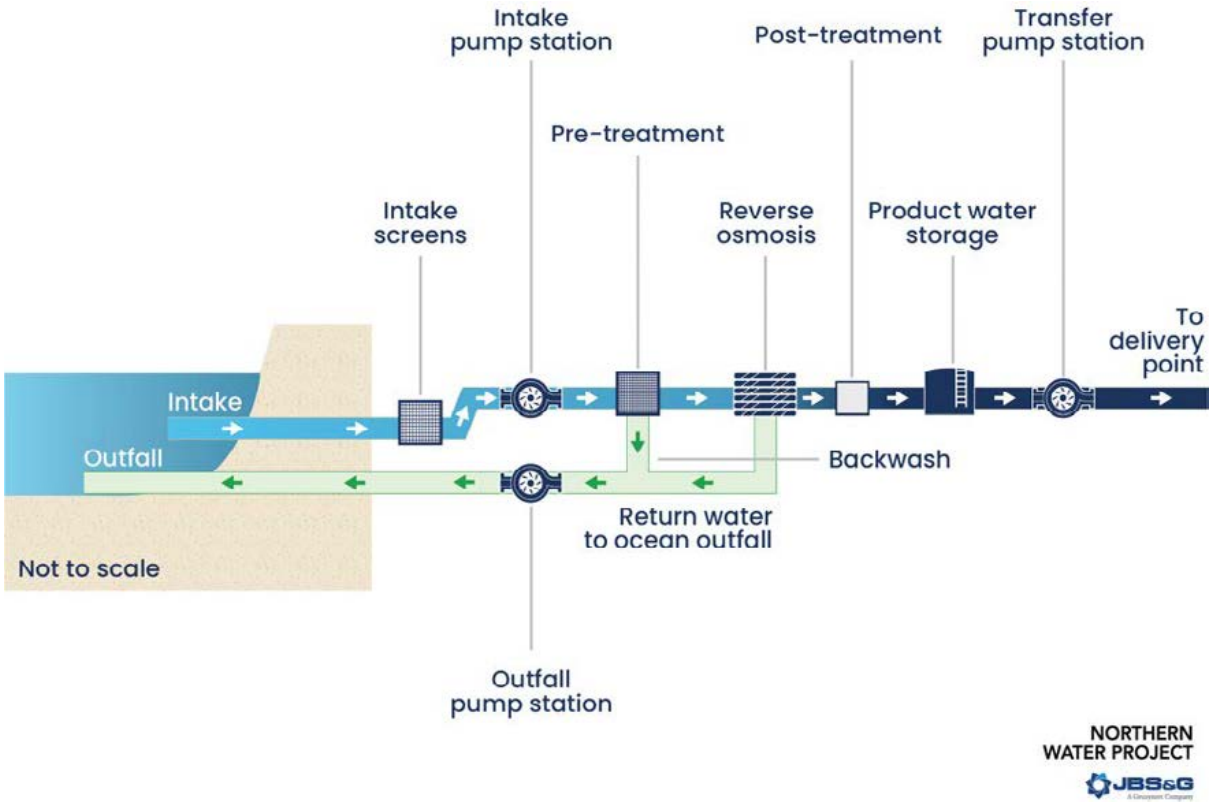
- seawater intake pump station
- desalination treatment process (pre-treatment and reverse osmosis (RO) systems)
- product water storage tank(s) and / or earth bank storage(s)
- facilities for post-treatment of desalinated water (product water), return water and ancillary equipment
- facilities and power infrastructure at the plant.

The proposed desalination process is seawater reverse osmosis which is a well-established, proven and mature technology and commonly adopted globally.

Under this process, seawater enters the system through an intake and passes through a pre-treatment stage, where material that could damage the desalination membranes are

removed. The pre-treated water is then pumped into the RO unit, where high pressure forces it through semi-permeable membranes. These membranes allow only clean water to pass while rejecting salts and impurities, producing two streams - desalinated (product) water and return water. The desalinated (product) water is stabilised post-treatment and stored to make it appropriate for distribution, while the return water is discharged via the outfall back to the ocean.

A simplified representation of the desalination plant process is shown below.



Simplified desalination plant process

Desalination plant marine infrastructure

Intake and outfall tunnels

Underground concrete-lined intake and outfall tunnel(s) will be constructed using TBMs and extend offshore into Spencer Gulf waters. The intake tunnel will be an indicative length of 4 km while the outfall tunnel will be an indicative length of 5 km. Internal diameter of both tunnels will be in the order of 3.2 m (subject to detailed design).

TBMs will be launched via box cut, decline and launch facilities constructed onshore and located as close as practicable to the marine environment while avoiding dune systems and intertidal zones. The TBMs will progressively tunnel under the dune systems, intertidal zones and the seabed to the required distance offshore, excavating and lining the tunnels with precast concrete sections. The material excavated from the tunnel (TBM spoil) will be transported above ground and stockpiled for drying as required. It is anticipated that spoil will be suitable for reuse on the desalination plant site.

Due to the complexities and potential environmental impacts of removing the TBM from the end point of the tunnel, salvageable TBM and other tunnel construction components would be removed while the TBM cutterhead and shield would be abandoned, and concrete-encased permanently within the tunnels.

In order to reduce the length of tunnels beyond an appropriate distance, the option of 'float and sink' methodology (which is currently contemplated for installation of the outfall diffuser) may be also considered for a section of the outfall pipeline infrastructure. This methodology for underwater pipeline installation involves fusion welding lengths of High-Density Polyethylene (HDPE) pipe at a nearby onshore facility (e.g. Whyalla Port), towing and floating the assembled pipeline into position and then sinking it slowly by filling it with water. Ballast weights are used to help sink and hold the pipe in its intended location on the seabed, where it would be secured and connected to the tunnelled outfall pipeline.

If the float and sink methodology is adopted, the disturbance footprint would be designed to be located beyond the extent of the *Posidonia* spp. seagrass.



Example of slurry TBM (left) and earth pressure balance TBM (right)



Desalination plant intake and outfall pipelines using float and sink methodology



Proposed intake and outfall alignment (Bathymetry is in mAHD)

Intake structure(s)

The intake structure collects the seawater for processing in the desalination plant and is likely to be located in shallower water and closer to shore than the outfall structure. The intake will also need to be a sufficient distance from the outfall to avoid unacceptable recirculation of return water back into the plant.

The intake structure(s) include a riser connecting the intake structure to the intake tunnel, a precast concrete structure and screened intake head. A jack-up-barge (JUB) (which is a non-powered floating platform with legs extending into the sea floor) will be established offshore, to support construction of the intake and outfall structures.

The proposed intake structure is approximately 6 m above the seabed and requires a water depth of no shallower than 13 m from Lowest Astronomical Tide (approximately -15m AHD) to address wave height and vessel navigation requirements. The structure would be comprised of a precast concrete caisson, stainless steel intake grills and precast concrete cap and placed on a 1.5 m thick bedding layer of rockfill, trenched below existing surface levels.

A maximum intake velocity for seawater of 0.15 m/s will minimise entrainment of marine organisms as the low velocity of the water entering the intake allows marine life to swim in, out and around the structure. A maximum grill width on the intake of 0.15 m also limits larger marine fauna entering the intake structure.



Concept of potential intake structure design

Outfall structure

After the desalination process, the return water will be discharged back into Spencer Gulf through an outfall tunnel connected to a diffuser system (or similar arrangement) via a riser.

The outfall diffuser structure has a series of nozzles attached to the end of the outfall pipe constructed using a float and sink methodology. The diffuser structure will be floated into position before the structure is flooded, sunk into place and secured to the seafloor, using piles, rather than being excavated into the seabed.

Design of the outfall structure and diffuser system will ensure that the return water is effectively mixed and dispersed into the marine environment in accordance with approval conditions and licensing requirements. Key drivers of the location of the diffuser system will be sufficient depth of water to ensure the outfall discharge does not breach the surface (referred to as breakthrough) and avoidance of unacceptable impacts to seagrass communities.



Concept of potential outfall / diffuser design (subject to detailed design)

Transfer system

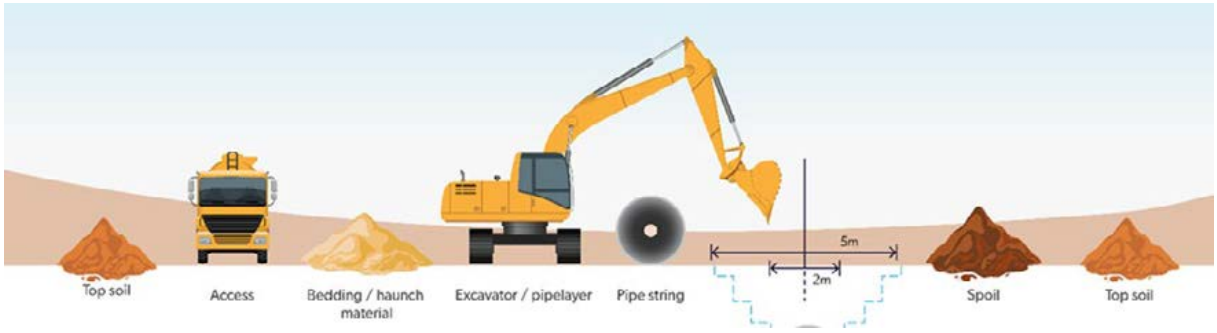
Pipeline

The main component of the transfer system is a 360 km pipeline from Mullaquana Station to Olympic Dam Mine Site with a 46 km lateral branch connecting the Carrapateena Mine to the main pipeline which follows this route:

- **Desalination plant (Mullaquana Station) to Whyalla** – alignment heads generally north following Eight Mile Creek Road and other existing tracks / fencelines on rural land skirting Whyalla to the west. The alignment then veers north-east following the Lincoln Highway.
- **Whyalla to Port Augusta** – alignment traverses a section of the Cultana Training Area following the Lincoln Highway heading north, before meeting the Stuart Highway alignment via a small section of the Eyre Highway.
- **Port Augusta to Pimba** – alignment generally follows the Stuart Highway, with portions following the former Stuart Highway alignment, and paralleling the existing Department of Defence Port Augusta to Woomera water pipeline.
- **Pimba to Olympic Dam** – generally follows the Olympic Dam Highway with the pipeline diverting to the east to avoid Woomera township.
- **Carrapateena mine lateral branch** - heads north-west from the main transfer pipeline, south of Lake Windabout. Construction of the Carrapateena mine lateral branch above ground has been considered as an alternative option in the EIS.

Construction of the pipeline will likely occur from south to north with two work fronts operating at most. Clearance of vegetation and grading of topsoil, initially with rolling of vegetation, then excavation, trenching, stringing (i.e. laying pipeline alongside trench) is expected to occur within the designated construction corridor.

The pipeline will be buried underground for the majority of the alignment. Sections which cross creeks will generally be constructed underground using open trench excavation in dry conditions. There will also be some locations which will require trenchless construction and others will require above-ground crossings. Highway crossings will most likely be constructed using trenching methodology with the pipe installed within an encasing pipe. Rail crossings are proposed to be constructed via trenchless methodology, with the pipe installed within an encasing pipe.



Typical construction layout for pipeline

The ultimate construction corridor width will be dependent on the outcomes of detailed design and related construction methodology. The maximum width for standard installation would be 40 m, however, the disturbance footprint may be narrowed in some locations due to construction constraints, or where extra workspace may be required in others.

Rehabilitation will commence following completion of construction activity and will be implemented progressively along the pipeline construction corridor as works are complete. Rehabilitation will involve respreading cleared topsoil and vegetation to encourage natural

regeneration. Additional rehabilitation methods (e.g. direct seeding) would only be implemented where required to supplement natural regeneration, following approximately 12 months of low intervention.

Pump stations and storage

The transfer system includes a series of transfer pump stations and product water storages (e.g. tanks, earth bank storage or other similar solutions) to move product water along the length of the main transfer pipeline.

Proposed pump stations, storages and tanks

Facility Name	Location
Mullaquana Station pump station	Mullaquana Station
Lincoln Gap pump station and storage	Lincoln Gap (Stuart Highway)
Kalaya pump station and storage	Kootaberra Station (Stuart Highway)
Mangata pump station and storage	Oakden Hills Station (Stuart Highway)
Carrapateena storage	Carrapateena Mine
Bimba storage (at the overall high point)	Arcoona Station (south of Pimba) (Stuart Highway)

Electricity supply infrastructure

New transmission lines, new network substations and upgraded substations are required to provide power to the desalination plant and the transfer pump stations. Facility substations would also be constructed within the pump station compounds incorporating electrical control rooms, electrical transformers and equipment.

Proposed Project electricity transmission infrastructure

Project electricity transmission infrastructure	Voltage
New transmission lines	
Mullaquana Station (desalination plant)	132kV
Pandurra (Lincoln Gap pump station)	275 kV
Bookaloo (Kalaya pump station)	132kV
Oakden Hills (Mangata pump station)	33kV
New network substations	
Mullaquana Substation (desalination plant)	132 kV
Kootaberra substation (Kalaya pump station)	275kV
Upgraded existing network substation	
Corraberra Hill substation (Lincoln Gap pump station)	275kV
Mount Gunson substation (Mangata pump station)	33 kV
Solar array and battery system	
Bimba (supply to Bimba storage)	n/a

It is likely that construction activities will proceed on several concurrent work fronts. Again, clearance of vegetation and grading of topsoil will commence with rolling of the vegetation and stockpiling of topsoil for use in rehabilitation. Following establishment of access and clearing, concrete footings transmission towers will be constructed followed by the construction of substation infrastructure, and erection and dressing of structures and later stringing of towers. For transmission lines, an average disturbance footprint of 20 m per linear metre of transmission line is expected. Rehabilitation will occur as described previously for the transfer system construction.

Lattice towers are expected to be partially fabricated off-site and transported to the tower locations in sections for final assembly and erection. Monopoles will be delivered to the Project works sites in sections. Large crawler cranes will be used to lift tower sections into place for final assembly.

The substation sites will house primary plant such as gantries, switch gear, transformers, control buildings, lighting and lightning masts and will be surrounded by a palisade perimeter fence. Substation construction activities typically include site clearance (i.e. removal of vegetation and topsoil), earthworks (i.e. bench formation, drainage and foundation construction) and installation of transformers and other electrical works.

Areas of temporary disturbance would be cleaned up and rehabilitated in accordance with requirements of the Project Construction Environmental Management Plan(s) (CEMP) and Restoration and Rehabilitation Plan.

STAKEHOLDER CONSULTATION

Engagement to date

Comprehensive community and stakeholder engagement has been undertaken progressively since project commencement in 2022 to support planning and design, land access and investigations. Concerns, suggestions and benefits raised by stakeholders have been considered and influenced the planning of the EIS and Project design.

Key stakeholders relevant to the Project were identified early in the planning and site selection process. As the Project progressed and more information became available about site locations, potential impacts and benefits, and stakeholder concerns, the stakeholder list was updated, and a range of meetings, workshops, surveys, reference groups and forums were undertaken.

Engagement and communication activities have included a broad range of methods tailored to different stakeholder groups and stages of the Project such as meetings, emails, phone calls, community events, stakeholder briefings and registrations of interest. The engagement has involved Traditional Owners, Aboriginal communities and stakeholders across government, industry, business, fisheries and aquaculture, environmental organisations, landholders, local residents (including shack owners) and the wider community.

The most frequently raised engagement topics during the late 2024 – August 2026 period related to:

- desalination plant options and preferred site selection

- marine and coastal environment considerations
- Project timing and assessment pathways
- environmental investigations and impact assessment processes
- employment and local business participation opportunities.

IMPACT ASSESSMENT

In addition to ensuring each Assessment Requirement is addressed, the EIS is required to provide a clear and comprehensive analysis of the proposed development, the existing environment in which it will be located (physical and socio-economic), the likely impacts of the development and how those impacts will be addressed.

The following key issues were identified by the SPC to be addressed in the EIS:

- effects on marine flora and fauna, ecological processes, and marine-based industry including recreational and commercial fisheries and aquaculture
- effects on terrestrial flora and fauna
- effects on MNES under the EPBC Act including listed threatened species and communities
- effects on Aboriginal cultural heritage
- economic and social effects for local and regional communities, and the State.

Land Use and Site Considerations

Use of land

The existing land uses in the Project Area are dominated by pastoral grazing over native vegetation (i.e. has not been extensively cleared for agriculture) and mining operations. The main forms of land tenure which interface with the Project Area include freehold, Crown lease and Crown Record (including State and Commonwealth land) as well as a number of resource and renewable energy tenements which interface with the Project.

Both the Kokatha People and Barngarla People have had areas of Native Title determined by the Federal Court in the Project Area. Native Title exists over much of the area associated with the transfer system between Whyalla and Olympic Dam, including pastoral leases and the Department of Defence's Cultana Training Area, but has been extinguished over Mullaquana Station and other adjacent Perpetual Crown Leases. It also continues to exist within coastal Crown land adjacent to Mullaquana Station.

Existing major infrastructure in the vicinity of the Project includes high voltage overhead transmission lines and substations, renewable energy facilities, water and hydrocarbon transmission pipelines, State and council-maintained roads, railway lines, and regional airports and airstrips.

Over the ~406 km of the Project, there is a realistic potential for Project activities to temporarily (during construction) or permanently (due to operations) affect some existing and future land uses.

The *Northern Water Project (Land and Infrastructure) Act 2026*, is special purpose legislation which provides a Project-specific framework for access to land and the acquisition of

interests in land required for delivery of the Project. The Act was passed by the Parliament in September 2026 and will commence on a day to be fixed by proclamation.

Key findings

- The majority of the Project's footprint (both in construction and operation) will be for the pipeline. Occupation for construction in any one location will generally be for days or weeks. In operation, the pipeline will be largely below ground and will require establishment of an easement, with limited impact on prior land use.
- Land Access Management Plans and property-specific Land Management Plans developed in consultation with landholders will minimise the potential for disruption to landholder operations, amenity and property infrastructure during the construction phase.
- Impacts to land use from land disturbance from pipeline and transmission line construction will be minimised by post-construction reinstatement and landholder consultation.
- DIT is engaging with the representatives of the Barngarla and Kokatha Peoples with the aim of negotiating the terms of Indigenous Land Use Agreements in accordance with the Commonwealth Native Title Act to enable the Project to proceed within their Native Title determination areas.

Use of marine waters

The USG supports key commercial fisheries, tourism, recreational boating and fishing, aquaculture, and major shipping and port infrastructure. Significant commercial and recreational fisheries in the vicinity of the Project include Western King Prawn, Snapper, King George Whiting, Garfish and Blue Swimmer Crab. Nursery sites for juvenile prawns, Snapper and King George Whiting are also recognised in the area.

There are no marine protected areas within 8 km of the marine Project Area. The EPBC Act listed Cuttlefish Coast Sanctuary Zone National Heritage Place is located approximately 34 km north-east of the outfall diffuser at the desalination plant. There are no marine aquaculture zones within 40 km of the desalination plant site.

Spencer Gulf waters offshore from the desalination plant site are an important shipping lane for export of bulk goods and petroleum products from Whyalla, Port Pirie and Port Bonython. The shipping navigation channel ('the recommended track') is located approximately 7 km east of the likely location of any of the Project's seabed infrastructure.

A marine exclusion zone of approximately 112 ha (which represents approximately 0.006% of Spencer Gulf waters), will be established around the location of the intake and outfall infrastructure to ensure the safety of the infrastructure located on the seabed, as well as construction vessels and operators, and other marine users.

Key findings

- Desalination plant design and implementation of a Marine and Coastal Environmental Construction and Operations Management Plans will minimise impacts to nearby marine parks.

- The marine exclusion zone will be necessary to protect desalination plant marine infrastructure and the safety of nearby users of marine waters. However, in the context of Spencer Gulf, the exclusion zone will have a negligible impact on the area available for marine activities including commercial fisheries.

Physical Environment

Coastal processes

Coastal zone ecosystems are influenced by a range of dynamic interactions and forces including wave action, tides, currents, sediment transport and storm surges. Understanding these processes is essential for assessing impacts from proposed coastal infrastructure projects.

At Mullaquana Station, the coastal zone comprises a low coastal plain which is subject to tidal inundation. The coastal area is largely saltmarsh, with beach ridges and short tidal channels with areas of mangrove behind extensive areas of low-tide sand and inter-tidal seagrass.

The subtidal environment at Mullaquana Station is generally sandy and flat with large seagrass beds that transition to sandy habitats in deeper water. Dense *Posidonia* seagrasses dominate the shallower areas to approximately -13 m depth (AHD), then transition to *Zostera* seagrass out to approximately -16 m depth (AHD). Beyond -16 m (AHD) bare sand dominates.

Onshore and marine construction activities particularly those that disturb the seabed have the potential to impact the coastal environment at Mullaquana Station.

Key findings

- There will be no construction in the active coastal zone, intertidal areas, coastal dunes, mangroves or *Posidonia* seagrass at the desalination plant site.
- The preferred TBM spoil strategy involves dewatering of TBM spoil via retention and sedimentation basins on land adjacent to the Mullaquana Station construction site.
- Some localised seabed disturbance and turbidity may occur surrounding the marine construction zones but is unlikely to impact upon coastal processes.
- There will be no ongoing impact to coastal processes or the coastal environment from the presence of the intake and outfall structures due to their significant distance from the coast and their depth.

Soils, landform and geology

Due to the nature of construction activities and the geographic coverage of the Project, a variety of landforms and soils will be subject to the effects of land disturbance. Key issues with the potential to affect soil and landform during Project construction include erosion potential, soil salinity, potential acid sulfate soils and localised contamination risk. The temporary but significant earthworks and vegetation clearance required for construction of the pipeline also have the potential to impact soils and landform if not managed appropriately.

Key findings

- Best practice erosion and sedimentation control measures will be implemented to minimise risk to soils and surface waters, maintain soil viability and minimise loss of topsoil.
- Pipeline construction methodology and appropriate management will prevent mobilisation of known and encountered acid sulfate soils and previously contaminated soil.
- Design of the transfer system and the desalination plant intake and outfall box cut and tunnels has considered risks of soil stability and ground subsidence over infrastructure design life.
- Implementation of appropriate storage and handling of fuels and chemicals and proactive spill management will minimise risks of soil contamination during construction and operation.

Surface water

Across the Project Area surface water features are scarce and include predominantly ill-defined or ephemeral watercourses, salt lakes and clay pan depressions. Surface water is typically absent for long periods, with flows occurring only after significant rainfall. Water quality is therefore highly variable ranging from fresh during rainfall runoff events to highly saline as evaporation concentrates salts.

Construction of the transfer system pipeline (and watercourse crossings in particular) and site run-off at the desalination plant are the primary potential sources of impacts to surface water.

Key findings

- There are no watercourses within the desalination plant site. Topography is generally sloping towards the east and clean runoff from upstream of the Project site will be diverted around the desalination plant and directed to a clay pan south-east of the site.
- Stormwater management at the desalination plant site is designed to separate stormwater catchments by potential contaminants to allow the most appropriate treatment for each catchment. Stormwater management for substations and pump stations will follow the same principles.
- All of the more than 200 watercourses crossed by the pipeline are ephemeral allowing construction to be undertaken while dry to prevent impacts to surface water and aquatic ecosystems. Control strategies are proposed to prevent run-off from impacting upon surface water if present.

Groundwater

The box cut, decline and TBM launch facilities at the desalination plant site are predicted to intersect the groundwater table while trenching of the pipeline and excavation of shafts for trenchless construction have the potential to intersect areas of shallow groundwater, most likely near watercourses.

Inflows of groundwater into excavations during construction have the potential to lower the groundwater table and reduce the water available to surrounding users, including groundwater dependent ecosystems (GDEs). Unmitigated reduction in groundwater levels from areas of potential acid sulfate soils (PASS) have the potential to allow oxidation leading to formation on sulphuric acid in these soils.

Key findings

- There is potential for short-term groundwater inflows and drawdown during installation of construction shafts (for pipeline trenchless construction) and pipeline trenching activities at some watercourses, highways and railway crossings.
- Short-term groundwater drawdown is expected at the desalination plant site during construction of the box cut, decline and TBM launch facilities. Proposed mitigation and management measures will be effective in ensuring there are no unacceptable impacts from PASS, and no unacceptable impacts to GDEs, threatened ecological communities or registered groundwater users.
- Any short-term reduction in groundwater levels due to dewatering from pipeline excavations is not expected to impact GDEs or registered groundwater users.

Biological Environment

Biosecurity

Terrestrial / aquatic

Key Project activities with potential to increase the level of pest fauna species include inappropriate management of waste (creating a food source for pest species), temporary increase in available surface water during construction (providing a new water source), and creation of access tracks and linear infrastructure (creating preferential corridors for pest species to travel).

During construction, vehicle movements present a possible source of weeds on tyres and vehicles which could introduce weeds into new areas. Ground disturbance can also remove established plant species making it easier for weed species to colonise an area. Buffel Grass has been noted as a specific concern by a number of stakeholders and there are known records in the Project Area, particularly along the Stuart, Eyre and Lincoln Highways.

Key findings

- Project activities and the presence of access tracks and other operational infrastructure are not expected to result in an increase in the existing level of pest species as existing access tracks will predominantly be utilised to access the Project during construction.
- Pest management would be carried out in consultation with landholders, the Eyre Peninsula and South Australian Arid Lands Landscape Boards, local councils and PIRSA as required. A specific focus will be on ensuring that pest risks are managed across the length of the pipeline and across Landscape Regions.
- Best practice vehicle hygiene during Project activities will be implemented to minimise the risk of introducing or spreading weeds, pests or pathogens, with a specific focus on preventing spread across Landscape Regions.

Marine

New invasive species may be introduced to the site via biofouling of Project vessels and equipment, or via external sources such as infected vessels.

Disturbed habitats, including marine construction sites, are particularly suitable settling habitat for invasive marine species and the introduction of new artificial habitat (the intake and outfall structures) would provide suitable settling substrate for opportunistic species.

Key finding

- The impact to marine ecology from the introduction, establishment or spread of marine invasive species during construction and operation will be effectively mitigated and managed. Appropriate and industry standard strategies would be adopted to mitigate invasive marine species (to be confirmed as part of detailed design and in operational management plans).

Marine flora and fauna

Key marine environmental values relevant to the Mullaquana Station site include mangroves, intertidal flats and seagrass beds, some of which provide key nursery and recruitment areas for important fisheries (particularly Western King Prawn, Snapper and Whiting) and marine water quality. Potential impacts to the marine environment at Mullaquana Station and its values have been assessed through detailed baseline studies and an impact assessment including ecotoxicology investigations and marine hydrodynamic modelling.

Operation of the Project involves seawater extraction and discharge of desalination plant return water into Spencer Gulf waters. Environmental considerations have been critical in driving the design and siting of the desalination plant.

Key findings

Construction

- The tunnelling construction methodology for the intake and outfall has been adopted to minimise impacts on sensitive intertidal and benthic habitats (intertidal mangroves, tidal flats and Posidonia dominated seagrass beds are avoided).
- The Reference Design requires a small area (0.25 ha) of Zostera seagrass disturbance to allow for construction of the intake (including 0.1 ha of temporary clearance from which this opportunistic species is expected to rapidly recover).
- There may be short-term localised disturbance associated with construction of the intake and outfall structures including intermittent underwater noise, dredging, limited marine construction wastewater discharges and increased construction vessels in the vicinity.

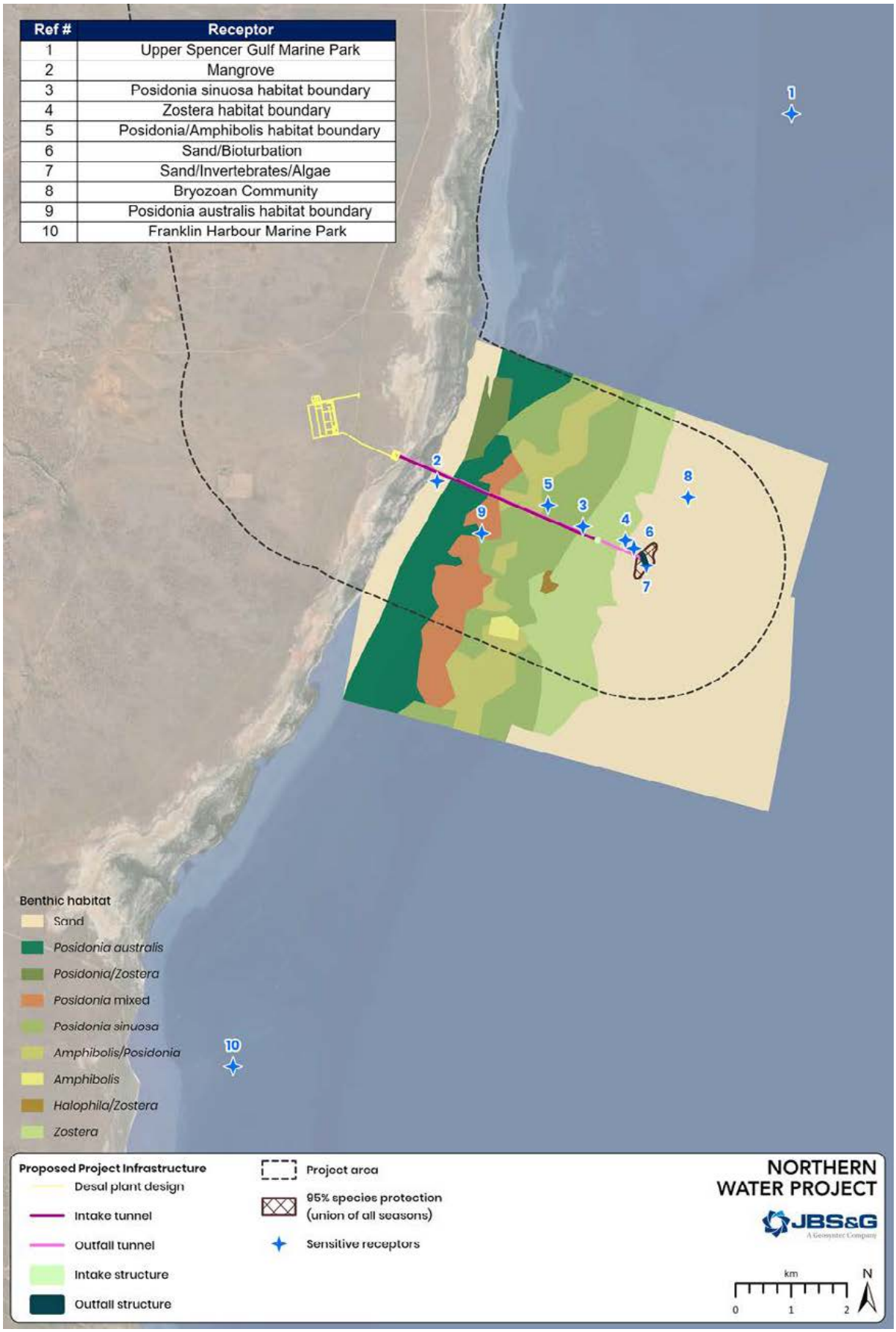
Operation

- During operation, potential return water impacts are expected to be localised to the immediate vicinity around the diffuser, and predominantly over sandy habitats. Seagrass and mangrove communities will not be affected.

- The return water has a limited zone of potential ecological effect.[2]
- 95% of species would be protected from chronic impacts associated with the return water beyond 370 m of the diffusers.
- Salinity beyond the immediate vicinity of the diffusers would remain within the range of natural seasonal variability (38 and 41 g/L) for most of the year.
- In addition to the limited zone of potential ecological effect and that salinity changes are within natural seasonal variability, fish and other mobile marine fauna generally have the ability to move away from the diffuser or osmoregulate in response to elevated salinity.
- Most of the sessile fauna recorded in the EIS marine study area have a tolerance for higher salinity than would be found near the diffuser (as inferred from their distribution in the USG).
- Of the few species that are potentially less tolerant of changes in salinity, most inhabit the seagrass habitat, throughout which more than 99% of species would be protected from chronic impacts associated with the return water.
- Duration and extent of potential stratification as a result of the return water would be insufficient to impact near bed dissolved oxygen concentrations.
- Total suspended solids modelling results conclude that discharging desalination plant backwash into the outfall/return water will have no impact on the receiving environment as modelled changes in total suspended solids are small and within natural variation.
- The gulf wide assessment predicted that far-field salinity changes are within the range of natural salinity variability within the gulf.
- Under conservative worst-case scenarios, the proportion of larvae in Spencer Gulf predicted to be entrained into the desalination plant intake is very low: **0.13%** for Prawn, **0.0002%** for King George Whiting, and **0.019 to 0.24%** for Snapper.

Key marine aspects of the EIS have undergone an independent peer review process. Each of the independent peer reviewers have provided the results of their review in Appendix G-17.

[2] The 'zone of potential ecological effect' is defined as the union of the 10th percentile dilution contours for 95% species protection levels for all seasons at 51 GL/y (refer Chapter 11 for more details).



Sensitive receptors in relation to the zone of potential ecological effect (51GL/y - union of the 10th percentile dilution contours for 95% species protection levels for all seasons)

Terrestrial flora and fauna

The key terrestrial flora and fauna values in the Project Area are the extensive vegetation communities, fauna habitats and small number of threatened species that are present. The Project Area has not been subject to broadscale clearance and supports native vegetation in generally in moderate to good condition. Vegetation is dominated by chenopod shrublands and low open woodlands, with extensive areas of very low open shrublands on stony tableland near Woomera, and low open woodlands in dunefields at the northern end. The vegetation types present are common and widespread, and other than the coastal saltmarsh adjacent to the desalination plant site (outside the disturbance footprint), none are listed as threatened. No EPBC-listed threatened flora species (and very few State-listed threatened flora species) have been detected in field surveys or are likely to occur.

The Project Area traverses widespread habitat for a small number of EPBC-listed threatened fauna species, including Western Grasswren (listed as Vulnerable), which is present in the southern section, and Plains Mouse (Vulnerable), which has not been detected, but suitable habitat is present in stony tableland north and south of Woomera. The Project Area contains very limited suitable habitat for migratory species. Declared weeds are generally uncommon, however Buffel Grass is known to occur, mainly along highways.

Key findings

The Project has used the avoidance and mitigation hierarchy (avoidance, minimisation, rehabilitation, offset) as a driving principle to minimise impacts on terrestrial flora and fauna.

General

- Approximately 1,992 hectares of terrestrial native vegetation will be cleared during construction along the approximately 406 km length of the Project. The majority of this is temporary and represents a very small proportion of native vegetation in the region traversed by the Project. It will be offset by achieving a 'Significant Environmental Benefit' in accordance with the *Native Vegetation Act 1991.*
- Progressive rehabilitation of temporary disturbance following construction will be undertaken in accordance with the Project's rehabilitation framework and management plans and will reduce the long-term impact of vegetation clearance
- Route selection has prioritised avoidance of conservation areas. There are no areas protected under the *National Parks and Wildlife Act 1972* or areas under native vegetation heritage agreement under the *Native Vegetation Act 1991* at the desalination plant site or on the transfer system alignment.

Threatened species and ecological communities

- There are no Critically Endangered or Endangered TECs present and there is no expected impact to TECs listed as Vulnerable under the EPBC Act.
- The Project will not impact any State-listed TECs.
- There are no impacts expected to any EPBC-listed flora.
- The project is not expected to have a significant impact on any species of EPBC-listed fauna except Western Grasswren (Commonwealth Vulnerable). It may have a residual significant impact on this species which will be compensated for by implementation of offsets. No long-term impacts to EPBC-listed fauna are expected.

- No significant impacts to EPBC-listed migratory fauna are expected.
- No significant or long-term impacts to State-listed flora and fauna are expected.

Indirect impacts

- The Project will not significantly increase habitat fragmentation.
- Indirect impacts to vegetation and fauna habitats will be short term and limited in extent.
- Lighting at the desalination plant during operation will not have a significant impact on any species and lighting effects at camps and other sites during construction will be short term and localised and will not have a significant impact on fauna.
- Noise disturbance during construction will be temporary and localised and will not have a significant impact on fauna.
- Noise generated during operation at the desalination plant and pump station sites during operation will be localised and will not have a significant impact on fauna.
- Measures will be implemented to minimise the incidence of fauna injury or mortality during construction. Any impacts would be short term and localised to the work front and are not likely to have a significant impact on any species.
- Potential for collision with transmission line infrastructure is not expected to have a significant impact on any species.
- Construction activities may temporarily displace fauna species with no expected long-term population impacts.
- The potential for cumulative impacts with other proposed projects is limited. There is some potential for cumulative impact on Western Grasswren, however with rehabilitation and implementation of offsets, any impact is likely to be short-term.

Amenity and Environmental Quality

Air quality

Existing air quality in the Project Area is mainly influenced by pastoral land uses, vehicle movements on unsealed roads, occasional dust storms and industrial, mining, and port activities around Whyalla, Olympic Dam and Carrapateena. Sensitive receptors potentially include rural homesteads, townships, public rest areas, commercial premises and historic sites. The nearest receptor to the desalination plant is Mullaquana Station homestead, more than 4 km west of the site.

Project construction and operation activities are potential sources of particulate matter and other emissions (Including odour) which if not appropriately managed can have adverse health or amenity effects on nearby sensitive receptors including people, flora and fauna.

Key findings

Construction

- Potential air quality impacts will primarily be related to dust associated with soil disturbance due to vegetation clearance, earthworks (including temporary stockpiling), vehicle movements on unsealed roads and general construction activities for the desalination plant and transfer system infrastructure.

- Although dust will be generated by construction activities, the region traversed by the Project is generally sparsely populated, with only three locations where sensitive receptors are within 250 m of construction activities (including potential laydown locations).
- With implementation of industry standard control measures, air quality impacts due to nuisance dust, PM_{10} and $PM_{2.5}$ emissions at these sensitive receptor locations are expected to be minor and short-term.
- Due to the distance of the nearest sensitive receptor from the desalination plant storage areas for saturated marine sediments (greater than 4 km), no odour impacts are expected during construction.

Operations

- Plant design and appropriate waste management procedures will minimise the potential for odour impacts from storage of fine solids received via the seawater intake during operations.
- Impacts of operational air emissions are expected to be negligible and limited to minor short-term dust from regular but infrequent Project inspection, maintenance and monitoring activities. These impacts will be typical of existing light vehicle movements on unsealed roads.

Noise and vibration

The existing acoustic environment is typical of rural and remote South Australia, with low background noise levels and intermittent localised noise sources. Existing noise sources at the desalination plant site include wind, insects and birds, with occasional vehicle and agricultural noise. Along the transfer system and electricity infrastructure corridor, existing noise sources include road traffic, rail movements, mining and industrial activity, generators at homesteads and outstations, and occasional aircraft or defence-related noise near Woomera.

Potential sensitive receptors include residential receptors (e.g. homesteads at Mullaquana Station and Lincoln Gap, residents at Pimba, Woomera, Roxby Downs and Olympic Dam Village), and public use areas, such as highway rest areas.

Project construction and operation activities are potential sources of noise and vibration which if not appropriately managed can have adverse health or amenity effects on nearby sensitive receptors including people, fauna and structures.

Key findings

- Potential impacts to the amenity of sensitive terrestrial receptors due to construction noise will be minimised through implementation of noise mitigation measures in Project design and construction activity planning.
- Laydown areas and construction camps along the transfer system alignment have been located away from sensitive receptors and adverse amenity impacts are not expected.
- Construction (including piling) at the desalination plant is unlikely to impact sensitive receptors due to the separation distance and adherence to Australian Standards.

- Impacts from the operation of the desalination plant will be below recognised thresholds for amenity noise with proposed mitigations in place.
- Noise and vibration from operation of the pump stations along the transfer system are not expected to adversely impact sensitive receptors due to the short-term nature of exposure (Kalaya pump station) or absence of sensitive receptors (Mangata pump station).
- Noise mitigation measures proposed for the pump station at Lincoln Gap will minimise adverse noise impacts at the nearest sensitive receptor.
- Vibration levels are expected to remain below human comfort thresholds. Short duration perceptible effects may occur during close-proximity activities but these are not expected to result in exceedance of acceptable limits.

Traffic and transport

Road

Key arterial routes that will be affected by the Project include the Lincoln, Eyre, Stuart, Olympic Dam and Iron Knob highways, all of which carry a mix of general traffic and relatively high proportions of heavy vehicles. Local access to the desalination plant site is currently via Horseshoe Road, Mullaquana Road and Eight Mile Creek Road, however a new access from Lincoln Highway to Eight Mile Creek Road following the pipeline alignment is considered in the EIS.

Key findings

- A Construction Traffic Management Plan (CTMP) will be developed by the Design Build, Operate Maintain (DBOM) Contractor in consultation with DIT and relevant councils to minimise the impacts of Project vehicle movements within towns, and on highways and local roads.
- Impacts to community amenity due to construction traffic will be managed through the CEMP and the CTMP. Impacts (with mitigations in place) are expected to be short-term and minor.
- Peak traffic volumes during construction and operation of the Project are likely to be well within the capacity of roads on proposed transport routes and impacts on the existing traffic network are expected to be minor.
- Movement of Oversize Overmass (OSOM) vehicles will be in accordance with National Heavy Vehicle Regulator (NHVR) requirements and the Project CTMP. Road condition audits and inspections will minimise the potential for impacts to road pavements from heavy and OSOM (Oversize Overmass) vehicle movements.
- The Project will consider implementation of enhanced turn treatments at specific Project site access intersections on the Lincoln, Eyre, Stuart and Olympic Dam highways to improve road safety.

Marine

Maritime activity in the USG includes commercial shipping, harbour support vessels, commercial fishing, tourism operators and recreational boating. Existing vessel traffic offshore from Mullaquana Station is low, and the main shipping navigation channel is located well east of the proposed desalination plant marine infrastructure area.

Key findings

- A minor localised and temporary increase to overall maritime vessel traffic is expected during marine construction, however, due to the small number of Project vessels and low frequency of vessel movements, impacts to existing maritime users are not expected.
- Implementation of the Marine and Coastal Construction Environmental Management Plan (MCCEMP) will minimise impacts to marine operations due to Project construction vessel movements.
- A marine exclusion zone will be implemented for construction and operation of the desalination plant marine intake and outfall structures to protect Project infrastructure and public safety. Due to the low level of marine vessel traffic in the vicinity of the exclusion zone and its small area in the context of the Spencer Gulf, impacts to vessel movements are not expected.

Rail

The region contains several rail assets, including the transcontinental rail line through Port Augusta and Pimba, the Whyalla to Port Augusta rail line, the SIMEC iron ore rail line serving the Middleback Range and Whyalla Port, and the Pimba spur line. These rail lines support interstate passenger services, interstate and regional freight, iron ore haulage and emerging logistics opportunities.

Key findings

- Impacts to railway freight and passenger services are not expected due to use of trenchless pipeline construction methodology at rail line crossings. Methodology and timing will be developed in consultation with railway operators to ensure design, construction and safety standards and requirements are met.

Air

Regional air services are provided through airports at Whyalla, Port Augusta and Olympic Dam. Smaller registered and unregistered airstrips occur throughout the broader region, associated with mining, pastoral, tourism, defence and emergency service activities.

Key findings

- Use of air services by Fly-in Fly-out (FIFO) construction workforce is not expected to negatively impact the capacity and cost of flights to and from Whyalla, Port Augusta and Olympic Dam.
- Air transport planning will be undertaken by the DBOM Contractor in collaboration with airport operators, owners and carriers to ensure that potential cost and capacity impacts on the community are minimised.
- The potential for wire strike or other collision with new transmission lines by low-flying aircraft will be mitigated through industry standard controls (e.g. marking of transmission line conductors), consultation with the Civil Aviation Safety Authority (CASA) and operation of air safety regulations.

Landscape character and visual amenity

Landscape and visual impact refers to how a proposed development may affect landscape character or a view and the way that people perceive that change. There will be a range of perceptions and opinions in the community about the scenic quality of the landscape, sensitivity of particular locations to change and the acceptability of the visual changes associated with the Project. It is acknowledged that the impact levels presented in the EIS may not align with the views of all community members, landholders or residents. In some cases, individuals may perceive the visual effects of the Project as more significant than indicated by the assessment due to the connection to or value they place on particular landscapes, views or places.

Key findings

- Changes to visual amenity will be experienced at sensitive visual receptors in the vicinity of construction activities. This will largely be due to the presence and movement of heavy equipment and vehicles at, and to and from the site, lighting of construction sites and an overall increase in the number of people present.
- Once constructed, the desalination plant, new transmission line and substation have been assessed as having a minor impact overall on landscape character and visual amenity for some onshore and offshore sensitive receptor locations. Depending on the location, these include Cowleds Landing, Nonowie Station homestead, travellers on the Lincoln Highway, and users of marine waters. Impacts of the desalination plant are generally mitigated by the distance from sensitive receptors.
    - Mullaquana Station is the closest sensitive receptor and will therefore experience the most significant change to visual amenity both as a working pastoral property and place of occupation.
- Outside both the 5km and 10km Zones of Theoretical Visual Impact, the desalination plant and the north-south alignment of the Mullaquana transmission line will have no discernible impact on the wider landscape and be a largely inconsequential feature within panoramic views from publicly accessible vantage spots.
- Transfer system construction phase impacts will be limited to the short period that construction activities will be underway in a particular location.
- Pump stations, storages and transmission lines will be visible and in some cases prominent when viewed from major highways, however visual impacts will largely be fleeting and temporary for the majority of visual receptors.

Social and Community

Aboriginal cultural heritage

Protection of Aboriginal cultural heritage has been a significant focus in Project planning and design and will continue to be during Project construction and operation. There are many areas of South Australia which have never been the subject of comprehensive Aboriginal heritage survey, meaning that there is potential for Aboriginal heritage to be revealed or discovered where there is no other indication of its presence

The key stakeholders for Aboriginal cultural heritage are the Traditional Owners and Native Title parties across the Project Area. The Kokatha and Barngarla Peoples have had areas of Native Title determined by the Federal Court and are the primary Traditional Owners for consultation on the Project and the undertaking of cultural heritage surveys.

Engagement and consultation activities with the Barngarla and Kokatha include initial engagement and consultation, protocols and agreement-making and cultural heritage surveys.

It is recognised that the Project may also be of interest to Aboriginal people and communities beyond the two recognised Native Title holders. Consultation with these groups has commenced and will continue as the Project progresses.

Key findings

- Due to appropriate infrastructure site and alignment selection, engagement with Traditional Owners and the undertaking of cultural heritage surveys, no known cultural heritage will be impacted by the Project.
- The Project construction and operational activities have been designed so as not to impact Aboriginal cultural heritage, as long as agreed cultural heritage management measures are implemented appropriately.
- Inadvertent discovery of Aboriginal sites, objects or ancestral remains during construction, operations or maintenance will be addressed by the heritage management processes agreed through Indigenous Land Use Agreement (ILUA) negotiations.
- CHMPs will be prepared in consultation with, and for endorsement by, the relevant Recognised Aboriginal Representative Bodies (RARB) / Traditional Owners. They will address both Design and Build, as well as Operate and Maintain phases of the Project.
- To create greater certainty for the Project in the event that unexpected cultural heritage discoveries occur during works, an authorisation under the Aboriginal Heritage Act will be sought subsequent to the ILUA negotiation process.

Non-Aboriginal cultural heritage

Post-European contact, the Eyre Peninsula and Far North regions reflect a long history of exploration and pioneering agricultural, pastoral, maritime and mining settlement and enterprise. Listed cultural heritage sites and places in these regions reflect this history and include buildings, maritime infrastructure and shipwrecks, and sites of special geological interest. More recently Defence facilities established around Whyalla and Woomera have introduced new heritage and historical values to the region.

Key findings

- Project infrastructure siting and alignment selection has avoided known sites and places of non-Aboriginal cultural heritage significance.
- As there are no Commonwealth, National, State or Local heritage places mapped within 5 km of the Project Area, impacts to known non-Aboriginal heritage due to Project construction are not expected.

- Sites or objects that may be discovered during construction activities will be managed by implementing unexpected discovery procedures in the CEMP and in accordance with relevant legislation and guidelines.
- Unexpected finds of historic shipwreck material will be managed by implementing procedures in the Marine and Coastal Construction Environmental Management Plan and in accordance with relevant legislation and guidelines.

Social environment

Maximising the benefits and understanding and reducing potential negative social impacts of the Northern Water Project to local and regional communities is a key focus in the design and management of the Project and is the driver of ongoing engagement with affected landholders and other key stakeholders.

Poorly managed construction impacts can affect quality of life, community wellbeing and perceptions of the Project. Key concerns raised in community engagement related to protection of the marine environment, roads and transport, noise and vibration, landscape and visual amenity, workforce accommodation pressures and broader community impacts associated with construction activity.

While social impact assessment includes addressing the potential impacts of the Project on the existing lifestyles and amenity of local communities, landholders and individuals, there is also a clear interrelationship between economic impacts and benefits, and community and social wellbeing.

Key findings

- The Project has the potential to contribute to broader economic revitalisation and to reinforce community confidence, sense of place and resilience across the Project Area.
- The Project represents a significant economic opportunity for the Upper Spencer Gulf and Far North, generating substantial demand for labour, goods and services across an extended construction period. Project requirements for local procurement will benefit local communities by providing opportunities for local industries, businesses service providers and workforce.
- Early and ongoing engagement with local communities will minimise the potential for impacts to social cohesion due to the presence of the construction workforce.
- The Project will seek to minimise impacts on local housing availability and affordability by accommodating the majority of non-local construction workers in a combination temporary workforce accommodation, existing short-stay accommodation, and where appropriate, marine based accommodation facilities.
- Impacts to local housing availability and affordability from the operational workforce will be negligible due to the relatively small number of long-term staff required.
- Presence of construction workforce is not expected to negatively impact access to local services.
- Impacts to community amenity (e.g. air quality, noise, traffic, visual and the marine environment) have been assessed in the EIS and with proposed mitigation measures in place the overall impacts to community amenity are expected to be minor.

Local Regional and State Economies

Economic environment

The Project is designed to support economic growth through the provision of a new, sustainable, climate resilient water source for industry in the Upper Spencer Gulf and the Far North regions of South Australia. In maximising the economic benefits of the Project across these regions and the State more broadly, there is also a commitment to reducing or avoiding potential negative economic impacts.

The Project seeks to deliver tangible local employment and business participation outcomes, while also protecting industries such as commercial fishing, aquaculture, tourism, agriculture and associated local supply chains.

Key findings

- The Project will have a significant economic benefit to the local communities in the Upper Spencer Gulf and northern South Australia with a State benefit to cost ratio of 1.25, and to the Australian economy with a national BCR of 1.75 (meaning the benefits outweigh the costs).
- Between 2026 and 2062, Gross Regional Product (GRP) in Northern South Australia could be approximately $3 billion larger on average and Gross State Product (GSP) $3.3 billion larger on average as a result of the Project.
- In average annual terms, between 2026 and 2062, an additional 2,000 FTEs are expected to be employed across South Australia, with 1,600 in Northern South Australia.
- Economic impacts to commercial fisheries and aquaculture from Project construction and the ongoing presence of Project infrastructure are expected to be negligible.
- Ongoing engagement with local business, workforce and industry stakeholders will maximise local employment, procurement and business participation in the Project.

Climate Change and Resource Efficiency

Climate change adaptation

Any proposed development is increasingly required to demonstrate resilience to the impacts of a changing climate in the longer term. In the context of the Project, consideration of climate change adaptation includes securing the coastal environment against increased coastal erosion and flooding, reducing risk and building resilience to more frequent and severe bushfires, storms, floods and heatwaves.

Key findings

- The primary climate variables with potential to impact the Project are increased ambient temperatures, increased frequency and intensity of heatwaves, increased rainfall intensity and surface water flooding, and changing marine conditions. Climate adaptation design and system controls have been planned and incorporated into the Project design.
- No residual extreme or high risks for the Project are expected from projected climate change impacts. Climate adaptation design and system controls are already planned and incorporated into the Project.

- Under a continued high-emissions scenario (RCP 8.5), regional climate-driven salinity increase is predicted to substantially exceed the contribution from the desalination plant alone. Any changes to background conditions would have proportional impacts on desalination plant outfall return water and are not expected to result in any cumulative impacts.
- Residual risks from climate change to the Project have been assessed as Low to Medium and acceptable.
- During detailed design, further consideration will be given to changing climate conditions relevant to Project infrastructure components and evaluation of the appropriateness of design and engineering changes.

Greenhouse gas (GHG) emissions

Increasing concentrations of GHGs in the atmosphere are known to contribute to climate change. Reducing these emissions across the life cycle of the Project would reduce the potential of the Project to contribute to GHG-related climate change.

Key findings

- Project construction is estimated to result in approximately 1.14 $MtCO_2e$ (mega tonnes of carbon dioxide equivalent) emissions, largely due to the manufacturing of pipeline and other construction materials. Opportunities to reduce GHG emissions during construction through use of low emission construction materials such low emission concrete are being investigated.
- Electricity use, primarily for water treatment and distribution, is the largest GHG contributor during operations. The emission impacts of this energy use will be mitigated through the Project's commitment to use 100% renewable electricity during operations, reducing total life of project emissions from 4.8 $MtCO_2e$ to approximately 3.2 $MtCO_2e$.
- Use of renewable electricity during operations will enable emissions reduction of over 33% compared to a case in which electricity was procured from the regular SA grid mix.
- Whilst the Project will result in an increase in the State's GHG emissions overall, it will provide a climate-resilient water supply to enable the continued operation and growth of industries that will contribute to decarbonisation efforts such as production of copper and critical minerals.

Sustainable use of resources

The Project is committed to supporting positive sustainability outcomes and long-term benefits. In developing its sustainability framework and key sustainability objectives the Project has drawn from State and Commonwealth legislative and policy drivers, and globally recognised sustainability standards and frameworks.

Sustainable procurement and efficient use of resources require consideration of inputs of natural resources, energy and water and the pollution produced from the manufacture, use and disposal of goods and biodiversity loss resulting from removal or alteration of natural resources.

Key findings

- Sustainability objectives have been integrated into the DBOM contract to ensure they are considered throughout the life of the Project.
- The primary contribution of the Project to South Australian circular economy and sustainability in the use of resources is by avoiding or optimising the use of raw materials.
- Specific circular economy strategies and sustainability principles have been integrated into the Project including design (climate resilience, efficiency and longevity), low emission / sustainable / locally sourced materials, water and energy conservation and emissions reduction.

Waste management

Minimising waste and disposal, and recovering materials for reuse, re-manufacturing and recycling are key sustainability considerations.

Key findings

- Project waste streams will be managed in accordance with the Waste Management Hierarchy which underpins the objectives of the EPA's Wastes to Resources Environment Protection Policy and is in line with South Australia's Waste Strategy. A Waste Management Plan will be prepared for Project construction and operation.

Hazards and Risks

The assessment in the EIS has considered hazards from bushfire, flooding, site and groundwater contamination, and dangerous substances (including marine spill management). A range of other hazards have also been considered including Harmful Algal Bloom (HAB), seismicity and unexploded ordnance.

Key findings

Bushfire

- There is a medium risk of Project construction activities accidently causing a bushfire. Industry standard control strategies set out in the Bushfire Risk Management Plan will reduce this risk to as low as reasonably practicable (ALARP).

Flooding

- Historical flooding risk at the desalination plant site is low. Desalination plant design will ensure that stormwater management will not increase the flood risk compared to existing conditions.
- Pump stations and substations have been located to minimise the risk of flooding and impacts to surface water flows.
- The pipeline will generally be located underground and will not change the flood risk to people, property, infrastructure, and the environment along the alignment.
- Stormwater management will not increase the flood risk at Project sites compared to existing baseline conditions.

Site and groundwater contamination

- There is a low risk of impacts to the environment caused by disturbance of existing known contamination during Project construction or operations.

Dangerous substances (including marine spill management)

- Transport, storage and disposal of dangerous substances will be in accordance with industry standard practice to reduce the risk to public safety to ALARP.
- Due to implementation of appropriate storage and handling of fuels and chemicals, there is a low risk of marine spills associated with the Project. In the event of a marine spills from a construction vessel industry standard control and mitigation measures will be implemented.
- Public exposure to the risk of uncontrolled blasts will be avoided through transport, storage and use of explosives in accordance with relevant legislation, standards and codes of practice.

Harmful algal bloom

- The Project design includes measures to remove algal organic matter and high suspended solids to maintain effective plant operation in case of a bloom.
- Localised changes to marine water quality during construction or operation are highly unlikely to result in conditions that would contribute to the onset of a HAB.

Department of Defence land

- Hazards management and emergency response in relation to Department of Defence land will be in accordance with the Project's broader health, safety and environmental management frameworks, and the Third Party Agreement between the Project and Defence.
- Exclusion zones will ensure no members of the public are close enough to construction to be impacted by potential UXO on former Defence land.

Electrocution

Hazard identification and mitigation is part of the ongoing detailed engineering design. Only one hazard assessed as part of the EIS is categorised as a high risk (after control strategies have been implemented) relating to risk of electrocution from high voltage transmission infrastructure (note, this is a rare likelihood and the risk is no different to all other high voltage transmission infrastructure within the State). The control strategies proposed have reduced the risk to As Low As Reasonably Practicable (ALARP).

Planning and Design Quality

The Project was assessed against relevant Zones, Subzones, Overlays and General Development Policies of the Planning and Design Code and the relevant State Planning Policies and Regional Plans.

Planning assessment

Key findings

- The Project overall is consistent with strategic planning instruments including the SPPs and applicable Regional Plans
- The Project overall is not inconsistent with the Code.
- The Project as a whole is consistent with the Remote Areas Zone, which hosts the majority of Project infrastructure.
- The Project as a whole is readily consistent with the relevant Hazards Overlays, including both bushfire and flooding Overlays.
- In areas where inconsistencies with applicable Zones, Subzones or Overlays are observed, no broader adverse impact is likely on the functionality or desired outcomes outside the Project's construction footprint.

CONCLUSION

The Northern Water EIS provides a comprehensive assessment of the Project and the expected effects on the receiving environment at a local, regional, state and national level. The EIS process is the highest level of assessment under the PDI Act and enables the holistic consideration of projects that are considered to be of economic, social or environmental importance to South Australia.

The Commonwealth Environment Minister has accredited the EIS process under the PDI Act to assess the controlled action for the Project. The State and Commonwealth governments liaised on the draft ARs for the EIS to ensure they met the requirements of South Australian and Commonwealth legislation. One EIS has been prepared, one period of public consultation is being undertaken, one Response Document and one Assessment Report will be developed to satisfy the legislative requirements of each jurisdiction.

The EIS is based on a significant body of technical studies and assessments. All of the EIS ARs set by the State and Commonwealth governments have been addressed through the application of sound science, evidence and reasoning.

Secure and reliable water supply is a critical constraint on development in regional South Australia, identified in SA's *Copper Strategy* and the State Government's *Water Security Statement 2022 – Water for Sustainable Growth.* Both strategies identify long-term water security as fundamental to economic growth and climate adaptation in South Australia.

If approved, the Northern Water Project would provide a climate-resilient water source to northern South Australia while delivering benefits to the USG and Far North regions of the state. Project benefits include:

- Increased economic activity
- Reduced reliance on existing water sources including the Great Artesian Basin, creating an opportunity to support the long-term protection of culturally significant water sources such as GAB mound springs and water pumped from the River Murray
- Improved liveability for communities in the Whyalla and Northern South Australia regions associated with increased economic growth.

Baseline studies, surveys, modelling and assessments have been undertaken to identify all potential environmental, social and economic impacts. Measures proposed to avoid, minimise, manage and offset those impacts are identified throughout the EIS and will be further developed as part of detailed design and incorporated into Project-specific environmental management plans.

Protection of the marine environment is a high priority for the local community and understanding how the Project is likely to interact with the marine environment is a key focus for the Project. Extensive marine studies and surveys have informed the Reference Design of the desalination plant marine infrastructure with consideration given to the presence of sensitive marine habitats and key commercial fishery species in the vicinity of the marine infrastructure. Overall the assessment demonstrates that the Project is expected to have only minor effects within a highly localised zone around the diffuser, with negligible impacts beyond that area.

Stakeholder and community engagement for the Project has been wide-ranging, inclusive and ongoing, involving government departments, local councils, industry, key stakeholders, Traditional Owners and local communities and businesses. Early and ongoing engagement with local providers of goods and services has provided a good understanding of the opportunities to maximise local employment, procurement, business participation and economic benefit to the community.

Engagement with Traditional Owners has resulted in agreements for ongoing Project engagement and processes for working collaboratively on identification and management of areas of cultural heritage significance, economic development and skills, training and employment opportunities.

Consultation with affected and interested parties will be ongoing.

The conclusion from the EIS, is that the environmental and social impacts of the Project are considered acceptable, including in relation to the relevant Matters of National Environmental Significance under the *Environment Protection Biodiversity Conservation Act 1999* identified by the Commonwealth. The EIS also demonstrates that the Project would be consistent with the objects of the Environment Protection Act 1993, the general environmental duty under that Act and relevant environment protection policies under that Act.

If approved, the Project will provide a significant positive impact to regional and State economic performance and regional prosperity, expected to last well beyond the initial investment in the Project.



EIS Document and Proponent Information

NORTHERN WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

ACKNOWLEDGEMENT OF COUNTRY 1
DISCLAIMER 2
COPYRIGHT 2
PROPONENT DETAILS 3
EIS PROJECT TEAM 4
CONTENTS OF EIS VOLUMES 8
ABBREVIATIONS AND ACRONYMS USED IN THE EIS 17
GLOSSARY OF TERMS USED IN THE EIS 27

ACKNOWLEDGEMENT OF COUNTRY

The Department for Infrastructure and Transport and JBS&G Australia Pty Ltd acknowledge the Traditional Custodians of the Country throughout South Australia and recognise their continuing connection to land and waters.

We pay our respects to the diversity of cultures, significance of contributions and to Elders past, present and emerging.

In particular, we acknowledge the Traditional Custodians of the Country on which the Northern Water Project is proposed, being the Barngarla and Kokatha people, and pay our respects to their ongoing contribution and custodianship of that Country.

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DISCLAIMER

This Environmental Impact Statement (EIS) has been prepared by JBS&G Australia Pty Ltd - A Geosyntec Company (JBS&G) on behalf of the Department for Infrastructure and Transport for submission to the South Australian Minister for Planning under the *Planning Development and Infrastructure Act 2016* and the Commonwealth Minister for Environment under the *Environment Protection and Biodiversity Conservation Act 1999*. The EIS has been prepared for that purpose only and the information contained in the EIS should not be relied upon by any other person to make any decision.

In preparing the EIS, JBS&G has relied upon the assistance of specialist consultants, government agencies and other third parties. While all reasonable care and effort have been taken to ensure the accuracy of the material provided, JBS&G and it's respective advisors or representatives do not take responsibility for any statement or representation contained in the EIS, nor any omission from it. Any projections and forecasts contained in this EIS represent best estimates only.

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PROPONENT DETAILS

This EIS has been prepared in accordance with the Assessment Requirements for the Project issued by the State Planning Commission. The EIS Assessment Requirements require the EIS to provide information relating to EIS preparation and Proponent information. Relevant Assessment Requirements have been covered in this chapters as set out in Appendix A-2.

Table 1: Proponent contact details

Full Name	Department for Infrastructure and Transport
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Registered ABN	92 366 288 135

Development, Management and Operation of the Project

1. The Department for Infrastructure and Transport

The Project Proponent is the Department for Infrastructure and Transport (DIT), an agency of the South Australian Government.

DIT is a public-sector organisation established under administrative arrangements of the South Australian Government and forms part of the State's executive government. As a government department, DIT operates within a statutory, policy, and accountability framework and undertakes its functions on behalf of the State and the community. It is accountable to the South Australian Parliament through its responsible Ministers, and is subject to public-sector governance, financial management, and reporting requirements.

In addition to being the Project proponent for the purpose of the EIS, DIT is responsible for procurement and delivery of the design, build, operate and maintain (DBOM) contract for the Project, and will likely remain as the responsible agency for the purpose of the design and build phase of the contract. Ownership and responsibility for the operation and maintenance phase of the Project will also remain with the South Australian Government, albeit that the agency and/or organisational level responsibilities are still to be finalised.

2. Design, Build, Operate, Maintain (DBOM Procurement)

The procurement process, which remains underway, aims to award the DBOM contract to a single consortium. With the procurement process still underway, the consortium structure is still to be confirmed. In a functional sense, however, the successful consortium will be responsible for the design, build, operation and maintenance of the Project.

EIS PROJECT TEAM

JBS&G was engaged as lead consultant and partnered with Jacobs Group (Australia) Pty Ltd (Jacobs), in late 2022 to prepare and deliver the primary environmental assessments and approvals for the marine and terrestrial works for the Northern Water Project.

Sub-consultants were engaged for a series of specialist studies to support the assessment in the EIS and are listed in Table 2 below.

The contact details for JBS&G and Jacobs are as follows:

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Table 2: EIS Project team

EIS Activity	Team member
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JBS&G EIS Leads and Project Management	Andrew Hickman (Project Director) Andrew Querzoli (Project Manager) Stephen Milne (EIS Lead) Angie Mayo (Approvals Manager / Marine Lead) Bronny White (EIS coordination) Anna Nambiar (Project Controls Lead)
Jacobs EIS Leads	Rob Tokley (Jacobs Program Lead / Terrestrial Studies Lead)
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JBS&G Communications and Engagement Support	Julie Mitchell, Laura Johnston
SPECIALIST STUDIES	
Air Quality Impact Assessment	Greg Simes, Isabel Neilson, and Michelle Hall (Jacobs)
Bushfire Risk Assessment	Louisa Robertson (JBS&G)
Climate Change Risk Assessment	Zara Henderson, James Wilkinson (Jacobs)
Coastal Processes Impact Assessment	Niels Smit, Jess Ryan-Slinger (Jacobs)
Greenhouse Gas Assessment	Nadya Serje, James Wilkinson (Jacobs)
Groundwater Impact Assessment	Gaby Wigley (JBS&G)
Hydrogeological Investigation	Joshua Edwards, Bini Zerai, Jim Finegan (Kleinfelder Australia Pty Ltd)
Landscape and Visual Amenity	Stuart Heseltine (Hemisphere Design (Aust) Pty Ltd)
Marine Environment	
Baseline Survey for Larval Fish and Larval Decapod Crustaceans	F. Diaz, G.L. Grammer, K.H. Wiltshire, C. White, A.G. Miskiewicz., V. Silva, S. Catalano, C. Cheesman and A. Ivey (SARDI)
Baseline Water Quality	Dr Nicole Pattern (JBS&G), Mark Doubell (SARDI), Ian Moody (SARDI), Hugo Bastos de Oliveira (SARDI)
Desalination Plant Discharge Modelling – Midfield Modelling	Dr Daniel Botelho, Tony McAlister, Xian Zhu, Will Hibberd (Water Technology Pty Ltd)
Desalination Plant Discharge Modelling – Nearfield Modelling	Dr Daniel Botelho, Tony McAlister (Water Technology Pty Ltd)
Invasive Marine Species Risk Assessment	Dr Michael Sierp (Aquatic Biosecurity Pty Ltd)
Giant Australian Cuttlefish Assessment	Angie Mayo and Dr Morgane Maillard (JBS&G)
Marine Desalination Plant Ecotoxicology Assessment	Dr Rick van Dam (WQ Advice Pty Ltd)
Marine Ecology Assessment	James Brook (J Diversity Pty Ltd)
Baseline Surveys for Fish Larvae, Fish Eggs, and Decapod Larvae at Mullaquana Station	F. Diaz, G.L. Grammer, K.H. Wiltshire, C. White, A.G. Miskiewicz., V. Silva, S. Catalano, C. Cheesman and A. Ivey (SARDI)

EIS Activity	Team member
Marine Sediments – Summary Baseline Report	James Brook (J Diversity), Amanda Browne, Mike Cowin, Angie Mayo and Dr Nicole Patten (JBS&G), Associate Professor Christopher Bolch (Microalgal Services)
Mullaquana Station Mangrove Baseline Report	Dr Greg Barbara and Dr Nathan Janetzki (Cooe Pty Ltd)
Oceanographic Farfield Modelling of Return Water Discharges and Larval Connectivity to Inform Northern Water, Spencer Gulf	Mark Doubell and Charles James (SARDI)
Oceanographic Far-field Modelling of Return Water Discharges Under a Future Climate Scenario	Mark Doubell and Hugo Bastos de Oliveira (SARDI)
Survey for Juvenile Prawn Recruitment at Mullaquana Station	G.E Hooper, J. Carmena-Wood, S, Catalano, V. Cipriani and K. Heldt (SARDI)
Potential Interaction Between the Proposed Desalination Plant at Mullaquana Station and Snapper and King George Whiting In Spencer Gulf	Dr Troy Rogers (SARDI)
Underwater Noise and Vibration Assessment	Nick Henrys and Darren Jurevicius (Resonate Consultants Pty Ltd)
Baseline Benthic Habitat Mapping Report	James Brook (J Diversity Pty Ltd)
Noise and Vibration (terrestrial)	Nick Henrys, Chyi Jie Low, Jon Cooper and Darren Jurevicius (Resonate Consultants Pty Ltd)
Planning Assessment Report	James Warrington (JBS&G)
Site Contamination Preliminary Site Investigation	Phoebe Yeomans (JBS&G)
Social Environment	Stephanie Hensgen (Planning Futures)
Surface Water Impact Assessment	Bron Gwyther, James Shelley, Ben Plowman, Kate Byrnes, Graigan Panosot, Darryl Lindner, Louisa Chen, Padrick Anderson, Eliza Caldecott (Jacobs)
Terrestrial Ecology	
EPBC Significant Impact Assessment	Steve Milne and Dr Morgane Maillard (JBS&G)
Terrestrial Ecology Assessment	Shelley Greer, Nazanin Nikoo, Emma Eichler, Anne Fairhead, Rob Tokley (Jacobs)
Draft Native Vegetation Clearance Data Report	Shelley Greer (Jacobs) and Steve Milne (JBS&G) (NVC Accredited Consultants)

EIS Activity	Team member
Additional Targeted Ecology Surveys Migratory Bird Impact Assessment Plains Mouse Habitat Assessment and Targeted Survey Threatened Species Management Strategy Draft EPBC Act Offset Strategy	Zeta Bull, Luke Ragless, Kelly Pelgrim, Alex Pate, Nick Bull, Rachel Farrugia, Torben Nielsen (Lathwida Environmental)
Preliminary SEB Offset Strategy	Department for Infrastructure and Transport
Topography, Geology and Soils Impact Assessment	Takashi Huang, Callum Nash and Ben Plowman (Jacobs)
Traffic Impact Assessment	R. Green, M. Rasigatale, H. Jeon, T, Cooper, S. J. Hamedani, M. Gunasena, A. Wescombe, S, Hosseini, H. Sandland, N. Tooley (GHD)

CONTENTS OF EIS VOLUMES

Volume 1 – Environmental Impact Statement

1. Introduction

1.1 Project Overview 1-1
1.2 The Proponent 1-1
1.3 Background to the Proposal 1-2
1.4 Objective of the Northern Water Project 1-2
1.5 The Proposal 1-2
1.6 Project Design Context 1-3
1.7 Project Timeline 1-5
1.8 Overview of Regulatory Approvals Process 1-5
1.9 Purpose and Description of the EIS 1-6
1.10 Project-specific Assessment Requirements 1-8
1.11 Structure of the EIS 1-8
1.12 Key EIS Spacial Definitions, Study Areas and Map Sections Study Areas 1-13

2. Justification and Alternatives

2.1 Setting the Context 2-1
2.2 Strategic Drivers for the Project 2-1
2.3 State and Commonwealth Government Policies and Strategies 2-6
2.4 Development of Project Alternatives and Options 2-8
2.5 Summary of Key Northern Water Project Costs and Benefits 2-15
2.6 Consequences If the Northern Water Project Does Not Proceed 2-22
2.7 Conclusion 2-24

3. Legislative Approvals Framework

3.1 Setting the Context 3-1
3.2 Environmental Assessment and Approval Process 3-1
3.3 South Australian Legislation 3-7
3.4 Commonwealth Legislation 3-26

4. Community and Stakeholder Engagement

4.1 Setting the Context 4-1
4.2 Approach to Stakeholder Engagement 4-2
4.3 Engagement Opportunities and Methods 4-8
4.4 Sentiment and Engagement Outcomes 4-14
4.5 Further Opportunities to Provide Feedback 4-25
4.6 Conclusion 4-26

5. Project Siting, Alignment and Optimisation

5.1 Overview 5-1
5.2 Setting the Context 5-1
5.3 Desalination Plant Site Selection 5-2
5.4 Transfer System and Electricity Infrastructure Route Selection 5-4
5.5 Stakeholder Feedback during Project Development 5-9
5.6 Project Optimisation and Ongoing Refinement 5-10

6. Project Description

6.1 Project Overview 6-1
6.2 Setting the Context 6-4
6.3 Approvals Scope Exclusions 6-4
6.4 Project Timing and Construction Staging 6-5
6.5 Desalination Plant 6-6
6.6 Transfer System 6-39
6.7 Electricity Supply Infrastructure 6-55
6.8 Telecommunications Infrastructure 6-61
6.9 Project Infrastructure Disturbance Footprints 6-61
6.10 Workforce, Hours and Accommodation 6-62
6.11 Haul Routes and Construction Traffic 6-64
6.13 Resources and Materials 6-64

7. Planning and Design Quality

7.1 Key Findings 7-1
7.2 Setting the Context 7-3
7.3 Planning Assessment 7-3
7.4 Assessment against State Planning Policies 7-7

7.5 Assessment against the Regional Plans 7-8
7.6 Summary of Assessment against the Planning and Design Code 7-11
7.7 Design Quality 7-41
7.8 Conclusion 7-47

8. Impact Assessment Methodology

8.1 Purpose of Impact Assessment 8-1
8.2 Relevant Environmental Attributes 8-1
8.3 Impact Assessment Processes 8-2

9. Use of Land and Marine Waters

9.1 Key Findings 9-1
9.2 Setting the Context 9-2
9.3 Assessment Method 9-4
9.4 Project Area Climate 9-5
9.5 Existing Use of Land 9-8
9.6 Existing Use of Marine Waters 9-43
9.7 Plans for Future Land Use 9-51
9.8 Impact Assessment 9-52
9.9 Conclusion 9-65

10. Coastal Processes

10.1 Key Findings 10-1
10.2 Setting the Context 10-2
10.3 Assessment Method 10-3
10.4 Description of the Existing Environment 10-4
10.5 Impact Assessment 10-14
10.6 Conclusion 10-18

11. Marine Environment

11.1 Key Findings 11-1
11.2 Setting the Context 11-3
11.3 Assessment Method 11-5
11.4 Description of the Existing Marine Environment 11-23
11.5 Project Marine Infrastructure – Reference Design and Option 11-59
11.6 Return Water Characteristics, Toxicity and Dispersion 11-61

11.7 Impact Assessment 11-90
11.8 Discussion 11-138
11.9 Conclusion 11-138

12. Soils, Landform and Geology

12.1 Key Findings 12-1
12.2 Setting the Context 12-1
12.3 Assessment Method 12-3
12.4 Description of the Existing Environment 12-4
12.5 Impact Assessment 12-21
12.6 Conclusion 12-31

13. Surface Water

13.1 Key Findings 13-1
13.2 Setting the Context 13-1
13.3 Assessment Method 13-3
13.4 Description of the Existing Environment 13-4
13.5 Impact Assessment 13-18
13.6 Conclusion 13-32

14. Groundwater

14.1 Key Findings 14-1
14.2 Setting the Context 14-1
14.3 Assessment Method 14-3
14.4 Description of the Existing Environment 14-5
14.5 Impact Assessment 14-26
14.6 Conclusion 14-32

15. Terrestrial Flora and Fauna

15.1 Key Findings 15-1
15.2 Setting the Context 15-3
15.3 Assessment Method 15-5
15.4 Description of the Existing Environment 15-15
15.5 Mitigation Hierarchy 15-74
15.6 Impact Assessment 15-75
15.7 Conclusion 15-129

16. Aboriginal Cultural Heritage

16.1 Key Findings 16-1
16.2 Setting the Context 16-1
16.3 Engagement with Traditional Owners 16-3
16.4 Assessment Method 16-5
16.5 Detailed Assessment – Site Surveys 16-7
16.6 Impact Assessment 16-13
16.7 Conclusion 16-16

17. Non-Aboriginal Cultural Heritage

17.1 Key Findings 17-1
17.2 Setting the Context 17-1
17.3 Assessment Method 17-4
17.4 Description of the Existing Environment 17-5
17.5 Impact Assessment 17-10
17.6 Conclusion 17-14

18. Air Quality

18.1 Key Findings 18-1
18.2 Setting the Context 18-2
18.3 Assessment Method 18-3
18.4 Description of the Existing Environment 18-5
18.5 Impact Assessment 18-13
18.6 Conclusion 18-20

19. Noise and Vibration

19.1 Key Findings 19-1
19.2 Setting the Context 19-1
19.3 Assessment Method 19-5
19.4 Description of the Existing Environment 19-11
19.5 Impact Assessment 19-18
19.6 Conclusion 19-28

20. Landscape Character and Visual Amenity

20.1 Key Findings 20-1
20.2 Setting the Context 20-2

20.3 Assessment Method 20-4
20.4 Description of the Existing Environment 20-7
20.5 Impact Assessment 20-24
20.6 Conclusion 20-40

21. Traffic and Transport

21.1 Key Findings 21-1
21.2 Setting the Context 21-2
21.3 Assessment Method 21-4
21.4 Description of the Existing Environment 21-7
21.5 Project Transport Task 21-26
21.6 Impact Assessment 21-30
21.7 Summary of Key Mitigation Measures 21-46
21.8 Conclusion 21-48

22. Economic Environment

22.1 Key Findings 22-1
22.2 Setting the Context 22-1
22.3 Assessment Method 22-3
22.4 Existing Regional and Local Economic Environment 22-6
22.5 Assessment of Economic Impacts and Benefits 22-22
22.6 Conclusion 22-37

23. Social Environment

23.1 Key Findings 23-1
23.2 Setting the Context 23-2
23.3 Assessment Method 23-4
23.4 Description of the Existing Environment 23-10
23.5 Impact Assessment 23-18
23.6 Conclusion 23-31

24. Climate Change and Sustainability

24.1 Key Findings 24-1
24.2 Setting the Context 24-2
24.3 Climate Change Risk Assessment 24-7
24.4 Greenhouse Gas Emissions 24-22

24.5 Sustainability and Efficient Use of Resources 24-31
24.6 Waste Management 24-37
24.7 Conclusion 24-44

25. Hazards and Risks

25.1 Key Findings 25-1
25.2 Setting the Context 25-2
25.3 Assessment Method 25-4
25.4 Evaluation of Hazards 25-7
25.5 Conclusion 25-41

26. Environmental Management Framework

26.1 Setting the Context 26-1
26.2 Northern Water Project Environmental Management Systems 26-2
26.3 Environmental Management Framework for the Project 26-4
26.4 Environmental Management Plan Implementation 26-10

27. Conclusion

28. References

Volume 2 – EIS Supporting Documents and Technical Reports

A EIS Assessment Requirements

A-1 EIS Assessment Requirements issued by State Planning Commission

A-2 Checklist against EIS Assessment Requirements

B Site Plans and Maps

B-1 Northern Water Project Site Plans

B-2 Marine Works

B-3 Desalination Plant

B-4 Transfer System and Electricity Infrastructure

C Certificates of Title

D Stakeholder Engagement

D-1 EIS Integrated Communications and Engagement Plan

D-2 Engagement Outcomes Report

E Planning

E-1 Planning Assessment Report

F Coastal Environment

F-1 Coastal Processes Impact Assessment

G Marine Environment

G-1 Baseline Water Quality

G-2 Baseline Habitat Mapping Report

G-3 Marine Ecology Assessment

G-4 Mullaquana Station Mangrove Baseline Report

G-5 Marine Sediments Summary Baseline Report

G-6 Baseline Surveys for Larval Fish and Larval Decapod Crustaceans

G-7 Survey for Juvenile Prawn Recruitment at Mullaquana Station

G-8 Interaction Between the Desalination Plant and Snapper and Whiting

G-9 Underwater Noise and Vibration Assessment

G-10 Marine Desalination Plant Ecotoxicology Assessment

G-11 Desalination Plant Discharge Modelling – Nearfield Modelling

G-12 Desalination Plant Discharge Modelling - Midfield Modelling

G-13 Oceanographic Far-field Modelling of Return Water Discharges and Larval Connectivity

G-14 Oceanographic Far-field Modelling of Return Water Discharge Under a Future Climate Scenario

G-15 Invasive Marine Species Risk Assessment

G-16 Giant Australian Cuttlefish Assessment

G-17 Independent Peer Reviews

H Physical Environment

H-1 Topography, Geology and Soils Assessment

H-2 Preliminary Site Investigation Report

H-3 Surface Water Impact Assessment

H-4 Hydrogeological Conceptual Model and Groundwater Impact Assessment Report for the Pipeline Alignment

H-5 Hydrogeological Investigation – Mulllaquana Desalination Plant Site

H-6 Watercourses of Interest Table

H-7 Stormwater Management Plan

I Terrestrial Ecology

I-1 Terrestrial Ecology Assessment

I-2 Plains Mouse Habitat Assessment

I-3 Plains Mouse Targeted Survey

I-4 Migratory Birds Impact Assessment

I-5 Draft Native Vegetation Clearance Data Report

I-6 Significant Impact Assessment

I-7 Draft EPBC Act Offset Strategy

I-8 Threatened Species Management Strategy

I-9 Preliminary SEB Offset Strategy

I-10 Western Grasswren and Plains Mouse Database Records

J Amenity

J-1 Air Quality Assessment

J-2 Terrestrial Noise and Vibration Impact Assessment

J-3 Landscape Character and Visual Amenity Impact Assessment

J-4 Traffic Impact Assessment

K Social Environment

K-1 Social Environment Technical Report

L Climate Change and Greenhouse Gas Assessments

L-1 Climate Change Risk Assessment

L-2 Greenhouse Gas Assessment

M Impact Event Register

N Bushfire Assessment

ABBREVIATIONS AND ACRONYMS USED IN THE EIS

Abbreviation	Definition	Chapter
AADT	Average annual daily traffic	21
AAR-AGD	Aboriginal Affairs and Reconciliation - Attorney-General's Department	16
AAQA Guideline	Ambient air quality assessment guideline	18
ABS	Australian Bureau of Statistics	22, 23
ADCP	Acoustic Doppler Current Profiler	10, 11
ADP	Adelaide Desalination Plant	11, 25
AEP	Annual Exceedance Probability	6, 7, 13, 25
AFDRS	Australian fire danger rating system	24
AH Act	*Aboriginal Heritage Act 1988* (SA)	16
Air Quality EPP / AQ EPP	*Environment Protection (Air Quality) Policy 2016*	3, 18
AIS	Automatic identification system	21
ALA	Atlas of Living Australia	11, 15
ALARP	As Low As Reasonably Practicable	25
AMSA	Australian Maritime Safety Authority	3, 21
AP	Arcoona Plateau	9
ARs	Assessment Requirements	Throughout
ARI	Annual Recurrence Interval	6, 10, 25
ARP	Arid Recovery Program	15
ARR	Australian Rainfall and Runoff	13, 24
ARTC	Australian Rail Track Corporation	5, 6, 21
ASD	Approach Sight Distance	21
ASS	Acid Sulfate Soils	12, 13, 25
ATSIHP Act	*Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth)	16
AVG	Abalone Viral Ganglioneuritis	11
BAL	Basic Left Turn	21
BAL	Bushfire Attack Level (as defined in Australian Standard AS3959)	25
BAM	Bushland Assessment Method	15
BAR	Basic Right Turn	21

Abbreviation	Definition	Chapter
BCR	Benefit Cost Ratio	2, 22
BDAC RNTBC	Barngarla Determination Aboriginal Corporation Registered Native Title Body Corporate	4, 9, 15, 16
BDBSA	Biological Database of South Australia	15
BIA	Biologically Important Area	11
BMA	Bushfire Management Area	25
BoM	Bureau of Meteorology	9, 18, 19
Bonn Convention	Convention on the Conservation of Migratory Species of Wild Animals	3
BRMP	Bushfire Risk Management Plan	15, 25
BRUV	Baited Remote Underwater Video	11
CAWCR	Centre for Australian Weather and Climate Research	10
CAMBA	China–Australia Migratory Bird Agreement	3, 15
$Ca(OH)_2$	Calcium hydroxide (hydrated lime)	6
CASA	Civil Aviation Safety Authority	21
CBA	Cost-Benefit Analysis	2, 22
CCSZ	Cuttlefish Coast Sanctuary Zone	9, 11, 17
CE	Critically endangered (EPBC Act)	15
CEA	Cultana Training Expansion Area	9
CEB	Chemically enhanced backwash	6
CEIP	Central Eyre Iron Project	22
CEMP	Construction Environmental Management Plan	All
CFS	Country Fire Service	23, 25
CHMP	Cultural Heritage Management Plan	9, 16
CIP	Clean in place	6, 11, 24, 25
CGE	Computable general equilibrium	2, 22
CL	Crown Lease	9
CNVMP	Construction Noise and Vibration Management Measures Plan	11
CO	Carbon Monoxide	18
CO_2	Carbon dioxide	6
CO_2e	Carbon dioxide equivalent	24
the Code	Planning and Design Code	7, 17, 20
CMS	Convention on migratory species	15

Abbreviation	Definition	Chapter
CP	Conservation Park	15
CPTED	Crime Prevention Through Environmental Design	7
CSIRO	Commonwealth Scientific and Industry Research Organisation	12, 13
CTD	Conductivity-temperature-depth	11
Cth	Commonwealth	15, 22, 24
CTMP	Construction Traffic Management Plan	21
CTS	Craft Tracking System	21
CUTA	Comprises the original Cultana Training Area and the Cultana Training Expansion Area	9
DAF	Dissolved Air Flotation	6
DAFF	Dissolved Air Flotation and Filtration	6, 11
DBOM	Design Build Operate Maintain (Project delivery)	Throughout
DCCEEW	Department of Climate Change, Energy, the Environment and Water	3, 4, 7, 12, 15, 17, 26
DEW	Department for Environment and Water	2, 7, 9, 15, 17
DHUD	Department for Housing and Urban Development	3,
DIT	Department for Infrastructure and Transport	6, 7, 11, 15, 19, 22, 26
DMP	Dredge Management Plan	11
DMP	Dust Management Plan	18
DNA	Deoxyribonucleic Acid	11
DO	Dissolved oxygen	11
DoD	Department of Defence	25
DRP	Decommissioning and Rehabilitation Plan	26
E	Endangered (under the South Australian NPW Act)	15
EBS	Earth Bunded Storage	12
EHTM	Environment and Heritage Technical Manual	26
EIA	Environmental impact assessment	3
EIS	Environmental Impact Statement	Throughout
EMF	Electromagnetic Field	25
EML	Extractive Mineral Leases	9, 13, 18
EMPs	Environmental Management Plans	26
EMS	Environmental Management System	26
EN	Endangered (EPBC Act)	15

Abbreviation	Definition	Chapter
EP	Eyre Peninsula	14
EPA	Environment Protection Authority	Throughout
EP Act	*Environment Protection Act 1993* (SA)	3, 7, 12, 14, 18, 19, 24, 25
EP Link	Eyre Peninsula Link (ElectraNet)	9
EP LMR	Eyre Peninsula Landscape Management Region	15
EPB	Earth Pressure Balance (type of tunnel boring machine)	6, 12
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	3, 6, 7, 9, 11, 15, 17, 26
EPBC guidelines	*Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999 guidelines* (DCCEEW 2023)	3
EPPs	Environment Protection Policies	3, 7, 24
ERP	Emergency Response Plan	26
ESG	Environmental, Social and Governance	2, 3, 24
EWRP	Eyre and Western Regional Plan	7
FIFO	Fly-in Fly-out	21, 22, 23
FNPWA	Far North Prescribed Wells Area	2
FNRP	Far North Regional Plan	7
FTE	Fulltime equivalent	2, 6, 22
GAB	Great Artesian Basin	2, 14, 16
GDE	Groundwater Dependent Ecosystem	13, 14, 15
GDP	Gross Domestic Product	2, 22
GDP	General Development Policy	7
GED	General Environmental Duty	18, 19
GEL	Geothermal Exploration Licence	3
GHG	Greenhouse Gas	24
GL	Gawler Lakes	9
GLCs	Ground level concentrations	18
GoSA	Government of South Australia	18
GR	General Requirement (with reference to ARs)	17
GRI	Global Reporting Initiative	24
GRP	Gross Regional product	2, 22
GSP	Gross State Product	2, 22

Abbreviation	Definition	Chapter
GSSA	Geological Survey of South Australia	12
HAT	Highest Astronomical Tide	10
HABs	Harmful Algal Blooms	5, 11, 18, 24
HAZOP	Hazard and Operability Analysis	18
HDPE	High Density Polyethylene	6, 11
HVAC	High Voltage Alternating Current	19
HVDC	High Voltage Direct Current	19
IADA	Impact Assessed Development Application	3
IAIA	International Association for Impact Assessment	23
IAP2	International Association for Public Participation	4
IBRA	Interim Biogeographic Regionalisation for Australia	6, 9, 12, 14, 15, 20
ICAM	Incident Cause Analysis Method	26
ICEP	Northern Water Integrated Communications and Engagement Plan	4
ICNIRP	International Commission for Non-Ionising Radiation Protection	25
IECA	International Erosion Control Association	6, 12
ILUA	Indigenous Land Use Agreement	9, 16
IMS	Invasive marine species	11
IPCC	Intergovernmental Panel on Climate Change	11, 24
ISO	International Standards Organisation	26
JAMBA	Japan–Australia Migratory Bird Agreement	3, 15
JUB	Jack-up barge	6, 12, 18, 21, 24
KAC RNTBC	Kokatha Aboriginal Corporation Registered Native Title Body Corporate	4, 9, 15, 16
KBA	Key biodiversity area	15
KGW	King George Whiting	11
KP	Kilometre point (distance along the pipeline from the Mullaquana Station Desalination Pant (KP 0) to the boundary of the BHP Special Mining Lease #1 at Olympic Dam (KP 359)	6, 9, 12, 13, 21, 25
LAP	Land access permit	16
LAT	Lowest Astronomical Tide	6, 10, 25
LCVIA	Landscape Character and Visual Amenity Impact Assessment	20
LGA	Local Government Area	22, 23

Abbreviation	Definition	Chapter
LHA	Local Heritage Agreement	9, 16
LIDAR	Light Detection and Ranging (remote sensing method used to map topography).	12, 13
LMR	Landscape Management Region	15
LNLC Act	*Local Nuisance and Litter Control Act 2016*	19
LoO	Likelihood of Occurrence	15
LSA Act	*Landscape South Australia Act 2019*	12, 14, 15
mAHD	Metres Australian Height Datum	12
MAOP	Maximum allowable operating pressure	6
MARS	Maritime Arrivals Reporting System	11
M bgl	Meters below ground level	12, 13, 14
MCA	Multi-Criteria Analysis	2, 5
MCCEP	Marine and Coastal Construction Environmental Management Plan	21
MHWN	Mean High Water Neap	10
MHWS	Mean High Water Springs	10
Minister	Minister for Planning	4
MLWN	Mean Low Water Neap	10
MLWS	Mean Low Water Springs	10
MM	Migratory Marine	15
MNES	Matters of national environmental significance (EPBC Act)	3, 7, 11, 13, 15, 26
MOU	Memorandum of Understanding	16
MP	Myall Plains	9
MPL	Miscellaneous Purposes Licences	9
MSA	Marine study area	11
MSL	Mean Sea Level	10
MT	Migratory Terrestrial	15
MVG	Major vegetation group	15
MW	Migratory Wetland	15
N	Nitrogen	13
NaOCl	Sodium hypochlorite	6
NATA	National Association of Testing Authorities	10

Abbreviation	Definition	Chapter
NGERS	*National Greenhouse and Energy Reporting Act 2007* National Greenhouse and Energy Reporting Scheme	3
NHVR	National Heavy Vehicle Regulator	21
NO_2	Nitrogen Dioxide	18
Noise EPP	*Environment Protection (Commercial and Industrial Noise) Policy 2023*	3, 19
NPI	National Pollutant Inventory	18
NPV	Net Present Value	2
NPW Act	*National Parks and Wildlife Act 1972*	15
NSESD	National Strategy for Ecologically Sustainable Development	3
NV Act	*Native Vegetation Act 1991*	15
NVC	Native Vegetation Council	3, 15
NVCDR	Native Vegetation Clearance Data Report	15
NW, the Project	Northern Water Project	3, 16, 23, 26
OEMP	Operational Environmental Management Plan	6, 9, 12, 16, 17, 25, 26
OSOM	Over-site, over mass (heavy vehicles)	21
ONWD	Office of Northern Water Delivery	15, 16, 22
P	Phosphorous	13
PAH	Polycyclic aromatic hydrocarbons	25
PARs	Public Access Routes	9
PASS	Potential Acid Sulfate Soils	12, 13, 14
PBS	Performance based standards	21
PCA	Potentially contaminating activities	12, 14, 25
PDI Act	*Planning, Development and Infrastructure Act 2016*	3, 7, 15, 17, 20, 21
PFAS	Per- and poly-fluoroalkyl substances	25
PIRSA	Primary Industries and Resources South Australia	5, 15
PL	Pipeline Licence (*Energy Resources Act 2000*)	3, 9
PM_{10}	Particulate Matter 10 micrometers or less in diameter	18
$PM_{2.5}$	Particulate Matter 2.5 micrometers or less in diameter	18
PMST	Protected Matters Search Tool	15
POMS	Pacific Oyster Mortality Syndrome	11

Abbreviation	Definition	Chapter
PPV	Peak Particle Velocity	19
PSD	Particle Size Distribution	10
PSI	Preliminary site investigation	12, 14, 25
PWA	Prescribed Wells Area	2, 14
RAAF	Royal Australian Airforce	21
R	Rare (NPW Act)	15
RAM	Rangelands Assessment Method	15
RARB	Recognised Aboriginal Representative Body	16
RCP	Representative Concentration Pathway	11, 13, 24
RFDS	Royal Flying Doctor Service	9, 23
RIA	Regional Impact Analysis	22
RL	Retention Lease	9, 18
RNTBC	Registered Native Title Body Corporate	15, 16
RO	Reverse Osmosis	6, 11, 25
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement	3, 15
RSA	Regional Study Area	23
SA	Statistical Area	22
SAAL	South Australian Arid Lands	14
SAAL LMR	South Australian Arid Lands Landscape Management Region	15
SAP	Standard Access Protocols	9
SAPN	SA Power Networks	6
SAPPA	South Australian Property and Planning Atlas	9
SARDI	South Australian Research and Development Institute	11, 24
SARIG	South Australian Resources Information Gateway	12, 14, 17
SBS	Sodium bisulphite	6
SDS	Safety Data Sheet	25
SEB	Significant Environmental Benefit	11, 15, 26
SEDMP	Soil, Erosion and Drainage Management Plan	6, 11, 13
SEIFA	Socio-Economic Indexes for Australia	23
SES	State Emergency Services	23
SIA	Significant / Social Impact Assessment	15, 23

Abbreviation	Definition	Chapter
SML	Special Mining Lease	5, 6
SPC	State Planning Commission	3, 4, 7, 8
spp.	Species	6
SPPs	State Planning Policies	7
SPRAT	Species Profile and Threats Database	15
SPTV	Species Protection Trigger Value	11
SR	Sensitive receptor	18, 19
SRG	Stakeholder Reference Group	4
SRLs	Sensitive Receptor Localities	20
SSP	Shared Socio-economic Pathway	24
TBM	Tunnel Boring Machine	Throughout
TDS	Total dissolved solids	6, 11, 14
TEC	Threatened ecological community (EPBC Act)	14, 15
TIA	Traffic Impact Assessment	21
TMP	Traffic Management Plan	26
TSP	Total suspended particulates	18
TSS	Total suspended solids	6, 11, 13
UCL	Urban Centres / Localities	23
UF	Ultrafiltration	6, 11, 25
UHF	Ultra High Frequency	9
USG	Upper Spencer Gulf	2, 5, 6, 7, 11, 20
UXO	Unexploded ordinance	25
V	Vulnerable (NPW Act)	15
VA	Vegetation Association	15
VP	Viewpoint	20
VU	Vulnerable (EPBC Act)	15
WAA	Water Affecting Activities	13
Waste to Resources EPP	*Environment Protection (Waste to Resources) Policy 2010*	3, 24
Water EPP / Water Quality EPP / WQ EPP	*Environment Protection (Water Quality) Policy 2015*	3, 10, 11, 13, 14
WDF	Waste Derived Fill	24
WET	Whole effluent toxicity	11
WHS	Work Health and Safety	26

Abbreviation	Definition	Chapter
WMP	Waste Management Plan	24
WoNS	Weed of National Significance	15
WRC	Woomera Range Complex	9
WS(U)D	Water Sensitive (Urban) Design	7
ZTVI	Zone of Theoretical Visual Influence	20

GLOSSARY OF TERMS USED IN THE EIS

Term	Definition
1% AEP, 72-hour event	1% probability of a 72-hour storm event exceeding this size in any given year (previously known as a 1 in 100-year flood event).
95% protection level	Where representative local species are protected from any chronic impacts from the return water (whole effluent toxicity)
Abundance	The number of individuals within a defined area or habitat
Accretion	A gradual increase, or growth, by the addition of new layers or parts.
Acoustic louvre	Specially designed ventilation components that reduced noise transmission while allowing airflow.
Active Coastal Zone	Active coastal zone lies between the landward boundary (cliff or front dune) and the closure depth.
Aeolian	Sediments deposited by wind.
Aeolian noise	Noise produced by wind passing over or through objects.
Aggregate	Road construction material used to form various road layers.
Alluvial	Sediments which have been deposited by a river, usually along the river pathway, either in the riverbed or associated floodplains.
Aquifer	An underground layer of water bearing material comprising unconsolidated sediments, permeable or fractured rock.
Aquitard	Impervious or less permeable sediments that restricts the transmission of groundwater between aquifers.
Arterial road	A high-capacity road designed to move large volumes of traffic over long distances.
Artesian pressure	Pressure that forces groundwater to the surface without pumping action.
Arthropod	Animals of the phylum Arthropoda, having a segmented body and jointed appendages.
Baseflow	The subterranean portion of streamflow that is sustained after precipitation events and fed into stream.
Bathymetry	The study and mapping of the sea floor, involving obtaining measurements of the depth of the ocean.
Bedrock and residual materials	Sediments created from weathering of underlying rock.
Benthic	Living on or near the seabed or in sediments.
Biocides	A chemical substance or microorganism intended to exert a controlling effect on harmful organisms.

Term	Definition
Biofouling	The unwanted accumulation of aquatic microorganisms, algae, plants and animals on submerged surfaces.
Brackish	Slightly salty (referring to water).
Bunding	A physical containment barrier designed to prevent liquid spills from entering the environment.
Calcareous	Mostly or somewhat comprised of calcium carbonate.
Carbon scrubber	A piece of equipment used to absorb carbon dioxide from the environment.
Cathodic protection	A method used in marine and coastal engineering projects to prevent the corrosion of metal pipelines by the application of a low electrical current to the metal.
Chemical dosing systems	Equipment that adds controlled amounts of chemicals to water to help clean it or prevent damage to pipes and equipment.
Chloramination	A water treatment process used to disinfect water using chloramine.
Circular economy	A model of production and consumption which involves minimising waste to extend the life cycle of products.
Climate change	Persistent change in the average weather for an extended period of time, typically decades or longer, distinguishable from typical year-to-year variability.
Climate-resilient water supply	A water supply system designed to remain reliable under changing climate conditions, including heat, drought and extreme events.
Closure depth	Depth at which wave action no longer significantly influences the seabed and sediment transport.
Computable general equilibrium model	A model that predicts how an economy may respond to external factors, using real-world data
Collector road	A low-to-moderate capacity road that connects arterial roads to local roads.
Colluvial	Sediments derived from land- or mud-slide action.
Corona noise/discharge	An electrical discharge causing by the ionisation of air surrounding the conductor.
Cost-benefit analysis (CBA)	Used to identify the costs and benefits of the Project.
Decommissioning phase	The final phase in the lifetime of the project facility, following permanent shutdown of the facility.
Depositional	Net transport in of sediments
Desalination plant	A facility that removes salts and minerals from seawater to produce freshwater.
Desalination plant reverse osmosis membranes	Thin filtering sheets that remove salt and impurities from seawater by forcing water through tiny pores.

Term	Definition
Dewatering	The process of removing water the accumulates in earthwork excavations or below ground structures.
Dinoflagellate	Unicellular organisms, that primarily inhabit marine environments.
Direct impact	Impacts caused directly by the proposed activities (e.g. clearing of vegetation).
Dissolved oxygen	Oxygen dissolved in the water, required by marine plants and animals to live and to reproduce, particularly when they cannot obtain it directly from the atmosphere. Measured in percent saturation or mg/L.
DRAINS	Surface water volume modelling software package.
Economic impact - direct	Those that relate to the initial or immediate avidity. This includes the employment generated during the construction and operations phases of a project and expenditure on the construction materials
Economic impact - indirect	Those that relate to linkages between different parts of the economy. These impacts include increased in output and employment form businesses supporting the direct suppliers to a project.
Economic impact - induced	Those that relate to an increase in income to the employees and owners of the businesses directly supplying a project. When this income is spent in the economy for personal consumption, it generates induced effects in the economy.
Ecotoxicology	The study of toxic chemicals and pollutants on ecosystems.
Electromagnetic field (EMF)	Areas of radiation associated with the use of electrical power.
Energy recovery system	Technology that captures and reuses energy from the high pressure water used in desalination.
Ephemeral drainage lines	Watercourses that only flow as a result high rainfall events in the surrounding area.
Epifauna	Organisms living on the surface of the benthos.
Epiphytes	Grows on the surface of a living plant (but not parasitic upon it).
Ethnographic	A qualitative research method used in anthropology and the social sciences to systematically study and document human cultures, behaviours, and societies.
Evapotranspiration	The process by which water is transferred from the land/soil and plants, to the atmosphere.
Farfield	The area farther away from the plant's discharge point where the released water has mixed more with the ocean. Environmental impacts here are usually weaker and more spread out.
Fire break	A non-flammable barrier that prevents or slows the progress of a wildfire by removing combustible material.
Float and sink	This methodology for underwater pipeline installation involves fusion welding lengths of HDPE pipeline at a nearby on-shore facility. The assembled pipeline is then towed and floated into position (typically

Term	Definition
	filled with air to maintain buoyancy) and then sunk by slowly filling it with water.
Flushing systems	Pipes and pumps that push clean water through equipment to remove dirt, sand, or chemicals.
Fluvial	Of a river.
Fly rock	Rock ejected from the blast site of a controlled explosion/blast.
Fouling	The build up of things like algae, minerals, or slime on pipes and membranes. Fouling reduces efficiency and needs regular cleaning to prevent damage.
Fugitive emissions	Gases that escape into the atmosphere from leaks/gaps in pressurized equipment.
Gantry	Overhead structure supporting construction operations.
Gibber	A rock and pebble littered area of arid or semi-arid land in Australia.
Gilgai	A small ephemeral lake formed by a surface depression in clay soils.
Great Artesian Basin (GAB)	An underground freshwater resources, lying beneath part of the Northern Territory, Queensland, South Australia and New South Wales.
Green iron / steel	Iron or steel manufactured with little to no carbon dioxide emissions.
Greenhouse gas (GHG)	Gaseous constituents of the atmosphere, that contribute to the greenhouse effect. Typically, within GHG accounting at a corporate or project level which is limited to the six gases covered by the United Nations Framework Convention on Climate Change (UNFCCC): carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulfur hexafluoride (SF_6).
Gross regional / state / domestic product	The total market value of all goods and services produced within a region / state / country within a given period, quantifying economic activity.
Ground level concentration (GLC)	The amount of a pollutant present in a unit volume of air near the earth's surface.
Gully erosion	When runoff concentrates and flows strongly enough to detach and move soil particles.
Harmful Algal Bloom (HAB)	A naturally occurring algal bloom that involves a species of microalgae that is harmful to marine life.
Heterogeneous	A mix of different materials.
HV switchyard	A high voltage electrical area that controls and distributes power to the desalination plant and pump stations.
HV transformer	Converts power from one voltage level to another.
Hydrodynamics	The movement and behaviour of water, including currents, tides and water circulation patterns.

Term	Definition
Hydrodynamic modelling	Computer-based modelling used to understand how water moves in the marine environment. This assesses how outfall will spread from the plant and mix with the ocean water.
Hydrostatic testing	A safety test where pipes or tanks are filled with water and pressurised to check for leaks.
Impact piling	A method of driving piles into the ground using impact hammers (typically hydraulic).
Indicative noise factor	A guideline established by the relevant regulatory body (in this case SA EPA) to determine the appropriate noise levels for various zones and subzones based on primary land use.
Indigenous Land Use Agreement (ILUA)	An acronym for Indigenous Land Use Agreement. It is a voluntary, legally binding agreement between Aboriginal peoples and/or Torres Strait Islander peoples who hold (or claim) native title, and other land users like governments, developers, or private companies.
Indirect impacts	Impacts where a secondary event occurs that is substantially caused by activities associated with the Project (e.g. sediment runoff generated from land clearing (the direct impact) for the Project entering a watercourse impacting its water quality (the indirect impact)).
Infauna	Organisms living within the benthic zone (lowest level of the ocean).
In situ	Not transported.
Intake/Outfall infrastructure	Tunnels, pipes, pump stations, diffuser, riser.
Intermittent shock dosing	Adding a strong burst of chemicals for a short time to kill bacteria or remove build up. It helps keep pipes and equipment clean.
Interstitial	Relating to the cavities and channels formed by the spaces between grains in a sediment (interstitial space).
Intertidal flats	Coastal areas that are submerged at high-tide, and exposed at low-tide.
Intertidal zone	Area between high and low tide.
Irruption	A sudden sharp increase in the relative numbers of a natural population usually associated with favourable alteration of the environment
Jack-up barge	A marine construction platform that can be raised above the water surface on supporting legs to provide a stable working base.
Lacustrine	Sediment formed in and deposited in a lake.
LIDAR	Light detection and ranging (remote sensing technique to measure topography).
Lignotubers	An organ that develops at the base of some plants that functions to protect against destruction of the plant stem.
Lime system	Equipment that adds hydrated lime to water to adjust its pH or hardness.

Term	Definition
Littoral zone	The part of an ocean that is close to the shore.
Loam	Referring to fertile soil composed of sand, silt and a small amount of clay.
Macrofauna	Small invertebrates greater than 500 µm (0.5 mm) in size, generally visible with the naked eye
Marine risers	Cylindrical conduits used to transfer crude oil to an offshore facility.
Marine sediment	Deposits of insoluble materials (rock, soil particles, marine organism remains) that accumulate on the ocean floor.
Megafauna	Large marine animals
Meiofauna	Small invertebrates that are typically less than 0.5 mm (53– 500 µm) in size
Metocean conditions	Meteorological and oceanographic conditions, such as waves, tides, winds and currents, that influence the marine environment.
Micro-siting	Small adjustments to the exact location of infrastructure to avoid constraints or reduce impacts while remaining within the assessed project area.
MODFLOW-USG	The US Geological survey modular finite-difference flow model, used to simulate the flow of groundwater through aquifers.
Multi criteria analysis (MCA)	A structured method used to compare options against multiple environmental, social, technical and economic criteria.
MUSIC	Stormwater quality modelling software package.
Native Title	Native title is the recognition in Australian law that Aboriginal and Torres Strait Islander people have rights and interests to land and waters according to their traditional laws and customs.
Native vegetation clearance	Destruction, removal, damaging or burning native vegetation (inclusive of trees, shrubs, grasses and seagrass)
Natural drainage lines	Geomorphic features that facilitate the flow of water on the earth's surface, allowing for runoff from precipitation events to reach bodies of water.
Nearfield	The area close to the plant's discharge point where changes in water quality are strongest.
Net zero	The state in which the amount of greenhouse gases released to the atmosphere is the same as the amount of greenhouse gases removed from the atmosphere (by natural or technological processes).
Noise contours	A series of lines superimposed on a map, used to represent equal levels of noise exposure, showing areas of excessive noise levels.
Osmoregulation	The biological process by which organisms regulate the balance of water and salt in their bodies.

Term	Definition
Outfall diffusers	Equipment used in marine and coastal engineering projects to control the discharge of effluent wastewater into the sea.
Overlay (Planning and Design Code)	Used to set out location-specific policy outcomes, linked to State Planning Policies, environmental values or where agency referral is required.
Oversize Over mass (OSOM)	Vehicles carrying loads that exceed standard legal dimensions or weight limits, requiring permits and compliance with relevant safety regulations.
Percent saturation	Percent saturation refers to the amount of a particular compound dissolved in the water relative to the total amount possible.
Photoquadrats	Photographs taken during surveys of a specifically sized area to study the distribution of marine organisms.
Plasticity	Plasticity indicates the fineness of the soil and its capacity to change shape without altering its volume. Composition, particle size, organic matter and additives may affect clay plasticity.
Potentially contaminating activities (PCAs)	Industrial, agricultural and commercial practices that can lead to the contamination of air, soil or water in the surrounding area.
Public Access Route (PAR)	A designated route allowing the public to traverse specific areas of pastoral leases without needing permission from the pastoral lease holder. These routes are established under the Pastoral Land Management and Conservation Act 1989.
Reference Design	The preliminary design used to define the Project for assessment, including the assumed location, layout and main engineering parameters. Based on GHD 2025. It will form the basis for more detailed engineering work.
Regolith	Soil and loose unconsolidated rock.
Representative Concentration Pathway (RCP) 4.5	RCP4.5 represents a moderate GHG emissions pathway, assuming global emissions will peak around 2040 and then decline, leading to a stabilisation of radiative forcing after 2100. This scenario is associated with a global temperature increase of around 2°C by the end of the 21st century.
Representative Concentration Pathway (RCP) 8.5	RCP8.5 represents a high GHG emissions pathway, assuming a continued increase in emissions throughout the 21st century without any mitigation efforts. This scenario leads to a significant rise in global temperatures, with projections exceeding 4°C by the end of the 21st century.
Response Document	The document providing responses to government and public comments on the EIS
Rills	Erosion landforms – shallow channel.
Riparian	An area that is the interface between land and a water course (e.g. a riverbank).

Term	Definition
Rip rap swale	A natural or constructed channel with erosion-resistant rock lining, designed to carry concentrated runoff to a stable outlet.
RO clean in place	A cleaning process that washes reverse osmosis membranes without removing them from the system.
RO permeate	The clean, low salt water that passes through the reverse osmosis membranes.
Rock scour	The inability of a rock in a waterway/channel to resist the erosive capacity of the water flowing over it.
Safe dilution	The dilution ratio of a potentially harmful discharge to an aquatic environment that is predicted to protect that environment. It can be expressed in terms of the percent of the discharge or a ratio of the discharge volume to receiving water volume.
Saline depression	Sunken landforms that often host salt tolerant organisms.
Scalding erosion	When wind and water erosion removes the topsoil and exposes saline or sodic soils.
Scope 1 emissions	direct emissions of GHGs from sources that are owned or operated by a reporting organisation
Scope 2 emissions	indirect emissions associated with the import of energy from another source
Scope 3 emissions	other indirect emissions – other than energy imports (above) which are a direct result of the operations of the organisation, but from sources not owned or operated by them.
Scour protection	Measures used to prevent erosion or removal of sediment around marine structures caused by currents, waves or turbulence. Includes rock armouring installed via rock chute or rock bags.
Scour structures	Parts of the pipeline system designed to release water quickly to clean out sediment or debris.
Scour valves	Hydrodynamic equipment located at low points or between valved sections of the pipeline, designed to allow for periodic flushing of waterways/channels to remove sediments.
Secant piling	A construction technique involving intersecting concrete piles, used to create retaining walls, or shore up deep excavations.
Sediment	Small particles of soil, sand, and organic matter accumulated at the seafloor
Sediment plume	A visible or measurable cloud of suspended sediment in the water column generated by disturbance of the seabed or sediments.
Seismic activity	The occurrence of ground vibrations such as earthquakes.
Sensitive Receptor	A viewpoint (visual impact) where the observer is more susceptible to the visual impact of the development. Verified through site assessment.

Term	Definition
Sensitive Receptor Locality	A selection of viewpoints with similar landscape character and visual impact, usually represented by a single viewpoint for the purposes of visual impact assessment.
Shared socio-economic pathway (SSP)	SSPs represent different emission scenarios based around likely policy, social and economic options and the impact this has on emissions.
Significant Wave Height	The average height (from wave crest to the previous trough) of the highest third of the waves.
Slug test	A field test used to determine the hydraulic conductivity of an aquifer by changing the water level in a well and measuring the subsequent response.
Slurry	A mixture of water and fine solids, such as soil or rock particles this is an essential input into the Slurry TBM process.
Solifluction	Movement downslope of soil from freezing and thawing cycles.
Sound pressure	Rapid fluctuation in air pressure caused by a soundwave.
Species protection trigger value	The concentration of a chemical below which, it is considered safe for the protection of a specific proportion (e.g. 95%) of a species in an ecosystem.
Spill sump	An area designed to capture spills and leaks from a vessel.
Spoil	Excess soil, rock, or material removed during construction.
Spur line	A short length of pipeline branching from the main pipeline.
Stormwater detention basins	Shallow basins that temporarily hold rainwater to prevent flooding and erosion. They help manage runoff from construction sites.
Stratification	Layering or grouping by distinct levels.
Stratigraphy	The geological study of layers of rocks.
Substrate	The surface or material on the seabed or ground where plants and animals live.
Subtidal	The zone where the seabed remains continuously submerged below lowest tide level
Subzone (Planning and Design Code)	Locationally specific Zoning applied to vary or build upon policy contained within the 'parent' Zone. Where conflict exists, Subzone policy supersedes Zone policy.
Sygnathids	A family of fish including seahorses, sea dragons and pipefish.
Thermohaline	Deep sea ocean currents driven by differences in water density, with the density being controlled by the temperature and salinity of the seawater.
Topography	The arrangement of natural and artificial physical features of an area.
Total dissolved solids (TDS)	A measure of the dissolved combined content of inorganic and organic substances in a liquid.

Term	Definition
Turndown	The ability to operate a desalination plant at a reduced production capacity below its maximum design rate. For the Project the turndown capacity is 40 ML/day.
Traditional Owner	A Traditional Owner refers to an Aboriginal or Torres Strait Islander person or group that holds a continuous, ancestral connection to a specific area of land or water in Australia.
Transfer system	Pipeline infrastructure
Transported material	Sediments of unknown origin
Tributary	A freshwater stream that feeds into a larger stream, river or other body of water.
Tunnel boring	A method of digging underground tunnels using a large machine called a tunnel boring machine (TBM). It is often used to install pipelines with minimal surface disturbance.
Turndown	The minimum stable operating capacity while maintaining design water quality and process reliability.
Unexploded ordnance (UXO)	Explosive ammunition and weapons that has failed to explode as intended.
Vibracore	A sediment sampling device used to collect deep sea sediment samples.
Viewpoint	Point where the project may be visible, selected during desktop assessment.
Visibility Shadow	The visibility shadow identifies where topography or vegetation may screen views of the Project infrastructure from the viewer.
Visual Exposure	A measure of the degree to which an observer at a location can see or potentially see the area to be affected by the proposed development. The visual exposure is subjectively classified as either none, low, moderate or high.
Wave period	The time between crests of a wave.
Zone (Planning and Design Code)	Applied spatially to areas of the State, the primary organising spatial layer under the Code. Provides guidance on what classes of development are permissible in an area.
Zone of Theoretical Visual Influence (ZTVI)	The ZTVI defines areas where the project may be visible from, noting as the viewer gets further away the project infrastructure will become indistinguishable from the background.



Chapter 1

Introduction

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

1 INTRODUCTION 1-1

1.1 Project Overview 1-1

1.2 The Proponent 1-1

1.3 Background to the Proposal 1-2

1.4 Objective of the Northern Water Project 1-2

1.5 The Proposal 1-2

1.6 Project Design Context 1-3

1.6.1 Reference Design 1-3

1.7 Project Timeline 1-5

1.8 Overview of Regulatory Approvals Process 1-5

1.9 Purpose and Description of the EIS 1-6

1.9.1 Purpose of the EIS 1-6

1.9.2 Preparation of the EIS 1-6

1.9.3 EIS Consultation and engagement 1-7

1.9.4 Key issues to be addressed in the EIS 1-8

1.10 Project-specific Assessment Requirements 1-8

1.11 Structure of the EIS 1-8

1.12 Key EIS Spatial Definitions, Study Areas and Map Sections 1-12

LIST OF TABLES

Table 1-1: Key Project milestones 1-5

Table 1-2: Volume One - EIS main report and chapter descriptions 1-8

Table 1-3: Volume Two – Supporting documentation and technical reports 1-10

Table 1-4: Key EIS spatial definitions 1-12

Table 1-5: EIS Study Areas 1-13

Table 1-6: Standard map sections and descriptions 1-16

LIST OF FIGURES

Figure 1-1: Northern Water Project location and Project Area 1-4

1 INTRODUCTION

1.1 Project Overview

The Northern Water Project (the Project) aims to provide a secure, climate resilient water source for industry in South Australia's Upper Spencer Gulf (USG)[1] and Far North.

The Project will help realise the full potential of one of Australia's most promising regions by supporting decarbonisation and net zero ambitions, where large scale renewable energy projects meet a strong industrial base. By providing a stable and reliable source of water, the Project will reindustrialise the region by unlocking private investment critical to Australia's sovereign capability, national resilience, and decarbonisation objectives.

It will help underpin Whyalla's transition to green iron and steel, enable a doubling of copper production, and support the potential development of Australia's largest smelter—among other nationally significant industrial outcomes.

Delivery of the Project will involve the construction and operation of a 51 gigalitre per year (GL/y) seawater reverse osmosis desalination plant and associated marine structures on the USG, a transfer system and required power supply infrastructure. The proposed desalination plant location is on the western shore of the USG at Mullaquana Station, south-west of Whyalla, and the transfer system runs generally north from the desalination plant to delivery points at the Olympic Dam and Carrapateena copper-gold mines (refer Figure 1-1).

Pursuant to s.131(25) of the *Planning, Development and Infrastructure Act 2016* (PDI Act), on 22 December 2025 the Minister for Planning directed that an Environmental Impact Statement (EIS) be prepared for the Project, subject to the procedures and requirements of being an 'impact assessed' development, as if the development had been declared under s.108(1)(c) of the Act.

The Project was referred to the Commonwealth Minister for the Environment and Water and the decision that the Project is a 'controlled action' was received on 5 February 2026, requiring assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An EPBC Act accredited assessment process under the South Australian PDI Act was decided as the pathway for the purposes of assessment of the proposed action.

An EIS has been prepared in accordance with the Assessment Requirements (ARs) issued by the South Australian State Planning Commission (SPC) for the consideration of both the State and Commonwealth governments. Planning and environmental authorisation from both governments is required before the Project can proceed.

1.2 The Proponent

The Project is being proposed by the Department for Infrastructure and Transport (DIT). In addition to being the project Proponent and progressing State and Commonwealth planning

[1] For the purposes of the EIS, the USG is defined as the area bounded by the local government areas of Whyalla, Port Augusta, Mount Remarkable and Port Pirie, and the area mapped as the Northern Spencer Gulf Marine Bioregion. The Far North region is as described by Regional Development Australia: https://www.rda.gov.au/rda-network/south-australia

and environmental assessments, DIT is responsible for pre-delivery activities and procurement and delivery of the design, build, operate and maintain (DBOM) contract for the Project. DIT will also likely remain as the responsible agency for the purpose of the design and build phase of the contract.

Contact details and other corporate structure and policy about the Proponent are provided in the EIS Preparation and Proponent Information Section.

1.3 Background to the Proposal

South Australia's north has a proud industrial history and is home to some of the world's largest multi-metal deposits, gas resources, key defence assets, and world-class renewable energy resources. As the world looks to decarbonise, the region is also likely to experience significant near-term industrial growth through renewable energy and other green industrial opportunities.

These ambitions are limited by:

- a reliance on the use of water sources such as the Great Artesian Basin, River Murray and local groundwater aquifers
- constraints to additional water supply for industry in the region to invest in future economic ambitions.

The need for the Project has been on the South Australian infrastructure agenda for several decades and while several iterations of the Project have been considered previously, none have progressed to development.

1.4 Objective of the Northern Water Project

The Project aims to enable the growth of industries and key mining resources crucial for contributing to decarbonisation initiatives, sustainability and unlocking long term economic prosperity for South Australia. The Project will also provide an alternative water supply to the Great Artesian Basin (GAB) and other groundwater sources in the Gawler Craton.

The achievement of this objective will provide a wide range of benefits at a local, State and national level as discussed in Chapter 2 Justification and Alternatives.

1.5 The Proposal

The Project comprises the following key elements:

- a 51 GL/y seawater reverse osmosis desalination plant located at Mullaquana Station, on the Upper Spencer Gulf approximately 25 km south-west of central Whyalla
- marine intake and outfall tunnels extending underneath the seabed and into the Spencer Gulf
- seawater intake with associated intake structure and pumps
- outfall pipe and diffuser structures for discharge of return water into the Spencer Gulf
- a transfer system approximately 406 km in length consisting of:
    - approximately 360 km of main transfer pipeline, largely constructed underground, from the desalination plant and terminating at the delivery point at the Olympic Dam copper-gold mine

  - approximately 46 km of lateral branch pipeline (which may be constructed above or below ground) to a delivery point at the Carrapateena copper-gold mine
  - associated pump stations and water storage
- high voltage electricity supply including new transmission lines and network and facility substations to provide power to the desalination plant and transfer pump stations
- associated temporary construction-related infrastructure (e.g. construction camps, site offices and amenities, yards, storages and laydown areas)
- access tracks including upgrading existing tracks and establishing new tracks
- enabling roadworks and road upgrades.

The desalination plant site selection, the alignment and location of transfer system and electricity infrastructure alignments are described in Chapter 5 Project Siting, Alignment and Optimisation. Further detail on the Project elements including their construction and operation are provided in Chapter 6 Project Description.

1.6 Project Design Context

1.6.1 Reference Design

A Reference Design (GHD 2025a) has been completed for the Project and supports the definition of the Project for the purpose of State and Commonwealth assessments.

The Reference Design is preliminary and further adjustments to the Project design will be required. Final decisions on a range of matters including construction methodologies, materials, site locations and alignments will be subject to the outcomes of ongoing design and engineering, stakeholder engagement, technical studies and further environmental and economic assessment. As a result, matters such as the overall disturbance footprint, native vegetation clearance and disturbance footprints are subject to change, however any changes are anticipated to be managed within the proposed Project Area and consistent with impact profile assessed as part of the EIS.

The final design for the desalination plant and the transfer system infrastructure will be determined by the DBOM Contractor during the detailed design phase, which will continue beyond the EIS assessment and approvals process. The detailed design process may ultimately result in a final design which differs from the Reference Design as assessed in the EIS. The extent to which the final design can depart from the Reference Design will be limited by the need to remain within the parameters of the impacts assessed in the EIS and the requirement to achieve the environmental outcomes required by any State and Commonwealth approvals.

Plant capacity

Some aspects of the desalination plant and transfer system design and construction may, largely through a function of the construction method, accommodate a production capacity of greater than the proposed 51 GL/y. This will support an increase in plant capacity should it be proposed in the future. Any increase in production capacity to the currently proposed 51 GL/y, however, will be subject to separate assessment processes and associated approvals at that time. The potential impacts of a future increase in production capacity greater than the proposed 51 GL/y is therefore not considered in the EIS.

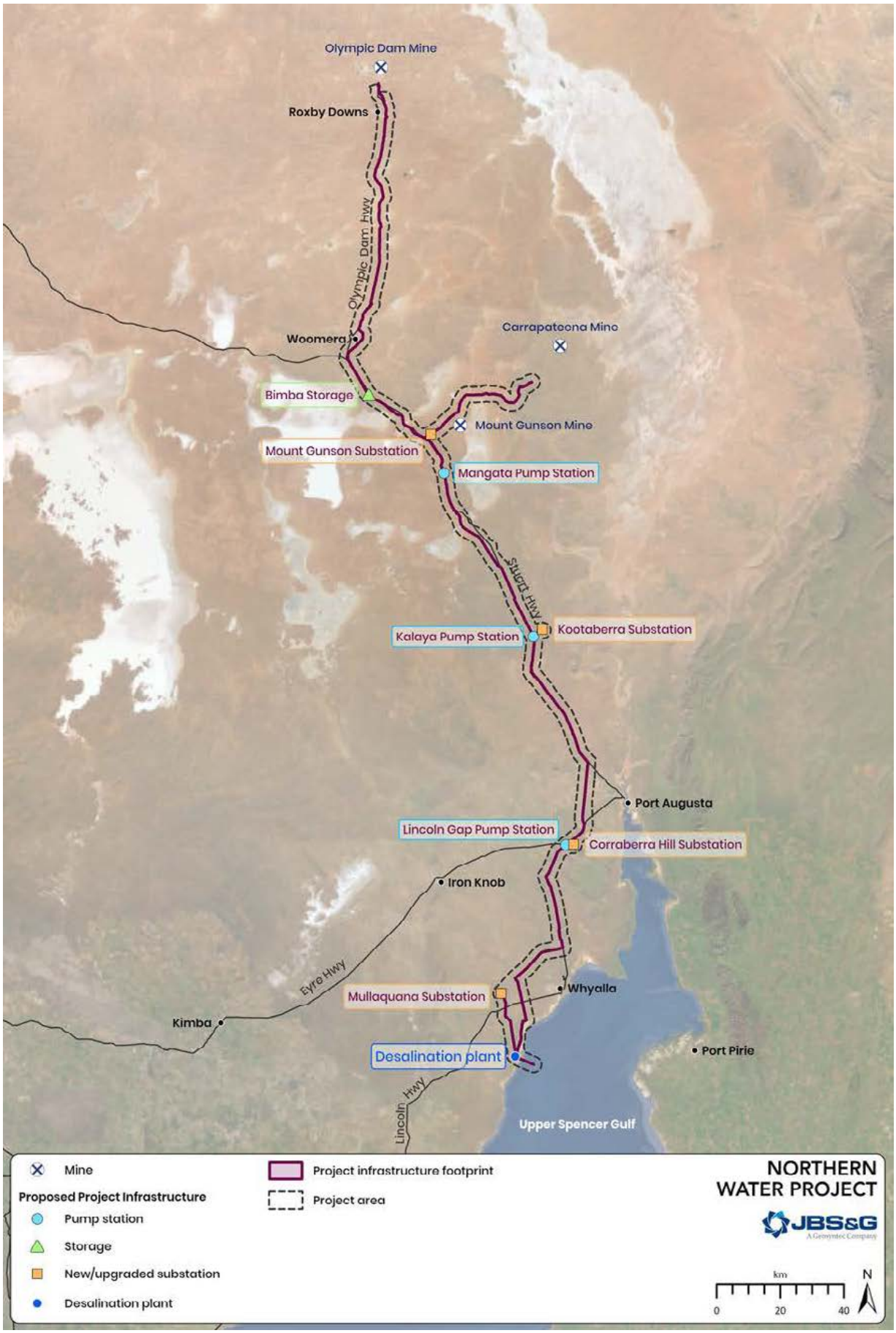


Figure 1-1: Northern Water Project location and Project Area

1.7 Project Timeline

Based on current planning, and subject to necessary environmental and development approvals and finalisation of land access arrangements, Project construction is expected to commence from the beginning of 2028. Key Project milestones are shown in Table 1-1.

Table 1-1: Key Project milestones

Milestone description	Timing
Crown Development Application submitted	4 December 2025 (Completed)
EPBC Act referral submitted to the Commonwealth government	11 December 2025 (Completed)
Impact assessed development directed by the Minister for Planning	22 December 2025 (Completed)
Direction to prepare an Environmental Impact Statement (EIS) published in SA Government Gazette	8 January 2026 (Completed)
Decision as an EPBC Act controlled action	5 February 2026 (Completed)
Impact Assessed Development Application and Planning Report submitted	19 March 2026 (Completed)
EIS Assessment Requirements published by the SPC	30 June 2026 (Completed)
EIS released for public consultation	**Q4 2026**
Development authorisation	Q1 2027
Commonwealth approval	Q2 2027
Construction commencement	2028
First water	2032

1.8 Overview of Regulatory Approvals Process

This EIS has been prepared in accordance with the Project-specific Assessment Requirements issued by the SPC under Section 113 of the PDI Act and Practice Direction 17 on 30 June 2026 (refer Appendix A-1 Assessment Requirements).

The Project will be assessed by the State and Commonwealth governments in accordance with the impact assessed development provisions of the PDI Act and the accredited assessment provisions of the EPBC Act, resulting in one assessment process, but two separate approvals.

The EIS process provides a rigorous assessment pathway for larger scale developments or those that require assessment of specific impacts, and provides a process for engagement with the public and State or Commonwealth Government agencies to ensure a single, integrated and streamlined assessment of the development. The EIS will address the impacts of the Project on the matters of environmental, social and economic importance defined by the SPC in the Assessment Requirements and will assess the extent to which the development is consistent with (amongst others) relevant State planning policies, regional plans and the Planning and Design Code (the Code).

In addition to ensuring each Assessment Requirement is addressed, the EIS is required to provide a clear and comprehensive analysis of the proposed development, the existing environment in which it will be located (physical and socio-economic), the likely impacts of the development and how those impacts will be addressed.

The impact assessed development and EIS provisions under the PDI Act, the accredited assessment arrangements under the EPBC Act and other relevant Commonwealth and State legislative approvals in relation to the Project are discussed in detail in Chapter 3 Legislative Approvals Framework.

1.9 Purpose and Description of the EIS

1.9.1 Purpose of the EIS

An EIS is an important, iterative process that will inform the construction and operational requirements of the Project. By understanding the relevant positive and negative impacts of a development, appropriate mitigation measures and management actions can be incorporated into the detailed design, construction and operation of the Project.

This EIS has been prepared to identify and assess the environmental, social and economic impacts and benefits of constructing the proposed desalination plant and associated marine infrastructure at Mullaquana Station, the transfer system and electricity infrastructure including relevant cumulative impacts and benefits.

The objectives of the EIS are to:

- provide a source of information for stakeholders to allow informed consultation and feedback
- explain the need for the Project and evaluate the case for approval of the Project over the alternatives which have been considered
- identify and assess the potential impacts of the Project on the community and the environment, and the measures to avoid, minimise and mitigate those impacts
- provide a framework for decision-makers to consider the Project in line with environmental, social, economic, cultural and technical factors; and
- address the EIS Assessment Requirements in taking into account the legislative framework described in Chapter 3 Legislative Approval Framework.

1.9.2 Preparation of the EIS

Preparation of the EIS for the Project has taken place over several years, during which the options for the preferred mode of delivery, and selection of sites and alignments of Project infrastructure were considered and determined. The Project has been subject to an extended, structured and complex process of design development which has aimed to balance the needs of the Project with stakeholder views at each stage. A longlist of potential infrastructure staging and scale configurations was developed by consolidating options considered in previous studies and assessments for a desalination plant and transfer system in this region. Strategic assessments were undertaken and additional options identified through technical review and stakeholder engagement.

Existing knowledge of the environmental, social and economic characteristics of the Project Area and experience / knowledge of similar projects have been utilised to inform requirements for Project-specific specialist studies. Previous reports and studies including those prepared for other desalination plant / pipeline projects in the State have been reviewed and current regulatory and community expectations and industry best practice have been considered in the preparation of the EIS.

A preliminary impact assessment prepared as part of the Planning Report (which accompanied the Impact Assessed Development Application submitted in March 2026) identified the key potential issues and impacts that might be expected from the construction and operation of the Project. This preliminary assessment determined the knowledge gaps or other uncertainties required to be addressed by proposed technical studies, and guided the scope of a range of terrestrial and marine-based environmental investigations which have been undertaken to address the EIS Assessment Requirements issued by the SPC.

1.9.3 EIS Consultation and engagement

Consultation with the community and other key stakeholders is an integral part of the Project design and impact assessment process, contributing to understanding of impacts and development of mitigation measures and management actions, mutually benefitting both the community and proponent. Effective engagement provides understanding of what is happening in the communities' 'backyard' and provides the proponent with useful feedback on the proposed development which can be incorporated into ongoing design and project planning.

The Integrated Communications and Engagement Plan prepared for the Project has been informed by South Australia's Community Engagement Charter (SPC 2025a) and principles of the International Association of Public Participation (IAP2 2024) and the State's Better Together framework (GoSA 2023a).

Stakeholder and community engagement for the Project has been wide-ranging, inclusive and ongoing through its various iterations, involving government departments, local councils, industry (as potential offtakers), key stakeholders (e.g. commercial fishers and landowners), Traditional Owners and local communities and businesses. Engagement activities have also been undertaken during the preparation of the marine and terrestrial technical assessments that support this EIS, the assessment of options for the location of infrastructure and refinement of proposed sites and alignments (refer Chapter 5 Project Siting, Alignment and Optimisation).

Consultation and engagement activities with a wide range of parties who may be affected by or interested in the Northern Water Project will continue throughout all phases of the Project. Given the Project's geographical extent, there is a diverse range of stakeholders to be consulted, therefore a wide range of communication methods are adopted to ensure all parties are provided opportunities for ongoing involvement in the engagement process.

Engagement will continue during the public consultation phase of the EIS and as part of the detailed design process.

Stakeholder engagement undertaken for the Project is discussed further in Chapter 4 Stakeholder Engagement. The Northern Water Project Integrated Communications and Engagement Plan is provided at Appendix D-1.

1.9.4 Key issues to be addressed in the EIS

The SPC undertook a preliminary review of the Project, based on the Impact Assessed Development Application and Planning Report submitted in March 2026, and in the Assessment Requirements, identified the following as key issues associated with the proposed development:

- effects on marine flora and fauna, ecological processes, and marine-based industry including recreational and commercial fisheries and aquaculture
- effects on terrestrial flora and fauna
- effects on Matters of National Environmental Significance under the EPBC Act including listed threatened species and communities
- effects on Aboriginal cultural heritage
- economic and social effects for local and regional communities, and the State.

1.10 Project-specific Assessment Requirements

This EIS has been prepared in accordance with the Assessment Requirements for the Project issued by the SPC.

The Assessment Requirements set out the matters relating to the environment that are to be addressed in the EIS for this Project. The EIS must also address all requirements set out in Section 113 of the PDI Act, Practice Direction 17 and Schedule 4 of the Commonwealth *Environment Protection and Biodiversity Conservation Regulations 2000*.

For ease of reference, each Assessment Requirement (including the general EIS content requirements) has been given an identifying number. A summary table cross-referencing each Assessment Requirement with the relevant section of the EIS in which it is addressed is provided at Appendix A-2 EIS Assessment Requirements Checklist.

The EIS Assessment Requirements relevant to this chapter include the requirement for information on the background, staging and timing of the Project and a description of the EIS process. The relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

1.11 Structure of the EIS

This EIS has been prepared to ensure that the Project is described adequately, the potential environmental impacts are assessed and proposed mitigation measures are identified. To present this information, the EIS consists of two volumes incorporating:

- Volume One – Executive Summary and EIS main report
- Volume Two – Supporting documentation and technical reports (Appendices A to N)

The structure and contents of these volumes are detailed in Table 1-2 and Table 1-3.

Table 1-2: Volume One - EIS main report and chapter descriptions

Chapter	Chapter Description
Executive Summary	Provides a summary of the key elements of the Project, the approvals process, the environmental, social and

Chapter	Chapter Description
	economic elements that were assessed and the key findings.
EIS Document and Proponent Information	Provides information on the preparation of the EIS document, the Proponent and EIS content.
1 Introduction	Provides background to the proposed Project, and overview of the EIS structure.
2 Justification and Alternatives	Sets out the objectives and justification for the Project, and the Project alternatives and other options which have been considered.
3 Legislative Approvals Framework	Describes the Commonwealth, State and local government legislative framework relevant to the Project.
4 Community and Stakeholder Engagement	Presents a summary of the key engagement activities undertaken as part of the EIS process, their outcomes and future engagement opportunities.
5 Project Siting, Alignment and Optimisation	Describes the approach used to select infrastructure site locations and the alignment of linear Project infrastructure.
6 Project Description	Provides a detailed description of the proposed Project.
7 Planning and Design Quality	Provides an assessment of the Project against the relevant State and local planning documents.
8 Impact Assessment Methodology	Describes the methodology for the impact and risk assessment process employed for the EIS.
9 Use of Land and Marine Waters	These chapters set out the impact assessment undertaken for each environmental, social and economic element by: • describing the existing baseline conditions for each environmental and social element and identify relevant environmental and social values • identifying and discussing potential impact events and proposed controls, mitigations and management strategies • presenting the outcomes of impact assessment for identified impact events for each environmental and social element, including any additional mitigation where relevant.
10 Coastal Processes	
11 Marine Environment	
12 Soils, Landform and Geology	
13 Surface Water	
14 Groundwater	
15 Terrestrial Flora and Fauna	
16 Aboriginal Cultural Heritage	
17 Non-Aboriginal Cultural Heritage	
18 Air Quality	
19 Noise and Vibration	
20 Landscape Character and Visual Amenity	
21 Traffic and Transport	
22 Economic Environment	
23 Social Environment	

Chapter	Chapter Description
24 Climate Change and Sustainability	Provides an assessment of the Project's vulnerabilities to future changes in climate over the life of the Project. It also provides a description of Project energy use and activities likely to generate greenhouse gas emissions, and the Project's approach to sustainability.
25 Hazards and Risks	Describes an overview of hazards and risk management for the Project, evaluates a range of potential and perceived hazards and outlines the Project's risk assessment and management framework.
26 Environmental Management Framework	Describes the environmental management framework that will be applied during construction and operation for the Project.
27 Conclusion	Conclusions of the EIS
28 References	Lists the references referred to or relied upon in the EIS

Table 1-3: Volume Two – Supporting documentation and technical reports

Appendix	Report	Reference in EIS
A	**EIS Assessment Requirements** A-1 EIS Assessment Requirements issued by SPC A-2 Checklist against EIS Assessment Requirements	All chapters
B	**Site Plans** B-1 Northern Water Project Site Plans B-2 Marine Works B-3 Desalination Plant B-4 Transfer System and Electricity Infrastructure	Ch.6 Project Description
C	**Certificates of Title**	Ch.9 Use of Land and Marine Waters
D	**Stakeholder Engagement** D-1 Integrated Communications and Engagement Plan D-2 Engagement Outcomes Report	Ch.4 Community and Stakeholder Engagement
E	**Planning** E-1 Planning Assessment Report	Ch.7 Planning and Design Quality
F	**Coastal Environment** F-1 Coastal Processes Impact Assessment	Ch.10 Coastal Processes
G	**Marine Environment** G-1 Baseline Water Quality G-2 Baseline Habitat Mapping Report G-3 Marine Ecology Assessment G-4 Mullaquana Station Mangrove Baseline Report G-5 Marine Sediments – Summary Baseline Report	Ch.11 Marine Environment

Appendix	Report	Reference in EIS
	G-6 Baseline Surveys for Larval Fish and Larval Decapod Crustaceans G-7 Survey for Juvenile Prawn Recruitment at Mullaquana Station G-8 Interaction between the Desalination Plant and Snapper and Whiting G-9 Underwater Noise and Vibration Assessment G-10 Marine Desalination Plant Ecotoxicology Assessment G-11 Desalination Plant Discharge Modelling – Nearfield Modelling G-12 Desalination Plant Discharge Modelling - Midfield Modelling G-13 Oceanographic Far-field Modelling of Return Water Discharges and Larval Connectivity G-14 Oceanographic Far-field Modelling of Return Water Discharge under a Future Climate Scenario G-15 Invasive Marine Species Risk Assessment G-16 Giant Australian Cuttlefish Assessment G-17 Independent Peer Reviews	
H	**Physical Environment** H-1 Topography, Geology and Soils Assessment H-2 Preliminary Site Investigation Report H-3 Surface Water Assessment H-4 Hydrogeological Conceptual Model and Groundwater Impact Assessment for the Pipeline Alignment H-5 Hydrogeological Investigation – Mulllaquana Desalination Plant Site H-6 Watercourses of Interest Table H-7 Stormwater Management Plan	Ch.12 Soils, Landform and Geology Ch.13 Surface Water Ch.14 Groundwater Ch.25 Hazards and Risks
I	**Terrestrial Ecology** I-1 Terrestrial Ecology Assessment I-2 Plains Mouse Habitat Assessment I-3 Plains Mouse Targeted Survey I-4 Migratory Birds Impact Assessment I-5 Draft Native Vegetation Clearance Data Report I-6 Significant Impact Assessment I-7 Draft EPBC Act Offset Strategy I-8 Threatened Species Management Strategy I-9 Preliminary SEB Offset Strategy I-10 Western Grasswren and Plains Mouse Database Records	Ch.15 Terrestrial Flora and Fauna
J	**Amenity**	Ch. 18 Air Quality

Appendix	Report	Reference in EIS
	J-1 Air Quality Impact Assessment J-2 Terrestrial Noise and Vibration Impact Assessment J-3 Landscape Character and Visual Amenity Impact Assessment J-4 Traffic Impact Assessment	Ch.19. Noise and Vibration Ch. 20 Landscape Character and Visual Amenity Ch.21. Traffic and Transport
K	**Social Environment** K-1 Social Environment Technical Report	Ch.22 Economic Environment Ch.23 Social Environment
L	**Climate Change and Greenhouse Gas** L-1 Climate Change Risk Assessment L-2 Greenhouse Gas Assessment	Ch. 24 Climate Change and Sustainability
M	**Impact Event Register**	All impact assessment chapters
N	**Bushfire Assessment**	Ch. 25 Hazards and Risks

1.12 Key EIS Spatial Definitions, Study Areas and Map Sections

Key spatial definitions

Table 1-4 lists the key EIS spatial definitions that are discussed throughout the EIS. A full list of terms used in the EIS is provided in the EIS Glossary.

Table 1-4: Key EIS spatial definitions

Spatial term	Definition / Explanation
The Project	The Northern Water Project (the Project) comprises the desalination plant located at Mullaquana Station, a ~406 km transfer system to the north of the State (including pump stations and storage) and electricity infrastructure.
Project Area	The standard Project Area is based on a 2.5 km buffer surrounding all Project infrastructure including the alignment of linear infrastructure (i.e. a 5 km wide corridor) with isolated areas identified outside of this buffer for potential laydown locations. Linear infrastructure includes pipelines, transmission lines and the desalination plant marine intake and outfall. The buffer effectively incorporates all Project infrastructure for the purposes of approvals. The defined Project Area does not include that section of the transfer system which is located within the BHP Special Mining Lease (SML) at Olympic Dam. The Project Area will be used as a guide for the assessment of impacts and final location of infrastructure is expected to remain inside this corridor.
Project infrastructure footprint	The Project infrastructure footprint is used mainly in mapping and figures. It includes:

Spatial term	Definition / Explanation
	• all Project infrastructure above and below the ground surface and seabed: o the desalination plant, tunnels, intake and outfall structures, pipelines (including trenchless crossings), pump stations, storages, transmission lines, substations and permanent access (e.g. to the desalination plant, pump stations and substations) • indicative areas of temporary and permanent surface disturbance for these components. This definition does not include potential locations of stand-alone construction laydown areas / camps, or construction access tracks.
Construction footprint	Description of the general area of expected ground disturbance for construction of Project infrastructure. Generally aligns with the disturbance footprint.
Disturbance footprint	Used for ecological assessments (terrestrial and marine). It is the estimated area of direct disturbance to ground surface and seabed due to construction and operation of all Project components. Includes: • indicative areas for all temporary and permanent disturbance • potential locations of stand-alone construction laydown areas / camps and construction access tracks (noting that these are nominal at this stage of the design, and additional or differing locations may be identified through detailed design). *Note: The Project design is preliminary and is expected to change through the detailed design process, or in response to cultural heritage matters or other refinements to minimise impacts as design and technical studies continue.* *The disturbance footprint will therefore be subject to change as the Project is refined. Any changes are anticipated to be contained within the Project Area and consistent with impact profile assessed as part of the EIS.*

EIS Study Areas

The study areas investigated for specialist studies have been defined in Table 1-5.

Table 1-5: EIS Study Areas

Study	Definition
Aboriginal Cultural Heritage	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure) within the respective Barngarla and Kokatha determined Native Title Claim areas.
Air Quality Assessment	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure).

Study	Definition
	The distance from the alignment and construction areas for which sensitive receptors were considered to be potentially affected by air quality emissions was set at 250 m from Project infrastructure.
Climate Change Risk Assessment	South Australia and, where applicable, the Project Area which was defined as follows: • the southern section: Mullaquana Station to Lake Dutton • the northern Section: Lake Dutton to Olympic Dam.
Coastal Processes Assessment	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure). Assessment focuses on the offshore marine environment surrounding the intake and outfall infrastructures, as well as the active coastal zone, which lies between the landward boundary (e.g. front dune) and the closure depth (depth at which wave action no longer significantly influences the seabed profile and sediment transport).
Ecological Study Area	Eyre Peninsula Land Management Region - 5km buffer surrounding the construction footprint. South Australian Arid Lands Land Management Region - 50 km buffer surrounding the construction footprint.
Economic Study Area	Dependent on data availability, study area was based on the Australian Bureau of Statistics (ABS) classifications for Statistical Area 2 (SA2) level, Regional Development Australia (RDA) regions, Local Government Areas (LGAs), the EIS Marine Study Area and the Eyre Peninsula and Flinders Ranges and Outback tourism regions.
EPBC Act Protected Matters Search Tool search area	The Project Area plus a 5 km buffer.
Groundwater Study Area	A 1 km buffer area from the nominal centre line of the pipeline infrastructure footprint (excluding the desalination plant site). A conservative zone of influence (based on potential drawdown) limited to within 100 metres of any trenching or trenchless excavation. A nominal 10 m vertical study area limit has been set for the depth of investigation.
Hazards and Risks	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure), including the Marine Study Area.
Landscape Character and Visual Amenity	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure). A 5 km radius from the centre of desalination plant site was identified as the likely extent of the Zone of Theoretical Visual Influence (ZTVI) for the desalination plant and Mullaquana transmission line alignment. Landscape character of the Project Area was described using relevant subregions in the Interim Biogeographical Regionalisation for Australia (IBRA) classifications, supplemented by descriptions in

Study	Definition
	the Eyre Peninsula Regional Landscape Plan and South Australian Arid Lands Regional Landscape Plan. Three locations of transfer system infrastructure representative of landscape character were assessed.
Marine Study Area (MSA)	A marine study area of approximately 35 km^2. The area covers an appropriate distance around the marine intake and outfall alignments and forms the broad basis for marine baseline studies and surveys at the Mullaquana Station site.
Non-Aboriginal Cultural Heritage Study Area	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure).
Planning Study Area	A corridor width of 200 m around Project assets (100 m from the nominal centreline of the asset) for the purposes of assessment against the Planning and Design Code.
Social Impact Study Area	• State Study Area (ABS State / Territory) - entirety of South Australia. • Regional Study Areas (ABS Statistical Areas Level 3) (RSA) - used for comparison purposes and to discuss regional impacts. • Local Government Study Areas (ABS Local Government Areas) (LGA) - includes areas directly impacted by the Project Area and / or adjoining areas likely to experience impacts associated with transport movements directly related to the Project. • Locality Study Areas (ABS Urban Centres / Localities) (UCL) – selected UCLs as defined by the ABS that sustain populations in proximity to or having connection to a location within the Project Area. Includes Woomera, Roxby Downs and Andamooka.
Surface Water Assessment	Project construction has the potential to impact water quality of downstream surface water features within 500 m of the Project. As this is expected to be the limit of significant water quality impacts this geographic extent represents the Study Area.
Terrestrial Noise and Vibration Assessment	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure).
Traffic and Transport Assessment	The area surrounding the transfer system route and associated infrastructure, extending broadly from Mullaquana Station to Olympic Dam.
Topography, Geology and Soils Assessment	The Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure).

Standard map sections

Where it will assist in descriptions and discussion of the approximately 406 km of transfer system and lateral branch pipeline, pump stations[2], storages and electricity infrastructure, maps provided in the EIS have been divided into two standard map sections referencing kilometre points (KPs) as described in Table 1-6.

[2] Note that pump station and storage locations may also be identified by number e.g. PS1. PS2 etc.

Table 1-6: Standard map sections and descriptions

Section	Coverage	Project elements in the section
Southern (KP0 – 195)	North of Munyaroo Conservation Park to south of Pernatty Lagoon. Coverage includes Murninnie Beach, Cowleds Landing, Whyalla and Port Augusta.	• Desalination plant and marine infrastructure • Mullaquana Station 132 kV transmission line • Mullaquana Station substation (new) • Southern section of main transfer pipeline • Lincoln Gap pump station and storage • Pandurra 275 kV transmission line • Corraberra Hill substation (existing) • Kalaya pump station and storage • Bookaloo 132 kV transmission line • Kootaberra substation (new)
Northern (KP 195 – 359) **Carrapateena (KP CA0 – CA46)**	Lake Dutton / Pernatty Lagoon to Olympic Dam Coverage includes Carrapateena Mine, Pimba, Woomera, Roxby Downs and Olympic Dam.	• Northern section of main transfer pipeline • Mangata pump station and storage • Oakden Hills 33 kV transmission line • Mount Gunson substation (existing) • Carrapateena lateral branch pipeline • Bimba high point storage * Note the pipeline construction footprint and Project Area terminate at the boundary of the BHP Special Mining Lease (SML)



Chapter 2

Justification and Alternatives

NORTHERN
WATER PROJECT

JBS&G
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TABLE OF CONTENTS

2 PROJECT JUSTIFICATION AND ALTERNATIVES 2-1

2.1 Setting the Context 2-1

2.2 Strategic Drivers for the Project 2-1

2.2.1 Current water supply scenarios 2-2

2.2.2 Mining demand – the Gawler Craton 2-2

2.2.3 Global demand for copper 2-3

2.2.4 Green iron and steel 2-4

2.2.5 Environmental sustainability 2-4

2.3 State and Commonwealth Government Policies and Strategies 2-6

2.3.1 South Australian strategies for copper and the mineral industry 2-6

2.3.2 State economic development 2-7

2.3.3 Net Zero Strategy 2-7

2.3.4 Water security 2-7

2.3.5 Commonwealth Government policies and strategies 2-8

2.4 Development of Project Alternatives and Options 2-8

2.4.1 Alternatives and water supply option studies 2-9

2.4.2 Development of options for capacity staging of supply 2-12

2.4.3 Options for desalination plant and transfer system siting 2-15

2.5 Summary of Key Northern Water Project Costs and Benefits 2-15

2.5.1 Key economic costs and benefits 2-16

2.5.2 Key environmental costs and benefits 2-18

2.5.3 Key social costs and benefits 2-20

2.6 Consequences If the Northern Water Project Does Not Proceed 2-22

2.7 Conclusion 2-24

LIST OF TABLES

Table 2-1: Options and long-list development 2-10

Table 2-2: Long to medium list screening criteria 2-11

Table 2-3: Summary of shortlisted options assessment 2-13

Table 2-4: Modelled Northern South Australia and South Australia results 2026-2062 2-16

Table 2-5: Key consequences if the Project does not proceed 2-22

2 PROJECT JUSTIFICATION AND ALTERNATIVES

The Northern Water Project (the Project) aims to provide a new sustainable, climate-resilient water source for industry in the Upper Spencer Gulf (USG) and Far North of South Australia, enabling growth of the industries and key mining resources that will contribute to State and national decarbonisation initiatives.

The need for the Project has been on the South Australian infrastructure agenda for several decades and while several iterations of the Project have been considered previously, none have progressed to development.

The preferred option for delivery involves the construction of a coastal desalination plant on Mullaquana Station on the western side of Upper Spencer Gulf south-west of Whyalla, and a transfer system to transport desalinated water to the Far North and principally to the Olympic Dam delivery point.

This chapter discusses the objectives and drivers for the Project, the Commonwealth and State government strategic and policy contexts, and the alternative supply and capacity options that were considered. A summary of local, regional and State benefits and costs is provided, along with the environmental, economic and social arguments to support the proposal including the consequences of not proceeding.

The process for identifying the options, assessment of alternatives, and selection of the location the desalination plant and alignment for transfer system infrastructure is described in Chapter 5 Project Siting, Alignment and Optimisation.

The economic and social impacts of the Project are described in Chapter 22 Economic Environment and Chapter 23 Social Environment.

2.1 Setting the Context

The EIS Assessment Requirements require a statement of the objectives and justification for the Project, the feasible alternatives and the implications if the Project does not proceed. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

2.2 Strategic Drivers for the Project

Four key strategic drivers have been identified for the Project:

- To support the continued development of South Australia's key mining resources to unlock globally significant deposits of strategic and critical minerals, and support economic growth and global decarbonisation efforts
- To unlock sustainable growth in key future industries (including the Whyalla Steelworks) which will contribute to decarbonisation initiatives, sovereign capability and enable employment / regional growth
- To increase environmental sustainability by reducing reliance on environmental water sources including the Great Artesian Basin (GAB), local water aquifers and the River Murray

- To preserve culturally and economically significant water sources for First Nations communities in South Australia.

2.2.1 Current water supply scenarios

The Far North and the USG regions in South Australia are increasingly water constrained and the need for new water for economic uses is common to both regions. However, the industries driving demand in the USG region are likely to require different volumes, on different timelines and in different locations to the demand from the more established and mature mining operations in the Gawler Craton mining province in the Far North. These regions are briefly described below.

Upper Spencer Gulf region

Water demand in this semi-arid region is centred around Whyalla. Most industrial and potable water is supplied by SA Water, drawn from the River Murray and is transferred across the Flinders Ranges via the Morgan to Whyalla Pipeline.

The USG region is in an economic transition, with a sustained period of minimal economic growth now offset by the prospect of investment in new renewable energy and sustainable green iron and steel industries which will themselves depend on secure access to water. The region is therefore expected to experience additional water demand for industrial intensification.

Far North region

The Far North of South Australia is characterised by globally significant mining, large scale pastoral activities and nationally significant Department of Defence assets. All but a small fraction of water used for industrial, agricultural and potable water in the region is sourced from groundwater aquifers, and principally the GAB. The Department of Defence receives a small portion of potable water from SA Water via its own, dedicated pipeline delivery system extending from Port Augusta to Woomera (the Port Augusta to Woomera Pipeline).

Groundwater extraction in the Far North is managed under the Far North Prescribed Wells Area[1] (FNPWA) Water Allocation Plan. The GAB is the source for 76% of groundwater allocated in the FNWPA. Mining activities and oil and gas industries (located in the far north-east of the State) within the GAB catchment resulted in groundwater extraction in 2021-22 being 24% higher than the average over the last 20 years. (DEW 2022a).

2.2.2 Mining demand – the Gawler Craton

The Far North is underlaid by the Gawler Craton mining province which contains some of the world's largest copper and other mineral deposits and hosts a number of large mining operations in the USG and Far North regions. Chief amongst these are BHP's operations, which has recently centred its global growth strategy on copper. BHP already operates three world class copper mines in South Australia (Olympic Dam, Prominent Hill, and Carrapateena) and intends to expand its mining, mineral processing and refining capabilities as well as future, new, copper development prospects.

[1] The FNPWA was prescribed in 2003 and imposes limits and measures to control water extraction and ensure active management of impacts across the GAB and other aquifers in the Far North.

Reliable water supply is fundamental to providing certainty that future water demands can be met and to encourage further mining investment. Mining in the Gawler Craton is currently dependent on groundwater supplied from the GAB and other groundwater sources like the Arckaringa Basin[2]. New and expanded mining developments will require new groundwater supplies, which would need to be located and have proven capacity to supply mine water requirements.

While the Olympic Dam and Carrapateena mines are located south of the GAB's southern artesian boundary, mine wellfields providing water for both are located more than 100 km north of Olympic Dam and draw water directly from the GAB. Expanding the spatial extent of groundwater abstraction wellfields to reduce local groundwater level drawdown will result in increased water supply costs that may be prohibitive. These costs are generally associated with a greater number of bores, increased length of pipelines, increased requirements for pump stations to transfer water, increased drilling depths, and higher water temperatures requiring energy and / or cooling prior to water transfer.

Any increase in water extraction from the GAB also comes with potential consequences through changes in artesian pressure and water flows that could impact cultural heritage and environmental assets.

The need to provide a sustainable and secure water supply to mining operations in the Gawler Craton has been on the South Australian infrastructure agenda for the last decade. Over this time, several option studies have concluded that a coastal desalination plant and pipeline is the preferred option to provide specific parts of the USG and Far North region with a sustainable and secure water supply (refer Section 2.4).

2.2.3 Global demand for copper

Copper is key to delivering global solutions to the challenges posed by climate change, particularly in renewable technology and electrification of transport (e.g. electric vehicles require three times as much copper as combustion vehicles). International energy and market authorities forecast that global copper demand will nearly double by 2050, driven by the clean energy transition. This surge in demand is occurring as the global supply chain faces unprecedented constraints. Key challenges include the long-term decline of ore grades at major international mines, increasing water scarcity in traditional production regions like South America, and rising geopolitical risks that threaten supply chain stability.

South Australia is home to globally significant copper assets, which account for 68% of Australia's 105 Mt of economic demonstrated resources[3], including the world's fifth largest copper resource at Olympic Dam. Despite this, South Australia only accounts for around a third of national copper production with current infrastructure.

As the world accelerates its decarbonisation efforts, a substantial gap between copper supply and demand has emerged, presenting both a significant global challenge and an opportunity for South Australia.

[2] SA Water, Aug 2021, Northern Water Supply (NWS) Options Report, version 1.0

[3] https://www.energymining.sa.gov.au/industry/minerals-and-mining/mineral-commodities/copper

The planned expansion of BHP's South Australian copper mines, mineral processing and refining facilities, and future copper development opportunities will require substantial volumes of water that cannot be met by existing surface and groundwater sources. With global demand for copper expected to remain strong, the absence of an alternative, reliable water supply would constrain future development in the region and limit the achievement of the Copper Strategy's objective of tripling copper production from 2018-levels.

2.2.4 Green iron and steel

Beyond copper, South Australia hosts significant magnetite iron ore deposits that are the ideal feedstock for a viable source of decarbonised green iron and steel. High-grade magnetite concentrate from this region has the potential to play a key role in decarbonising the global steel industry, which is currently responsible for approximately 8% of global carbon emissions.

The transition to green steel production coupled with unlocking the region's vast magnetite resources would enable a green metals value chain to be established within South Australia to produce green steel. This transformation would allow South Australia to produce premium, low-carbon green steel, a product with rapidly growing demand in a decarbonising global economy. The Whyalla Steelworks is one of only two integrated steelworks operations in the country and is located strategically near high-quality and abundant iron ore resources.

A new, secure water supply would be a critical enabler to achieving this growth opportunity, with water volumes in excess of available supplies, required in all steps of the value chain.

2.2.5 Environmental sustainability

Great Artesian Basin

The GAB is among the world's largest groundwater basins, originating in Queensland and terminating above the Gawler Craton. Groundwater use over more than a century in South Australia and Queensland has seen rising salinity and falling aquifer pressures including falls in groundwater pressure that support the protected mound springs, and other natural watercourses fed by the GAB within South Australia. The South Australian Government prescribed the Far North Prescribed Wells Area (FNPWA) in 2003, imposing limits and measures to control water extraction and ensure active management of impacts across the GAB and other aquifers in the Far North.

While basins like the GAB and Arckaringa Basin naturally recharge, drawdown of groundwater reduces natural pressures and flows, with potential consequential environmental impacts.

Climate change is expected to increase the likelihood and severity of droughts in these regions. Should this eventuate, the reduced availability of natural water sources would have a direct impact on the environment, reduce water availability for industries, and have the potential to impact the cultural traditions that depend on these water resources.

As water demand and the impact of climate change increases in the Far North region, so does pressure on groundwater systems, potentially resulting in increases in the nature or extent of impacts to environmental values.

Preservation of culturally and economically significant water sources

The Far North region encompasses valuable natural and cultural assets, but licenced water extraction has seen reduction in artesian water pressure and changing water flows, which has the potential to impact on areas of Aboriginal cultural significance.

For the Arabana people, the GAB mound springs form a key feature in creation and cultural stories and a vital part of their continuing association with the land. The permanent GAB mound springs, watercourses and arid wetlands created by the GAB provide food and means of passage across some of the world's most arid landscapes. As virtual oases in the desert, the springs are of vital importance to Aboriginal people.

The GAB mound springs are also of importance to non-Aboriginal cultural heritage. Their presence as a source of water in the arid landscapes of the Far North guided exploration and the routes of iconic national infrastructure including the Overland Telegraph line, and the original Ghan railway.

GAB mound springs are protected under various management plans and statutory regimes and are a key factor in determining the allocation of groundwater extraction licences by the State government. The Project has the potential to contribute to the preservation of the mound springs, the GAB and other groundwater resources by providing a new water supply.

River Murray

South Australia's position at the terminus of the Murray Darling Basin can see the State exposed during periods of drought, as occurred during the Millennium Drought of 2001-2009, when inflows to South Australia reached historically low levels due to the combined effects of extreme drought and decades of over-allocation across the Basin.

The USG's water supply is primarily drawn from the River Murray via the Morgan to Whyalla pipeline. In non-drought periods the USG has an average annual water demand of ~60 ML/day, a large proportion of which is used by the region's industries, including Whyalla Steelworks, the Port Bonython liquids processing facility and other industries. The Department of Defence also imports water, sourced from SA Water and transported via the Port Augusta to Woomera pipeline which is owned and operated by the Department of Defence.

River Murray water supplies are currently constrained by the limited water supply network and the need to maintain environmental flows in the River Murray to prevent downstream impacts to the environments that rely on this water. There is also increasing pressure to reduce extraction from the Murray Darling Basin to achieve targets set under the Murray Darling Basin Plan to recover 450 GL/year of environmental water by 2027.

Current mitigations focus on reducing and reallocating upstream water demands to maintain flows, further constraining growth in the sectors that use this water supply. In the absence of the Project, emerging and critical industries in the region would place further demand on the limited water supply from the River Murray.

Climate change

In the Eyre Peninsula and South Australia Arid Lands regions, climate change is forecast to reduce average annual rainfall by 9-11% by 2039 and 13-19% by 2099 under a medium greenhouse gas emissions scenario. This increases the likelihood of severe droughts in these parts of South Australia. The Murraylands and Riverland regions are similarly forecast to

experience a 7-11% reduction in average rainfall under the same scenarios which will impact the sustainability and reliability of the River Murray as a water source into the future (DEW 2022b).

SA Water projections show the USG's water demand exceeding supply within the decade based on current forecasts, with water security risks arising earlier should rainfall patterns change markedly from current forecasts. Water sourced from the River Murray is therefore not climate resilient and may be subject to restrictions during periods of drought.

From a national perspective, the Commonwealth Government regards the return of any additional volume of River Murray water entitlements as being of high significance. The Project demonstrates that South Australia is exploring all options to maximise its own water recovery.

2.3 State and Commonwealth Government Policies and Strategies

The Project strongly aligns with key national and State economic, industry and environmental policies and priorities, with the Project already identified as a priority in the SA Government's State Prosperity Project[4], South Australia's 20-Year Infrastructure Strategy 2025[5], South Australia's Climate Change and Resilience and Adaptation Actions[6], and Infrastructure Australia priority lists (Infrastructure Australia 2021a).

The Project would support a range of strategic export and production industries, particularly by increasing the availability of water to allow enhanced copper production, mineral processing and export.

The Project aligns with State and Commonwealth policies and strategies described below.

2.3.1 South Australian strategies for copper and the mineral industry

Development of the Project aligns with the State's mineral industry project pipeline and will support unlocking the globally significant Gawler Craton minerals province north and north-west of the Eyre Peninsula which contains extensive copper, gold, silver, iron ore, lead, zinc and graphite deposits[7].

South Australia is home to around 68% of Australia's demonstrated copper resources, and the State has established itself as the nation's premier copper-producing region and is competitive on a world-scale in terms of the quality and quantity of its known reserves. In 2024–25, South Australia's total copper exports increased to $4.3 billion, up 17% from the previous year. Many major mining companies, including BHP have recently centred global growth strategies on copper.

South Australia also has one of the largest magnetite resources in the world. The State's Magnetite Expansion Project (MEP1) centred in the Middleback Ranges will secure the

[4] Available at: www.stateprosperity.sa.gov.au/our-projects

[5] Available at: www.infrastructure.sa.gov.au/20-year-strategy/2025-Strategy

[6] Available at: www.environment.sa.gov.au/topics/climate-change/government-action-on-climate-change/adapting-to-climate-change

[7] www.energymining.sa.gov.au/industry/geological-survey/geology/gawler-craton

magnetite supply required by the Whyalla Steelworks and is expected to produce 2.5 million tonnes of magnetite per year when complete[8].

The State government's strategies for green iron and steel, copper, magnetite and critical minerals[9] recognise that water is a limiting factor in the development of prospective areas in regional South Australia (refer Section 2.2). The Project will contribute to addressing the availability and security of water supply which is a well-known and longstanding constraint on the expansion of mining and mineral processing activity in Whyalla and the northern region of South Australia.

2.3.2 State economic development

The Project will provide stable and reliable water, independent of climate variability, to support the growth of future industries in the region. In doing so, it will help realise the full potential of the State's copper province, where major mines are connected to a central smelter and refinery hub, and significantly boost Australia's position as a key driver of global decarbonisation.

The State Prosperity Project is a strategic initiative aimed at transforming South Australia's economy through the development of renewable energy, critical minerals, and green manufacturing. The plan focuses on leveraging South Australia's natural resources to position the State as a leader in sustainable industries.

The Project, the green steel transition which aims to transform the Whyalla Steelworks from a coal-based steelmaker to a low-carbon, green steel producer and the Port Bonython Hydrogen Hub are key elements of the plan.

2.3.3 Net Zero Strategy

South Australia's Net Zero Strategy 2024-2030 sets out the government's objectives, policy priorities and actions to reduce greenhouse gas emissions for South Australia and improve the prosperity and wellbeing of South Australians. Implementation of the strategy will help achieve South Australia's interim emissions reduction targets and drive progress towards net zero emissions by 2050.

The Project will assist the strategy through the expansion of industries critical to a decarbonised economy, by supporting water-intensive mineral processing activity to provide Australia and partners with the inputs required to achieve net zero, including green iron and copper.

2.3.4 Water security

The State Government's *Water Security Statement 2022 – Water for Sustainable Growth* (DEW 2022c) and *Annual Water Security Update* (DEW 2025) provide an overview of water security across South Australia and strategic priorities for ensuring long-term water security and meeting the State's growth targets, while adapting to a changing climate. Key challenges

[8] https://www.minister.industry.gov.au/ministers/timayres/media-releases/backing-whyallas-future-expansion-points-industrial-transformation

[9] Critical minerals are a collection of metal and non-metal commodities considered essential for economic and industrial development, and for which there are significant concerns around future supply due to resource scarcity or geopolitical factors.

which the Project aims to address include sustainable growth of the economy of the USG and Far North and protecting the environment into the future.

Water allocation plans for the River Murray Prescribed Watercourse and the Far North Prescribed Wells Area are statutory documents established under the *Landscape South Australia Act 2019.* These plans provide for the sustainable management of water resources in the River Murray to help protect its economic, cultural and environmental needs, and for water allocation and licencing of extraction from the GAB in the Far North and protection of water dependent ecosystems and sites of cultural significance.

2.3.5 Commonwealth Government policies and strategies

Infrastructure Australia's Priority List[10] presents nationally significant infrastructure investment opportunities for Australian cities and regions. The Priority List identifies projects that should be further developed over the next 15 years, with recommended Commonwealth funding. The Project was announced as a priority initiative on the Infrastructure Priority List in February 2021 (Infrastructure Australia 2021a) as providing a new sustainable water source expected to improve water resilience and increase water supply to the northern parts of South Australia.

The Project also aligns with a range of Commonwealth government strategies and policies ranging from critical minerals initiatives, net zero and emissions reduction strategies to sustainable water management. These include:

- The *Future Made in Australia* initiative which addresses maximising the economic and industrial benefits of the move to net zero and securing Australia's place in a changing global economic and strategic landscape. Critical minerals processing and green metals are identified as key national interest industries.
- The national *Critical Minerals Strategy 2023-2030* which provides a framework to grow Australia's critical minerals sector.
- Australia's *Net Zero Plan* which is a whole-of-economy plan to achieve net zero by 2050, focussing efforts on helping to cut emissions while creating jobs and growing the economy.
- *Great Artesian Basin Strategic Management Plan* which provides the framework for responsible groundwater and related natural resource management in the Basin.
- *National Water Grid Investment Framework 2022* which prioritises projects that support primary production, promote the growth and sustainability of regional economies and build resilience
- *National Water Initiative 2022* which is a shared commitment by governments to increase the efficiency of Australia's water use, leading to greater certainty for investment and productivity for rural and urban communities, and the environment.

2.4 Development of Project Alternatives and Options

The need for a secure climate resilient water supply for industry in the USG and Far North has been on the South Australian infrastructure agenda for decades. Several iterations of the

[10] https://www.infrastructureaustralia.gov.au/ipl

Project have been considered previously, driven by recognition of the increasing need to identify an alternative sustainable water supply for these regions.

2.4.1 Alternatives and water supply option studies

Previous option studies including studies completed by BHP and SA Water concluded that a coastal desalination plant and transfer system on the eastern Eyre Peninsula is the preferred option to provide a secure water supply to specific parts of the USG and Gawler Craton areas. The most relevant studies including findings are described below.

2009-2011: BHP Olympic Dam Expansion EIS

The BHP Olympic Dam EIS for expansion of its mining and processing operations at Olympic Dam (BHP 2009a) investigated and rejected numerous alternative sources and options, including sourcing additional water from:

- the GAB, largely due to potential impacts to mound springs
- the Arckaringa Basin due to likelihood of insufficient supply
- Adelaide treated wastewater, which was considered unviable due to distance, variable water quality and competing demand from industry on the Adelaide Plains
- the River Murray which was not considered feasible due to initiatives to improve drought security and recover ecological damage.

The BHP EIS identified a 280 ML/day coastal desalination plant located at Point Lowly to be the preferred option for meeting additional water requirements.

2019: WSP Northern Water Supply Options Analysis Report

The WSP Northern Water Supply Options Analysis Report commissioned by SA Water in 2019 investigated solutions for a sustainable water supply to Olympic Dam, Carrapateena and the Department of Defence in the Far North.

The study focused on desalination as the water source to supply new demand in the north of the state and did not contemplate replacing River Murray water supplies to existing customers.

Seven alternatives produced a longlist of 41 options which was shortlisted to 14 options following stakeholder engagement. Four configuration options were evaluated in a Multi Criteria Analysis (MCA) against technical and commercial criteria covering environmental, heritage and approvals, social and economic, and technical feasibility.

A coastal desalination plant was determined in this analysis as the preferred option but no specific site within the USG was preferred.

2022: Arup and Inside Infrastructure Northern Water Options Analysis

The Northern Water Supply Options Analysis[11], prepared by Arup and Infrastructure South Australia in 2022, also assessed a broad range of potential water supply solutions to meet projected industrial and regional demand in northern South Australia.

[11] Available at https://yoursay.sa.gov.au/northern-water-supply

Options longlist

The analysis developed a long list of 68 options drawing on previous studies and assessments, and the addition of alternatives as set out in Table 2-1.

Water supply options considered were not limited to desalination and included increased or new groundwater extraction (including the GAB and Arckaringa Basin), use of River Murray allocations, reuse of Adelaide treated wastewater, utilisation of Cooper Basin produced water, potential supply from the Adelaide Desalination Plant and a range of coastal and inland desalination configurations. Options involving different scales, locations, staging approaches, pipeline alignments and brine or dual-quality water supply arrangements were also considered.

Table 2-1: Options and long-list development

Process	Sources	Number of options
Previous studies and assessments considered	• BHP Olympic Dam Expansion Draft EIS (2009-2011) • WSP Northern Water Supply Options Report, SA Water and Project Partners (2019) • Northern Water Supply (NWS) Options Report, SA Water (2021) • Northern Water Supply Technical Assessment Report, Jacobs & GHD (2021) • New Water for South Australia's Far North, Infrastructure SA (2021) • Arup and Inside Infrastructure Northern Water Options Analysis	63
Identification of additional options	• Additional options were identified by Arup based on technical experience and review of the Project proposal	5
Long list		**68 options**

Screening for medium list of options

The long list of 68 options was then progressively screened against criteria including timing, scale, source security, demand reliability and duplication. Options were removed where they were constrained by limited supply, competing allocations, reliance on other industries, or inability to support multiple users at regional scale.

This process resulted in a medium list of 20 (and included the addition of 2 supplementary options (refer Table 2-2)). The medium list water supply options comprised 17 coastal desalination-based solutions and 3 inland-based desalination options supplied with seawater pumped from the USG.

Table 2-2: Long to medium list screening criteria

Screening criteria	Outcome	Number of options
Long list of options before screening process		**68**
Timing	Removed options likely to require extended approval timeframes, shifting the start of operations beyond the five-year timeframe (e.g. options at significantly (>20%) larger scale or in challenging coastal locations.	-3
Scale	Removed all options providing less than 50 ML/day capacity as options of this scale could potentially be more economically/ technically provided through augmentation of existing water infrastructure and source options.	-15
Water source security	Removed options that provided source or supply with dependency on viability of another industry (e.g. surplus water from Cooper Basin oil / gas extraction) or had known existing constraints on supply volume identified in previous studies (e.g. increased GAB extraction or drawing on regional aquifers).	-6
Demand reliability	Removed options which could not demonstrate a level of demand reliability to support further consideration and development.	-3
Brine management	Removed options that did not demonstrate a significant beneficial use (or return to environment) of desalination brine[12]. This removed most of the inland desalination plant options due to the significant volume of unallocated brine.	-13
Duplicates	Removed options effectively the same in scale (+/- 10%), water source and offtake / customer mix	-10
Add supplementary options	Options added to support the assessment of industrial water quality alternatives	+2
Medium list of options following screening process		**20 options**

Strategic merits testing

The medium list 20 options were put through a strategic merit testing stage to develop a shortlist of five supply options to go forward to a Multi Criteria Assessment (MCA).

These options were assessed against three demand scenarios (conservative, realistic, optimistic), supply management (balancing supply to meet demand), the area to be served by each option (northern areas only, regional supply to Whyalla / USG), community views (alignment with expectations, ability to obtain land access from relevant parties) and ability to obtain required regulatory State and Commonwealth approvals.

[12] Desalination brine is the concentrated saline water byproduct after freshwater is extracted from seawater.

Five shortlisted supply options were identified for further, more detailed MCA. These options were all coastal desalination plants on the USG, and adopted the same pipeline route, with two options serving the northern areas only. Other than the area to be served, the key difference between the options was the system capacity, sizing and staging in relation to meeting differing demand scenarios.

- S1. Regional balanced system[13] / conservative demand
- S2. Staged regional balanced system / realistic demand
- S3. Regional on-demand system / realistic demand
- S4. Northern areas only / balanced system / realistic demand
- S5. Northern areas only / dual supply /realistic demand.

Options S1, S2 and S3 were identified as the preferred supply options for progression to further assessment.

2.4.2 Development of options for capacity staging of supply

Water demand assessment

A demand-led approach to determining the optimal capacity of the Project infrastructure was adopted. Identifying and assessing demand for the Project has been an ongoing process over the past several years, largely focussed on a market engagement approach. This included consultation with companies and industry sectors in the region as well as government, to understand the need, timing and specific requirements the Project would be required to address.

Three demand scenarios were developed based on the assessed likelihood of Project progression and strategic importance to State objectives, which were then used to inform capacity options:

- **Demand scenario 1:** current demand and immediate known growth opportunities in the USG and Far North
- **Demand scenario 2:** scenario 1 + potential for additional mining and other industrial expansion in the USG region. This scenario is considered the most likely and is referred to as the central demand scenario.
- **Demand scenario 3:** scenario 2 + assumes high growth and large future industrial water demand in the USG

Supply capacity options

Three capacity options[14] were shortlisted based on the ability to support the different projected future demand scenarios:

[13] A 'balanced system' meets peak demand requirements predominately through new storage and/or increased utilisation of existing storage.

[14] Note that the Business Case refers to desalination plant capacity in megalitres / day (ML/day). For the purposes of the EIS and other approvals, this capacity has been converted to gigalitres / year (GL/year).

- **Capacity Option 1**: A minimum viable product (51 GL/y capacity) that best supports demand scenario 1 and is based on current demand and a known set of opportunities. No assets are oversized to meet a future demand above 51 GL/y.
- **Capacity Option 2**: A modified version of capacity option 1 developed to 51 GL/year with added future proofing to 73 GL/year[15] and capable of a later expansion that best supports the central demand scenario.
- **Capacity Option 3**: 95 GL/year capacity delivered in two stages that best supports addressing demand scenario 3 for large future industrial water demand.

Capacity options assessment

Capacity options 1, 2 and 3 were taken through further financial, social, environment and cost-benefit assessments to determine the preferred option. The outcomes of these assessments are summarised in Table 2-3. Further detail of the cost benefit analysis is provided in Chapter 22 Economic Environment.

Table 2-3: Summary of shortlisted options assessment

Assessment	Description	Outcome
Financial assessment	Comparison of the relative revenues, capital and operating costs between the options	**Capacity Option 1** has the highest economic Benefit-Cost Ratio (BCR) and the strongest financial Net Present Value (NPV) as it does not include any enabling works to support future proofing. However, this option is unable to support additional demand beyond 51 GL/year and is therefore unable to fully support the central (and most likely) demand scenario. **Capacity Option 2** has future-proofing through enabling works providing greater future capacity potential than Capacity Option 1, enabling this option (through a future expansion) to support the full extent of the central demand scenario. Additional cost of enabling works to support future proofing comes at the cost of slightly weaker economic and financial performance compared to Capacity Option 1 (under the medium demand scenario). Despite this, Capacity Option 2 still demonstrates a strong economic BCR and financial NPV, with the potential for additional upside if the future expansion occurs and the full capacity of the expansion is sold. **Capacity option 3** was the poorest performing in the CBA as it is significantly oversized for the central demand scenario, leading to the lowest economic BCR and a negative financial NPV.
Cost-benefit analysis (CBA)	Comparison of the economic merit of the three shortlisted Project capacity options relative to the Base Case	

[15] Future proofing was included as part of Capacity Option 2 through enabling works in the marine works infrastructure and the section of pipeline between the desalination plant site and Whyalla North to enable possible future expansion.

Assessment	Description	Outcome
Social assessment	High-level, qualitative assessment of the relative social impacts of the capacity options	The Project provides a range of social benefits including: • distribution of economic benefits across regional areas of South Australia • ongoing jobs accessible to local people in the region through the ongoing Project operations as well as jobs created through mining and industry • supporting protection of culturally significant water sources There is considered to be limited difference in the social assessment between the three capacity options, however the greater capacity of the desalination plant and transfer system in Capacity Option 3 may result in a marginally higher overall social impact. Site selection for the preferred option is a significant factor that will influence the ultimate social impact of the Project. Further analysis of site selection is provided in Chapter 5 Project Siting, Alignment and Optimisation.
Environmental assessment	High-level, qualitative assessment of the relative environmental impacts of the capacity options	There is expected to be limited difference in environmental impact between the three capacity options. All three options are able to substitute the current extraction of water by existing users to the same extent. The larger scale of the desalination plant in Capacity Option 3 may result in a marginally higher overall environmental impact. Similar to social impact, the ultimate environmental impact of the Project will be driven by site selection for the preferred option. Further analysis of site selection is provided in Chapter 5 Project Siting, Alignment and Optimisation.

Preferred capacity option – Option 2

The options assessment determined that the preferred option is Capacity Option 2 (refer Table 2-3) which would deliver the Project design capacity of 51 GL/year, with future-proofing enabling works to 73 GL/year (dependent on future demand)[16].

The key difference between the options is that through future-proofing, Capacity Option 2 has the best ability to support the full extent of demand scenario 2 which is considered the most likely demand scenario. Whilst this option was assessed as having slightly lower financial and economic performance (refer Table 2-3), the economic opportunity provided

[16] The potential for a future increase in production capacity greater than the proposed 51 GL/y is therefore not considered further in the EIS.

by the future-proofing provides the ability for further upside which is demonstrated by a higher economic BCR.

Capacity Option 1 is unable to support additional demand beyond 51 GL/year, providing limited scope to support demand beyond current and known industrial requirements and is therefore unable to fully support the most likely demand scenario. Capacity Option 3 is significantly over-sized for the central demand scenario meaning the plant would have significant under-utilisation throughout the initial operating life under the likely demand scenario, causing costs to outweigh the benefits.

Capacity Option 2 is therefore the basis of the Reference Design[17] which has been used for the assessments presented in this EIS. Key elements have been sized for the potential future expansion capacity, in particular the intake and outfall tunnels and transfer system pipelines, as these elements of the Project are difficult, and inefficient to expand later.

2.4.3 Options for desalination plant and transfer system siting

As well as the numerous studies which concluded that a coastal desalination plant and transfer system on the eastern Eyre Peninsula is the preferred option to deliver on the strategic needs of the Project, several previous studies have also investigated a range of possible locations and alignments for the desalination plant and transfer system. A similar process of long listing, screening and shortlisting against a range of criteria was undertaken, and included extensive consultation with affected stakeholders.

Mullaquana Station was selected as the site for the desalination plant for the following reasons:

- The location meets strategic Project objectives through closer proximity to demand
- The site offers greater economic and financial viability in terms of construction and operation
- Favourable ground conditions are present at the site for the construction environment
- The location better supports growth in Whyalla and the region
- Estimated greenhouse gas emissions are lower than the Cape Hardy site

The transfer system alignment has also been subject to significant assessment and optimisation to deliver on a preferred technical and hydraulic outcome while minimising impacts.

Further detail on the shortlisting and final selection process for the desalination plant at Mullaquana Station and siting of the transfer system infrastructure is provided in Chapter 5 Project Siting, Alignment and Optimisation.

2.5 Summary of Key Northern Water Project Costs and Benefits

As discussed in Section 2.4, despite a series of proposals and detailed studies, stand-alone private sector water supply options to serve industry in the USG and Far North have failed to eventuate to date. A government-driven solution enables the Project to operate by serving multiple industrial users, with a single shared facility which can reach a scale that

[17] As noted in Chapter 1 Introduction, the final design for the desalination plant and the transfer system infrastructure will be determined in consultation with the DBOM contractor during the detailed design phase.

significantly lowers average costs to a level that could not be achieved by smaller individual projects on their own.

Delivery by the South Australian government also allows better consideration and response to the wider economic, social, cultural and environmental potential costs and benefits that the Project could deliver to the state of South Australia.

2.5.1 Key economic costs and benefits

The Project will promote additional economic activity by providing water for industrial uses in the region including new mines, resulting in additional investment, employment, taxation revenue and mining royalties.

Further detail of the economic benefits and potential impacts of the Project is provided in Chapter 22 Economic Environment.

State and regional economies

The additional investment and activity associated with the Project has the potential to positively impact the economies of Northern South Australia[18], South Australia and Australia. Computable General Equilibrium modelling was undertaken to assess the economy-wide impact of construction and operation of the Project on key economic metrics. The modelling results indicate that the Project could increase Gross Regional Product (GRP), Gross State Product (GSP) and employment (in Full-Time Equivalent (FTE) terms) substantially over the period between 2026 and 2062 (refer Table 2-4).

Between 2026 and 2062, GRP in Northern South Australia could be expected to be approximately 12% (or $3 billion) larger on average. Between 2026 and 2062, South Australian GSP could be expected to be 1.5% (or $3.3 billion) larger on average.

Table 2-4: Modelled Northern South Australia and South Australia results 2026-2062

Option 2	Northern South Australia		South Australia	
	Average (2026-2062)	2062	Average (2026-2062)	2062
GRP / GSP ($B deviation)	$3 billion	$4 billion	$3.3 billion	$4.3 billion
GRP / GSP (% deviation)	12%	13%	1.5%	1.5%
Employment (FTEs)	1,600	2,000	2,000	2,100

National economy

Modelling of national impacts shows that as a whole Australian Gross Domestic Product (GDP) is expected to be 0.1%, or $4.2 billion higher on average between 2026 and 2062 (including the impact in South Australia). Results at the national level are higher than for South Australia, demonstrating some positive spillover impacts from the Project in other Australian states. Additional employment impacts for both South Australia and Australia

[18] For the purposes of the modelling, Northern South Australia is defined as the combination of the ABS Eyre Peninsula and Southwest and Outback - North and East Statistical Area Level 3 (SA3) geographic regions (refer Chapter 22 Economic Environment).

peak in 2040, at 2,700 and 5,800 additional FTEs respectively. Further detail is provided in Chapter 22 Economic Environment.

Copper and mining

The Project will create greater investment security and opportunities in the Gawler Craton and USG regions by providing an alternative, secure and sustainable water supply to support current mining operations as well as incentivising exploration and mine expansion. The provision of water to the mining industry is expected to lead to increased mining productivity (relative to the Base Case) and therefore a producer surplus (post tax and post royalties) for South Australian mining company owners and shareholders. Unlocking mineral resources through reliable access to water from the Project, and the resulting increased investment and expanded mining sector activity is expected to create employment and economic growth for the region and the State.

Copper is in high demand worldwide because it is a highly efficient electricity conductor and is used in renewable energy systems to generate power from solar, hydro, thermal and wind energy. South Australia has significant deposits of copper and other critical minerals essential for global decarbonisation and electrification.

South Australia is currently and will continue to be a major global exporter of copper and other critical minerals into the future. Approximately two thirds of Australia's copper reserves are located in South Australia, generating a production value of $5 billion per annum. A new secure water source will result in water costs becoming a predictable operating charge rather than a repeated and uncertain capital investment. This will enable miners to reliably plan the development of the resources they are exploiting.

Mining is one of the nine priority industry sectors identified by the SA Government to increase interstate and global demand and attract investment[19]. The Department for Energy and Mining (DEM) have projected $9 billion in additional royalty revenue to the State in nominal terms to 2050 from forecast projects as a direct result of the water supplied by the Project.

Royalties

The provision of water to the mining industry in the Far North and USG regions of South Australia is also expected to lead to increased mining productivity (relative to the Base Case) and therefore an increase in royalty payments received by the SA Government. These payments will be distributed indirectly to all South Australians through government funding of services, infrastructure projects and other government activities. Regional communities in the USG and Far North of SA would be expected to receive a larger portion of the benefits given the location of the desalination plant.

Employment

The Project is expected to have a significant positive impact on employment within Northern South Australia. In average annual terms, between 2026 and 2062, an additional 2,000 FTEs are expected to be employed across South Australia, with 1,600 in Northern South Australia. This includes employment initially generated in sectors directly linked to construction of the Northern Water Project (and ancillary sectors such as heavy manufacturing and services),

[19] Department of Treasury and Finance SA, Jobs and Economic Growth Fund Guidelines

before moving to the mining sector as mining production increases once the desalination plant is operational.

On average, an additional 2,000 FTEs are expected to be employed in Northern South Australia in the post construction phase between 2033 and 2062, with approximately 75% of these in the mining sector as it expands due to access to additional water.

Growth in the construction, mining, construction and water sectors also leads to positive employment generated in a range of other sectors such as trade (retail and wholesale) as these sectors draw on a range of services throughout the economy. Government services will also experience a degree of growth in demand due to the increase in incomes more broadly across the region.

Aboriginal economic participation is a key factor in enhancing the sustainability and viability of Aboriginal communities and can be expected to increase due to targets proposed for Aboriginal employment, training, business spend in the supply chain, and for the number of Aboriginal businesses involved across the Project life cycle.

Labour force

Modelling results for the employment benefits have taken into account reduced employment in sectors that may face increased competition for labour due to the Project. 'Crowding out' could occur as the expansion in mining and water sectors creates competition for labour, diverting workers away from other sectors that are not explicitly expected to grow under the scenario, such as the agriculture sector.

Modelling indicates that overall, crowding out effects of the Project on employment in Northern South Australia are moderate with agriculture facing some competition for labour as the mining sector expands. The existing reliance on migrant and fly-in-fly-out workers which typically supply the mining sector in Northern South Australia means that labour required for the expansion of mining can be imported from neighbouring regions with relative ease – moderating the competitive effects on other sectors.

2.5.2 Key environmental costs and benefits

The Project has the potential to provide environmental benefit as an alternative sustainable climate resilient source of water for users that currently extract water from the GAB, local groundwater sources and potentially the River Murray. The environmental costs of the various options proposed were also considered in the development of the Project and the selection of capacity Option 2.

Options that provided access to seawater and proximity to end users were the primary drivers in the development of a final shortlist of four potential desalination plant sites located on the western Spencer Gulf. The MCA undertaken of the shortlisted sites further considered the environmental sustainability of these options including minimisation of marine and climate impacts and risks to native flora and fauna (refer Chapter 5 Project Siting, Alignment and Optimisation).

Stakeholder and community feedback has acknowledged the economic benefits of the Project, but a community expectation that this should not come at a cost to the environment through potential impacts on terrestrial and marine species and habitats has also been clearly expressed.

Reduced reliance on existing water sources

Currently, the industries proposed to be supplied by the Project are dependent on water largely taken from the GAB and the River Murray (refer Section 2.2.5).

The USG's water supply via the River Murray is exposed under severe drought conditions, and even in non-drought conditions, this is a single, distant water source with limited flexibility in the event of operational disruptions. There is similar uncertainty in reliable future availability and quality of groundwater in the Gawler Craton region, particularly for mining activities, impacting water security and investment in this region.

The Project will provide an alternative, climate resilient water supply that may create opportunities for future reductions in reliance by industry on existing water sources.

Relationship with Great Artesian Basin groundwater use and culturally significant water sources

The GAB mound springs are of great significance to the Arabana people and are an important part of the cultural heritage of Traditional Owners in the arid areas in the north of the State. There are concerns that continued extraction from the GAB will result in a significant reduction to the 'vitality and the ecological viability of the springs'[20], and that there is a high likelihood of extinction of more springs.

The Project has the potential to contribute to a reduction in future demand for groundwater from the GAB where water users utilise desalinated water supplied by the Project instead of existing groundwater sources. To the extent that this occurs, there may be indirect environmental, cultural and economic benefits associated with reduced pressure on groundwater resources and groundwater-dependent ecosystems, including mound spring systems.

However, the Northern Water Project does not of itself alter groundwater extraction entitlements, groundwater allocation limits or groundwater management arrangements. The intention of the Project is to provide an alternative, climate-resilient water supply source for industrial users currently using, or with the potential to use, groundwater and other existing water resources. Any future reduction in groundwater abstraction from the GAB would be determined through decisions made by individual water users and the operation of separate water allocation, licensing and regulatory policy and frameworks.

Potential changes to GAB groundwater extraction and any resulting impacts or benefits to mound springs have therefore not been assessed as direct outcomes of the Project within this EIS. The role of the Project is limited to providing an alternative water supply source that may create opportunities for future reductions in dependence on existing groundwater resources.

Site selection for Project infrastructure

The location of major infrastructure in the landscape and in marine waters has the potential to cause significant impacts if site selection is not informed by thorough and rigorous

[20] *A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge*, Joint Standing Committee on Northern Australia, October 2021.

environmental investigations and engagement with affected communities and stakeholders.

The preferred location and alignment of the desalination plant, marine, transfer system and electricity infrastructure have been selected following a comprehensive analysis of site options that considered environmental sustainability and aimed to avoid or minimise potential impacts to the environment where possible (refer Chapter 5 Project Siting, Alignment and Optimisation).

Transfer system and electricity infrastructure locations and alignments have been selected to follow existing infrastructure corridors and other previously disturbed areas where possible. Environmentally sensitive areas have been avoided where possible and practicable, including Aboriginal culturally significant locations and high value fauna habitat. These locations and alignments will be further refined as detailed design is finalised, environmental and cultural heritage investigations and ground-truthing surveys are completed, and in ongoing consultation with relevant stakeholders.

Managing potential impacts from construction and operation of the Project

Activities associated with construction and operation of the Northern Water Project are likely to lead to some impacts to the terrestrial and marine environments in which they are undertaken. These are most likely to be derived from ground / seabed disturbance and removal of native vegetation, including seagrass. Potential impact events from these and other Project activities have been assessed in the EIS and measures proposed to avoid, minimise or manage the resulting impacts.

The EIS concludes that the Project will not have unacceptable impacts on biodiversity, including nationally listed threatened species and communities, and migratory species. The majority of environmental impacts from construction and operation of the Project are expected to be short-term, localised and readily managed. Impacts have been minimised through the mitigation hierarchy, and offsets are proposed to deliver a significant environmental benefit. It is considered that any potential environmental impacts will be far outweighed by the overall (albeit indirect) environmental benefits of the Project to water resources.

2.5.3 Key social costs and benefits

Along with environmental sustainability, social sustainability and liveability were key considerations for selection of site options, which included assessment of potential impacts of development on community health, wellbeing and social values.

Improved liveability for communities in the region

Economic growth predicted by the construction and operation of the Project is expected to support the development of new businesses and social infrastructure that improves the liveability of Upper Spencer Gulf and Far North communities. The additional employment and business opportunities created by the Project will play a significant role in helping to attract people to South Australia, and in particular the USG region.

Economic growth would be expected to attract and grow small and medium enterprises, many of which would be owned and operated locally, significantly benefitting the socio-economic wellbeing of the region's communities. A focus on sourcing construction and

operations workforces locally where possible will also increase employment and expenditure in local communities resulting in social benefits.

The most significant indirect benefit from the Project involves spending from Project employees and increased economic activity from related induced trade during construction of the Project. Local communities have expressed a desire to see benefits associated with the Project flow back into the local economy in a manner that is within their capacity to sustain without eroding local character or community cohesion.

Where an introduced workforce is present, this may also result in increased benefits to local sporting and recreational groups through increased patronage, membership and social activity. These benefits are likely to be small but locally significant and could be enhanced through Project sponsorship and collaborations with local clubs, associations and sporting teams. Encouraging workers to participate in local groups can benefit the wider sustainability and cohesion of the local community, and the health and wellbeing of the workforce itself.

Stakeholder engagement for the Project has shown that the prospect of an incoming construction and operational workforce is generally perceived positively, as a source of local economic benefit rather than primarily as a source of disruption. However, management of behaviours and introduction of initiatives and strategies that seek to integrate a working community into the resident community will be an important part of workforce planning.

The Project proposes open and transparent community engagement to assist in mitigating the effects in communities on public perception of the Project and social cohesion.

Economic opportunity

The Project will be an enabler of new businesses and industries which will contribute to and enhance career choices and pathways for regional and State communities. Pathways for further education may be expanded locally and regionally, and there will be opportunities to develop the new skills required to support emerging industries.

With appropriate management of potential displacement of tourists during peak periods, the use of tourist accommodation by the Project could result in a reliable, consistent supply of occupants for the duration of the construction phase, providing a steady income stream, improving the resilience and increasing opportunities for investment in this sector.

Investment in local capacity building may be required to mitigate the social impacts of demand, especially during the busy tourist season in some locations so as not to impact on the availability of goods and services for local residents and visitors. Ongoing engagement of residential and business communities in relation to potential impacts and collaborative approaches to mitigating and / or offsetting these impacts will assist.

There are also potential opportunities for the Project to recognise and celebrate connection to Country, provide employment opportunities to Aboriginal and Torres Strait Islander people, and support Aboriginal businesses to provide goods and/or services to the Project. Ensuring adequate and specifically tailored support services for an Aboriginal workforce and business community will be critical to maximising these opportunities.

Community amenity

Protection of community amenity is a key input to the planning and design of the Project, ensuring that costs to local communities of the necessary construction activities and the

long-term presence of Project infrastructure are minimised. This includes impacts such as noise and vibration, dust emissions, changes to traffic and the visual appearance of machinery, equipment and infrastructure.

Communication with local residents and communities about the timing and location of proposed Project construction and operation activities will be important. Clear and timely information will be provided about possible impacts to local amenity and the feedback from those potentially affected incorporated in the planning of activities where practicable.

Given the rural and remote nature of the Project, there are a relatively small number of potential sensitive receptors who could experience direct amenity impacts from the construction and operation of the Project. Assessment in the EIS predicts that these impacts are likely to be minor, temporary, localised and readily managed.

2.6 Consequences If the Northern Water Project Does Not Proceed

There are a number of key consequences if the Project does not proceed and a long-term sustainable water source is not found for the USG and Gawler Craton regions. These consequences would impact the region and the State for a range of economic, environmental and social reasons which are set out in Table 2-5.

Table 2-5: Key consequences if the Project does not proceed

Consequences	Impact
Socio-economic	
Inability to support future-focused industries	The region, due to its abundance of natural resources (minerals, wind and solar potential) and connection to shipping routes, has been identified as an ideal location to support the development and expansion of future-focused industries in particular the export of green iron and steel. These industries require substantial volumes of a stable and sustainable water supply and without the Project will either be unable to proceed or be required to develop their own water sources. Of particular importance is the successful transition of the Whyalla Steelworks to long term decarbonised steelmaking which requires a sustainable water supply of similar longevity.
Constrained copper production	Without an alternative additional water supply, there is the potential for reduced output from existing mining operations due to the changing mineralogy of the deposits. Recent drilling and associated mineralogy studies have found that Copper Sulphide ratios of the Olympic Dam smelter feed will decline to a point where a change in configuration of the smelter will be required to maintain current levels of sulphur removal efficiency. The changing composition of the copper ore, if fully realised, would be expected to cause a progressive reduction of total copper production. South Australia has significant potential for discovery and development of additional large copper deposits. Without a sustainable water source to assist industries in their operations this copper may go undiscovered and unutilised resulting in a significant

Consequences	Impact
	opportunity cost for South Australia in stimulation of economic growth and hampering efforts overall efforts to reach net zero by 2050.
Loss of additional mining royalties	If the project does not proceed, additional mining royalties of approximately $1.1 billion (Present Value, $2026, discounted at 5%) paid on increased mineral production, is estimated to be foregone.
Negative impact on the region's economic growth trajectory	The region's economy is significantly based around mining in the Far North and heavy industry in the USG. Mining and associated industries require continued water supply for operations and with current water sources near capacity, will be unable to continue a positive growth trajectory without the development of a new sustainable water source.
Lost opportunities for job creation – both immediate and long-term	Economic modelling found that the Project is expected to result in additional employment of approximately 500 FTEs, on average, in Northern South Australia during the initial construction period (between 2026 and 2032). In the operations phase between 2033 and 2062, an additional 2,000 FTEs are expected to be employed in Northern South Australia, largely in the mining sector. If the Project does not proceed, jobs and economic opportunities will be lost, impacting the social and economic prospects of local communities.
Environmental	
Continued reliance on constrained water sources	Currently mining in the Far North is reliant upon extracting water from the GAB and other groundwater aquifers, while industry in the USG is reliant on water from the River Murray. A do-nothing scenario would likely result in continuing reliance on these constrained water sources. In previous years, the groundwater allocation in the Far North of South Australia, petroleum, mining and pastoralism account for more than 90% of the water use (DEW 2022c). As water demand increases with population growth and additional economic activity, the strain on these existing water sources will continue.
Environmentally and culturally significant sites	Current rates of water extraction from the GAB and other groundwater sources have been recognised as impacting the flow rates at GAB mound springs which are of culturally significance to Aboriginal people. A do-nothing scenario would result in continued dependence on extraction by licenced users from groundwater sources, potentially impacting GAB mound springs and other environments reliant on groundwater flows.
Increasing exposure to climate change, including more severe droughts	Climate change will result in altered weather patterns that may result in lower rainfall, potentially increasing the likelihood of severe droughts in parts of Australia and South Australia. This is likely to impact the amount of water available from the River Murray, further reducing the reliability and sustainability of this water source into the future. This issue is compounded by the USG region being entirely reliant on a pipeline from the River Murray.

Consequences	Impact
	Not providing an alternate sustainable water source will affect stable water supplies for key industries in the USG if water restrictions are imposed in future drought years.

2.7 Conclusion

The current and future demand scenarios for copper, mining and green industries underpin the economics of the Project. Providing a new and alternative option to the constrained water resources of the GAB and the River Murray and the potential for environmental benefits as a result are also strong drivers.

A coastal desalination plant and transfer system has been identified as the preferred option to provide the USG and Far North regions with a secure climate resilient water supply. An extensive and rigorous analysis of options for the desalination plant found the preferred solution is delivery of a plant with a design capacity of 51 GL/y and future-proofing to 73 GL/y, with the preferred location identified as Mullaquana Station.

Not only does the Northern Water Project address the identified demand and market drivers, but it will also provide a significant positive impact to regional and State economic performance and regional prosperity, expected to last well beyond the initial investment in the Project.



Chapter 3

Legislative Approvals Framework

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

3 LEGISLATIVE APPROVALS FRAMEWORK 3-1

3.1 Setting the Context 3-1

3.2 Environmental Assessment and Approval Process 3-1

3.2.1 Impact assessed development - PDI Act 3-3
3.2.2 Project-specific Assessment Requirements 3-3
3.2.3 Accredited assessment under the EPBC Act 3-4
3.2.4 Submission of the EIS 3-5
3.2.5 Consultation on the EIS 3-5
3.2.6 Response Document 3-6
3.2.7 Assessment Report and final decisions 3-6

3.3 South Australian Legislation 3-7

3.3.1 Environment Protection Act 3-7
3.3.2 Other relevant South Australian legislation 3-11

3.4 Commonwealth Legislation 3-26

3.4.1 Environment Protection and Biodiversity Conservation Act 3-26
3.4.2 Other Commonwealth legislation 3-26
3.4.3 International Conventions and Agreements 3-32
3.4.4 Principles of ecologically sustainable development 3-33
3.4.5 Proceedings under environmental laws 3-36

LIST OF TABLES

Table 3-1: Potential prescribed activities of environmental significance 3-9
Table 3-2: Other South Australian legislation that may apply to the Project 3-12
Table 3-3: Relevant State Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS 3-23
Table 3-4: Relevant Commonwealth legislation and approvals requirements 3-27
Table 3-5: Relevant Commonwealth Standards, Codes of Practice, Guidelines and other regulatory instruments referred to in the EIS 3-29

LIST OF FIGURES

Figure 3-1: Overview of the Northern Water Project assessment and approval process 3-2

3 LEGISLATIVE APPROVALS FRAMEWORK

This chapter addresses the primary legislative requirements, describes the approval process and sets out the key State and Commonwealth legislation relevant to the Project. Relevant policies, standards and Codes of Practice that will be applied to Project activities are described, including Project approvals and permits / licences for specific activities.

Each chapter also describes the specific legislation, guidelines and regulatory requirements relevant to the assessments in that chapter.

A summary of the assessment of the Project against the Planning and Design Code, State Planning Policies and Regional Plans is provided in Chapter 7 Planning and Design Quality.

3.1 Setting the Context

The EIS Assessment Requirements (ARs) require description of the State and Commonwealth statutory environmental assessment and approval requirements. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

3.2 Environmental Assessment and Approval Process

The *Planning, Development and Infrastructure Act 2016* (PDI Act) and EIS Assessment Requirements ensure that proponents prepare an EIS that provides a clear, detailed and comprehensive analysis of the proposed development, the environment (i.e. physical, biological and socio-economic aspects) in which it will be located, the likely impacts of the development and how those impacts will be addressed.

Pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the State and Commonwealth have agreed to undertake an accredited assessment whereby an EIS will be prepared to address both State and Commonwealth requirements.

Assessment of the EIS involves the following steps:

- submission of a draft EIS to the Planning and Building Division within the State Department for Housing and Urban Development (DHUD) for adequacy review before being released for public consultation by the State Minister for Planning
- a public exhibition / consultation period of at least 6 weeks (i.e. 30 business days)
- preparation of a Response Document by the proponent, responding to submissions made during the public consultation period
- preparation of an Assessment Report by the Chief Executive of DHUD for the consideration of the State Minister for Planning and the Commonwealth Minister for the Environment and Water
- decision to approve or not approve by the Minister for Planning in relation to the EIS and the Commonwealth Environment Minister in relation to Matters of National Environmental Significance (MNES).

An overview of the assessment and approval process is provided in Figure 3-1 and further detail is provided in the following sections.

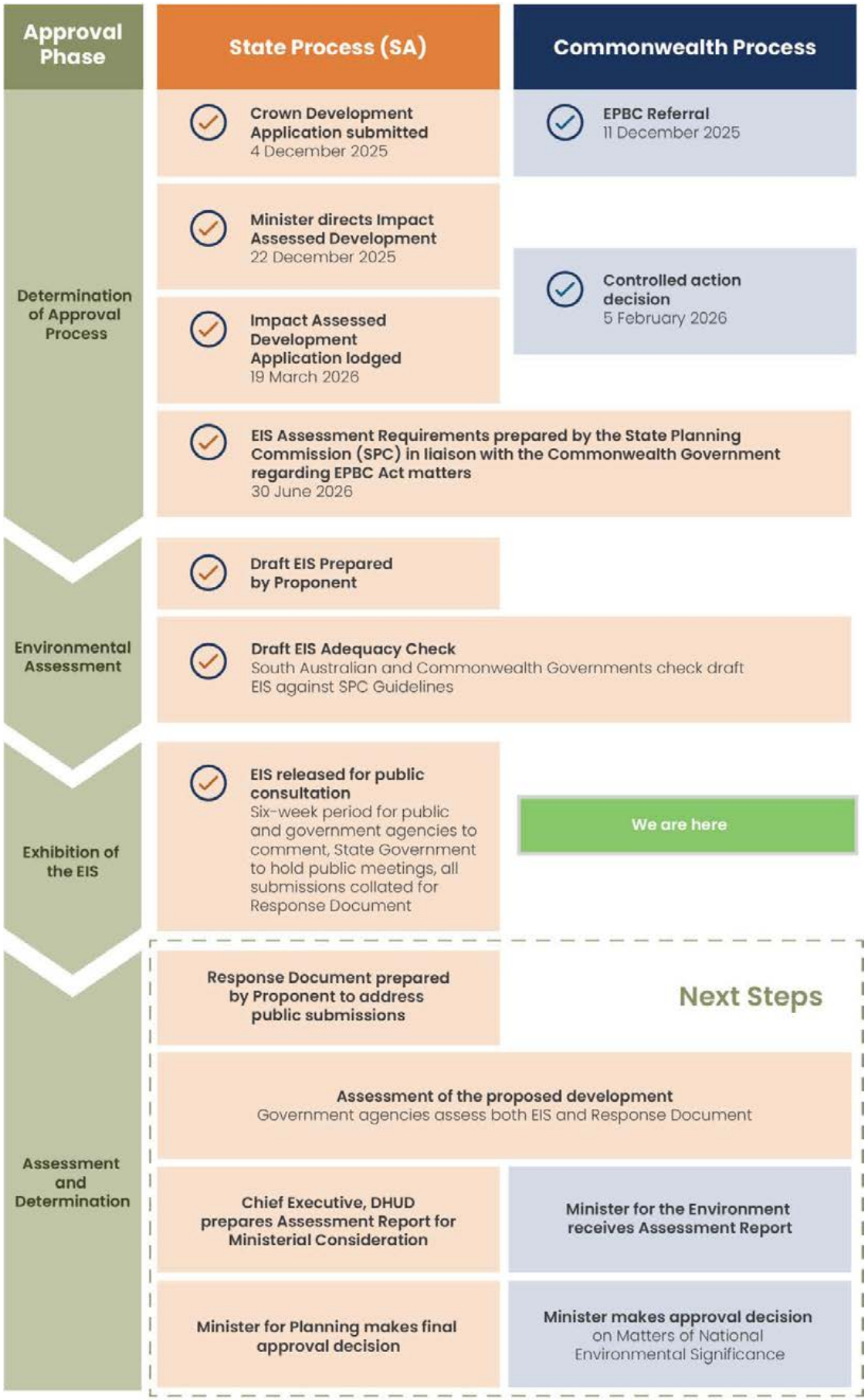


Figure 3-1: Overview of the Northern Water Project assessment and approval process

3.2.1 Impact assessed development - PDI Act

The PDI Act governs the planning system in South Australia and sets out the process and pathways for granting development approvals, including approvals for major infrastructure projects.

Projects being undertaken by Crown agencies are generally subject to the approval processes applying to a Crown Development under section 131 of the PDI Act. However, sections 108 and 131(25) of the PDI Act make provision for the Minister for Planning to direct an EIS be prepared, subject to the procedures and requirements of being an impact assessed development, as if the development had been declared under s.108(1)(c) of the Act. This alternative pathway requires preparation of an EIS, the process for which is set out in sections 111-115 of the PDI Act. The Minister for Planning may make this direction if they believe it is appropriate or necessary for proper assessment of the proposed development. The impact assessed development direction triggers a thorough State-run assessment process with opportunity for public comment before any decision is made on whether the proposal warrants an approval.

A Crown Development Application for the Project was submitted by DIT on 4 December 2025 and the Minister for Planning directed that an EIS was to be prepared for the Project on 22 December 2025[1].

3.2.2 Project-specific Assessment Requirements

This EIS was prepared in accordance with Section 113 of the PDI Act and Part 2 Clause 6 of Practice Direction 17 (SPC 2023) and the Project-specific ARs.

Following the direction for preparation of an EIS, an Impact Assessed Development Application (IADA) was submitted in accordance with SPC Practice Direction 17 Clause 5[2] on 19 March 2026. The purpose of the IADA and the accompanying Planning Report was to assist with scoping the potential impacts of the Project by providing information that would enable the formulation of EIS ARs by the SPC. The Planning Report incorporated a description of the Project (to the extent that it was known at the time), and a preliminary assessment of the key social, environmental and economic issues and impacts associated with the proposed development.

Consultation was also undertaken with the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) in relation to preparation of the ARs, following submission of a referral under the EPBC Act. As discussed in Section 3.2.3, the South Australian EIS assessment process has been accredited for the assessment of the controlled action under the EPBC Act.

The Department for Infrastructure and Transport (as the Proponent) was provided an opportunity to comment on the draft ARs prior to finalisation by the SPC. The final ARs for the

[1] South Australian Government Gazette No.1 8 January 2026, p.5 https://www.governmentgazette.sa.gov.au/2026/January/2026_001.pdf

[2] The SPC is South Australia's principal development assessment and planning advisory body and issues practice directions to specify procedural requirements in connection the PDI Act.

preparation of the EIS were released by the SPC on 30 June 2026 and are publicly available on the PlanSA Portal / website[3].

The ARs set out the key issues and impacts associated with the proposed development and categorises them into either standard or detailed categories, to indicate the level of detail and investigation that should be given to those issues in preparation of the EIS. The level of detail required for assessment of impacts on an environmental attribute is determined by the SPC in consideration of:

- the scale of the impact taking into account intensity, geographical extent and duration
- the nature of the impact which should consider direct, indirect, cumulative and perceived impacts
- the sensitivity of the receiving environment
- the ability to avoid, minimise and / or offset the impacts of the project, to the extent known at the scoping application stage
- the complexity of technical assessments and investigations required to identify and assess mitigation measures.

Cumulative impacts[4] are also considered and are characterised by:

- impacts to environmental values over time or in combination with other impacts in the dimensions of scale, intensity, duration or frequency of the impacts
- impacts created by the activities on other adjacent, upstream and downstream developments and infrastructure, and landholders.

If additional matters requiring detailed assessment become apparent after the final ARs are issued, the EIS must also address these new matters in a comprehensive manner and identify means by which the effects can be managed.

3.2.3 Accredited assessment under the EPBC Act

The Northern Water Project requires assessment by the Commonwealth Environment Minister following submission of a referral under the EPBC Act and declaration of the Project as a controlled action on 5 February 2026 (refer Section 3.4). The EPBC Act allows the Commonwealth to accredit a State's environmental assessment process for the assessment required under the EPBC Act.

The Commonwealth Environment Minister has accredited the South Australian environmental assessment process under the PDI Act to assess the controlled action for the Project. The State and Commonwealth governments liaised on the draft ARs for the EIS to refine the content, scope and level of detail and to ensure the Project-specific ARs met the requirements of the South Australian and Commonwealth legislation.

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[3] https://plan.sa.gov.au/__data/assets/pdf_file/0004/1624414/Northern-Water-Project-Assessment-Requirements-EIS.pdf

[4] For the purposes of the Northern Water Project, cumulative impacts have been considered in the context of construction and operation of the Project in conjunction with other approved future projects. Relevant future projects are defined as approved projects in the vicinity of the Project that would have material interaction with the Project.

The effect of the accreditation is that the Project will undergo a thorough but streamlined State assessment process in co-ordination with the National Environmental Protection Agency (National EPA)[5]. One environmental impact assessment document (the EIS) will be prepared, one period of public consultation will be undertaken, and one Response Document will be developed to satisfy the legislative requirements of each jurisdiction.

Following the State assessment processes, the Minister for Planning will provide an EIS Assessment Report to the Commonwealth Environment Minister. The EIS and the Assessment Report will be used by the Commonwealth Environment Minister to make a separate decision on whether or not to approve the proposed action under Part 9 of the EPBC Act.

3.2.4 Submission of the EIS

The EIS was prepared in accordance with Practice Direction 17 and the Project-specific ARs. Prior to formal submission of the final EIS to the Minister for Planning for public exhibition, the draft EIS documentation was submitted for an initial assessment by State and Commonwealth agencies of the adequacy of the documentation provided.

Following the adequacy assessment of the draft EIS by the State and Commonwealth agencies the final EIS was prepared and submitted.

3.2.5 Consultation on the EIS

Consultation on the EIS is being undertaken in accordance with the principles of the SPC's Community Engagement Charter (SPC 2025a). These principles guide public participation in the planning process to ensure people and communities have a greater opportunity to engage.

The Project-specific ARs also require the EIS to include an appropriate public consultation program which is outlined within a Community Engagement Plan (CEP) and undertaken consistent with the requirements of the *Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment Protection and Biodiversity Conservation Act 1999* guidelines (DCCEEW 2023a) (EPBC guidelines).

The consultation and engagement approach undertaken for the EIS is described in Chapter 4 Community and Stakeholder Engagement.

Prior to the public release of the EIS, the Northern Water CEP was reviewed by the Minister for Planning against the principles of the State Government's Community Engagement Charter to ensure there is an appropriate level of public participation in the EIS process and consistency with the Charter and the EPBC guidelines.

In accordance with the PDI Act, the EIS will be on exhibition for public comment for a period of at least six weeks (30 business days) on the PlanSA Portal. Copies of the EIS are also available for public inspection in places which have been nominated by the Minister for Planning. Interested persons are invited to make written submissions on the EIS within the timeframe defined by the Minister for Planning.

During this period, the EIS will be referred to the local councils within which Project infrastructure is located together with other relevant government agencies and boards.

[5] The National EPA was established on 1 July 2026 taking over the role of DCCEEW in assessments and approvals under the updated EPBC Act.

These will include (but not be limited to) the Environment Protection Authority (EPA), Department for Environment and Water (Coast Protection Board, Native Vegetation Council), Aboriginal Affairs and Reconciliation, Department for Energy and Mining, Department of Primary Industries and Regions and relevant Landscape SA Boards.

3.2.6 Response Document

All written submissions received will be provided to the Proponent for development of a formal response (the Response Document). The Response Document will address all relevant matters raised in the submissions received and provide any relevant additional or updated information in response to the issues raised.

The Response Document may include amendments to the EIS as a result of consultation or indicate changes to the original proposal in response to issues raised. Further public consultation may be required if substantial changes are proposed.

3.2.7 Assessment Report and final decisions

The EIS, including the Response Document, public submissions and comments from local councils and agencies will be assessed and the Chief Executive of DHUD will prepare an Assessment Report with recommendations for the Minister for Planning's consideration.

The Response Document and Assessment Report will also be provided to the Commonwealth Environment Minister for their consideration in accordance with the accredited assessment approach.

The Minister for Planning will make a final decision on the Project in accordance with Section 115 of the PDI Act. In making the decision the Minister for Planning must have regard to

- the State Planning Policies
- Regional Plans
- provisions of the Planning Rules and the Regulations
- the Building Code of Australia (if relevant)
- where development involves or is for the purposes of a prescribed activity of environmental significance, the *Environment Protection Act 1993* including the objects, General Environmental Duty and relevant Environment Protection Policies (EPPs)
- the EIS, Response Document and the Chief Executive's Assessment Report
- where relevant, any other government policy and / or legislation.

The Commonwealth Environment Minister will also make a decision to approve or not approve the controlled action for each of the relevant MNES.

The Assessment Report and the Response Document will be published on the PlanSA Portal once the Minister for Planning has made a decision on the development. The Development Authorisation with all reserved matters and conditions will be published in the South Australian Government Gazette. The Commonwealth Environment Minister's decision will be published on the EPBC Act public portal

3.3 South Australian Legislation

3.3.1 Environment Protection Act

Under section 113 of the PDI Act, the Minister for Planning must have regard to the *Environment Protection Act 1993* (EP Act) and prescribed activities of environmental significance in assessing the EIS.

The EP Act provides the regulatory framework for the management of pollution and general environmental protection in South Australia. The objects of the EP Act are to protect the environment, promote the principles of ecologically sustainable development (ESD) and ensure that all reasonable and practicable measures are taken to protect, restore and enhance the quality of the environment, having regard to ESD principles.

The EP Act provides for a general environmental duty, sets out environment protection policies (EPPs) developed for specific issues, and specifies the activities of environmental significance which require licencing.

General environmental duty

The general duty of environmental care is set out in section 25 of the EP Act. In relation to development activities, the general environmental duty requires that all reasonable and practicable measures are taken to prevent or minimise environmental harm if potentially polluting activities are undertaken.

In determining what measures are required to meet the general environmental duty, regard must be had to:

- the nature of the pollution or potential pollution and the sensitivity of the receiving environment
- the financial implications of the various measures
- the current state of technical knowledge and likelihood of successful application of the various measures that might be taken.

Environment Protection Policies

A number of EPPs are established under the EP Act, each of which set out requirements, standards, goals and guidelines relating to matters such as air quality, noise, water quality and hazardous materials. The EPPs relevant to the Project are discussed below.

Environment Protection (Air Quality) Policy 2016

The main objective of the *Environment Protection (Air Quality) Policy 2016* (Air Quality EPP) is to protect air quality and minimise the emission of air pollutants. The Air Quality EPP was updated in October 2022 to align with the National Environment Protection Measure (NEPM), and includes statutory limits on emission rates, emission concentrations and cumulative concentrations of air pollutants. The impact on sensitive receptors of air pollutants is measured according to the *Evaluation Distances for Effective Air Quality and Noise Management* (EPA 2023a).

The Air Quality EPP, the general environmental duty and the *Local Nuisance and Litter Control Act 2016* are relevant to aspects of the Project largely relating to the potential for dust

emissions from construction activities. Discussion of potential air quality impacts (including local nuisance) and their management is provided in Chapter 18 Air Quality.

Environment Protection (Water Quality) Policy 2015

The *Environment Protection (Water Quality) Policy 2015* (Water EPP) aims to achieve the sustainable management of water and protection of the environmental values of water, particularly by controlling the emission of pollutants to surface, ground and marine waters.

The Water EPP is relevant to the marine aspects of the Project (i.e. the construction and operation of the desalination plant and offshore infrastructure) and construction of the water delivery infrastructure, particularly pipeline trenching and water course crossings. Discussion of potential impacts to water resources and their management is provided in Chapter 11 Marine Environment, Chapter 13 Surface Water and Chapter 14 Groundwater.

Environment Protection (Commercial and Industrial Noise) Policy 2023

The *Environment Protection (Commercial and Industrial Noise) Policy 2023* (Noise EPP) replaced the former *Environment Protection (Noise) Policy 2007* in 2023. The Noise EPP regulates noise associated with activities licensed under the EP Act. The Noise EPP is relevant to the operation of the desalination plant.

Management of potential noise impacts from construction of the Project will be managed under the general environmental duty under the EP Act and the *Local Nuisance and Litter Control Act 2016* as discussed in Chapter 19 Noise and Vibration.

Environment Protection (Waste to Resources) Policy 2010

The objective of the *Environment Protection (Waste to Resources) Policy 2010* (Waste to Resources EPP) is to achieve sustainable waste management by applying the waste management hierarchy to improve resource recovery and reduce waste going to landfill. The EPP provides the regulatory underpinning of South Australia's Waste Strategy and prohibits the disposal of certain types of waste directly to landfill.

The Waste to Resources EPP is relevant to construction and operational waste management aspects of the Project which are addressed in Chapter 24 Climate Change and Sustainability.

Prescribed Activities of Environmental Significance

Schedule 1 of the EP Act prescribes particular activities as being of environmental significance which require licencing under the EP Act[6].

The potential prescribed activities of environmental significance for the Project are listed in Table 3-1. Descriptions of the relevant Project activities are provided in Chapter 6 Project Description, Chapter 11 Marine Environment, Chapter 13 Surface Water, Chapter 18 Air Quality and Chapter 19 Noise and Vibration. A licence under the EP Act will be obtained for such activities, if required.

[6] EP Act Schedule 1 activities are also reflected in the provisions requiring referral of proposals to agencies under Schedule 9 of the *Planning, Development and Infrastructure Regulations 2017* and Part 9.1 of the Planning and Design Code.

Table 3-1: Potential prescribed activities of environmental significance

Prescribed activities	Description of relevant Project activity
Section 1 (1) – Chemical storage and warehousing facilities *Storage or warehousing of chemicals or chemical products that are, or are to be, stored or kept in bulk or in containers having a capacity exceeding 200 litres at facilities with a total storage capacity exceeding 1,000 cubic metres.*	Chemical dosing systems and water treatment are required for functioning of the desalination plant.
Section 2(1) Abrasive blasting *Cleaning of materials by the abrasive action of any metal shot or mineral particulate propelled in a gaseous or liquid medium (otherwise than solely by using blast cleaning cabinets less than 5 cubic metres in volume or totally enclosed automatic blast cleaning units).*	May be required during construction for cleaning of pipeline, pumps and valves and in operation for ongoing maintenance.
Section 2 (5) Concrete batching *Production of concrete or concrete products that are manufactured / capable of being manufactured by the mixing of cement, sand, rock, aggregate or other similar materials, with a total capacity for production exceeding 0.5 cubic metres per production cycle.*	Concrete will be required for the desalination plant, transmission tower and other foundations, in-situ poured tanks and sumps and potentially other Project infrastructure. May be provided by mobile concrete batching plants at some locations.
Section 3(1) Waste recovery *The conduct of a waste recovery facility, being a depot, facility or works that, during a 12-month period, receives for preliminary treatment, or has the capacity for the preliminary treatment of—* *(a) more than 100 tonnes of solid waste or matter; or* *(b) more than 100 kilolitres of liquid waste or matter, prior to its transfer elsewhere for lawful reuse, further treatment or disposal.*	May be required as part of the Project – to be confirmed as part of detailed design.
Section 3(4) Wastewater treatment *The conduct of wastewater treatment works, being sewage treatment works, a CWMS, winery wastewater treatment works or any other wastewater treatment works with the capacity to treat, during a 12-month period—* *(a) in the case of works located wholly or partly within a water protection area—more than 5 megalitres of wastewater; or* *(b) in the case of works located wholly outside of a water protection area—more than 50 megalitres of wastewater*	<u>Construction</u>: • Wastewater from the tunnelling operation and run off from spoil dewatering areas • Black / greywater produced during construction (construction camps) <u>Operation</u>: • DAF / DAFF waste (typically comprises floated sludge, added coagulant and spent backwash water).
Section 3(5) An activity producing listed waste *The conduct of an activity in which a listed waste is produced as waste or becomes waste*	Dependent on waste streams. Small quantities of listed wastes (e.g. waste oil from equipment maintenance) may be

Prescribed activities	Description of relevant Project activity
	produced during construction and operation activities.
Section 7 (4) Dredging *Removing solid matter from the bed of any marine waters or inland waters by any digging or suction apparatus*	Construction of marine intake and outfall pipes / risers / structures for the desalination plant – will depend on final construction methodology. Construction of the transfer system where it crosses a freshwater watercourse and excavation of sediment from the watercourse as necessary.
Section 7 (6) Earthworks Drainage *Conduct of earthworks operations in the course of which more than 100 kilolitres of wastewater containing suspended solids in a concentration exceeding 25 milligrams per litre is discharged directly or indirectly to marine waters or inland waters.*	Construction of the desalination plant and pipeline – will depend on final construction methodology.
Section 7 (Discharges to Marine or Inland Waters) *The conduct of operations, other than a desalination plant referred to in subclause (6a), involving discharges into marine waters or inland waters where—* *(a) the discharges—* *(i) raise the temperature of the receiving waters by more than 2 degrees Celsius at any time at a distance of 10 metres or more from the point of discharge; or* *(ii) contain antibiotic or chemical water treatments; and* *(b) the total volume of the discharges exceeds 50 kilolitres per day.*	Discharge of dewatered groundwater to creeklines if the water contains chemical water treatments and is at a rate above 50 kilolitres per day.
Section 8 (2) Fuel burning *The conduct of works or facilities involving the use of fuel burning equipment, including flaring (other than flaring at petroleum production, storage or processing works or facilities that do not have a total storage capacity or total production rate exceeding the levels respectively specified in clause 1(5)) or incineration, where the equipment alone or in aggregate is capable of burning combustible matter—* *(a) at a rate of heat release exceeding 5 megawatts*	Temporary construction camps may require generators Generators are required to operate the tunnel boring machines (TBMs). Fuel burning capacity is likely to exceed 5 MW.
Section 8 (6a) – Desalination Plants Desalination plants with a production capacity exceeding 200 kilolitres of desalinated water per day	Operation of the desalination plant

3.3.2 Other relevant South Australian legislation

In addition to the legislation discussed in Section 3.3.1, the Project will require a range of approvals under other relevant State legislation.

The list of approvals and other legislative requirements identified in Table 3-2 is indicative of the types of approvals that may be required but is not a conclusive or exhaustive list and may change subject to final engineering design. Relevant State Codes of Practice and guidelines, including Environment Protection Authority (EPA) guidelines, will also be considered and utilised during design and construction (refer Table 3-3). Responsibility for obtaining some required approvals and permits will be with the Design Build Operate Maintain (DBOM) Contractor (refer Chapter 26 Environment Management Framework).

Northern Water Project (Land and Infrastructure) Act 2026

In September 2026, special purpose legislation, the *Northern Water Project (Land and Infrastructure) Act 2026* (the Act) was passed by the Parliament and (at the time of writing) will commence on a day to be fixed by proclamation.

The Act will establish a clear, Project-specific framework for access to land and acquisition of interests in land required for delivery of the Project, and will be supported by regulations which are yet to be drafted.

The legislation will be limited in scope to access and acquisition activities only and provides a consistent, equitable and efficient mechanism to support the investigation, construction, operation and maintenance of Project infrastructure.

The framework provided for in the legislation and supporting regulations will apply to State land and will be designed to address the complex land tenure encountered across the Project's footprint, which includes freehold land, Crown land, pastoral and other leases, Native Title and overlapping resource interests. The legislation will not be able to be applied to Commonwealth land or land subject to BHP's Special Mining Lease 1 (SML1).

The legislation will enable access to land for investigations and construction through defined temporary areas, supported by notification requirements and compensation for occupation and disturbance. The legislation will also include powers to acquire land or interests (with compensation) that broadly align with established acquisition frameworks. The majority of permanent interests in land that can be established under the legislation are expected to be in the form of easements for transmission lines and the transfer system which constitute at least 90% of the Project's footprint.

The framework is intended to operate alongside existing State and Commonwealth legislation. It does not generally displace other laws except where necessary to enable timely access and acquisition, and it preserves the application of key legislation, including Native Title. Regulations may further tailor the interaction with other statutory regimes to ensure alignment with the Project's delivery requirements.

Further information on the new Act's framework for access and acquisition of land and interests in land is provided in Chapter 9 Use of Land and Marine Waters.

Table 3-2: Other South Australian legislation that may apply to the Project

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Aboriginal Heritage Act 1988	Provides protection for any Aboriginal sites, objects or remains (whether known or unknown, tangible and intangible).	The area of the Project includes items and places of Aboriginal heritage value and significance. There are a number of Traditional Owner groups who will have an interest in the Project both through formal Native Title rights and also cultural heritage connection to the lands where the Project occurs.	No Aboriginal sites, objects or remains may be damaged, disturbed or interfered with unless prior approval has been obtained from the Minister for Aboriginal Affairs and Reconciliation. Indigenous Land Use Agreements, detailed cultural heritage surveys and cultural heritage management plans will be agreed with the relevant Traditional Owners to ensure that Aboriginal sites, objects, remains and native title interests will be protected.	Chapter 16 Aboriginal Cultural Heritage
Agricultural and Veterinary Products (Control of Use) Act 2002 *Agricultural and Veterinary Products (Control of Use) Regulations 2017*	Imposes a general duty of care on a person who uses or disposes of agricultural and certain veterinary chemical products and fertilisers.	Weed and pest plant control will be required to ensure horticultural and agricultural practices are not disrupted as a result of Project activities.	Compliance with regulations. No specific approvals required.	Chapter 15 Terrestrial Flora and Fauna
Aquaculture Act 2001	Establishes a broad framework for the regulation of aquaculture activity in SA. Allows for development of Zone Policies identifying specific areas within State	There are no aquaculture zones in proximity to the proposed Mullaquana Station desalination plant site.	The Project will not extend into any Aquaculture Exclusion Zones. No specific approvals required.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
	waters appropriate for aquaculture development.			
Biodiversity Act 2025	Act will consolidate and strengthen existing biodiversity protections currently provided under the *Native Vegetation Act 1991* and the *National Parks and Wildlife Act 1972*, creating a more streamlined approach to conserving, restoring and enhancing biodiversity in South Australia.	Legislation has been enacted but has not come into operation at the time of writing.	See references below to *National Parks and Wildlife Act 1972* and the *Native Vegetation Act 1991.*	
Climate Change and Greenhouse Emissions Reduction Act 2007 (Also see National Greenhouse and Energy Reporting Scheme in Table 3-4)	To assist in achieving ESD in the State by addressing issues associated with climate change, in particular through the reduction of greenhouse gas emissions and an increase in renewable energy.	Provides emissions reduction targets for the State. Emissions will arise from combustion of fuel by Project vehicles, plant and equipment and land clearing.	Policy context. No specific approvals required.	Chapter 24 Climate Change and Sustainability
Coast Protection Act 1972	Establishes the Coast Protection Board whose key functions are to protect, restore or develop the coast for aesthetic purposes and review and provide advice on proposals for development near the coast	The Project traverses coastal land.	The Board provides advice to the Minister for Planning on projects where the Minister has requested an EIS.	Chapter 10 Coastal Processes Chapter 11 Marine Environment

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
	to ensure appropriate coastal protection.			
Dangerous Substances Act 1979 *Dangerous Substances (General) Regulations 2017*	To regulate the keeping, handling, transporting and conveyance, use, disposal and quality of dangerous substances.	There is a wide variety of circumstances in which dangerous substances (e.g. diesel, fuel, oil and LPG (liquified petroleum gas)) would be used during the Project.	Licences may be required to keep or transport dangerous substances.	Chapter 25 Hazards and Risks
Electricity Act 1996 *Electricity (General) Regulations 2012* *Electricity (Principles of Vegetation Clearance) Regulations 2010*	To regulate the electricity supply industry and to provide for the development of safety and technical standards for electrical installations. Specify the requirements for vegetation clearance around transmission lines.	Clearance distances between vegetation and powerlines must be maintained in accordance with the *Electricity (Principles of Vegetation Clearance) Regulations 2010*.	New licences, or a variation of an existing licence, may be required to carry out work near electrical infrastructure.	Chapter 9 Use of Land and Marine waters Chapter 15 Terrestrial Flora and Fauna Chapter 25 Hazards and Risks
Energy Resources Act 2000	Regulates the recovery, production, transmission, storage and management of energy resources exploration and development in South Australia	Energy resource tenements are intersected by the pipeline alignment, the major one being the Moomba to Port Bonython petroleum liquids pipeline licence (PL2).	No specific approval required. There will be ongoing engagement with tenement holders.	Chapter 9 Use of Land and Marine Waters
Explosives Act 1936	Regulates the handling of, and access to, explosives to protect public health and	Explosives maybe required for construction of the transfer system or	Transport and storage of explosives requires a licence under the Act.	Chapter 25 Hazards and Risks

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Explosives Act 2024[7]	safety, property and the environment.	transmission lines (depending on underlying geology).		
Fire and Emergency Services Act 2005 *Fire and Emergency Services Regulations 2005*	Provides for the prevention, control and suppression of fires and for the handling of certain emergency situations.	The Act sets out requirements for management of bushfire fuels on private and public land to prevent or inhibit the outbreak and spread of fire; protect property; and minimise the threat to human lives.	Permits may be required in relation to fire bans and hot work. Act also provides for declaration of fire danger seasons and total fire ban restrictions which must be adhered to by Project operations.	Chapter 25 Hazards and Risks
Fisheries Management Act 2007	Provides the legislative framework, objectives and guiding principles for the management of SA fisheries, conservation of aquatic resources and reserves, protection of aquatic habitats, mammals and resources including control of exotic aquatic organisms and diseases[8].	Key Spencer Gulf fisheries in the vicinity of the Project include Western King Prawn, King George Whiting, Snapper, Garfish and Blue Swimmer Crab.	Policy context. No specific approvals required.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment

[7] As the *Explosives Act 2024* has yet to come into operation, the *Explosives Act 1936* remains in force.

[8] The *Biosecurity Act 2025* was passed by Parliament on 6 February 2025 and will commence on a date to be fixed by proclamation once the regulations have been developed. When operational, the Biosecurity Act will provide for certain matters relating to aquatic pests, which are currently addressed in the *Fisheries Management Act 2007*.

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Harbors and Navigation Act 1993	Provides for the administration, development and management of harbors and safe navigation in South Australian waters.	Construction of the marine infrastructure.	A licence is required for activities requiring exclusive use of a designated area or waterway. If relevant, a Notice to Mariners relating to marine activities may be required.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment Chapter 21 Traffic and Transport
Heavy Vehicle National Law (South Australia) Act 2013	Implements a national scheme for facilitating and regulating the use of heavy vehicles on roads.	National regulations prescribe mandatory standards for heavy vehicles using public roads.	Compliance with regulations. Regulations apply to all heavy vehicles over 4.5 tonnes.	Chapter 21 Traffic and Transport Chapter 25 Hazards and Risks
Heritage Places Act 1993	Provides for the identification and conservation of places and objects of non-Aboriginal heritage significance.	A desktop assessment for known and potential sites of non-Aboriginal heritage has been undertaken to determine the potential for impacts.	A permit may be required to recover archaeological heritage objects if they are discovered during activities.	Chapter 17 Non-Aboriginal Cultural Heritage
Historic Shipwrecks Act 1981	Protects historic shipwrecks in State waters including the Spencer Gulf.	There are no shipwrecks within 5 km of the proposed site, with the closest being the 'Mary Ann' located more than 11 km south-west of the of the proposed desalination plant and associated marine works.	A permit may be required if historic shipwreck materials are discovered during activities.	Chapter 17 Non-Aboriginal Cultural Heritage
Hydrogen and Renewable Energy Act 2023 (HRE Act)	Provides for the facilitation and regulation of hydrogen	There are areas of tenure under the HRE Act which intersect the proposed	Small scale renewable energy (<5MW in nameplate generation capacity or	Chapter 6 Project Description

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
	and renewable energy generation/storage in the State.	pipeline corridor and project transmission lines. These include an application for a Renewable Energy Infrastructure Licence (north-west of the desalination plant site) by Tilt Renewables (wind farm), and the 'Whyalla West' Hydrogen and Renewable Energy Act Release Area.	storage capacity) that forms part of the Project can be approved in accordance with the PDI Act (rather than requiring separate approval under the HRE Act).	Chapter 9 Use of Land and Marine Waters
Landscape South Australia Act 2019	Promotes sustainable and integrated management of the State's landscapes and makes provision for the protection of the State's natural resources.	Provisions relevant to the Project address land management, water resource management and pest plant and animal control.	Permits may be required to undertake a water affecting activity e.g. construction in a watercourse, lake or floodplain; destroying vegetation in a watercourse, lake or floodplain (noting that activities authorised by a development authorisation under the PDI Act may not require a permit). The South Australian Arid Lands and Eyre Peninsula Landscape Boards are relevant to the Project. Each board has specific policies regarding water affecting activities.	Chapter 12 Soils and Landform Chapter 13 Surface Water Chapter 14 Groundwater Chapter 15 Terrestrial Flora and Fauna

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
			Owners of land are obliged to control or destroy certain pest plants and animals declared under the Act.	
Local Government Act 1999	Provide Councils with broad powers to make decisions and deliver services.	Councils have responsibility for ensuring appropriate maintenance and repair of public roads.	Councils may make agreements to recover costs for roadworks to repair damage to a road.	Chapter 10 Coastal Processes Chapter 21 Transport and Traffic
Local Nuisance and Litter Control Act 2016	Provides local government with powers to manage and respond to nuisance complaints, littering and illegal dumping.	May apply to Project out-of-hours construction noise or air quality in some circumstances.	An exemption may be sought from Council(s) for noise or air emissions from construction works that may be considered a local nuisance.	Chapter 18 Air Quality Chapter 19 Noise and Vibration
Marine Parks Act 2007	Protects a variety of marine habitats. Marine national park and Sanctuary Zones established under the Act are core conservation areas, protecting vital feeding, breeding, nursery and resting areas for marine plants and animals.	There are no areas protected under the Marine Parks Act at the location of the proposed desalination plant intake and outfall pipes. The Upper Spencer Gulf Marine Park is located approximately 8.2 km to the north and the Franklin Harbor Marine Park 11.6 km to the south.	Project context only. No specific permit or approval required.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment
Mining Act 1971	Provides for mineral exploration and mining.	There are several Exploration Licences and other mining tenements issued under the	No specific approval required.	Chapter 9 Use of Land and Marine Waters

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
		Mining Act within 10 km of the proposed pipeline corridor, including Retention Lease 137 in the name of S Uranium Pty Ltd., located less than 2 km from the onshore desalination plant infrastructure. Exploration Licence 5926, also held by S Uranium Pty Ltd, covers the majority of the onshore desalinate plant infrastructure plus approximately the first 20 km of the pipeline. In addition, the pipeline corridor intersects multiple exploration licences.	There will be ongoing engagement with tenement holders.	
National Parks and Wildlife Act 1972	Establishes the system of conservation reserves in South Australia and provides protection for native plants and animals.	The pipeline alignment does not pass through any conservation parks or reserves. At its closest point, the Whyalla Conservation Park is approximately 2 km from the pipeline to the north and north-west of the Park.	A permit is required for the relocation of protected fauna during construction activities.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment Chapter 15 Terrestrial Flora and Fauna

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Native Title (South Australia) Act 1994 (Also see Commonwealth Native Title legislation in Table 3-4)	To recognise and protect Native Title.	There are determined areas of Native Title over the area of the Project.	No approval required under this Act. (Note: DIT is in the process of negotiating agreements with the relevant Native Title groups that will be impacted by the Project under the *Native Title Act 1993* (Cth) – refer to Section 3.4 – Commonwealth Legislation).	Chapter 9 Use of Land and Marine Waters Chapter 16 Aboriginal Cultural Heritage
Native Vegetation Act 1991 *Native Vegetation Regulations 2017*	Applies to the management and clearance of native vegetation on private and public land in South Australia. Establishes the Native Vegetation Council (NVC) and Native Vegetation Fund. Provides for native vegetation heritage agreements (VHA) between the State and landholders.	The Project will require clearing of native vegetation. Significant environmental benefit (SEB) measures are proposed for this clearance. The Project infrastructure does not intersect any VHAs.	Consent is required under the Act to clear native vegetation unless the clearing activity meets circumstances prescribed under the Regulations. Under Regulations 12 and 13, vegetation clearance for major developments that are approved under an EIS (that was referred to the NVC for comment) is permitted, provided that it is undertaken in accordance with the development consent and an approved management plan (or a payment into the Native Vegetation Fund) which	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment Chapter 15 Terrestrial Flora and Fauna

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
			results in a significant environmental benefit.	
Pastoral Land Management and Conservation Act 1989	To provide for the management and conservation of pastoral land, including the monitoring, prevention of harm and rehabilitation of this land.	The Project will require the use of pastoral land for linear infrastructure and potentially for camps and / or laydown areas and / or access tracks.	Approval may be required to use pastoral land for purposes other than pastoral activities.	Chapter 9 Use of Land and Marine Waters Chapter 12 Soils, Landform and Geology
Protection of Marine Waters (Prevention of Pollution from Ships) Act 1987[9]	Protection of the sea and certain waters from pollution by oil and other substances.	Vessels will be in marine waters for construction activities.	Vessels accessing the offshore site works area will need to comply with the Act, including jack-up barge (JUB) vessels.	Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment Chapter 25 Hazards and Risks
Radiation Protection and Control Act 2021	Controls activities involving radiation sources and to provide for the protection of people and the environment from the effects of radiation,	Transmission lines emit electric and magnetic fields.	Approval not required. Policy context for required standards.	Chapter 25 Hazards and Risks
Rail Safety National Law (South Australia) Act 2012.	Provision for a national system of rail safety; and for other purposes.	The Project will require underboring of rail lines.	Operators of affected rail lines will be consulted to ensure safety for rail operations and workers.	Chapter 21 Traffic and Transport

[9] This Act gives effect to the International Convention for the Prevention of Pollution from Ships (MARPOL).

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Road Traffic Act 1961	[Amongst a range of objectives], provides for vehicle standards, mass, loading and other safety measures for light vehicles, installation, use and maintenance of traffic control devices and closing of roads for traffic management and other purposes.	The Project is expected to require the transport of over-dimensional loads. Temporary traffic control devices or road closures may be required.	DBOM Contractor may require an oversize or over-mass vehicle exemption and / or restricted access approval for heavy vehicles and over-sized loads being delivered to site. Approval is required for temporary closures and / or rerouting of arterial roads and highways under the Commission of Highways care, control and management.	Chapter 21 Traffic and Transport
South Australian Public Health Act 2011 *South Australia Public Health (Wastewater) Regulations 2013*	To provide for the protection of the health of the public. To provide for wastewater system requirements.	Accommodation facilities will be subject to a variety of permits and licences relating to matters such as wastewater.	Wastewater works approvals will be required to ensure public health to accommodation facility workers, and other workers as relevant.	Chapter 24 Climate Change and Resource Sustainability Chapter 25 Hazards and Risks
Work Health and Safety Act 2012 *Work Health and Safety Regulations 2012*	To provide for the health, safety and welfare of persons at work and eliminate risks.	The Project will have a large construction workforce and smaller operational workforce, all of whom must be protected under this Act.	The DBOM Contractor has a duty to ensure that the workplace is safe and that employees and the public are safe from injury and risks to health.	Chapter 25 Hazards and Risks

Table 3-3: Relevant State Codes of Practice and Guidelines and other regulatory instruments referred to in the EIS

Document	Purpose	EIS chapter
Air and Water Quality Guideline – concrete batching guideline (EP SA 2016) (EPA 427/16)	Provides information to those involved in the management and operation of concrete batching plants, to assist with compliance with the *Environment Protection Act 1993*	Chapter 18 Air Quality
Ambient air quality assessment guideline (EPA 2016b)	Provides guidance on approaches and methods for obtaining information to assist EPA in assessing proposals	Chapter 18 Air Quality
Archaeological Provisions Guideline – Heritage Places Act 1993 (2022)	Provides best-practice advice on the process for managing potential, newly discovered, or known, historical archaeological sites or artefacts in South Australia	Chapter 17 Non-Aboriginal Cultural Heritage
Bunding and spill management guideline (EPA 2016a)	Provides guidance on the use of bunds and spill containment systems for storage of liquids above ground	Chapter 12 Soils and Landform Chapter 13 Surface Water
Discovery of Aboriginal Sites and Objects (Fact sheet) (AGD n.d.)	Provides guidance on management of discovery of Aboriginal sites or objects during project works	Chapter 16 Aboriginal Cultural Heritage
Environmental management of dewatering during construction activities (EPA 1093/21)	Provides guidance on the environmental management of dewatering during construction activities	Chapter 12 Soils and Landform Chapter 13 Surface Water Chapter 14 Groundwater
Evaluation distances of effective air quality and noise management (EPA 2023a)	Provides recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receivers need to be assessed	Chapter 18 Air Quality
Guideline for stockpile management (EPA 2020)	Outlines the potential risks associated with the stockpiling of materials (waste or other matter) and provides guidance on appropriate stockpile management and relevant controls to reduce those risks	Chapter 12 Soils, Landform and Geology

Document	Purpose	EIS chapter
Guidelines for the Assessment and Remediation of Site Contamination (EPA 2019a)	Provides information to ensure the assessment and remediation of site contamination is conducted to an appropriate standard in South Australia	Chapter 25 Hazards and Risks
Guideline for the management of Noise and Vibration: Construction and Maintenance Activities (DIT 2021)	Prepared by DIT to ensure that Contractors consider and address the potential effects of construction and maintenance noise and vibration and undertake reasonable and practicable mitigation to avoid nuisance to the community and the environment	Chapter 17 Noise and Vibration
Guideline for the Use of the Environment Protection (Commercial and Industrial Noise) Policy 2023 (EPA 2023d)	Provides a clause-by-clause explanation, and include examples to assist in understanding and using the Noise EPP	Chapter 19 Noise and Vibration
Indicative Noise Factor Guidelines for the (Commercial and Industrial Noise) Policy 2023 (EPA, 2023c)	Provides guidance on the indicative noise levels (INLs) for noise sources set out in the *Environment Protection (Commercial and Industrial Noise) Policy 2023*	Chapter 19 Noise and Vibration
Industry Guideline – Construction environmental management plan guidelines (EPA 2024)	Describes the impacts of construction activities and the information that should be included in a construction environmental management plan (CEMP) to ensure activities will be managed to avoid or mitigate environmental or nuisance impacts	Chapter 26 Environment Management Framework Appendix O
Managing Aboriginal Heritage in South Australia (Fact sheet) (AGD 2025)	Provides guidance on managing the potential for impact on Aboriginal heritage during project works	Chapter 16 Aboriginal Cultural Heritage
Site contamination – acid sulfate soil materials (EPA 2007)	Provides information for activities that may disturb acid sulfate soil materials (including soil, sediment and rock), the identification of these materials and measures for environmental management	Chapter 12 Soils, Landform and Geology
Standard for the Production and Use of Waste Derived Fill (EPA 2013).	Describes the information and processes that are required by the EPA to support the beneficial reuse of a range of wastes specifically recovered for use as fill	Chapter 12 Soils, Landform and Geology

Document	Purpose	EIS chapter
South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines v.4 2015 (State Bushfire Coordination Committee)	Provides a consistent approach to the establishment and maintenance of firebreaks and tracks used for fire access for government agencies and private landholders	Chapter 25 Hazards and Risks
Stormwater Management for Wash Bays (EPA 517/16)	Provides information to ensure activities are undertaken in a way that ensures stormwater is protected from pollutants such as washwater, detergents, cleaning agents, grease, oil and general rubbish	Chapter 13 Surface Water
Stormwater Pollution Prevention Codes of Practice: Building and Construction Industry (EPA 1999)	Addresses a range of potential pollution sources from a variety of building and construction industry practices, and issues related to construction activities that are subject to the approval of relevant authorities	Chapter 13 Surface Water
Underwater Piling and Dredging Noise Guidelines (DIT 2023)	Provide guidance to addressing underwater noise for marine maintenance activities or a marine infrastructure project, and designate safety zones for marine activities based on the potential for hearing injury in marine mammals	Chapter 11 Marine Environment

3.4 Commonwealth Legislation

3.4.1 Environment Protection and Biodiversity Conservation Act

The EPBC Act is the primary Commonwealth legislation regulating environmental matters. Under the EPBC Act, any action that is likely to have a significant impact on a 'matter of national environmental significance' (MNES) requires approval from the Commonwealth Environment Minister (i.e. a 'controlled action').

The EPBC Act also regulates actions that impact Commonwealth land.

If a proponent believes that a proposed action is likely to result in a significant impact to an MNES or Commonwealth land, they must refer the project to National EPA to determine if it will need formal assessment and approval under the EPBC Act. The referral document is the principal basis for informing the Commonwealth Environment Minister's decision as to whether approval is necessary and, if so, the type and level of assessment that will be undertaken.

A referral for the Project was submitted to DCCEEW[10] for assessment on 11 December 2025. On 5 February 2026 the Project was declared to be a 'controlled action' and therefore subject to assessment under the EPBC Act. The relevant protected matters for the controlled action are:

- listed threatened species and communities
- listed migratory species.

As discussed in Section 3.2.3, the Commonwealth Environment Minister has accredited the South Australian environmental assessment process under the PDI Act to assess the controlled action. Further detail on the assessment and approval process is provided in Section 3.2.

3.4.2 Other Commonwealth legislation

The purpose and objectives of other relevant Commonwealth Government legislation are identified in Table 3-4, and the implications of these Acts for the Project are addressed where relevant throughout the EIS.

Relevant Commonwealth Standards, Codes of Practice and Guidelines including Australian Standards will also be considered and utilised during design and construction.

[10] Note the referral was submitted to DCCEEW prior to the change to the National EPA on 1 July 2026.

Table 3-4: Relevant Commonwealth legislation and approvals requirements

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	To preserve areas and objects under threat, which are of particular significance to, or in accordance with, Aboriginal tradition	The area of the Project includes items and places of Aboriginal significance.	No approvals required. However, there is a general duty to comply with the requirements of the Act.	Chapter 16 Aboriginal Cultural Heritage
Biosecurity Act 2015	Manages biosecurity threats to plant, animal and human health. Provides requirements and regulatory powers related to importing goods into Australia.	Vessels will be required to operate in accordance with the Act, specifically relating to ballast water management. Relates to the importation of goods required for the Project.	Relates to any goods and services required for the Project coming into any SA port. No specific approval required.	Chapter 11 Marine Environment Chapter 15 Terrestrial Flora and Fauna Chapter 25 Hazards and Risks
Airspace Act 2007 *Airspace Regulations 2007* *Civil Aviation Act 1988* *Civil Aviation Safety Regulations 1998*	These Acts outline the Commonwealth Government's policy with respect to classification, designation, administration and management of Australian-administered airspace, including aviation safety.	Effects of the Project (presence of transmission towers and powerlines) on aircraft safety and airfield operations.	Consultation with the Civil Aviation Safety Authority (as required) to ensure relevant authorities are aware of construction works and final alignment of the transmission lines.	Chapter 9 Use of Land and Waters Chapter 21 Traffic and Transport
Australian Maritime Safety Authority Act 1990	Establishes the Australian Maritime Safety Authority (AMSA) which is Australia's national maritime regulatory agency responsible for	AMSA administers a range of legislation and intergovernmental agreements which implement international and	No approvals required. Provided for policy context only.	Chapter 9 Use of Land and Waters Chapter 21 Traffic and Transport

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
	maritime safety, protection of the marine environment, and maritime aviation search and rescue.	national standards relating to marine navigation, protection of the sea and shipping registration.		
National Greenhouse and Energy Reporting Act 2007 *National Greenhouse and Energy Reporting Scheme* (NGERS)	To establish a national framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production.	Greenhouse gas emissions have been identified for a range of Project construction activities.	Emissions will be reported under the NGERS as required	Chapter 24 Climate Change and Sustainability
Native Title Act 1993	Recognition and protection of Native Title. Also provides for Indigenous Land Use Agreements.	There are determined areas of Native Title over the area of the Project.	DIT is in the process of negotiating agreements with the relevant native title groups that will be impacted by the Project.	Chapter 5 Legislative Approval Framework Chapter 9 Use of Land and Marine Waters Chapter 16 Aboriginal Cultural Heritage
Navigation Act 2012	Gives effect to a number of international conventions for maritime issues where Australia is a signatory. This includes the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS)	Marine vessels will be utilised for construction of offshore marine infrastructure.	Approvals not required. Provided for policy context only.	Chapter 9 Use of Land and Marine Waters Chapter 21 Traffic and Transport

Legislation	Objective	Project relevance	Approvals / other requirements	EIS chapter
	and the International Convention for the Prevention of Pollution from Ships (MARPOL).			
Underwater Cultural Heritage Act 2018	Protects all shipwrecks and associated artefacts underwater for 75 years.	The closest historic shipwreck is located approximately 5 km from the proposed desalination plant.	None required. The shipwreck will not be impacted by the Project.	Chapter 17 Non-Aboriginal Cultural Heritage

Table 3-5: Relevant Commonwealth Standards, Codes of Practice, Guidelines and other regulatory instruments referred to in the EIS

Document	Purpose	EIS chapter
AS 1692: Steel tanks for flammable and combustible liquids	Provides design and construction requirements for the storage of flammable and combustible liquids in steel tanks	Chapter 6 Project Description
AS 2187.1 Explosives - Storage, transport and use – storage	Specifies requirements for the storage of explosives including pyrotechnics as defined in AS2187.0, and for the location, design, construction and maintenance of magazines. It applies to portable magazines, relocatable magazines, fixed or permanent magazines, bulk storage and underground storage.	Chapter 6 Project Description Chapter 25 Hazards and Risks
AS 4799 - Installation of underground utility services and pipelines within railway boundaries	Sets out the technical requirements for the installation, use and maintenance of services such as communication, high-voltage and low-voltage electric power cables and pipelines carrying combustible liquids, flammable fluids and non-flammable substances laid under railway track or elsewhere, below ground, and within railway boundaries	Chapter 21 Traffic and Transport
AS 5334-2013 Climate change adaptation for settlements and infrastructure – a risk-based approach	Provides principles and generic guidelines on the management of the risks that settlements and infrastructure face from the impacts of climate change. In particular, it describes a systematic approach to planning the adaptation of	Chapter 24 Climate Change and Sustainability

Document	Purpose	EIS chapter
	settlements and infrastructure based on the risk management process given in AS/NZS ISO 31000:2009.	
AS 9140: The storage and handling of flammable combustible liquids	Provides technical guidance on the storage and handling of flammable combustible liquids	Chapter 6 Project Description
Australian Ballast Water Management Requirements	Provides guidance on how vessel operators should manage ballast water when operating within Australian seas in order to comply with the *Biosecurity Act 2015*	Chater 11 Marine Environment
Australian Code for the Transport of Dangerous Goods by Road and Rail	Sets out the requirements and guidelines for transporting dangerous goods by road or rail	Chapter 25 Hazards and Risks
Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water (2018)	To facilitate the productive and sustainable use of water resources while still maintaining the biological communities and ecological processes that the resource supports, consistent with the principles of ecologically sustainable development	Chapter 11 Marine Environment Chapter 13 Surface Water Chapter 14 Groundwater
AUSTROADS Guide to Road Design	Provides designers with a framework that promotes efficiency in design and construction, economy, and both consistency and safety for road users	Chapter 21 Traffic and Transport
AUSTROADS Guide to Traffic Management	Provides comprehensive traffic management guidance for practitioners involved in traffic engineering, road design and road safety	Chapter 21 Traffic and Transport
Building Code of Australia (National Construction Code)	Contains technical provisions for the design and construction of buildings and other structures	Chapter 6 Project Description
Environmental Management Plan Guidelines	Provides general guidance to stakeholders preparing environmental management plans for environmental impact assessments and approvals under Chapter 4 of the EPBC Act	Chapter 15 Terrestrial Flora and Fauna
Interim Engaging with First Nations People and Communities on Assessments and Approvals under the Environment	Provides guidance on respectful and effective engagement with First Nations peoples and communities as part of the environment referral, assessment and approval process under Chapter 4 of the EPBC Act	Chapter 4 Community and Stakeholder Engagement

Document	Purpose	EIS chapter
Protection and Biodiversity Conservation Act 1999 guidelines		Chapter 16 Aboriginal Cultural Heritage
International Commission on Non-Ionizing Radiation (ICNIRP) Guidelines	Adopted by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). Establishes guidelines for the protection of humans exposed to electric and magnetic fields in the low-frequency range of the electromagnetic spectrum.	Chapter 25 Hazards and Risks
National Electricity Law (NEL) and National Electricity Rules (NER)	The NEL is the schedule to the *National Electricity (South Australia) Act 1996* (refer Table 5-4). The NEL is supported by further regulations and the NER. The NER govern management of power system security by AEMO and applies to the states and territories in the NEM. The NER have the force of law.	Chapter 6 Project Description
National Electricity Network Safety Code	Provides a basic overview of the safety principles applying to design, construction, operation, maintenance, commissioning and decommissioning of electricity networks	Chapter 6 Project Description Chapter 25 Hazards and Risks
National Environment Protection (Ambient Air Quality) Measure (Ambient Air Quality NEPM)	Establishes national ambient air quality standards and a national framework for the monitoring and reporting of six common air pollutants	Chapter 18 Air Quality
National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM)	Provides nationally consistent guidance on how to assess and manage contamination	Chapter 25 Hazards and Risks
National Light Pollution Guidelines for Wildlife	Outline the process to be followed where there is the potential for artificial lighting to affect wildlife. They apply to new projects, to lighting upgrades (retrofitting) and where there is evidence of wildlife being affected by existing artificial light.	Chapter 15 Terrestrial Flora and Fauna

3.4.3 International Conventions and Agreements

The international conventions and agreements relevant to the Project relate to protection of biodiversity, threatened species and habitats, and migratory species. Australia meets its obligations under these agreements for the protection and management of species and habitats through the EPBC Act and a range of government programs, strategies, plans and policies.

United Nations Convention on Biological Diversity

Australia is a Party to the United Nations Convention on Biological Diversity, which is implemented through the national biodiversity strategy and action plan – *Australia's Strategy for Nature 2019-2030*. The strategy is the overarching framework for all national, state, territory and local strategies, legislation, policies and actions that target nature protection. Such strategies include the Threatened Species Strategy, the Australian Weeds Strategy and Australia's Strategy for the National Reserve System, and legislation such as the EPBC Act.

These strategies have informed the assessment of the impacts of the Project on threatened species and communities contained in this EIS.

In making a decision on whether to approve an action under the EPBC Act, the Commonwealth Environment Minister must not act inconsistently with Australia's obligations under the Biodiversity Convention. To ensure consistency with the Biodiversity Convention, a proposed action should:

- identify listed threatened species and communities that may be impacted by the action, and the likely impacts
- not cause the extinction or uplisting of a species or community
- not result in a substantial impact on an important population of a species
- avoid exacerbating threatening processes for listed threatened species and communities
- overall, promote the protection of ecosystems, natural habitats, and the maintenance of viable populations.

Impacts on threatened species and communities are discussed in Chapter 15 Terrestrial Flora and Fauna and Chapter 11 Marine Environment. These chapters:

- identify the components of biodiversity that are likely to be impacted by the Project, including any listed threatened species and communities
- describe the extent, magnitude and duration of expected impacts
- detail the avoidance, mitigation and offset measures that will be implemented to minimise adverse impacts, address any threatening processes and ensure a significant environmental benefit
- provide the evidence base to support the conclusion that the Project will not have unacceptable impacts on any threatened species or community.

On this basis, it is considered that approval of the Project will not be inconsistent with the Biodiversity Convention.

International Migratory Bird Agreements

The Australian Government is signatory to a number of international bilateral migratory bird agreements aimed at conserving migratory bird populations and their habitats. These agreements include the Japan–Australia Migratory Bird Agreement (JAMBA), China–Australia Migratory Bird Agreement (CAMBA), Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA), and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The agreements provide for the protection and conservation of migratory birds and their important habitats, protection from take or trade, the exchange of information, and building of cooperative relationships.

Australia meets its obligations under these agreements through the EPBC Act. In making a decision on whether to approve an action under the EPBC Act, the Commonwealth Environment Minister must not act inconsistently with the Bonn Convention, JAMBA, CAMBA or ROKAMBA. To ensure consistency with these agreements, a proposed action should:

- overall, encourage the conservation of migratory species and their habitat and prevent these species becoming endangered
- not seriously prevent or impede the migration of species
- avoid exacerbating threatening processes for endangered migratory species
- not adversely impact sanctuaries for the management and protection of migratory birds.

Impacts on migratory species are discussed in Chapter 15 Terrestrial Flora and Fauna. This chapter:

- identifies the migratory species that are likely to be impacted by the Project
- describes the extent, magnitude and duration of expected impacts
- details the avoidance, mitigation and offset measures that will be implemented to minimise adverse impacts, address any threatening processes and ensure a significant environmental benefit
- provides the evidence base to support the conclusion that the Project will not have unacceptable impacts on any migratory species.

On this basis, it is considered that approval of the Project will not be inconsistent with the Bonn Convention, JAMBA, CAMBA or ROKAMBA.

3.4.4 Principles of ecologically sustainable development

The Commonwealth government's goal for ESD is defined in the National Strategy for Ecologically Sustainable Development (NSESD) as:

'development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.'

The NSESD was adopted by all levels of government in Australia in 1992 and since then Commonwealth and State governments have applied the objectives and principles to strategic and policy frameworks to ensure they are taken into consideration in policy making processes, decision making, development of legislation and design of government programs. A range of South Australian legislation has adopted the principles of ESD as

objectives for their operation including the *Environment Protection Act 1993*, the *Climate Change and Greenhouse Emissions Reduction Act 2007* and the *Landscape South Australia Act 2019* (refer Table 3-2).

ESD is also enshrined in section 3A of the EPBC Act as the following set of principles:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making
- Improved valuation, pricing and incentive mechanisms should be promoted.

A summary of how the Project has addressed these principles is set out below.

Integration of economic, environmental, social and equitable considerations

Through the supply of industrial water to mining offtakers (under commercial arrangements), the Project has the potential to secure and sustain economic activity into the future, generate billions of dollars that will directly and indirectly benefit all South Australians in the long-term and relieve pressure on natural water systems.

As part of the environmental impact assessment process, the Proponent undertook comprehensive environmental, social and economic impact assessments and stakeholder engagement to identify potential short and long-term issues (as well as the benefits) associated with the construction and operation of the Project. The outcomes of these assessments, including the management and mitigation of identified impacts, have been integrated through the planning, design and operational requirements for all stages of Project development. Sustainability objectives have also been identified for the Project and integrated into the design, build, operate and maintain (DBOM) contract to ensure they are considered throughout the life of the Project.

Importantly, the Project will:

- support the continued development of South Australia's key mining resources, which will unlock globally significant deposits of strategic and critical minerals, to support economic growth and decarbonisation efforts
- unlock sustainable growth in key future industries which will contribute to decarbonisation initiatives, sovereign capability and benefit local communities through increased employment opportunities and regional growth over the long-term
- increase environmental sustainability, through reducing reliance on environmental water sources in particular the Great Artesian Basin.
- support the preservation of culturally and economically significant water sources for First Nation communities in South Australia.

An Environmental, Social and Governance (ESG) Strategy and Framework has been developed for the Project. The ESG Strategy provides a practical structure to codify the commitment to achieving long-term social, environmental and economic benefits. It also establishes a clear foundation for identifying, measuring and reporting on the Project's sustainability performance and the broader benefits enabled through the Project (refer Chapter 24 Climate Change and Sustainability).

Development of the ESG Strategy has drawn on globally recognised sustainability standards and frameworks, including the United Nations Sustainable Development Goals, the Global Reporting Initiative, the International Financial Reporting Standards and the European Financial Reporting Advisory Group. These frameworks guided the approach to the assessing the Project's ESG context, risks, opportunities and priorities and will underpin the approach to future sustainability reporting for the Project.

In alignment with these recognised sustainability standards, a 'double materiality' assessment was completed. This process considered the sustainability context, risks, opportunities and outcomes most relevant to the Project, its stakeholders and value chain. Prioritised material topics informed the identification of Project ESG priorities and objectives. For each objective, actions and measurable targets will be developed as part of ongoing Project development and detailed design.

The strategy establishes governance and reporting requirements for identified priorities and objectives. These priorities and objectives together with the final targets will form the basis for future sustainability disclosures and reporting.

Precautionary Principle

The precautionary principle requires decision makers to take a cautious risk-based approach to decision making where there is uncertainty regarding the impacts of their decision. It recognises that decision makers will rarely have all the information necessary to determine the precise short and long-term impacts of a decision.

DIT is committed to delivering sustainable infrastructure that is planned, designed, constructed and operated to optimise environmental, social and economic outcomes over the long term. Extensive environmental impact studies have been undertaken focusing on potential threats to marine ecosystems, coastal habitats, and local biodiversity. These assessments have examined various options and scenarios, including worst-case assumptions, and used conservative estimates to ensure that all unlikely but significant environmental risks are considered and mitigated. The conclusion from these assessments, as detailed in the following chapters, is that the environmental and social impacts of the Project are considered acceptable and do not present a serious or irreversible threat of environmental damage.

The evidence base presented in this EIS means there is an adequate level of scientific certainty regarding the environmental, social and economic impacts of the Project to inform decision-making. Any uncertainties regarding the impacts of the Project are discussed in the relevant EIS chapter. Measures proportionate to the combined effect of the seriousness of the threat and the degree of uncertainty are proposed in each chapter to address residual environmental and social risks.

Intergenerational Equity

The Project aims to provide a sustainable water supply for use in the copper mines in northern South Australia. These mines, including Olympic Dam and Carrapateena, are critical sources of copper which is used in a variety of ways, including for the production of parts required for the renewables industry (e.g. solar panels and wind turbines). Providing water from the Project for copper mining will reduce the current reliance on the Great Artesian Basin and other deep saline groundwater resources, allowing for these resources to be intact for future generations.

Comprehensive environmental, social and economic impact assessments and stakeholder engagement processes have been undertaken as part of the Environmental Impact Assessment (EIA) process. These processes have also identified potential intergenerational risks and mitigation strategies.

Conservation of biodiversity and ecological integrity

Conservation of biological diversity and ecological integrity has been a significant consideration throughout all stages of development, including the Options Assessment stage which considered a range of locations and alignments for Project infrastructure (refer Chapter 5 Project Siting, Alignment and Optimisation).

The EIA has identified impacts to the natural environment spanning coastal processes, marine habitats and species, soil and landform, surface and ground water, and terrestrial flora and fauna. The relevant chapters in this EIS set out the existing baseline conditions for each of the environmental elements examined during the process, and details on potential impact events and proposed controls, mitigations and management strategies.

The EIS concludes that the Project will not have unacceptable impacts on biodiversity, including matters of nationally listed threatened species and communities, and migratory species. Impacts have been minimised through the mitigation hierarchy, as described in Chapter 15 Terrestrial Flora and Fauna, and offsets proposed to deliver a significant environmental benefit.

Improved valuation, pricing and incentive mechanisms

The improved valuation principle essentially requires accounting for the short-term and long-term external environmental impacts of a proposed action and internalising external environmental costs.

The environmental impacts of the Project are comprehensively described in the following EIS chapters. Design and mitigation measures have been developed, as required, to ensure residual environmental impacts and risks are acceptable and as low as reasonably practicable.

The design and mitigation measures selected are considered to be the most cost-effective measures to achieve the intended environmental outcomes.

3.4.5 Proceedings under environmental laws

The referral for the Northern Water Project was submitted by DIT on behalf of the South Australian Government on 11 December 2025. Over the last 10 years, DIT has referred eight projects under the EPBC Act as either the proponent or delivery partner.

All but two were determined to be 'not controlled action'. The Truro Bypass Project (2022/09398) was determined a controlled action but was later withdrawn without proceeding. The Adelaide Festival Centre Precinct Upgrade (2016/7787) was deemed invalid, as at the time a State Agency could not act as a proponent for a Commonwealth application – this has since changed.

There are no current or historical proceedings under a Commonwealth, State or territory law for the protection of the environment or conservation and sustainable use of natural resources against DIT.



Chapter 4

Community and Stakeholder Engagement

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

4 COMMUNITY AND STAKEHOLDER ENGAGEMENT 4-1

4.1 Setting the Context 4-1

4.1.1 Requirements in legislation and other standards 4-1

4.2 Approach to Stakeholder Engagement 4-2

4.2.1 Objectives 4-3

4.2.2 Integrated Communications and Engagement Plan 4-4

4.2.3 Engagement with Traditional Owners 4-4

4.2.4 Stakeholder Identification 4-4

4.3 Engagement Opportunities and Methods 4-8

4.3.1 Desalination plant design, site and alignment selection 4-8

4.3.2 Pre-EIS engagement 4-9

4.4 Sentiment and Engagement Outcomes 4-14

4.4.1 Sentiment 4-14

4.4.2 Key findings – Social Pinpoint 4-14

4.4.3 Key findings – market research sentiment survey 4-15

4.4.4 Summary of key issues raised during engagement 4-16

4.5 Further Opportunities to Provide Feedback 4-25

4.5.1 Public exhibition of the EIS 4-25

4.5.2 Ongoing community engagement 4-25

4.6 Conclusion 4-26

LIST OF TABLES

Table 4-1: Key Project stakeholders 4-5

Table 4-2: Engagement methods utilised 4-11

Table 4-3: Reference and Working Groups 4-12

Table 4-4: Key themes in stakeholder engagement during Project development 4-18

Table 4-5: Engagement activities during EIS public exhibition process 4-25

4 COMMUNITY AND STAKEHOLDER ENGAGEMENT

This chapter addresses the stakeholder engagement objectives and engagement approach adopted for the Project, the stakeholders identified and consulted, and the methods used to share information and receive feedback. It also summaries by theme the key topics raised by stakeholders during engagement and consultation activities.

The Northern Water Integrated Communications and Engagement Plan (ICEP) is attached as Appendix D-1. The ICEP was developed with consideration of the principles of various South Australian and Australian guidance materials, including the Community Engagement Charter[1] prepared by the State Planning Commission (SPC 2025a).

Regulation 72 of the *Planning, Development and Infrastructure (General) Regulations 2017* provides that the Minister should have regard to the principles applying under the Community Engagement Charter with respect to consultation in relation to an EIS. The ICEP was submitted to the Minister for Planning (Minister) and in accordance with Practice Direction 17[2] which states that 'Prior to the public release of the EIS, the Community Engagement Plan will be reviewed by the Minister with regard to the principles of the State Planning Commission's Community Engagement Charter'.

Comprehensive community and stakeholder engagement has been undertaken progressively since Project commencement in 2022 to support planning, environmental investigations and ongoing stakeholder participation. Concerns, suggestions and benefits raised by stakeholders have been considered and influenced the planning of the EIS and Project design.

An Engagement Outcomes Report comprising an overview of engagement undertaken to date and a detailed analysis of stakeholder and community feedback is provided at Appendix D-2. The key issues raised during consultation are presented by theme in the report and have been utilised to support the EIS.

4.1 Setting the Context

The EIS Assessment Requirements require information to be provided on stakeholder engagement and consultation undertaken prior to, or as part of, the EIS preparation. This includes a summary of engagement with stakeholders and the community, including the implementation of the ICEP reviewed by the Minister. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section also describes the relevant requirements in legislation and other standards.

4.1.1 Requirements in legislation and other standards

A comprehensive list of legislation relevant to the Project is provided in Chapter 3 Legislative Approvals Framework.

[1] https://plan.sa.gov.au/__data/assets/pdf_file/0005/1464044/Community-Engagement-Charter-Version-2.pdf

[2] https://plan.sa.gov.au/__data/assets/pdf_file/0010/1185607/Practice-Direction-17-Impact-Assessed-Development-Version-2.pdf

The following best practice guidelines and standards for stakeholder consultation and engagement have been utilised:

- Community Engagement Charter (State Planning Commission (SPC) 2025a)
- The Government of South Australia. The 6 Better Together Principles (Government of South Australia 2023)
- International Association of Public Participation (IAP2) Spectrum of Public Participation (IAP2 2024)
- The Interim Engaging with First Nations People and Communities on Assessments and Approvals under the *Environment Protection and Biodiversity Conservation Act 1999* (interim guidance) (DCCEEW 2023a).

4.2 Approach to Stakeholder Engagement

The key approach to engagement has been to build Project awareness and understanding among stakeholders and communities, and to inform the early planning and development of the Project.

The IAP2 Spectrum of Public Participation (IAP2 2024) was utilised to assist with stakeholder identification, form the approach to engagement and guide engagement and consultation activities.

The 6 Better Together Principles of Engagement are six inter-related principles that provide a foundation for effective engagement. The Principles are founded on the premise that good engagement helps create better decisions by bringing the voices of the stakeholders into the issues that are relevant to them.

The six principles are:

- We know why we are engaging
- We know who to engage
- We know the history
- We start together
- We are genuine, and
- We are relevant and engaging.

The ICEP also draws on interim guidance issued by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), specifically *The Interim Engaging with First Nations People and Communities on Assessments and Approvals under Environment Protection and Biodiversity Conservation Act 1999* (DCCEEW, 2023a).

The interim guidance outlines expectations for effective engagement with First Nations people and communities, focusing on:

- Ensuring cultural safety
- Building and maintaining trust
- Engaging early and often
- Negotiating suitable timeframes

- Agreeing on appropriate submission formats.

As it was important for consultation to be tailored to the needs and interests of different stakeholder groups, a range of different opportunities were provided for people interested to learn more about the Project and to provide feedback (refer Section 4.3). This has ensured information has been shared and feedback gathered in ways that were appropriate to different audiences and stages of Project development.

This approach will continue during all further Project phases, including the assessment of this EIS.

4.2.1 Objectives

The ICEP (Appendix D-1) sets out the following objectives which have been key drivers for the engagement and consultation process undertaken for the Project:

- Communicate clearly to build understanding of the Project, the EIS process and the associated benefits (refer Plate 4-1)
- Provide engagement opportunities for the Traditional Owners, stakeholders, community and the public before and during public release of the EIS
- Identify and address issues early through targeted engagement with stakeholders
- Clearly explain technical investigations, assessment outcomes and how impacts will be avoided where possible, mitigated and managed
- Build understanding of the Project's environmental commitments by addressing key concerns such as how desalination works and how the marine environment will be protected
- Foster trusted relationships with Traditional Owners, communities, stakeholders and government agencies through ongoing and regular engagement
- Demonstrate how feedback has influenced decisions to close the engagement loop.

Engagement has informed the scope of environmental investigations, cultural heritage surveys, Project planning, mitigation measures and stakeholder communication strategy, activities and materials throughout the Project's development.

Refer Section 4.4.4 and Appendix D-2 for further detail on the key issues raised during engagement.

As the Project progresses through the EIS assessment process and beyond, ongoing engagement will continue to focus on:

- building project understanding and awareness
- providing accessible, evidence-based information
- supporting stakeholder participation
- maintaining transparent communication regarding environmental investigations, assessment outcomes, mitigation measures and future project activities.



Plate 4-1: Fact sheets provided at a community event

4.2.2 Integrated Communications and Engagement Plan

The proponent is committed to open and transparent engagement with stakeholders and communities and has developed the Northern Water ICEP (refer Appendix D-1) to direct consultation and engagement activities for the Project. These include statutory engagement requirements under the Community Engagement Charter (SPC 2025), the *Planning, Development and Infrastructure Act 2016* (PDI Act) and Practice Direction 17.

The ICEP will be continually reviewed and updated as the Project progresses to ensure it remains relevant and captures stakeholder views.

4.2.3 Engagement with Traditional Owners

The Proponent has a detailed approach for engaging with Traditional Owners and Native Title parties within the Project Area and with other Aboriginal groups and representatives in surrounding areas that have been identified as having an interest in the Project. The same objectives and approach to consultation and engagement as discussed above apply, and the plan will be continually reviewed and updated to ensure it remains relevant.

Details of engagement and consultation activities with Traditional Owners are provided in Chapter 16 Aboriginal Cultural Heritage and Appendix D-2.

4.2.4 Stakeholder Identification

Key stakeholders relevant to the Project were identified early in the planning and site selection process. As the Project progressed and more information became available about site locations, potential environmental impacts and stakeholder concerns, the stakeholder list was updated, and a range of meetings, workshops, surveys, reference groups and forums were undertaken.

The ICEP provides detailed information (including a full list) of stakeholders and their respective areas of interest that was utilised to provide information and seek feedback. Table 4-1 provides an overview of key Project stakeholders.

Table 4-1: Key Project stakeholders

Stakeholder Group	Stakeholder
Registered Native Title Body Corporates (RNTBCs) directly related to the Project area	Barngarla Determination Aboriginal Corporation (BDAC) Registered Native Title Body Corporate (RNTBC)
	Kokatha Aboriginal Corporation (KAC) Recognised Aboriginal Representative Body and RNTBC
First Nations Groups surrounding the Project area	Arabana Aboriginal Corporation
	Adnyamathanha Traditional Lands Association
	Adnyamathanha Yura Language and Heritage Association
	Dieri Aboriginal Corporation
	Nukunu Wampa Thura Aboriginal Corporation
	Kuyani Yartah Aboriginal Corporation
	Narungga Nation Aboriginal Corporation
	Nauo Aboriginal Corporation
	Gawler Rages Aboriginal Corporation
	Antakirinja Matu – Yankunytjatjara aboriginal Corporation RNTBC
	Whyalla Aboriginal Corporation
Lessees / Landholders	Directly affected landholders / lessees within the Project footprint
	Adjoining or nearby landholders that may be indirectly affected by the Project
Parliament of Australia	Minister for Environment and Water, Hon Murray Watt MP
	Minister for Climate Change and Energy, Hon Chris Bowen MP
	Minister for Indigenous Australians, Senator the Hon Malarndirri McCarthy
	Tom Venning MP, Federal Member for Grey
Commonwealth Government	Attorney-General's Department
	Department of Agriculture, Fisheries and Forestry
	Regional Development Australia
	Department of Defence
	Department of Climate Change, Energy, the Environment and Water
Local (State) MPs	Eddie Hughes MP, State Member for Giles
	Geoff Brock MP, Independent State Member for Stuart

Stakeholder Group	Stakeholder
	Sam Telfer MP, Member for Flinders
Local Government	Whyalla City Council
	Port Augusta City Council
	Municipal Council of Roxby Downs
	Outback Communities Authority
	Upper Spencer Gulf Common Purpose Group comprising Whyalla, Port Pirie and Port Augusta Councils.
Parliament of South Australia	Premier of South Australia - Hon Peter Malinauskas MP
	Deputy Premier, Attorney General, Minister for Aboriginal Affairs - Kyam Maher MLC
	Minister for Housing and Urban Development - Hon Nick Champion MP
	Minister for Climate, Environment and Water - Emily Bourke MLC
	Treasurer and Minister for Energy and Mining - Hon Tom Koutsantonis MP
	Assistant Minister for Copper, Steel, Critical Metals and Minerals – Lawrence Ben MP
	Minister for Infrastructure and Transport - Hon Joe Szacacks MP
	Minister for Primary Industries and Resources - Hon Clare Scriven MP
South Australian Government	Department of Housing and Urban Development
	Department for Infrastructure and Transport including Transport Assessment and Marine Services
	Department for Environment and Water
	Attorney-General's Department - Aboriginal Affairs and Reconciliation
	Department for Energy and Mining
	Environment Protection Authority
	Department of the Premier and Cabinet
	Department of Treasury and Finance
	Department of Primary Industries and Regions
	Department of State Development
State Government boards, committees, councils and institutes	Pastoral Board of South Australia
	Landscape Boards: Eyre Peninsula and Arid Lands
	Native Vegetation Council
	Coast Protection Board

Stakeholder Group	Stakeholder
	South Australian Research and Development Institute
Local and regional communities	Communities in Eyre Peninsula, Upper Spencer Gulf and Far North
	Residents in Whyalla, Port Augusta, Pimba, Woomera, Roxby Downs, Andamooka
	Neighbouring landholders, residents and holiday house / shack owners at Cowleds Landing and Murninnie Beach
Businesses	Local and regional businesses and service providers registered for opportunities
	Agricultural businesses
	Mining, exploration and resources companies
	Retail and industrial businesses
	Transport and logistics
Industry – Commercial and Recreational Fishing	Marine Fishers Association of South Australia Inc
	Spencer Gulf and West Coast Prawn Fishermen's Association
	South Australian Blue Crab Pot Fishers
	Marine Scalefish Fishery
	South Australian Professional Fishers Association
	Recreational Fishing Association
	Local commercial fishers in Whyalla
	Local recreational fishing clubs including, Whyalla Sportfishing Club and Steel City Sportfishing Club
Groups, associations and peak representative bodies	Business and tourism groups and associations including Whyalla Business and Tourism
	Community groups, clubs, associations and committees
	Environment, marine and conservation groups
	Industry peak representative bodies including tourism, aquaculture and fishing; and exploration and mining
Educational institutions	TAFE SA (Whyalla) including Whyalla TAFE Aboriginal Access Centre
	Adelaide University Campus (Whyalla)
	Unihub Spencer Gulf
Emergency services	SA Police, SA Ambulance Service, Country Fire Services, Metropolitan Fire Service, State Emergency Service
Service providers	Health services, transport services, education services, community services
Transport	Freight Council, QANTAS, regional airports

Stakeholder Group	Stakeholder
Utilities	Power, telecommunications and water utilities
Public	Eyre Peninsula, Upper Spencer Gulf, Far North, Adelaide and wider South Australia communities
Third parties	Australian Rail Track Corporation
	Alligator Energy
	Tilt Renewables
	Total Energies / TEH2
	D & L Blackwell Nominees Pty Ltd
Industry peak bodies and representative organisations	Upper Spencer Gulf Common Purpose Group
	South Australian Chamber of Mines and Energy
	Association for Mining and Exploration Companies
	Regional Development Australia – Eyre Peninsula and Far North
	TACTIC
	Far North Aboriginal Economic Collective
Media	Television, radio, social media, newspapers

4.3 Engagement Opportunities and Methods

The following section summarises the engagement undertaken leading up to the submission of this EIS for public exhibition, and the methods used to engage with stakeholders. Further opportunities for stakeholder feedback are outlined in Section 4.5.

Given the Project's geographical extent, there are a significant number and diverse range of stakeholders to be consulted, therefore a wide range of communication methods have been adopted to ensure all parties are provided opportunities for ongoing involvement.

4.3.1 Desalination plant design, site and alignment selection

Stakeholder engagement commenced in 2022 following determination of a coastal desalination plant as the preferred option for a new sustainable water supply. The main focus of early engagement was firstly to assess potential market demand for water which would drive the design, size and scale of a desalination plant, and secondly the preferred location and alignment of the water delivery infrastructure.

A market engagement approach to identifying and assessing demand for the Project included consultation with companies and industry sectors in the region as well as government, to understand the need, timing and specific requirements the Project would be required to address. Detail of the market engagement process is provided in Chapter 2 Justification and Alternatives.

As noted in Chapter 5 Project Siting, Alignment and Optimisation, multiple locations were looked at as potential options for the proposed desalination plant. These locations were assessed against multiple criteria including timing, scale, source security, demand reliability and duplication. Options were progressively removed where they were constrained by

limited supply, competing allocations or reliance on other industries. Ultimately, several sites on the Upper Spencer Gulf were shortlisted and relevant industry, government and community-representative stakeholders were engaged to provide input into a Multi Criteria Analysis to determine the most suitable site.

A targeted engagement approach was delivered to ensure key representative stakeholders were given significant and meaningful opportunities to participate in the site selection process as summarised in Table 4-2 and Plate 4-2.



Plate 4-2: Engagement on desalination plant site and alignment

4.3.2 Pre-EIS engagement

General community engagement opportunities commenced in August 2023 in parallel with the commencement of environmental and technical investigations. The investigations cover the marine and terrestrial environments and have been undertaken by specialists in their fields to ensure that all potential environmental and social impacts have been identified, understood and can be avoided or mitigated.

The Project team utilised a range of different engagement methods to reach as many stakeholders and community members as possible, to present the Project and the findings of the investigations, and to receive feedback. Each of the specialist technical reports are attached as Appendices to this EIS, with key technical reports having been independently peer reviewed. Study findings and assessment outcomes are also summarised in the individual EIS chapters, together with a summary of stakeholder feedback received relevant to specific chapters.

Engagement and consultation opportunities

Engagement and communication activities have included a broad range of methods tailored to different stakeholder groups and stages of the Project such as meetings, emails,

phone calls, community events, stakeholder briefings and registrations of interest. The engagement has involved Traditional Owners and stakeholders across government, industry, business, fisheries and aquaculture, environmental organisations, landholders, local residents (including holiday house and shack owners) and the wider community.

A distribution list of approximately 1,120 registered stakeholders has been maintained and utilised to distribute regular electronic Direct Mail updates at key Project milestones. Engagement records indicate that communication activities between late 2024 and EIS submission included approximately 169 email and campaign email interactions, with communications distributed across stakeholder groups including businesses, local residents, environmental organisations, fisheries and aquaculture representatives, Aboriginal stakeholder groups, industry participants and government agencies.

Key stakeholders were also provided with Project updates through targeted correspondence, including direct emails, meetings, phone calls and letter mail outs. Communication activities included approximately 122 meetings, 54 phone calls and 24 events and community engagement activities over the reporting period. Figure 4-1 provides a snapshot of the number and types of activities undertaken during the November 2024 – August 2026 period.

A dedicated website has provided a centralised source of Project information, giving stakeholders access to updates, fact sheets, videos, animations, environmental reports and Frequently Asked Questions. Website content is regularly updated to reflect Project milestones, investigation outcomes and emerging stakeholder interests.

Further details regarding engagement phases and methods of engagement per stakeholder group are provided in Table 4-2. In addition to wider community engagement, the Project team has utilised the reference and workings groups outlined in Table 4-3 for particular discussions and obtaining feedback.



Figure 4-1: Snapshot of numbers and types of engagement and consultation undertaken
[Source: Appendix D-2]

Table 4-2: Engagement methods utilised

Engagement Topic	Stakeholder Groups	Engagement Methods
Desalination plant site and transfer system alignment selection	• Landholders • Traditional Owners • Local, State and Federal governments • Commercial fisheries and aquaculture • Recreational fishers • Environment and conservation groups • Tourism operators • Broader industry	• Site analysis workshop • Multi-criteria analysis • Briefings and presentations • Face to face meetings • Stakeholder Reference Group (SRG) and Mullaquana subgroup meetings • Direct engagement
	• General community • Shack owners • Affected residents and businesses	• Multi-criteria analysis survey • Site selection survey • Project survey • YourSAy website • Project telephone and email • Stakeholders' social media • Posters and postcards • Networks • Summary document • Staffed pop ups and events
Landholder engagement	• Directly affected landholders	• Face to face meetings • Written communications • Project telephone and email • Agreement making (access, easements, licences and/or land transfers)
Traditional Owner engagement (heritage and native title)	• BDAC RNTBC • KAC RNTBC	• Board briefings and presentations • On Country meetings and presentations • Common Law Holder meetings • Cultural heritage surveys • Agreement making
Traditional Owner engagement (surrounding)	• Arabana • Nukunu • Narungga • Nauo • Dieri • Kuyani • Adnyamathanha • Gawler Ranges	• Direct email Project update • Briefings and presentations • Engagement at industry and community events

Engagement Topic	Stakeholder Groups	Engagement Methods
	• Whyalla Aboriginal Corporation • Port Augusta Community Council	
All pre-EIS topics	• Landholders • Traditional Owners • Broader Aboriginal Groups • Local, State and Federal governments • Communities • Marine advocacy • Commercial fisheries and aquaculture • Recreational fishers • Environment and conservation groups • Broader industry • Residents and businesses • General public	• Staffed pop-ups and community information sessions at Whyalla and Port Augusta • Workshops • Briefings and presentations • Display booths at industry events • Face to face meetings • Reference Groups and Working Groups (see Table 4-3) • Pop-ups at local community and sporting events • EIS Social Pinpoint EIS Survey • Market research survey • Project website • Fact sheets and project information • Project telephone and email • Social media

Table 4-3: Reference and Working Groups

Group	Purpose of engagement
SRG and Mullaquana Station SRG sub-group for desalination plant site selection	The SRG functions as a forum for key stakeholders with a direct interest in the Project or are expected to be directly impacted. Bi-monthly SRG meetings were held from 2022 and comprised representatives from industry (including fishing, workforce and tourism), conservation and community groups, and regional representatives from State and local government. The meetings provided an open and transparent forum to share project information and capture local knowledge, priorities and concerns from a broad range of government and non- government organisations, interest groups and peak bodies. The Mullaquana Station SRG sub-group was established in early 2025 in response to renewed investigations of this location as an option for the desalination plant. The sub-group comprised a smaller membership of the SRG with a specific interest in Mullaquana Station. The proponent met with this group on multiple occasions to capture local insights and inform site assessments.
Technical Working Group (TWG)	The TWG was set up specifically to advise the proponent on legislative and technical matters relating to the Project and transitioned to a

Group	Purpose of engagement
	formal TWG as part of the EIS process. Managed by Planning and Building group within the Government Department for Housing and Urban Development (formerly the Planning and Land Use Services group), the TWG comprises representatives from government departments/agencies and councils responsible for reviewing and assessing various sections of the EIS.

Landholder engagement

Engagement with landholders (including private landholders, Crown lessees, pastoralists and Native Title parties) was prioritised during desalination plant and transfer system site and infrastructure alignment selection to enable access to land for investigation works (e.g. environmental studies and geotechnical investigations). Some parts of the Project infrastructure footprint are located on land under the care and control of local government and State government agencies, or on land owned by the Commonwealth government. Engagement was also undertaken with these landholding entities.

Once in the construction phase, ongoing land access and landholder interactions will be governed through a Land Access Management Plan (LAMP), which sets out the approach that will be applied in practice to manage those interactions. The LAMP requires early, ongoing and structured communication with all affected landholders, including the provision of regular updates on upcoming activities. Property-specific Land Management Plans will also be developed in consultation with individual landholders to address site-specific constraints, operational requirements and agreed mitigation measures.

Engagement methods used to consult with landholders are summarised in Table 4-2.

Traditional Owner engagement

The primary Traditional Owners and Native Title holders for consultation on the Project are the Barngarla People via the BDAC RNTBC and the Kokatha People via the KAC RNTBC.

Communications with BDAC and KAC first commenced in 2022, and consultation has continued since that time. This consultation has included the development of engagement protocols and general arrangements relating to the Project, the undertaking of cultural heritage surveys, and the ongoing negotiation of an Indigenous Land Use Agreement with each of BDAC RNTBC and KAC RNTBC

Methods of engagement have included meetings, presentations, briefings and onsite visits, including cultural heritage surveys. Economic development opportunities such as skills training and employment opportunities are also being discussed.

Engagement with other Aboriginal groups with an interest in the Project has commenced and will continue as the Project progresses. Aboriginal groups with traditional lands surrounding the Project Area including the Adnyamathanha, Arabana, Dieri, Gawler Ranges, Kuyani, Narungga, Nauo and Nukunu Peoples. These groups have been identified as key stakeholders due to their expressed interest in the Project, their proximity to the Project Area, and the potential for the Project to have environmental, cultural, and economic benefits beyond the Project's construction footprint.

Further information on Traditional Owner engagement is provided in Chapter 16 Aboriginal Cultural Heritage.

4.4 Sentiment and Engagement Outcomes

4.4.1 Sentiment

As part of the pre-lodgement engagement activities for the EIS, the Proponent undertook a survey to capture community sentiment and to identify key areas of interest and concern. The survey was undertaken via Social Pinpoint between 2 June – 9 August 2026 and promoted through the SRG, industry groups, the Project website, electronic Direct Mail, social media posts and pop-ups in shopping centres.

The survey and interactive map were designed to gain insights on community values, concerns and priorities in relations to the project. A total of 120 people responded to the survey.

An independent market research sentiment survey was also undertaken during the period 3 July 2026 – 10 August 2026 by McGregor Tan to understand broader sentiment, project knowledge and areas of interest among stakeholders and the community.

A summary of the key issues raised by respondents of the Social Pinpoint and market research surveys are provided in Section 4.4.2 and Section 4.4.3 respectively, with full details provided in Appendix D-2.

4.4.2 Key findings – Social Pinpoint

A total of 120 people responded to the online survey and interactive map. The majority of respondents were from the Whyalla area (28%) and Adelaide (25%) with some respondents from Port Augusta (5%) and Roxby Downs (6%). Of these:

- Whyalla respondents were generally supportive of the Project, with almost two thirds expressing support generally due to jobs, economic development and water security
- Adelaide respondents were also generally supportive, with support linked to water security, economic development and Project benefits
- Port Augusta, Roxby Downs and Pimba was more mixed, with a high proportion of neutral responses.

Survey respondents were asked to rate the level of importance that they placed on key aspects of the Project during construction and operation. The top three issues rated as extremely important or very important were:

- protection of marine environment (habitats and species) – extremely important (39%) and very important (39%)
- protection of the terrestrial environment (plants and animals) – extremely important (28%) and very important (38%)
- social and community wellbeing across the Project area during construction and operation – extremely important (18%) and very important (31%).

Positive feedback focused on the employment, economic development and regional growth opportunities expected to arise from the Project. Respondents also highlighted the

importance of long-term water security, renewable energy use and transparency regarding environmental management, monitoring and project commitments.

4.4.3 Key findings – market research sentiment survey

The key findings of the independent market research sentiment survey[3] are summarised below under three main themes - Project awareness, level of support, and key issues. Further detail is provided in Appendix D-2.

Project awareness

A sentiment survey of 345 respondents from Whyalla, the broader region and metropolitan Adelaide found strong awareness of the Project, particularly in Whyalla (69%), followed by the broader region (56%) and metropolitan Adelaide (52%). Respondents generally associated the Project with construction opportunities (76%), a reliable and climate-resilient water supply for industry (75%), and long-term employment and regional growth (70%).

Level of support

An average of 50% of the respondents support the Project, with 30% remaining neutral and 20% opposed. Sentiment among the neutral respondents may become more defined as the Project develops.

Opposition levels overall were lowest (20%) which appears to be concentrated on environmental concerns, particularly potential impacts on the marine environment and the Spencer Gulf, rather than opposition to the Project's overall objectives.

There was more positive than negative sentiment for Mullaquana Station as the proposed location for the desalination site across all regions, including 47% positive sentiment in both Whyalla and the broader region. There was also reasonable recognition of the logic behind the location, with 56% agreeing it made sense given its proximity to existing and future industry.

Key issues

The importance of the environment was consistent throughout the research, with environmental impacts and safeguards for the marine environment being the leading future information priority (60%), followed by impacts on existing water sources such as the Great Artesian Basin and River Murray (49%).

Environmental concern was not confined to those opposed to the Project, with 21% of supporters also raising environmental impact concerns when explaining their level of support. This also might indicate why there was strong support, but lower positive and mixed sentiment (i.e. how people feel) in the Whyalla area demonstrating that people understood the benefits but were concerned about environmental impacts.

[3] The majority of stakeholder engagement activities, including the Social Pinpoint survey and a substantial proportion of the market research fieldwork, were undertaken prior to announcements regarding the closure of the Whyalla Steelworks blast furnace. Engagement outcomes and sentiment results presented in this chapter therefore reflect stakeholder views at the time they were collected.

The results of the sentiment survey indicate a generally positive view of the Project, provided environmental values are protected. Ongoing transparent engagement will remain critical to maintaining stakeholder confidence and informed participation as the Project progresses.

4.4.4 Summary of key issues raised during engagement

Engagement activities captured feedback and local insights from community members, Traditional Owners, Aboriginal communities, government agencies, environmental organisations, industry stakeholders, fisheries and aquaculture representatives, landholders, businesses and regional interest groups. The most frequently raised engagement topics during the November 2024 – August 2026 period related to:

- desalination plant options and preferred site selection
- marine and coastal environment considerations
- Project timing and assessment pathways
- environmental investigations and impact assessment processes
- employment and local business participation opportunities.

These topics are shown in Figure 4-2, noting that some topics are separated out further than presented above, while others have been grouped together.

Examples of feedback received per topic are presented at a high level in Table 4-4 and EIS chapters also contain a specific summary of the issues raised by stakeholder that relate to that chapter. Table 4-4 indicates how the feedback has been responded to and where in the EIS it has been addressed. Each of the overarching technical reports for the environmental / social aspect raised are appended to this EIS.

The Engagement Outcomes Report (Appendix D-2) provides further detail on issues raised during stakeholder engagement activities conducted to date, and how these have been addressed by the proponent. This includes the number and type of engagement activities undertaken by the Project team with stakeholders during the November 2024 – August 2026 period.

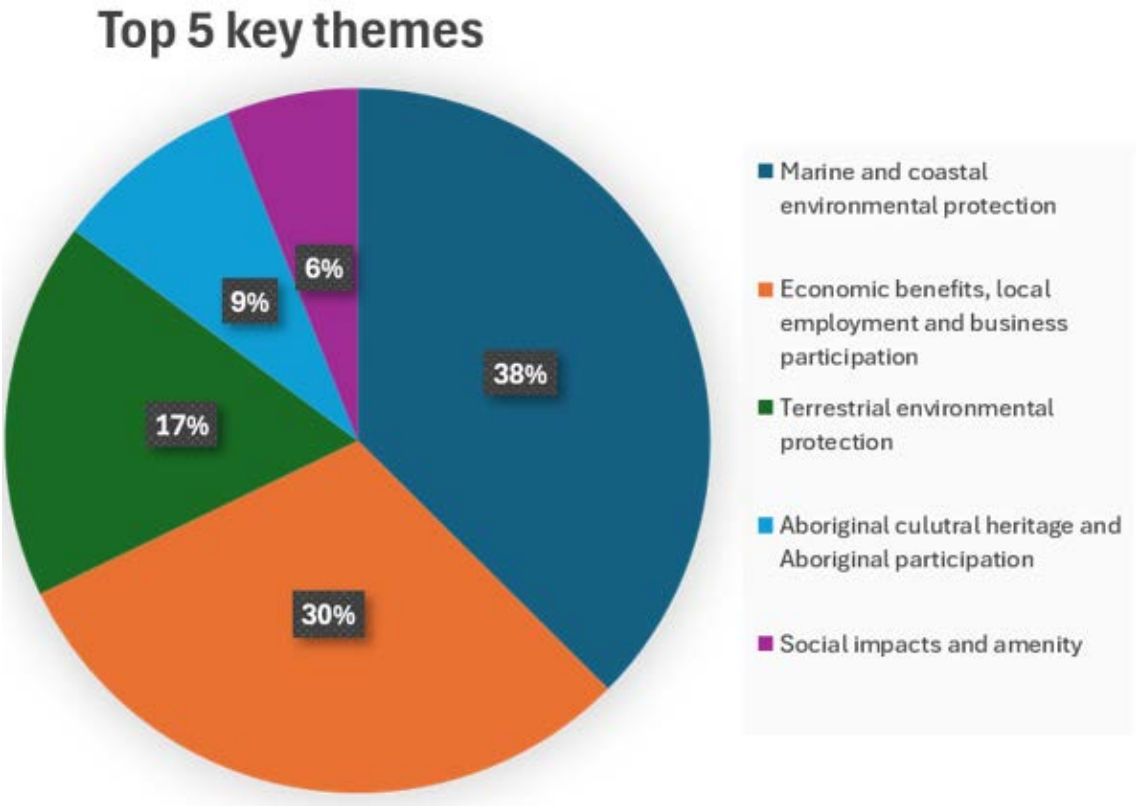


Figure 4-2: Frequently raised topics
[Source: Appendix D-2]

Table 4-4: Key themes in stakeholder engagement during Project development

Theme	Detail	Proponent Response	EIS Chapter(s)
Marine and coastal environment impacts	Potential impacts associated with intake and discharge infrastructure, salinity and dilution, water extraction, flushing rates, marine fauna pathways, aquaculture interactions and cumulative impacts within the Upper Spencer Gulf. Protection of the Upper Spencer Gulf marine and coastal environment including impacts to commercial and recreational fishing; marine nurseries and habitats; tourism; Giant Australian Cuttlefish; and general ecological and environmental impacts.	Significant engagement has been undertaken with the SRG, Traditional Owners, Aboriginal groups, commercial and recreational fishing representatives, local fishers, nearby residents, tourism representatives, cuttlefish experts and relevant government agencies to discuss marine risks and mitigation strategies. Informed by stakeholder feedback, marine specialists were engaged to undertake extensive marine investigations. Preliminary findings from marine and environmental investigations were shared with stakeholders, to support transparent discussions regarding coexistence, cumulative impacts, and how potential risks could be avoided, minimised or managed. The marine studies described in the EIS are comprehensive and include marine and intertidal surveys, larval surveys, mangrove condition surveys, benthic and seagrass health surveys, prawn recruitment surveys, epibenthic and infauna surveys, site-specific water quality testing, vertical water profiling, ecotoxicity review, underwater noise, marine sediment analysis, algae investigations and a Giant Australian Cuttlefish assessment. The work was independently peer reviewed by experts from the University of Adelaide, CSIRO and University of NSW. The outcomes of these investigations have informed detailed design. Modelling also indicated that desalination plant return water would disperse well before reaching the EPBC Act listed Cuttlefish Coast Sanctuary Zone.	Ch.9 Use of Land and Marine Waters Ch.10 Coastal Processes Ch.11 Marine Environment Ch.22 Economic Environment Ch.23 Social Environment Ch.25 Hazards and Risks

Theme	Detail	Proponent Response	EIS Chapter(s)
Terrestrial environment impacts	Potential impacts on flora, fauna, groundwater, soils, landscape values, transport routes and construction-related impacts. Site and pipeline alignment should consider impacts on habitat, protected species and surface water flows.	Extensive seasonal terrestrial ecological investigations, including vegetation and habitat mapping, threatened species surveys and hydrological assessments, were undertaken to apply an avoidance and mitigation hierarchy in respect of route selection and design, to understand potential impacts, and to formulate management and mitigations measures to reduce impacts wherever possible. The Project will be constructed in accordance with a Construction Environmental Management Plan that will include (but not be limited to) measures addressing flora, fauna and threatened species protection; implementation of weed hygiene and biosecurity controls; soil stability, drainage and erosion and sediment control measures; and encouraging regrowth of disturbed areas following pipeline installation. Potential constraints for the pipeline were identified including areas of known significant cultural heritage sensitivities, known significant environmentally sensitive areas (e.g. salt lakes) and conservation areas, steep topography and large water crossings. Where possible and practicable the pipeline has been aligned with existing transmission lines, existing roads/ access tracks, previously disturbed areas and fence lines. The proposed alignment will be subject to ongoing refinement at the local level as the design phase progresses.	Ch.9 Use of Land and Marine Waters Ch.12 Soils, Landform and Geology Ch.13 Surface Water Ch.14 Groundwater Ch.15 Terrestrial Flora and Fauna Ch.16 Aboriginal Cultural Heritage Ch.18 Air Quality Ch.19 Noise and Vibration Ch.20 Landscape Character and Visual Amenity Ch.21 Traffic and Transport
Aboriginal cultural heritage and	Protection of cultural heritage values, including the GAB mound springs and the Giant Australian Cuttlefish.	The Project will be a secure climate resilient water supply for industry in South Australia's Upper Spencer Gulf and Far North, driven by the growing needs of the copper industry	Ch.2 Project Justification and Alternatives

Theme	Detail	Proponent Response	EIS Chapter(s)
Traditional Owner engagement	Ongoing consultation processes. and opportunities for Aboriginal employment, procurement and participation.	and potentially reducing the overall level of demand and reliance on the GAB and the River Murray as sources of water. The Northern Water Project does not of itself alter groundwater extraction entitlements, groundwater allocation limits or groundwater management arrangements. Extensive Aboriginal cultural heritage surveys have been undertaken with both BDAC RNTBC and KAC RNTBC in respect of all Project infrastructure and there will be no impacts to cultural heritage. This process identified cultural heritage constraints and management measures that informed design development. Ongoing negotiations for various agreements with the Traditional Owners will embed matters of commercial interest such as employment, training and business opportunities; together with cultural heritage protection requirements (e.g. monitoring during construction).	Ch.16 Aboriginal Cultural Heritage
Desalination plant options	Preferred site selection, including the rationale for revisiting Mullaquana Station, site selection processes and alternative site considerations.	Mullaquana Station was selected as the site for the desalination plant, following comprehensive environmental, engineering and socio-economic investigations. It was selected for the following reasons: • Meets strategic Project objectives –enables the supply of water closer to demand in the Upper Spencer Gulf and Far North. • Greater economic and financial viability – the desalination plant and transfer pipeline will be more cost effective to build and operate due to the plant's proximity to available workforce, local industry and existing transport infrastructure (newly redeveloped	Ch.2 Justification and Alternatives Ch.5 Project Siting, Alignment and Optimisation

Theme	Detail	Proponent Response	EIS Chapter(s)
		airport, rail and port facilities) and the pipeline's proximity to water demand. • Favourable construction environment – on and offshore geotechnical investigations found that the ground conditions at Mullaquana Station are predominantly clay, making it favourable to construct the desalination plant and establish underground pipelines / tunnels. • Supports growth in Whyalla and the region – Mullaquana Station is closer to potential water off takers, industry, workforce and infrastructure, aligning favourably with the State's aspirations to grow the economy of the Upper Spencer Gulf and Far North. • Lower estimated greenhouse gas emissions –The Project, with the final desalination plant location at Mullaquana Station, has lower greenhouse gas emissions and reduced operational energy consumption.	
Business and employment opportunities	Tangible local employment and business participation outcomes, while also protecting industries (e.g. fishing, aquaculture, tourism, agriculture). Using local, regional and State businesses to provide goods and services to the Project and maximising local workforce participation. Potential workforce influx impacts during construction, including pressure on housing and accommodation availability, local services, infrastructure capacity and community amenity.	Engagement and consultation have occurred with business, workforce and industry stakeholders to better understand regional capacity, supply chain readiness and opportunities to maximise local employment, procurement and business participation. In addition, engagement with industry associations, local businesses, workforce and development bodies have been conducted with the aim of embedding these considerations into procurement frameworks, contractor obligations and local participation strategies. This work was intended to inform decisions regarding procurement design, timing and contract packaging, as well as expectations placed on delivery partners relating to	Ch.22 Economic Environment Ch.23 Social Environment

Theme	Detail	Proponent Response	EIS Chapter(s)
	Concern that the Project will deliver only short-term benefits (e.g. during the construction phase) whereas it should contribute to long-term regional resilience and economic capacity.	local workforce utilisation, training outcomes and reporting on local participation performance. Engagement also supported a clearer understanding of regional constraints, including labour availability, accommodation capacity and service pressures, so that potential impacts could be anticipated and managed. A Social Environment Technical Report has been prepared which describes the socio-economic environment and discusses potential opportunities, benefits and impacts of the Project (refer Appendix K-1).	
Community and social impacts and benefits	Construction traffic, workforce accommodation pressures, amenity impacts and broader cumulative pressures associated with regional industrial development.	Construction methodologies have been refined through environmental investigation, technical studies and design development, and by assessing traffic, environmental, social, visual and amenity impacts through the EIS process. Particular consideration was given to issues raised by nearby residents, holiday house owners and the Whyalla City Council regarding the management of temporary construction impacts and potential cumulative pressures on local infrastructure and services. The EIS has assessed: • construction traffic routes, timing and volumes • noise, dust and vibration impacts • visual impacts and effects of lighting • potential pressures on housing, accommodation and local services • cumulative impacts associated with concurrent regional projects and seasonal activity • opportunities and benefits. Construction planning will incorporate measures to avoid or minimise amenity impacts where practicable, supported by targeted management plans. These include traffic and	Ch.21 Traffic and Transport Ch.22 Economic Environment Ch.23 Social Environment

Theme	Detail	Proponent Response	EIS Chapter(s)
		transport management measures to maintain safety and access, noise and dust controls, limitations on working hours where appropriate, lighting design to minimise unnecessary spill and glare, and workforce accommodation strategies intended to reduce pressure on local housing, accommodation and community services. The Social Environment Technical Report (Appendix K-1) provides further discussion of potential impacts, benefits, opportunities and mitigations.	
Assessment process (planning and environment), project timing and approvals.	Requests for transparency regarding scientific studies, modelling methodologies, environmental monitoring, impact assessment criteria and mitigation measures. Questions relating to project staging, assessment pathways, approvals processes and construction timing.	Preliminary findings from key marine and terrestrial environmental investigations undertaken by specialists were shared with the SRG and Traditional Owners, in addition to relevant agencies and Councils to ensure local knowledge and values could inform planning and design decisions. This provided an opportunity for those stakeholders to review methodologies, clarify approvals pathways and identify where further investigations, mitigation or management measures may be required. Approvals pathways and the assessment process have been subject to significant conversations with state government agencies, together with the Commonwealth government in relation to matters under the *Environment Protection and Biodiversity Conservation Act 1999*.	Ch.1 Introduction Ch.3 Legislative Approvals Framework
Hazard and risk management	Hazards and risks relating to bushfire, flooding, site and groundwater contamination, marine spills, the handling / storage of dangerous goods and harmful algal bloom (HAB).	Bushfires in the Project Area are a medium risk, with construction activities having a higher risk of ignition sources (e.g. sparks or exhaust systems from heavy machinery; welding and grinding; electrical faults during construction of the transmission line; and flammable	Ch.11 Marine Environment Ch.12 Soils, Landform and Geology

Theme	Detail	Proponent Response	EIS Chapter(s)
		materials stored in laydown areas. Industry standard control strategies set out in the Bushfire Assessment will reduce this risk to as low as reasonably practicable (ALARP). The Bushfire Assessment can be found as Appendix N of this EIS. The pipeline will generally be located underground and will not change the flood risk to people, property, infrastructure, and the environment along the alignment. Project infrastructure is sited to avoid flooding surrounding highways or third-party infrastructure. An assessment of site contamination has been undertaken and is low in relation to all Project infrastructure. There has been a high interest in the recent Harmful Algal Bloom (HAB). In addition to the fishing and tourism impacts, there was debate about whether it was linked to the operation of the Adelaide Desalination Plant. The SA Environment Protection Authority (EPA) has concluded that there is no evidence to support a causal link between the two. Each hazard and risk identified has been assessed and is subject to control and management measures to reduce or eliminate risks where practicable.	Ch.24 Climate Change and Sustainability Ch.25 Hazards and Risks

4.5 Further Opportunities to Provide Feedback

4.5.1 Public exhibition of the EIS

As required under the PDI Act, the EIS will be on exhibition for public comment for a period of at least six weeks (30 business days) on the PlanSA Portal. An advertisement will be placed in The Advertiser and local newspapers and online platforms (PlanSA and / or YourSAy) inviting submissions. Copies of the EIS will be available for public inspection in places nominated by the Minister. Interested persons are invited to make written submissions on the EIS within the timeframe defined by the Minister.

During this period, the Minister will refer the EIS to the Whyalla City Council, Port Augusta City Council and Roxby Downs Municipal Council together with relevant government agencies for comment. These are likely to include (but will not be limited to) the SA EPA, Department for Environment and Water, Aboriginal Affairs and Reconciliation, Primary Industries and Regions, and Department for Infrastructure and Transport (Transport Assessment and Marine Services).

4.5.2 Ongoing community engagement

In addition to the formal public exhibition process noted above, DIT (as the Proponent) will continue to actively engage with stakeholders and provide further opportunities for feedback to be received on the Project and this EIS. Key engagement activities may include those outlined in Table 4-5.

These activities are in addition to ongoing meetings with key stakeholder groups including Traditional Owners, Councils and the SRG.

Table 4-5: Engagement activities during EIS public exhibition process

Engagement Activity	Focus / Collateral
Online - electronic direct mail; social media; and website	Update regarding commencement of EIS Public Consultation Period. Overview of EIS process and upcoming engagement opportunities.
Community Information Sessions – Whyalla, Port Augusta and Roxby Downs	Providing access to technical experts. EIS process and findings. Provide clarifications and responses to questions. EIS Summary document; hard copy EIS; fact sheets; flyers; display boards and posters.
Community Pop-ups - Whyalla, Port Augusta, Pimba / Woomera and Roxby Downs	EIS process and findings. Opportunity to provide additional information.
Online Information	Public, with a focus on remote communities and those who cannot get to a face-to-face session. Provide an overview of EIS process and findings.
Large static display - Councils, TAFEs/Unis, Shopping Centres, Information Centres, Recreation Centres	Advertising awareness that the EIS is underway and providing information on how people can provide comment.

Engagement Activity	Focus / Collateral
	Pull up banner or poster with QR code to survey and online version of EIS; EIS Summary Document; hard copy of full EIS; hard copy of survey; Fact sheets; Flyer
Stakeholder briefings – as scheduled	To provide briefings to key stakeholder groups and organisations, to discuss EIS findings and answer questions/queries.

4.6 Conclusion

Consultation and engagement with communities and stakeholders has been a priority for the Proponent throughout all phases of Project development. Engagement has informed project planning, environmental investigations and the preparation of this EIS, while also providing opportunities for stakeholders to identify issues, share local knowledge and inform the ongoing refinement of the Project.

Engagement with Traditional Owners, landholders, community members, local councils, businesses, industry groups, environmental organisations and government agencies has highlighted several recurring themes, including marine and coastal environmental protection, Aboriginal cultural heritage, terrestrial impacts, business and employment opportunities, project timing, approvals and the need for transparent communication. These matters have been considered in the design of specialist studies, the assessment of alternatives, and the identification of mitigation and management measures across the EIS.

Overall, the engagement undertaken to date demonstrates a broad and ongoing commitment to inclusive, transparent and responsive consultation. The issues raised through engagement have helped shape the EIS and will continue to inform the Project as it moves through public exhibition, assessment and subsequent construction and operational phases.

Ongoing engagement with stakeholders will continue during the EIS assessment process and beyond, with feedback received to date helping the Proponent to guide that next stage of engagement. This will include the supporting of informed participation, building stakeholder confidence, and maintaining transparency as the Project progresses.



Chapter 5

Project Siting, Alignment and Optimisation

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

5 PROJECT SITING, ALIGNMENT AND OPTIMISATION 5-1

5.1 Overview 5-1

5.2 Setting the Context 5-1

5.3 Desalination Plant Site Selection 5-2

5.3.1 Site identification and shortlisting 5-2

5.3.2 Multi Criteria Analysis of shortlist 5-2

5.3.3 Mullaquana Station location 5-3

5.4 Transfer System and Electricity Infrastructure Route Selection 5-4

5.4.1 Pipeline route selection 5-6

5.4.2 Pipeline alignment 5-7

5.4.3 Pump stations and product water storage 5-8

5.4.4 Electricity infrastructure 5-9

5.5 Stakeholder Feedback during Project Development 5-9

5.6 Project Optimisation and Ongoing Refinement 5-10

5.6.1 Intake and outfall construction 5-11

5.6.2 Intake design 5-11

5.6.3 Diffuser optimisation 5-11

5.6.4 Desalination plant optimisation in response to Harmful Algal Bloom 5-12

5.6.5 Pipeline alignment optimisation 5-13

LIST OF TABLES

Table 5-1: Key route selection assumptions and criteria for pipeline route selection 5-6

LIST OF FIGURES

Figure 5-1: Key constraints and opportunities for transfer system siting and alignment 5-5

5 PROJECT SITING, ALIGNMENT AND OPTIMISATION

This chapter outlines how the preferred desalination plant site, transfer system alignment and associated infrastructure locations were identified, assessed and refined for the Project.

It focuses on the siting and alignment decisions that followed the strategic options assessment and selection of the preferred Project configuration and capacity described in in Chapter 2 Justification and Alternatives. It also explains how environmental, social, technical and economic considerations informed the process and contributed to optimisation of the selected configuration.

5.1 Overview

The Project is intended to provide a secure, climate-resilient water supply to the Upper Spencer Gulf (USG) and Far North of South Australia. The development of the preferred infrastructure locations and alignments has been undertaken through a structured, iterative process that balances stakeholder input with environmental, heritage, social, engineering and commercial considerations.

An extensive options analysis was undertaken to identify viable strategic responses / configurations for the Project's strategic drivers, drawing on previous studies, strategic Project assessments and stakeholder engagement. A longlist of potential infrastructure staging and scale configurations was developed by consolidating these options, with additional options identified through technical review and ongoing engagement. As discussed in Chapter 2 Justification and Alternatives, the longlist considered project configurations that included further use of water from the River Murray, treated wastewater, incorporation of the Adelaide Desalination Plant and a range of other scale and staging options that were screened and tested against Project objectives.

The preferred strategic configuration identified through that process was a 51 GL/y coastal desalination plant located in the Spencer Gulf or on the Eyre Peninsula with a transfer pipeline extending north to Olympic Dam. This chapter explains how that strategic configuration was translated into the preferred site, alignment and infrastructure locations assessed in the EIS. As the majority of the Project footprint / area is associated with the terrestrial pipeline from the desalination plant site to Olympic Dam, significant effort was focussed on selecting and optimising the terrestrial pipeline alignment.

5.2 Setting the Context

The EIS Assessment Requirements require a description of the location options which were considered for all Project infrastructure, the reasons for location selection and how the proposed locations avoid or mitigate potential environmental impacts. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

5.3 Desalination Plant Site Selection

5.3.1 Site identification and shortlisting

Following a high-level review of existing and readily available land and marine environment data, ten key sites with access to seawater and proximity to potential end-users were identified for further assessment of their feasibility as a desalination plant site.

The ten sites were assessed using a two-phase process, utilising desktop assessment methodology based on publicly available data. The process provided an opportunity to cross-check and highlight any common themes and involved:

- **an initial qualitative assessment** of the feasibility and uncertainty associated with each site against a range of criteria which could influence the viability of development of a desalination project in a given area or site. Key considerations included:
  - proximity to the ocean for the desalination plant seawater intake and outfall
  - oceanic features that could provide the required intake water quality and where the return water can be rapidly diluted and dispersed
  - accessibility and constructability of a water transfer pipeline
  - proximity to a power supply, roads, and telecommunications infrastructure
  - existing land features and compatibility of land use
  - terrestrial and marine environmental sensitivities
  - community concerns.
- **a risk assessment** against multiple criteria, to assess technical risks and anticipated environmental impacts associated with each potential site.

The cost differential between each site option against a 'baseline' option of a plant sited at Point Lowly was also assessed. Point Lowly was used as a baseline for comparison as there was extensive existing data on that site from previous work undertaken for the BHP Olympic Dam Expansion EIS (BHP 2009a, BHP 2011) and other projects.

The outcome of these assessments initially led to three shortlisted sites: Crag Point, Point Lowly and Mullaquana Station. It should be noted that Cape Hardy was not shortlisted at this time due to the indicative cost relative to Point Lowly as the base case.

5.3.2 Multi Criteria Analysis of shortlist

From late 2022 to late 2025, the decision on a selected location for the desalination plant was subject to multiple phases of analysis.

In January 2023, the three sites that were initially shortlisted were assessed against multiple criteria with the assistance of technical experts and key stakeholders representing commercial and recreational fishers, conservation interests, government agencies, local government, and business, tourism and industry groups. Based on the outcome of the analysis at that time, Mullaquana Station scored highest across the three sites and on this basis was identified to move forward for further investigations and consideration as the location for the desalination plant.

In mid-2023, a potential industrial demand for water was identified adjacent to Cape Hardy which would have required a pipeline to be constructed on the Eastern Eyre Peninsula. This

requirement prompted the revisiting of the shortlist and Cape Hardy was added for consideration. The four shortlisted sites were assessed against the same multiple criteria using a similar approach and methodology as previously.

Based on the outcome of that analysis, Cape Hardy was the highest scoring site for further consideration for the desalination plant, with Mullaquana Station scoring second highest. However, Mullaquana Station was also preserved as a site option for the desalination plant while more detailed environmental field and technical investigations continued at both sites as part of due diligence processes and to support a final site selection decision.

Once further detailed field investigations had been undertaken for the two site options, detailed comparative analysis was undertaken of the two remaining sites in early 2025 using a suitable, data-driven multi criteria analysis (MCA) to inform desalination site selection for the Project.

The MCA was designed in line with Infrastructure Australia guidelines on best practice and other relevant frameworks. This led to the establishment of 15 criteria across five categories including Strategic Objectives, Economic / Financial, Social, Environmental and Deliverability.

Mullaquana Station was ultimately selected as the preferred location for the desalination plant for the following reasons:

- **Meets strategic Project objectives:** locating the desalination plant at Mullaquana Station enables the supply of water closer to demand in the USG and Far North.
- **Greater economic and financial viability:** the desalination plant and transfer system will be more cost effective to build and operate due to the plant's proximity to available workforce, local industry and existing transport infrastructure (i.e. newly redeveloped airport, rail and port facilities) and the transfer system's proximity to water demand.
- **Favourable construction environment:** on and offshore geotechnical investigations found that the ground conditions at Mullaquana Station are predominantly clay, making it favourable to construct the desalination plant and establish underground tunnels / pipelines.
- **Supports growth in Whyalla and the region:** Mullaquana Station is closer to potential water offtakers, industry, workforce and infrastructure, aligning favourably with the State's aspirations to grow the economy of the USG and Far North.
- **Lower estimated greenhouse gas emissions:** The Project, with the final desalination plant location at Mullaquana Station, has lower estimated greenhouse gas emissions and reduced operational energy consumption.

5.3.3 Mullaquana Station location

The proposed desalination plant site location is on Mullaquana Station, located approximately 25 km south-west of Whyalla. The plant is located approximately 14 km east of the Lincoln Hwy and 1.5 km from Spencer Gulf coastal waters (refer Figure 5-1). The site would be accessed via Eight Mile Creek Road, with a new access road proposed connecting the Lincoln Highway to Eight Mile Creek Road, following the pipeline alignment described in Section 5.4.2.

The desalination plant site is on pastoral land predominantly comprising chenopod shrubland modified by stock grazing. Approximately 200 ha of land would be required to

construct the desalination plant. The land-based infrastructure includes the desalination plant, product water storage, high voltage switchyard, intake and outfall pump station areas, and stormwater management systems.

Marine infrastructure includes the desalination plant intake / outfall tunnel(s), pipes and structures. The intake and outfall tunnels for the plant will be constructed using a tunnel boring machine (TBM) underneath the adjoining coastal marine areas and the Spencer Gulf seabed. Marine infrastructure will be located beyond Posidonia seagrass meadows, no less than 3 km and no more than 5 km from the onshore intake pump station, in water approximately 13 to 17 m deep at the Lowest Astronomical Tide (LAT) (being approximately 15 m to 19 m Australian Height Datum).

Further detail of the desalination site layout and marine infrastructure is provided in Chapter 6 Project Description.

5.4 Transfer System and Electricity Infrastructure Route Selection

The transfer system consists of the following key components:

- ~360 km main transfer pipeline, largely constructed underground, from the desalination plant terminating at the delivery point at the Olympic Dam copper-gold mine
- ~46 km of lateral branch pipeline terminating at a delivery point at the Carrapateena mine (which may be constructed above or below ground)
- a transfer pump station at the desalination plant
- additional transfer pump stations at three locations along the pipeline
- storage at transfer pump station locations and one at the transfer system high point.

The proposed alignments for the transfer system and electricity transmission infrastructure have been selected to follow existing infrastructure corridors and previously disturbed areas, where possible. Figure 5-1 shows key opportunities and constraints that were considered during the process. Highly sensitive areas were avoided where possible and practicable (refer Table 5-1).

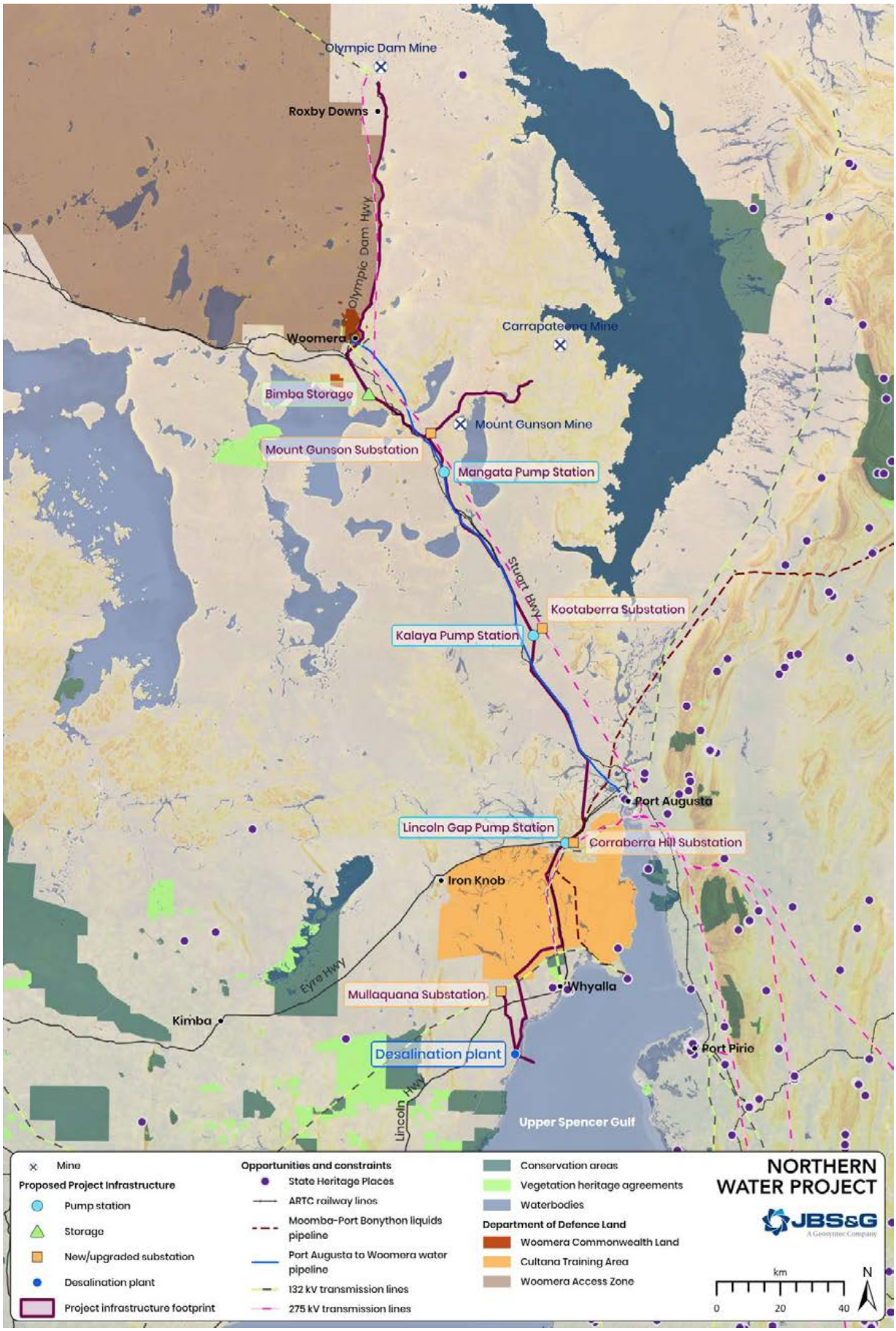


Figure 5-1: Key constraints and opportunities for transfer system siting and alignment

5.4.1 Pipeline route selection

An obvious option for designing linear infrastructure is to take a straight-line approach from point to point, however this option is not often feasible due to the presence of environmental, cultural heritage, social, land use, topographical and engineering constraints. The pipeline route selection was an iterative process involving identification of key criteria for optimal route selection while delivering on the asset's functional and operational requirements (refer Table 5-1).

The proposed pipeline alignment was selected based on:

- provision of water at the required delivery points
- topography and a hydraulic outcome that results in fewer pump stations and water storage locations and lower operational energy use associated with pumping
- connectivity with other Project infrastructure and location in parallel with or utilising existing and previously disturbed areas where possible
- minimise interaction with existing services, in order to reduce potential landholder, environmental and Aboriginal cultural heritage impacts.

A range of potential constraints were identified including built-up areas, Department of Defence land, significant infrastructure (e.g. Australian Rail Track Corporation railway corridors, the Moomba Port Bonython Liquids Line, existing transmission lines), areas of known significant cultural heritage sensitivities, known significant environmentally sensitive areas and conservation areas (e.g. native vegetation, high value fauna habitat or salt lakes), steep topography and large water crossings. Opportunities included alignment with existing transmission lines, existing roads and access tracks, previously disturbed areas and disturbed fence lines. Figure 5-1 provides an overview of constraints across the broad subject area.

Alignments may be further refined as further opportunities come out of the detailed design phase, though any changes required are expected to be minor and would remain within the Project Area[1].

Key assumptions and criteria considered for the pipeline route selection are summarised in Table 5-1.

Table 5-1: Key route selection assumptions and criteria for pipeline route selection

Criterion	Consideration
Constructability and operability	• Location of the pipeline above or below ground • Targeting of flat terrain • Pipeline construction parameters requiring accommodation of a range of pipeline diameters • Length, number of bend and straight runs • Connectivity with other Project infrastructure (e.g. pump station and storage tank locations)

[1] As noted in Chapter 1 Introduction, the standard Project Area is based on a 2.5 km buffer surrounding all Project infrastructure including the alignment of linear infrastructure (i.e. a 5 km wide corridor).

Criterion	Consideration
	• The need to preserve flexibility for future expansion / offtakers • Appropriate distance between pipeline and electricity transmission assets (low frequency induction) • Availability of construction water supply • Distance from power connection • Proximity / access to other assets for equipment etc • Physical access for construction and ongoing maintenance • Construction safety (including avoidance of road reserves where necessary to reduce existing utility interaction and high vehicle speeds) • Consideration of relevant CFS bushfire planning requirements
Land use and landholders	• Constraints related to Department of Defence land • Impacts to other existing and future land uses (e.g. pastoral) • Minimising crossing of other linear infrastructure (e.g. in particular rail lines, major sealed highways and hydrocarbon transmission pipelines) • Minimisation of the number of land parcels affected
Cultural heritage	• Avoidance of known cultural heritage sites • Avoidance of areas with high potential for the presence of Aboriginal cultural heritage • Minimisation of overall land disturbance • Avoidance of waterways and water bodies where possible
Environmental	• Utilise existing disturbed areas where possible • Locating alignment parallel to existing easements where appropriate • Avoidance of areas protected for conservation purposes where possible • Avoidance of major watercourses and waterbodies where possible, including salt lakes • Minimise impact on native vegetation / habitat, especially trees • Minimisation of impact on EPBC / State listed species / communities • Avoidance of potential acid sulfate soils • Avoidance of areas of contamination • Ability to manage impacts from the Project to significant transport infrastructure and traffic

5.4.2 Pipeline alignment

The transfer system pipeline extends approximately 360 km north from the desalination plant to the delivery point at the Olympic Dam mine at the boundary of the BHP Special Mining Lease No. 1 (the SML), with an approximately 46 km lateral branch pipeline to the delivery point at the existing Carrapateena mine.

The proposed pipeline route as set out in the Reference Design is as follows:

- **Desalination plant (Mullaquana Station) to Whyalla** – alignment heads generally north following Eight Mile Creek Road and other existing tracks / fencelines on rural land skirting Whyalla to the west. The alignment then veers north-east following the Lincoln Highway.
- **Whyalla to Port Augusta** – alignment traverses a section of the Cultana Training Area following the Lincoln Highway heading north, before meeting the Stuart Highway alignment via a small section of the Eyre Highway.
- **Port Augusta to Pimba** – alignment generally follows the Stuart Highway, with portions following the former Stuart Highway alignment, and paralleling the existing Department of Defence Port Augusta to Woomera water pipeline.
- **Pimba to Olympic Dam** – generally follows the Olympic Dam Highway with the pipeline diverting to the east to avoid Woomera township.
- **Carrapateena mine lateral branch** - heads north-west from the main transfer pipeline, south of Lake Windabout.

The main transfer pipeline alignment would require crossing of the Moomba to Port Bonython Liquids Line (Epic Energy), the Whyalla Steelworks to Middleback Ranges slurry pipeline (One Steel Manufacturing Pty Limited) and high-voltage overhead transmission infrastructure. The alignment would run parallel to existing water assets to avoid unnecessary service crossings, but crossing of some existing road and rail infrastructure (including Commonwealth assets) would be required.

The alignment would traverse the Department of Defence Cultana Training Area (which is Commonwealth land) and may be located within the road reserve of the Lincoln Highway or immediately adjacent to the west of the road reserve in the Cultana Training Area, subject to ongoing heritage survey. The transfer system alignment avoids interaction with the township of Woomera and the Woomera Prohibited Area and other population centres.

The proposed transfer system alignment does not traverse any conservation parks, national parks, Wilderness Protected Areas, conservation reserves or native vegetation heritage agreement areas. Proposed transfer system infrastructure is not located within an area where the water resource is prescribed under the *Landscape South Australia Act 2019* and is not within a water protection area declared under the *Environment Protection Act 1993*. Alignments would be further refined through the detailed design process which may result in changes to the alignment or the design of the transfer system.

Further information on pipeline design is provided Chapter 6 Project Description. Further information on land use on the proposed pipeline alignment is provided in Chapter 9 Use of Land and Marine Waters.

5.4.3 Pump stations and product water storage

Land of sufficient elevation is required for the location of the transfer pump stations and storages. Pump station locations are proposed on relatively flat areas at key high points along the main transfer pipeline.

Pump stations are proposed at the desalination plant site, at Lincoln Gap at the intersection of the Lincoln and Eyre Highways, on Kootaberra Station (Kalaya pump station) and on Oakden Hills Station (Mangata pump station) on the Stuart Highway. Product water storage

would be located at the desalination plant site and at transfer pump stations along the pipeline alignment. The Bimba storage is also proposed at the overall high point on the main pipeline and alignment located south of Pimba.

Pump station and storage locations were selected based on elevation data, site topography and locations of existing infrastructure (e.g. transmission lines, roads, rail etc.). Consideration was also given to achieving sufficient elevation difference between the storage and the pump station, while also locating these facilities directly adjacent (or as close to) the pipeline alignment.

Location and construction of pump stations and water storages are discussed in further detail in Chapter 6 Project Description.

5.4.4 Electricity infrastructure

In order to connect to ElectraNet's transmission network, both new and augmented network substations have been identified. The electricity infrastructure siting has been determined based on the existing network, and the transmission line alignments are largely dictated by the location of the network connection and the most effective route to the facilities (i.e. the pump stations and desalination plant).

Additional considerations in determining the location and alignment of new transmission lines and access include topography, environmental features (e.g. presence of native vegetation, threatened species, land reserved for conservation purposes), land ownership, other proposed land use / development, known or potential cultural heritage, design criteria and electricity infrastructure regulations.

The proposed transmission network substations are mainly located in previously disturbed areas. New network substations are proposed at the Mullaquana transmission line and near the Kalaya pump station location. New facility substations will be located within transfer pump station disturbance footprints. Establishment of transmission lines will also require creation of access tracks and passing lanes which will remain for ongoing operations and maintenance.

During surveys to finalise placement, there is potential for the proposed location of transmission towers to be micro-sited to avoid sensitive sites (e.g. important native vegetation or habitat features). Location and construction of the proposed electricity infrastructure is discussed further in Chapter 6 Project Description.

5.5 Stakeholder Feedback during Project Development

Stakeholder engagement has been integral to the siting, alignment and optimisation process. Feedback from Traditional Owners, landholders, industry, local government, community representatives and government agencies informed the refinement of the desalination plant location, transfer system alignment and associated infrastructure.

Communication and engagement commenced in 2022 to build awareness, test assumptions, identify local constraints and opportunities, and support early planning and development of the Project. Further detail on stakeholders consulted and engagement methods is provided in Chapter 4 Community and Stakeholder Engagement.

The Project siting and alignment process has involved extensive engagement and negotiation with Traditional Owners, specifically the Kokatha and Barngarla Peoples, as well as pastoral land and leaseholders and relevant government agencies. Feedback from this process, together with Aboriginal cultural heritage surveys and terrestrial / marine investigations, has helped to identify portions of the transfer system alignment that needed refinement to better respond to local land use, environmental, amenity and cultural heritage considerations.

Examples of concerns and opportunities raised by stakeholders during engagement activities are presented by theme in Chapter 4 Community and Stakeholder Engagement. Outcomes and responses to the engagement are also covered in Chapter 4. Key themes related to Project siting, alignment and optimisation include a desire that the Project decision is based on the best outcome balancing economic, social and environmental considerations. There was also a desire that decision-making be driven by strategic opportunity not just near-term existing demand.

Protection of the Upper Spencer Gulf marine environment is the most prominent theme across stakeholder groups, including commercial and recreational fishers, environmental organisations and local communities. The Eyre Peninsula community also showed significant interest in the role that the Project may be able to play in providing increased water security for the region. Feedback indicated general optimism about the Project acting as a catalyst for further development in the region and for realising opportunities for industry.

The importance of protecting Aboriginal and non-Aboriginal cultural heritage emerged as a key theme of community engagement. This has been and continues to be a key focus of the Project. Aboriginal cultural heritage is located within parts of the Project footprint and broader landscape. Traditional Owner groups have advised that water and landscape are closely connected to their cultural responsibility and custodianship of Country, so ensuring strong environmental protections and proper consultation is critical. Early (and ongoing) engagement and collaboration with Traditional Owners have been undertaken, to inform Project planning and development, guide design solutions and explore options to protect and mitigate any risks to cultural heritage.

Key early stakeholder concern raised during the initial Project site selection, was in regard to the desalination plant being in the USG and in proximity to the highly valued Giant Australian Cuttlefish aggregation and the recently declared 'Cuttlefish Coast Sanctuary Zone' National Heritage Place. Acknowledging the high value of this aggregation and their habitat, and the need to properly understand the potential impacts of the Project, hydrodynamic modelling of the return water from various potential desalination plant locations was undertaken early in the planning and siting phase.

5.6 Project Optimisation and Ongoing Refinement

Several Project elements have been optimised or refined in light of environmental sensitivities, engineering design progression, and in response to engagement with Traditional Owners, landowners, and other stakeholders.

The Reference Design is expected to be adjusted in response to the findings of ongoing stakeholder engagement, evolution of Project design and delivery options and in response to on-ground surveys and environmental assessments. Any adjustments to infrastructure

design or location are anticipated to be minor and would generally be to reduce or avoid impacts and within the current assessment parameters of the EIS.

5.6.1 Intake and outfall construction

The tunnel boring machine was the preferred methodology for constructing the pipeline under the seabed as it also minimises coastal and seabed disturbance, avoids disturbance to mangroves and seagrass, avoids impacts to coastal Aboriginal cultural heritage, and also limits the extent of obstruction to other marine users.

5.6.2 Intake design

The presence of sensitive marine habitats and key commercial fishery species in the vicinity of the discharge location has required special consideration in terms of habitat clearance, direct impingement and entrainment of organisms. The Project has been designed to minimise impact to the important Posidonia seagrass beds in the Project Area.

The intake has been designed with an appropriate 0.15 m/s intake velocity cap which would allow swimming marine fauna to move away from the intake grill. The grill itself is designed to stop larger marine organisms from becoming impinged (refer Chapter 6 Project Description and Chapter 11 Marine Environment for further detail).

5.6.3 Diffuser optimisation

The outfall system has been designed to be capable of achieving the performance requirements for production flows of 51 GL/y. Several key factors were considered to ensure optimal performance and minimal environmental impact of the diffuser arrangement. In order to understand the operational discharge, the design considers the characteristics of the receiving water body, including the depth, currents, and ambient salinity. These factors influence the initial dilution and dispersion of the concentrated seawater discharge, which is essential for minimising the potential effects on marine ecosystems.

As well as characteristics of the ambient condition, the diffuser design also considers the discharge flow rate and the desired dilution level, as these parameters determine the number, size, and spacing of the diffuser ports.

The design of marine diffusers also needs to meet environmental regulations and water quality standards. Conditions of approval often specify the maximum allowable salinity increase above ambient levels and the minimum dilution factor that must be achieved at a specified distance from the diffuser. Compliance with standards and post-approval conditions are crucial for ensuring the long-term sustainability of the desalination plant.

The diffuser configuration has been designed to avoid operational impacts to the seagrass beds in the Project Area.

As part of the Reference Design process, hydrodynamic modelling was undertaken in an iterative manner to optimise the diffuser design to ensure the best engineering and environmental performance. The optimisation process considered the following elements:

- the type and style of diffusers
- the physical arrangement of the diffusers
- the number of diffuser nozzles, their sizes, spacing and direction / angle of flow

The results of the optimisation process resulted in improved diffuser performance and have been adopted in the Reference Design for the purposes of the EIS.

Finally, the constructability and operational requirements of the diffuser system, including access for inspection and maintenance, have been factored into the design to ensure the system's reliability and longevity.

5.6.4 Desalination plant optimisation in response to Harmful Algal Bloom

In recent years there has been an increase in the frequency, duration, and intensity of marine heat waves across Australia (EPA 2026). Marine heat waves are prolonged periods of unusually high sea surface temperatures, and when combined with calm marine conditions can provide a favourable setting for phytoplankton to bloom, as recently observed in South Australia.

Most algal blooms in coastal waters are natural occurrences and not necessarily harmful to marine life. In certain cases, a bloom can involve a species that is harmful to marine life, and are known as harmful algal blooms (HABs). Predicting algal blooms is difficult, though factors such as marine heatwaves and increased nutrients can increase the likelihood or severity of blooms (EPA 2026). It is likely that as the climate continues to change, there will be an increase in algal blooms in the future, some of which may be harmful.

Engineering response: Desalination plant pre-treatment systems

As South Australia has recently experienced, and with a changing climate, it was important that the Project acknowledged the potential for increased prevalence of algal blooms in the environment and the risk this posed to desalination plant operation, (i.e. fouling / clogging of filters or membranes) and then the risk back to the environment (i.e. returning increased organic matter via the outfall).

To mitigate the risk associated with potential increased prevalence of algal blooms, the Project has adopted the capability for pre-treatment. A range of pre-treatment options can operate continuously or as required (subject to quality of the intake water) to maintain stable, low-fouling water entering the more sensitive downstream processes. Pre-treatment generally combines chemical conditioning with physical separation to remove algal cells, suspended solids, and dissolved organics. This may involve the addition of coagulants or other conditioning agents to aggregate algae and fine particles, followed by separation using clarification processes (e.g. settling or flotation) and / or filtration systems.

Waste generated through pre-treatment is then managed on land (i.e. disposed of to a licensed waste facility) removing the risk of releasing increased organic loads back into the environment (and potentially 'feeding' any existing algal bloom).

The functioning of the pre-treatment is explained in Chapter 6 Project Description.

Project baseline extended: Sediment characterisation (including HAB cysts / resting cells)

An extensive marine baseline study forms part of the EIS, including water quality surveys that measure for phytoplankton and algae. Another Project response to the South Australian HAB was to bolster the marine baseline by including marine sediment sampling to establish a pre-HAB baseline prior to the algal bloom reaching the marine waters off Mullaquana Station. This was to ascertain a snapshot of the existing HAB resting cells or cysts in the sediments at

the site. The algal bloom has since passed through the site area since the baseline characterisation was undertaken (see Chapter 11 Marine Environment for additional information and PIRSA 2025a).

5.6.5 Pipeline alignment optimisation

The pipeline alignment process described in this chapter demonstrates how a combination of technical, engineering, environmental, social, land access, and economic factors have been considered and balanced to achieve best Project outcomes.

The native vegetation impact footprint for the Project has been minimised through targeting disturbed or previously cleared areas where possible, constraining and micro-siting construction areas, and avoiding sensitive vegetation and habitats as far as practicable.

The proposed alignment will be subject to ongoing refinement at the local level as the design phase progresses, and as engagement continues with landholders, Traditional Owners and other stakeholders. Any subsequent realignments are generally expected to remain within the nominated Project Area. Results of geotechnical assessments and ongoing cultural heritage surveys may lead to minor re-alignments and also result in some sections of the pipeline being installed above ground.



Chapter 6

Project Description

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

6 PROJECT DESCRIPTION 6-1

6.1 Project Overview 6-1

6.2 Setting the Context 6-4

6.3 Approvals Scope Exclusions 6-4

6.3.1 Future increase in desalination plant and transfer system capacity 6-4

6.3.2 BHP Special Mining Lease 1 6-4

6.3.3 Geotechnical investigations and other works 6-4

6.4 Project Timing and Construction Staging 6-5

6.4.1 Construction timing and staging 6-5

6.4.2 Project lifespan 6-6

6.5 Desalination Plant 6-6

6.5.1 Overview 6-6

6.5.2 Desalination process 6-8

6.5.3 Desalination plant footprint and layout 6-16

6.5.4 Construction of the desalination plant facility 6-21

6.5.5 Design of marine structures 6-22

6.5.6 Diffuser performance and adaptive design measures 6-29

6.5.7 Construction of marine intake and outfall 6-30

6.5.8 Operation 6-36

6.6 Transfer System 6-39

6.6.1 Overview 6-39

6.6.2 Transfer system alignment 6-40

6.6.3 Pipeline land access and easements 6-44

6.6.4 Pipeline design 6-44

6.6.5 Pipeline construction 6-46

6.6.6 Pump stations and water storage design 6-52

6.6.7 Pump stations and water storage construction 6-53

6.6.8 Commissioning of water delivery infrastructure 6-54

6.6.9 Operation of water delivery infrastructure 6-54

6.7 Electricity Supply Infrastructure 6-55

6.7.1 Overview 6-55

6.7.2 Design 6-56

6.7.3 Construction 6-58
6.7.4 Operation 6-61
6.8 Telecommunications Infrastructure 6-61
6.9 Project Infrastructure Disturbance Footprints 6-61
6.10 Workforce, Hours and Accommodation 6-62
6.10.1 Workforce and hours 6-62
6.10.2 Workforce accommodation 6-63
6.11 Haul Routes and Construction Traffic 6-64
6.12 Resources and Materials 6-64
6.12.1 Borrow / bedding material 6-64
6.12.2 Electricity supply 6-64
6.12.3 Water supply 6-65
6.12.4 Concrete batching 6-66
6.12.5 Plant and equipment 6-66
6.12.6 Fuel storage for construction plant and equipment 6-66
6.12.7 Waste management 6-67

LIST OF TABLES

Table 6-1: Overview of proposed desalination process 6-8
Table 6-2: Key non-process site components 6-16
Table 6-3: Summary of components of intake design 6-26
Table 6-4: Summary of components of outfall design 6-29
Table 6-5: Product water quality specification 6-38
Table 6-6: Flow scenarios/assumptions for assessment 6-38
Table 6-7: Pump stations, storages and tanks 6-52
Table 6-8: Project electricity transmission infrastructure 6-55
Table 6-9: Summary of indicative disturbance impacts for key Project components[1] 6-62

LIST OF FIGURES

Figure 6-1: Project Area showing northern and southern sections 6-3
Figure 6-2: Desalination plant site location 6-8
Figure 6-3: Simplified process schematic of the desalination plant 6-10
Figure 6-4: Conceptual desalination process flow diagram 6-15

Figure 6-5: Desalination plant site layout 6-20
Figure 6-6: Intake and outfall pump station layout 6-20
Figure 6-7: Intake and outfall alignment 6-24
Figure 6-8. Depth of intake structure and clearance from surface (subject to final design) 6-26
Figure 6-9: Concept of potential intake structure design 6-26
Figure 6-10: Indicative riser and multiport array arrangement (subject to final design) 6-28
Figure 6-11: Concept of potential outfall / diffuser design (subject to final design) 6-28
Figure 6-12: Indicative tunnelling construction site layout 6-35
Figure 6-13: Conceptual seabed disturbance at intake / outfall 6-36
Figure 6-14: Transfer system schematic 6-40
Figure 6-15: Location of Project infrastructure (southern section) 6-42
Figure 6-16: Location of Project infrastructure (northern section) 6-43
Figure 6-17: Typical construction layout for pipeline 6-47
Figure 6-18: Transmission line voltages and structure types 6-57
Figure 6-19: Indicative substation layout and elevations 6-58

LIST OF PLATES

Plate 6-1: Example of decline and box cut 6-31
Plate 6-2: Example of slurry TBM (left) and earth pressure balance TBM (right) 6-32
Plate 6-3: Desalination plant intake and outfall pipelines using float and sink methodology 6-32
Plate 6-4: Example of a jack-up barge for Adelaide Desalination Plant construction 6-33
Plate 6-5: Air valves above-ground (left) and air valve in chamber (right) 6-45
Plate 6-6: Looking into scour structure / de-chlorination chamber 6-46
Plate 6-7: Pipe laydown prior to transport to construction corridor (left) and pipeline strung along construction corridor ready for trenching and laying (right) 6-48
Plate 6-8: Example of pipeline trenching and laying 6-48
Plate 6-9: Example of rehabilitation of pipeline alignment 6-51

6 PROJECT DESCRIPTION

This chapter provides descriptions of the key Project components, processes, activities and other elements that will inform and support the environmental impact assessment.

The Northern Water Project Reference Design developed by GHD (GHD 2025a) forms the basis of this chapter and has been used to determine the potential impacts of the Project on relevant environmental aspects addressed in the impact assessment chapters. Where relevant, the impact assessments presented in Chapters 9 to 25 of the EIS assess more conservative scenarios (i.e. those with the greatest potential for negative impacts), or where it is unclear which option is most conservative, all scenarios are assessed.

This chapter presents an option for a specific Project marine infrastructure element which forms part of the EIS assessment. Project descriptions in this chapter are based on the current available designs and information to enable comprehensive and conservative assessment, and provide flexibility for detailed design and operational improvements without compromising the ability to mitigate the potential impacts.

6.1 Project Overview

Delivery of the Project will involve the construction and operation of a 51 gigalitre per year (GL/y) seawater reverse osmosis desalination plant and associated marine structures on the Upper Spencer Gulf (USG), a transfer system and required power supply infrastructure. The proposed desalination plant location[1] is on the western shore of the USG at Mullaquana Station, south-west of Whyalla, and the transfer system runs generally north from the desalination plant to delivery points at the Olympic Dam and Carrapateena copper-gold mines (refer Figure 6-1).

The Project comprises the following key elements proposed for development approval:

- a 51 GL/y seawater reverse osmosis desalination plant located at Mullaquana Station ~25 km south-west of central Whyalla
- marine intake and outfall tunnels extending underneath the seabed and into Spencer Gulf
- seawater intake with associated intake structure and pumps
- outfall pipe and diffuser structures for discharge of return water into Spencer Gulf
- a transfer system consisting of:
  - ~360 km of main transfer pipeline, largely constructed underground, terminating at the delivery point at the Olympic Dam copper-gold mine
  - ~46 km of lateral branch pipeline to a delivery point at the Carrapateena copper-gold mine (which may be constructed above- or below-ground)
  - associated transfer pump stations and water storage

[1] References to the desalination plant and other Project components are not referred to as 'proposed' after the first reference.

- high voltage electricity supply including new transmission lines, new network and facility substations to provide power to the desalination plant and transfer pump stations
- associated temporary construction-related infrastructure (e.g. construction camps, site offices and amenities, yards, storages and laydown areas)
- access tracks including upgrading existing tracks and establishing new tracks
- enabling roadworks and road upgrades.

Due to the geographical coverage / extent of the Project, where appropriate for the purposes of the EIS, the Project will be described according to its southern and northern sections (based broadly on Interim Biogeographic Regionalisation for Australia (IBRA) regions) as shown in Figure 6-1.

The Reference Design (GHD 2025a) for the Project has been used for the description of the key Project components for the purposes of State and Commonwealth assessments and impact assessment presented in this EIS, in addition to known options and optimisations relative to the Reference Design that are also described. The Reference Design is preliminary and is expected to change through the detailed design process, or in response to cultural heritage matters or other refinements to minimise impacts as design and technical studies continue.

Final decisions on a range of matters including construction methodologies, materials, site locations and alignments will be subject to the outcomes of ongoing design and engineering, stakeholder engagement, technical studies and further environmental and economic assessment. As a result, matters such as the overall disturbance footprint and native vegetation clearance and disturbance footprints are subject to change; however changes are anticipated to be managed within the Project Area (defined as a 2.5 km buffer on the Project footprint which is shown in Figure 6-1).

Project components

The Project can be broadly divided into the following main components:

- **Desalination plant** – the facility covering pre-treatment, reverse osmosis and post-treatment and pumping of product water and return water
- **Desalination plant marine works** – currently comprising intake / outfall tunnel(s), pipelines and structures
- **Transfer system** – comprises an approximately 360 km transfer pipeline from the desalination plant to the Olympic Dam mine delivery point, approximately 46 km lateral branch to the Carrapateena mine delivery point, transfer pump stations and water storages
- **Power supply** – provision of power to the desalination plant and pumping stations, including transmission lines and substations to connect to the grid and potential for solar arrays.

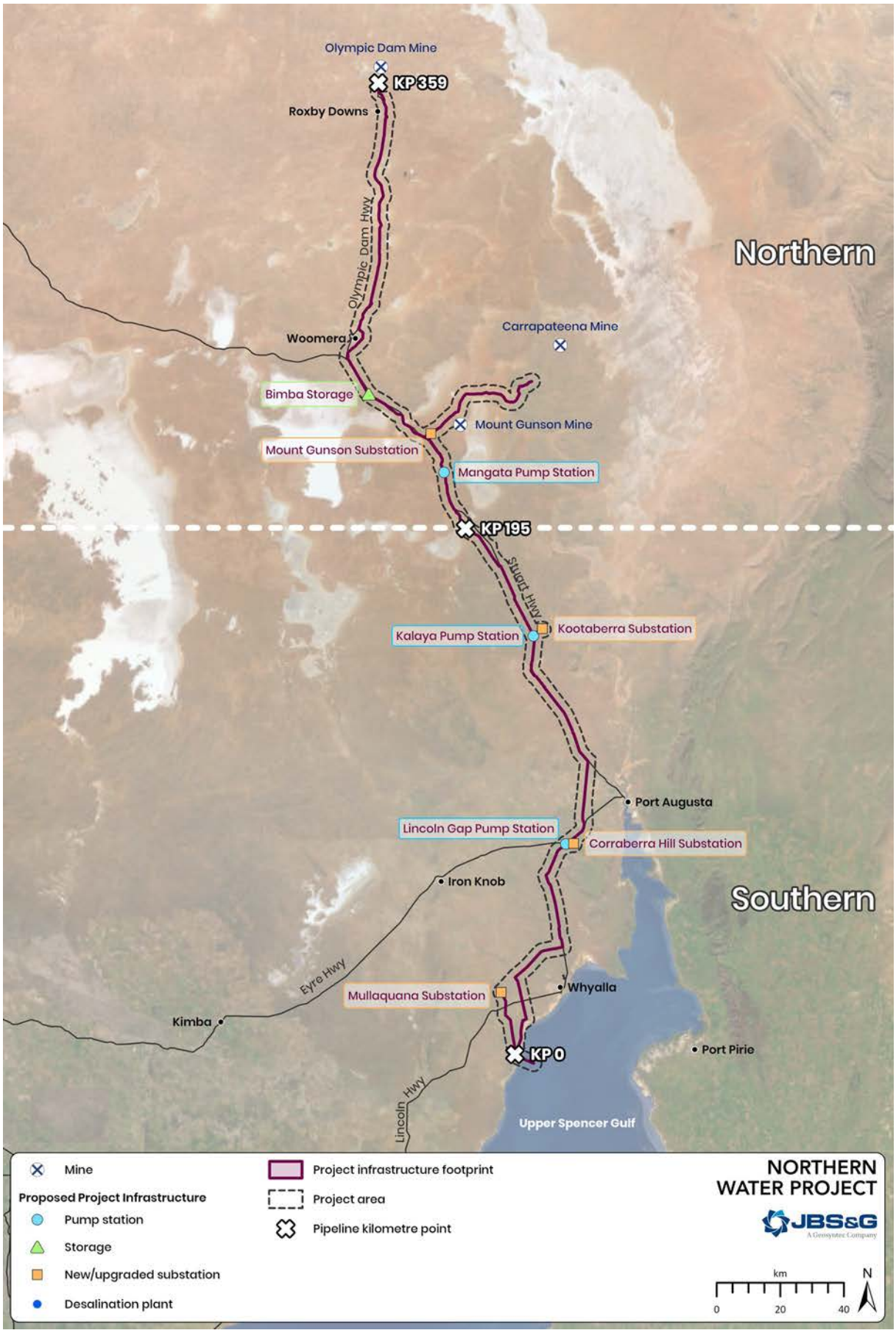


Figure 6-1: Project Area showing northern and southern sections

6.2 Setting the Context

The EIS Assessment Requirements require a comprehensive and consolidated description of the Project. Relevant Assessment Requirements have been covered in this chapter, as set out in Appendix A-2.

This chapter also sets out those aspects of the Project which are excluded from the scope approvals being sought through the EIS.

6.3 Approvals Scope Exclusions

6.3.1 Future increase in desalination plant and transfer system capacity

The design capacity for the desalination plant, and the production capacity for which approval is being sought, is 51 GL/y.

Some aspects of the desalination plant and transfer system design and construction may (largely through a function of the construction method), accommodate a production capacity of greater than the proposed 51 GL/y. Based on the current Reference Design, this has been estimated to be approximately 73 GL/y.

In particular, the additional capacity is accommodated by the marine infrastructure (i.e. tunnels, intake and outfall structures) and larger sizing of the transfer pipeline to Whyalla North. The transfer system also incorporates blank flanges for additional connection points. Any increase in production capacity to that currently proposed, however, will be subject to separate design development, assessment processes and associated approvals at that time. Subject to the outcome of design and approvals, as a minimum, construction of additional desalination plant facilities at Mullaquana Station and water supply infrastructure from additional connection points to associated delivery points along the transfer system would be required.

With this in mind, the potential for a future increase in production capacity greater than the 51 GL/y proposed is not considered further and will not be assessed in the EIS. The exception to this is production volume scenarios that have been assessed through hydrodynamic modelling (refer Chapter 11 Marine Environment).

6.3.2 BHP Special Mining Lease 1

The final 1 km of the transfer system and connection to a new storage at Olympic Dam are located within Special Mining Lease 1 (SML 1) for the Olympic Dam mine and will be the subject of separate BHP approval applications at both the State and Commonwealth levels. These components will not be assessed in the Project EIS.

6.3.3 Geotechnical investigations and other works

To progress the Project engineering design, a series of investigations are required to understand the topographic and geotechnical conditions where the land-based infrastructure is proposed, and the seabed and sub-surface conditions in the marine infrastructure areas. Minor preliminary site works are also proposed.

The following works are being undertaken as separate packages of work, and not considered part of the impact assessment scope of the EIS:

- ongoing environmental surveys, pre-condition surveys and monitoring
- terrestrial geotechnical, soil and water investigations that may involve small, discrete test pits or soil bore drilling and well construction
- marine bathymetric surveys, seismic testing of the ground conditions and marine geotechnical sampling (to provide an understanding of the condition of the sub-surface to inform tunnelling design and construction)
- establishment of a site access, signage and / or temporary fencing to prevent formation of multiple, ad hoc tracks from site early works or other, unauthorised access
- development and use of berthing facilities that are already approved for that activity
- where necessary to support site development, establishment of borrow pits or use of existing borrow pits where those activities are already approved or are the subject of separate approvals or legislative regimes (and in particular, approval pursuant to the *Mining Act 1971*)
- where necessary to support site development, asset relocation or service provision for third-party utilities where those activities are the subject of separate approvals and / or self-assessments
- accommodation camps outside the Project footprint that would be the subject of separate approvals and / or self-assessments
- laydowns that are located in existing premises or areas that are already approved for that activity, or would be the subject of separate approvals and / or self-assessments
- fixed or mobile concrete batching plants that are the subject of separate approvals and / or self-assessments and / or already approved / licensed
- select alteration or maintenance of public roads which the Project will utilise, but where the alteration or maintenance is delivered separately (as early works or otherwise) and is subject to separate approvals and / or self-assessments (if required at all). This may include, as an option to the currently proposed access, the alteration and / or upgrade of Mullaquana Road and Eight Mile Creek Road (comprising resealing and sealing) from the intersection with the Lincoln Hwy (at Whyalla) to Cowleds Landing, being the extent of the public road
- an additional permanent water storage facility and associated connection infrastructure that may be established at Port Augusta to support this and other projects and would be subject to separate agreements and approvals by the relevant asset owners and regulators.

6.4 Project Timing and Construction Staging

6.4.1 Construction timing and staging

Construction stages include:

- Site preparation – surveys, clearance, geotechnical investigations, set up temporary construction laydowns, plant, equipment and facilities.
- Construction of infrastructure – the desalination plant site will include construction work groups at the desalination plant site, the TBM tunnels as well as offshore on the

jack-up barge (JUB). the transfer system will involve multiple work fronts working from Mullaquana Station north to Olympic Dam.

- Clean up – following construction of infrastructure, all plant, equipment and excess materials will be removed, sites levelled, ripped and scarified.
- Commissioning including hydrotesting of pipe will be conducted to ensure all equipment is operating as expected.

It is anticipated that subject to the grant of necessary environmental and development approvals and the finalisation of land access arrangements, construction of the Project may commence in Q1-Q2 2028, with first water expected to be available in 2032.

Contingency for construction delays

Potential delays to construction would be managed through DIT's established project governance, contract and project management frameworks which will also inform the Project Management Plan(s), once in the design and build phase. These frameworks and plans will provide for the identification, assessment and management of risks that may affect delivery, including schedule delays. Where delays are identified, appropriate mitigation measures and corrective actions would be developed and implemented to minimise impacts on Project delivery.

6.4.2 Project lifespan

The design life of a water delivery infrastructure asset is defined as the nominal asset life without rehabilitation or replacement. Assets that are more difficult to renew, such as those buried or located in the marine environment have a longer design life than those which can be efficiently renewed.

The minimum design life for Project infrastructure components ranges from 5 years for desalination plant reverse osmosis membranes to 50 years for concrete tanks and 100 years for the intake and outfall tunnels. An overall Project lifespan of 100 years has been assumed for the purposes of the environmental impact assessment.

6.5 Desalination Plant

6.5.1 Overview

The desalination plant location is on Mullaquana Station, a property comprising ~13,000 hectares (ha) of land located approximately 25 km south-west of Whyalla. The plant is to be located in the south-eastern corner of the identified parcel (H560400 Section 53), which is Crown Land with a perpetual lease currently held by Joyce Pastoral Pty Ltd. The site is located approximately 14 km east of the Lincoln Highway and 1.5 km from Spencer Gulf coastal waters. Marine infrastructure includes the desalination plant intake / outfall tunnel(s), pipes and structures (refer Figure 6-7 and Sections 6.5.5, 6.5.6 and 6.5.7).

Approximately 200 ha of land would be required for the purposes of construction. The site would be accessed via Eight Mile Creek Road from Whyalla during both the construction and operation periods. A new 6 km road is likely to be constructed adjacent to the pipeline alignment which will connect Eight Mile Creek Road to the Lincoln Highway.

The site will accommodate all temporary works requirements (i.e. required for construction) and permanent works (i.e. the facilities). This encompasses the desalination plant, water storage, high voltage switchyard, intake and outlet pump station areas, stormwater management systems and future-proofed land to support the potential development of additional treatment plant up to a production capacity of greater than the proposed 51 GL/y (refer Figure 6-5). Major temporary works will include the Tunnel Boring Machine (TBM) launch box, laydowns, construction water storage and spoil drying areas. The final placement of the desalination plant and marine infrastructure within the site will be subject to further design development as field data are gathered, stakeholder engagement continues and further impact assessment is undertaken.

Information on the key considerations and process for selection of the desalination plant site is provided in Chapter 5 Project Siting, Alignment and Optimisation. Information on the current uses of land and marine waters at the desalination plant site is provided in Chapter 9 Use of Land and Marine Waters.

The Reference Design for the desalination plant site (including marine components) includes the following key desalination process infrastructure which is discussed further in Section 6.5.3 and Section 6.5.4:

- seawater intake pump station
- desalination treatment process (pre-treatment and reverse osmosis (RO) systems)
- product water storage tank(s) and / or earth bank storage(s)
- facilities for post-treatment of desalinated water, return water and ancillary equipment
- facilities and power infrastructure at the plant[2].

Relevant desalination plant site plans and drawings are provided in Appendix B-3 Desalination Plant Site Plans.

[2] The transfer pump station at the desalination plant is discussed as part of the transfer system infrastructure.

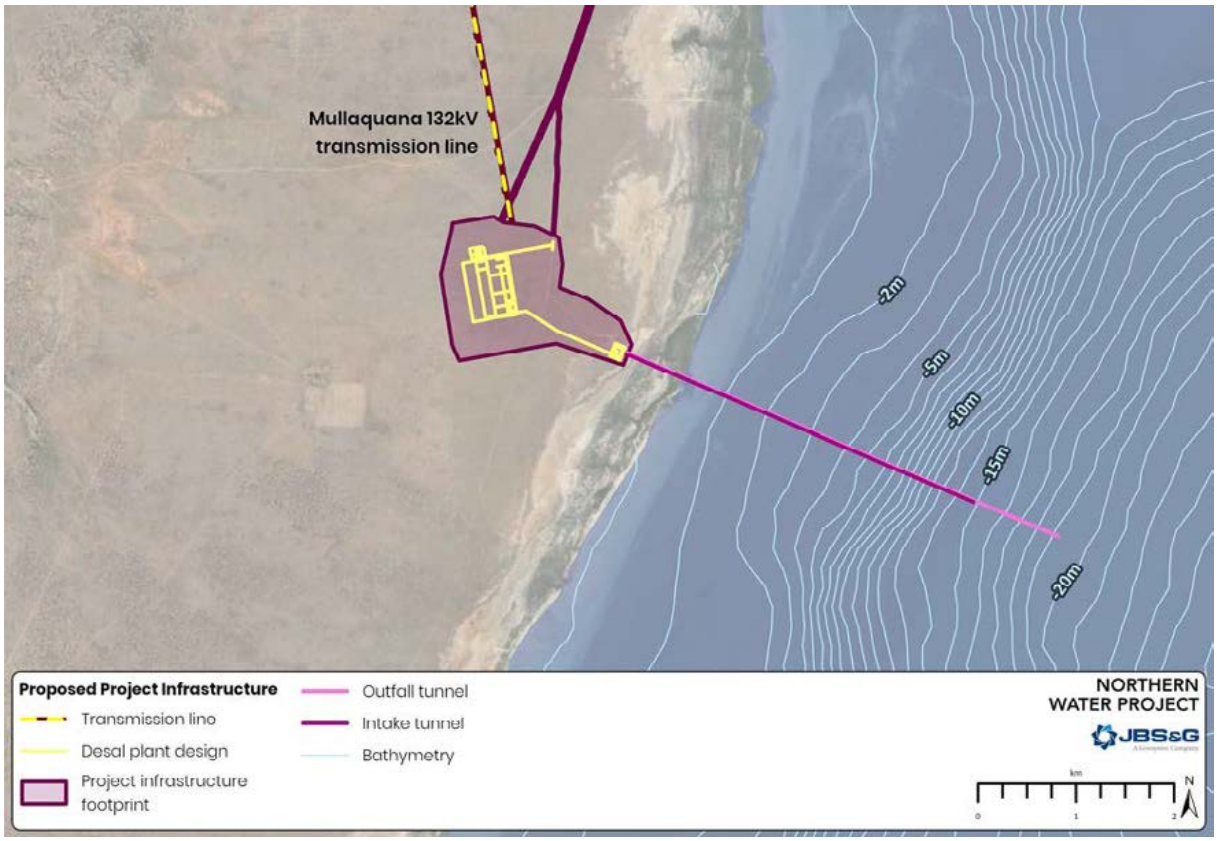


Figure 6-2: Desalination plant site location
[Note: Bathymetry = mAHD]

6.5.2 Desalination process

An overview of the proposed desalination process is provided in Table 6-1 and a simplified schematic is provided in Figure 6-3. A conceptual desalination process flow diagram is provided in Figure 6-4.

Table 6-1: Overview of proposed desalination process

Treatment step	Function of process unit
Intake structures	
Intake tunnel and intake head	Marine structures which convey seawater to the seawater desalination plant site. A screened intake head (with intake velocity limit) minimises the entrainment of marine life.
Intake screens	Located within the intake pump station (on land) Coarse screens exclude materials down to 3 mm in size to protect downstream equipment from any large solids breaching the intake screen.
Intake pumping	Lifting seawater from the intake tunnel to the ultrafiltration (UF) feed tank via a rising main.
Pre-treatment system(s)	
Fine strainer	Protection of downstream pre-treatment infrastructure against physical abrasion caused by marine materials larger

Treatment step	Function of process unit
	than 80µm (e.g. broken shells and barnacles) and foreign debris that are not removed by the intake screen.
Ultrafiltration (UF)	Designed to protect the RO membranes from fouling, scaling and damage, removing suspended solids, organic matter, microorganisms, and dissolved substances that could clog or harm the RO system, reducing its efficiency and lifespan. Subject to the UF system design, chemicals can be used for operating scenarios where the seawater has higher organic load or suspended solids. to maintain operability and effectiveness of the UF system. Backwash from the UF system can be discharged back to the ocean. Can be operated standalone or with other pre-treatment technologies.
Dissolved air flotation and filtration (DAFF)	Provides additional filtration step if seawater has higher organic load or suspended solids. Designed to protect the RO membranes from fouling, scaling and damage, removing suspended solids, organic matter, microorganisms, and dissolved substances that could clog or harm the RO system, reducing its efficiency and lifespan Treatment involves using bubbles and coagulant (typically ferric or aluminium based) to cause suspended particles to float to the surface for skimming before passing through a granular filter. Can be operated standalone or with other pre-treatment technologies and subject to seawater quality, may be able to be bypassed.
Pre-treatment waste management	In scenarios where the seawater quality has higher organic load or suspended solids, pre-treatment systems may result in a waste stream of sufficient solid content and / or chemical content that requires management of that waste stream on land. A waste management process is required to collect sludge for disposal on land in accordance with legislative requirements.
Reverse osmosis plant	
Reverse osmosis	Removes the bulk of dissolved substances (e.g. total dissolved solids (TDS), and individual ions, such as bromide). Provides additional microbial removal.
Post treatment	
Post treatment – stabilisation	Control of the corrosiveness of the RO permeate. Remineralisation of the permeate water for meeting relevant water standards (pH, alkalinity).
Post treatment – chlorination	Chlorination is added to control microbial growth.
Treated water tank and pumps	Storage and pumping to the water delivery network.

Treatment step	Function of process unit
Residuals management	
Residuals management (liquid)	Treatment of spent chemical cleaning solution waste streams from the pre-treatment and RO processes by pH adjustment and quenching residual chlorine in a common neutralisation tank before discharge to the outfall.
Residuals management (solids)	Dewatering of solids generated by the lime system using a centrifuge, which are subsequently trucked off-site.
Chemical dosing systems	
Chemical dosing systems	Delivery, storage and dosing of chemicals used in the treatment process.
Outfall structure	
Return water discharge	Return water discharged at a target range of flow and pressure to the ocean via the outfall diffusers.

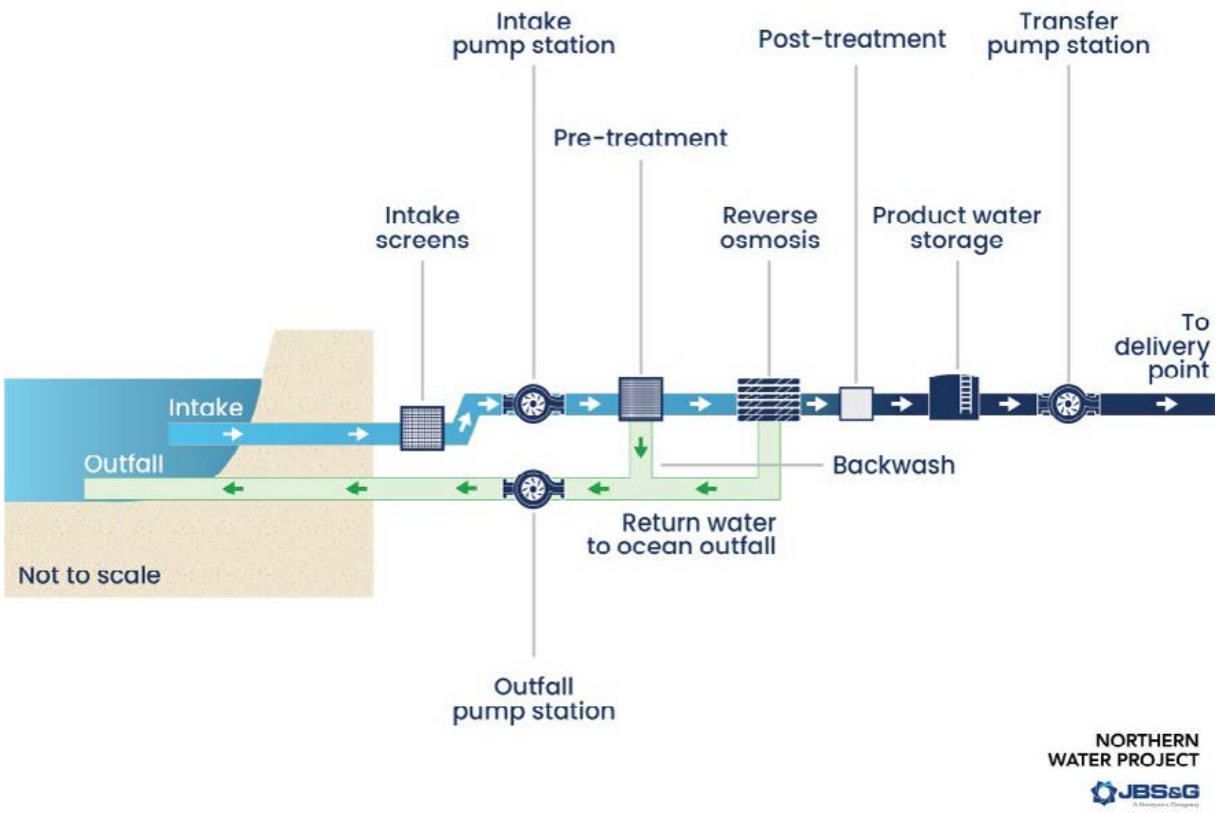


Figure 6-3: Simplified process schematic of the desalination plant

Plant intake pumping station and screening

The intake pump station transfers the seawater to the screen structure where screens remove gross solid particles that may be contained in the seawater. Engineering design measures are utilised to mitigate the entrainment of smaller fauna species (e.g. key marine larvae), with a low marine intake velocity being a key measure.

The intake pumps discharge seawater which then circulates through the intake screens where materials with particle size higher than 3 mm are retained and discharged into bins for appropriate disposal. The screened seawater is then pumped to the pre-treatment system. Section 6.5.5 provides further detail on the design of the intake structures.

Pre-treatment

Pre-treatment is designed to protect the RO membranes from fouling, scaling and damage, removing suspended solids, organic matter, microorganisms, and dissolved substances that could clog or harm the RO system, reducing its efficiency and lifespan.

Ultrafiltration (UF)

The Reference Design currently assumes a UF pre-treatment technology to remove suspended solids from the seawater prior to desalination by the RO system. Subject to its design, UF can be used independently or with other pre-treatment systems to address the range of expected seawater quality.

Backwash from the UF system, which comprises only solids removed from the raw seawater, is typically acceptable for direct discharge back to the ocean via the marine outfall. Adoption of this approach is dependent on:

- generally good quality seawater with low suspended solids and organic material enabling stable UF and RO operation
- a comprehensive marine water quality baseline monitoring program (refer Chapter 11 Marine Environment) that informs engineering design and environmental impact assessment
- environmental approvals to discharge backwash via the marine outfall, which will be supported by detailed process design and marine hydrodynamic modelling that demonstrates an appropriate return to ambient suspended solids conditions within close proximity to the outfall.

The UF feed tank receives screened seawater transferred from the intake pump station. An overflow weir may be attached to the side of the tank. Overflow will be directed to the return water pipe, returning overflow to the outfall structure. UF feed pumps draw from the tank to feed the downstream pre-treatment system.

The UF membranes further remove fine particles and impurities with the filtrate collected in the RO feed tanks. Backwashing and air scouring of the UF membranes removes accumulated solids to maintain flux rates and low differential pressures across the membranes. Air scouring is employed to assist in physical breakdown of material.

The UF pretreatment system will be installed to capture any excess overflow and direct it (filtered but not chemically treated) to the return water outfall.

Subject to the UF design, chemicals (including coagulant) can be used for operating scenarios where the seawater has higher organic load or suspended solids to maintain operability and effectiveness of the UF system. In this instance, a waste management process is required to collect sludge for disposal on land in accordance with legislative requirements.

Dissolved air flotation and filtration (DAFF)

Pre-treatment may include a DAFF subject to the incoming seawater quality.

The dissolved air flotation (DAF) process of the DAFF works by dissolving air into water under pressure, then releasing this water into a flotation tank where the pressure drop generates bubbles. Through the addition of coagulants (typically ferric or aluminium based), these bubbles adhere to flocculated particles, increasing buoyancy, and causing them to rise to the surface as a float layer which is mechanically skimmed off.

When DAF is combined with filtration, the flotation stage is followed by granular filtration. The filtration removes any remaining fine particulates that were not captured during flotation.

The pre-treatment waste (comprising the floated solids and any added coagulant is typically managed by thickening, dewatering, and disposing the solids to land (i.e. a licensed waste facility). At lower total suspended solids (TSS) concentrations, introduction of the floated solids to the return water and discharge via the marine outfall is possible, subject to chemical use, ecotoxicity testing and TSS modelling.

DAFF can be used independently or with other pre-treatment systems. The configuration of the pre-treatment process (including the role of DAFF and management of DAFF waste), will be determined subject to seawater quality specifications for the desalination plant and as part of the ongoing detailed design process.

Pre-treatment chemicals

To maintain the performance of a pre-treatment system, and subject to the seawater quality, various chemicals may be used. This will be subject to the pre-treatment process adopted, but typically comprise one of two applications as follows:

- addition of coagulants to enhance the removal process of TSS from the seawater. These are typically ferric or aluminium based coagulants.
- short, frequent chemically enhanced backwash (CEB) and extended Clean-In-Place (CIP) cleans are typically employed. CEB and CIP wastes are directed to the neutralisation tank. Cleaners containing hypochlorite are quenched with sodium bisulphite (SBS). Sodium hydroxide or hydrochloric acid is added to adjust to neutral pH prior to discharge to the concentrate drain and marine return water outlet.

Management of the waste associated with use of these chemicals will be subject to the specific chemicals used, frequency of use and concentrations. Notably, however, the coagulants, cleaning chemicals and antiscalants likely to be used in the pre-treatment process will be in line with those approved by the South Australian EPA for use at the Adelaide Desalination Plant.

Reverse osmosis system

The RO system is the core of the desalination process, where the pre-treated seawater is forced through a semi-permeable membrane under high pressure, effectively separating salts and impurities from the water. The resulting permeate undergoes additional post-treatment, and the remaining seawater (i.e. the return water) is discharged to the ocean via the outfall. The performance requirements for the plant require a one-pass RO system to meet product water specification / quality for non-potable water supply.

The RO system consists of RO trains, high pressure pumps, energy recovery device and ancillary systems including RO CIP and flushing systems. Antiscalant is dosed to the RO feed to mitigate inorganic scale formation on the membranes and SBS dosing occurs to the RO feed as required to quench residual chlorine to protect the membranes from oxidative damage. To maintain RO membrane performance, a CIP process is used to remove fouling which can develop on the RO membranes limiting throughput and increasing feed pressure requirements. Cleaning wastes will be directed to the neutralisation tank for adjustment prior to discharge with the return water.

Post treatment system

The purpose of the post treatment system is to adjust the quality of the permeate water to meet the product water specification prior to distribution. Remineralisation (addition of lime and carbon dioxide (CO_2) is undertaken to stabilise permeate and reduce its corrosivity. Chlorine dosing is undertaken to mitigate biological and organic fouling within the distribution infrastructure, noting that that the post treatment system does not connect to the marine outfall.

Lime dosing and dewatering

Because RO permeate is deficient in alkalinity and hardness, it can be corrosive to metallic and concrete infrastructure within water distribution networks. Permeate produced is remineralised through the addition of hydrated lime ($Ca(OH)_2$) and CO_2 to increase alkalinity and condition the pH. This conditioning process adjusts the pH and alkalinity prior to final transfer of the product water to storage tanks or earth bank storage.

Lime is dosed as saturated lime water. Hydrated lime powder is fed from storage silos to the slurry preparation tank. Lime slurry is then transferred to a lime saturator to form saturated lime water. Sodium silicate and polymer are dosed to the saturator to aid lime clarification. The resulting lime supernatant is stored in a lime water tank for post treatment dosing (recycle / re-use) and lime sludge is sent to dewatering facilities for disposal.

To minimise waste disposal and truck movements, lime sludge from the lime saturator is dewatered to a concentration of thickened solids residual (which is generally targeted at 20% solids) that can be trucked off-site for appropriate disposal. To enable this, sludge from the saturator is captured in the centrifuge feed tank and dewatered using a centrifuge. Polymer is dosed upstream of the centrifuges to aid in dewatering and achieve a target thickened solids residual of 20%. Solids from the centrifuges are captured in waste bins to be transferred off-site, while the liquid stream is recycled to the lime slurry preparation tank.

Chemical dosing systems

The chemical storage and dosing systems are distributed at the desalination plant site based on chemical properties and application point. The bulk chemical storage and dosing systems areas are located within covered buildings. Liquid chemicals are stored in tanks, in dedicated bunds for each chemical, with minimum bund volumes to be designed in accordance with EPA liquid storage guidelines (EPA 2016a). Each building has a covered and concrete bunded truck unloading bay for chemical deliveries typical of other major desalination plants. Spill sump and pump out facilities are included within bunds. All areas where chemicals will be delivered, handled and stored on site are covered and bunded. The

bunded areas drain to onsite storage tanks with the ability to be pumped out for off-site disposal.

Carbon dioxide is stored as a compressed liquid. Vaporisers convert CO_2 liquid to gas, then inject it into service water for dosing.

Following remineralisation, chlorine gas will be dosed into the water to maintain a chlorine residual throughout the downstream distribution network. Chlorine is applied after water stabilisation and prior to entry into the product water tanks / earth bank storage, serving to control biological growth in the RO permeate.

The chlorine storage and dosing system is within a standalone chlorine building equipped with chlorine detectors. As chlorine is heavier than air, in the event of a leak, gas will flow downhill. The storage building will therefore be located at lower points and away from higher frequented areas (i.e. office and control room) to minimise exposure risks. The chlorine drum storage configuration will be designed to provide sufficient time between chlorine deliveries. It is also likely that the chlorine drum inventory will be below a 25-tonne threshold (for a major hazard facility) during both operation and deliveries.

Due to the hazardous nature of the storage and usage of gaseous chlorine systems, appropriate safety features will be included in the facility. Further information is provided in Chapter 25 Hazards and Risks.

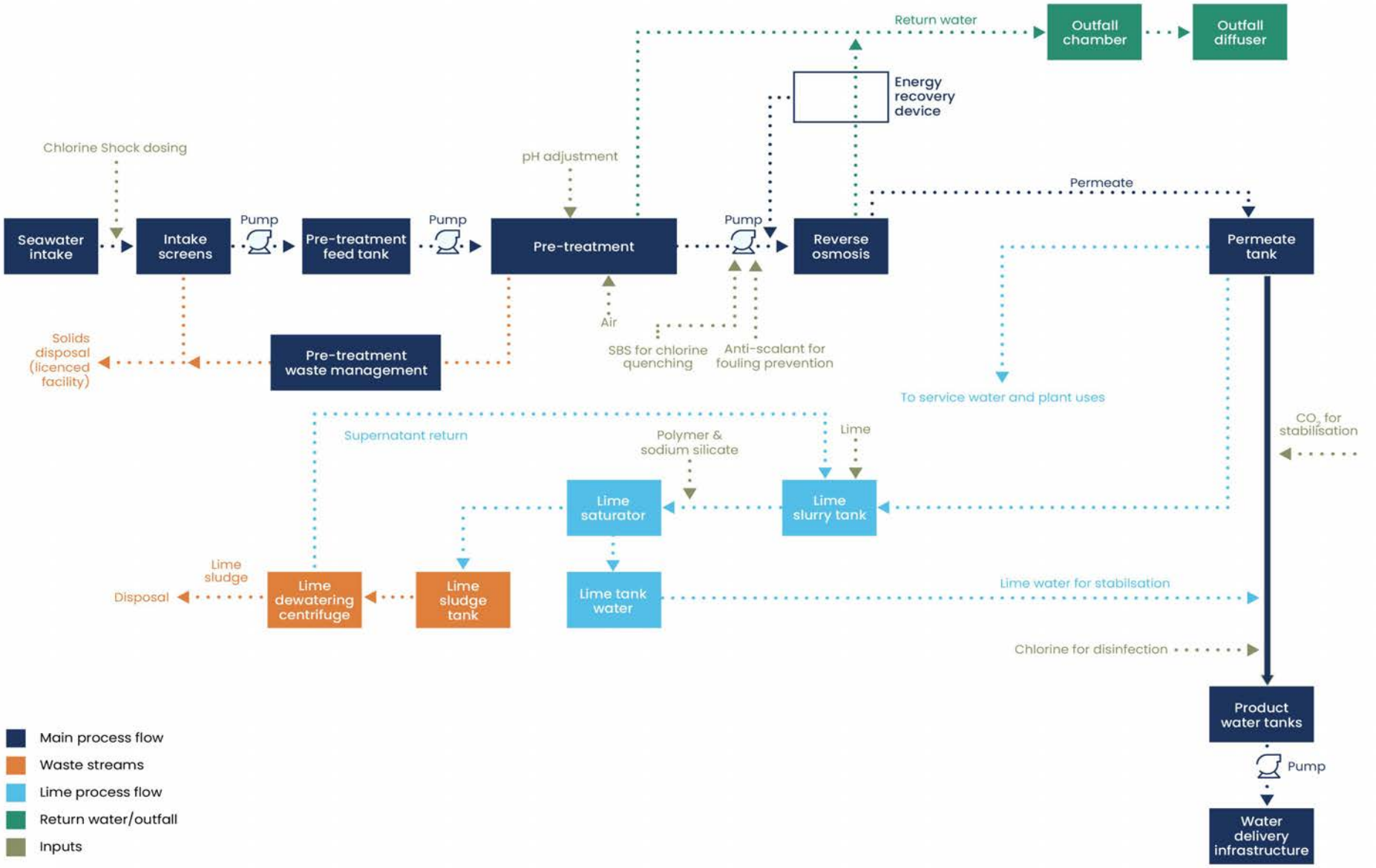


Figure 6-4: Conceptual desalination process flow diagram

6.5.3 Desalination plant footprint and layout

The key layout features of the desalination plant as proposed in the Reference Design are summarised below and shown in Figure 6-5 and Figure 6-6.

The primary access road to the desalination plant is expected to be via a new road connecting Lincoln Highway with the extension of Eight Mile Creek Road, and then via the remainder of Eight Mile Creek Road which enters the desalination plant at the north-eastern corner. Secondary access would be obtained via Mullaquana Road and Eight Mile Creek Road when the primary access is unavailable.

The following are key components and considerations for the desalination plant footprint and layout:

- a Project specific access track with a separate entry / security gate off the access road
- intake pump station located as close to the coast as possible to reduce tunnel length (whilst also avoiding / minimising impacts to the environment and heritage)
- power supply enters the site from the north via a new transmission line and substation to be connected to the 132 kV Cultana to Yadnarie transmission line
- high voltage substation located on the northern side of plant closest to incoming high voltage services
- administration building, workshop and car park located close to the desalination plant entry / security gate
- fire system located south of the administration building
- 40 ML treated water storage tanks, and pumping station located west of the administration building with the option of 140 ML Earth Bank Storage (EBS) located east of the desalination plant compound
- stormwater detention basin positioned on the south-eastern corner of the desalination plant site at the point of the downstream run off collection from the site
- provision for a crane hardstand.

Key non-process site components at the desalination plant are summarised in Table 6-2 below. This information would be further refined during detailed design.

Table 6-2: Key non-process site components

Facility element	Details
Construction	
TBM launch site and intake pump station	TBM launch location and intake pump station are located as close to the coast as practicable (while avoiding environmental impacts) to reduce tunnel length.
Site offices	Compacted hardstand with site offices.
Construction camp	Construction camp in region with shuttle buses to site. Capacity and location to be determined as part of detailed design.
Site access and roads	Access via Eight Mile Creek Road. A new 6 km road is likely to be constructed adjacent to the pipeline alignment which will connect Eight Mile Creek Road to the Lincoln Highway. This will allow for access

Facility element	Details
	to the desalination plant site via the Lincoln Highway from Whyalla, potentially limiting use of Horseshoe Road, Mullaquana Road and a northern section of Eight Mile Creek Road. Permanent tenure for the new road, if pursued as an option, is still to be confirmed, but will likely be public (i.e. local or State Government owned and maintained). The road may however be managed as a 'private road' for the period of construction. As an alternative or addition, upgrade to Mullaquana Road and Eight Mile Creek Road may be required and would likely be performed as other works (refer Section 6.3.3). • A secondary access / egress gate is provided for emergencies when the primary access is unavailable. • Access is gated at the boundary to Mullaquana Station and marked as a private road. • A southern gate and road (1 km) will provide access to the intake pump station.
Spoil management	Spoil from earthworks at the desalination plant site, including the excavation for the TBM launch site and spoil from TBM and marine construction activities, may involve dewatering and drying in settlement and evaporation ponds, treatment (if required) and reuse on site where possible. If spoil cannot be reused onsite it will be disposed of in accordance with relevant EPA guidelines (EPA 2013a).
Wastewater treatment	Wastewater from construction, including excavation dewatering, the tunnelling operation and run off from spoil dewatering areas will be managed using a combination of methods that may include (subject to quality of the water requiring management) setting / evaporation lagoons and temporary, containerised water treatment plant onsite. Black / greywater produced during construction to be managed via portable containerised ablutions systems.
Construction water supply	Potable and non-potable water would be required for a range of construction activities. Construction water is expected to be sourced primarily from the SA Water network and the Port Augusta to Woomera Pipeline (PAWP). Further detail is provided in Section 6.12.3.
Construction power supply	The majority of construction power would be provided by diesel generators, with the potential for temporary solar and battery systems to be added. Notably, some temporary facilities already have integrated solar.
Construction fuel storage	Construction will require the use of diesel fuel for construction plant, heavy vehicles, tunnelling equipment, marine construction activities, temporary power generation and associated construction support infrastructure. Diesel fuel would be stored within designated construction compounds and supplied progressively throughout the construction period by licensed fuel suppliers. Further detail is provided in Section 6.12.6

Facility element	Details
Operation	
Administration buildings and infrastructure	Building design and sizes are subject to ongoing detailed design and optimisation. • Administration building located at the site's main entrance gate. The one storey building (approximately 29.5 m (L) x 14.5 m (W)) consists of offices, meeting rooms, lunchroom, toilets, control room and laboratory. Building is designed for an occupancy level of 25 people. • Workshop and storage shed for equipment and spares (Colorbond shed approximately 25 m (W) x 40m (L) x 6m (H)). • Carpark providing 40 car spaces located at site entrance. Site-wide fire protection system consists of site storage tank (coated steel), booster pump station and reticulation to buildings for hydrant connection.
Internal roads	Design vehicles for internal roadways will provide access to: • roads to / from chemical storage or delivery areas (Performance Based Standard Level 3A); • accommodate construction vehicles; and • all other roads must accommodate general purpose vehicles (19m semi-trailer combination). Pavements for internal roadways will: • be suitable for the design traffic and loading (including construction traffic) including loads from turning (slewing) heavy vehicles; • have a sealed surface (e.g. concrete, asphalt, spray seal) at the desalination plant; • included 8m two-way roads throughout the extent of the site; and • integrate with the site stormwater management system (drainage, drain swales / pit and pipes). The National Master Building Specification (NATSPEC) will be utilised as the basis of design for site roads signage, shoulders, posts, guardrail for road collision protection. Bollards to protect infrastructure within the site. Chemical delivery loading bays to be concrete bunded with storm covering.
Fencing and security	Security gates and fencing integrated with the plant's communication system. Security systems designed to meet current bulk storage of hazardous goods codes (e.g. access control, perimeter intrusion detection, gates and bollards, video surveillance, signage). Security lighting.
Stormwater management	Detention basin to restrict post-development flows to not exceed the pre-development flows for the 20% Annual Exceedance Probability (AEP) (approximately a 1 in 5-year Annual Recurrence Interval (ARI)

Facility element	Details
	equivalent) and 1% AEP (approximately a 1 in 100-year ARI equivalent) design storm event. Flows from the plant's detention basin directed towards natural flow paths which run towards a low-lying claypan located to the south-east of the plant, within the site boundary. Flows from areas not within the plant footprint treated as runoff from undeveloped areas and diverted around the plant area without detention. Stormwater from process areas and chemical delivery handling and storage areas bunded in accordance with EPA guidelines and roofed to prevent rainfall ingress. Bunded areas drain to onsite storage tanks with the ability to be pumped out for off-site disposal. Stormwater from rainfall on hard stand areas, roads and car parks will be directed to the detention basin.
Landscaping	Final landscaping will consist of planting of natural species (appropriate to the site) to reinstate areas where no construction has occurred and also for landscaped areas (e.g. vegetated swales).
Permanent wastewater management	An onsite aerobic septic tank and disposal field arrangement. This will be suitable for domestic related wastewater generated on site (i.e. toilets, sinks, showers etc). Additional or alternative solutions may be required with further design definition which may include storage tanks to hold waste unsuited for septic tank disposal for trucking to Whyalla (or other approved facilities) or disposal.
Power supply	Electricity supply comes into the site from the north-west via the new 132 kV Mullaquana Station transmission line, terminating at a substation located adjacent to the desalination plant.
Potable water system	For the purposes of the Reference Design, it is assumed that potable water could be carted in for critical potable water uses (drinking, lunchrooms, etc). Other service water sources could be provided from the permeate tanks. Further detail is provided in Section 6.12.3.

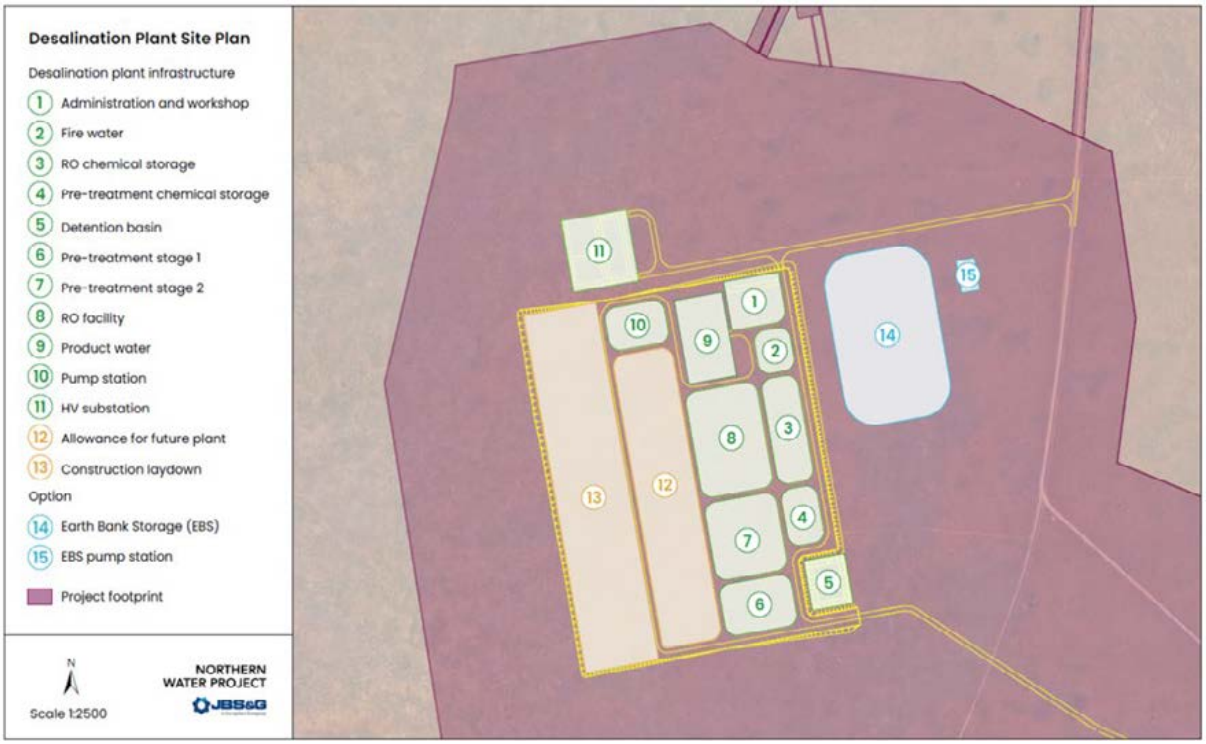


Figure 6-5: Desalination plant site layout

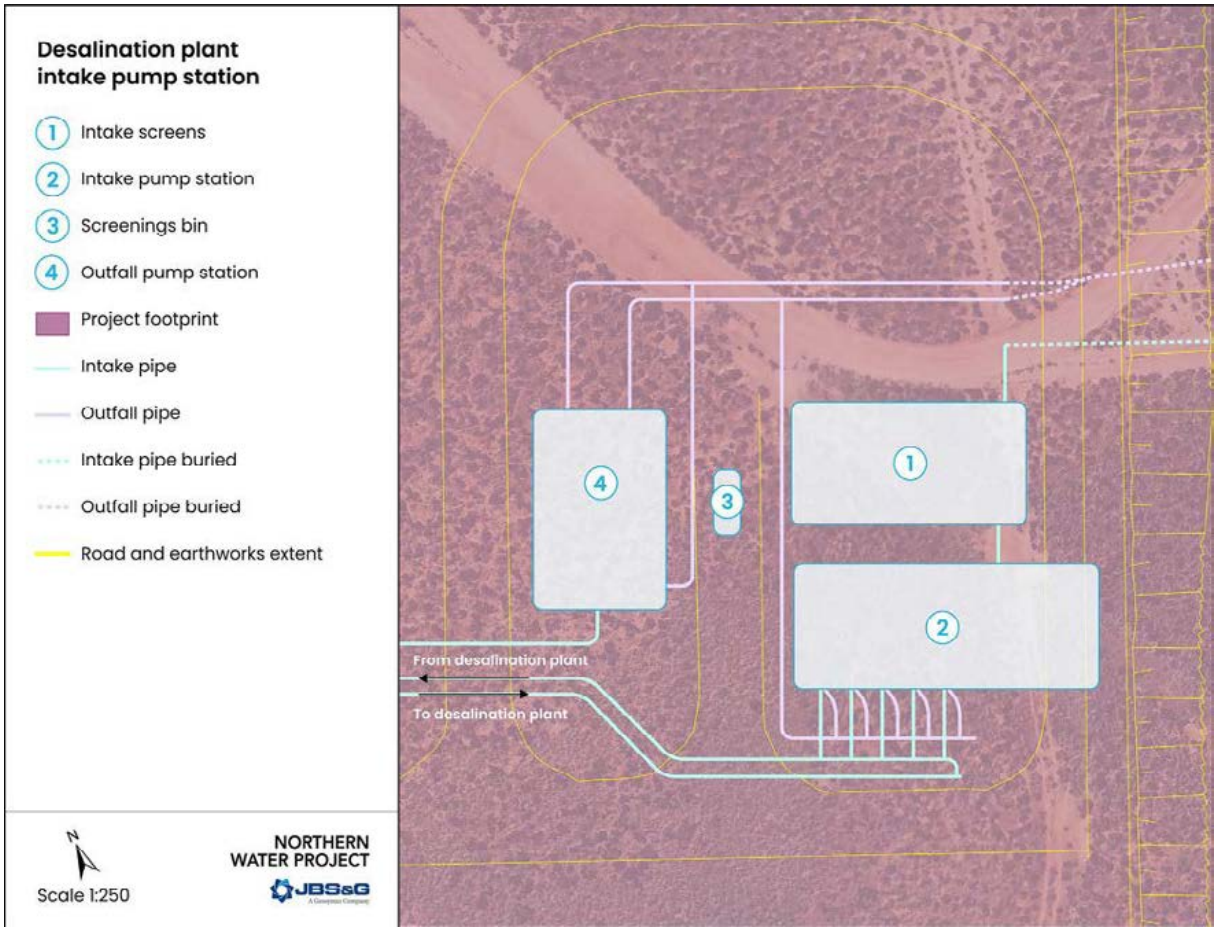


Figure 6-6: Intake and outfall pump station layout

6.5.4 Construction of the desalination plant facility

Site earthworks

It is noted that the present stage of design, earthworks and plant orientation have been developed based on currently available geotechnical data.

Bulk earthworks will be required onsite to form a flat pad for the desalination plant, substation and intake and outfall pump station. A box cut decline will be constructed to launch the TBM for marine construction with spoil from the box cut to be retained on site for later rehabilitation and / or construction of temporary and permanent earth bank structures. The design has aimed to balance the amount of cut and fill required onsite so only material with specific requirements (e.g. road base) is required to be imported.

Any excess spoil generated from civil works at the desalination plant site will be managed in accordance with the waste hierarchy, and where reuse or treatment is not practicable, will be disposed of at a licenced facility.

Site roadworks and access tracks

The road layout allows for two-way traffic around the site for ease of servicing plant. Road design assumes an 8 m wide road throughout the entire site with a 1 km access road connecting the desalination plant with the intake and outfall pump station.

Drainage

A Soil, Erosion and Drainage Management Plan (SEDMP) will be developed for the construction phase in accordance with EPA Codes of Practice for Stormwater Pollution Prevention and International Erosion Control Association (IECA) guidelines (IECA 2008). The SEDMP is likely to include a staged approach to construction (to minimise the area of disturbance at any one time), development of temporary sediment control structures to be used before the operational drainage system is established or in temporary disturbance areas (e.g. berms, swales, sediment fencing) and early establishment of operational drainage system and basins to be used throughout construction phase.

Traffic management and temporary sediment controls (such as silt fencing or hay bale screening) may be employed during bulk earthworks until longer term drainage control can be completed.

Temporary construction area

A temporary laydown area would be required to support construction activities for the desalination plant and associated infrastructure. This area is located immediately west of the desalination plant, within the bulk earthworks footprint.

Surface water flows from the west to the east of the site. Bunding will be put in place upgradient (west) of the construction laydown to redirect runoff around the site and minimise the volume of runoff requiring management.

The Project construction area is shown in Figure 6-5 and Figure 6-12. Further detail of the Project disturbance footprints is provided in Section 6.9.

Buildings and mechanical and electrical installation

A series of buildings and tanks will form the key components of the desalination plant. Buildings are expected to be steel cladded structures, installed with the assistance of 100 t – 200 t cranes. Tanks are expected to concrete structures, constructed either in-situ or with precast elements.

Heavy duty mechanical and electrical equipment such as pipes, pumps, generators and transformers will be installed within the desalination plant buildings. Heavy lifts will be via the building overhead gantry cranes. Lighter equipment will be installed via forklifts/telehandlers.

Restoration and rehabilitation

Areas of temporary disturbance on the desalination plant site would be rehabilitated in accordance with requirements of the Project Construction Environmental Management Plan (CEMP) and Restoration and Rehabilitation Plan. Key rehabilitation activities are expected to include decommissioning of construction equipment, plant, backfilling the box cut decline and ripping hard stand areas.

Intentional, designed landscaping will be <5% of the desalination plant footprint and limited to areas immediately around facilities. Elsewhere, restoration will comprise respreading topsoil and cleared vegetation to encourage natural regeneration of vegetation with limited intervention for a minimum of 12 months. Further detail on the Project rehabilitation approach for other Project construction areas is provided in Section 6.6.5.

6.5.5 Design of marine structures

Basis for EIS assessment

The EIS assessment is broadly based on the Reference Design for the Project. Regarding marine structures, the Reference Design includes:

Reference Design: Two tunnels (one each for the intake and outfall), for conveying seawater to the seawater desalination plant site and return water from the plant to the outfall diffusers. The intake structure(s) includes a riser, precast concrete structure and screened intake head. The outfall diffuser structure includes a riser, manifold pipe and series of nozzles attached to the end of the outfall pipe.

For marine structures, the following option for marine structures also forms part of the EIS assessment:

Float and sink pipeline option: The float and sink pipeline option involves tunnelling the outfall to around the same distance from the launch box as the intake location, and continuing offshore via approximately 1,000 m of additional outfall conduit placed on the seafloor to the outfall diffuser manifold using a float and sink method.

Intake and outfall tunnels

The Mullaquana Station desalination plant will extract seawater via an intake pipeline connected to an intake structure(s), and discharge the resulting return water back into Spencer Gulf through an outfall tunnel / pipeline connected to a diffuser manifold array (refer Figure 6-7).

The intake and outfall tunnel(s) are proposed to extend offshore from the desalination plant location into the Spencer Gulf waters to depths and distances required to meet key functional and operational requirements, including both engineering and environmental performance requirements. These include:

- tidal ranges, wave climate and storm events
- hydraulic and hydrodynamic performance
- provision of sufficient clearance for navigation of vessels
- targeting of water depths for suitable intake water quality to ensure the outfall does not breach the surface (referred to as 'breakthrough')
- wind and wave generated resuspension of sediments and transport into the intake
- impacts to seagrass meadows / benthic habitats.

Based on these key requirements, marine intake and outfall structures are likely to be located in a minimum approximate water depth of 13 m to maximum of 17 m from Lowest Astronomical tide (LAT) (approximately -15m to -19m in Australian Height Datum (AHD)), and no less than 3 km and no more than 5 km from the onshore intake pump station. The intake structure(s) is likely to be located in shallower water and closer to shore than the outfall structure and the structures located a sufficient distance apart to avoid unacceptable recirculation of return water back into the plant.

Seawater quality can be influenced by the presence of the desalination return water discharge (e.g. recirculation or inadequate separation between the intake and outfall). To avoid unacceptable recirculation of the outfall plume back toward the intake, hydrodynamic modelling of the plume is required to confirm the salinity at the intake location is not impacted by the plume under most wind and tidal current conditions. Typically, a minimum separation distance of 500 m was adopted for the Reference Design as a reasonable distance (based on project experience) to minimise the likelihood that recirculation would affect incoming seawater quality. This has been the subject of more detailed studies of local ecology, wave patterns, ocean currents, hydrodynamic modelling and dilution in nearfield, midfield and far-field (refer Chapter 11 Marine Environment for further detail).

The current Reference Design for the intake and outfall and the construction methodology, is described in further detail in Sections 6.5.4, 6.5.6 and 6.5.7. Relevant plans and drawings for the intake and outfall design are provided in Appendix B-2.



Figure 6-7: Intake and outfall alignment
[Note: Bathymetry = mAHD]

Intake structures

Intake structures enable the collection of seawater for processing within the desalination plant. Intakes will be located in the mid to lower portion of the water column to target optimal feedwater, substrate, benthic, and seawater conditions, while also minimising environmental impacts. The water depth for installation is informed by size of the structure, location in relation to the likely sensitive receptors and environmental parameters, clearance from the impact of waves during storm events and navigational impacts.

The Reference Design intake structure has the following configuration (refer GHD 2025a and Figure 6-8):

- intake head diameter = approximately 11.3 to 11.5 m
- vertical extent of intake screens = 2.5 m
- intake structural cap = 0.5 m
- clearance of bottom of screen to seabed = 3.0 m

The Reference Design intake structure is approximately 6 m above the seabed, which requires a minimum water depth of approximately 13 m LAT (approximately -15m AHD) to address wave height and vessel navigational requirements. A single intake structure of different dimensions, or multiple intake structure solution, may also be considered on the basis it may provide constructability benefits. The location (and number of intake structures) is therefore preliminary and subject to further refinement, detailed design and completion of environmental studies.

The dimensions of an intake head are governed by the screen area required to satisfy the maximum allowable horizontal intake velocity criteria. This screen area can be achieved through various combinations of screen height and intake head perimeter, which will be further refined during detailed design. For the Reference Design, a minimum clearance for the intake head of 3 m above the existing seabed level was adopted, but this will be subject to further validation during detailed design, informed by marine ecology survey results, wave height investigations and hydrodynamic modelling.

Coarse bar screens on the seabed intake structure have a maximum 150 mm spacing between bars to prevent large objects and marine fauna entering the intake.

The intake is designed to achieve a maximum intake velocity of 0.15 m/s (including marine growth assumptions). The low velocity horizontal inflow through the static screens of the intake head will minimise entrainment of marine organisms and debris.

For a single intake structure, the intake velocity is calculated based on the peak daily seawater intake capacity divided by the surface area of the intake (less surface area of the grill). For the single intake structure proposed by the Reference Design, the variables and calculated intake velocity is presented below for the design capacity scenario (51 GL/y) as well as the hypothetical high-capacity scenario upon which the far field and entrainment modelling was based (73 GL/y):

	51 GL/y scenario	**73 GL/y scenario**
• Plant production flow:	140 ML/d	200 ML/d
• Total Intake flow[3]:	368 ML/d	526 ML/d
• Screen opening:	150 mm	150 mm
• Velocity at screen[4]:	0.1 m/s	0.15 m/s

For multiple intake structures, the same calculation will provide an average intake velocity for each structure. The intake velocity may, however, vary across the multiple structures as a result of the hydraulic gradient. Hydraulic modelling may therefore be required to estimate intake velocity for each intake.

The calculation of the intake velocity will be undertaken again as part of detailed design.

To control marine growth within the tunnels, intermittent shock dosing with sodium hypochlorite (NaOCl) will likely be required. A small diameter conduit for hypochlorite solution dosing is fitted into the tunnel and a dosing ring installed at the intake end of the riser. The dosing ring position can be adjusted to remove the risk of accidental release of chlorine into the environment. Alternative solutions, including use of construction materials that limit marine growth, or oversizing of conduit diameter to allow for marine growth may also be considered.

[3] Based on plant recovery of 40%.

[4] The velocity calculation presents a "high-velocity case" that assumes up to 20 mm of marine growth across the screen. This reduces the effective opening width from 150 mm to 110 mm.

The components of the intake design as set out in the Reference Design are summarised Table 6-3. Further detail on marine works construction methodology is provided in Section 6.5.7.

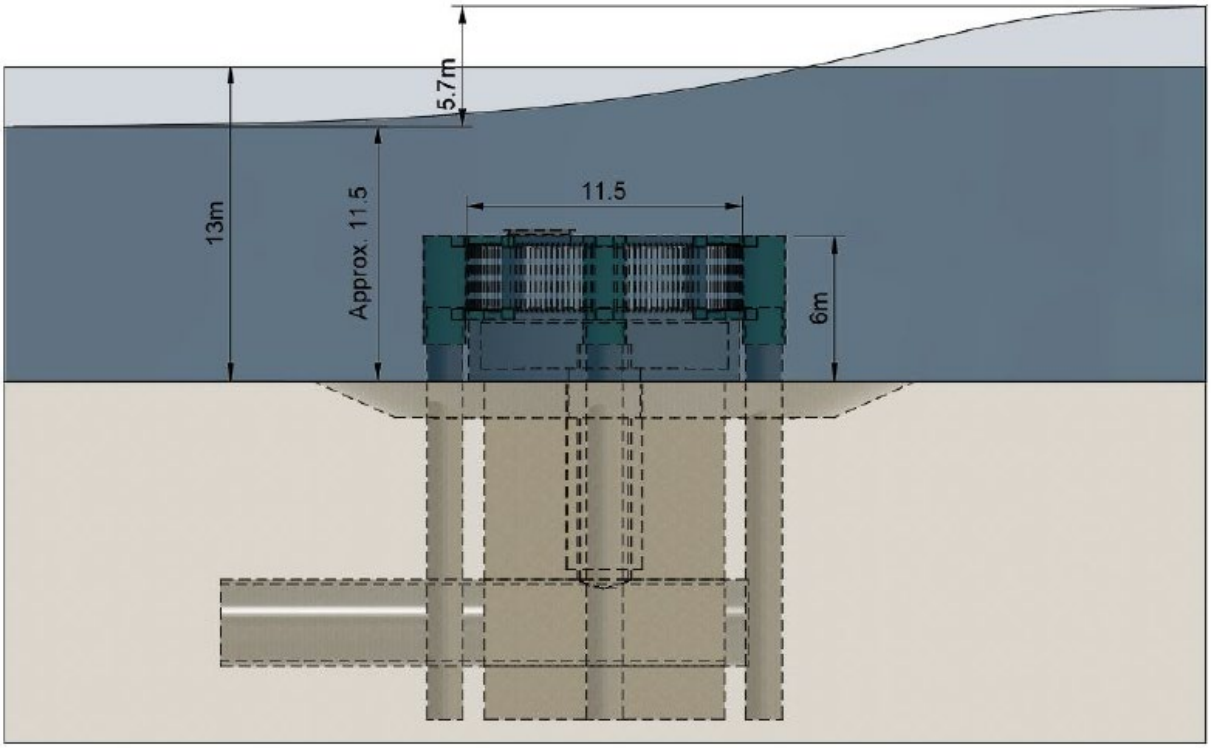


Figure 6-8. Depth of intake structure and clearance from surface (subject to final design)

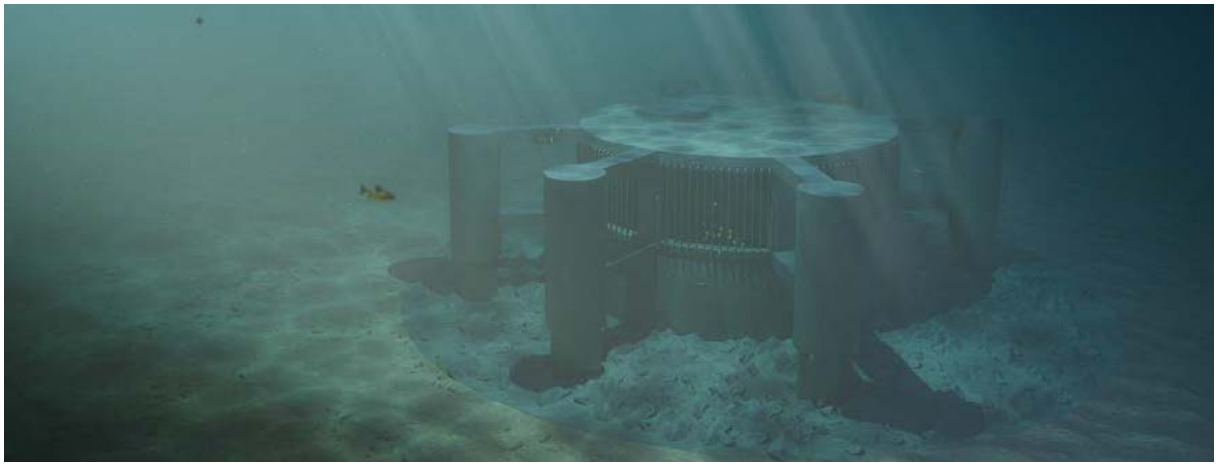


Figure 6-9: Concept of potential intake structure design

Table 6-3: Summary of components of intake design

Intake design components
• An underground, concrete-lined intake tunnel constructed using a TBM with an indicative length of 4 km and an internal diameter typically in the order of 3.2m.
• Tunnel will extend approximately 20 m clear of the intake riser with the TBM cutter head and shield components to be abandoned, and concrete encased permanently within the tunnel.

Intake design components
• Intake structure is connected to the tunnel via a riser which is pre-drilled to a depth below the tunnel invert level. A glass reinforced plastic liner will be fitted into the riser, and the riser is connected into the tunnel via a tee-arrangement. The riser is designed to allow for isolation between the riser / tunnel interface for construction and future inspection and maintenance.
• Small diameter conduit for chlorine solution dosing (to prevent marine growth) will be fitted into the tunnel and installed within the riser to enable intermittent shock dosing within the intake head structure.
• Intake structure located at a water depth of no shallower than 13 m from LAT to target optimal substrate, benthic and seawater conditions. The structure would be comprised of a precast concrete caisson, stainless steel intake grills and precast concrete cap and placed on a 1.5 m thick bedding layer of rockfill, trenched below existing surface levels. The Reference Design has adopted the following configuration: o coarse bar screens on the seabed intake structure have a maximum 150 mm spacing between bars to prevent large objects and marine fauna entering the intake. o maximum intake velocity of 0.15 m/s will minimise entrainment of marine organisms o intake head diameter of approximately 11.3 to 11.5 m to meet the required velocities o height of the intake screen 2.5 m (and 6.0 m total height above seabed) to meet navigational requirements and adequate depth of water column o clearance of bottom of screen to seabed at 3.0 m to reduce risk of ingress of solids o located in a minimum approximate water depth of 13 m from LAT (approximately -15m AHD).

Outfall structures

The desalination plant will discharge the return water back into Spencer Gulf through an outfall tunnel connected to a diffuser system (or similar arrangement). The diffuser system will be connected to the outfall tunnel via a riser. A riser cap would be fitted to the riser, and the diffuser system connected into the riser via a tee-arrangement housing a series of diffuser nozzles. The diffuser array would be secured to the seabed using piles, rather than being excavated into the seabed.

Should a 'float and sink pipeline' option be chosen as the outfall solution (option case), the HDPE float and sink section of the outfall infrastructure will connect to the riser cap, with the diffuser structure either connected to the HDPE pipe or with the diffuser integrated into the HDPE pipe (i.e. with nozzles directly attached).

Design of the outfall structure and diffuser system will ensure that the return water is effectively dispersed into the marine environment in accordance with approval conditions and licensing requirements. Site-specific environmental impact assessment studies and modelling have evaluated the potential impacts of the desalination plant on the Project-specific marine environment (refer Chapter 11 Marine Environment), and the diffuser design has been refined and optimised as part of the of this process (refer Chapter 5 Project Siting, Alignment and Optimisation). Achieving effective mixing of the return water with ambient seawater and adequate transfer and mixing across the mid and far field[5] is necessary to

[5] A midfield model is focused on dispersion of the return water in the local vicinity of the point of discharge (from 50 m to 10 km). A farfield model is focused on Spencer Gulf-wide effects of the desalination plant (from 10's to 100's of km).

minimise impacts on local marine ecosystems, while the outfall location should ensure no unacceptable recirculation of return water back to the location of the intake.

The Reference Design has sited the outfall structure at a depth of approximately 17 m (at LAT and -19m AHD) to ensure that the return water does not breach the surface and adequate mixing occurs as the plume jet disperses across the nearfield[6] area.

As one of the primary drivers of the location, the outfall will be located sufficient distance away from seagrass beds to ensure impacts (if any) are acceptable. A separation distance of approximately 900 m between the intake and outfall structures was adopted for the Reference Design, largely due to a need to target a minimum depth of water and distance from seagrass meadows. This is considered more than sufficient to mitigate the potential for unacceptable recirculation of higher saline seawater into the desalination plant's intake system. The positioning, design and construction methodology of the outfall structure is expected to be refined following the completion of further hydrodynamic modelling and detailed design.

The components of the outfall design configuration as set out in the Reference Design are shown in Figure 6-10 and Figure 6-11. Further detail on marine works construction methodology is provided in Section 6.5.7.

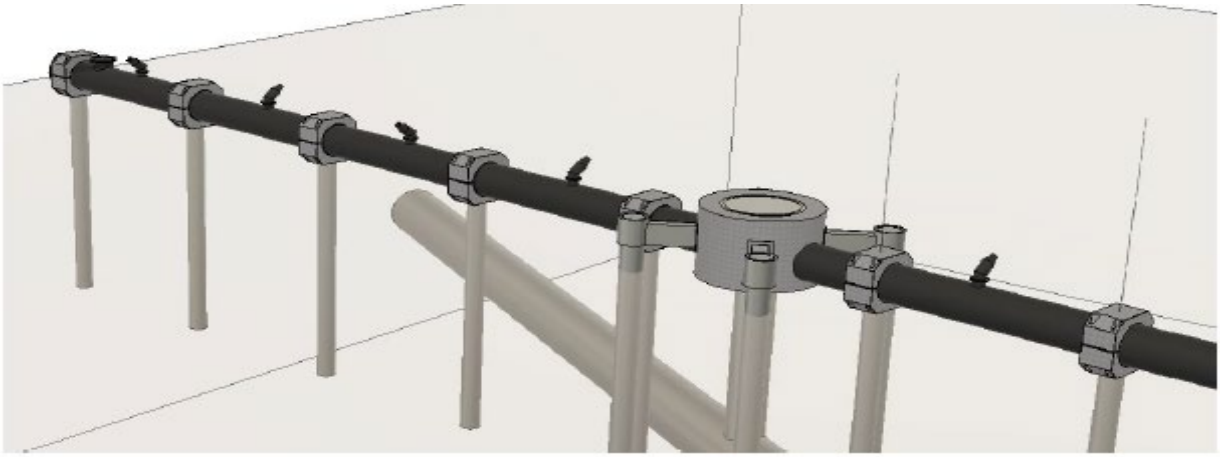


Figure 6-10: Indicative riser and multiport array arrangement (subject to final design)



Figure 6-11: Concept of potential outfall / diffuser design (subject to final design)

[6] A nearfield model is focused on effects of the discharge in the immediate vicinity of the point of discharge (from 1 to 100 m from the outfall).

Design considerations for the diffuser also include clearance from the seabed to reduce the risk of entrainment of seabed sediment into the plume, the geometry of the riser / nozzle transition and limiting the total height of the outfall pipe to minimise impacts on navigation while maximising the water column depth available for plume rise.

The components of the outfall design configuration as set out in the Reference Design are summarised in Table 6-4. Further detail on marine works construction methodology is provided in Section 6.5.7.

Table 6-4: Summary of components of outfall design

Outfall design components
• The return flow streams (pre-treatment and RO return water systems) will discharge to an outfall chamber which has been designed to provide for emergency overflows to discharge to the outfall system.
• An underground, concrete-lined outfall tunnel constructed using a TBM with an indicative length 5 km and an internal diameter typically in the order of 3.2m.
• Tunnel will extend approximately 20 m clear of the intake riser with the TBM cutter head and shield components to be abandoned, and concrete encased permanently within the tunnel
• The diffuser design selected comprises a diffuser manifold array with 8 nozzles at 45 degree angles, 12 m spacing between nozzles and 12 m spacing between driven support piles (refer Figure 6-10).
• Outfall diffuser located at a minimum 17 m depth at LAT (-19m AHD) with 12 m of separation between the nozzles.
• The foundation of the diffuser structure will comprise rockfill placed into a 1.5 m deep trench.
• Plume does not break the surface directly after discharge.
• Diffusers to be located to avoid unacceptable recirculation back through the intake structure.

6.5.6 Diffuser performance and adaptive design measures

The Reference Design has been developed through an iterative process of engineering design and hydrodynamic modelling to ensure the predicted diffuser performance achieves the required mixing, dilution and dispersion outcomes for the return water discharge.

The Reference Design also incorporates a range of adaptive design features that provide flexibility to optimise diffuser performance, should monitoring or operational experience identify a need for adjustment. These measures include:

- provision for additional diffuser nozzles to provide operational flexibility and facilitate future optimisation of discharge performance
- the ability to open or close diffuser nozzles to adjust discharge velocities and mixing performance
- modification of nozzle diameters to alter discharge velocities and improve mixing outcomes
- adjustment of nozzle orientation or discharge angles to optimise plume behaviour and dilution under prevailing oceanographic conditions

- incorporation of duckbill valves or similar devices to assist in maintaining target discharge velocities during lower flow operating conditions.

These adaptive design features have been considered as part of the Reference Design and provide potential optimisation measures that could be implemented, if required, in response to commissioning or operational monitoring results. The detailed design process undertaken by the DBOM Contractor is expected to further refine the diffuser configuration and confirm the most appropriate means of achieving the required discharge performance outcomes.

More substantial modifications, such as changes to diffuser spacing, diffuser numbers or diffuser array length, may also be considered if required to satisfy diffuser performance requirements. Such measures would only be considered following further engineering assessment and are not anticipated based on the current modelling and design.

The Reference Design also incorporates a seawater bypass system, primarily to support diffuser performance during low flow and plant turndown operating conditions where maintaining discharge velocity and achieving required mixing and dilution performance objectives presents the greatest operational challenge. The role of the seawater bypass system and its contribution to diffuser performance are described in Section 6.5.8.

The diffuser design and associated aspects of the near-field hydrodynamic model have undergone an independent peer review process. The results of this review are provided in Appendix G-17.

6.5.7 Construction of marine intake and outfall

Two options are being considered for construction of the marine intake and outfall tunnel(s).

The Reference Design contemplates construction of two separate intake and outfall tunnels via tunnel boring from shore under the seabed to the intake and outfall structure locations. The outfall diffuser structure has a series of nozzles (manifold) attached to the end of the outfall pipe constructed using a float and sink methodology. This method involves floating the diffuser structure into position before flooding the structure, sinking it into place and securing it to the seafloor. Some dredging for the 'float and sink' section may be required to ensure hydraulic performance and asset protection requirements are met (subject to detailed design).

An alternative construction method may be considered (i.e. the option case), incorporating more of the 'float and sink' method for longer parts of the outfall pipeline. This technique involves floating the outfall pipeline into position after tunnelling reaches a suitable depth, then flooding, lowering and securing it to the seabed using permanent anchoring methods (i.e. piled collars / weights). Dredging the footprint of the 'float and sink' section may be required to ensure level and secure anchoring to the seabed, hydraulic performance and asset protection (subject to detailed design).

Tunnel boring machine methodology

Tunnel(s) would be constructed using tunnel boring machines (TBMs) launched via a temporary launch box that will facilitate tunnelling under the seabed to the required distance offshore. The starting point for the tunnel(s) would be located as close as practicable to

marine waters whilst avoiding impact to cultural heritage and to the coastal environment as far as practicable.

The Reference Design proposes operation of the TBM from a temporary longitudinal launch box, incorporating a decline and box cut[7] section instead of from a vertical shaft. The decline / box cut can be excavated by bulk excavation equipment that can be easily driven in and out of the box cut (refer Plate 6-1). A decline / box cut at the tunnel portal allows the TBM (expected to be approximately 120 m long during operation), to be set up entirely before launch. The TBM will be assembled using cranes adjacent to the box cut, allowing the machine to be built on the alignment.

The tunnel boring machines[8] progressively excavate the tunnels and line them with precast concrete sections (refer Plate 6-2 for typical tunnel boring machine arrangements). TBM spoil (i.e. the material excavated from the tunnel) is transported above-ground and stockpiled for drying as required. It is anticipated that all spoil will be suitable for reuse on the site.

Due to the complexities and potential environmental impacts of removing the TBM from the end point of the tunnel, certain components of the TBM would be buried upon completion. At the completion of tunnelling works, to a nominal distance beyond the last riser connection, salvageable TBM and other tunnel construction components would be removed and the TBM cutterhead and shield grouted in place.



Plate 6-1: Example of decline and box cut

[7] A decline is a downward sloping structure. A box cut is a type of excavation where a vertical, open cut is made in the ground, providing a starting point for the TBM to bore the intake and outlet tunnels.

[8] As the geology is expected to be predominantly clay, both earth pressure balance (EPB) and slurry TBMs will be viable options. The key difference is spoil transport where, EPB TBM uses a conveyor or locomotive driven spoil skips, and a slurry TBM uses pipes to pump the spoil suspended in a slurry to a slurry treatment plant. The Reference Design considers both options.



Plate 6-2: Example of slurry TBM (left) and earth pressure balance TBM (right)

The key waste stream from construction of the intake and outfall tunnels is the TBM spoil. TBM spoil is expected to contain a mixture of the excavated ground, conditioning agents utilised and ground water. There are a range of options for the management of water from the dewatering process and for the re-use / disposal of the dewatered spoil which will depend on the quality of each stream. These are discussed further below.

Float and sink methodology

This methodology for underwater pipeline installation involves fusion welding lengths of HDPE pipeline at a nearby onshore facility (e.g. the Whyalla Port). The assembled pipeline is then towed and floated into position (typically filled with air to maintain buoyancy) and then sunk by slowly filling it with water, usually starting from the shore end (refer Plate 6-3).

The sinking rate is carefully controlled by releasing air through a valve at the opposite end of the pipeline, ensuring the pipe doesn't kink or become damaged. Ballast weights are used to help sink and hold the pipe in its intended location on the seabed, where it would be secured and connected to the tunnelled outfall pipeline. This may require dredging along the alignment to ensure hydraulic performance and asset protection requirements are met (subject to detailed design).

This methodology is currently contemplated within the Reference Design for the diffuser installation and may be also considered for a section of the outfall pipeline infrastructure, beyond an appropriate distance, in order to reduce length of tunnels.

The disturbance footprint if the float and sink methodology is adopted would be designed to be located beyond the extent of the *Posidonia* spp. seagrass. Further detail of the Project disturbance footprints is provided in Section 6.9.



Plate 6-3: Desalination plant intake and outfall pipelines using float and sink methodology

Marine intake and outfall structures

Marine construction works for intake /outfall riser and structure construction would be undertaken from a jack-up barge[9] (JUB) which would be positioned above the location of the intake and outfall structures.

The JUB and any other vessels would be supported by land infrastructure likely located at the Whyalla Port. This infrastructure area would provide a point for vessels to transport personnel and construction materials to the JUB and marine construction zone, as well as accepting dredge from marine construction which would be trucked to the desalination plant site for drying and reuse.

Construction of the intake and outfall structures is likely to require dredging, piling, grouting, rip-rap placement, floating and sinking of diffuser structures and installing of the riser caps.

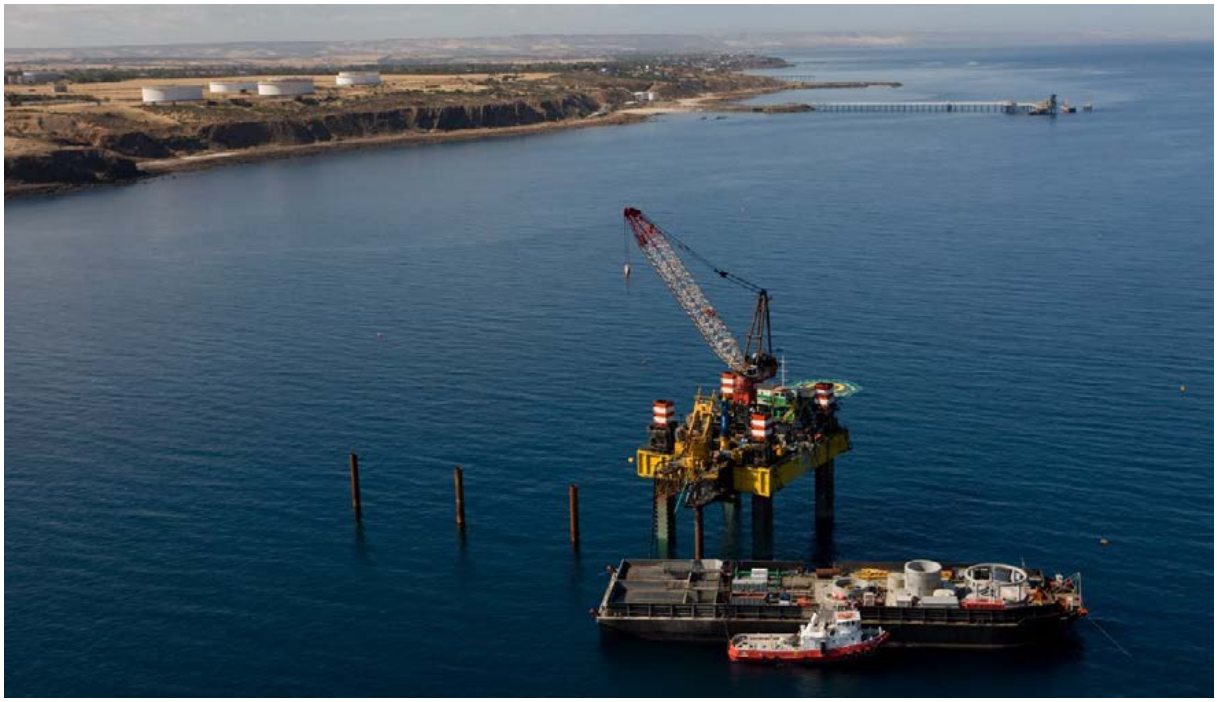


Plate 6-4: Example of a jack-up barge for Adelaide Desalination Plant construction
[Source: Maritime Constructions[10]]

Dredging

Dredging, being any excavation of the seabed (excluding tunnelling), will be required for the construction of risers, intake structure(s) and outfall structure(s) and for seabed levelling for installation of float and sink pipe (if adopted). The key waste stream from the construction of these structures will therefore be dredge.

Dredge will be deposited on a 'dump barge' moored adjacent to the JUB. Through the process of excavation and placement of the spoil on the dump barge, turbidity impacts

[9] A JUB is a non-powered floating platform with legs extending into the sea floor, providing a relatively stable working platform above the sea surface away from swell and currents. The JUB legs can also be retracted from the sea floor allowing it to be moved within the work area.

[10] www.maritimeconstructions.com.au/adeldesalplant

associated with this activity will be managed using industry standard controls and measures. Spoil will be transported back to land on the dump barge for onshore management.

There are a range of options for the management of water from the dewatering process and for the re-use / disposal of the dredge which will depend on the quality of the material.

Management of spoil from marine intake / outfall construction

The key waste streams from construction of the intake and outfall are derived from the TBM launch box excavations, TBM spoil and dredge material returned from the JUB to land from the excavation of the risers and other marine infrastructure. The box cut and majority of spoil from the tunnels will most likely consist of soil, clay and inert (unreactive) rock which will be reused elsewhere at the desalination plant. Anticipated volumes are:

- ~65,000 m^3 from the TBM launch box
- ~110,000 m^3 from the TBM
- ~2,000 m^3 from the JUB.

Earth Pressure Balance (EPB) TBMs, being the most common TBM type for use in clay, has an average solid content of 55%-75% solids. Spoil material from the TBM will be transported to surface via either rail or rubber-tyred locomotives which carry small carts that are tipped in stockpiles for drying when they reach the stockpile area. Spoil will be dosed with lime to increase spoil workability. Approximately 21 days of spoil stockpiles have been allowed for in land requirements. Once dry, the material will be tested and transported to areas of reuse; including for construction of the EBS or to stockpile as backfill for the box cut once construction has been completed. Should a slurry TBM be selected (more common in sandy conditions), a surface slurry separation plant will be required to separate slurry (returned to TBM) from the spoil which is then treated using the same process.

Spoil from the riser and other marine infrastructure excavations will be deposited on the JUB directly onto a dump vessel. Spoil will then be transported to the supporting infrastructure at Whyalla Port and trucked to the desalination plant where it will be dried and stockpiled for use as fill. If unsuitable for re-use, spoil will be disposed of at a licensed waste facility.

Adequate temporary storage space will be required on the desalination plant site for dewatering of TBM cuttings and JUB spoil and / or trucking and disposal at a licenced waste facility. Figure 6-12 shows the indicative layout of tunnelling support infrastructure.

There is a range of options for the re-use / disposal of the dewatered spoil which will depend on the quality of each stream. This is discussed further in Chapter 24 Climate Change and Sustainability.

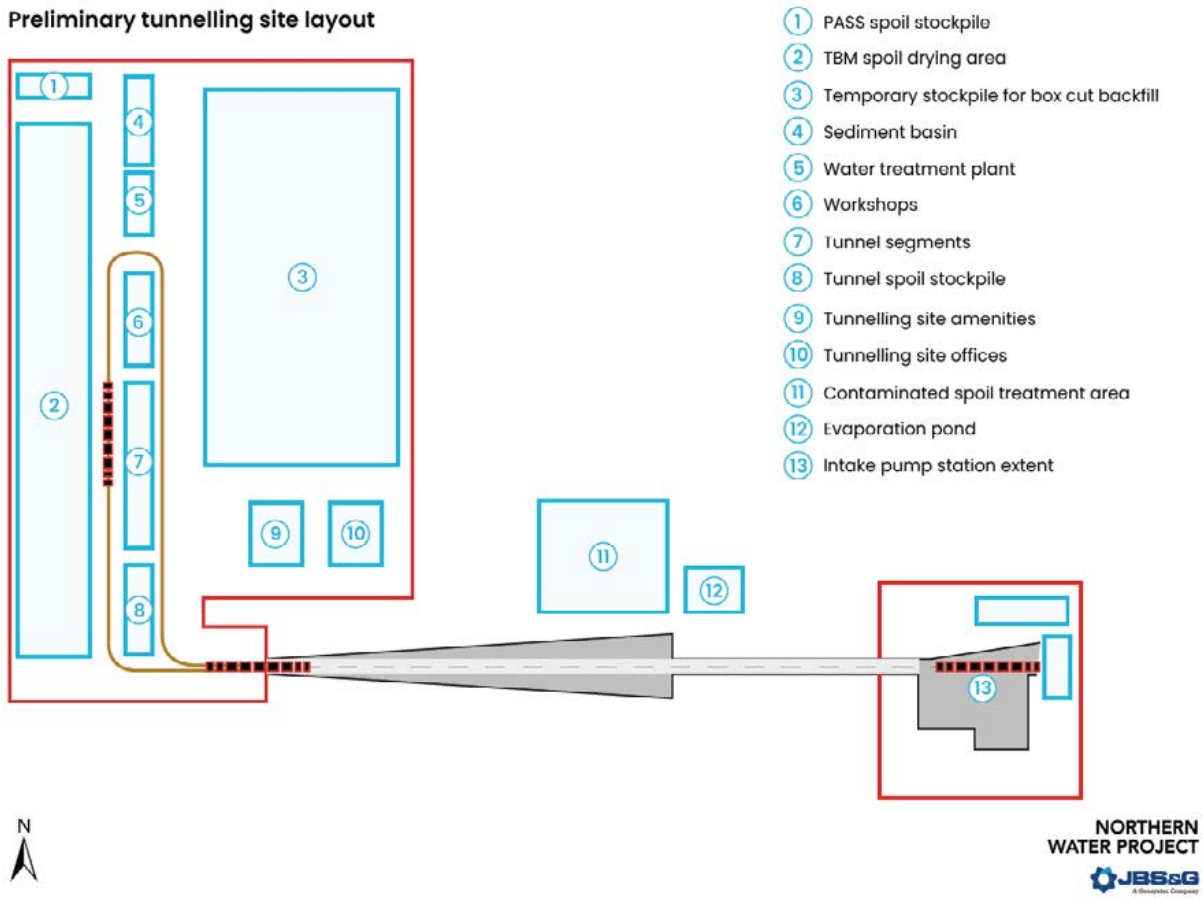


Figure 6-12: Indicative tunnelling construction site layout

Management of wastewater discharge

Water from the JUB will be recirculated, although batch discharge of excess water is expected every 2-3 days. Water will be temporarily stored onboard in wastewater tanks and pumped to tanks on supply vessels for transport to Whyalla Port where it will be discharged into existing wastewater infrastructure.

Wastewater from the TBM and groundwater inflows from the tunnel(s) will be conveyed to the water treatment plant via dewatering pipes. The water treatment plant will be situated within the construction tunnelling site laydown area. A containerised water treatment plant will provide physical separation, sedimentation tanks or cyclones, flocculation / coagulation followed by sand or membrane filtration. The treated water will likely be too saline for recirculation in the TBM, however, it is expected that some of the treated water could be used for washdown, wheel wash and dust suppression measures. In lieu of trucking the treated water from the water treatment plant offsite, evaporation ponds may be established to allow the natural disposal of water.

Disturbance of native vegetation (seagrass)

The proposed methodology for installation and the under seabed nature of the intake and outfall tunnel(s) using TBMs in conjunction with 'float and sink', means that impacts to the *Posidonia* spp. seagrass meadows are avoided.

The Reference Design intake structure is located within *Zostera* spp. seagrass (which is fast growing and more resilient than *Posidonia* spp.) and its footprint would require a small area of permanent *Zostera* spp. seagrass clearance. The Reference Design outfall is located in bare sand, and benthic habitat disturbance from the outfall location will depend on the construction methodology beyond the intake (i.e. tunnelling with no seabed impact or float and sink) which may affect *Zostera* spp. seagrass and bare sandy habitats.

A conceptual depiction of the Project's marine disturbance footprint is shown in Figure 6-13.

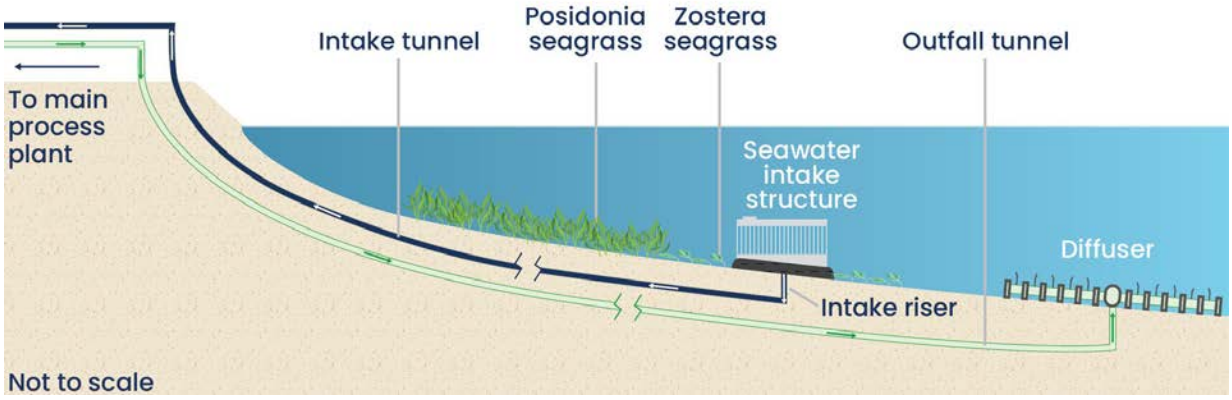


Figure 6-13: Conceptual seabed disturbance at intake / outfall

6.5.8 Operation

Testing and commissioning

Prior to the plant becoming operational there will be a commissioning period to test plant systems and confirm return water quality targets can be achieved. During this period, product water produced would be combined with the return water prior to discharge.

Commissioning and diffuser performance verification

Following construction, a commissioning and performance verification program will be undertaken to confirm that the diffuser system is performing as intended and that the assumptions adopted during design and hydrodynamic modelling remain valid.

Commissioning activities will include verification of key diffuser performance parameters, including discharge characteristics, plume behaviour, mixing performance and dilution outcomes. Monitoring undertaken during commissioning will be used to assess whether the diffuser is achieving the performance criteria and environmental objectives required of the Project.

In the unlikely event that commissioning or operational monitoring indicates diffuser performance criteria are not being achieved, the adaptive design measures incorporated within the Reference Design may be implemented.

Diffuser underperformance and contingency measures

The Project will adopt an adaptive management approach to diffuser performance throughout commissioning and operation. Should monitoring indicate that diffuser performance criteria are not being achieved, a range of operational and engineering

measures will be available to improve diffuser performance depending on the operating conditions and the specific performance issue identified.

One operational measure available under certain operating scenarios is the use of the seawater bypass system. Pre-dilution of return water using unprocessed seawater can improve mixing and minimise the formation of dense return water plumes by maintaining discharge velocities and reducing the density and salinity of the return water.

The seawater bypass system forms part of the Reference Design and provides an important contingency measure during low flow or plant turndown operating conditions, when there is a greater risk of dilution and dispersion performance requirements not being achieved. Under these operating conditions, bypass flows can:

- reduce return water salinity concentrations
- increase total discharge flow through the outfall system
- maintain or increase nozzle discharge velocities
- improve nearfield dilution and mixing performance.

The amount of bypass flow required would depend on the corresponding operating capacity of the plant; however, bypass flows are expected to be most effective during lower production scenarios where additional discharge volume is required to achieve diffuser performance objectives.

With the above in mind, it is noted that the seawater bypass system is not intended to function as a general operational tool for modifying discharge characteristics when the plant is operating at or near full design capacity given the intake, outfall and associated hydraulic systems are not designed to accommodate additional bypass flows under full-capacity operating conditions.

Where operational measures alone are insufficient to achieve the required performance outcomes, adaptive design measures incorporated within the Reference Design may be implemented, where appropriate, following further engineering assessment. As described previously, these measures may include modification of nozzle operation, nozzle sizing, nozzle orientation or other diffuser optimisation measures identified through monitoring and performance assessment.

In the unlikely event that diffuser performance issues cannot be addressed through operational optimisation or implementation of the adaptive design measures incorporated within the Reference Design, more substantial infrastructure modifications may be investigated. Such measures could include changes to diffuser spacing, diffuser numbers, diffuser array extent or other engineering modifications identified through further assessment and modelling. Any such modifications would be subject to detailed engineering assessment and any relevant approval requirements. Monitoring and assessment will distinguish between issues associated with nearfield diffuser performance and broader far-field environmental performance outcomes, recognising that different operational or engineering responses may be required depending on the cause of the observed performance outcome.

Flow scenarios /assumptions

The plant will produce water quality which meets the requirements of Table 6-5.

Table 6-5: Product water quality specification

Parameter	Unit	Product water quality
Total Dissolved Solids (TDS)	mg/L	≤ 500
Boron	mg/L	≤ 2
Bromide	mg/L	≤ 1.5
Chloride	mg/L	≤ 200
pH	-	7.7 ± 1.0
Alkalinity	mg/L as $CaCO_3$	≥ 50 & ≤ 90
Langelier Saturation Index	-	≥ -1.0 & ≤ +0.2
Turbidity	NTU	≤ 1

Key flow rates and assumptions based on the Reference Design are shown in Table 6-6. The desalination system is expected to have an approximate overall plant recovery rate of 40%, so more than half of the water processed through the plant will return via the outfall. The system has a 95% operational availability, on a per annum basis.

Table 6-6: Flow scenarios/assumptions for assessment

Flow scenarios	Production flow	Intake flow	Outfall flow
Plant turndown	40 ML/d	105 + 35 Bypass ML/d	65 + 35 Bypass ML/d
Design capacity	51 GL/y (140 ML/d)	368 ML/d	228 ML/d
Higher hypothetical capacity	73 GL/y (200 ML/d)	526 ML/d	362 ML/d

Operating hours

The desalination plant is expected to be manned 24 hours per day / 7 days per week with most maintenance activities being undertaken during daylight hours or from 7:30 am to 4:00 pm, or as negotiated by the Contractor.

Operational Environmental Management Plan

A detailed Operational Environmental Management (OEMP) will be required for the operation of the desalination plant. This plan will be developed to identify potential environmental risks and impacts associated with the desalination plant operations and specify mitigation measures to minimise impacts, as well as ongoing monitoring requirements. The OEMP will be implemented as required by conditions of approval under the PDI Act, and operational monitoring will also form part of an environmental authorisation (EPA licence) obtained as per Schedule 1 of the *Environment Protection Act 1993*.

Ongoing water quality monitoring systems will ensure return water quality criteria set by PDI Act approvals and / or EPA licence requirements are measured and adhered to.

Stormwater management

Surface water flows from the west to the east of the site. Stormwater management at the desalination plant site has been designed based on the following philosophy:

- process water streams and the stormwater system will be kept entirely separate
- amount of rainwater that falls onsite and requires management will be minimised by:
  - exterior site bunding to divert clean runoff from upgradient around the site
  - roofing process and bunded areas where possible
  - rainwater collection tanks from rooftop with reuse onsite
  - separation of catchments depending upon potential contaminants to reduce volumes required for treatment
- collection and treatment of stormwater based on the potential contaminants in the catchment (i.e. oily water separators to be employed for car parks)
- potential for water sensitive urban design to be considered as part of detailed design
- stormwater from site will be directed via open channel swales towards the detention basin in the south-eastern corner of site. This detention basin has been designed to ensure post-development flows do not exceed pre-development and is of general dimensions 70 x 90 x 1.5 m with a rock-lined overflow weir directing overflow to a natural clay pan south-east of the site.

Further detail on stormwater management at the desalination plant is provided in Chapter 13 Surface Water.

Chemical / waste storage and use

Several chemical dosing systems are required for the plant to function. The chemical storage and dosing systems are located within two bunded areas along the eastern side of the facility. Chemicals are stored in bunds designed with roofs (or similar) where possible to capture rainfall. The net capacity of a bunded area will be at least 120% of the net capacity of the largest tank. Bunds will be designed in accordance with EPA Bunding and Spill Management Guideline (EPA 2016a). An indicative list of chemicals likely to be stored at the desalination plant and storage requirements is included in Chapter 25 Hazards and Risks.

6.6 Transfer System

6.6.1 Overview

The transfer system will run north from the desalination plant site at Mullaquana Station to Olympic Dam passing Whyalla, Port Augusta, Woomera and Roxby Downs (refer Figure 6-14).

In the Reference Design, the transfer system consists of the following key components:

- main transfer pipeline from the desalination plant to the Olympic Dam mine delivery point
- lateral branch from the main transfer pipeline to the Carrapateena mine delivery point
- transfer pump station at the desalination plant
- transfer pump stations at up to three locations along the pipeline
- storage at transfer pump station locations and at the transfer system high point.

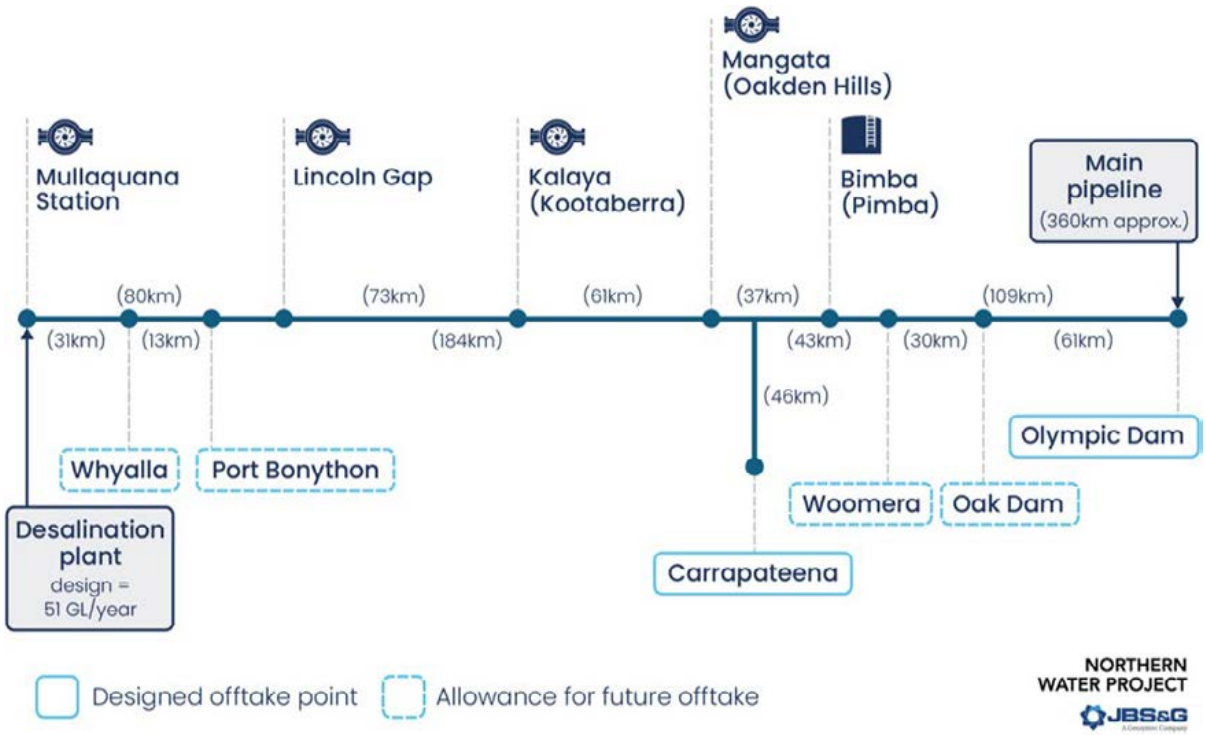


Figure 6-14: Transfer system schematic

6.6.2 Transfer system alignment

The transfer system pipeline extends approximately 360 km north from the desalination plant to the delivery point at the Olympic Dam mine at the boundary of the SML, with an approximately 46 km lateral branch pipeline to the delivery point at the existing Carrapateena mine (refer Figure 6-15 and Figure 6-16).

As discussed in Chapter 5 Project Siting, Alignment and Optimisation, the alignment of the transfer system has been selected to parallel / or utilise existing and previously disturbed areas whilst minimising interaction with existing services, in order to reduce potential for impacts to the environment and Aboriginal cultural heritage. The pipeline route as set out in the Reference Design is as follows:

- **Desalination plant (Mullaquana Station) to Whyalla** – alignment heads generally north following Eight Mile Creek Road and other existing tracks / fencelines on rural land skirting west of Whyalla. The alignment then veers north-east following the Lincoln Highway.
- **Whyalla to Port Augusta** – alignment traverses a section of the Cultana Training Area following the Lincoln Highway heading north, before meeting the Stuart Highway via a small section of the Eyre Highway.
- **Port Augusta to Pimba** – alignment generally follows the Stuart Highway, with portions following the old Stuart Highway alignment, and paralleling the existing Department of Defence Port Augusta to Woomera water pipeline.
- **Pimba to Olympic Dam** – generally follows the Olympic Dam Highway with the pipeline diverting to the east to avoid Woomera township.
- **Carrapateena mine lateral branch** - heads north-west from the main transfer pipeline, south of Lake Windabout.

The main transfer pipeline alignment would require crossing of the Moomba to Port Bonython Liquids Line (Epic Energy), the Whyalla Steelworks to Middleback Ranges slurry pipeline (One Steel Manufacturing Pty Limited) and high-voltage overhead transmission infrastructure. The alignment would run parallel to existing water assets to avoid unnecessary service crossings, but crossing of some existing road and rail infrastructure would be required.

The alignment would traverse the Department of Defence Cultana Training Area (CUTA) and may be located within the Lincoln Highway road reserve or immediately adjacent (west of the road reserve) in CUTA, subject to ongoing heritage survey. The transfer system alignment avoids interaction with the township of Woomera and the Woomera Prohibited Area and other population centres.

The transfer system alignment does not traverse any conservation parks, national parks, Wilderness Protected Areas, conservation reserves or native vegetation heritage agreement areas. Transfer system infrastructure is not located within an area where the water resource is prescribed under the *Landscape South Australia Act 2019* and it is not within a water protection area declared under the *Environment Protection Act 1993*. Alignments would be further refined through the detailed design process which may result in changes to the alignment or the design of the transfer system. Further information on land use on the pipeline alignment is provided in Chapter 9 Use of Land and Waters.

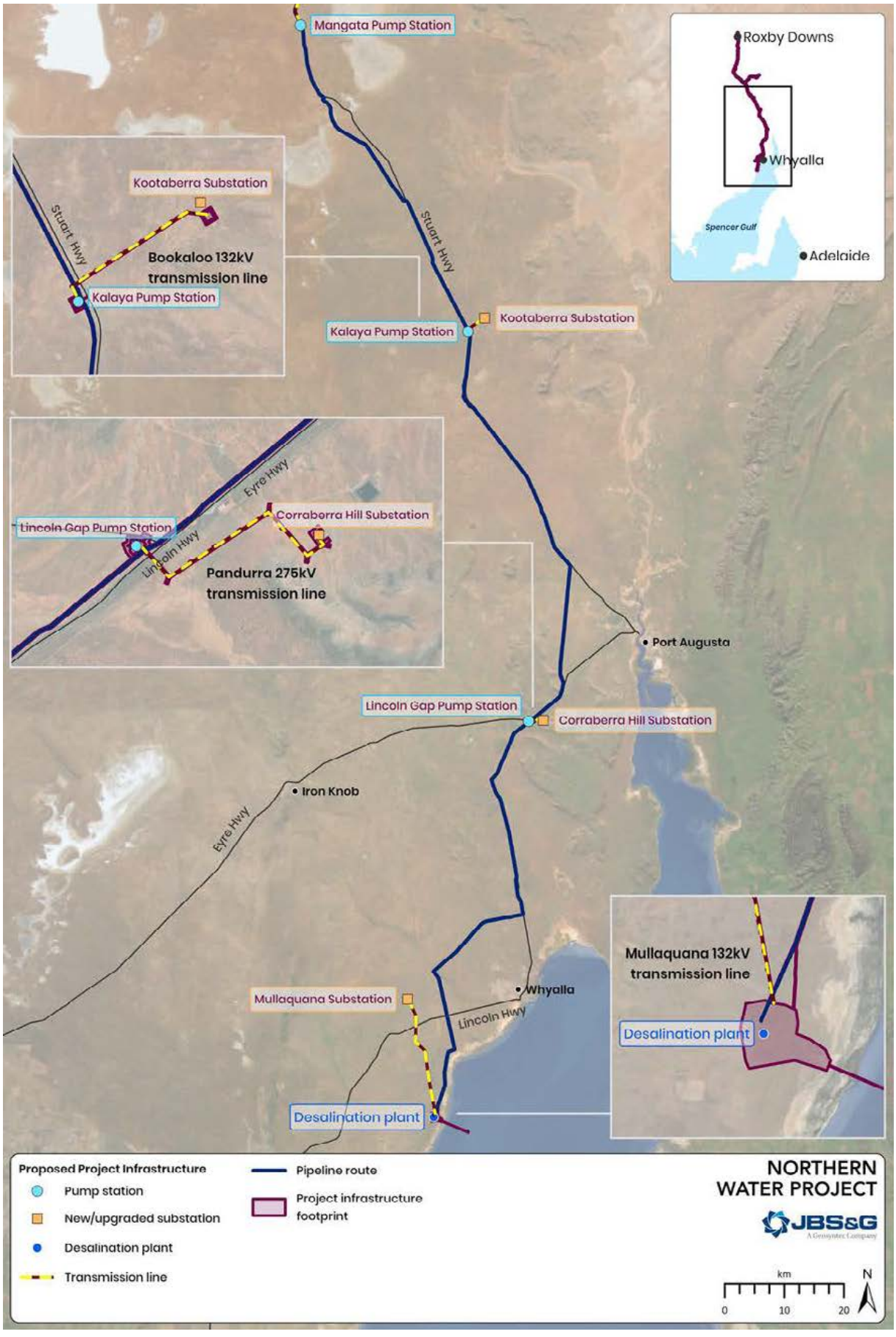


Figure 6-15: Location of Project infrastructure (southern section)

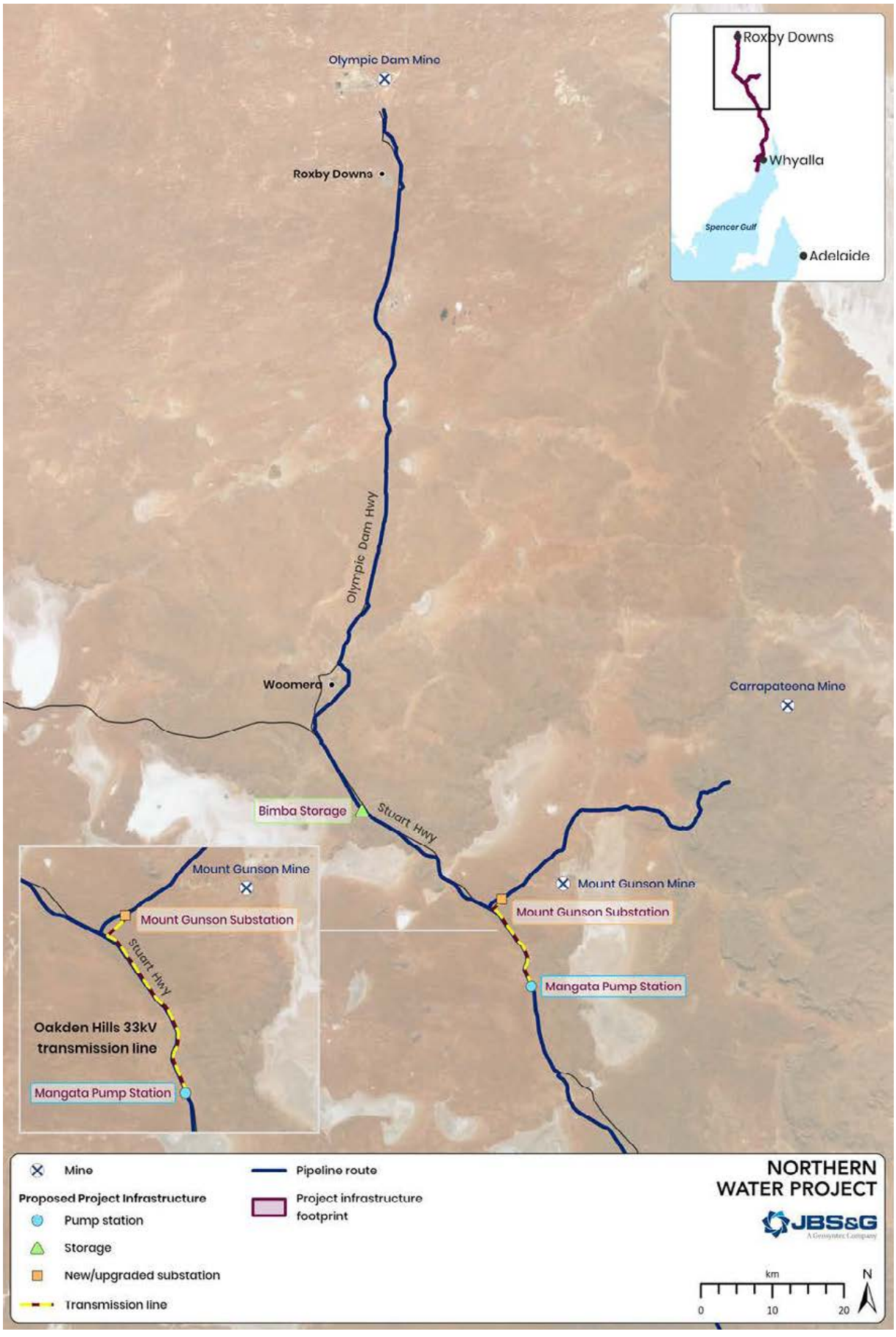


Figure 6-16: Location of Project infrastructure (northern section)

6.6.3 Pipeline land access and easements

The Project will seek to acquire access for construction and register a permanent easement post-construction. The maximum construction corridor width for standard installation pipeline would be 40 m, with narrowing in constrained locations and extra workspace to accommodate 'overflow' from adjacent, laydown and stack sites. The permanent easement will be a maximum of 20 m width (refer Section 6.6.5). Chapter 9 Use of Land and Marine Waters provides additional information on land access and easements.

6.6.4 Pipeline design

Relevant plans and drawings for the design of the pipeline are provided in Appendix B-4.

Pipeline materials and sizing

Options for the pipe material include mild steel cement line (MSCL) and ductile iron cement lined (DICL). Alternative pipe materials may be considered in future stages of design development, and notably the use of HDPE for the Carrapateena lateral, subject to final hydraulic assessment outcomes, economic conditions and market availability.

The pipe diameters will vary along the length of the pipeline alignment. Based on the Reference Design, the pipe nominal diameter leaving the desalination plant is DN1200, reducing to a combination of DN1100 and DN1000 along the alignment from Whyalla to Olympic Dam. Pipe nominal diameter for the Carrapateena mine lateral branch is DN450.

Pipeline placement

The transfer system pipeline will generally be buried underground for the majority of the alignment. There are locations where the pipeline is required to be located above ground level for discrete sections, for example where that is the preference of Traditional Owners, where hard rock is encountered, or at crossings such as creeks where pipe bridges may be used. Where the pipeline is located above-ground, the pipe may be placed on supports or supported by a pipe bridge; however, it will generally not be located above-ground at bends along the alignment due to the significant thrust forces that must be restrained.

The lateral branch pipeline to a delivery point at Carrapateena may be located either above- or below-ground, with any above-ground sections laid directly on the ground without supports. The extent and location of below- and above-ground installation will be detailed in the final design.

Underground pipeline sections provide numerous advantages including improved water quality outcomes (impacted by water temperature), reduced maintenance requirements due to vandalism, improved landholder and emergency access, free movement of native fauna and livestock, improved visual amenity, and unrestricted overland water flow.

In order to meet the required design life, the pipeline and trenching design must give consideration to the need to accommodate vehicle loads from construction, operations and maintenance traffic along with other private or public traffic not able to be controlled by the pipeline owner. The depth of the buried pipeline will depend on the pipe diameter and will be in line with minimum cover values calculated using AS/NZS 2566.1:1998 Buried Flexible Pipelines. Minimum cover values depend on factors including pipe material characteristics, pipeline pressure, weight of trench fill, and design loads related to specific land uses. The

majority of the pipeline will be located between approximately 450 mm and 600 mm below the ground surface, with deeper cover (up to 1,500 mm) provided at major road, rail, pipeline and creek crossings.

Where above-ground sections are required, additional design considerations include asset design life (including application of additional external coatings), water quality (impacted by water temperature), thermal expansion, and appropriate restraint design. Other factors influencing the location of above- or below-ground sections include impacts on community and landholders, disruption to fauna movement, visual amenity, and protection against vandalism and damage by vehicular impact.

The final configuration of above-ground and below-ground sections will be determined through detailed design.

Valves

To facilitate emergency or unplanned maintenance the pipeline will include isolation valves, spaced approximately every 20 km along the alignment as well as air valves (at high points) and scour valves (at low points) (refer Plate 6-5 and Plate 6-6 for examples).

The pipeline incorporates five types of valves with each valve having an above-ground marker post and structure as required:

- **Air valves:** located at high points in the vertical alignment.
- **Scour valves**: located at selected low points in the vertical alignment.
- **Isolation valves:** located at approximately 20km spacings and at critical interface locations (pump stations, storages, offtake). These valves will be positioned to minimise their inconvenience to landowners.
- **Check valves** and **control valves**: located at key locations within the pipeline system including pump stations, major branches and offtake locations.

There is the potential for air, scour and isolation valves to be offset from the pipeline where engineering / hydraulic conditions allow, and where this will benefit the land user (e.g. closer to property boundaries).



Plate 6-5: Air valves above-ground (left) and air valve in chamber (right)
[Source: Ventomat]



Plate 6-6: Looking into scour structure / de-chlorination chamber

Cathodic protection

Cathodic protection is located at approximate 5 km spacing and at critical interface locations (i.e. pump stations, storages, offtakes). Where cathodic protection is present within the easement, an above-ground cathodic protection test point, marker post, and a 2000 x 2000 mm crushed rock gravel pad will be installed.

Access to the easement

Access to the easement for operation and maintenance will be required where surface infrastructure such as air valves, scour valves and test points are installed. Where possible, existing gates and tracks will be utilised to access the easement, otherwise new access swing gates and tracks will be installed where necessary. A continuous formed road or track is not expected to be necessary for the entire alignment. Minor improvements to access paths may be necessary between gates and the nearest surface infrastructure, depending on the site conditions following construction.

6.6.5 Pipeline construction

Pipeline construction corridor

The construction corridor width required over the length of the transfer system will vary based on topographical, geotechnical, pipe material and jointing method selected, required clearances from other services, and environmental and cultural heritage constraints. The maximum construction corridor width for standard installation would be 40 m to allow the trench, pipeline installation, stockpiles, main and secondary vehicle access, and pipe laydown (refer Figure 6-17).

This corridor width is subject to various construction constraints in some locations (typically due to cultural heritage, environment or design constraints) where narrowing of the disturbance footprint is required. The ultimate construction corridor width will be dependent on the outcomes of detailed design and related construction methodology. It may be reduced in some locations, however, there may also be instances where extra workspace is required e.g. adjacent to highly constrained sections or to accommodate laydown, stacking sites and passing of vehicles.

Previously disturbed areas would be targeted where possible, and typically include:

- land currently and previously used for grazing
- railway land (former sidings, railway stations, and other intensively used areas of the Australian Rail Track Corporation (ARTC) railway network)
- disturbed land around townships such as Woomera and Roxby Downs
- existing and former (redundant) roads and tracks.

Disturbance corridors will be resolved when final construction design is determined as they are dependent on detailed design and may also vary depending on pipe diameter. Corridor requirements are expected to be similar for above-ground and below-ground pipe installation.

Further detail of the Project disturbance footprints is provided in Section 6.9.

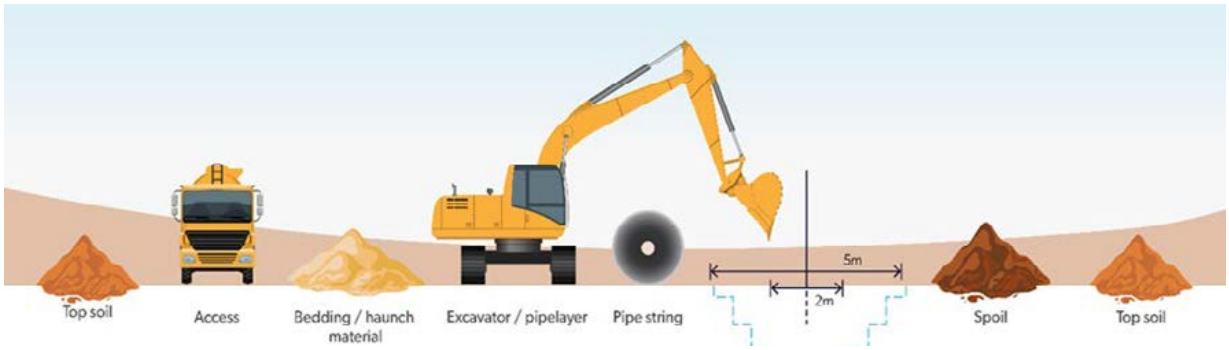


Figure 6-17: Typical construction layout for pipeline

Construction of buried pipeline

Due to the geographic coverage and linear nature of the buried pipeline it is expected that its construction will be split into a number of concurrent work fronts. The pipeline is planned to be constructed at an approximate average rate between 400 – 700 m per day, with the rate depending on the location and complexity of each pipeline section.

The pipeline route and construction corridor would be pegged and fences that cross the construction corridor will be cut and replaced with temporary construction gates that will remain in place for the duration of the pipeline construction period. The construction corridor is cleared of vegetation primarily via rolling rather than grading. Topsoil is then graded, separated and stockpiled for reinstatement during the rehabilitation process.

Once a pipeline section has been cleared and graded, pipe is transported to the pipeline construction corridor in sections and placed end-to-end, on raised skids (typically timber blocks adjacent to where the trench will be dug) to protect the pipe coating from damage. This is known as stringing (refer Plate 6-7).

Concurrent with the pipe stringing work front, the trench excavation crew will be following behind. It is anticipated that heavy machinery such as bucket wheel excavators and 50 t excavators will be used to dig out the trench.

The depth of the trench will depend on the pipe diameter for the various sections of the pipeline and hydraulic requirements. The minimum depth of cover will also vary with

prevailing land use, with a minimum of 450 mm for non-trafficable areas and 600 mm for trafficable areas (sealed and unsealed roads).

After the trench is excavated, suitable bedding material is placed and the pipe is moved from the string and laid in the trench. Once the pipe is placed, the pipeline is embedded and the trench is backfilled with a suitable backfill material.

Laydown and storage areas at regular intervals along the pipeline alignment will be identified to allow set down and stockpiling of materials such as pipe lengths, backfill material and construction water tanks, placement of site amenities and construction equipment storage. Additional stacking sites may be utilised for temporary stockpile of backfill material to reduce trucking distances.

Sand dune areas are recognised as being of heightened cultural sensitivity. Where sand dune areas are encountered, construction activities will seek to avoid disturbance where practicable through localised alignment refinement within the approved development envelope, together with adjustments to work areas and access arrangements. Where avoidance is not practicable, construction methods will be implemented, in consultation with Traditional Owners, that minimise disturbance.



Plate 6-7: Pipe laydown prior to transport to construction corridor (left) and pipeline strung along construction corridor ready for trenching and laying (right)

[Source: T Carton, MPC Kinetic]



Plate 6-8: Example of pipeline trenching and laying

Pipeline crossings

Pipeline sections that are required to cross creeks would generally be constructed underground using open trench excavation in dry conditions. Such watercourse crossings are typically completed within the shortest period practicable. The trench is generally not completed through the watercourse channel and banks until immediately prior to pipe installation. Cover to top of pipe would be increased for creek crossings for additional erosion protection.

Several creek crossings have been identified as sensitive cultural heritage sites as a result of engagement with the Traditional Owners, requiring special considerations. Engagement is ongoing with the Traditional Owners, and it is anticipated that some locations will require crossing via trenchless construction and some locations will require above-ground crossings. Where trenchless methods are used, additional disturbance area may be required to facilitate specialist machinery and equipment and potential dewatering processes (i.e. where water is intersected in the construction process).

Highway crossings will most likely be constructed using trenching methodology with the pipe installed within an encasing pipe. Assessment of traffic management and safety hazards will be required in future design stages to confirm the highway crossing approach. Other sealed and unsealed road crossings would be designed as open trenched installation with pavement reinstatement.

Rail crossings would be constructed via trenchless methodology, with the pipe installed within an encasing pipe. All rail crossings will be pipe-jacked in accordance AS4799-2000 and any other requirements detailed by ARTC.

Management of spoil from pipeline construction

To minimise the amount of excavated fill requiring disposal, excavated materials will be reused (where suitable) as backfill, subject to the geotechnical suitability of that material to be reused as engineered fill and the plant and equipment the contractor will use for the sorting and blending of the soils.

The quality of the bedding and embedment material is important to prevent damage to the pipeline from coarse, sharp gravel-sized particles, and provide sufficient side support to the pipe to prevent excessive vertical deflection or buckling of the pipe due to imposed loadings. Should the trench spoil not be suitable for reuse as bedding and embedment these materials will need to be imported from local quarries or suppliers.

Trench fill above the embedment material and to the finished surface level would generally be excavated material from the trenching operations except for where settlement of the surface is to be controlled, e.g. under trafficable surfaces.

The aim will be to screen the excavated trench spoil to be reused as pipeline bedding, and the remainder blended for pipeline trench backfill. Additional spoil post-pipeline installation will be spread across the construction corridor as part of rehabilitation works.

Pipeline excavation and fill volumes have been estimated for the Project with reuse of spoil in trench backfill a priority to reduce waste and volumes of material required to be imported. A small mound will be left following trench backfill which will use excess spoil and help prevent surface water erosion along the trench.

Disturbance footprint

The disturbance footprint will be constrained to minimise impact on vegetation. Minimising impacts to vegetation aims to preserve biodiversity by maintaining habitats and ecosystems, protect flora which may hold cultural significance for indigenous communities, help protect waterways and water quality, prevent soil erosion, and maintain soil health.

Native vegetation and habitats will be disturbed within the construction corridor primarily via rolling rather than grading where possible (refer Section 6.6.3 for discussion of corridor widths). Expected disturbance footprints have been applied along the alignment[11] and are reflected in the total disturbance footprint estimates in Section 6.9.

The construction corridor layout and construction disturbance footprints will be refined during detailed design and minimised as far as practicable.

Restoration and rehabilitation

Areas of temporary disturbance within the construction corridor for the transfer system (and for other construction footprints such as electricity infrastructure) would be rehabilitated in accordance with requirements of the CEMP Restoration and Rehabilitation Plan and associated environmental management plans. The approach to rehabilitation comprises:

- no intentional, designed landscaping along the corridor
- encouragement of natural recruitment of vegetation with limited intervention for a minimum of 12 months
- should revegetation be required, use of locally suitable native species adapted to local soils and climate, require no ongoing irrigation
- focus on shrubs and groundcovers that support habitat while maintaining future operational access and avoiding future vegetation clearance approvals.

Rehabilitation will commence following completion of construction activity and will be implemented progressively along the pipeline construction corridor as works are complete.

A continuous formed access road or track is not expected to be necessary for the entire alignment. An allowance of 3 m for an access track along the alignment has been included in permanent disturbance area estimates to account for unformed tracks that may result from occasional vehicle access along the alignment and for established access tracks to infrastructure such as air valves, scour valves and test points.

Rehabilitation of the construction corridor would involve the following:

- removal of temporary construction materials and waste
- recontouring the land to match the surrounding landform
- re-establishment of natural drainage lines and bank restoration (where necessary)
- installation of permanent erosion control structures where required
- deep ripping to break up compacted soils (perpendicular to the slope of the land) where relevant
- respreading of preserved topsoil containing retained seedstock and rootstock

[11] In the spatial files for the Project footprint used for impact assessment discussed in Chapter 15.

- respreading of preserved gibber stone where relevant
- soil scarification perpendicular to the slope of the land where relevant (to control surface water flows and reduce potential for erosion, and to retain windborne seeds and organic materials, rainwater, and surface flows)
- respreading cleared vegetation over topsoil
- ongoing removal and destruction of weeds (where weed control will not damage regenerated vegetation).



Plate 6-9: Example of rehabilitation of pipeline alignment

Additional areas of disturbance

Additional areas of disturbance would be required along the pipeline alignment to support construction activities. These include laydown areas to accommodate lengths of pipe, construction machinery and equipment, and stockpiling of construction materials. Other sources of disturbance would include establishment of new access tracks and maintenance and widening of existing access tracks, and upgrade or augmentation of road traffic infrastructure to accommodate movement of Project materials. Temporary accommodation camps will also be required along the pipeline route.

Laydowns

Multiple pipe laydown areas will be needed along the pipeline route for pipe storage as it is delivered from manufacturing facilities prior to it being strung along the pipeline. These are typically areas that are either already used as laydowns for recent projects, industrial areas available for use in built up areas (e.g. in Whyalla and Port Augusta), or areas that will be affected as part of the Project. Laydowns of up to 15 ha are expected to be required approximately every 70 km along the pipeline route.

Detailed design and a construction phasing assessment will seek to optimise the locations and areas of laydown to balance the rate of pipe delivery and pipe stringing. The final location and size of laydown areas required will be largely dependent on factors including, but not necessarily limited to:

- how much pipeline will be laid from a dedicated laydown before another laydown will be closer to the work front and can be used in preference.
- the rate of pipe delivery from the supplier as it varies across the Project extent.
- the rate of pipe stringing (removal from the laydown).

Access and egress to construction site

It is proposed to use turnoffs into the pipeline corridor approximately every 10 km along the route from the main highway. Highway turnoffs will also be needed wherever laydown areas are located. The majority of these turnoffs are existing minor branch roads from the highway, private driveways or unofficial turnoffs to private land. Where these are private driveways or unofficial turnoffs from the highway, there will be engagement with landowners regarding the construction of the required temporary and accommodation works.

Where access and egress is expected to have slow moving plant in and out, traffic management will be implemented. Traffic management measures will be investigated further as part of the DBOM Contractor's Traffic Management Plan.

6.6.6 Pump stations and water storage design

The transfer system includes a series of pump stations and associated water storages required to move water along the length of the main transfer pipeline. The Reference Design currently proposes a single concrete storage tank with fixed steel roof for each storage location; however, the final storage solution may include earth bank storage rather than concrete tanks or other similar solutions (subject to detailed design). For earth bank storage, the design will include a base liner and floating geomembrane cover. Based on the site specific geotechnical conditions, appropriate embankment designs will be adopted, including consideration of upstream and downstream embankment slope angles.

Based on the Reference Design, storage will be located at the desalination plant site and at pump stations along the transfer pipeline (refer Figure 6-15 and Figure 6-16). The Reference Design also proposes a storage at the overall high point on the main transfer pipeline, located south of Pimba. Detailed design will seek to optimise the number and location of pump stations and storages.

Sizing of the transfer system water storages will be in the order of 5 to 10 ML at each location, but remains subject to optimisation and detailed design by the DBOM contractor given that sizing needs to support the required reliability and availability performance requirements.

Table 6-7: Pump stations, storages and tanks

Pump station / storage / tank	Location (kilometre point)
Mullaquana Station pump station	KP 0
Lincoln Gap pump station and storage	KP 80
Kalaya pump station and storage	KP 154
Mangata pump station and storage	KP 215
Carrapateena storage	KP CA46
Bimba storage	KP 251.5

In addition to the transfer system pumps, pump stations will incorporate an electrical control room, electrical transformers and equipment, and facilities for operational and maintenance personnel. The final form of these facilities remains subject to detailed design but may comprise enclosed buildings or open facilities. Facilities will be made secure with fencing.

Power supply for the transmitters and receivers at pump stations will be provided by local low voltage power distribution. Small solar arrays (approximately 5 MW – subject to detailed design) may be considered at pump stations to provide supplementary power and at locations where no low voltage power distribution is available e.g. Bimba storage. Should solar farms be utilised, the intention is that they would not be grid connected and would only be used for the purpose of the Project (i.e. behind the meter).

A water supply point will be located at each pump station for Country Fire Service (CFS) truck booster use.

Pump stations are not anticipated to be subject to inundation due to location near high points. Stormwater flows over the area will be directed away from the buildings and working areas by including upgradient bunding to redirect water around the site and final floor levels of key infrastructure to be raised above surrounding land.

Access is provided via all-weather unsealed access roads, with an unsealed hardstand for access, parking and vehicle turnaround for operational and maintenance personnel.

Relevant plans and drawings for the design of pump stations and storages are provided in Appendix B-4.

6.6.7 Pump stations and water storage construction

Pump stations and storages

Pump station construction areas will be cleared, stripped of topsoil and compacted. Construction material (either imported or reused from the Project) will be used to create a suitable hardstand in some locations. At the conclusion of the construction phase and subject to there being no constraints from an operational safety perspective, areas that will not become part of the final site footprint will be landscaped and rehabilitated.

Access

To facilitate maintenance of critical pipeline assets such as pump stations and control equipment a durable all-weather road (graded gravel road trafficable in both wet and dry conditions) will be constructed to provide access for operation and maintenance.

Building, and mechanical and electrical installation

The pump station buildings are expected to be steel cladded structures, installed with the assistance of 100 t – 200 t cranes. For construction of concrete storage tanks, precast post-tensioned concrete tanks are proposed.

Heavy duty mechanical and electrical equipment such as pipes, pumps, generators and transformers will be installed within the pump station buildings. Heavy lifts will be via the building overhead gantry cranes. Lighter equipment will be installed via forklifts / telehandlers.

Restoration and rehabilitation

Areas of temporary disturbance at pump station and water storage locations would be rehabilitated in accordance with requirements of the Project CEMP Restoration and Rehabilitation Plan. Key rehabilitation activities are expected to include decommissioning of construction equipment, plant, ripping hard stand areas, landscaping and passive

revegetation. Intentional, designed landscaping will be <5% of the disturbed footprint (if any) and limited to areas immediately around facilities. Elsewhere within the disturbed footprint, rehabilitation will comprise respreading topsoil and cleared vegetation to encourage natural regeneration of vegetation with limited intervention for a minimum of 12 months. Further detail on the rehabilitation approach for Project construction footprints such as the transfer system and electricity infrastructure is provided in Section 6.6.5.

Ongoing weed management will be implemented.

6.6.8 Commissioning of water delivery infrastructure

Non-potable discharges are likely to be required mainly in the commissioning stages of the scheme (i.e. the first six months post construction). Hydrostatic testing of the pipeline will require it to be filled in sections for testing, after which the test water will be discharged from the pipeline. The test water may require pH adjusting and sediment control during discharging. This is because the pipeline coating, a form of cement, interacts with water to increase the pH over time and hydrostatic testing water will need to be treated with acid to target a neutral pH level before discharge.

Following hydrostatic testing, disinfection of the pipeline will be carried out by elevating the chlorine content of the water within the pipe. This water will need to be discharged prior to the pipeline going 'live'. The base case is for this water to be transferred to water storages at the Olympic Dam and Carrapateena delivery points. The water may need pH adjusting and dechlorinating if discharged to the environment.

6.6.9 Operation of water delivery infrastructure

Pipeline operation and maintenance is approached in a systematic manner over the life of the assets. Inspection and monitoring of pipelines are carried out, and operating procedures are followed to ensure that they are operated within their design capability. Maintenance programs for the transfer system pipeline would typically involve periodic maintenance, inspection and monitoring, with potential for use of smart devices to inspect the condition within the pipeline for signs of unusual wear, corrosion or damage. It is expected that regular visits will be made by operations and maintenance personnel to each above-ground infrastructure site.

Planned discharges of water to the environment are unlikely to be required given the location and functionality of isolation valves along the transfer system, enabling maintenance (including replacement of valves tec) to occur without release.

Unplanned discharges can occur in situations such as mains breaks, valve breaks, or faulty air valves without prior warning at any location along the pipeline. Occasional unplanned maintenance may require isolating sections of pipeline (by shutting off isolation valves) and releasing water at regular scour points along the pipeline. Water would be dechlorinated prior to release to the environment.

Unplanned discharges can also occur from tank sites, where a dedicated tank overflow and scour will allow release of water to the environment i.e. if there is a fault in the system, water can be released from the overflow structure as the level rises in the tank. These discharges are usually of short duration. Regular maintenance will be required for the pump stations

including maintenance or replacement of pumps, flow meters, check valves and other components.

6.7 Electricity Supply Infrastructure

6.7.1 Overview

New transmission lines, new network substations and upgraded substations are required to provide power to the desalination plant and the transfer pump stations, as set out in Table 6-8. Facility substations would also be constructed within the pump station compounds.

Approximately 20 km north of the desalination plant, a new ElectraNet substation, the Mullaquana Substation, will be constructed and operated by ElectraNet. It will connect to the desalination plant via a ~20 km, 132 kV private transmission line, which will be built and operated by the Project (refer Figure 6-15 and Figure 6-16).

At Lincoln Gap, the existing ElectraNet Corraberra Hill Substation will be augmented by ElectraNet. This substation will supply power to the Project's Lincoln Gap transfer pump station through a ~3 km, 275 kV private transmission line built and operated by the Project (refer Figure 6-15 and Figure 6-16).

A new ElectraNet substation will be constructed and operated by ElectraNet on Kootaberra Station. It will supply power to the Project's Kalaya transfer pump station via a ~4 km, 132 kV private transmission line built and operated by the Project (refer Figure 6-15 and Figure 6-16).

At Oakden Hills, the Mount Gunson Substation will potentially be augmented by SA Power Networks (SAPN) with a new ~15 km, 33 kV distribution line constructed and operated by SAPN to connect the substation to the Project's Mangata pump station. The final scope of this remains subject to ongoing engagement with, and assessment by, SAPN noting that there is an option to 're-string' the existing distribution line rather than construct a new one (refer Figure 6-15 and Figure 6-16).

Power for the Project's Bimba storage will be provided by a solar panel array and battery system (approximately 5 MW – subject to detailed design). Should solar arrays be utilised, the intention is that they would not be grid connected and would only be used for the purpose of the Project (behind the meter).

The Project will also include new facility substations, one dedicated to the desalination plant and located within the site at Mullaquana Station, and others dedicated to the transfer pump stations. These facility substations will be located within the facility sites, are expected to be smaller in size, may be enclosed, and will be constructed by the Project (refer Figure 6-15 and Figure 6-16).

Table 6-8: Project electricity transmission infrastructure

Project electricity transmission infrastructure	Length	Operator	Voltage
New transmission lines			
Mullaquana Station (desalination plant)	20 km	Private	132kV
Pandurra (Lincoln Gap pump station)	3 km	Private	275 kV
Bookaloo (Kalaya pump station)	4 km	Private	132kV
Oakden Hills (Mangata pump station)	15 km	SAPN	33kV

Project electricity transmission infrastructure	Length	Operator	Voltage
New network substations			
Mullaquana Substation (desalination plant)	-	ElectraNet	132 kV
Kootaberra substation (Kalaya pump station)	-	ElectraNet	275kV
Upgraded existing network substation			
Corraberra Hill substation (Lincoln Gap pump station)	-	ElectraNet	275kV
Mount Gunson substation (Mangata pump station)	-	SAPN	33 kV
Solar array and battery system			
Bimba (supply to Bimba storage)	-	Project	-
New pump station electricity infrastructure			
Desalination plant electrical control room, electrical transformers and equipment	-	Project	132 kV
Lincoln Gap pump station electrical control room, electrical transformers and equipment	-	Project	275 kV
Kalaya pump station electrical control room, electrical transformers and equipment	-	Project	132kV
Mangata pump station electrical control room, electrical transformers and equipment	-	Project	33kV

6.7.2 Design

Transmission lines

A range of key environmental aspects have been considered in transmission line design to ensure environmental impacts are avoided or effectively mitigated. Key issues considered included environmental features, land ownership, heritage, existing infrastructure, design criteria and regulations (Electricity General Regulations, 2012).

The common components of transmission line corridors include (refer Figure 6-18):

- **Towers or poles** made from steel and concrete and individually designed and positioned to ensure conductors are suspended with adequate clearance from vegetation and obstacles. The type of tower or pole is dependent on the line's voltage, weight of the conductor, environmental conditions and the safe clearance distance required around the conductors.
- **Conductors (or wires)** typically made of aluminium alloy strands that are wound around a steel core to form a cable. These carry the electricity and are attached to towers or poles with insulators. Transmission towers may also carry an earth wire to reduce the likelihood of direct lightning strikes to the conductors.
- **Insulators** which prevent the transfer of electricity to the tower or pole. Insulators are made from glass, porcelain or composite polymer materials and are suspended in a string, with the number of 'caps' increasing with the line's voltage.
- **Easements** in the form of registered agreements (grants) that appear on a landowner's Certificate of Title, or authorisation by an Act of Parliament. Easements do

not grant title over the land, but allow the operator certain rights of access and may restrict the activities a landowner or occupier can conduct within the easement area to ensure the safe operation and condition of the line.

Overhead transmission lines are supported by a number of unique structure types, including steel lattice towers, and several different pole designs. The diagram below shows the types of transmission structures most commonly used in South Australia and their typical voltages.

For portions of the route that are relatively straight, spans between structures for 275kV and 132kV transmission lines will be roughly 300 – 400 m, with either a lattice tower or monopole design with a height between 50 m and 60 m. Spans for 33kV lines will be shorter (100 – 150 m) and structures 30 – 40 m high. Where the line has a change in direction, strain towers or larger monopoles are likely to be used. In general, footings will be 10 m deep, and depending on soil type, may be required to extend further below ground level.

Substations

The substation sites will house primary plant such as gantries, switch gear, transformers, control buildings, lighting and lightning masts. The tallest structures would be a lightning mast (approximately 25-30 m), telecommunication tower (approximately 50 m) and gantries (approximately 25 m). The substations will be surrounded by a palisade perimeter fence (refer Figure 6-19).

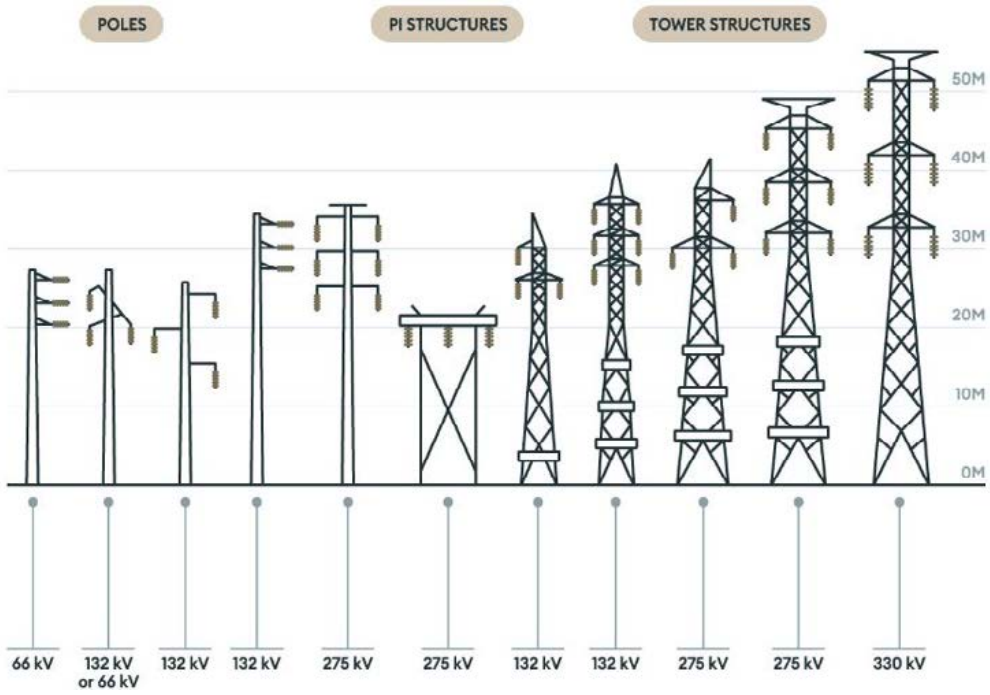


Figure 6-18: Transmission line voltages and structure types

[Source: www.electranet.com.au/our-approach/safety/transmission-lines]

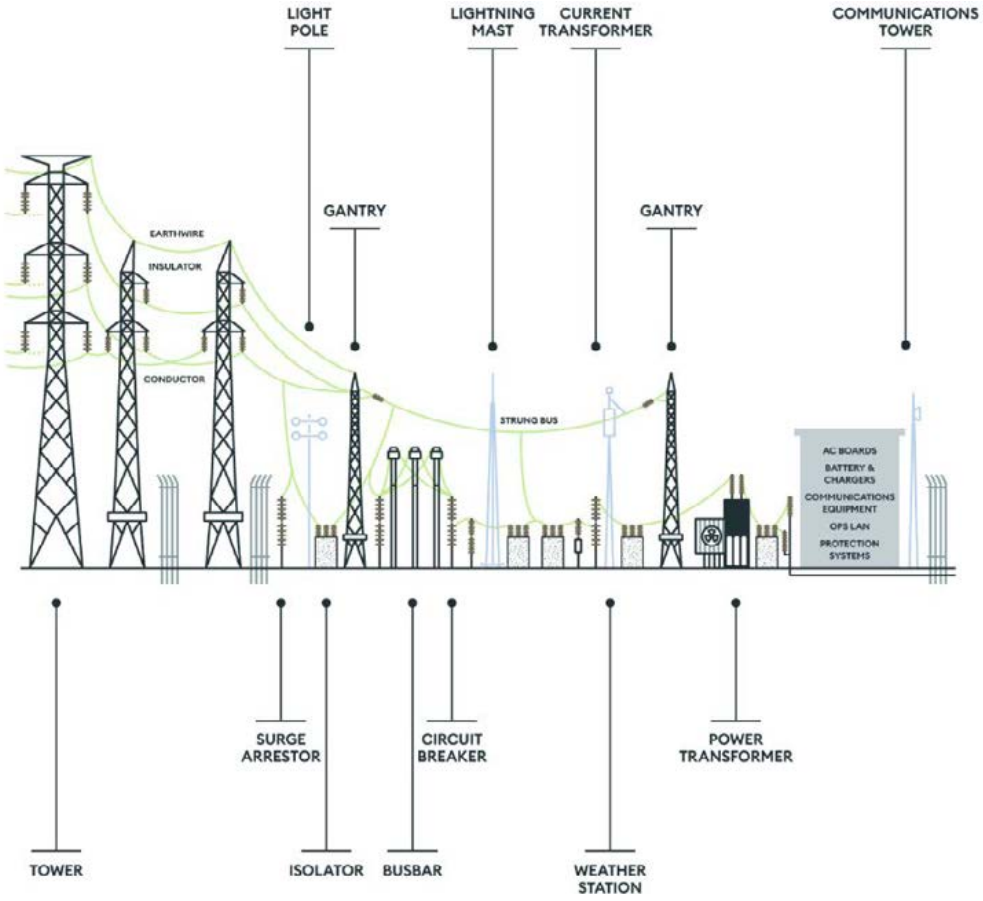


Figure 6-19: Indicative substation layout and elevations

[Source: https://electranet.com.au/safety/transmission-substations]

6.7.3 Construction

Transmission lines

For transmission line construction, concrete footings will be constructed first, followed by the erection and dressing of the structures and later stringing.

Existing access tracks and laydowns will be utilised wherever possible. New access tracks will be approximately 7 m wide except where passing areas or turning points are required. Sensitive areas such as important vegetation, culturally significant locations and areas susceptible to erosion will be avoided where possible. Minor grading may be required for access tracks with limited requirement for importation of capping material.

Disturbance footprint

The following indicative footprints are proposed for the construction of the electricity infrastructure:

- disturbance areas of 40 m x 40 m for construction of lattice tower structure pads (which may be reduced if monopoles are used) located at approximately 400 m intervals along 132 kV and 275 kV transmission lines (168 structures in total), of which 15 m x 15 m remains as permanent disturbance after construction

- disturbance areas of 10 m x 10 m for construction of stobie pole structure pads located at approximately 150 m intervals along 33 kV and 66 kV transmission lines (356 structures in total), which remains as permanent disturbance after construction
- permanent disturbance footprints for the construction of three new network substations and the extension of three existing substations (noting the disturbance footprint for the facility substations is included with the pump station disturbance footprint)
- creation of access tracks and passing lanes along the length of the transmission lines which will remain for ongoing operations and maintenance
- creation of stringing tracks along the length of the transmission lines which are temporary and will be rehabilitated
- creation of stringing pads to set up machinery to install conductors which are temporary and will be rehabilitated after construction.

Access preparation

Access tracks will be established using bulldozers and graders to clear any vegetation present and provide a trafficable surface. Light grading is often a suitable preparation; however, some areas may need capping with imported material. In areas of stony 'gibber' soils, the surface stone cover may be left in place where feasible, with light grading or use of rollers implemented to remove larger rocks and create a trafficable surface. In sandy areas, bulldozers may be used to pull equipment and plant along the easement.

Clearance of work areas

Vegetation at the structure locations will be cleared or rolled to allow structure installation and cleared vegetation stockpiled for use in rehabilitation where required. Large lattice towers generally require a cleared construction working area of approximately 40 m x 40 m. In more sensitive areas this can potentially be reduced.

Additional cleared areas will be required at winch sites for restringing works. Two areas of approximately 50 m x 50 m will be required at strain structure locations, indicatively every 3 km to 5 km but dependent upon terrain and number of direction changes.

During stringing, there will be a need to clear or roll a narrow path between structures to enable pulling of the draw wire. Portions of this track may (depending on terrain) become the long-term maintenance access track. Wherever possible, vegetation clearance will be avoided for the stringing corridor.

Vegetation assessments, including canopy height measurement, will be used to design the line profile. Where possible, structure heights will be set to avoid or minimise vegetation clearance both during construction and ongoing operation and maintenance of the transmission lines. Where vegetation clearance is unavoidable and to minimise the risk of power outages, damage to transmission lines or fire starts, vegetation management works are undertaken to make sure that clearance distances between vegetation and transmission lines are established and maintained in accordance with the *Electricity (Principles of Vegetation Clearance) Regulations 2010* (SA).

As much of the open woodland and scrubland vegetation (where present on the alignment) is relatively low, slow growing and at mature height, it is possible that it can be spanned

across with minimal clearance required. If this is not possible, some clearance or lopping of trees may be required under the conductors in some areas.

Stockpiles

The temporary stockpiling of topsoils and subsoils may be required during the construction phase of the Project, specifically for the establishment of the structure pads and for laydown areas along the linear corridor. Structure stringing sites would nominally require approximately 50 m x 50 m of clearance. Assuming the average depth of the clearance is approximately 100 mm, each tower would require a temporary stockpile of approximately 250 m^3, with stockpiles limited to 2 m in height and approximately 15 m x 15 m in area.

The exact dimensions of the stockpile will vary to fit within the available cleared area (i.e. no further land disturbance is required for the stockpiles). Stockpiles will be located outside of defined watercourses to reduce the potential for surface water erosion impacts to creek lines and may be temporarily covered with cleared vegetation to reduce the potential for wind erosion.

Following completion of construction activities, the stockpiled topsoil and subsoil will be respread over the cleared area with the cleared vegetation, and the sites left to naturally regenerate.

Foundations

Excavations for the structure foundations are typically dug using equipment such as excavators or borers. Blasting or pile driving may be used in areas where it is dictated by the geology, however these are not expected to be extensively required. Soil from excavations for foundations is typically spread at the tower site if suitable, or it may be used off site (e.g., for capping or used by the landowner).

Concrete for the foundations is likely to be supplied by existing batch plants within the Whyalla industrial area. Alternatively, mobile concrete batching plants may be utilised, however this has not been confirmed and will be determined as part of the detail design. The location of such plant along the route is not yet known and will be determined once the construction contractor is engaged.

Tower assembly and installation

Lattice towers are expected to be partially fabricated off site and transported to the tower locations in sections for final assembly and erection. Monopoles will be delivered to the Project works sites in sections. Large crawler cranes will be used to lift tower sections into place for final assembly. Insulators and fittings will be attached to the tower and sheaves attached to the crossarms for stringing.

Stringing

Conductors will be installed using conventional land-based stringing techniques. Land-based tension stringing using a drum and winch involves running steel draw wires out on the ground from a moving vehicle and lifting them into running blocks on the towers. Conductors are pulled well clear of the ground and vegetation under tension using a winch. Tension is maintained by braking apparatus located with the conductor drums. The conductors are held in tension in the sheaves for up to two weeks for the wires to bed in before final adjustment, cutting and dead-ending at tension positions on suspension towers.

Substations

Substation construction activities typically include site clearance (i.e. removal of vegetation and topsoil), earthworks (i.e. bench formation, drainage and foundation construction) and installation of transformers and other electrical works.

Restoration and rehabilitation

Areas of temporary disturbance would be cleaned up and rehabilitated in accordance with requirements of the Project CEMP Restoration and Rehabilitation Plan.

Rehabilitation of the construction areas associated with electricity supply infrastructure would be consistent with the rehabilitation approach described for the transfer system discussed in Section 6.6.5.

6.7.4 Operation

Although little ongoing maintenance is likely to be required for transmission lines, access tracks would be retained for inspection and maintenance activities, predominantly by light 4WD vehicles. Helicopter-based condition assessment will be undertaken at an appropriate frequency, and any remediation (including bird nest removal) undertaken where required, in accordance with permits obtained under the *National Parks and Wildlife Act 1972*. Major maintenance (e.g. replacement of insulators) is likely to take place after 20–25 years.

Extensive vegetation maintenance on linear infrastructure easements during operations is not expected to be required as vegetation present is generally slow-growing and at mature height and therefore can be considered into the design of the transmission line. Vegetation trimming is typically carried out every three to four years with trimming to allow for a three-year growth period. This may vary depending on the type of vegetation and speed of growth.

6.8 Telecommunications Infrastructure

It is expected that the infrastructure will be connected via a fibre-optic network in the transfer system trench. This will provide reliable data telemetry between pumping stations, storage tanks and the supervisory control and data acquisition (SCADA) system.

Communication towers (if required) and the associated equipment are likely to be connected to power via the adjacent pump station electrical system. In locations where that distance is too great, power supply may be provided by a solar panel / battery arrangement at the communication tower site. Towers will provide point-to-point radio link connectivity and controllability between pump stations and storage tanks.

6.9 Project Infrastructure Disturbance Footprints

The majority of the disturbance footprint for land-based infrastructure is located on pastoral land which has not been extensively cleared. The disturbance footprint will be constrained to minimise impact on vegetation, however, clearing will be required to enable the construction of the desalination plant, transfer system and electricity infrastructure.

Marine construction methods which require seabed disturbance may lead to clearance of small areas of *Zostera* spp. seagrass in some locations, however the disturbance footprint would be designed to be located beyond the extent of the *Posidonia* spp. seagrass.

Disturbance areas include infrastructure footprints as well as buffers for construction and are considered estimates (at the current stage of Project design) with assumptions stated where relevant. The overall indicative disturbance footprint and temporary and permanent disturbance areas noted in Table 6-9 below are subject to change as the Project is refined, for example in response to cultural heritage matters. Any changes are anticipated to be managed within the Project Area.

The indicative disturbance footprint for the Project is estimated at 2,154 ha, of which an estimated 407 ha is permanent disturbance. The remaining 1,747 ha is estimated as temporary disturbance which will be rehabilitated following construction (i.e. approximately 81 % of disturbance is proposed to be rehabilitated). Note this is the total surface disturbance footprint and does not differentiate between areas with or without native vegetation.

A summary of the disturbance impacts of key project components is provided in Table 6-9.

Table 6-9: Summary of indicative disturbance impacts for key Project components[1]

Project component	Estimated total disturbance (ha)	Estimated breakdown (ha)	
		Permanent	Temporary
Desalination plant	187	187	0
Access road to desalination plant	35	35	0
Offshore construction of marine infrastructure, including risers, intake structure and outfall diffusers	7	4	3
Main transfer pipeline and lateral branch (includes construction corridor disturbance and permanent access track)	1603	122	1481
Pump stations, water storages	28	14	14
Electricity infrastructure	85	45	40
Other temporary construction areas (camps / laydowns / yards / offices)	209	0	209
TOTAL	**2154**[2]	**407**	**1747**

[1] Indicative estimate subject to refinement

[2] Numbers may not add up exactly due to rounding of spatial data

Note: the total area in the disturbance footprint shapefile includes an additional ~2 ha for underboring, which has no surface disturbance.

6.10 Workforce, Hours and Accommodation

6.10.1 Workforce and hours

Construction workforce

Workforce numbers engaged at any particular time are expected to vary throughout the course of the construction period and will depend on activities being undertaken. Workforce will include plant operators, excavators, riggers, labourers, mechanics, delivery and ancillary

staff. The anticipated number of construction workers peaks during year two of construction at approximately 1,500 Full Time Equivalent (FTE) workers. These workers are split between two work fronts along the transfer system, in addition to dedicated sites such as tunnelling works, infrastructure sites (i.e. desalination plant, pump stations, storages) and the marine JUB.

Labour requirements will vary over the course of the Project, increasing during the early establishment stage to peak during the stages of construction when the full range of activities are proceeding concurrently. Preference will be given to utilising local labour, where appropriate, noting that many of the jobs to be provided will require skills that may not be available in the local region.

Shuttle buses will be utilised where possible to transport the workforce to and from work sites, particularly during pipeline construction.

Standard construction hours will vary depending on scope:

- tunnelling – 24 hrs a day, 7 days a week
- transfer system and offshore marine works – 12 hrs a day, 7 days a week (6am to 6pm)
- desalination plant – 12 hrs a day Monday to Friday (6am to 6pm) with half a day on Saturdays (6am to 12pm).

Depending on construction scheduling, some work may need to occasionally be undertaken outside these hours. Any requirement to operate outside these hours will be undertaken in accordance with EPA requirements.

Operation workforce

The operation and maintenance phase is estimated to require approximately 45 FTEs across two to three depots. Final locations of maintenance depot(s) would be subject to discussions with the operational Contractor, but are expected to be located at Whyalla and potentially at Port Augusta and in the Woomera / Roxby Downs area. Contractors providing specialised services (e.g. fire system servicing, pump overhauls, grounds maintenance, etc.) have been excluded from the labour resources estimate but will be required to support operation and maintenance activities.

6.10.2 Workforce accommodation

While it is anticipated that the Whyalla and Port Augusta regions would be capable of providing some accommodation requirements for the Project, the workforce will be simultaneously concentrated at the desalination plant site and distributed along the pipeline alignments.

A combination of temporary workforce accommodation, existing short-stay accommodation and marine-based accommodation (where appropriate) is proposed during construction. The scale, location and configuration of temporary workforce accommodation will be determined by the preferred DBOM Contractor having regard to workforce requirements, construction method, program and planning approval.

Multiple temporary work camps spread along the pipeline route would provide a positive safety measure enabling reduced travel time to the work front, minimising vehicle movements, improving productivity and reducing fatigue. Construction camps would only be utilised while the pipeline work front is within an appropriate distance of the work camp

to the north or south. Once the pipeline has been laid to the north and south of the work camp (and past it), then it is assumed the camp site will be decommissioned.

Camps would include temporary accommodation and office buildings, sewage treatment systems and possibly a mobile reverse osmosis plant for water treatment.

6.11 Haul Routes and Construction Traffic

The main haulage associated with the project is the delivery of the pipeline segments. The delivery of pipeline segments from manufacture to the intermediate laydown areas will depend on the pipeline material type and chosen supplier. The pipeline adopted in the Reference Design may be manufactured either in Australia or overseas. Nearby ports for receiving any potential overseas shipments are at Whyalla and Port Bonython.

It is expected that pipe would be trucked from these areas, though may utilise the rail network to Port Augusta if coming from interstate.

There would be significant truck movements but these would be dispersed over both time (4-year construction period) and space (approximate 400 km transfer system alignment).

6.12 Resources and Materials

6.12.1 Borrow / bedding material

As discussed in Section 6.6.4, it is anticipated that excavated materials will be reused as backfill for the pipeline trench where appropriate which will minimise the amount of imported fill required. It is assumed that excavated trench spoil will not be screened for use as pipeline bedding.

Should the trench spoil not be suitable for reuse as backfill these materials would be obtained from a range of sources including commercial suppliers, existing approved borrow pits or new borrow pits. The appropriate approvals will be in place if borrow pits are utilised.

6.12.2 Electricity supply

During construction of the Project infrastructure, electricity would be supplied initially from mobile (diesel-powered) gensets or from temporary connections to the existing electricity network. When permanent electricity connections are established to the desalination plant and pump station sites, electricity would be drawn from the electricity network. Some remote work sites may require the use of gensets throughout the construction phase.

During operations, electricity requirements would largely be met through renewable electricity purchased under agreements and distributed to site via the electricity network (refer Section 6.7). Consideration will also be given during the detailed design phase to installation of small-scale solar arrays (including batteries) at pump stations or water storage sites to provide power. Solar arrays would be approximately 5 MW in size (subject to detailed design). Should solar arrays be utilised, the intention is that they would not be grid connected and would only be used for the purpose of the Project (behind the meter).

6.12.3 Water supply

Construction

As noted in Table 6-2, potable and non-potable water will be required during construction of Project infrastructure for workforce amenities (including drinking water and bathing), concrete batching, tunnelling activities, hydrotesting of water retaining structures, earthworks compaction and dust suppression. Construction water is expected to be sourced primarily from existing regional water supply infrastructure, principally from the SA Water network and the Port Augusta to Woomera Pipeline (PAWP).

For potential SA Water connection points, SA Water would be responsible for infrastructure and metering up to the point of supply. Infrastructure downstream of the meter, including temporary water storage, pumps and pipework, and its operation and maintenance, would form part of the Project. Temporary water storage locations supplied from the SA Water network are currently proposed at Whyalla North and Lincoln Gap, both of which are located within the disturbance footprint for the Project.

For potential PAWP connection points (all of which would be located north of Port Augusta), connection infrastructure, metering and all infrastructure downstream of the point of supply, including temporary water storage, pumps and pipework, together with its operation and maintenance, would form part of the Project. The locations of temporary water storage facilities supplied from the PAWP are currently being finalised but would be located within the Project disturbance footprint.

Subject to ongoing negotiations with SA Water and the Department of Defence, supplementary sources of water may also be utilised including groundwater extraction bores and an offtake from BHP's Roxby Downs water supply system.

Opportunities to minimise water demand and maximise the reuse of suitable water streams would also be considered where practicable. This may include the capture, treatment and reuse of hydrotest water, commissioning water, dewatering water and other suitable construction water streams, provided it can be demonstrated that such reuse does not result in environmental harm.

Operations

Water will be required for a range of operational uses at infrastructure sites including:

- domestic services such as lunchrooms, showers, hand washing, toilets
- fire water supply
- nominal landscaping (if required)
- washdown water and general site utilities
- building services such as air conditioning, systems, chillers / refrigerated areas, heating loops

Water produced by the desalination plant is not tested / certified to be compliant with potable water standards. The Reference Design has assumed that potable water at the desalination plant could be carted in for critical potable water uses (i.e. drinking, lunchrooms, etc). Other service water sources could be provided from the permeate tanks.

Similarly, at pump stations, potable water supply for amenities will not be possible from the desalinated product water storage tanks or the transfer pipeline. An alternative drinking water source (e.g. bottled water coolers) may be required at pump stations.

6.12.4 Concrete batching

Concrete for foundations, footings and in-situ tanks and other Project structures may be supplied via the existing batch plants within the Whyalla industrial area. For the northern section of the Project (north of Port Augusta), mobile concrete batching plants could be utilised. Mobile concrete batching plants may be required at various locations along the transfer system alignment. The location of any such plant along the route will be determined once the construction contractor is engaged. Concrete batch plants are outside the scope of this approval and would be subject to separate EPA licencing.

6.12.5 Plant and equipment

In accordance with Reference Design, relevant equipment for the construction phase of the Project (and modelled for noise impacts) include:

- Mobile crane
- Fixed tower crane
- Overhead gantry crane
- Franna
- Front end loader
- Forklift
- Bulldozer
- Drill rig
- Excavator (tracked) 35 t (with or without hydraulic hammer)
- Bucket wheel excavators
- Piling machines
- Shotcrete machine
- Concrete truck
- Concrete pump
- Concrete agitator
- Dump truck
- Water cart
- Grader
- Roller (large pad foot)
- Vibratory roller
- Chainsaw 4-5 horse power
- Welding equipment
- Elevated Work Platforms
- Light vehicles
- Semi-truck
- Telehandler
- Power generator
- Trenchless excavation machinery
- Tunnel boring machines
- Locomotives
- Jack up barge
- Crane barge
- Supply vessels
- Tug boats

6.12.6 Fuel storage for construction plant and equipment

Construction of the Project will require use of diesel fuel for construction plant, heavy vehicles, tunnelling equipment, marine construction activities, temporary power generation and associated construction support infrastructure. Fuel demand will vary throughout the construction program, with peak demand occurring during periods when major civil works, marine works and tunnel construction activities are undertaken concurrently.

Based on the current Reference Design construction program, peak diesel consumption is estimated to be approximately 2,200 kL per month. To support construction activities, diesel fuel would be stored within designated construction compounds (for example, the tunnelling laydown area and transfer system workshop and laydown areas) and supplied progressively throughout the construction period by licensed fuel suppliers.

At the desalination plant construction site, temporary bulk fuel storage is currently expected to comprise one or more self-bunded tanks with a combined storage capacity of approximately 500 kL to 1,000 kL, equivalent to approximately one to two weeks of fuel demand during peak construction periods. Smaller temporary fuel storage facilities may also be established at other construction work areas where required. For marine construction activities, fuel is expected to be transported from Whyalla Port to offshore construction vessels and barges via a dedicated fuel bunker barge operating in accordance with applicable maritime safety and environmental requirements. Final storage capacities, locations and arrangements will be determined by the Contractor during detailed construction planning.

Fuel would be supplied to site and to Whyalla Port by road tanker and replenished regularly throughout the construction period. During peak construction periods, fuel deliveries to the desalination plant construction site may occur several times per week. All fuel storage and handling facilities would be designed, protected from vehicle impact where required (e.g. concrete barriers), and operated in accordance with relevant Australian Standards, dangerous goods requirements and environmental protection requirements, including secondary containment, spill response measures and emergency management procedures. Storage volumes would be managed to maintain construction activities while minimising onsite fuel inventories and associated risks.

6.12.7 Waste management

Expected construction waste sources include packaging, spoil, potentially contaminated soil, vegetation and organic material, wastewater (grey and black) from camps, waste concrete, steel and timber, domestic waste and hazardous materials, fuels and chemicals. Waste spoil from the construction of marine tunnels is described in Section 6.5.7.

Wastes would be managed in accordance with the SA EPA Waste Hierarchy. If waste materials cannot be reused on site, they will be collected by appropriately licensed contractors for offsite reuse, reprocessing, recycling or final disposal. Final disposal of wastes will be to a licensed waste facility that is suitable for the type and quantity of waste.

A Project CEMP and Waste Management Plan would be prepared prior to construction commencing, detailing aspects for waste management at the desalination plant and the water delivery pipeline construction sites.

Operation of the desalination plant will generate a number of waste streams from the treatment process that will require appropriate management. Wastes may include:

- intake screenings
- pre-treatment wastes
- antiscalants
- clean-in-place (CIP) chemicals as part of wash solutions

- membrane preservative and flushing solutions
- post-treatment wastes (e.g. lime solids)
- other general wastes.

A full list of wastes produced and their management is included in Chapter 24 Climate Change and Sustainability.



Chapter 7

Planning and Design Quality

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

7 PLANNING AND DESIGN QUALITY 7-1

7.1 Key Findings 7-1

7.2 Setting the Context 7-3

7.2.1 Identification and management of impacts 7-3

7.3 Planning Assessment 7-3

7.3.1 Assessment method 7-4

7.3.2 Nature of development 7-4

7.3.3 Subject land 7-6

7.3.4 Current land uses 7-7

7.4 Assessment against State Planning Policies 7-7

7.4.1 Summary of assessment 7-7

7.5 Assessment against the Regional Plans 7-8

7.5.1 Eyre and Western Regional Plan 7-9

7.5.2 Far North Regional Plan 7-9

7.5.3 Regional Plan principles 7-9

7.6 Summary of Assessment against the Planning and Design Code 7-11

7.6.1 Zone, Subzone, Overlay and GDP application 7-11

7.6.2 Summary of assessment of Zones and Subzones 7-13

7.6.3 Summary assessment of Overlays 7-19

7.6.4 General Development Policies 7-33

7.6.5 Planning Assessment conclusions 7-40

7.7 Design Quality 7-41

7.7.1 Requirements in legislation 7-41

7.7.2 Assessment method 7-42

7.7.3 Contextual analysis 7-43

7.7.4 Design principles 7-43

7.7.5 Siting and design of the desalination plant 7-45

7.8 Conclusion 7-47

LIST OF TABLES

Table 7-1: Project development types 7-5

Table 7-2: Summary of assessment against relevant State Planning Policies 7-8
Table 7-3: Summary of Regional Plan assessment 7-10
Table 7-4: Zone, Subzone, Overlay and GDP applicability and Consistency Statement 7-11
Table 7-5: Zones and Subzones assessment summary 7-14
Table 7-6: Overlays Assessment Summary 7-20
Table 7-7: General Development Policies assessment summary 7-33
Table 7-8: SPP 2 Design Quality Assessment 7-43
Table 7-9: Potential / indicative schedule of colours and materials 7-46

LIST OF FIGURES

Figure 7-1: Zones and Subzones in the Project Area - southern section 7-17
Figure 7-2: Zones and Subzones in the Project Area - northern section 7-18
Figure 7-3: Selected Overlays – southern section 7-29
Figure 7-4: Selected Overlays – desalination plant 7-30
Figure 7-5: Selected Overlays - Lincoln Gap pump station 7-31
Figure 7-6: Selected Overlays -northern section 7-32

LIST OF PLATES

Plate 7-1: Indicative visualisation of schedule of materials and colours 7-46

7 PLANNING AND DESIGN QUALITY

This chapter provides a summary of the assessment against the Planning and Design Code (the Code), the relevant Regional Plans, the State Planning Policies (SPPs) and relevant special legislative schemes. The Planning Assessment Report is provided in Appendix E-1.

This chapter also provides an evaluation against urban design and placemaking guidance, including the principles of good design and other guidance relevant to design quality.

7.1 Key Findings

Planning assessment

Based on an 'in-principle' assessment of Project asset classes against relevant Zones, Subzones, Overlays and General Development Policies (GDPs) of the Code, and assessment of the Project against the relevant SPPs and Regional Plans, utilising a stipulated Project assessment area and the Reference Design (GHD 2025a), the planning assessment found that:

- the Project overall is **consistent** with strategic planning instruments including the SPPs and applicable Regional Plans.
- the Project overall is **not inconsistent** with the Code.

On the basis of the above, the Project is supported from a planning and land use perspective. Inconsistency with specific performance outcomes expressed through the Code does not indicate the potential of an unacceptable impact to the relevant environmental value. Identification of potential environmental impacts, proposed mitigations and control measures are considered by the Planning Assessment Report (Appendix E-1) and by this chapter in discussing the materiality of inconsistencies with the Code.

These overall Project conclusions are based on the following:

- The Project as a whole is consistent with the Remote Areas Zone, which hosts the majority of Project infrastructure.
- The Project as a whole is readily consistent with the relevant Hazards Overlays, including both bushfire and flooding Overlays.
- Marine aspects of the desalination plant (intake and outfall pipelines, tunnels and seabed-mounted intake riser and return water diffusers) are consistent with the Coastal Waters and Offshore Islands Zone, reflecting the Project's approach to mitigating potential impacts to the marine and coastal environment. This includes avoidance of areas of Posidonia seagrass (noting that some areas of Zostera seagrass will be impacted), and minimisation of impact to areas of economic and primary production significance.
- Aspects of the desalination plant (intake pump building and excavation works for tunnel boring machine (TBM) launch infrastructure) are inconsistent with the Conservation Zone, Visitor Experience Subzone and Coastal Areas Overlay. This is due to the extent of excavation required, and the scale of development proposed within the

Zone, Subzone and Overlay. Where spoil stockpiling and dewatering occurs within the Zone, those activities would also be inconsistent with the Zone, however, stockpiling and dewatering is not inconsistent with the Coastal Areas Overlay.

- In areas where inconsistencies with applicable Zones, Subzones or Overlays are observed, these are primarily associated with the inherent characteristics of the infrastructure, rather than avoidable siting or design decisions. No broader adverse impact is likely on the functionality or desired outcomes outside the Project's construction footprint.
- Overall it is considered that despite inconsistencies with specific performance outcomes, the Project on balance does not adversely affect the intended use of Zones, Subzones or Overlays, and incorporates adequate separation distances from sensitive land uses (or Zones intended principally to accommodate sensitive land uses) to minimise potential adverse impacts.
- The transfer pipeline is inconsistent with the Water Resources Overlay due largely to the necessary disturbance of natural drainage lines by Project construction and the requirement for dewatering during underground pipeline installation works. The extent of this inconsistency is partly absolved by the temporary nature of disturbance works (construction phase only) and the minor extent of potential impacts to surface hydrology arising from above-ground sections of pipeline. The development of Soil, Erosion and Drainage Management Plan for the Project would adequately control potential impacts relevant to the environmental values of the Water Resources Overlay.
- The Project is not inconsistent with all other assessed Zones, Subzones and Overlays, on the basis of Project infrastructure having no material impact on the function or application of those instruments.
- Final construction planning and sequencing is anticipated to readily achieve consistency with the relevant GDPs, through compliance with the design principles adopted through the Reference Design (GHD 2025a).

Design quality

An evaluation of the Project against relevant urban design and placemaking guidance was undertaken. The design quality evaluation focused on the desalination plant only, as the largest element of the Project and the only Project asset with substantive design latitude. The design of other Project elements is dictated by engineering requirements and have limited capacity to incorporate design treatments.

- No part of the desalination plant is intended to be publicly accessible, and is located with significant separation from public receptors, built environments or an urban or neighbourhood context.
- The desalination plant is an industrial facility in a remote location. The potential for public interface with the desalination plant is precluded by the nature and location of the Project.
- The relative remoteness of the desalination plant site and its location outside of urban areas is considered to minimise the extent to which the Project may foster an environment conducive to criminal behaviour.

- The Project's general consistency with the relevant design principles is taken to be reflected in general consistency with the relevant SPPs, Regional Plan objectives, and amenity policies in the Code.
- The Project is consistent with SPP2 Design Quality, noting that SPP 2 is primarily intended to elevate the design quality of South Australia's built environment and public realm with a focus on public accessibility, useability and active interfaces.

7.2 Setting the Context

The EIS Assessment Requirements require an assessment against the Planning and Design Code and other statutory planning instruments and requirements, as well as a statement of the extent to which the expected, predicted or potential effects of the Project are consistent with or at variance to these requirements. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

7.2.1 Identification and management of impacts

The environmental impact assessment presented in subsequent chapters identifies, verifies and assesses potential or likely adverse impacts from the Project on environmental attributes identified in the Project-specific Assessment Requirements.

Chapter 8 Impact Assessment Methodology describes the impact assessment process applied by the Project, including the identification of relevant environmental attributes and receptors, potential impact events (direct and indirect), and proposed avoidance and mitigation measures.

Design and development of the Project is discussed in Chapter 2 Justification and Alternatives, and Chapter 5 Project Siting, Alignment and Optimisation.

Where possible and so far as reasonably practicable, avoidance and minimisation of adverse impacts has occurred through iterative and responsive Project design, alignment and siting. Project design has responded to a range of environmental factors, with potential impacts identified and proactively avoided early in the design process. As Project design and optimisation continues, further opportunities for impact avoidance or minimisation may occur.

Where adverse impacts have been identified and verified, mitigation and control measures are proposed in the relevant parts of the impact assessment. The adequate management and control of adverse impacts will occur through operationalisation of the Project's various management plans, prepared under the Project's overarching Environmental Management Framework as described in Chapter 26 Environmental Management Framework.

7.3 Planning Assessment

Practice Direction 17[1] requires the EIS to include an assessment of the consistency of the expected effects of the Project with:

- relevant SPPs

[1] https://plan.sa.gov.au/__data/assets/pdf_file/0010/1185607/Practice-Direction-17-Impact-Assessed-Development-Version-2.pdf

- relevant Regional Plans
- the Code
- any matters prescribed by the Regulations.

This section provides a summary of the key Project elements and conclusions of the planning assessment against the above documents. The Planning Assessment Report is attached at Appendix E-1.

7.3.1 Assessment method

Information basis

For the purposes of an assessment against the relevant statutory and non-statutory planning instruments, the Reference Design (GHD 2025a) was utilised to inform an 'in principle' assessment of Project asset classes against the relevant instruments. The planning assessment contemplated a generic design which responds to the design basis described in the Reference Design.

Assessment area

To allow for minor changes in siting and alignment during the ongoing design phase of Project development, a stipulated assessment corridor of 200 m was used to inform the planning assessment (100 m from the centreline of Project assets).

Assessment approach

For all relevant planning instruments against which the Project is able to be objectively assessed, an assessment outcome of **consistent, not inconsistent,** or **inconsistent** was applied. These are defined as:

- **Consistent:** The Project is assessed to align with all, or a majority, of applicable objectives of the planning instrument. Objectives with which the Project does not align are not significantly at variance, or have no material impact on the planning instrument.
- **Not Inconsistent**: The Project is assessed to neither support, nor be at variance with the objectives of the planning instrument, or to have no material impact on the planning instrument overall. Variances with specific objectives are feasibly able to be ameliorated through proposed controls and mitigations.
- **Inconsistent:** The Project is assessed to not align with all, or a majority, of applicable objectives of the planning instrument.

7.3.2 Nature of development

For the purposes of assessment against the Code, the Project was contemplated by the development class of particular assets. Each asset class was assessed only against those Zones, Subzones and Overlays within which the asset class occurs (including the Project assessment area), as summarised in Table 7-1. A detailed description of the Project is provided in Chapter 6 Project Description.

Table 7-1: Project development types

Project asset class	Included Project assets	Key development types
Desalination plant and marine infrastructure	• Desalination plant • Intake pump building • Temporary disturbance activities including material laydown, site amenities, construction phase site controls	• Building work – General Industry • Clearance of native vegetation
	• Intake and outfall tunnels, pipelines, seabed-mounted infrastructure (risers and diffusers)	• Tunnelling or under-boring work near the coast • Pipeline infrastructure (below ground) in the marine or coastal environment • Dredging • Pipeline infrastructure (seabed mounted) • Clearance of native vegetation (marine environment)
	• Associated electrical connection infrastructure, water treatment and storage, transfer pump station within desalination plant footprint	• Ancillary and subordinate development to desalination plant: o Water storage o Electrical equipment o Building work – General Industry
	• Access tracks and internal roads associated directly with desalination plant and marine infrastructure	• New or upgraded vehicle access points to/from State maintained roads or local roads
	• TBM launch infrastructure	• Excavation near the coast (>9 m^3) • Earthworks and earthworks drainage (spoil stockpiling, dewatering and on-site re-use)
Water transfer system – main transfer and Carrapateena lateral branch pipelines	• Main transfer pipeline (assumed underground) • Carrapateena lateral branch pipeline (assumed 'on ground' construction) • Maintenance points, offtake flanges, scour valves	• Pipeline infrastructure (below ground) by: o Trenching o Trenchless excavation • Pipeline infrastructure (above ground) • Clearance of native vegetation • Communications towers (where not ancillary and subordinate to other development types)

Project asset class	Included Project assets	Key development types
	• Access roads (construction) and maintenance tracks (operation) - (including access tracks to pump stations and water storages)	• New or upgraded vehicle access points to/from State maintained roads or local roads
Water transfer system – transfer pump stations and water storages	• Lincoln Gap pump station and storage • Kalaya pump station and storage • Mangata pump station and storage • Bimba high point storage (storage only).	• Building work – General Industry • Above-ground water storage, electrical infrastructure (facility substations) and associated works • Clearance of native vegetation • Earthworks, fencing, lighting and temporary disturbance areas
Power supply	• Overhead transmission lines (described in full in Chapter 6 Project Description) • Mullaquana and Kalaya network substations • Corraberra and Mount Gunson substation upgrades	• Electricity infrastructure – overhead transmission lines (≥ 33 kV) • Electricity infrastructure – substations • Clearance of native vegetation • Establishment of new, or upgrades of existing vehicle access points to/from State maintained roads or local roads
Construction camps and material laydowns	• Construction camp and materials laydown facility at Pimba • Materials laydown areas at Whyalla North • In-principle assessment of other potential construction camp and laydown facilities within Project Area (necessity and locations to be confirmed as part of final site selection) including construction water storage and provision	• Workers' accommodation • Temporary water storage (above-ground tanks, treatment and supply) • Clearance of native vegetation (where not utilising previously cleared sites) • Temporary storage of fuels and other chemicals • Temporary fencing, lighting, power supply and wastewater collection • Water treatment (for human consumption) • Wastewater collection and management

7.3.3 Subject land

The Project traverses the local government areas of Whyalla, Port Augusta and Roxby Downs as well as large areas of the Pastoral Unincorporated Area. The Project also extends through Department of Defence land, (i.e. the Cultana Training Area near Whyalla and Port Augusta) and is located adjacent to (but not within) Woomera Commonwealth Land east of Woomera.

The land parcels proposed to be traversed by the Project are provided in Appendix C Certificates of Title.

7.3.4 Current land uses

High-level generalised uses of land are depicted spatially through the Land Use Generalised 2024 layer in the South Australian Property and Planning Atlas (SAPPA 2024). However, it is common for the actual or practical use of land to differ from the land uses defined by the Land Use Generalised layer. The majority of Project infrastructure occurs in land mapped as Livestock, with smaller regions of Public Institution (referring to Department of Defence land), Utilities / Industry where existing infrastructure easements are present, and Vacant Urban Land in the Woomera vicinity. The actual uses of land and waters, land tenure, environmental context and anticipated future development patterns are discussed in Chapter 9 Use of Land and Marine Waters.

7.4 Assessment against State Planning Policies

SPPs (SPC 2025b) and special legislative schemes (SPC 2025c) are the highest order policy document in the South Australian planning system and, amongst a suite of other documents, policies, standards and guidelines, must be considered as part of impact assessment.

The SPPs provide guidance regarding the Government's strategic directions for land use planning. In some instances, there may be competing priorities or conflict between SPPs. A planning assessment and decision must be balanced, having regard to contemporary knowledge and local circumstances. This is sought through the application of the Principles of Good Planning as set out in the SPPs (SPC 2025b).

A detailed assessment of the Project against all relevant SPPs is presented in Appendix E-1 Planning Assessment Report and summarised below.

7.4.1 Summary of assessment

The Northern Water Project is consistent with the majority of relevant SPP objectives and policies. The Project is intended to facilitate the sustainable and dependable supply of water to regions of the State which are increasingly water constrained. This goes directly to the objective of SPP 14 Water Security and Quality, and both directly and indirectly supports the objectives of SPP 1 Integrated Planning, SPP 5 Climate Change, SPP 8 Primary Industry and SPP 10 Mineral and Energy Resources.

The Project finds general consistency with the majority of SPP criteria, notwithstanding minor inconsistencies with specific objectives focused on environmental protection and sustainable development. However, the Project's contribution to social and economic development outcomes, and provision of an alternative water supply in the Far North, should be taken to balance relatively minor inconsistencies.

The desalination plant and associated infrastructure is necessarily coastal, however has been sited and positioned well back from the natural coastline to protect infrastructure from natural hazards, and to minimise the Project's potential impact on natural coastal processes. The positioning of intake and outfall pipeline infrastructure below ground via tunnel boring through the coastal interface, and the positioning of the main transfer pipeline underground for the majority of its terrestrial alignment, serve to minimise the potential disturbance to the

natural landform and seabed, and facilitate the ongoing use of land and water largely unimpeded by the Project's presence.

The Project is therefore assessed as being **consistent** with all relevant SPPs, insofar as variances with specific policy outcomes are either of no material significance to the proper operation of the SPP, or are readily able to be ameliorated through known controls and mitigations proposed by the Project.

Table 7-2: Summary of assessment against relevant State Planning Policies

State Planning Policy	Planning Assessment Summary	Outcome
SPP 1: Integrated Planning	Project is consistent with the objective of SPP 1, and with all relevant policies.	Consistent
SPP 4: Biodiversity	Project is consistent with the objective of SPP 4, and with a majority of relevant policies.	Consistent
SPP 5: Climate Change	Project is consistent with the objective of SPP 5, and with a majority of relevant policies.	Consistent
SPP 7: Cultural Heritage	Project is consistent with the objective of SPP 7, and with all relevant policies	Consistent
SPP 8: Primary Industries	Project is consistent with the objective of SPP 8, and with all relevant policies.	Consistent
SPP 9: Employment Lands	Project is consistent with the objective of SPP 9, and with a majority of relevant policies.	Consistent
SPP 10: Mineral and Energy Resources	Project is consistent with the objective of SPP 10, and with all relevant policies.	Consistent
SPP 13: Coastal Environment	Project is consistent with the objective of SPP 13, and with a majority of relevant policies.	Consistent
SPP 14: Water Security and Quality	Project is consistent with the objective of SPP 14, and with all relevant policies.	Consistent
SPP 15: Natural Hazards	Project is consistent with the objective of SPP 15, and with a majority of relevant policies.	Consistent
SPP 16: Emissions and Hazardous Activities	Project is consistent with the objective of SPP 16, and with a majority of relevant policies.	Consistent
SPP 19: Special Legislative Scheme *Marine Parks Act 2007*	Project is consistent with the objective of SPP 19, and with all relevant policies.	Consistent

7.5 Assessment against the Regional Plans

The relevant regional plans for the Project are the Eyre and Western Regional Plan (EWRP) (DHUD 2026a) and Far North Regional Plan (FNRP) (DHUD 2026b), which were published by the State Planning Commission on 19 January 2026.

The EWRP and FNRP have much in common, with many shared objectives and a planning vision which prioritises the effective balance of economic growth and infrastructure provision with the preservation of natural landscapes and environmental values, and underpinned by

effective township planning, residential land supply and building climate change resilience. The Project traverses large areas of both the Eyre and Western and Far North regions.

A detailed assessment of the Project against the themes, outcomes and objectives of the Regional Plans is presented in Appendix E-1, and summarised in Table 7-3.

7.5.1 Eyre and Western Regional Plan

The EWRP promotes economic development of the region, appropriately balanced with preserving, restoring and protecting environmental assets, natural and landscape beauty, ecosystem function and hydrological systems. Water availability is highlighted as a regional challenge for supporting sustainable economic, social and industrial development.

The EWRP calls for a balanced and strategic approach to development and promotes alternative water and energy supplies to sustainably maximise economic growth and job creation throughout the region.

The Project is consistent with the EWRP through the development of an alternative water supply, which will in turn support the continued development of the region's key mining resources, unlock sustainable growth in the key future industries, potentially including the Whyalla Steelworks, supporting employment and economic growth.

7.5.2 Far North Regional Plan

The Far North is highlighted as a region of significant economic importance to South Australia. The FNRP describes the region's economy as "supported by new technology in sustainable energy production, mineral resourcing and agri-business" (DHUD 2026b).

The FNRP recognises that continued economic prosperity is underpinned by tourism, a skilled workforce, and food and water security. The FNRP encourages economic growth through support of the mining industry balanced with protection of the region's unique and variegated landscape character, and provision of services to remote and regional communities. Diversification of water supply options to build resilience to drought and seasonal rainfall variability, and management of water resources to allow for the expansion of mining, defence and tourism activities supported by appropriate infrastructure, are key policy objectives.

The Project is consistent with the FNRP through the development of an alternative water supply, which will in turn support the continued development of the region's key mining resources, particularly including the State's copper province, unlock sustainable growth in the key future industries, supporting employment and economic growth.

7.5.3 Regional Plan principles

The themes, outcomes and objectives of the Regional Plans are consistent between the EWRP and FNRP. The Project's general consistency with the relevant SPPs supports its consistency with the Regional Plans.

Key priorities in the EWRP and the FRNP relevant to the Project include:

- Capitalising on key economic drivers such as mining in Olympic Dam and the Gawler Craton, supporting and facilitating greater development of renewable energy resources, and enhanced ecotourism in Ikara-Flinders Ranges,

- Safeguarding agricultural land and supporting climate-resilient projects like the Northern Water Project to diversify the economy and create jobs,
- Building climate resilient infrastructure to adapt to hotter, drier conditions,
- Investing in infrastructure to support economic growth and employment opportunities,
- Preserving biodiversity, protecting vulnerable species, and managing ecologically significant areas such as Lake Eyre Basin, and
- Preparing for the impacts of climate change, including rising temperatures, reduced rainfall, and increased frequency of natural hazards such as bushfires, floods, and coastal erosion.

Table 7-3: Summary of Regional Plan assessment

Regional Plan Theme	Planning Assessment - Summary
Theme: People, Housing and Liveability	The Project is supported by the objective both directly and indirectly by: • Ongoing and proactive consultation with Traditional Owner groups, local communities and stakeholders enabling the holistic consideration of sites and areas of cultural heritage significance, and • Avoidance of areas identified for future residential growth, to preclude the possibility of sensitive receptors being impacted by ongoing Project operations in the future.
Theme: Productive Economy	The Project is supported by the objective both directly and indirectly by: • Avoidance of areas of high tourism value, • Placement of infrastructure to minimise the potential for land use fragmentation, future encroachment of sensitive land uses, and impacts to the primary production value of land and waters, and • Supporting sustainable future growth through critical infrastructure support of identified key economic drivers in the regions.
Theme: Natural Resources, Environment and Landscapes	The Project is supported by the objective both directly and indirectly by: • Avoiding placement of infrastructure in areas of high biodiversity value including the coastal area (as far as is reasonably practicable), preserving the ecosystem value and carbon sequestration value of such environments, • Positioning and designing infrastructure with regard to natural hazards including bushfire, flooding, extreme heat, and potential acid sulfate soils, and developing appropriate controls and mitigation measures to minimise impacts • Undertaking detailed studies to identify and quantify potential impacts from Project emissions, including dust, noise, and return water from the desalination plant, to enable Project design to respond to the level of potential impact.
Theme: Transport and Infrastructure	The Project is supported by the objective both directly and indirectly by: • Representing strategic infrastructure supporting the continued economic development of the regions, • Contributing to water security in the Far North by enabling reduced reliance on groundwater and surface water resources, and

Regional Plan Theme	Planning Assessment - Summary
	• Ensuring that Project construction, operation and maintenance aligns with objectives to maintain and improve an integrated and resilient transport network.

7.6 Summary of Assessment against the Planning and Design Code

This section summarises the assessment against the Zones, Subzones, Overlays and General Development Policies (GDPs) relevant to the Project, presented by Project element and Performance Outcome category[2]. Detailed assessment against the Code is provided in Appendix E-1.

7.6.1 Zone, Subzone, Overlay and GDP application

Table 7-4 provides a summary of the Zones, Subzones, Overlays and GDPs relevant to each Project element that were assessed[3]. Where a Zone, Subzone, Overlay or GDP was assessed to apply to a Project element, that Project element's assessment outcome is represented visually through application of the rubric below.

Consistent	Not Inconsistent	Inconsistent

Table 7-4: Zone, Subzone, Overlay and GDP applicability and Consistency Statement

Zone or Overlay	Relevant Project Element				
	Desalination plant and marine infrastructure	Transfer pump stations and water storages	Main transfer / Carrapateena pipelines	Power supply	Construction camps and materials laydown
General Development Policies					
Clearance from Overhead Powerlines	✓	✓	✓	✓	✓
Design	✓	✓	✓		✓
Infrastructure and Renewable Energy Facilities	✓	✓	✓	✓	✓
Interface Between Land Uses	✓	✓	✓	✓	✓
Transport, Access & Parking	✓	✓	✓	✓	✓
Waste Treatment and Management Facilities	✓				

[2] This assessment summary refers to Version 2026.1 of the Code, published 15 January 2026.

[3] Excludes Zones, Subzones and Overlays that apply to subject land parcels but not to the Project's stipulated assessment area.

Zone or Overlay	Relevant Project Element				
	Desalination plant and marine infrastructure	Transfer pump stations and water storages	Main transfer / Carrapateena pipelines	Power supply	Construction camps and materials laydown
Workers Accommodation and Settlements					✓
Zones and Subzones					
Coastal Waters and Offshore Islands	✓				
Commonwealth Facilities			✓		
Conservation	✓		✓		
Visitor Experience Subzone					
Remote Areas	✓	✓	✓	✓	✓
Rural			✓		
Strategic Employment					✓
Overlays					
Airport Building Heights (Aircraft Landing Area)			✓		
Building Near Airfields			✓		
Coastal Areas	✓				
Gas and Liquid Petroleum Pipelines			✓	✓	
Hazards – Bushfire (Outback)		✓	✓	✓	✓
Hazards – Bushfire (Regional)	✓		✓	✓	✓
Hazards (Flooding)					✓
Hazards – Flooding (Evidence Required)	✓	✓	✓	✓	✓
Key Outback and Rural Routes		✓	✓	✓	✓
Native Vegetation	✓	✓	✓	✓	✓
Significant Interface Management			✓		
Water Resources	✓	✓	✓	✓	✓

7.6.2 Summary of assessment of Zones and Subzones

The Project demonstrates a mixed level of consistency with the relevant Zones and Subzones, reflecting its scale and linear nature across multiple land use contexts. Where inconsistencies are identified, these are primarily associated with the inherent characteristics of the infrastructure, rather than avoidable siting or design decisions. Applicable elements of the desalination plant (applied spatially and with regard for the Project Assessment Area) are assessed to be consistent with the Coastal Waters and Offshore Islands Zone and not inconsistent with the Remote Areas Zone, but inconsistent with the Conservation Zone and its associated Visitor Experience Subzone. The Project is assessed to be not inconsistent with the Commonwealth Facilities Zone and the Rural Zone, with applicable Project infrastructure having no material impact on the functionality of those Zones.

In areas where inconsistencies with applicable Zones are observed, no broader adverse impact is likely on the functionality or desired outcomes of those Zones outside the Project's construction footprint. Overall it is considered that the Project on balance does not adversely affect the intended use of applicable Zones, and incorporates adequate separation distances from sensitive land uses (or Zones intended principally to accommodate sensitive land uses) to minimise the potential of adverse impacts to the intended functionality of adjacent land uses.

At Mullaquana Station, development of desalination plant intake and outfall infrastructure and the intake pump station finds non-compliance with the Visitor Experience Subzone and the Conservation Zone, as these elements are not principally for the conservation and enhancement of the natural coastal environment, nor fit the desired development pattern of the Conservation Zone. However, environmentally important coastal features have been avoided through the placement of most development proposed within the Zone and Subzone in subjacent land, and by the placement of above-ground infrastructure landward of identified coastal native vegetation. It is noted that the precise location of temporary dewatering and stockpiling areas are not finalised, and these may occur outside the Conservation Zone. Where these activities occur outside the Conservation Zone, the degree of their inconsistency with the Remote Areas Zone is less significant.

The intake pump station is necessarily co-located with the coast, as are earthworks associated with the launch of TBM equipment for construction of the underground intake and outfall tunnel. However, on balance, the proposed construction methodology preserves habitat and the environmental values of the coastal fringe, including mangrove areas and the active intertidal zone which may otherwise be substantially disturbed by earthworks by alternative construction methodologies.

Intake and outfall infrastructure traversing the coastal fringe is necessarily placed within the Coastal Waters and Offshore Islands (CWOI) Zone. The under-seabed location of the majority of infrastructure within the CWOI Zone and the temporary nature of jetty-like and pontoon-like activity associated with construction, together with the proactive avoidance of sensitive seagrass areas, marine parks, sensitive marine ecosystems and aquaculture achieves consistency with the CWOI Zone.

In summary, the identified inconsistencies arise from the scale and functional requirements of the infrastructure, including necessary co-location of the infrastructure with the coastal interface. Notwithstanding this, the design and construction methodologies minimise

disturbance to the extent reasonably practicable and maintain the broader intent of the Zones and Subzones.

Table 7-5 presents a summary of the assessment provided in full as part of Appendix E-1 Planning Assessment Report. Zones and Subzones relevant to the Project assessment area are shown in Figure 7-1 and Figure 7-2.

Table 7-5: Zones and Subzones assessment summary

Zones / Subzones and Performance Outcomes	Assessment summary
Desalination Plant and Marine Infrastructure	
• Coastal Waters and Offshore Islands Zone PO 1.1, 2.6, 3.1, 3.2, 3.3, 3.4, 3.5 • Conservation Zone PO 1.1, 1.2, 3.1, 3.2 4.1, 4.2, 4.4, 5.1, 5.2, 5.3, 5.6, 7.1 Visitor Experience Subzone PO 1.1, 1.2 • Remote Areas Zone PO 1.1, 2.1, 2.2	The CWOI Zone applies to the intake and outfall pipelines and tunnel construction, and seabed-mounted riser and diffuser infrastructure in the marine environment. Intake and outfall infrastructure is assessed to be **consistent** with the CWOI Zone, on the basis of detailed control measures and siting of infrastructure, and the comparability of 'float and sink' construction methodology for seabed-mounted assets with Jetty or Aquaculture developments, which are envisaged in the Zone. The intake pump building, TBM launch infrastructure (including excavation) and associated pipeline components occur in the Conservation Zone (and Visitor Experience Subzone). These Project assets are assessed to be **inconsistent** with the Zone and Subzone, finding significant variance with a majority of applicable Performance Outcomes. However, the extent of this variance is partly ameliorated due to the remoteness of the subject land and relatively low chance that Project infrastructure could adversely impact the capacity of the Zone and Subzone more broadly to function as intended. The underground installation of substantial Project infrastructure via TBM limits the Project's potential for adverse impacts on the desired outcomes of both the CWOI and Conservation Zones. The desalination plant occurs in the Remote Areas Zone. While desalination plants are not a specified form of development, the scale and intensity of a desalination plant is comparable with forms of development envisaged by the Zone, and the Project is generally able to achieve compliance with a majority of the relevant Performance Outcomes, resulting in an assessment of **not inconsistent.**
Water Transfer System – main transfer and Carrapateena lateral branch pipelines	
• Commonwealth Facilities Zone PO 1.1 • Conservation Zone PO 1.1, 1.2, 3.1, 4.1, 4.2, 4.4, 5.1, 5.2, 7.1 • Remote Areas Zone PO 1.1, 1.2	The majority of pipeline infrastructure associated with the water transfer system occurs in the Remote Areas Zone, including the entirety of the Carrapateena lateral branch pipeline. The water transfer system is an envisaged form of development within the Zone, and is therefore assessed as **consistent** with the Zone. The main transfer pipeline traverses the Commonwealth Facilities Zone near Whyalla. While the Project has the potential to limit future uses of land over and adjacent to the pipeline easement, the Project

Zones / Subzones and Performance Outcomes	Assessment summary
• Rural Zone PO 1.1, 4.3	also has the potential to provide benefits to the ongoing use of land envisaged by the Zone. The Project is therefore **not inconsistent** with the Zone. Pipeline infrastructure is **not inconsistent** with the Conservation Zone where interaction occurs near Roxby Downs, and is not expected to adversely impact the desired outcomes or proper functioning of the Zone outside the disturbance footprint. Pipeline infrastructure in the Conservation Zone is limited in scale, and similar to existing infrastructure in the locality. The water transfer system (main transfer pipeline) is **not inconsistent** with the Rural Zone. The water transfer system interacts with the Rural Zone in two localities, north of Whyalla (land to which the Significant Interface Management Overlay also applies), and west of Port Augusta. Industry and related or associated activities of a comparable scale and form to the pipeline are envisaged in the Rural Zone. The buried nature of the pipeline and its proposed alignment outside of townships and away from developed areas limits its potential impact on the functionality of the Zone.
Water Transfer System – transfer pump stations and water storages	
• Remote Areas Zone PO 1.1, 2.1, 2.2	Transfer pump stations and water storages assessed by the Planning Assessment (Appendix E-1) all occur in the Remote Areas Zone. Large buildings can be incongruous with a natural landscape. Areas of high conservation value have been avoided, however in some localities, substantial setbacks from public roads are not possible to achieve due to the necessity for co-location with pipeline infrastructure. Visual amenity impacts arising from transfer pump stations are expected to be readily mitigated through design and finish of structures, which broadly are of a scale comparable to agricultural buildings. Transfer pump stations and water storages are assessed as **consistent** with the Remote Areas Zone.
Power supply	
• Remote Areas Zone PO 1.1, 2.1, 2.2	Energy generation, storage and pipeline infrastructure are envisaged within the Zone. All proposed power supply assets are proposed in the Remote Areas Zone. Power supply infrastructure is **consistent** with the Remote Areas Zone.
Construction Camps and Laydown Areas	
• Remote Areas Zone PO 1.1, 2.1, 2.2, 3.1 • Strategic Employment Zone PO 1.1, 3.3, 6.1	Workers accommodation is an envisaged and supported form of development in the Remote Areas Zone, satisfying DTS/DPF 1.1. Noting that the final location and layout of construction camps and materials laydowns within the Remote Areas Zone are yet to be finalised, it is expected that all other performance outcomes relevant to workers' accommodation will be readily achievable, resulting in an 'in principle' assessment of **consistent**.

Zones / Subzones and Performance Outcomes	Assessment summary
	It is likely that land parcels north of Whyalla will be utilised for materials and equipment storage and laydown, within the Strategic Employment Zone. This use of land is temporary by nature, and preferences land parcels previously used for similar purposes. The use of land for materials laydown temporarily restricts the development of land for other envisaged uses, however the provision of equipment and materials laydown areas in proximity to port facilities and major transport routes supports the efficient use of land sought by the Zone. It is expected that materials laydown areas would be readily able to achieve consistency with all relevant performance outcomes of the Strategic Employment Zone, and are therefore, noting the above, assessed as **not inconsistent** with the Zone.

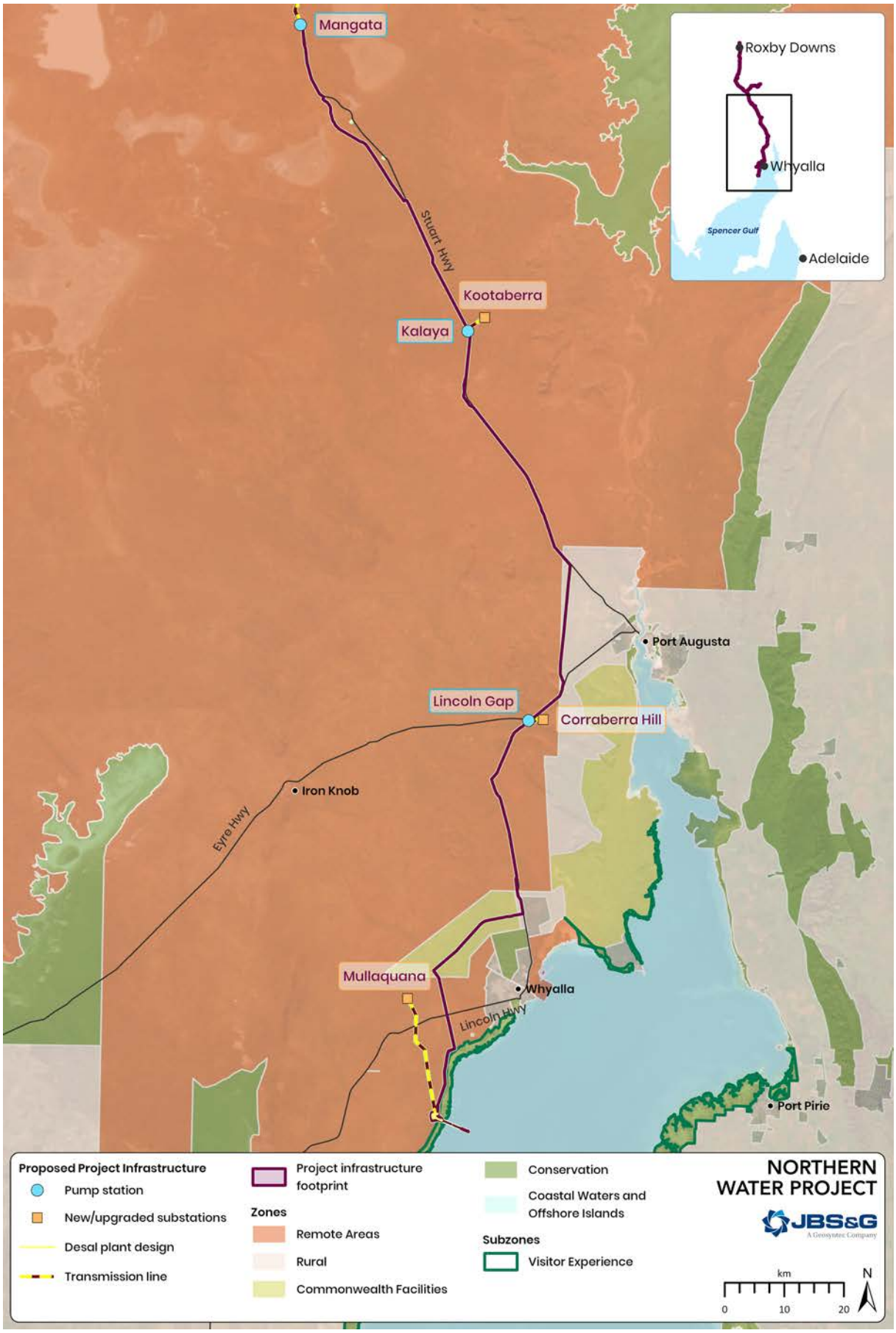


Figure 7-1: Zones and Subzones in the Project Area - southern section

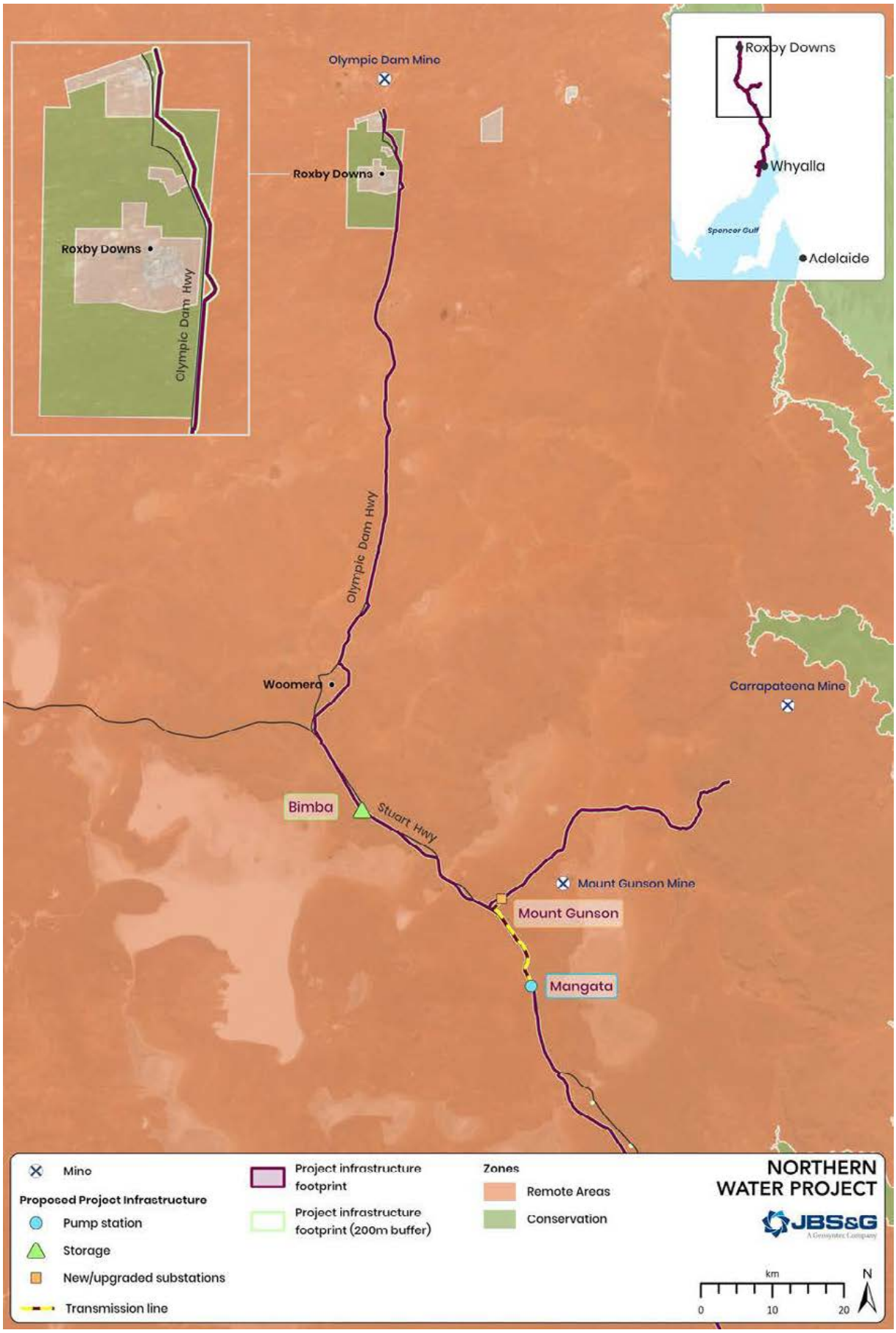


Figure 7-2: Zones and Subzones in the Project Area - northern section

7.6.3 Summary assessment of Overlays

The assessment has found a general level of consistency with Overlay performance outcomes. Where inconsistencies are apparent, the Project is able to demonstrate appropriate control measures, mitigations and offsets through impact assessment in accordance with the Project's adopted mitigation hierarchy of *avoid, minimise, rehabilitate/restore, offset,* such that inconsistency with Code performance outcomes is not an indicator of an unacceptable impact to the relevant environmental value.

Development within the Coastal Areas Overlay at Mullaquana Station avoids environmentally important coastal features by means of underground installation, and is set back a sufficient distance from the active intertidal zone to prevent interruption to natural coastal processes. Development is also sited to minimise the potential for future damage due to increasing sea levels, coastal inundation or erosion. However, excavation is proposed within the Coastal Areas Overlay to an extent exceeding 9 m^3, and the presence of the intake pump building in the Coastal Areas Overlay is an incongruous feature which does not find consistency with the desired outcome of the Overlay.

Temporary disturbance activities including stockpiling of excavation, TBM and dredge spoil may be wholly or partly located within the Overlay. It is noted that the precise location of temporary dewatering and stockpiling areas are not finalised. However, proposed excavation spoil stockpiling and drying is not inconsistent with the Coastal Areas Overlay, since the activity avoids impacts to the marine and coastal environment, would be temporary in nature, and would be entirely located outside of the active intertidal zone.

All relevant components of the Project demonstrate consistency with, or are able to demonstrate consistency with, the Hazards Overlays for both Bushfire (both Regional and Outback), and Flooding, through appropriate siting, alignment and construction methodology. Additionally, the Project demonstrates consistency with the Airport Building Heights and Building Near Airfields Overlays. Independently-sited communications towers, should they be required and are proposed within these Overlays, should have regard for proximity to aviation facilities. Communications towers, should they occur within these Overlays, would be the tallest structures associated with the Project within the Overlays.

The Project is broadly able to remain consistent with the objectives of the Key Outback and Rural Routes Overlay, through appropriate siting and design of access track interfaces with State maintained roads. Referral to the Commissioner of Highways and preparation of traffic management procedures will ensure the continued safe operation of the public road and rail network. Detailed design of relevant components of the Project in accordance with the General Development Policies relevant to access and traffic management will support the Project's consistency with the Key Outback and Rural Routes Overlay, as well as traffic and access performance outcomes expressed through other Zones and Overlays.

The Project necessitates the clearance of native vegetation. Some Project infrastructure within the Native Vegetation Overlay finds inconsistency with specific performance outcomes of the Overlay, however State-significant native vegetation is avoided and the Project proposes proportionate offset strategies in accordance with the mitigation hierarchy. Further, the siting of the desalination plant, water transfer system infrastructure and power supply infrastructure has considered land previously disturbed for grazing. Wherever

practicable, existing disturbed areas, access tracks, and infrastructure are utilised to co-locate Project infrastructure to minimise new disturbance and vegetation clearance.

The water transfer system (pipeline infrastructure) generally finds inconsistency with the Water Resources Overlay, due largely to the necessity for project infrastructure to disturb natural drainage lines, undertake dewatering for underground pipeline installation works, or (where pipeline infrastructure is assumed to be installed above-ground) present the potential for a physical barrier to surface water flows. It is noted that in relation to the Carrapateena lateral branch pipeline, interactions with drainage features and roads are anticipated to be managed through horizontal directional drilling, avoiding impediment to surface water flows.

Erosion and sedimentation of surface water flows (predominantly referring to stormwater) are also possible within the cleared construction corridor for pipeline infrastructure, including the export of sediment to natural drainage lines down-gradient from Project infrastructure. Inconsistency with the Water Resources Overlay is considered able to be controlled through the implementation of appropriate construction and operational management procedures, and engineering solutions which minimise potential impacts. The residual impacts of above-ground pipeline segments to surface water are assessed in Chapter 13 Surface Water as *minor/negligible*. Construction works are also able to be staged to avoid periods of heavy rainfall.

Disturbance is demonstrably minimised to the greatest practicable extent through the adoption of construction methodologies which minimise impacts to watercourse banks and flow regimes. Disturbance of watercourse banks, beds or floodplains for any purpose other than environmental protection or enhancement gives rise to inconsistency with the relevant performance outcomes of the Overlay. In this instance, inconsistency with the performance outcomes is not indicative of an unacceptable risk to surface hydrology (see Appendix E-1 Planning Assessment Report. Figure 7-3 and Figure 7-4 present selected Overlays which interact with the Project's stipulated assessment area. Overlays which apply uniformly to the Project assessment area have been excluded from these figures.

Table 7-6 summarises the assessment against the relevant Overlays presented in detail in Appendix E-1 Planning Assessment Report. Figure 7-3 and Figure 7-4 present selected Overlays which interact with the Project's stipulated assessment area. Overlays which apply uniformly to the Project assessment area have been excluded from these figures.

Table 7-6: Overlays Assessment Summary

Overlay and Performance Outcomes	Assessment Summary
Desalination Plant and Marine Infrastructure	
• Coastal Areas Overlay PO 2.2, 2.3, 2.4, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 5.4	**The desalination plant is not inconsistent with the Overlay** Relevant elements of the Project are consistent with a majority of Performance Outcomes of the Coastal Areas Overlay (relating to the intake and outfall building, landward components of intake and outfall infrastructure). However, excavation within the overlay is required to construct the TBM launch box, and tunnel-boring also occurs within the Overlay (albeit sub-surface). While the scale and intensity of activities required are not fundamentally compatible with the desired

Overlay and Performance Outcomes	Assessment Summary
	pattern of development sought by the Overlay, the Project is not assessed to unduly detract from the purpose, management or amenity of the broader Overlay with appropriate mitigations and controls in place.
• Hazards (Bushfire – Regional) Overlay PO 1.1, 2.1, 5.1, 5.3 • Hazards (Flooding – Evidence Required) Overlay PO 1.1, 2.1	**The desalination plant is consistent with the Overlays.** The desalination plant and associated terrestrial infrastructure are located within the Hazards (Bushfire – Regional) Overlay and the Hazards (Flooding – Evidence Required) Overlay. Relevant elements of the Project are consistent with all relevant performance outcomes of these Overlays.
• Native Vegetation Overlay PO 1.1, 1.2, 1.4	**The desalination plant is not inconsistent with the Overlay** The desalination plant and associated infrastructure (including marine and coastal infrastructure) are consistent with the relevant performance outcomes of the Native Vegetation Overlay, however as vegetation clearance is unavoidable, the relevant aspects of the Project are assessed as not inconsistent with the Overlay. An offset management plan will be referred to the Native Vegetation Council as part of EIS assessment.
• Water Resources Overlay PO 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8	**The desalination plant is consistent with the Overlay** The Water Resources Overlay applies only to components of the desalination plant which are positioned underground. Above-ground infrastructure including the TBM launch box are located entirely outside the Overlay. Underground components of the Project are consistent with the Overlay, through avoidance of interference with the natural surface water cycle. Potential impacts to surface water quality arising from earthworks and other construction activities are controlled through the Soil, Erosion and Drainage Management Plan as described in Chapter 13 Surface Water (see Section 13.5).
Water Transfer System – main transfer and Carrapateena lateral branch pipelines	
• Airport Building Heights (Aircraft Landing Area) Overlay PO 1.1 • Building Near Airfields Overlay PO 1.1, 1.2	**The water transfer system is consistent with the Overlays** Water transfer system infrastructure occurring within the Airport Building Heights and Building Near Airfields Overlays is limited to a section of underground pipeline at the Project's northern extent adjacent to Olympic Dam airstrip (both Overlays), and a section of underground pipeline east of the Woomera airstrip (Building Near Airfields Overlay only). Construction and operation of the pipeline is not expected to pose a hazard to aircraft navigation or safety owing to the underground placement of infrastructure.
• Gas and Liquid Petroleum Pipelines Overlay PO 1.3	**The water transfer system is not inconsistent with the Overlay** A segment of underground infrastructure occurs within the Overlay in the Lincoln Gap locality. An existing underground liquid petroleum pipeline (the Santos-operated Moomba to Port Bonython Liquids Line (PL 2) is present in the area, protected by the Overlay. The Overlay seeks to protect strategic gas infrastructure from encroachment by

Overlay and Performance Outcomes	Assessment Summary
	development and, by extension, seeks to manage risk to life, environment and energy security through avoidance of activities which could create or exacerbate hazards. Various management plans, including a Construction phase and O&M phase Interface Management Plan, will identify measures to avoid risk to life via damage to adjacent gas infrastructure. This is expected to include infrastructure/pipeline identification and verification survey prior to ground disturbance, plant and materials handling techniques, and incorporating induction and pre-start procedures.
• Hazards (Bushfire – Outback) Overlay PO 2.1 • Hazards (Bushfire – Regional) Overlay PO 1.1, 5.1 • Hazards (Flooding – Evidence Required) Overlay PO 1.1	**The water transfer system is consistent with the Overlays** The entirety of the water transfer system occurs within the Hazards (Flooding – Evidence Required) Overlay, and *either* the Hazards (Bushfire – Regional) *or* the Hazards (Bushfire – Outback) Overlay. The water transfer system is consistent with all relevant performance outcomes of these three Overlays.
• Key Outback and Rural Routes Overlay PO 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1	**The water transfer system is not inconsistent with the Overlay** Establishment of new access roads, or the upgrade of existing access roads are required for all Project assets, and were assessed collectively in the Planning Assessment Report (Appendix E-1). The Traffic Impact Assessment (Appendix J-4) made recommendations which the Project will consider, including specific recommendations for turning area treatments to State-maintained roads (see also Chapter 21 Transport and Traffic). The Planning Assessment Report concluded that sufficient opportunity exists for the Project to achieve full compliance with the Overlay.
• Native Vegetation Overlay PO 1.1, 1.2, 1.4	**The water transfer system is not inconsistent with the Overlay** Placement of the water transfer system (main transfer pipeline and Carrapateena lateral branch pipeline) will necessitate the removal of native vegetation. To the greatest extent practicable, Project infrastructure preferences placement in previously disturbed areas to minimise impacts. Due to the nature and scale of infrastructure proposed and the requirement to retain access to infrastructure, revegetation via planting of disturbed areas is not proposed. However, rehabilitation works will include a range of measures to encourage the natural regrowth of native vegetation. An offset management plan will be referred to the Native Vegetation Council as part of EIS assessment.
• Significant Interface Management Overlay PO 1.1	**The water transfer system is consistent with the Overlay** Project infrastructure occurring within the Overlay is limited to a segment of underground main transfer pipeline, in proximity to the Strategic Employment Zone and Significant Industry Subzone, north of

Overlay and Performance Outcomes	Assessment Summary
	Whyalla. The water transfer system precludes the construction of buildings within the easement, which supports the operation of the Overlay. The pipeline itself does not conflict with the operation or application of the Overlay.
• Water Resources Overlay PO 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8	**The water transfer system is inconsistent with the Overlay.** The main transfer pipeline and Carrapateena lateral branch were considered separately in this assessment, owing to the possibility of above-ground installation of the Carrapateena lateral. This was utilised as a 'worst case' scenario. The Planning Assessment Report (Appendix E-1) found that the water transfer system (main transfer and Carrapateena lateral branch pipelines) overall are inconsistent with the objectives of the Water Resources Overlay on the basis that the water transfer system requires disturbance or modification of watercourse banks or beds (including through temporary dewatering) for a purpose other than environmental protection or the enhancement or repair of those watercourses. Construction activities are temporary in nature and during ongoing operations, the degree of variance with the intent of the Overlay is expected to be manageable through implementation of surface water management plans, standard measures for erosion control at locations identified to be prone to erosion, and maintenance of natural watercourse banks and contours. Control measures for the management of impacts to watercourses during the construction phase include: • Compliance with any Water Affecting Activity Permit conditions (if applicable), • Development of a site erosion and sediment control methodology with consideration of contingencies for moderate to high flows during instream works, • Scheduling works to minimise the construction period within watercourses, • Staging of work to avoid construction activities when heavy rain events are forecast, and • Managing site works and the placement of plant and machinery to avoid erosion and the destabilisation of banks. The rehabilitation of watercourses (as with other areas of disturbance) is expected to occur as soon as practicable following construction, and will include reinstatement of natural surface flows, and the replacement of topsoil and removed vegetation where disturbed. **Main transfer pipeline** While the main transfer pipeline was assessed to be at variance with the Overlay, it was considered that the majority of this inconsistency would be observed during the construction phase, with impacts (including dewatering of groundwater in areas containing

Overlay and Performance Outcomes	Assessment Summary
	groundwater-dependent ecosystems, placement of infrastructure within watercourses, and the potential for sedimentation of surface water flows) largely confined to construction activities. Variance with the Overlay during ongoing operations is expected to be manageable through implementation of stormwater management plans, measures for sedimentation control at erosion-prone localities, and (where practicable) the avoidance of placement of infrastructure in or near drainage lines. **Carrapateena lateral branch pipeline** The Carrapateena lateral branch pipeline was assessed to be at variance with the objectives of the Overlay, where it is to be installed at surface level. This variance is of a similar magnitude to that observed for the main transfer pipeline during construction, but in the case of the Carrapateena lateral branch, predominantly arises during ongoing operations. This arises from the assumed construction methodology of surface-level placement of the pipeline, which has the potential to create a physical impediment to natural surface water flows. However, it is noted that where creek and drainage line crossings are required, this is assumed to be undertaken using horizontal directional drilling beneath those features, thus preserving the natural contours of the watercourse and minimising impacts. The assessment of impacts to surface water (see Chapter 13 Surface Water) concluded that impacts to surface water flows arising from on-ground installation of the Carrapateena lateral branch pipeline would be minor to negligible. Miscellaneous Purposes Licence (MPL) 152 applies to the entirety of the Carrapateena lateral branch pipeline and envisages water infrastructure associated with the operation of the Carrapateena copper mine. Should the Carrapateena lateral branch pipeline be installed underground, it is assessed as being materially comparable to the main transfer pipeline — that is, inconsistent with the Overlay, but with variances with the Overlay confined to the construction period.
Water Transfer System – transfer pump stations and water storages	
• Hazards (Bushfire – Outback) Overlay *No POs applicable* • Hazards (Flooding – Evidence Required) Overlay PO 1.1, 2.1	**Transfer pump stations and water storages are consistent with the Overlays** All localities for proposed transfer pump stations and water storages occur within the Overlays. No performance outcomes of the Hazards (Bushfire – Outback) Overlay are relevant to transfer pump stations or water storages, since no habitable buildings are proposed and the design and operation of access tracks will be managed in compliance with bushfire protection (access and egress) requirements. The design of transfer pump stations and water storages will incorporate stormwater management infrastructure (berms, drainage, bunding where required) to prevent ingress of stormwater

Overlay and Performance Outcomes	Assessment Summary
	to Project infrastructure or export of litter, grease or contaminants from development sites.
• Key Outback and Rural Routes Overlay PO 1.1, 2.2, 3.1, 4.1, 5.1, 6.1, 7.1	**Transfer pump stations and water storages are not inconsistent with the Overlay** The Overlay applies to all transfer pump station and water storage locations as presently proposed. The application of the Overlay to transfer pump stations and water storage locations is taken to be consistent with that discussed in relation to pipeline infrastructure, due to necessary colocation. The water transfer system as a whole, therefore, is assessed to be not inconsistent with the Overlay.
• Native Vegetation Overlay PO 1.1, 1.2, 1.4	**Transfer pump stations and water storages are not inconsistent with the Overlay** To the greatest extent practicable, Project infrastructure preferences placement in previously disturbed areas to minimise impacts, noting the necessity for colocation with pipeline infrastructure. Rehabilitation works will include a range of measures to encourage the natural regrowth of native vegetation. An offset management plan will be referred to the Native Vegetation Council as part of EIS assessment.
• Water Resources Overlay PO 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8	**Transfer pump stations and water storages are consistent with the Overlay** Pump stations are not anticipated to be subject to inundation due to watercourse adjacency or overland flows, thanks to their location in relatively flat areas at or near high points. The incorporation of finished floor levels above 1% AEP flood levels and the incorporation of stormwater controls will ensure that surface water flow rates, velocity and depth are maintained close to pre-development levels. Stormwater flows over the area will be directed away from the buildings and working areas by appropriately grading the area away from the pump station building via bunds and/or into swale drains as necessary.
Power Supply	
• Gas and Liquid Petroleum Pipelines Overlay PO 1.3	**Power supply is not inconsistent with the Overlay** A segment of overhead powerline occurs within the Overlay in the Lincoln Gap locality. An existing underground liquid petroleum pipeline (the Santos-operated Moomba to Port Bonython Liquids Line (PL 2) is present in the area, protected by the Overlay. Interactions between Project infrastructure and existing pipelines are discussed in Chapter 9 Use of Land and Marine Waters and are expected to be readily manageable through construction management planning to avoid or minimise risks. Various management plans, including a Construction phase and O&M phase Interface Management Plan, will identify measures to avoid risk to life via damage to adjacent gas infrastructure.

Overlay and Performance Outcomes	Assessment Summary
• Hazards (Bushfire – Outback) Overlay PO 2.1 • Hazards (Bushfire – Regional) Overlay PO 1.1, 2.1, 5.1, 5.3 • Hazards (Flooding – Evidence Required) Overlay PO 1.1, 2.1	**Power supply is consistent with the Overlays** The entirety of the power supply system occurs within the Hazards (Flooding – Evidence Required) Overlay, and *either* the Hazards (Bushfire – Regional) *or* the Hazards (Bushfire – Outback) Overlay. The power supply system is consistent with all relevant performance outcomes of these three Overlays.
• Key Outback and Rural Routes Overlay PO 1.1, 2.2, 3.1, 4.1, 5.1, 6.1, 7.1	**Power supply is not inconsistent with the Overlay** All power supply infrastructure occurs within the Overlay with the exception of: • Portions of the Mullaquana 132 kV overhead transmission line • Portions of the Pandurra 275 kV overhead transmission line • Corraberra Hill substation upgrade The application of the Overlay to power supply infrastructure locations is taken to be consistent with that discussed in relation to pipeline infrastructure, due to necessary colocation and the identical nature of access requirements. Power supply infrastructure, therefore, is assessed to be not inconsistent with the Overlay.
• Native Vegetation Overlay PO 1.1, 1.2, 1.4	**Power supply is not inconsistent with the Overlay** The Project will result in the removal of native vegetation. Locations of relevant Project elements may continue to be refined as the Project progresses via engagement with stakeholders and route analysis. An offset management plan will be referred to the Native Vegetation Council as part of EIS assessment.
• Water Resources Overlay PO 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8	**Power supply is consistent with the Overlay** The Overlay applies to the majority of power supply infrastructure, predominantly as a broad application of the Overlay to large areas of the State's inland. Power supply infrastructure within the Overlay is readily able to achieve compliance with the relevant performance outcomes of the Overlay through micro-siting of transmission tower footings and inclusion of stormwater flow controls consistent with transfer pump stations and water storages.
Construction Camps and Laydowns	
• Hazards (Bushfire – Outback) Overlay PO 1.1, 2.2 • Hazards (Bushfire – Regional) PO 1.1, 2.1, 5.1, 5.3	**Construction camps and laydowns are consistent with the Hazards (Bushfire – Outback) Overlay.** The Overlay applies to the Project assessment area generally north of the Lincoln Gap, and thus is taken to apply to the majority of potential sites for construction camps and materials laydown areas (other than those specifically discussed occurring in the Hazards (Bushfire – Regional) Overlay). Consistency with all relevant performance outcomes is readily achievable.

Overlay and Performance Outcomes	Assessment Summary
	Materials laydown areas (Whyalla North) are consistent with the Hazards (Bushfire – Regional) Overlay. The Overlay applies to materials laydown areas north of Whyalla. No habitable buildings are proposed in these areas. The use of land for materials and equipment laydown will be temporary, with no ongoing impact to the envisaged land uses anticipated. Consistency with the Overlay is readily achievable.
• Hazards (Flooding) Overlay PO 2.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 4.1 • Hazards (Flooding – Evidence Required) Overlay PO 1.1, 2.1	**Construction camps and laydowns are consistent with the Hazards (Flooding – Evidence Required) Overlay.** In the absence of specific surface water modelling for all potential sites, and having regard for the terrain and soil types encountered along the alignment of the Project area, it is anticipated that compliance with PO 1.1 and PO 2.1 would be readily achievable through elevation of buildings and structures intended to be habitable, or to contain or store hazardous materials, at least 300mm above natural ground level, or incorporation of site drainage works to direct stormwater away from such structures. The selection of construction camp and materials laydown areas preferences previously disturbed areas which are more likely to have pre-existing stormwater management in place (swales and berms). The avoidance of drainage lines and low-lying areas further mitigates risk. **Materials laydown areas (Whyalla North) are consistent with the Hazards (Flooding) Overlay.** Materials laydown areas (Whyalla North) are by nature a temporary use of land, which will not create new allotments, nor create new permanent land uses susceptible to risks posed by flood potential. Materials laydown areas are assessed as not inconsistent with PO 2.1. No flood protection works are proposed, consistent with PO 3.1. Due to the nature of materials laydown areas, no significant new impermeable surface treatment is proposed, other than the roof area of structures intended to store listed substances (if any). It is reasonably foreseeable that crushed rock, or other similarly permeable surface treatment, would be sufficient to mitigate the potential for machinery bogging or drag-out, while avoiding loss of flood storage or impacts to adjoining properties through stormwater diversion – consistent with PO 3.2 and PO 3.3. Significant pre-existing flood and stormwater management infrastructure is pre-existing in the locality of the Whyalla North materials laydown areas, including surface level and underground drainage systems, stormwater basins and culverts designed to retain and/or divert stormwater. Flood mapping undertaken for the Whyalla Stormwater Management Plan (Tonkin 2019) indicates that the subject land is not expected to experience inundation under the 100-year ARI rainfall scenario, achieving compliance with PO 3.4 and PO 3.5. Fencing installed around the materials laydown areas would be temporary construction fencing, of a type unlikely to impede floodwaters, should they occur, consistent with PO 3.6.

Overlay and Performance Outcomes	Assessment Summary
	Materials laydown areas will be utilised primarily for the temporary storage of construction equipment, materials and associated uses, managed by the DBOM contractor. Compliance with the relevant Australian Standards (such as AS 1940:2017 T*he storage and handling of flammable and combustible liquids*) and relevant EPA guidelines including EPA 080/16 *Bunding and spill management* ensures that materials which have the potential to impact on surface water quality are retained in-situ, consistent with PO 4.1, noting that inundation of the subject land is not predicted under the 100-year ARI scenario (Tonkin 2019).
• Key Outback and Rural Routes Overlay PO 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1	**Construction camps and laydowns are not inconsistent with the Overlay.** The Overlay applies to the majority of potential construction camp and materials laydown areas (with the exception of the Whyalla North materials laydown areas). Due to the proximity of other potential camp and laydown areas to the water transfer system, application of the Overlay to construction camps and laydowns is taken to be consistent with that discussed in relation to pipeline infrastructure, due to necessary colocation. Construction camps and laydowns, therefore, are assessed to be not inconsistent with the Overlay.
• Native Vegetation Overlay PO 1.1, 1.2, 1.4	**Construction camps and laydowns are not inconsistent with the Overlay.** Locations of relevant Project elements may continue to be refined as the Project progresses via engagement with stakeholders, and site analysis. An offset management plan will be referred to the Native Vegetation Council as part of EIS assessment.
• Water Resources Overlay PO 1.1, 1.2, 1.3, 1.5, 1.6, 1.7, 1.8	**Construction camps and laydowns are consistent with the Overlay.** Subject to site selection, consistency with all relevant performance outcomes is readily achievable through the avoidance of construction or materials placement within identified drainage lines or watercourses.

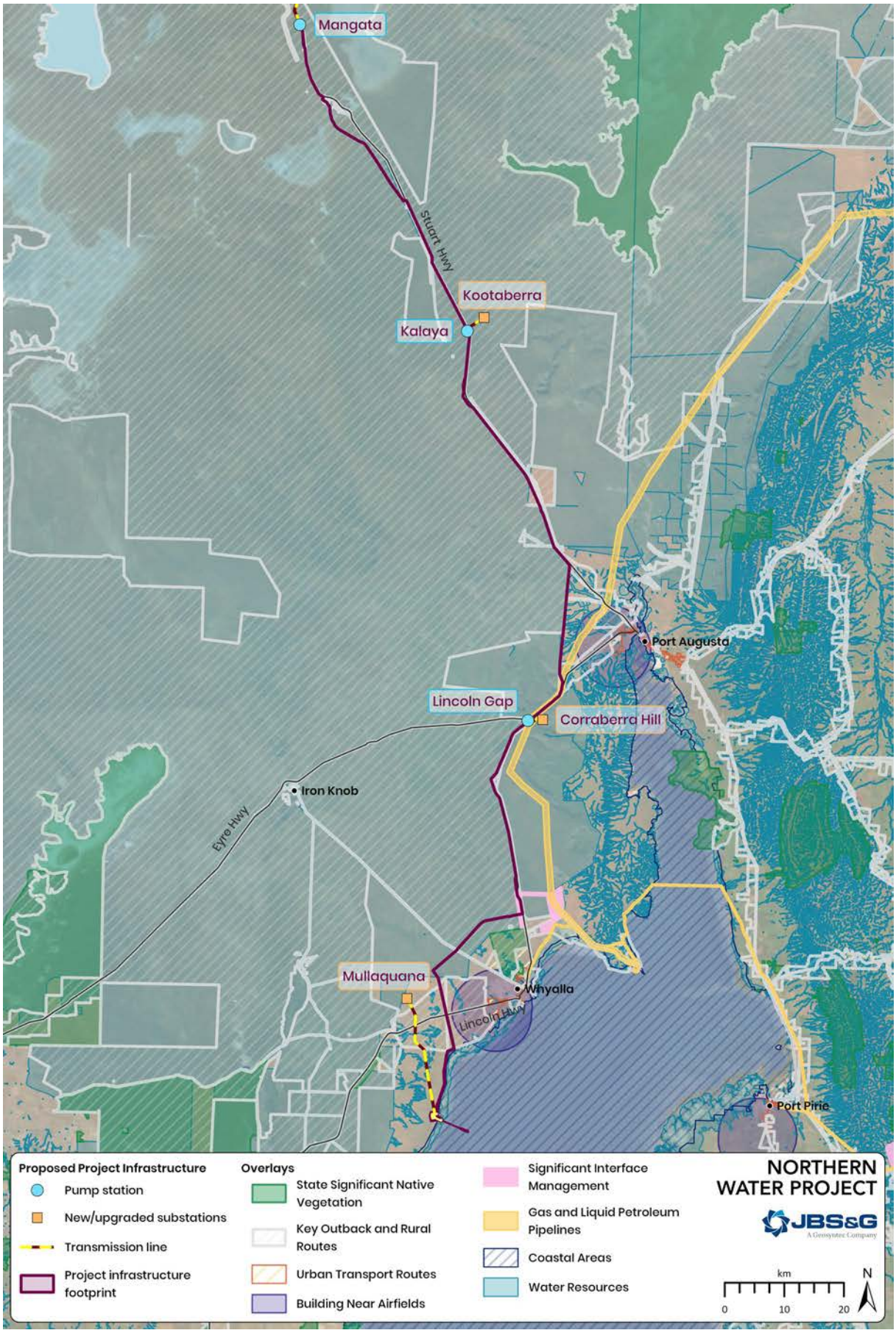


Figure 7-3: Selected Overlays – southern section

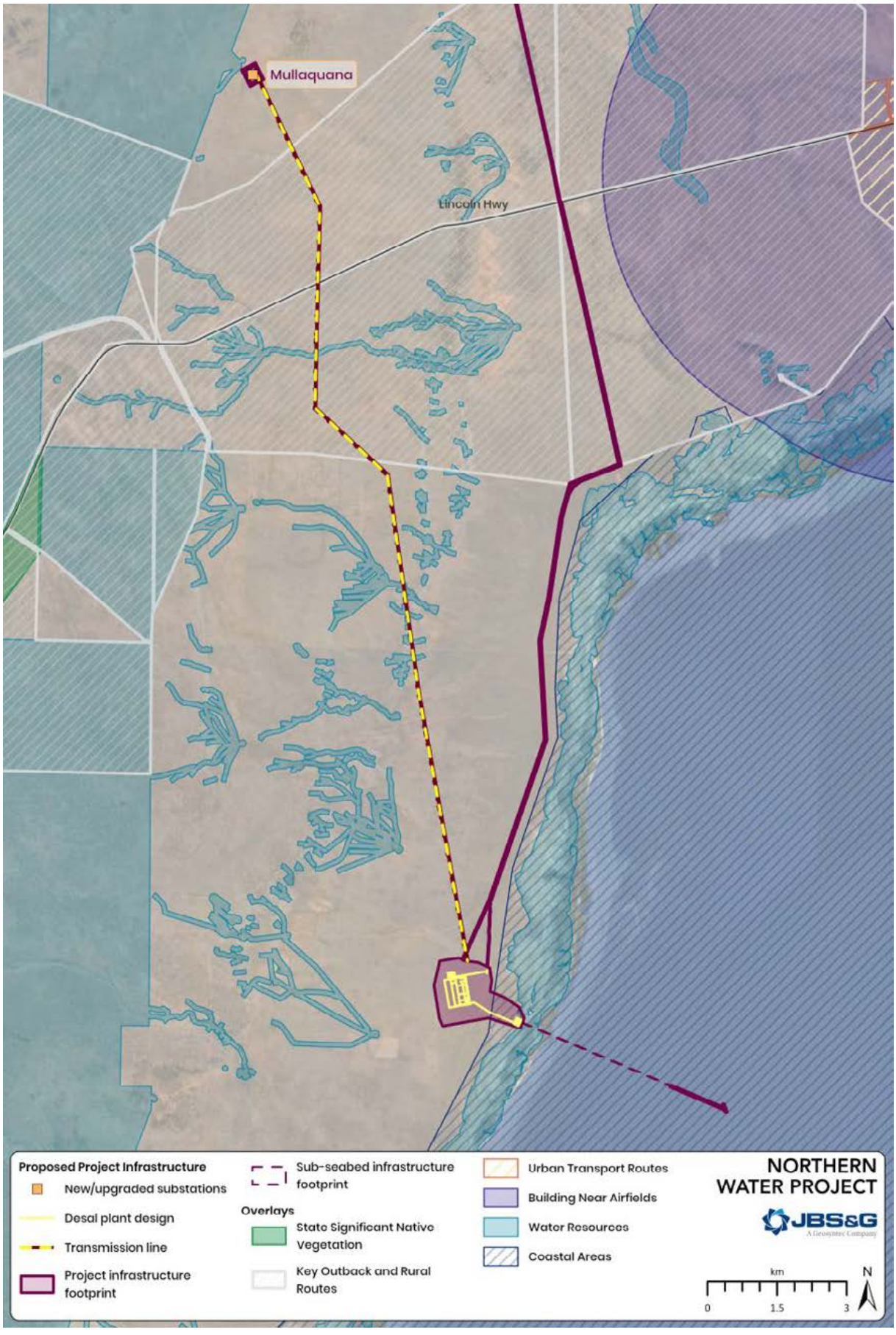


Figure 7-4: Selected Overlays – desalination plant



Figure 7-5: Selected Overlays - Lincoln Gap pump station

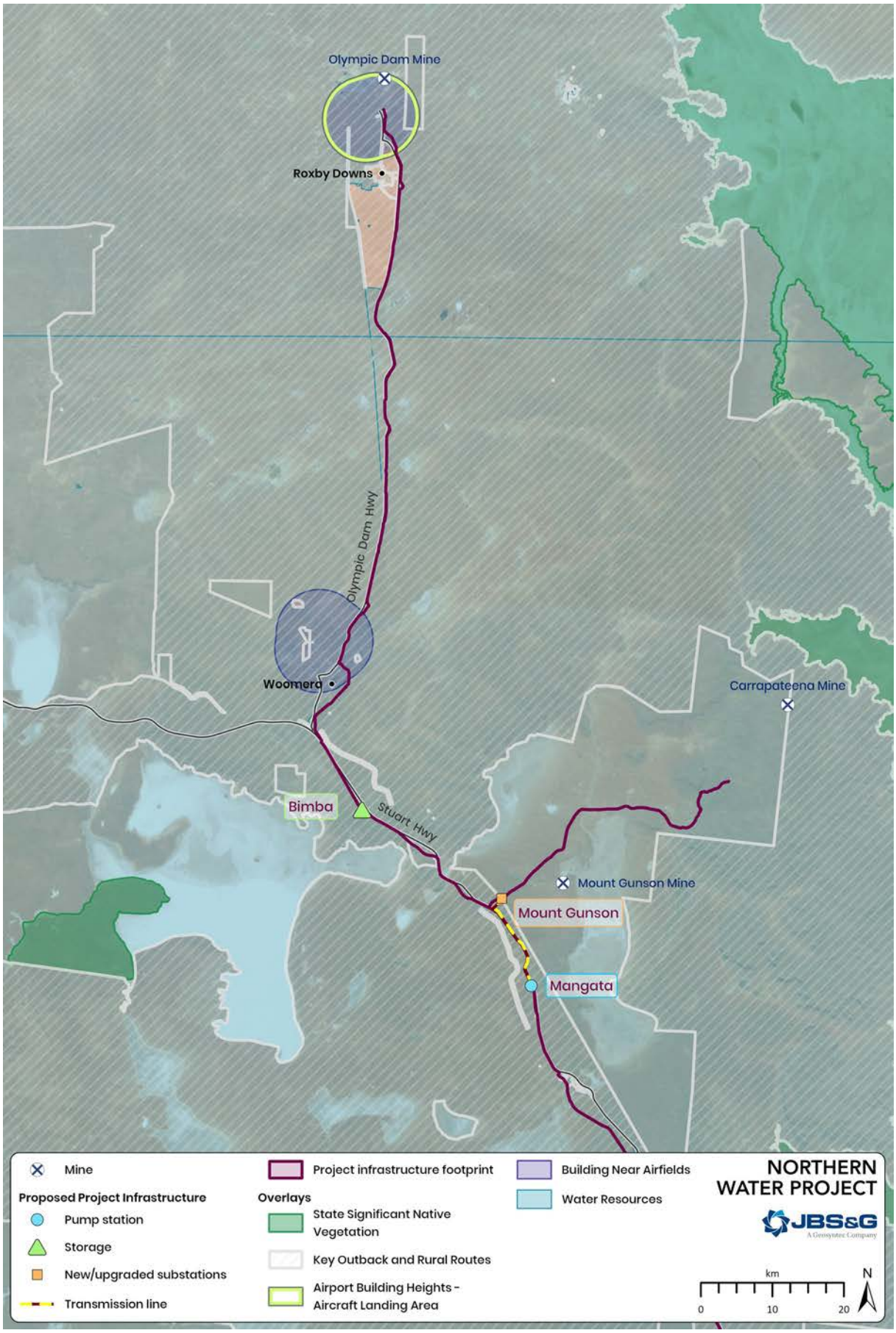


Figure 7-6: Selected Overlays -northern section

7.6.4 General Development Policies

The GDPs defined in Part 4 of the Code provide a range of development-specific criteria against which aspects of development must be assessed. The GDPs are applied to all relevant development and are not applied spatially. Table 7-7 provides a summary of assessment conclusions detailed in Appendix E-1 Planning Assessment Report.

Table 7-7: General Development Policies assessment summary

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
Clearance from Overhead Powerlines ***The Project is consistent with the GDP***	
PO 1.1: **Project is consistent with all relevant performance outcomes.** At several points along the Project assessment area, linear infrastructure (both buried water transfer pipeline and proposed power supply infrastructure) occurs adjacent to, or crosses, existing overhead powerlines. Proposed above-ground structures proximate to existing overhead powerlines comprise electricity substations, whose construction will be subject to approval by the Technical Regulator. During the construction phase, adequate separation from existing overhead powerlines is required to be maintained by construction equipment, vehicles and personnel. Satisfaction of the relevant criteria of the *Electricity Act 1996* are achievable through approval of the Project by the Technical Regulator, and standard construction management procedures.	Chapter 25 Hazards and Risks
Design ***The Project is not inconsistent with the GDP, notwithstanding inconsistencies with Landscaping and Earthworks performance outcomes. Where inconsistencies are present, no material impact to any sensitive receiver is anticipated.***	
External Appearance - PO 1.4, 1.5: **The Project is consistent with the relevant performance outcomes.** Building layouts will be simple, orderly and aesthetically pleasing in appearance, with due consideration for the incorporation of plant and equipment into building profiles, and the appropriate siting of outdoor storage, waste management, loading and service areas. Buildings will utilise modular construction, where appropriate and efficient, and subject to final construction planning and sequencing have the capacity to be finished in matte, natural colours complementary to the landscape in which they are sited.	Chapter 5 Project Siting, Alignment and Optimisation Chapter 6 Project Description Chapter 9 Use of Land and Marine Waters Chapter 11 Marine Environment Chapter 12 Soils and Landform Chapter 13 Surface Water Chapter 14 Groundwater
Landscaping - PO 3.1, 3.2: **The Project is inconsistent with the relevant performance outcomes.** Soft landscaping is generally considered to be unnecessary or unfeasible, given the scale and nature of the Project, the arid climate of the receiving environment, the remoteness of most assets, and significant separation distances from most sensitive receptors. No part of the Project is intended to be utilised by the general public. The Project will support low intervention rehabilitation of disturbed areas not required during operations, enabling	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
the regrowth of native vegetation which can assist with stormwater infiltration, provide shade and contribute to biodiversity.	Chapter .20 Landscape and Visual Amenity Chapter 21 Transport and Traffic Chapter 24 Climate Change and Sustainability Chapter 26 Environmental Management Framework
Environmental Performance - PO 4.1, 4.2, 4.3: The Project is consistent with the relevant performance outcomes. Compliance with PO 4.1, PO 4.2 and PO 4.3 is expected to be readily achievable through the siting and layout of temporary workers' accommodation, which is additionally discussed in relation to the *Workers Accommodation and Settlements GDP*. **Water Sensitive Design - PO 5.1:** *See Water Sensitive Design – All Non Residential Development (PO 31.1, 31.2)*	
On-site Waste Treatment Systems - PO 6.1: The Project is consistent with the relevant performance outcomes. On-site wastewater treatment systems will be required for a number of Project assets and at multiple locations throughout the construction and operational phases. The collection and treatment of human wastewater arising from construction camps and temporary on-site amenities will occur without discharge of effluent to the environment, consistent with PO 6.1. Where wastewater from dewatering of tunnelling, excavation or dredge spoil is generated, a range of options are available for the management of water from the dewatering process, dependent on the quality of the material. This is further discussed in relation to the *Waste Treatment and Management Facilities GDP*.	
Carparking Appearance - PO 7.2, 7.4, 7.5, 7.6, 7.7: The Project is not inconsistent with the relevant performance outcomes. Car parking and vehicle access are discussed in *Transport, Access and Parking* below. Project infrastructure is not intended to be publicly accessible and, owing to its relative remoteness from sensitive receptors, is not considered likely to present adverse amenity impacts arising from car parking. As such, soft landscaping is not proposed as part of Project design. The Project is able to achieve consistency with the relevant performance outcomes through separation distance from sensitive receptors.	
Earthworks and Sloping Land - PO 8.1: The Project is inconsistent with the relevant performance outcomes. Earthworks to accommodate most above-ground Project assets including access tracks, and the gradient of access tracks, are expected to be relatively minor, given the topography of land is flat-to-gently undulating throughout the Project area. Longitudinal grades associated with access tracks have been limited to 8% for the Reference Design (GHD 2025a). Earthworks are required to install the water transfer system utilising a trench and backfill technique, which preserves as far as reasonably practicable naturally occurring surface-level soils. Disturbance to natural topography arising from the Project overall is considered to not be inconsistent with the GDP.	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
Earthworks to construct the TBM decline and launch box occur within the Coastal Areas Overlay as noted above, and exceed a total combined vertical height of 2 m. The decline and launch box design contemplates the management of stormwater by inclusion of a sump. Excess spoil generated from excavation and tunnelling works will be re-used on site (subject to material quality), including in the construction of the platform on which the desalination plant infrastructure will be constructed, backfilling of the box cut and construction of a permanent water storage. This has regard for the Project's resilience to projected future climate-related risks, ensuring that Project assets are adequately protected from natural hazards.	
Massing - PO 15.1: **The Project is consistent with all relevant performance outcomes.** The Project achieves general consistency with PO 15.1 largely through the remoteness of the desalination plant and water transfer pump stations. There are limited public roadways from which Project infrastructure is likely to be visible in the landscape to the extent of visual mass being a detriment to the landscape.	
Water Sensitive Design - PO 31.1, 31.2: **The Project is consistent, or able to achieve consistency with, the relevant performance outcomes.** The desalination plant will manage stormwater runoff to avoid pollution or other detrimental impacts. The desalination plant site incorporates stormwater management infrastructure (see Chapter 6 Project Description). The Project is expected to present short-term localised impacts to surface water and groundwater flows associated with construction activities. Following construction, no significant adverse impacts to surface water or groundwater are expected. Project infrastructure is sited to maintain natural hydrological systems.	
Wash-down and Waste Loading and Unloading - PO 32.1: **The Project is consistent with the relevant performance outcomes.** Areas for the handling of waste, washdown of plant and equipment will be constructed in accordance with the relevant Australian Standards, achieving compliance with the GDP.	
Infrastructure and Renewable Energy Facilities ***The Project is consistent, or able to achieve consistency, with the GDP***	
General (Location and Design) - PO 1.1: **The Project is consistent with the relevant performance outcomes.** Hazards to third parties including envisaged land use of adjacent land are controlled through the limitation of public access to, and the remoteness of, the Project.	Chapter 6 Project Description Chapter 9 Use of Land and Marine Waters Chapter 12 Soils and Landform Chapter 13 Surface Water
Visual Amenity - PO 2.1, 2.2, 2.3: **The Project is generally consistent with the relevant performance outcomes.** The scale and nature of the Project is such that the visual prominence, particularly of the desalination plant, is unable to be entirely avoided. The	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
relative remoteness of Project infrastructure partially absolves the Project of this. Pump stations and other ancillary structures are sited to minimise their visual prominence in the landscape. As discussed above, soft landscaping for amenity purposes is considered broadly unnecessary for most Project assets due to remoteness, the absence of public accessibility and short-duration occupancy by most people. The Reference Design (GHD 2025a) stipulates the use of low-reflectivity finishes and materials.	Chapter 18 Air Quality Chapter 19 Noise and Vibration Chapter 20 Landscape and Visual Amenity Chapter 21 Transport and Traffic Chapter 25 Hazards and Risks
Hazard Management - PO 4.1, 4.2, 4.3: **The Project is consistent with the relevant performance outcomes.** The Project is assessed as consistent with the Building Near Airfields Overlay, and is similarly able to achieve consistency with PO 4.1 of the GDP. Power supply infrastructure is sited in rural or remote areas, reducing risks to public safety as sought by PO 4.2. In accordance with PO 4.3, bushfire risk can be minimised for electricity substations by incorporating sufficient asset protection zones within the compounds. No electricity substation or transmission infrastructure traverses areas of unacceptable fire risk posed by vegetation or landform.	
Electricity Infrastructure - PO 5.1: **The Project is consistent with all relevant performance outcomes.** The visual impact of the Project's transmission line infrastructure is reduced as sought by PO 5.1, via siting in land cleared of native vegetation and/or resulting in minimal clearance of native vegetation where avoidable, and grouping associated buildings with other Project buildings, such as the desalination plant and pump stations.	
Telecommunication Facilities - PO 6.1, 6.2, 6.3: **The Project is inconsistent with relevant performance outcomes.** While consistency with PO 6.1, PO 6.2 and PO 6.3 may not be feasibly achievable, the degree of impact arising from inconsistency is not considered to be materially significant due to the remoteness (by necessity) of independently-sited communications towers and associated power supply infrastructure.	
Water Supply - PO 11.1: **The Project is consistent with all relevant performance outcomes.** Construction camps and materials laydown areas are readily able to comply with PO 11.1 through provision, as part of site preparation, of temporary water supply, portable reverse osmosis water treatment plants, and adequate non-potable water to support associated construction activities. Connection to mains water is not proposed for the majority of Project assets due to remoteness.	
Wastewater Services - PO 12.1, 12.2: **The Project is consistent with all relevant performance outcomes.** Whilst subject to further geotechnical investigations, wastewater from permanent facilities at the desalination plant site such as toilet/showers and wash basins is expected to be directed to a suitable septic system. If determined to not be feasible, wastewater will be directed to containment	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
tank which will be regularly emptied. Further details will be prepared as part of final construction planning and sequencing, however, it is expected that consistency with PO 12.1 can be achieved. Wastewater will be managed in accordance with the *Public Health Act 2011* and *Public Health (Wastewater) Regulations 2013*. Pertaining to temporary construction activities requiring wastewater servicing, it is assumed that temporary wastewater collection and storage will be integrated into construction camp facilities, with disposal managed by appropriately licensed contractors.	
Temporary Facilities - PO 13.1, 13.2: **The Project is consistent with all relevant performance outcomes.** Construction camps and laydown areas are sited, and will be operated, to minimise environmental impact. This will be achieved through preferential selection of sites that have historically been used for comparable purposes to reduce the necessity to clear and prepare new areas. To the greatest practicable extent, existing facilities would be utilised and are excluded from the EIS. Some temporary activities including borrow pits, concrete batching, and construction camps within townships are excluded from the EIS, and will be subject to separate approvals and permitting processes as necessary.	
Interface Between Land Uses ***The Project is consistent with the GDP***	
General Land Use Compatibility - PO 1.2: **The Project is consistent with all relevant performance outcomes.** Due to substantial separation distances of noise-generating equipment and activities from neighbouring users of land, no impacts to sensitive receivers, or zones primarily intended to accommodate sensitive receivers, is predicted.	Chapter 6 Project Description Chapter 9 Use of Land and Marine Waters Chapter 18 Air Quality Chapter 19 Noise and Vibration Chapter 20 Landscape and Visual Amenity Chapter 25 Hazards and Risks
Hours of Operation - PO 2.1: **The Project is consistent with all relevant performance outcomes.** Operational noise sources from the desalination plant, such as the on-site manoeuvring of service and delivery vehicles is not expected to cause noise that is noticeable from nearby receivers, given the large separation distances.	
Activities Generating Noise or Vibration - PO 4.1, 4.2: **The Project is consistent with all relevant performance outcomes.** The Project was assessed to be compliant, or have the ability to comply with, all relevant criteria of the *Environment Protection (Commercial and Industrial Noise) Policy 2023*.	
Air Quality - PO 5.1, 5.2: **The Project is consistent with all relevant performance outcomes.** Project does not include activities with the potential for harmful or environmentally damaging air emissions. Odour from biological by-product recovered from the pre-treatment filters of the desalination plant	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
is expected to be controllable and odour is unlikely to impact sensitive receptors.	
Light Spill - PO 6.1, 6.2: **The Project is consistent with all relevant performance outcomes.** Outdoor lighting where required will be installed having regard for AS4282 *Control of the obtrusive effects of outdoor lighting* and *National light pollution guidelines for wildlife* (DCCEEW, 2023b)	
Solar Reflectivity/Glare - PO 7.1: **The Project is consistent with all relevant performance outcomes.** Setbacks, limited glazing and the relative remoteness of Project elements minimise the potential of adverse impacts on road users or adjacent land users.	
Electrical Interference - PO 8.1: **The Project is consistent, or able to achieve consistency with the relevant performance outcomes.** Electrical interference caused by Project structures is unlikely. If considered necessary, analysis to confirm that structures exceeding 10 m in height will not cause electrical interference would be undertaken during detailed design.	
Transport, Access and Parking ***The Project is consistent, or able to achieve consistency, with the GDP***	
Movement Systems - PO 1.1, 1.2, 1.3, 1.4: **The Project is consistent with all relevant performance outcomes.** The traffic impact assessment undertaken for the Project (GHD 2026a) concluded that ongoing operational impacts to the functional performance of the transport system are minimal. Management of the potential impacts to residents from the increase in heavy vehicle traffic associated with the Project is considered able to be addressed through construction traffic management procedures. Site safety inductions including traffic management are considered adequate to address potential conflict where both passenger vehicles and heavy vehicles are likely to be present. All on-site traffic movements associated with the Project are able to be fully contained within development sites.	Chapter 6 Project Description Chapter 21 Transport and Traffic Chapter 25 Hazards and Risks
Sightlines and Vehicle Access - PO 2.1, 2.2, 3.1, 3.3, 3.4, 3.7, 3.8, 3.9: **The Project is not inconsistent with the relevant performance outcomes.** The traffic impact assessment (GHD 2026a) made recommendations for siting and access considerations of several Project assets. Sightline assessment during final construction planning and sequencing is anticipated to facilitate compliance with vehicle access (sightlines) performance outcomes where new access points interface with State maintained roads. Separation distances between new access points and railway level crossings are adequate to avoid impacts. Access tracks, parking and laydown areas will be designed specifically for Project purposes, to account for the volume and type of vehicles anticipated.	

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
The Project does not achieve consistency with PO 3.9 on account of overall scale, the presence of multiple worksites and likelihood of vehicle movements between sites requiring the use of public roads. However, it is considered that no feasible alternatives exist, and vehicle circulation between activity areas will not cause undue adverse impacts to the functionality of the road network.	
Vehicle Parking Areas - PO 6.1, 6.2, 6.6: The Project is consistent with all relevant performance outcomes. No part of the Project includes a parking area which requires the use of public roads for movement from one part of the parking area to another. No landscaping of parking areas is proposed due to the preclusion of public access, and the nature of development. Separation distances to sensitive receivers are substantial, such that no visibility, noise, glare or emissions impacts from vehicles in parking areas are credible. Parking areas proposed as part of the Project incorporate all required service vehicle access requirements, including access and egress in a continuous forward motion consistent with the relevant Hazards (Bushfire) Overlays.	
Heavy Vehicle Parking - PO 11.1, 11.2: The Project is generally consistent with all relevant performance outcomes. Separation distances to sensitive receivers are substantial, such that no visibility, noise, glare, emissions, vibration, hazard or odour impacts from vehicles in parking areas are credible. The design of internal roadways at the desalination plant and transfer pump stations have regard for the relevant Hazards (Bushfire) Overlays and for traffic and access performance outcomes of the relevant Zones and Subzones, such that roadways will be formed from an all-weather trafficable formed surface commensurate with the expected volume of vehicles requiring access during all phases of the Project's lifecycle. Access and egress of heavy vehicles in a continuous forward motion and the on-site queueing capacity of Project assets assists in ensuring minimal hazard to vehicular traffic on public roads.	
Waste Treatment and Management Facilities ***The Project is consistent, or able to achieve consistency, with the GDP***	
Siting; Soil and Water Protection - PO 1.1, 2.1, 2.2, 2.3: The Project is consistent with all relevant performance outcomes. Waste treatment and management facilities associated with the Project are, by nature, ancillary and subordinate to the primary intended use of land (relating to excavation stockpiling and spoil dewatering infrastructure associated with the construction of a desalination plant and marine infrastructure). The management of excavation and dewatering waste streams readily achieves compliance with PO 1.1 through significant separation distances from sensitive receivers, specifically from noise, air and dust emission vectors.	Chapter 6 Project Description Chapter 10 Coastal Processes Chapter 12 Soils, Landform and Geology Chapter 13 Surface Water

Performance Outcome Category and Relevant POs	Relevant EIS Chapters
The Project is able to achieve compliance with PO 2.1 and PO 2.3 to the extent practicable (noting interaction with both the marine environment and groundwater) through specific proposed treatments of waste streams identified as likely to contain higher concentrations of potential contaminants, such as slurry drying wastewater and dredge wastewater. Separation of waste streams assists in segregating waste streams of potentially higher impact potential, enabling the safe and efficient disposal. The Project is readily compliant with PO 2.2 through the establishment of substantial waste management and treatment infrastructure at the desalination plant site for the specific purpose of avoiding impacts to the environment and natural hydrological systems.	
Workers Accommodation and Settlements ***The Project is consistent, or able to achieve consistency, with the GDP***	
Workers Accommodation and Settlements - PO 1.1, 1.2, 1.3, 1.4: The Project is consistent with all relevant performance outcomes. Construction camp and materials laydown areas are anticipated to readily achieve compliance with all Performance Outcomes of the GDP. Principally, this is achievable through: • Avoidance of areas of scenic, tourism or conservation significance by the Project in general, consistent with PO 1.1, • Remoteness of Project infrastructure, meaning that nuisance impacts to adjacent land uses are precluded on the basis of separation distance, consistent with PO 1.2, • The use of pre-fabricated or otherwise standardised, modular structures for the establishment of construction camps, compliant with the relevant Australian Standards and consistent with PO 1.3, and • The establishment of temporary power supply, amenities and water tankage, treatment for potability and supply to habitable buildings as part of construction camp site preparation.	Chapter 6 Project Description Chapter 13 Surface Water Chapter 23 Social Environment

7.6.5 Planning Assessment conclusions

The Project overall is **consistent** with strategic planning instruments including the State Planning Policies and applicable Region Plans. The Project overall is **not inconsistent** with the Planning and Design Code.

The Project supports a number of key aspirations of the State Planning Policies, and the Eyre and Western and Far North Region Plans. A new climate resilient supply of water represents significant economic benefit to existing and future industries.

It is considered that the Project satisfies, or has the capacity to satisfy, a majority of applicable provisions of the Code. Where there is conflict between the Code and the outcomes sought by the Project, there is limited consequence to the proper planning of the locality, or impact upon adjoining land or the receiving environment. Inconsistency with specific performance outcomes expressed through the Code does not indicate the potential of an unacceptable impact to the relevant environmental value.

On the basis of the above, the Project is supported from a planning and land use perspective.

7.7 Design Quality

This section provides a review of the Project against the Design Quality Assessment Requirement, focused on the desalination plant and associated intake pump building. The desalination plant is an industrial facility in a remote location. The potential for public interface with the desalination plant is precluded by the nature and location of the Project.

The nature of urban design and placemaking as an environmental attribute relies on the presence of a public interface, an experiential human receptor, or an existing built environment or landscape context into which development must integrate.

For landscape context, the applicable environmental attribute becomes Landscape Character and Visual Amenity, which is discussed and assessed in Chapter 20 and Appendix J-3.

The quality and accessibility of desalination plant design, including wayfinding, inclusive accessibility and safety, is governed by the National Construction Code, relevant Australian Standards and, where applicable, the *Work Health and Safety Act 2012*.

7.7.1 Requirements in legislation

General guidance for assessment and management of design quality is provided through application of design principles through State's statutory planning framework.

The majority of relevant guidance above is addressed as part of the Planning Assessment (Appendix E-1) and relevant sections of this chapter. Performance outcomes related to built form and character, siting and design of development are set out in the provisions of Zones and Subzones, with additional visual amenity and specific design criteria expressed through the GDPs. These capture development-specific parameters such as water sensitive design, landscaping, external appearance, and integration of plant and equipment into the building envelope. These provisions are present in some measure at all levels of Code policy, with which the Project is assessed to be **not inconsistent,** as above.

The Planning and Design Code

The Code provides for the design and siting of structures to reduce aesthetic impacts to scenic and rural vistas, minimise impacts on the natural environment and rural amenity, avoid obscuring existing public views to landscape and minimise impacts from key public vantage points and scenic routes. The requirements for visual amenity considerations are set out in desired outcomes and performance outcomes for each individual planning zone, an assessment of which is provided in Section 7.6. **No further assessment against the Code is provided in this section.**

Regional Plans

An assessment of the Project against the policies of the EWRP is provided in the Planning Assessment Report in Appendix E-1, and summarised in earlier sections of this chapter (see Section 7.5). **No further assessment against the EWRP is provided in this section.**

State Planning Policies

State Planning Policy 2, Design Quality (SPP 2) notes that the success of buildings, places and spaces to meet the needs of the people who use and experience them is related to the integration of design quality principles, supported by community engagement and a holistic planning approach. SPP 2 focuses strongly on the design and function of public spaces, or places accessible to the public. Alignment with SPP 2 as it pertains to the desalination plant focuses on the Project's use of the relevant design principles, described below. Assessment of the Project against other SPPs is provided in the Planning Assessment Report in Appendix E-1, and summarised in Section 7.4.

Design Principles

Design quality provisions in the Code, SPP 2 and the EWRP are underpinned by the application of design principles, which include:

- Principles of Good Design (Office for Design and Architecture South Australia)[4],
- Principles of Universal Design,
- Crime Prevention Through Environmental Design (CPTED),
- Access and Inclusion, and
- Water Sensitive Urban Design (WSUD).

7.7.2 Assessment method

The desalination plant is the most visually prominent element of the Project due to its coastal location, scale and nature. It is also the only Project element with design latitude, with the design of other Project elements dictated by engineering requirements. Resultantly, this evaluation of design quality focuses on the desalination plant, and presents a qualitative analysis of relevant design quality instruments which are not assessed elsewhere in the EIS.

Where assessment against an instrument has occurred as part of the planning assessment or the design instrument is not relevant, it is excluded from the design quality assessment. As such, the design quality evaluation focuses on SPP 2 Design Quality and the design principles described in Section 7.7.1 as they apply to the desalination plant site. The assessment against SPP 2 and the design principles is provided in Section 7.7.4, with assessment method consistent with that described in Section 7.3.1.

Project elements excluded from evaluation

The water transfer system, power supply and temporary facilities will comprise standardised plant and equipment, or be predominantly assembled from prefabricated components and have limited capacity to feasibly incorporate specific design treatments beyond the siting, setback, screening and building material treatments discussed in Chapter 9 Use of Land and Marine Waters, and Chapter 20 Landscape and Visual Amenity. Hence the following Project elements are excluded from evaluation:

- Water transfer system (main transfer pipeline and Carrapateena lateral branch)

[4] https://dhud.sa.gov.au/__data/assets/pdf_file/0007/1171078/ODASA-Principles-of-Good-Design_2025-Update_WEB-FINAL.pdf

- Water transfer system (transfer pump stations and water storages)
- Power supply
- Temporary facilities including construction camps, equipment and material laydown areas, temporary earthworks and construction compounds.

7.7.3 Contextual analysis

Existing site conditions

Chapter 20 Landscape and Visual Amenity includes a detailed description of the landscape character of the subject land, including visibility of Project infrastructure from the marine environment, and a detailed contextual analysis. Chapter 9 Use of Land and Marine Waters provides a detailed description of existing uses of land in the vicinity of the Project's construction footprint, and describes usership patterns of coastal waters and the foreshore.

Transportation and movement patterns

Chapter 21 Transport and Traffic provides descriptions of existing transport networks and movement patterns.

Local environmental conditions

As described in Chapter 5 Project Siting, Alignment and Optimisation, and in Chapter 20 Landscape Character and Visual Amenity, the desalination plant is situated in a locality dominated by private, publicly inaccessible land. The landscape is described as remote, sparsely populated and with limited public access to the coastline.

7.7.4 Design principles

Table 7-8 provides an assessment of the desalination plant against SPP 2 Design Quality. SPP 2 was not assessed as part of the Planning Assessment Report (Appendix E-1). The same assessment metric used in assessment of the other SPPs was applied to SPP 2 (see Section 7.3.1). The desalination plant (and the Project more broadly) is assessed as **consistent** with SPP 2.

Due to the relevant policies of SPP 2 largely reflecting incorporation of the relevant design principles described in Section 7.7.1, the Project's consistency with SPP 2 is taken to represent consistency with the relevant design principles.

Table 7-8: SPP 2 Design Quality Assessment

Relevant Policy	Assessment	Outcome
Policy 2.1: Promote best practice in the design of buildings, places and the public realm by applying the Principles of Good Design.	The Principles of Good Design state that development should be: • **Contextual** – the desalination plant is necessarily of a scale that is substantial in a coastal location (see Section 7.6.1 and Table 7-5) and will be a visible feature in the landscape (Chapter 20 Landscape Character and Visual Amenity). To the extent possible, material and surface treatments are able to seek to minimise the visual incongruity of substantial infrastructure.	Consistent.

Relevant Policy	Assessment	Outcome
	• **Inclusive** – No part of the desalination plant is accessible to the general public, as an active industrial facility. Internal site accessibility and navigability are governed by the National Construction Code, Australian Standards and, where applicable, the *Work Health and Safety Act 2012.* • **Durable** – The desalination plant has a design life of 100 years. • **Valuable** – The project will be a catalyst for regional and State-wide investment through provision of a new alternative water supply supporting development in water-constrained regions of the State. • **High Performance** – Not applicable from a design quality perspective – see *Durable.* • **Sustainable** – An alternative supply of water supports long term economic productivity through enabling development in the Far North.	
Policy 2.2: Promote best practice in access and inclusion planning in the design of buildings and places by applying the principles of Universal Design, CPTED and Access and Inclusion.	The desalination plant was designed to incorporate Universal Design elements, insofar as those elements are applicable to the Project. Since the site is not intended for access by the general public, Universal Design incorporation into Project design emphasises the standardisation of design of industrial buildings and infrastructure in alignment with the National Construction Code, prioritising safety and accessibility by personnel, contractors and other visitors. Concept designs for interior and exterior lighting, entrance design, safety equipment, wayfinding, amenities and vehicular access have been developed and will progress to final design in accordance with relevant Australian Standards ensuring the desalination plant is able to be operated safely. The relative remoteness of the desalination plant site and its location outside of urban areas is considered to minimise the extent to which the Project may foster an environment conducive to criminality. Access to the desalination plant site is to be controlled and fenced. At all stages of construction and operation, sites and activities will be controlled and monitored with appropriate security measures in place for the protection of property and third parties.	Not Inconsistent.
Policy 2.3: Apply WSUD and energy efficiency design solutions.	WSUD principles are assessed as part of the Planning Assessment, in particular PO 31.1 and PO 31.2 of the Design GDP under the Code. See Table 7-7 and Appendix E-1 Planning Assessment Report for detailed assessment.	Consistent.

Relevant Policy	Assessment	Outcome
Policy 2.8: Recognise the unique character of areas by identifying their valued physical attributes in consultation with communities.	The Northern Water Integrated Communications and Engagement Plan is attached as Appendix D-1. The Plan was developed with consideration of the principles of various South Australian and Australian guidance materials and must be approved by the Minister for Planning (Minister) prior to the release of this EIS for statutory public consultation, as described in Chapter 4 Community and Stakeholder Engagement. Comprehensive community and stakeholder engagement has been undertaken progressively since project development commencement in 2022 to support project planning, environmental investigation and ongoing stakeholder participation. Concerns, suggestions and benefits raised by stakeholders have been considered and influenced the planning of the EIS and project design.	Consistent.

7.7.5 Siting and design of the desalination plant

The siting and design of the desalination plant has sought to balance the necessity for a coastal location with the likely impacts of substantial infrastructure in such a location on environmental values (see Chapter 5 Project Siting, Alignment and Optimisation).

Screening and landscaping

Screening (either through vegetation or landform) is not currently proposed, due to:

- the remoteness of the desalination plant's location,
- the relative absence of visual receptors in the surrounding area,
- lack of public access to the desalination plant site, adjacent land or surroundings, and
- the arid to semi-arid coastal climate, resulting in screening vegetation being unfeasible due to the scale of the desalination plant and challenging growing conditions for screening vegetation.

As described in the Planning Assessment Report (Appendix E-1), the Project's approach to native vegetation clearance minimisation, management and offsetting includes, as far as reasonably practicable, low intervention rehabilitation in temporarily disturbed areas to encourage natural recruitment of vegetation.

Screening (either through vegetation or landform) may be reconsidered as design development progresses.

Indicative schedule of materials and finishes

Proposed surface treatments, materials and finishes are expected to be neutral in colour, complement the natural coastal landscape colours and hues, be of a low reflectivity and high quality, and utilise variance in shape and colour to avoid large expanses of unbroken colour or material, consistent with the relevant provisions of the Code and the principles of good design. Visual representations of buildings at the desalination plant are presented in Appendix B Site Plans.

Buildings will be constructed from steel and pre-cast concrete and clad in a commercially available colour-treated sheet metal, for example, Lysaght Klip-Lok Classic with Colorbond surface treatment. An indicative schedule of materials is presented in Table 7-9 and will be confirmed as part of final construction planning and sequencing. Plate 7-1 provides indicative visualisations of the desalination plant buildings.

Table 7-9: Potential / indicative schedule of colours and materials

Material	Potential Application
	Colorbond 'Surfmist' • building roof materials
	Colorbond 'Shale Grey' • building walls (partial – patterned with Colorbond 'Wallaby')
	Colorbond 'Wallaby' • building walls (partial – patterned with Colorbond 'Shale Grey') • fascias • gutters and downpipes • ridge vent
	Colorbond 'Dune' • Building doors
	Steel Profile: *Lysaght 'Klip-Lok' Classic 700* • all cladding steel including roofing
	Precast Concrete: *Colorbond 'Monument'* • lower building wall sections



Plate 7-1: Indicative visualisation of schedule of materials and colours

Reception, visitor amenities and facilities

Amenities, including ablutions, site office, reception, administration and workshop buildings, will be designed to provide safe, accessible and easily navigable spaces. Wayfinding, lighting, exit signage, bathrooms, showers, pedestrian areas and parking will all be

constructed to relevant Australian Standards, consistent with the principles of Universal Design.

7.8 Conclusion

The planning assessment found that the Project overall is **consistent** with strategic planning instruments including the SPPs and applicable Regional Plans and overall is **not inconsistent** with the Code.

A new climate resilient supply of water represents significant economic benefit to existing and future industries and the Project therefore supports a number of key aspirations of the SPPs, and the Eyre and Western and Far North Regional Plans. In particular, the desalination plant is consistent with SPP 2, resulting from a general level of consistency with the relevant design principles. The Project also satisfies, or has the capacity to satisfy, a majority of applicable Code policies. Where there is conflict between Code policy and the outcomes sought by the Project, there is limited consequence to the proper planning of the locality, or impact upon adjoining land or the receiving environment.

On the basis of the above, the Project is supported from a planning and land use perspective, subject to appropriate mitigations and control measures implemented where inconsistency with the Code may present the possibility of environmental impacts.

The design quality assessment focused on the desalination plant and associated intake pump station. The desalination plant is an active industrial facility in a remote location characterised by a lack of publicly accessible areas in the locality. The desalination plant itself is not a publicly accessible development, and features restricted site access for public health and safety purposes. The site lacks public road access and is exposed to minimal public usership or access to the foreshore. As a result, there is extremely limited potential for the desalination plant to interface with active public spaces.



Chapter 8

Impact Assessment Methodology

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

8 IMPACT ASSESSMENT METHODOLOGY 8-1

8.1 Purpose of Impact Assessment 8-1

8.2 Relevant Environmental Attributes 8-1

8.3 Impact Assessment Processes 8-2

8.3.1 Identifying environmental values 8-2

8.3.2 Identifying potential impact events 8-3

8.3.3 Avoidance and mitigation measures 8-4

8.3.4 Assessing expected environmental impacts 8-4

8.3.5 Categorising impact level 8-4

8.3.6 Addressing Uncertainty 8-7

LIST OF TABLES

Table 8-1: Assessment categories and environmental attributes 8-1

Table 8-2: Categorisation of impact level– biophysical environment 8-5

Table 8-3: Categorisation of impact level– people and amenity 8-6

Table 8-4: Factors affecting level of certainty 8-7

Table 8-5: Description of likelihood 8-9

Table 8-6: Risk rating matrix 8-9

8 IMPACT ASSESSMENT METHODOLOGY

8.1 Purpose of Impact Assessment

The purpose of the impact assessment process is to:

- assess the adverse and beneficial environmental (biophysical, social and economic) impacts of the Project
- determine the environmental outcomes the Project should seek to achieve to be acceptable to regulators, the community and other stakeholders
- consider the potential environmental impacts of the Project and develop appropriate measures to avoid, minimise, mitigate or offset these impacts
- engage the community and other stakeholders to enable them to provide informed feedback on the Project and its impacts
- enable regulators to make an informed response to the Project's application and impact assessment, and the conditions that should be applied to ensure its impacts are acceptable.

8.2 Relevant Environmental Attributes

The assessment considered the environmental attributes in Table 8-1 consistent with the Project-specific EIS Assessment Requirements (ARs) issued by the State Planning Commission.

Table 8-1: Assessment categories and environmental attributes

Assessment category	Environmental attribute
Amenity and environmental quality	• Air quality • Noise and vibration (terrestrial) • Transport and traffic • Landscape and visual amenity
Biological environment	• Biosecurity (terrestrial and marine) • Matters of National Environmental Significance (i.e. as defined in the controlled action decision) • Marine flora and fauna (including underwater noise and vibration) • Terrestrial and aquatic flora and fauna
Climate change and resource use efficiency	• Climate change adaptation • Greenhouse gas emissions • Sustainable use of resources • Waste management
Economic environment	• Local, regional and state economies (assessment of economic impact)
Hazards and risks	• Bushfire

Assessment category	Environmental attribute
	• Floods • Site contamination
Land use and site considerations	• Land tenure, protected areas and use of land and marine waters
Physical environment	• Coastal land systems and marine water quality • Soils, landform and geology • Groundwater • Surface water
Design	• Design quality
Social and community	• Aboriginal cultural heritage • Non-Aboriginal heritage places and areas • Community wellbeing and social impact

8.3 Impact Assessment Processes

The impact assessment process for the Project incorporated the following for each environmental attribute identified above:

- Determining the environmental values relevant to each attribute that could be impacted by the Project and the condition and significance of these values.
- Reviewing the proposed Project design and activities across construction, operation and decommissioning phases, to determine the ways in which the Project could potentially impact environmental values. These were called the 'potential impact events'.
- For each potential impact event, assessing the duration, magnitude and extent of the impacts from the Project, initially assuming industry-standard mitigation measures are applied.
- Identifying any additional management and mitigation measures needed for each potential impact event to eliminate or otherwise reduce any potential environmental harm to as low as reasonably achievable.
- Determining the impacts from the Project that are expected to remain after proposed control and mitigation measures have been applied (i.e. post controls). These are the impacts that are planned for, and a necessary consequence of carrying out the Project. These are described in conjunction with control, mitigation and management measures.
- Use of risk assessment tools to evaluate the uncertainty in the assessment of expected impacts, where appropriate.

These steps are discussed in more detail below.

8.3.1 Identifying environmental values

Environmental values are broadly defined to incorporate the physical, social / cultural and economic environments. These values comprise the physical characteristics and qualities of

the environment that contribute to biodiversity conservation, and the social, spiritual and economic health of individuals and society.

Values that could be impacted by the Project were identified through:

- desktop reviews of existing information and technical studies including field surveys and assessments of baseline conditions
- stakeholder views on the values of importance to them (views of affected stakeholders are described in Chapter 4 Community and Stakeholder Engagement)
- reviewing legislative and regulatory requirements including relevant standards, guidelines and policies that ascribe values to environmental attributes (e.g. threatened species legislation, air quality standards).

The values considered were those within the area of influence of the Project. The boundary for this varies for each potential impact event depending on the nature and extent of the impact being considered. It could, for example, comprise the air shed, water catchment or bioregion. Subject matter specialists determined the appropriate study area for assessing each environmental value.

8.3.2 Identifying potential impact events

The Project may impact on environmental values through different sources of impact and pathways. These are called the potential impact events. They include events that are expected to occur, and those that are not certain but may potentially occur because of planned construction and operational activities. Both direct and indirect impacts were considered in the impact assessment:

- **Direct impacts** are those that are caused directly by the proposed activities (e.g. clearing of vegetation).
- **Indirect impacts** are those where a secondary event occurs that is substantially caused by activities associated with the Project e.g. sediment runoff generated from land clearing (the direct impact) for the Project, entering a watercourse impacting its water quality (the indirect impact).

Impact events were initially identified for the Project at a workshop which generated a broad range of potential impact events. These were subsequently refined into a list of credible and realistic potential impacts as Project detail was developed, and detailed investigations and stakeholder consultation were undertaken.

For an impact to occur there must be a connection between a source and a receptor:

- **Source** of the potential impact event means the source which alone or in combination has the potential to cause harm to an environmental or social receptor.
- **Receptor** is an environmental value that may reasonably be expected to be adversely impacted by the source.

If such a connection did not exist but a potential impact event (or events) was of specific importance to stakeholders and / or there was a legislative or regulatory driver, the potential impact event was still assessed.

8.3.3 Avoidance and mitigation measures

Avoidance and mitigation measures are used to avoid, reduce and / or mitigate the likelihood, magnitude, extent and / or duration of potential adverse impacts. The measures can include physical controls (design measures) and procedural (management) controls. These were applied in the following priority order:

- **Avoidance:** measures taken to avoid creating adverse effects on environmental values from the outset, such as careful placement of infrastructure or disturbance.
- **Minimisation:** measures taken to reduce the duration, intensity and extent of impacts that cannot be avoided.
- **Rehabilitation / restoration:** measures taken to improve a degraded environment following exposure to impacts that cannot be completely avoided or minimised as well as capitalising on opportunities to restore and enhance environmental values.
- **Offsets:** measures taken to compensate for any residual, adverse impacts after the previous three steps were implemented.

The impact assessment was an iterative process that considered each identified potential impact event and determined how it may affect environmental values. Where the Project was expected to impact on an environmental value, the assessment considered whether there was an opportunity to redesign the Project infrastructure and / or the Project activities to avoid the impact or use control measures to prevent or minimise the impact.

Specific design measures for each attribute are detailed in the chapters of this EIS, together with management controls to further reduce the potential for impact from Project activities.

8.3.4 Assessing expected environmental impacts

An environmental impact is any change, positive or negative, to the identified environmental values expected as part of planned activities associated with the construction and operation of the Project. Unlike environmental risks, environmental impacts are changes that are expected to occur if the Project proceeds.

Impacts on environmental values were assessed by technical specialists as detailed in the following chapters. The assessments used a range of methods as appropriate for each environmental value (e.g. literature reviews, field surveys, modelling, stakeholder input).

The impact assessments considered the scale, intensity, duration and frequency of impacts and the sensitivity of each environmental value. Where these could not be predicted with certainty, realistic worst-case assumptions were made to provide a conservative assessment.

8.3.5 Categorising impact level

Impacts were assessed against the categories in Table 8-2 and Table 8-3 taking into account any proposed avoidance or mitigation measures. Impacts were considered acceptable if they were in the 'Negligible' category, while impacts in the 'Minor' or 'Moderate' category were generally considered acceptable if they were as low as reasonably practicable following the application of mitigation measures. Major and catastrophic impacts were considered unacceptable necessitating Project redesign.

Table 8-2: Categorisation of impact level– biophysical environment

Category	Listed flora and fauna species (terrestrial, aquatic and marine)	Other flora and fauna (terrestrial, aquatic and marine)	Habitat (terrestrial, aquatic and marine)	Contamination	Soil quality and quantity	Water (groundwater, surface water and marine)	Landform
Negligible	Not measurable	Local short-term (< 12 months) decrease in abundance of some species without reduction in local community viability	Not measurable	Not measurable	Localised and short-term (< 6 months) soil disturbance with low erosion potential	Minimal change with no measurable loss of water quality or quantity	Not measurable
Minor	Local short-term (< 12 months) decrease in abundance with no lasting effects on local population	Local long-term decrease in abundance of some species resulting in little or no change to community structure	Disturbance of well-represented landforms / habitats	Local contamination that can be immediately remediated	Some soil disturbance with minimal implications for offsite erosion that can be readily rectified with no significant loss of land capability	Local short-term (< 6 months) reduction in water quality or quantity	Small change in geomorphology within localised portions of landform
Moderate	Local long-term decrease in abundance without reduction in regional population viability	Regional long-term decrease in abundance of some species and / or local loss of some species diversity resulting in some change to the community structure	Local loss of well-represented landforms / habitats.	Local contamination that can be remediated in less than 12 months.	Soil disturbance with a high risk of offsite erosion potentially requiring months of remediation with short-term loss of land capability	Local long term or widespread short-term reduction in water quality or quantity	Widespread small changes in geomorphology
Major	Regional long-term decrease in abundance and / or local loss resulting in reduction in regional viability	Regional long-term decrease in abundance of numerous species and / or some loss of species diversity resulting in significant changes to community structure	Local loss of a unique or critical landform / habitat.	Widespread contamination that can be remediated in less than 12 months	Soil disturbance with a high risk of erosion potentially requiring years of remediation with long-term loss of land capability	Widespread (regional) short-term reduction in water quality or quantity	Localised major changes in geomorphology
Critical	Regional extinction of the species	Regional long-term loss of numerous species resulting in the dominance of only a few species	Regional loss of unique or critical landforms / habitats	Widespread contamination that requires a regional incident response and more than 12 months to remediate	Extensive impacts to surface soils with irreversible soil erosion and significant and widespread permanent decline in land capability	Widespread (regional) long-term reduction in water quality or quantity	Large changes in geomorphology resulting in effects beyond footprint

Table 8-3: Categorisation of impact level– people and amenity

Category	Noise and air quality	Visual amenity	Public health and safety	Heritage (natural, historic and cultural)	Socio-economic	Land use
Negligible	Recognised standards met at all times	No discernible deterioration or improvement in the existing view at a sensitive receptor location. Limited / no visual effect on the landscape, visible as a very minor feature in some locations.	No injury or illness	No impact to matters of heritage significance	No impact or small reparable socio-economic impacts on local population	No measurable impact to current or future land uses
Minor	Isolated and localised exceedance of recognised standards Complaints received about air quality that are resolved within days	A barely perceptible deterioration in the existing view at sensitive receptor locations. Developments can be seen in the visual field and alter the landscape to a small degree	An injury or illness that does not require first aid or medical treatment	Impact to locally significant heritage matters that is readily rectified	Short-term (< 6 months) impacts on local businesses and / or wellbeing of local communities	Minor repairable damage to land or disruption to land use with no compromise to ongoing or future land use
Moderate	Local ongoing exceedance of recognised standards, or widespread short-term (< 1 month) exceedance of recognised standards, that do not result in hospitalisation of members of the public Ongoing complaints	Noticeable deterioration in the existing view at sensitive receptor locations. Developments are obvious but do not dominate the landscape.	Injury or illness requiring first aid or medical treatment	Damage to State or nationally listed / significant natural, cultural or historic heritage that can be rectified so that it does not alter its heritage significance	Ongoing impacts on a limited number of local businesses and / or wellbeing of a limited number of local community members	Damage to land and infrastructure that results in remediation costs and / or loss of income of up to $1 million
Major	Widespread short-term exceedance of recognised standards resulting in hospitalisation of members of the public	Significant deterioration in the existing view at multiple sensitive receptor locations. Developments are very obvious in the visual field and dominate the landscape.	Injury or illness that results in hospitalisation or disablement	Permanent damage to State or nationally listed / significant natural, cultural or historic heritage that results in a loss of heritage significance	Ongoing impacts on the wellbeing of regional communities that results in a significant proportion of the community leaving the area and / or serious mental health issues across the affected communities Ongoing impacts to regional businesses that result in closures and (direct and indirect) loss of employment for more than 100 employees and / or towns in the region becoming unviable Suspension of important community services (e.g. transport, telecommunications, energy) for several days or more.	Damage to land and infrastructure that results in remediation costs and / or loss of income of up to $10 million
Critical	Public exposed to an exceedance of recognised standards that results in severely debilitating chronic health impacts or life-threatening hazards	Developments dominate the visual field and dramatically alter the landscape from multiple and widespread sensitive receptor locations.	Injury or illness that results in fatality or long-term disability	Destruction or permanent damage to State or nationally listed / highly significant natural, cultural or historic heritage (resulting in the site no longer meeting the listing criteria where applicable)	Ongoing impacts to regional businesses that result in closures and (direct and indirect) loss of employment for more than 100 employees and / or towns in the region becoming unviable Suspension of important community services (e.g. transport, telecommunications, energy) for several weeks or more.	Extensive damage to land or disruption to land use that results in remediation costs and / or loss of income of over $10 million

8.3.6 Addressing Uncertainty

Risk assessment tools were used to evaluate the level of uncertainty / certainty in the assessment of expected impact.

Sources of uncertainty create a risk that the impacts on environmental values may be greater than expected. Uncertainties in the impact assessment can derive from:

- uncertainty in the nature and scale of the Project infrastructure and activities
- quality of site-specific baseline and / receptor data
- the reliability of any predictive modelling undertaken in the impact assessment
- control measures not being as effective as expected.

Table 8-4 describes the factors that can affect the level of certainty for each of these sources.

Table 8-4: Factors affecting level of certainty

Level of certainty	Quality of data	Extent to which modelling has been validated	Effectiveness of design measures	Effectiveness of management measures
High	Comprehensive data. Further studies are unlikely to generate additional information that would change the conclusions reached in the impact assessment.	Excellent baseline data available. Model has been run and provides accurate predictions over different seasons. Model has been extensively used and is regarded by discipline experts as leading practice and/or the impact assessment does not rely to any significant extent on the use of a model.	Widely used and demonstrated to be effective at a range of infrastructure sites including sites with similar topographical / climatic conditions. Requires minimal checking and failure risk has been shown to be low.	Management measures are considered routine and used effectively throughout industry. Reduction in the level of impact from an unmitigated level does not rely primarily on the management measures.
Medium	Some site-specific information available to provide ground-truthing of regional desktop information. Further studies could change some of the conclusions reached in the	Some baseline data available. Model shows a reasonable approximation of real conditions but relies on a number of assumptions and sufficient data not available to demonstrate the model accurately	Has been used at sites with similar conditions but requires regular checking or maintenance to ensure performance. Has only been used at limited sites. OR	Management measures have been effectively used at a limited number of sites and have not been demonstrated at similar sites or in the long term and / or reduction in the level of impact from an

Level of certainty	Quality of data	Extent to which modelling has been validated	Effectiveness of design measures	Effectiveness of management measures
	impact assessment.	portrays seasonal conditions.	Effectiveness has not been established in the long term or at sites similar to the Project site.	unmitigated level relies primarily on the management measures.
Low	Minimal site-specific data available. Reliance on regional desktop studies that may not accurately reflect site conditions. Low level of confidence in the impact assessment.	Minimal baseline data. Model is unable to be validated with current data.	Measures are novel and have not been demonstrated in the field.	Management measures are novel and / or heavily reliant on specialised technical expertise.

The level of certainty for each potential impact event was classified using the factors outlined in Table 8-4. 'High' certainty potential impact events were considered to be sufficiently certain to require no further analysis.

A risk assessment was used to evaluate impact events with a 'Low' or 'Medium' level of certainty. The risk assessment considered:

- the credible worst-case consequence (as defined using the impact levels in Table 8-2 and Table 8-3) that could occur if assumptions made in the impact assessment were found to be incorrect (for example, if management measures were found to be not as effective as expected)
- the likelihood of such a consequence occurring (as described in Table 8-5).

The level of risk was then categorised using the matrix in Table 8-6.

This process was also iterative. 'Low' risks were generally accepted, and 'Medium' and 'High' risks reviewed to determine if each risk was as low as reasonably practicable. Where necessary, changes were made to the Project design and control measures or further studies undertaken to ensure risks were adequately minimised. 'Extreme' risks were regarded as unacceptable.

The evaluation of uncertainty (using the risk assessment tools) is discussed for each impact event (where relevant) in the impact assessment chapters (Chapters 9 to 24) in this EIS. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

In addition, a number of potential hazards that have no expected impact but have a perceived or material level of risk have been specifically addressed in Chapter 25 Hazards and Risk Management.

Table 8-5: Description of likelihood

Descriptor	General description	Probability per year
Almost certain	This consequence is expected to occur in most circumstances.	> 80%
	Expected to occur at least once each year.	
Likely	This consequence may occur in some given circumstances.	50 – 80%
	May occur during any given year.	
Possible	This consequence might occur at some time.	10 – 50%
	Not likely to occur in any given year but is possible	
Unlikely	This consequence could occur at some time.	0.5 – 10%
	Very unlikely to occur in any given year.	
Rare	This consequence may only occur in very exceptional circumstances.	< 0.5%
	Examples of this have occurred historically but are not anticipated.	

Table 8-6: Risk rating matrix

	Consequence				
Likelihood	Negligible	Minor	Moderate	Major	Critical
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme	Extreme
Possible	Low	Low	Medium	High	Extreme
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High



Chapter 9

Use of Land and Marine Waters

NORTHERN
WATER PROJECT

JBS&G
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TABLE OF CONTENTS

9 USE OF LAND AND MARINE WATERS 9-1

9.1 Key Findings 9-1

9.2 Setting the Context 9-2

9.2.1 Requirements in legislation and other standards 9-2

9.2.2 Views of stakeholders 9-3

9.3 Assessment Method 9-4

9.4 Project Area Climate 9-5

9.5 Existing Use of Land 9-8

9.5.1 Summary of physical environment and land uses in the Project Area 9-8

9.5.2 Population centres 9-18

9.5.3 Land tenure 9-20

9.5.4 Native Title 9-24

9.5.5 Department of Defence land 9-27

9.5.6 Existing major infrastructure 9-30

9.5.7 Mining and associated tenements 9-35

9.5.8 Renewable energy 9-40

9.5.9 Primary production 9-40

9.5.10 Protected areas 9-41

9.5.1 Tourism and recreation land uses 9-41

9.6 Existing Use of Marine Waters 9-43

9.6.1 Shipping 9-43

9.6.2 Maritime infrastructure 9-43

9.6.3 Marine protected areas 9-44

9.6.4 Native Title 9-45

9.6.5 Fisheries and aquaculture 9-46

9.6.6 Recreational marine uses 9-47

9.7 Plans for Future Land Use 9-51

9.7.1 Relevant government plans 9-51

9.7.2 Known plans for future land use at the desalination plant site 9-51

9.8 Impact Assessment 9-52

9.8.2 Disruption to landholder operations and activities 9-52

9.8.3 Disruption to Department of Defence operations and activities 9-54
9.8.4 Loss of access or damage to property infrastructure 9-54
9.8.5 Disruption to landholder amenity 9-55
9.8.6 Land and vegetation disturbance 9-56
9.8.7 Introduction or spread of weeds, pests and pathogens 9-58
9.8.8 Restrictions on land use and property activities due to the presence of Project infrastructure 9-58
9.8.9 Ongoing access to infrastructure easements 9-62
9.8.10 Interference with communication network and radio frequencies 9-62
9.8.11 Conservation values and uses of marine parks 9-63
9.8.12 Marine exclusion zone at Mullaquana Station 9-64
9.8.13 Summary of key mitigation measures 9-65
9.9 Conclusion 9-65

LIST OF TABLES

Table 9-1: Representative climate data for the Project Area 9-5
Table 9-2: Generalised environment and land use descriptions – Myall Plains subregion 9-10
Table 9-3: Generalised environment and land use descriptions – Arcoona Plateau subregion 9-12
Table 9-4: Generalised environment and land use descriptions – Gawler Lakes subregion 9-14
Table 9-5: Generalised environment and land use descriptions – Roxby subregion 9-16
Table 9-6: Land parcels in the vicinity of the desalination plant and related infrastructure 9-21
Table 9-7: Summary of land tenure of transfer system infrastructure 9-23
Table 9-8: Major highways in the Project Area 9-31
Table 9-9: Key mitigation measures – Use of land and marine waters 9-65

LIST OF FIGURES

Figure 9-1: Mean temperature along the Project alignment 9-6
Figure 9-2: Mean rainfall along the Project alignment 9-7
Figure 9-3: Mean 9am wind speeds along the Project alignment 9-7
Figure 9-4: IBRA subregions in the Project Area 9-9
Figure 9-5: Relevant land parcels at desalination plant location 9-22

Figure 9-6: Native Title determined areas and ILUAs 9-26
Figure 9-7: Department of Defence land in the Project Area 9-29
Figure 9-8: Existing major infrastructure in the Project Area– southern section 9-33
Figure 9-9: Existing major infrastructure in the Project Area - northern section 9-34
Figure 9-10: Mining tenure in Project Area - southern section 9-37
Figure 9-11: Mining tenure in Project Area - northern section 9-38
Figure 9-12: Mining exploration licences in the Project Area 9-39
Figure 9-13: Protected areas in the vicinity of the Project Area (terrestrial) 9-42
Figure 9-14: Distance of shipping navigation channel from Project seabed infrastructure. 9-43
Figure 9-15: Marine protected areas 9-49
Figure 9-16: Prawn and Marine Scalefish fisheries in Upper Spencer Gulf 9-50
Figure 9-17: Proposed desalination plant intake and outfall exclusion zone (indicative) .9-64

LIST OF PLATES

Plate 9-1: 'Accessible Cuttlefish Throne' at Whyalla Jetty 9-18
Plate 9-2: Port Augusta 9-19
Plate 9-3: Woomera Theatre (left) and Spud's Roadhouse Pimba (right) 9-19
Plate 9-4: Roxby Downs 9-20
Plate 9-5: Cowleds Landing 9-20
Plate 9-6: Cultana Expansion Area in the Project Area 9-28
Plate 9-7: Eyre Peninsula Link from Wild Dog Hill, Whyalla 9-30
Plate 9-8: Lincoln Gap Wind Farm looking west from the Stuart Highway 9-40
Plate 9-9: Stock grazing - Mullaquana Station and Lincoln Gap 9-41
Plate 9-10: Cowleds Landing Sanctuary Zone 9-44
Plate 9-11: Eight Mile Creek beach trailhead (left) and Murninnie Beach (right) 9-47

9 USE OF LAND AND MARINE WATERS

This chapter provides a general description of the environmental context of the Project Area including climate, landscape and the uses of land and marine waters that will be referred to in the following EIS assessment chapters.

This chapter provides an assessment of how key existing and future land and marine uses within the Project Area may be impacted by construction and operation of the Project. The assessment addresses all Project infrastructure components and considers the range of land uses in the Project Area including pastoral activities, significant industries, major infrastructure and protected areas. Tenures traversed by the Project include private, Crown and Department of Defence land, land held under Native Title, and resource and energy tenements and other land-based agreements.

The chapter also provides context for the marine Project Area by describing marine protected areas, commercial and recreational uses of marine waters and relevant port and maritime infrastructure.

9.1 Key Findings

- Land Access Management Plans and property-specific Land Management Plans developed in consultation with landholders will minimise the potential for disruption to landholder[1] operations, amenity and property infrastructure during the construction phase.
- A Third Party Agreement with the Department of Defence will minimise the potential for disruption to Defence operations and training activities at the Cultana Training Area and at Woomera during the construction phase.
- Impacts to land use from ground disturbance due to pipeline and transmission line construction will be minimised by post-construction reinstatement activities and landholder consultation.
- Best practice vehicle hygiene during Project activities will be implemented to minimise the risk of introducing or spreading weeds, pests or pathogens, with a specific focus on preventing spread across Landscape Regions.
- The pipeline easement will include a 15 m width above the pipeline where planting of deep-rooted species will not be permitted.
- Consultation with landholders on location of Project infrastructure has considered potential long-term impacts on landholder activities, and engagement regarding ongoing access requirements will minimise disruption to land use and impacts to property access and security.
- DIT is engaging with the representatives of the Barngarla and Kokatha Peoples with the aim of negotiating the terms of Indigenous Land Use Agreements in accordance with the Commonwealth Native Title Act to enable the Project to proceed within their Native Title determination areas.

[1] 'Landholder' includes owners of land as well as land occupied or controlled under tenures other than freehold.

- Desalination plant design and implementation of a Marine and Coastal Environmental Construction Management Plan will minimise impacts to nearby marine parks.
- A marine exclusion zone will be necessary to protect desalination plant marine infrastructure and the safety of nearby users of marine waters. However, in the context of Spencer Gulf, the exclusion zone will have a negligible impact on the area available for marine activities, including commercial fisheries.

9.2 Setting the Context

The EIS Assessment Requirements require a description of the existing environment, current uses of land and marine waters, and relevant tenures (including Native Title) in the immediate and broader location of the Project. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 9.3.

9.2.1 Requirements in legislation and other standards

Relevant legislation

A number of pieces of legislation apply to protection of land, land tenure and other legal interests in land that maybe affected by the Project.

Legislation for the protection of land includes the *National Parks and Wildlife Act 1972* and the *Marine Parks Act 2007* which protect areas reserved for conservation purposes, while the *Fisheries Management Act 2007* and *Aquaculture Act 2001* provide the frameworks for protection of aquatic species, fisheries and the State's aquaculture industry.

The *Planning, Development and Infrastructure Act 2016* provides for special legislative schemes which are policy directions that designate areas of significant importance to the state. There are no Special Legislative Schemes relevant to the Project.

The Project Area comprises two separate determined Native Title areas as provided for under the *Native Title Act 1993* (Cth), held by the Barngarla and Kokatha Peoples. The Native Title Act also provides for the negotiation and registration of Indigenous Land Use Agreements (ILUA) made between Native Title parties and other parties, including government, in relation to the use and management of land and waters.

The *Mining Act 1971*, *Energy Resources Act 2000* and *Hydrogen and Renewable Energy Act 2023* provide the tenement framework for exploration and / or development of the State's mineral, hydrogen, renewable and energy resources.

A range of legislation including the *Civil Aviation Act 1988*, *Civil Aviation Safety Regulations 1998, Airspace Act 2007* and *Airspace Regulations 2007,* regulate airfield operations and

aircraft safety. Aircraft undertaking mustering, firefighting or other aerial activities may be present in the vicinity of Project transmission lines during construction and operation.

Legislation regulating activities in marine waters is also relevant including the *Harbors and Navigation Act 1993* and *Protection of Marine Waters (Prevention of Pollution from Ships) Act 1987.*

Other South Australian and Commonwealth Government legislation and other standards which may relate to land use and tenure in the Project Area are described in Chapter 3 Legislative Approvals Framework.

Land access and acquisition

As discussed in Chapter 3 Legislative Approvals Framework, special purpose legislation, the *Northern Water Project (Land and Infrastructure) Act 2026* (the Act), was passed by the Parliament in September 2026 and (at the time of writing) will commence on a day to be fixed by proclamation. The legislation will provide a Project-specific framework for access to land and the acquisition of interests in land required for delivery of the Project and will be supported by regulations which are yet to be drafted.

Statutory powers to be provided by the Act can be utilised for State land (i.e. freehold land, Crown land, pastoral and other leases), but cannot be utilised for Commonwealth land or BHP's Special Mining Lease 1 (SML 1) at Olympic Dam.

The Act will enable access to land for investigations and construction through defined temporary areas, supported by notification requirements and compensation for occupation and disturbance. The framework will also provide for the establishment of permanent interests in land based on the 'as-built' infrastructure footprint. These interests are expected to be predominantly in the form of easements for transmission lines and the transfer system (as these comprise at least 90% of the Project's footprint). Easements enable ongoing access for operation and maintenance, with freehold or other tenure used only where necessary (for example, at fixed facility sites).

The Act will also include powers to acquire land or interests where required, supported by compensation arrangements. These will be broadly aligned with established acquisition frameworks, subject to Project-specific modifications provided in the Regulations. There will also be flexibility to create interests that may not align with traditional common law characteristics, enabling fit-for-purpose tenure solutions.

9.2.2 Views of stakeholders

Stakeholder views expressed during community engagement include potential impacts to land uses on properties where Project construction activities or permanent infrastructure are located or are in close proximity.

Other concerns related to uses of the marine environment include impacts on the Cuttlefish Coast Sanctuary Zone (CCSZ) (i.e. Giant Australian Cuttlefish migration and breeding areas) and commercial fisheries (King Prawn and Snapper). Commercial fishery concerns relate particularly to the impacts on salinity of the desalination plant return water, and the scale, location and operational implications of asset-protection exclusion zones offshore from the desalination plant for commercial fishing operations.

The potential for cumulative impacts, particularly in relation to Harmful Algal Bloom (HAB) events and existing ecosystem pressures in the Upper Spencer Gulf has also been raised in community engagement. Recent HAB events have affected marine users and industries within Upper Spencer Gulf, including commercial fisheries, aquaculture and tourism operators. As a result, stakeholder concern regarding cumulative impacts on marine values has increased and has informed engagement undertaken for the Project

Other issues include interactions with other developments (largely mining and renewable energy projects) on land with which the Project interfaces.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

9.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

Desktop assessment

The desktop assessment study area for use of land and marine waters was the standard Project Area definition (i.e. a 2.5 km buffer of the desalination plant footprint and either side of the centreline of linear infrastructure, including marine infrastructure (i.e. a 5 km wide corridor)).

An initial desktop review was undertaken which considered the EIS ARs, legislative requirements and an assessment of publicly available information from the following sources:

- Department of Environment and Water (DEW), NatureMaps Version 3.4.1, viewed online via https://data.environment.sa.gov.au/NatureMaps
- Location SA MapViewer, viewed online via https://location.sa.gov.au/viewer/
- South Australian Property and Planning Atlas, viewed online via https://sappa.plan.sa.gov.au/
- South Australian Resources Information Gateway, viewed online via https://map.sarig.sa.gov.au
- Bureau of Meteorology, viewed online via http://www.bom.gov.au/climate/
- Eyre and Western Regional Plan (DHUD 2026a) and Far North Regional Plan (DHUD 2026b)
- Eyre Peninsula Regional Landscape Plan 2026-2031 (EPLB 2026)
- South Australian Arid Lands Regional Landscape Plan 2026-2031 (SAALLB 2026)
- The Native Title Tribunal Native Title Register viewed online at https://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/Search-Register-of-Native-Title-Claims.aspx

Relevant descriptions from other relevant major infrastructure projects were also reviewed including BHP's Olympic Dam Expansion EIS (2009a).

Field surveys and site visits

The outcomes of a range of detailed terrestrial field surveys and other marine studies conducted for the Project have been incorporated into the assessment in this chapter. These were primarily to obtain data for terrestrial and marine ecology of the Project Area (focusing on threatened and migratory species and their habitats), geomorphology and hydrology, Aboriginal cultural heritage and visual amenity.

Site visits to the Project Area were also valuable in obtaining relevant information to supplement and ground-truth the desktop assessment. Stakeholder engagement undertaken with the local community provided the opportunity for landholders, Traditional Owners, local government and local communities to share information on existing land and marine uses and activities that have potential to be affected by the construction and operation of the Project.

Northern Water Project reports

This chapter has also drawn information from a number of reports prepared specifically for the Project particularly those relating to soils and landform, surface water, air quality, noise and vibration, landscape quality, and terrestrial and marine ecology baseline studies. These reports are provided as Appendices to the EIS.

9.4 Project Area Climate

Temperature, rainfall and general wind data in the Project Area is provided for four Bureau of Meteorology (BoM) stations within the Project Area, which are considered as representative of conditions (refer Table 9-1, Figure 9-1 and Figure 9-2).

Figure 9-1 shows temperature fluctuations are relatively consistent along the Project alignment with higher summer temperatures and a general trend for more extreme temperature ranges over the year in the northern section of the Project Area. As shown in Figure 9-2, rainfall in the southern section of the Project Area is higher than the northern section, with rainfall fairly evenly spread over the year. Figure 9-3 depicts the mean 9am wind speed by month along the Project alignment.

Wind, wave and tide information for the coastal and marine environment at Mullaquana Station is provided in Chapter 10 Coastal Processes.

Table 9-1: Representative climate data for the Project Area

BoM Station	Wind conditions	Mean annual rainfall	Mean max and min temperature
Southern section			
Whyalla Aero (BoM 018120) Approximately 5 km inland	Predominant southerly winds, stronger in the afternoon with speeds between 17.6 and 24.6 km/h. Maximum gusts of 115 km/h recorded during winter months.	270.4 mm with rainfall fairly evenly spread over the year. Mean daily evaporation is 7 mm/day.	Mean highs of 30.2°C in January to 5.3°C in July.

BoM Station	Wind conditions	Mean annual rainfall	Mean max and min temperature
Port Augusta Aero (BoM 018201) Approximately 2.4 km inland, adjacent to main pipeline.	Predominant southerly winds[2], stronger in the afternoon with speeds between 13.4 and 22.6 km/h. Gusts of up to 130 km/h recorded (October).	222.9 mm with rainfall fairly evenly spread over the year.	Mean highs of 34.1°C in January to 4.6°C in July.
Northern section			
Woomera Aerodrome (BoM 016001) Adjacent to the pipeline, approximately 170 km inland	Predominant south-easterly winds becoming southerly in the afternoon with average speeds between 10.7 and 20.8 km/h. Gusts of up to 167 km/h recorded (November).	184.1 mm with rainfall fairly evenly spread over the year. Mean daily evaporation: 8.6 mm/day	Mean highs of 34.7°C in January to lows of 5.8°C in July.
Olympic Dam Aerodrome (BoM 016096). Adjacent to pipeline, approximately 240 km inland	Predominant southerly winds with average speeds between 11.4 km/h to 20.4 km/h. Gusts of up to 109 km/h recorded (November).	149.5 mm with slightly higher rainfall in October to April.	Mean highs of 36.9°C in January to mean lows of 4.2°C in June.

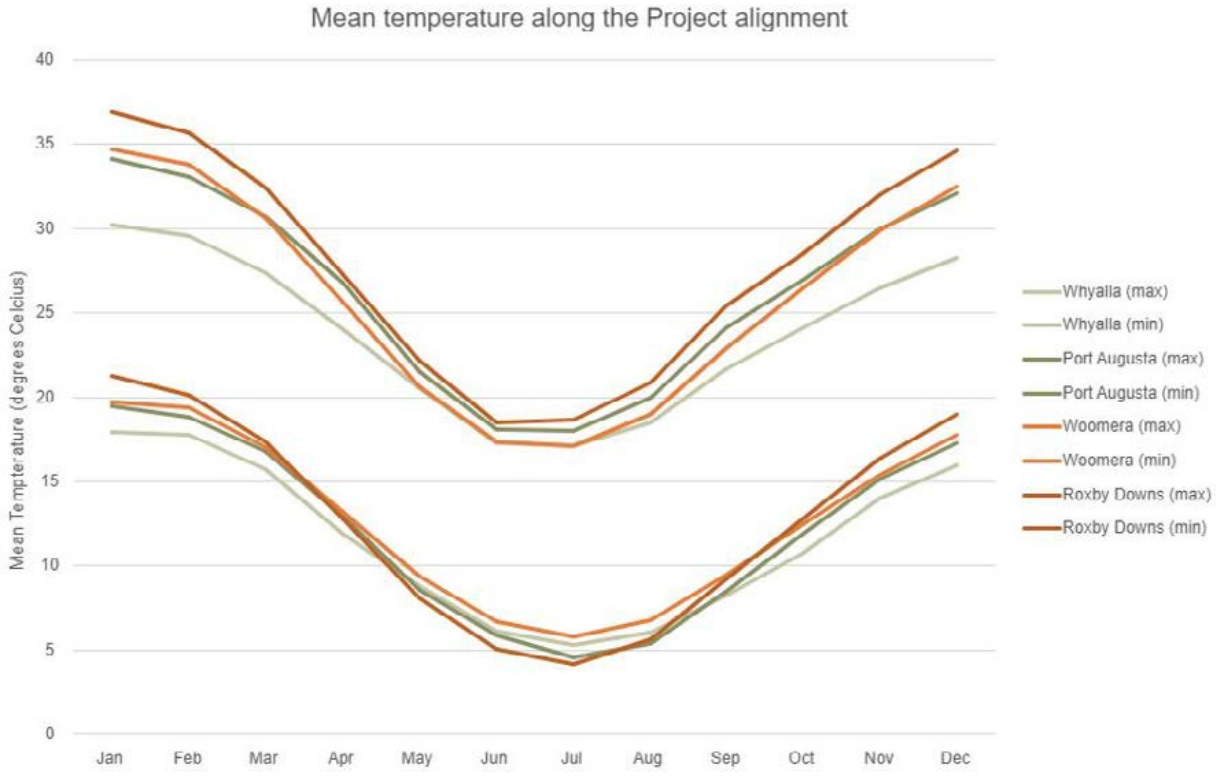


Figure 9-1: Mean temperature along the Project alignment

[2] Port Augusta Aero (BoM 018201) did not include summary wind statistics. Wind data was obtained from Port Augusta Power Station (BoM 019066).

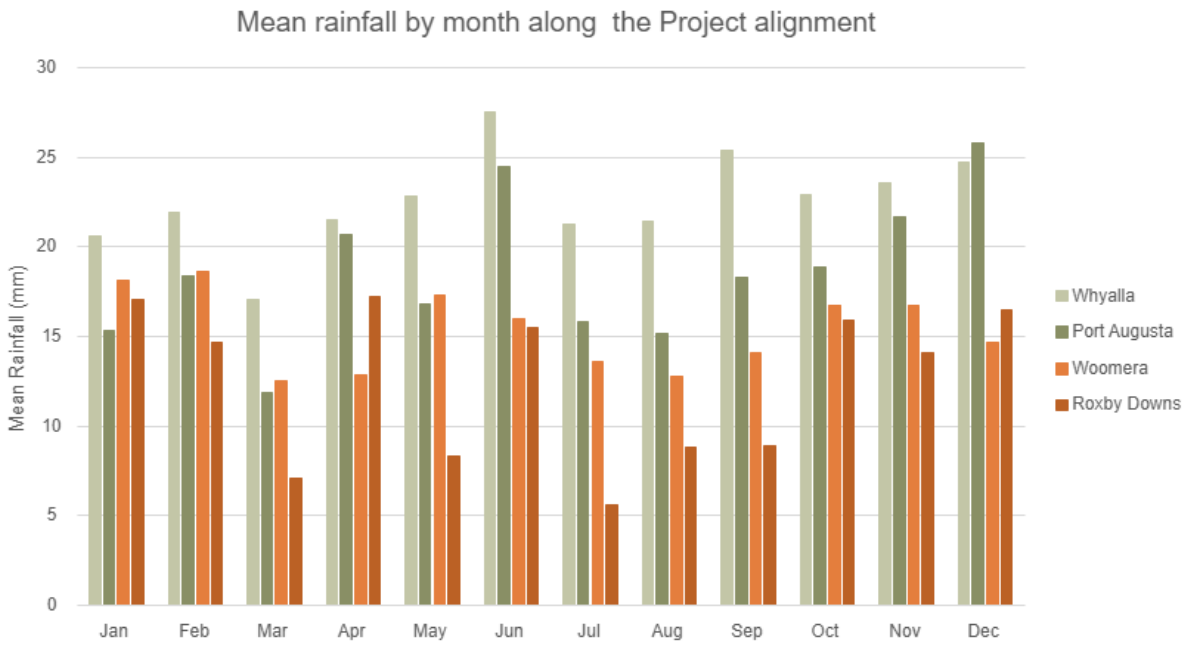


Figure 9-2: Mean rainfall along the Project alignment

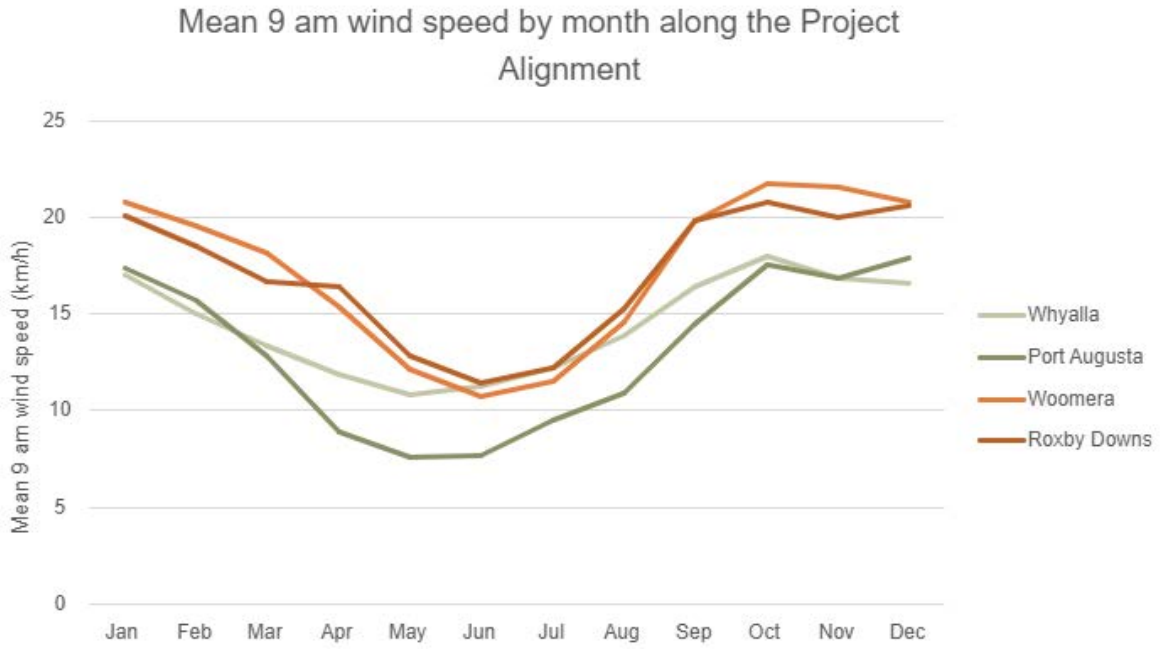


Figure 9-3: Mean 9am wind speeds along the Project alignment

9.5 Existing Use of Land

This section provides a general description of the physical environment of the Project Area, existing land uses and land tenure categories for the desalination plant site, the transfer system and electricity infrastructure alignments.

9.5.1 Summary of physical environment and land uses in the Project Area

Table 9-2 to Table 9-5 provide a general summary of the landform and vegetation character of the Project Area (based on the Interim Biogeographical Regionalisation of Australia (IBRA) system) and referencing the location of Project infrastructure components within each subregion. A brief summary of existing land use and interaction of Project infrastructure with significant landscape and other features is also provided. The descriptions reference kilometre points (KP)[3] on the transfer system alignment where relevant to the description.

The IBRA system classifies Australia's landscapes into geographically distinct bioregions based on climate, geology, landform and vegetation. The Project traverses the Gawler bioregion and four IBRA subregions (Myall Plains, Gawler Lakes, Arcoona Plateau and Roxby) (refer Figure 9-4). The Gawler bioregion comprises one quarter of South Australia's pastoral rangelands and is characterised by semi-arid to arid flat-topped to rounded hills, rocky quartzite hills, sandstone plateaux, depositional plains, gibber plains and salt-encrusted lake beds.

This section should be read in conjunction with more detailed summaries of land systems (Chapter 12 Soils and Landform), surface water features (Chapter 13 Surface Water), native flora and fauna (Chapter 15 Terrestrial Ecology) and the visual landscapes at Project infrastructure locations (Chapter 20 Landscape and Visual Amenity).

Further information on the location of the desalination plant, transfer system and transmission line alignments and locations of pumps stations and storages is provided in Chapter 5 Project Siting, Alignment and Optimisation.

A full description of all land-based and marine Project activities is provided in Chapter 6 Project Description.

[3] Kilometre points include pump station and storage locations as these are located on the main transfer pipeline alignment and lateral branch alignment but does not include transmission lines and substations.

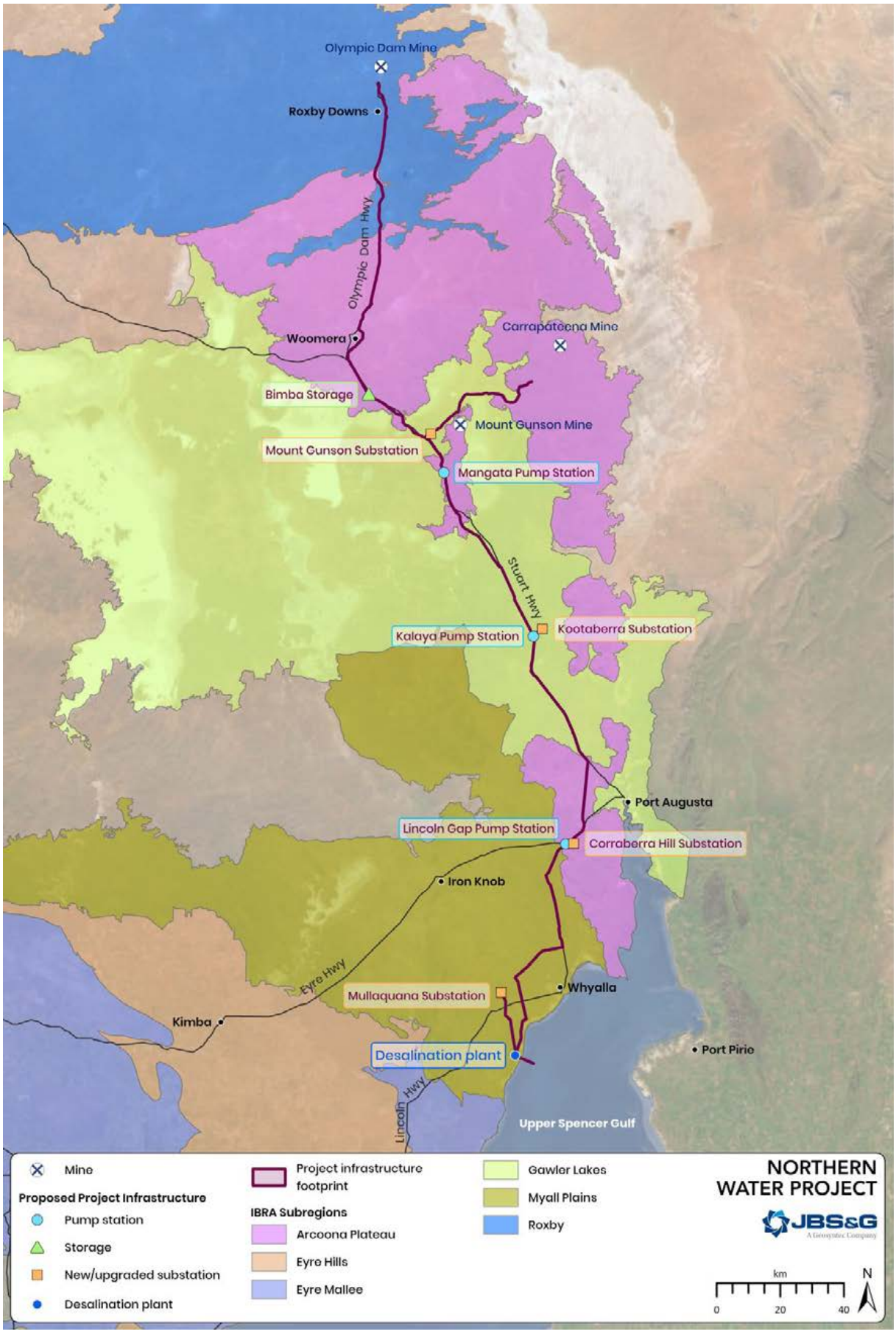
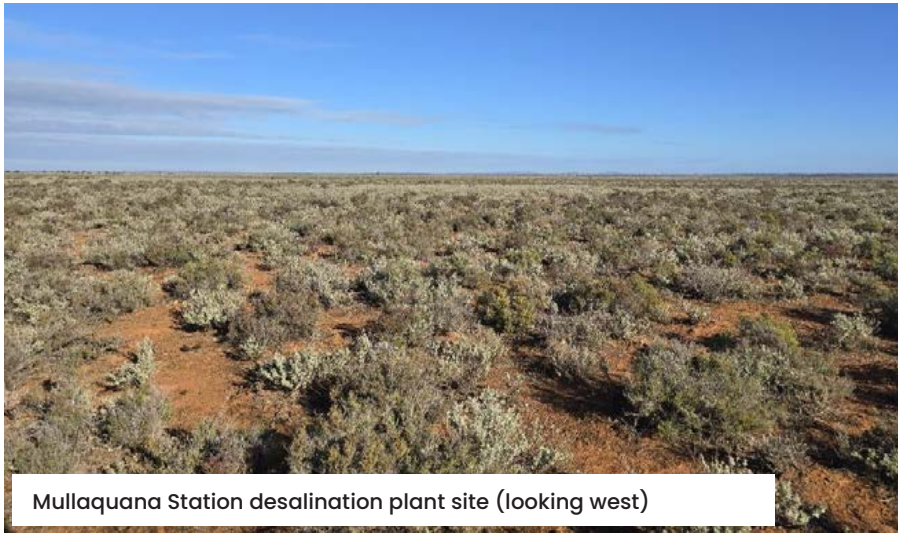


Figure 9-4: IBRA subregions in the Project Area

Table 9-2: Generalised environment and land use descriptions – Myall Plains subregion

IBRA region: Gawler - Myall Plains subregion
Landform and vegetation Landform in the Myall Plains (MP) MP subregion (refer Figure 9-4) is characterised by undulating, sand-covered calcareous plains of northern Eyre Peninsula, interrupted by quartzitic hills and salt lakes. Vegetation comprises mallee and heathy shrubs with vast plains of chenopod shrubland with emergent trees transitioning to lower chenopod shrubland and eventually samphire low open shrublands and areas of mangrove moving towards the coast. Smaller patches of mallee occur on plains and small sand dunes. The Middleback Ranges are a narrow north-south series of low hills in the subregion and are the highest topographic feature in the vicinty of the Project Area. Weeds on the Eyre Peninsula that present a potential threat if spread include Buffel Grass, White Weeping Broom, Boneseed, Fountain Grass and Prickly Pear. **Land use** Land use is predominantly grazing of stock over native vegetation. Whyalla is located in this subregion and is the largest community and regional service centre in proximity to Project infrastructure. Whyalla is also the principal centre for manufacturing, steel production and resources processing in the Upper Spencer Gulf. Small coastal settlements include Cowleds Landing and Murninnie Beach. Other land uses in the subregion include mining in the Middleback Ranges and Defence activities in the Cultana Training Area (CUTA which incorporates the Cultana Expanison Area (CEA)). The Whyalla Conservation Park is located adjacent to the Lincoln Highway approximately 10 km from Whyalla. Wild Dog Hill which is located within the Whyalla Conservation Park is known to be an important cultural site for the Barngarla People. **Location of new Project infrastructure** New Project infrastructure in the MP subregion includes the desalination plant, Mullaquana transmission line and transfer system pipeline (KP 0 – 79). From the desalination plant site, the pipeline alignment follows Eight Mile Creek Road, a new access road to the Lincoln Highway, other local roads and tracks, traversing grazing land south-west and west of Whyalla. The alignment avoids the residential areas of Whyalla, crosses land in the south of the CEA and passes north of the Whyalla Conservation Park. The alignment continues north towards Lincoln Gap generally following the alignment of the Lincoln Highway north of Whyalla. **Project interaction with landscape features** The desalination plant, Mullaquana transmission line and substation and transfer system pipeline are generally located in chenopod shrubland modified by grazing. Intake and outfall tunnels will be excavated underneath the adjoining coastal marine areas. Salt Creek is a broad sandy channel crossed by the pipeline west of Whyalla (KP 26). Other poorly defined channels located in the CEA are crossed by the pipeline west of the Whyalla Conservation Park.

IBRA region: Gawler - Myall Plains subregion



Mullaquana Station desalination plant site (looking west)



Coastal samphire fringe at Mullaquana Station



Wild Dog Hill – Whyalla Conservation Park

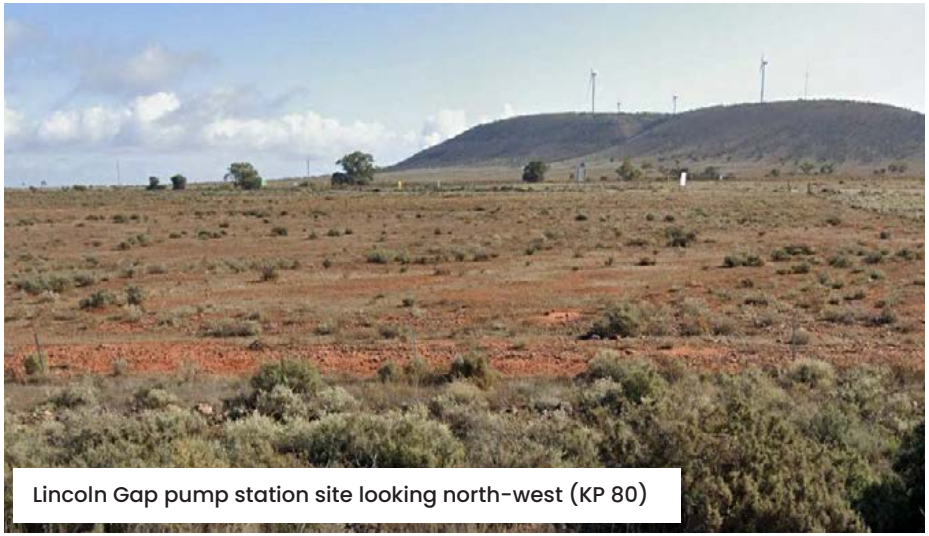


Mangroves at Cowleds Landing, south of Whyalla

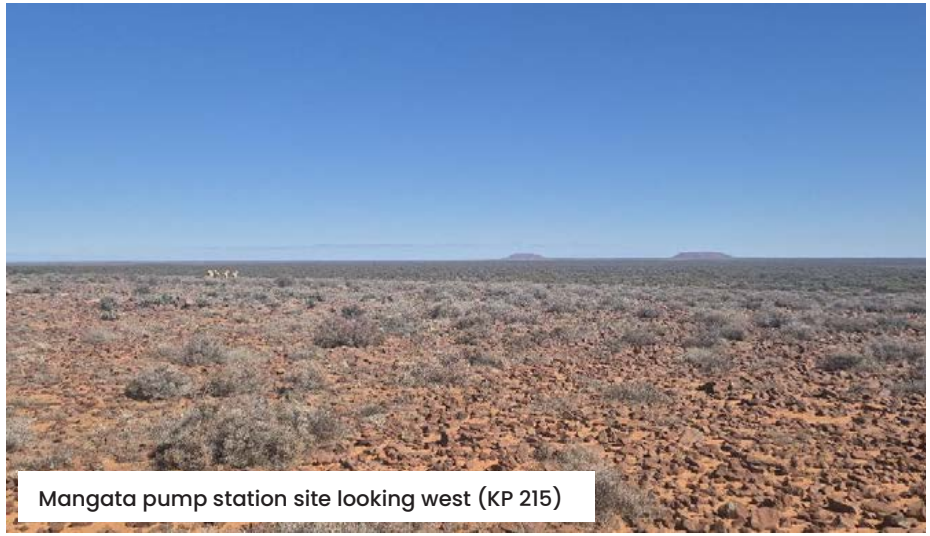
Table 9-3: Generalised environment and land use descriptions – Arcoona Plateau subregion

IBRA region: Gawler - Arcoona Plateau subregion
Landform and vegetation In the Project Area, the Arcoona Plateau (AP) subregion is comprised of two blocks separated by the Gawler Lakes subregion (refer Figure 9-4). Landform in the subregion is characterised by dissected stony tablelands and plains underlain by sediments of the Stuart Shelf. Vegetation comprises Saltbush low shrublands on gilgai soils with mixed tall shrublands on sand mantles of more recent age. Treeless low stony hills with clay soils supporting Chenopod and Samphire low open shrubland and creeklines with open woodlands and taller shrublands. Inland saline depressions occur in small patches. The stony plains of this subregion extend from the western side of Lake Torrens, and from Whyalla to north of Woomera. The stony plains landscape is varied and includes gently sloping gibber plains with a cobble-sized stone cover and gibber pavements characterised by a dense cover of small pebbles. The subregion is free of large infestations of weeds. Weeds that present a potential threat if spread include Buffel Grass, Athel Pine Cactus species, African Rue, and Mesquite and Parkinsonia which have naturalised around the Woomera township. **Land use** Land use is predominantly livestock grazing over native vegetation undertaken on pastoral leases. Department of Defence facilities are prominent in the subregion which accommodates the eastern extent of the CUTA, the Woomera township and Woomera Prohibited Area. Major infrastructure including the Moomba to Port Bonython Liquids Line (Pipeline Licence (PL) 2), the transcontinental rail line, major highways, the Lincoln Gap windfarm and high voltage electricity transmission infrastructure are also located in the subregion. Woomera and Pimba are the only population centres in the subregion. **Location of new Project infrastructure** The tranfser system alignment in the AP southern block moves between the AP and Gawler Lakes subregions as it progresses north. A section of the pipeline is located in the southern block of the AP subregion at KP 79 to 111, along with the Lincoln Gap pump station and storage (KP 80) and the Pandurrra 275 kV transmission line. The pipeline alignment similarly moves between the AP northern block and the Gawler Lakes subregion between KP 195–221 and KP 237-310. The Mangata pump station and storage (KP 215), half of the Oakden Hills 33kV transmission line and the Bimba storage (KP 251.5) are also located in the AP northern block. The eastern section of the Carrapateena lateral branch is located in the subregion from KP 228 of the main transfer pipeline to the Carrapateena mine delivery point. **Project interaction with landscape features** In the southern block of the AP subregion, the pipeline crosses several ephemeral sandy channels which drain to Lake Dempsey, an intermittently filled salt lake approximately 5 km north-west of Port Augusta. In the subregion northern block, the pipeline crosses a number of ephemeral drainage lines including Black Oak Creek which connects Pernatty lagoon and Dutton Lake (KP 196.5), and sandy vegetated channels connecting to Lake Windabout (between KP 238-241). While the Carapateena lateral branch crosses tributary channels to Pernatty lagoon, the lake itself is avoided to the north. Parts of the main transfer pipeline and the Carrapateena lateral branch will be constructed through areas of gibber soils.

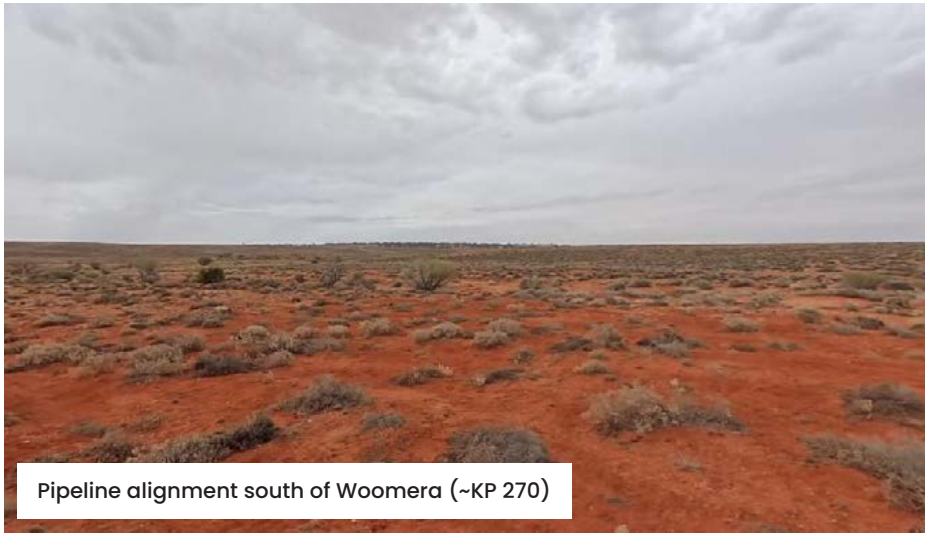
IBRA region: Gawler - Arcoona Plateau subregion



Lincoln Gap pump station site looking north-west (KP 80)



Mangata pump station site looking west (KP 215)



Pipeline alignment south of Woomera (~KP 270)



Arcoona Station (Bosworth Road) looking east (~KP 284)

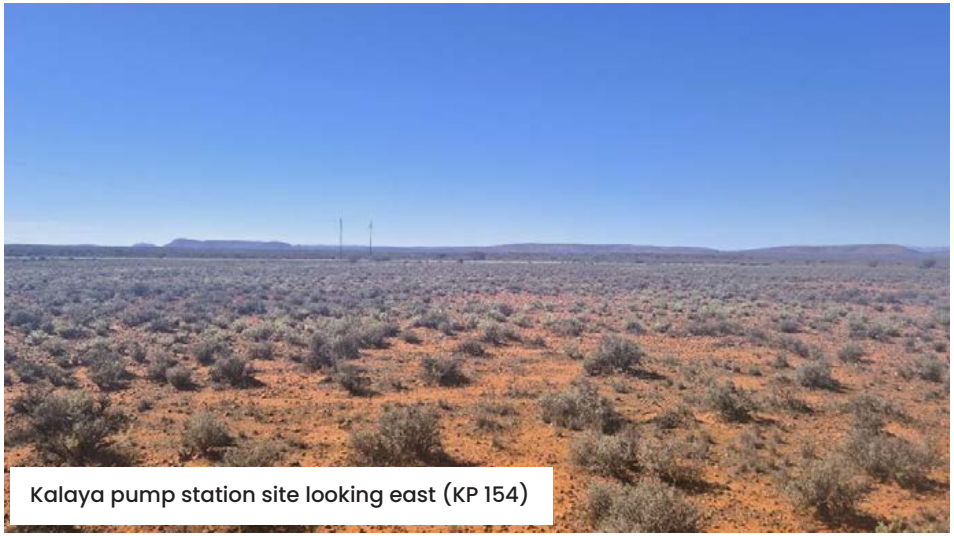
Table 9-4: Generalised environment and land use descriptions – Gawler Lakes subregion

IBRA region: Gawler - Gawler Lakes subregion
Landform and vegetation The Gawler Lakes (GL) subregion is located between two blocks of the AP subregion (refer Figure 9-4). Landform in the GL subregion is characterised by extensive undulating calcareous plains north of the Gawler Ranges, including Lake Gairdner, Lake Torrens, Lake Acraman and Island Lagoon complexes. Vegetation comprises plains of western Myall, Mulga and Bluebush, with saline plains and low open chenopod shrubland and ephemeral salt lakes fringed with Samphire low open shrublands. Salt lakes and claypans are prominent drainage features, and mainly occur at the ends of drainage lines, or as a series of depressions along ancient river channels that have been in-filled by river sands or gravels and are now covered by more recent sediments. Catchment for the lakes is from minor creeks, significant rainfall events, and run-off from adjacent ranges. Vegetation includes both salt tolerant plants and those able to survive extended periods of inundation. Lake shores are usually bare but sometimes support low samphire shrublands. The subregion is relatively free of large infestations of problem weeds. Weeds which constitute a potential threat include, Buffel Grass, Cactus species, African Rue (thought to be spread into the region along the Stuart Highway) and Athel Pine and Pepper Trees which have demonstrated invasiveness along rivers. **Land use** There is a long history of pastoralism (stock grazing) in the subregion from as early as the 1850s. Sheep grazing for wool and meat production is the primary land use in the broader subregion, however cattle are also run on pastoral leases in the subregion. Major infrastructure includes the Moomba to Port Bonython Liquids Line, the transcontinental rail line, major highways and high voltage electricity transmission infrastructure which traverse parts of the subregion. Port Augusta is located in the southern extent of the subregion and is the largest centre and transport hub. **Location of new Project infrastructure** The GL subregion is traversed by two sections of Project infrastructure. The first section incorporates the transfer system pipeline from KP 111 – 195, the Kalaya pump station and storage (KP 154), the Bookaloo 132 kv tranmsission line and Kootaberra substation. A second short section incorporates the pipeline (KP 221-237) and the western section of the Carrapateena lateral branch (KP CA0–29). **Project interaction with landscape features** Project infrastructure is generally located on the open sandy chenopod plains of the subregion. Salt lakes and other significant ephemeral surface water features are avoided. As noted above, the pipeline crosses the sandy drainage channels of Lake Dempsey which is located in the south of the subregion. The pipeline also crosses the south-western margins of the Lake Windabout drainage area in the north of the subregion.

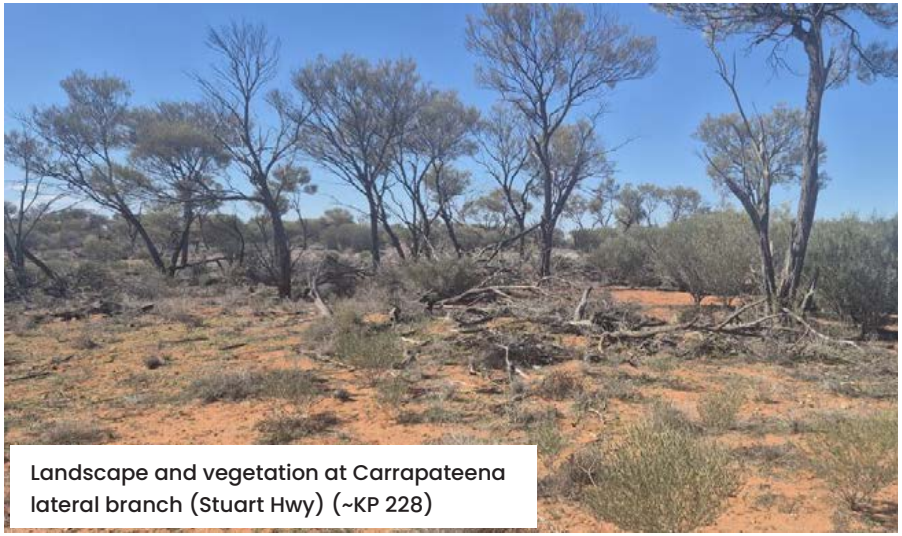
IBRA region: Gawler - Gawler Lakes subregion



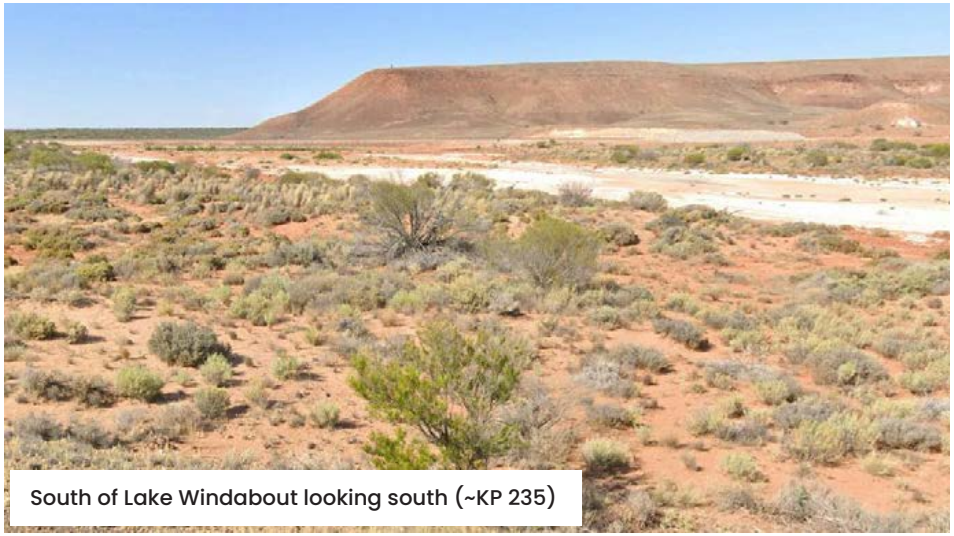
Lake Dempsey looking towards Port Augusta



Kalaya pump station site looking east (KP 154)



Landscape and vegetation at Carrapateena lateral branch (Stuart Hwy) (~KP 228)



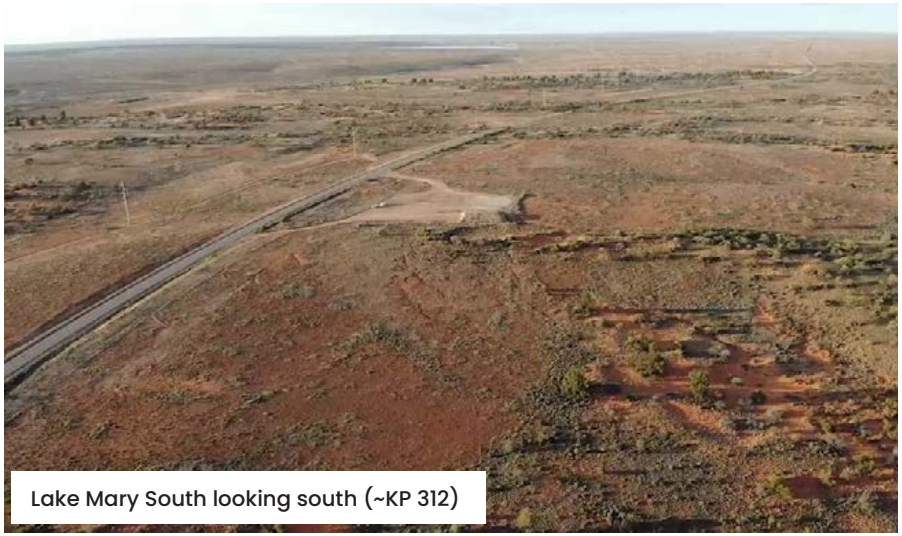
South of Lake Windabout looking south (~KP 235)

Table 9-5: Generalised environment and land use descriptions – Roxby subregion

IBRA region: Gawler - Roxby subregion
Landform and vegetation
The Roxby subregion lies north of the Arcoona Plateua subregion (refer Figure 9-4).
This subregion is characterised by sand sheets and dunefields over partly exposed alluvial plains covering the Gawler Craton and Stuart Shelf sediments. Vegetation comprises Mulga grassy woodlands on sand sheets grading to Sandhill Wattle and Northern Cypress-pine linear dunes with Western Myall woodlands over chenopods on calcareous plains. Low sand dunes are vegetated by low open woodland and mixed grasses, sandy interdune swales with Acacia low open woodland over Chenopod low open shrubland and interdune swales with clay soils supporting Cane-grass tall grassland.
Lake Mary which is located between Woomera and Roxby Downs is known to be an important cultural site for the Kokatha People[4].
Land use
Land use is predominantly livestock grazing over native vegetation undertaken on pastoral leases.
The transfer system terminates at the Olympic Dam mine which is the most significant mining activity in the subregion, extracting copper, uranium, gold and silver, and currently is one of Australia's largest underground mines.
Roxby Downs is the largest South Australian town north of Port Augusta and was built to support workers from the Olympic Dam mine site. In addition to the local population, the township also provides services for neighbouring communities and pastoralists. The small opal mining town of Andamooka is located approximately 26 km east of the Project. Roxby Downs and Andamooka are wholly dependent on water from the Great Artesian Basin drawn via the Olympic Dam mine operations.
The Woomera Protected Area covers 127,000 km², with almost a third of the Gawler bioregion, stretching across the subregions of Arcoona Plateau, Kingoonya, Roxby and Commonwealth Hill. It is the largest land-based rocket launching and testing range in the western world.
North of Olympic Dam is the internationally renowned Arid Recovery reserve which is an ecosystem restoration initiative working towards the restoration of Australia's arid lands.
Location of new Project infrastructure
This subregion accommodates most of the final 50 km of the transfer system alignment (KP 309.5 – 359) which terminates at the boundary of the BHP Special Mining Lease for the Olympic Dam mine.
Project interaction with topographic features
The pipeline alignment passes (and avoids) several ephemeral salt lakes including Lake Mary and Coorlay Lagoon and the township of Roxby Downs.

[4] https://kokatha.com.au/important-information-about-lake-mary/

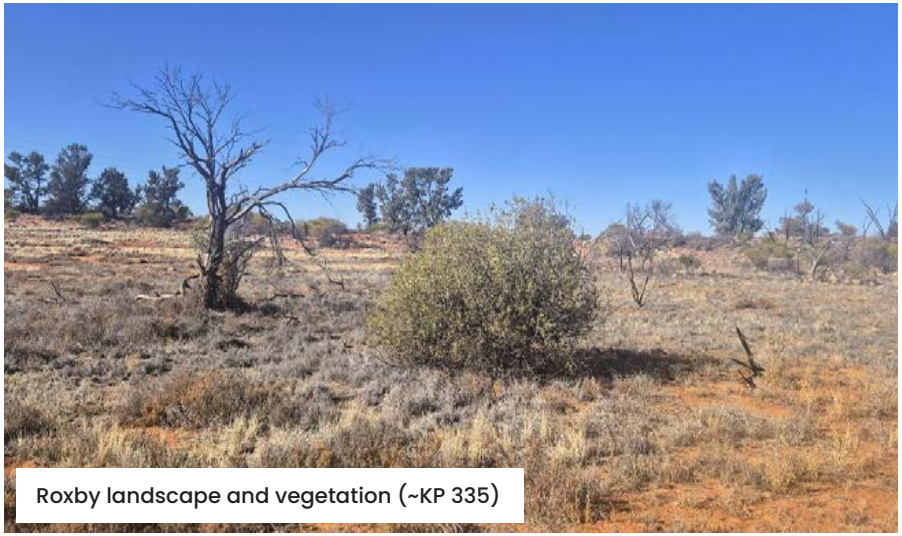
IBRA region: Gawler - Roxby subregion



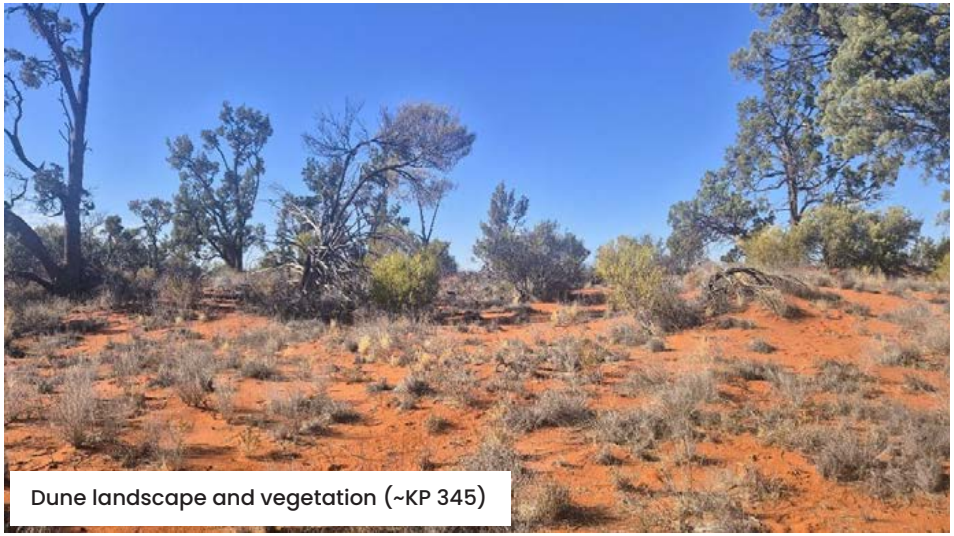
Lake Mary South looking south (~KP 312)



Coorlay Lagoon looking east (~KP 330 -



Roxby landscape and vegetation (~KP 335)



Dune landscape and vegetation (~KP 345)

9.5.2 Population centres

Whyalla

Whyalla is the largest community in proximity to Project infrastructure, the largest industrial city in regional South Australia and the principal centre for manufacturing, steel production and mineral resources processing in the Upper Spencer Gulf. In recent years there has been a strong focus on diversifying industry and increasing tourism in the Whyalla area. The iron ore mines and steelworks are major employers in the region and utilise local businesses and suppliers.

Relevant Project infrastructure includes the transfer pipeline, located approximately 8 km west of the western edge of Whyalla, and potential camp and laydown areas.



Plate 9-1: 'Accessible Cuttlefish Throne' at Whyalla Jetty
[Source: City of Whyalla]

Port Augusta

Port Augusta is the second largest city in the Upper Spencer Gulf region and is a major junction for road and rail transport, connecting Adelaide, Darwin and Perth via the Stuart, Eyre and Princes Highways and national rail network. It is also a major service centre for the northern and Far North region and provides a regional base for many government services, access to the tourist destinations of the Flinders Ranges and Far North, and support for a range of industries including renewable power generation, transport logistics, manufacturing and agriculture.

Commercial fisheries and aquaculture developments, largely located around Port Augusta and Fitzgerald Bay (near Whyalla) are important industries. Significant Department of Defence training facilities are located at Cultana, extending from Fitzgerald Bay to Port Augusta.

Relevant Project infrastructure includes the transfer system pipeline, located approximately 13 km west of Port Augusta and potential camp and laydown areas.



Plate 9-2: Port Augusta

Woomera and Pimba

The township of Woomera was established in 1947 to accommodate the joint Australian and British project to test weapons at the Woomera rocket range and is located 76 km south of Roxby Downs and 188 km north of Port Augusta. Until 1982, Woomera was classified as a military base with restricted public access, and is now maintained as a public township, supported by the Department of Defence.

Pimba is a small settlement located 6 km south of Woomera on the national rail network, at the junction of the Stuart Highway to Alice Springs and the Olympic Dam Highway to Woomera and Roxby Downs. It was established originally as a workers' camp during the construction of the transcontinental railway to Western Australia at the end of World War I and was retained as a railway siding once the track became operational. Both The Ghan and the Indian Pacific trains pass through Pimba.

Relevant Project infrastructure includes the transfer pipeline, a water storage site south of Pimba and a potential laydown area.



Plate 9-3: Woomera Theatre (left) and Spud's Roadhouse Pimba (right)

Roxby Downs

Roxby Downs is the largest South Australian town north of Port Augusta. Originally a cattle station, Roxby Downs was built to support workers from the Olympic Dam mine site now owned and operated by BHP. Roxby Downs was officially opened in November 1988 and is located approximately 10.5 km south of the Olympic Dam operation. In addition to the local population, the township also provides services for neighbouring communities such as Andamooka and pastoralists, and has modern, well-maintained infrastructure. The

significant level of mining activity currently results in low unemployment and high incomes in Roxby Downs.

Relevant Project infrastructure includes the transfer pipeline located approximately 1 km east of Roxby Downs, and potential temporary construction camp location.

Olympic Dam Village which also accommodates BHP workers is located approximately 7 km north of Roxby Downs. The transfer pipeline is located 350 m east of the village.




Plate 9-4: Roxby Downs

Cowleds Landing and Murninnie Beach

The small coastal holiday settlements of Cowleds Landing (8 km north) and Murninnie Beach (10.5 km south) are the closest population centres to the desalination plant on Mullaquana Station. There are no services at these locations, which provide holiday house / shack accommodation and boat launching sites on a sparsely populated coastline which is generally inaccessible by vehicles.



Plate 9-5: Cowleds Landing

9.5.3 Land tenure

Desalination plant site

The desalination plant infrastructure is located primarily on Mullaquana Station within Section 54, Hundred of Poynton which is held under a perpetual lease (Crown Lease 6186/2). The intake and outfall tunnels will pass through the subsurface of a small strip (approximately 30 m wide) of unallocated coastal land (Crown Record 5768/672) held in the name of the Minister for Environment and Water before the tunnels enter the subjacent land (i.e. land beneath the seabed) of the Spencer Gulf waters.

A list of the land parcels traversed by the desalination plant and Project linear infrastructure in the immediate vicinity of the plant is provided in Table 9-6 and shown in Figure 9-5.

Table 9-6: Land parcels in the vicinity of the desalination plant and related infrastructure

Infrastructure	Title / tenure reference	Allotment ID
Desalination plant	CL 6186/2	H560400SE54
Transfer system pipeline (commencement at desalination plant) New desalination plant access from Lincoln Highway to Eight Mile Creek Road	CL 6186/2	H560400SE54
	CL 6171/767	H560400SE5
	CL 6171/768	H560400SE7
	CL 6198/825	H560500 SE30
	CL 6198/824	H560500SE11
Transmission line and substation.	CL 6186/2	H560400SE54
	CL 6171/767	H560400SE5
	CL 6171/768	H560400SE7
	CL 6198/825	H560500 SE30
	CL 6198/824	H560500SE12
	CL6201/587	H560500SE6
	CL6201/587	H560500SE5
Laydown and construction footprint	CL 6186/2	H560400SE54
Intake / outfall tunnels	CL 6186/2	H560400SE54
	CR 5768/672	H560400S67

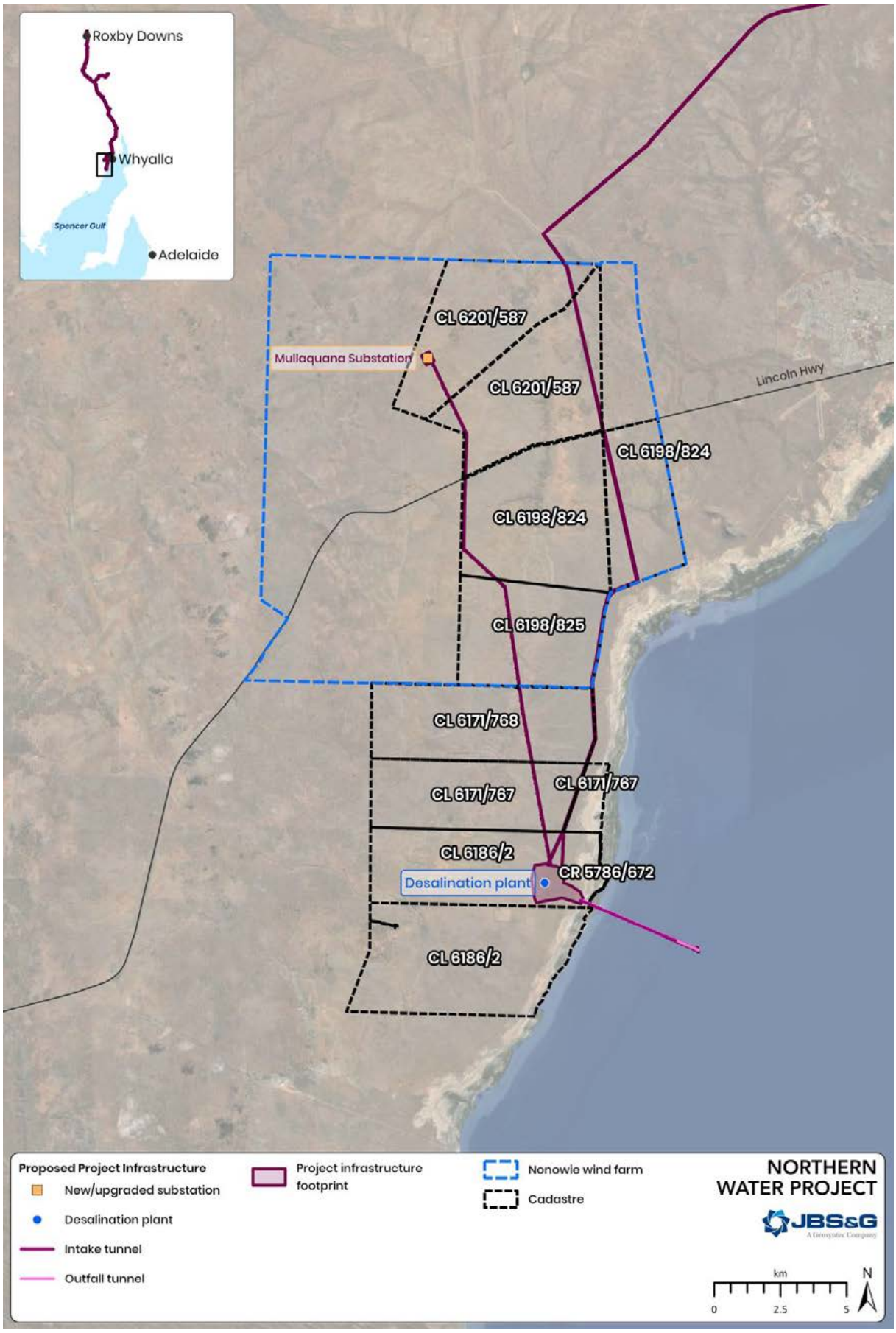


Figure 9-5: Relevant land parcels at desalination plant location

Transfer system and electricity infrastructure

The transfer system infrastructure locations and alignments traverse or are located adjacent to numerous properties held under a range of tenures which include freehold, Crown land (with perpetual or pastoral lease) and Commonwealth land (refer Table 9-7 for a summary of land tenure).

Land held by the South Australian government (excluding pastoral leases) is typically associated with pastoral activities, towns and residential areas, roads and other infrastructure, industry, institutions and conservation areas. There are also land parcels which are owned or leased by the Commonwealth which are potentially impacted by construction of the pipeline (i.e. Department of Defence land and land owned by the Australian Rail Track Corporation).

A full list of the land parcels currently proposed to be traversed by linear infrastructure and associated Project elements is provided in Appendix C.

Table 9-7: Summary of land tenure of transfer system infrastructure

Land tenure	Description
Freehold	The interface with freehold land is limited. The most notable interface is land at Lincoln Gap which includes the transfer system, a substation augmentation and transmission line. BHP land comprising Special Mining Lease No.1 (SML1) is also freehold, noting that land and development proposed within SML1 is outside the scope of the assessment in this EIS.
Crown Lease	Crow land includes land held under Perpetual Crown Leases and Pastoral Leases which are the dominant land tenure traversed by the transfer system from the desalination plant heading north. The primary land use on these leases is livestock grazing. Pastoral leases over Crown land are held by individuals or companies pursuant to the *Pastoral Land Management and Conservation Act 1989*. The Project interfaces with these pastoral properties north of Lincoln Gap. Many of these leases already have registered interests such as easements for BHP, government or utility infrastructure as well as other mining and renewable energy interests. Perpetual leases over Crown land are held by individuals or entities pursuant to the *Crown Land Management Act 2009*. The transfer system and transmission infrastructure interfaces with three perpetual leasehold properties, all south of Whyalla, including Mullaquana Station where the desalination plant is proposed to be located, and Moonabie and Nonowie Stations. These leases are subject to existing registered interests, including easements for government, utilities and infrastructure providers, as well as mining and renewable energy interests that may co-exist with the underlying leasehold tenure. Crown leases crossed by the transfer system also include a Crown Lease held by One Steel for the SIMEC rail corridor, Department of Defence and land vested in the Minister for Environment (generally for conservation purposes or as unmade road reserves).

Land tenure	Description
Crown Record	Generally comprises land on the transfer system alignment held by the Minister for Environment and Water, Minister for Infrastructure or Minister for Energy and Mining. Includes the alignment south of CEA, at Lincoln Gap, highway crossings, and east of Roxby Downs.
Commonwealth land	The proposed alignment interacts with Department of Defence land (albeit a Crown lease from the State) at the CEA north and west of Whyalla but is outside the surveyed boundary of the infrequent use (green) zone of the Woomera Prohibited Area at the Woomera township (refer Figure 9-7). There are also intersections with land held by the Australian Rail Track Corporation.

9.5.4 Native Title

Native Title may exist over certain areas of land or water, including vacant or unallocated Crown Land. However, it is extinguished by some types of tenure that confer exclusive possession, most notably freehold estates, and other 'previous exclusive possession acts' as defined in Schedule 1 of the *Native Title Act 1993* (Cth). This can include road reserves and other forms of tenure. In addition, the Federal Court has the authority to determine whether Native Title exists over land or waters, either on an exclusive or non-exclusive basis within the boundaries of a registered Native Title claim.

Native Title exists (predominantly determined as non-exclusive Native Title rights) over much of the area associated with the transfer system between Whyalla and Olympic Dam, including pastoral leases and the Cultana Training Area. While Native Title has been extinguished at Mullaquana Station, it exists non-exclusively along a narrow strip of coastal land on the Spencer Gulf extending from south of Port Augusta to south of Port Lincoln, including the coastline of Mullaquana Station. There is a registered ILUA between the State of South Australia and the Barngarla People in relation to this coastal land (SI2018/003) being Section 67, Hundred of Poynton (Crown land), which is shown on Figure 9-6.

Barngarla People

The desalination plant site is located within the Barngarla Native Title determination area (SC1996/004) (refer Figure 9-6) which extends across the majority of the eastern and central Eyre Peninsula from the Spencer Gulf to the Eyre Highway, incorporating an area of approximately 34,401 km^2. Native Title has been determined by the Federal Court to exist in parts of the determination area (SCD2016/001). Native Title has been extinguished over Mullaquana Station and other adjacent Perpetual Crown Leases.

Proposed Project ILUA

DIT on behalf of the relevant Minister (to be determined) is engaging with the Barngarla Determination Aboriginal Corporation (BDAC) Registered Native Title Body Corporate (RNTBC), on behalf of the Barngarla People, with the aim of negotiating the terms of an ILUA in accordance with the Native Title Act to enable the Project to proceed within the Barngarla Native Title determination area.

The ILUA and associated Aboriginal Cultural Heritage Agreement and Management Plan will include heritage mitigation measures and management procedures, governance matters,

compensation regimes, and ongoing reporting. Further details are provided in Chapter 16 Aboriginal Cultural Heritage.

To address the risk of potentially encountering undiscovered cultural heritage during construction, the parties have agreed on a process whereby the government can seek an authorisation under the Aboriginal Heritage Act to impact cultural heritage discoveries in accordance with agreed management measures considered in the ILUA and associated Aboriginal Cultural Heritage Agreement.

Kokatha People

In the northern section of the Project Area, the proposed main transfer pipeline and Carrapateena lateral branch, pump stations, storages and transmission line alignments are located within the determined Kokatha People (Part A) Native Title Claim. The Federal Court determined on 1 September 2014 that Native Title exists in parts of the Kokatha determination area (SCD2014/004) (refer Figure 9-6).

Existing Indigenous Land Use Agreements

There is an existing ILUA, being the Kokatha Native Title Claim Settlement ILUA between the State of South Australia, BHP Billiton and the Kokatha Aboriginal Corporation (KAC) dated 2 December 2014 (SI2014/011) (refer Figure 9-6).

Proposed Project Indigenous Land Use Agreement

DIT, on behalf of the relevant Minister (to be determined), is engaging with the KAC Registered Native Title Body Corporate (RNTBC), on behalf of the Kokatha People, with the aim of negotiating the terms of an ILUA in accordance with the Native Title Act to enable the Project to proceed within the Kokatha Native Title determination area.

The ILUA and associated Aboriginal Cultural Heritage Agreement and Management Plan will include heritage mitigation measures and management procedures, governance matters, compensation regimes, and ongoing reporting. Further details are provided in Chapter 16 Aboriginal Cultural Heritage.

KAC and the proponent (on behalf of the relevant Minister) have agreed on a process to address the risk of potentially encountering cultural heritage during construction, whereby the government can seek an authorisation under the Aboriginal Heritage Act to impact cultural heritage discoveries. This must be handled in accordance with agreed management measures considered in the ILUA and associated Aboriginal Cultural Heritage Agreement.

Further detail on engagement in relation to the ILUAs and protection of Aboriginal cultural heritage is provided in Chapter 16 Aboriginal Cultural Heritage.

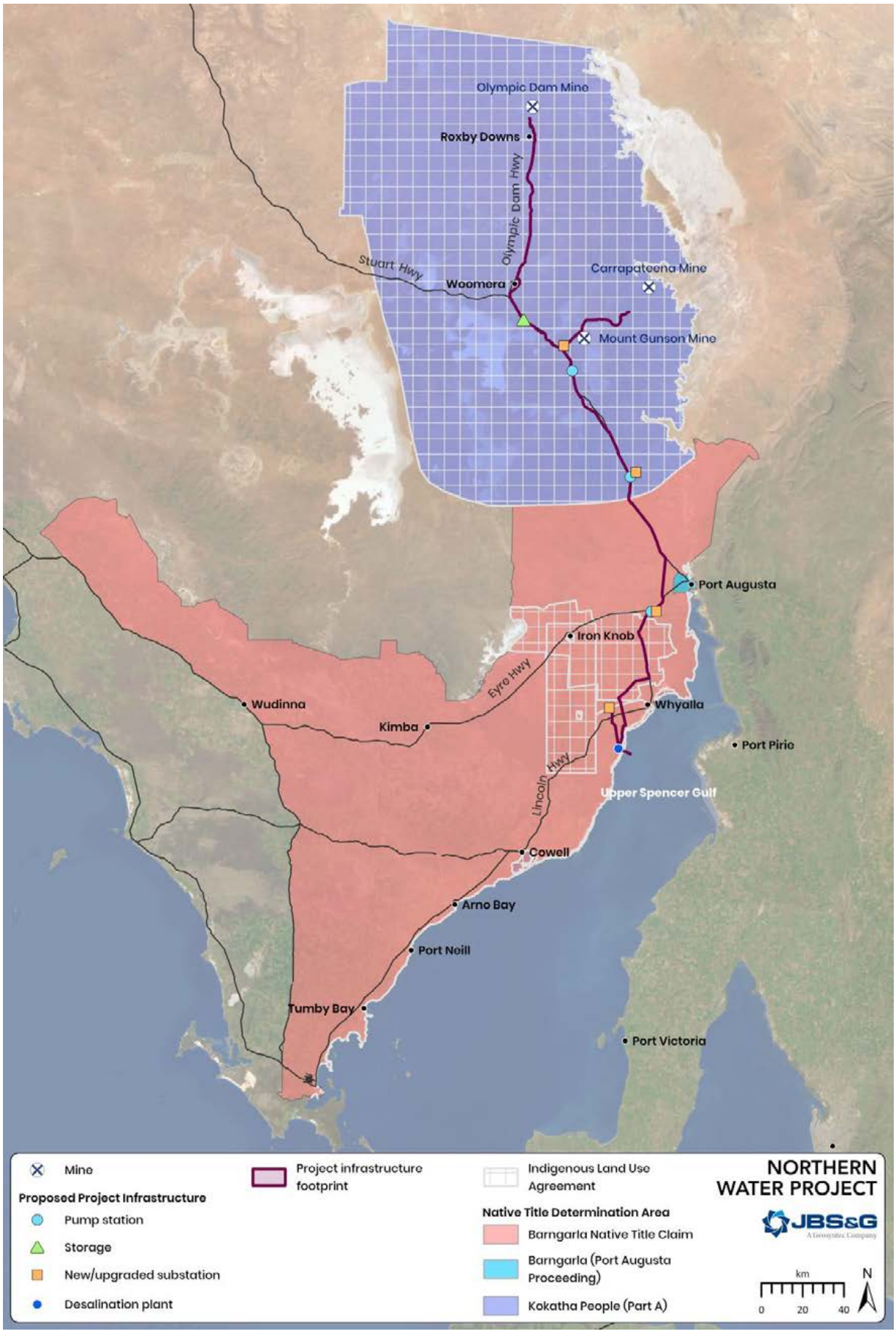


Figure 9-6: Native Title determined areas and ILUAs

9.5.5 Department of Defence land

Significant Department of Defence (Defence) training and testing facilities are located in the vicinity of the Project, primarily at Cultana (near Whyalla) and Woomera.

Cultana Training Area and Cultana Expansion Area

The CUTA is the largest Defence training area in South Australia capable of supporting full combined arms exercises. It is located approximately 370 km north-west of Adelaide extending from Fitzgerald Bay near Whyalla to Port Augusta (refer Figure 9-7).

CUTA consists of the original Commonwealth-owned Cultana Training Area and the Cultana Training Expansion Area (CEA). The site is used primarily for Defence training activities and operations including:

- combined arms manoeuvring training
- live firing of ammunition, including small arms, field and medium artillery weapons and air-delivery weapons
- air mobile and airborne operations including air to ground live-firing
- unmanned aerial system training activities
- electronic warfare training activities.

The South Australian Government granted a Miscellaneous Lease for Defence Purposes over the CEA, which is a Crown Lease issued to the Department of Defence. Under a land exchange agreement signed between the South Australian and Commonwealth governments in November 2023, land parcels located on the southern boundary of the CEA have been subject to a staged transfer of ownership to the South Australian government (refer Figure 9-7).

The Lincoln Highway runs north-south through the CEA separating it into two main sections. High voltage powerlines cross several parts of the area and a substation is located west of the highway near the southern boundary. The transfer system is located in the CEA portion of the broader CUTA, traversing the southern boundary of north of Whyalla, then following the Lincoln Highway north through the CEA.

In 2025, Defence formally approved the proposed siting of the Project's infrastructure through the CEA. Site selection is a formal process, with geographical siting and proposed use of facilities within the Defence Estate requiring approval by a specially convened panel. This process involves the detailed assessment of all operational, environmental, heritage, technical interfaces, and safety considerations related to the Project. The Project will continue to work with Defence through the detailed design process.



Plate 9-6: Cultana Expansion Area in the Project Area

Woomera Range Complex

The Woomera Range Complex (WRC) is located in the north-west pastoral region of South Australia and is comprised of the Woomera Test Range (Air Force Test Ranges Squadron), RAAF Base Woomera (20SQN) and the Nurrungar Test Range. The operational area of the WRC is encompassed by the Woomera Prohibited Area. RAAF Base Woomera provides essential operational support to the WRC and includes the Woomera airfield, hangars, technical areas and the township of Woomera. The Woomera village supports public access to facilities and services that support the township.

The pipeline is located east of the Olympic Dam Highway from Pimba, then deviates east of Woomera and rejoins the highway approximately 2.5 km north-east of Woomera, remaining outside Defence land. North of Woomera, the pipeline briefly crosses west of the Olympic Dam Highway before moving back to the east for the final alignment to the Olympic Dam mine. The alignment does not enter into Defence land at this location.

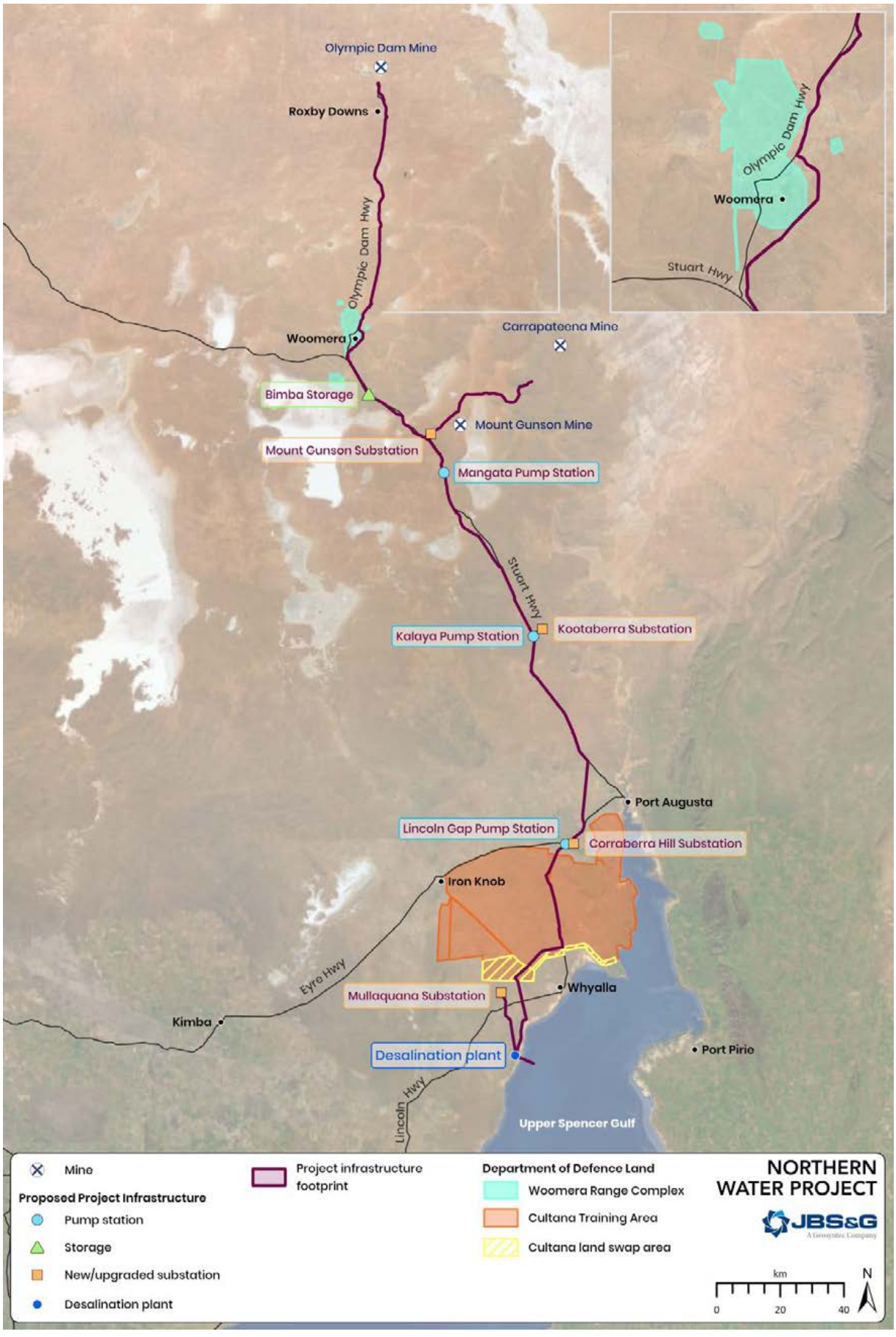


Figure 9-7: Department of Defence land in the Project Area

9.5.6 Existing major infrastructure

Existing major infrastructure in the vicinity of the Project includes high voltage overhead transmission lines and substations, water and hydrocarbon transmission pipelines, State and council-maintained roads, railway lines, regional airports and airstrips (refer Figure 9-8 and Figure 9-9). Further detail of the road, rail and airfield infrastructure in the Project Area is provided in Chapter 21 Transport and Traffic.

Transmission and distribution lines and substations

The Project will utilise existing and new electricity infrastructure to supply the desalination plant and pump stations (refer Figure 9-8 and Figure 9-9).

There are no existing major electricity transmission lines or substations within the Mullaquana Station area. The closest transmission line is the 275 kV Eyre Peninsula Link (EP Link) transmission line from Cultana to Port Lincoln, owned and operated by ElectraNet (refer Plate 9-7). A SA Power Networks 19kV overhead line located approximately 5 km west of the site provides electricity the Mullaquana Station homestead and the small community at Murninnie Beach to the south.

A new substation and 132 kV transmission line will connect the desalination plant to the grid. The transmission line commences at the desalination plant on Mullaquana Station, and traverses the adjoining Moonabie and Nonowie Stations (including land owned by Nonowie Energy) to the proposed new Mullaquana substation located on Nonowie Station.

Between Whyalla and Lincoln Gap the pipeline crosses under or parallels sections of the 132 kV Whyalla Terminal to Davenport and Davenport to Cultana transmission lines. The Lincoln Gap pump station will connect to the grid via a new 275 kV transmission line to the existing Coraberra Hill substation. Three high voltage transmission lines extend from the Davenport Substation, near Port Augusta, to the vicinity of Pimba and Woomera, and on to Olympic Dam, roughly following the alignment of the Stuart and Olympic Dam Highways. These lines are owned by BHP and ElectraNet and range in capacity from 132 kV to 275 kV. The pipeline crosses under or generally parallels the existing transmission line alignments.

The Project will connect into the grid via a new 275 kV transmission line and substation at Kalaya pump station, and a new 33 kV distribution line to the existing Mount Gunson substation to supply the Mangata pump station.



Plate 9-7: Eyre Peninsula Link from Wild Dog Hill, Whyalla

Existing pipelines

The Santos operated 659 km Moomba to Port Bonython Liquids Line (PL 2) transports hydrocarbon liquids from Moomba for processing at Port Bonython and export to national and international markets. The proposed Lincoln Gap transmission line easement crosses the PL 2 easement and the pipeline alignment follows the PL 2 easement from north of Lincoln Gap for approximately 8.5 km before veering away to the west and north. PL 2 will be crossed by the transfer system pipeline (using trenchless excavation) in two places along this length.

The Whyalla lateral gas pipeline for the Moomba Adelaide Pipeline System (PL 1) is located at least 5.5 km from the transfer system at its nearest point and will not be impacted by the Project.

Several Eyre Peninsula and Far North communities are supplied by reticulated water from the River Murray via the Morgan-Whyalla pipeline system, including Whyalla, Kimba and Port Augusta. A number of the system pipelines will be crossed by the Project. Woomera and Pimba access this water via the Port Augusta-Woomera Pipeline, however this pipeline will not be impacted by the Project. Andamooka accesses water via a pipeline from Roxby Downs, and this pipeline will also not be impacted by the Project.

Roads

The major highways in the Project Area are the Stuart Highway, Eyre Highway, Lincoln Highway and Olympic Dam Highway. Other main roads intersected by the pipeline include Iron Knob Road.

Smaller, sealed and unsealed locally maintained roads occur throughout the Project Area while numerous unsealed roads and tracks are located on and maintained within private land and pastoral stations. Much of the pipeline follows existing roads and tracks as the alignment has been selected to utilise previously disturbed areas wherever possible.

There are no Public Access Routes[5] in the Project Area.

Table 9-8: Major highways in the Project Area

Highway	Description	Project interaction
Stuart Highway	Heads generally north from Port Augusta and forms part of the major intercity highway system between Adelaide and Darwin. The highway supports movement of freight and passengers and access to the north of the State for mining operations, pastoral properties, tourism destinations and rural and remote communities.	Pipeline generally parallels (with a number of crossings) the Stuart Highway from north-west of Port Augusta (KP 109) to the intersection with the Olympic Dam Highway (~KP264.5).
Eyre Highway	Is the primary sealed east-west link between South Australia and Western Australia, commencing at	The pipeline crosses the Eyre Highway at the intersection with the Lincoln

[5] A Public Access Route (PAR) is a designated route allowing the public to traverse specific areas of pastoral leases without needing permission from the pastoral lease holder. These routes are established under the *Pastoral Land Management and Conservation Act 1989*.

Highway	Description	Project interaction
	Port Augusta, crossing the top of the Eyre Peninsula, Nullarbor Plain to Western Australia.	Highway at Lincoln Gap (~KP80) and parallels the highway (west) to KP 89.
Lincoln Highway	Heads south from Port Augusta to Port Lincoln, via Whyalla, providing the main highway connection on the east coast of the Eyre Peninsula.	The pipeline crosses the Lincoln Highway at KP 18, then parallels the highway(west) from KP 44.5 to the intersection with the Eyre Highway at Lincoln Gap (~KP80).
Olympic Dam Highway	Services the Pimba to Roxby Downs / Olympic Dam Road freight route.	Pipeline generally parallels the Olympic Dam Highway from north of Woomera (~KP 277) to Roxby Downs with two crossings.

Airports

Regional airports receiving scheduled air services in proximity to the Project are located at Port Augusta (which is the operational base for the Royal Flying Doctor Service (RFDS)), Whyalla and Olympic Dam. The RAAF Base at Woomera is a located in the northern section of the Project Area.

The proposed transmission line alignment west of Whyalla is approximately 13 km from the Whyalla airport. There are numerous smaller landing strips throughout the Project Area associated with mining operations, tourism activities and pastoral stations which can also accommodate RFDS aircraft.

Rail

The region is at the intersection of the Sydney–Perth and Adelaide–Darwin transcontinental rail lines which provide regional and interstate passenger and freight services. The Adelaide to Darwin rail link passes through Port Augusta and Pimba and north through central Australia to Darwin. Smaller rail lines in the Whyalla area include the Whyalla to Port Augusta freight line and the Iron Baron iron ore transport line.

The pipeline crosses the Iron Baron line north-west of Whyalla (~KP31), with five crossings of the transcontinental line between KP 144.5 and Pimba (~KP265). There are no crossings of the Whyalla to Port Augusta line.

The transcontinental rail line and the Whyalla-Port Augusta line are operated by the Australian Rail Track Corporation. The impacts of the Project on rail operations have been assessed in Chapter 21 Traffic and Transport.

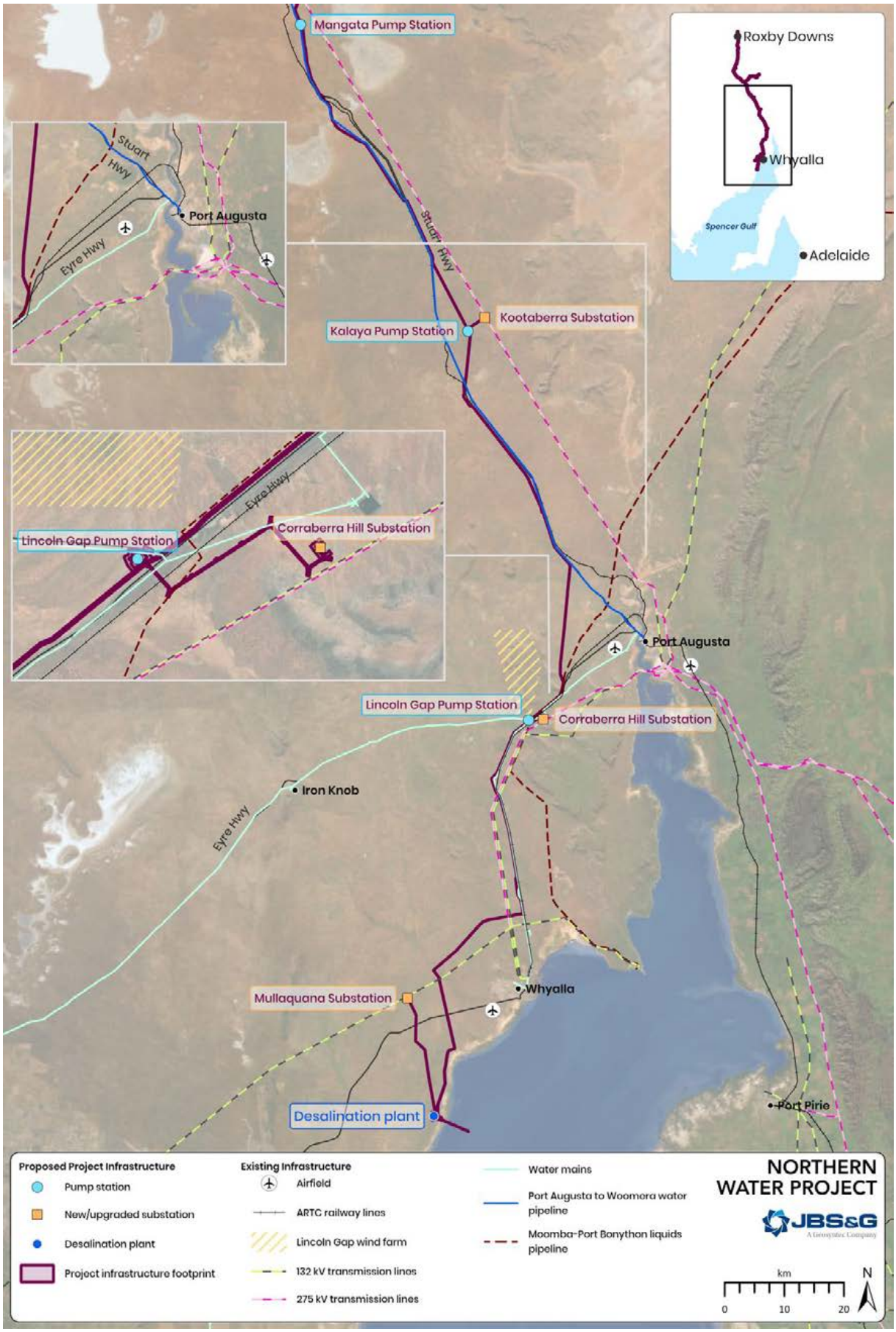


Figure 9-8: Existing major infrastructure in the Project Area– southern section

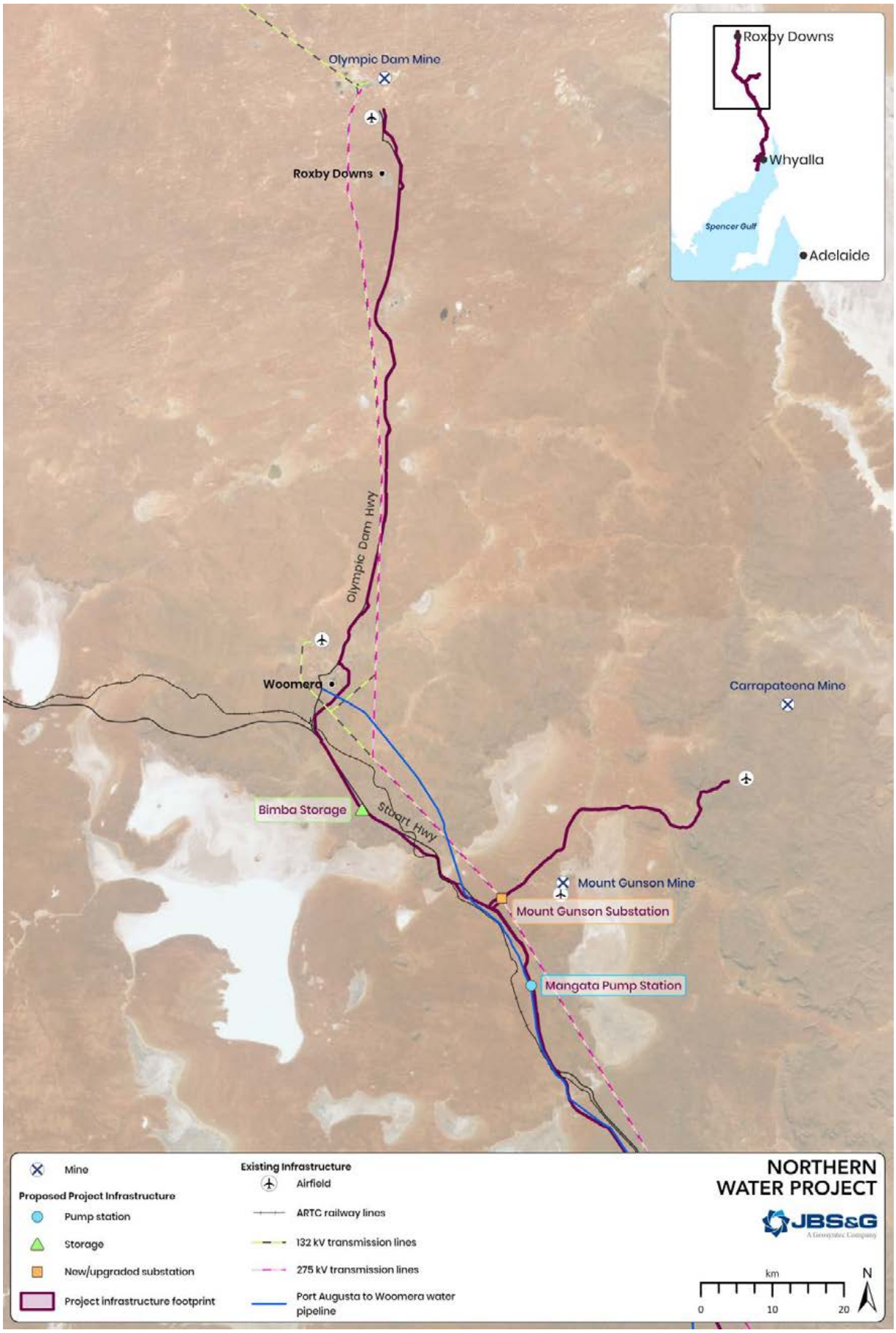


Figure 9-9: Existing major infrastructure in the Project Area - northern section

9.5.7 Mining and associated tenements

There are a number of mining tenements granted under the *Mining Act 1971* in the vicinity of the proposed Project infrastructure including numerous mineral exploration licences (refer Figure 9-12). Other types of exploration and production tenure also exist, including One Steel Manufacturing's Miscellaneous Purposes Licences (MPL) 69 and 70 which comprise a service corridor containing buried pipelines to transport iron ore concentrate from the Middleback Ranges into the Whyalla steelworks, and return water back to the mines. The Northern Water pipeline will traverse the MPLs in a south to north direction, and the Mullaquana substation is located immediately to the south of the MPLs.

BHP, under the name of OZ Minerals Carrapateena Pty Ltd, holds MPL 152 which runs from the Stuart Highway to the Carrapateena copper mine. The MPL has been granted for various purposes to support the Carrapateena mine (e.g. a site access and haulage road, water pipeline and other associated infrastructure). The Carrapateena lateral branch pipeline will run entirely within the MPL. Additionally, along this alignment, the pipeline is closely located to nine Carrapateena borrow pits (which service the mine and infrastructure corridor), with the pipeline intersecting with three of the mining leases (EML 6483, 6484 and 6487).

There are three adjoining Extractive Mineral Leases (EMLs) approximately 10 km west of the Whyalla outskirts, north of the Lincoln Highway and south from where the pipeline crosses Iron Knob Road, one of which (EML 5653) will be traversed by the pipeline (refer Figure 9-10).

Other active mines and quarries in the general vicinity of the proposed alignment include:

- a quarry (comprising of EML 4101 and 4102) is located north of the desalination plant's intake pump station
- various other EMLs are located on either side of the pipeline alignment
- S Uranium Pty Ltd's (Alligator Energy) Samphire Uranium Project, held under Retention Lease 137 and located approximately 1.3 km to the north-west of the desalination plant and approximately 600 metres from the Mullaquana transmission line

  S Uranium also hold the overarching Exploration Licence 5926 over land that includes the whole of the desalination plant (onshore infrastructure) and approximately the first 22 km of the pipeline.
- Mount Gunson Copper mine (KPs CA06 to CA10)
- Carrapateena mine (Mineral Lease 6471) and associated EMLs (used as borrow pits) (in addition to MPL 152); and
- BHP's Olympic Dam mine.

Figure 9-10, Figure 9-11 and Figure 9-12 show the location of Project infrastructure in relation to the quarry and mining tenements discussed above.

The Gawler Craton in the northern section of the Project Area hosts some of the world's largest copper and other mineral deposits and is home to a number of large mining operations. The Gawler Province remains largely underexplored and analysis suggests there are significant opportunities for further economic mineral discoveries, which could be supported by the Project.

At the time of writing there is no petroleum tenure granted under the *Energy Resources Act 2000* that will be impacted by the Project.

Potential interaction with other planned major infrastructure development

The Nonowie Wind Farm and the Alligator Energy projects are two major projects in the planning phase in the vicinity of the desalination plant site.

A concept design has been developed by Tilt Renewables in March 2025, although the project remains under assessment. It appears that primary access to this site would be from Lincoln Highway rather than Eight Mile Creek Road. Potential traffic interactions between the projects are more likely to occur near the proposed Mullaquana Station Substation site.

The Samphire Uranium Project is located in the close vicinity of the desalination plant site (refer Figure 9-10). As a retention lease of 5 years was granted to Alligator Energy for this project in August 2025, it is anticipated that some traffic interactions may occur during Project construction and operation.

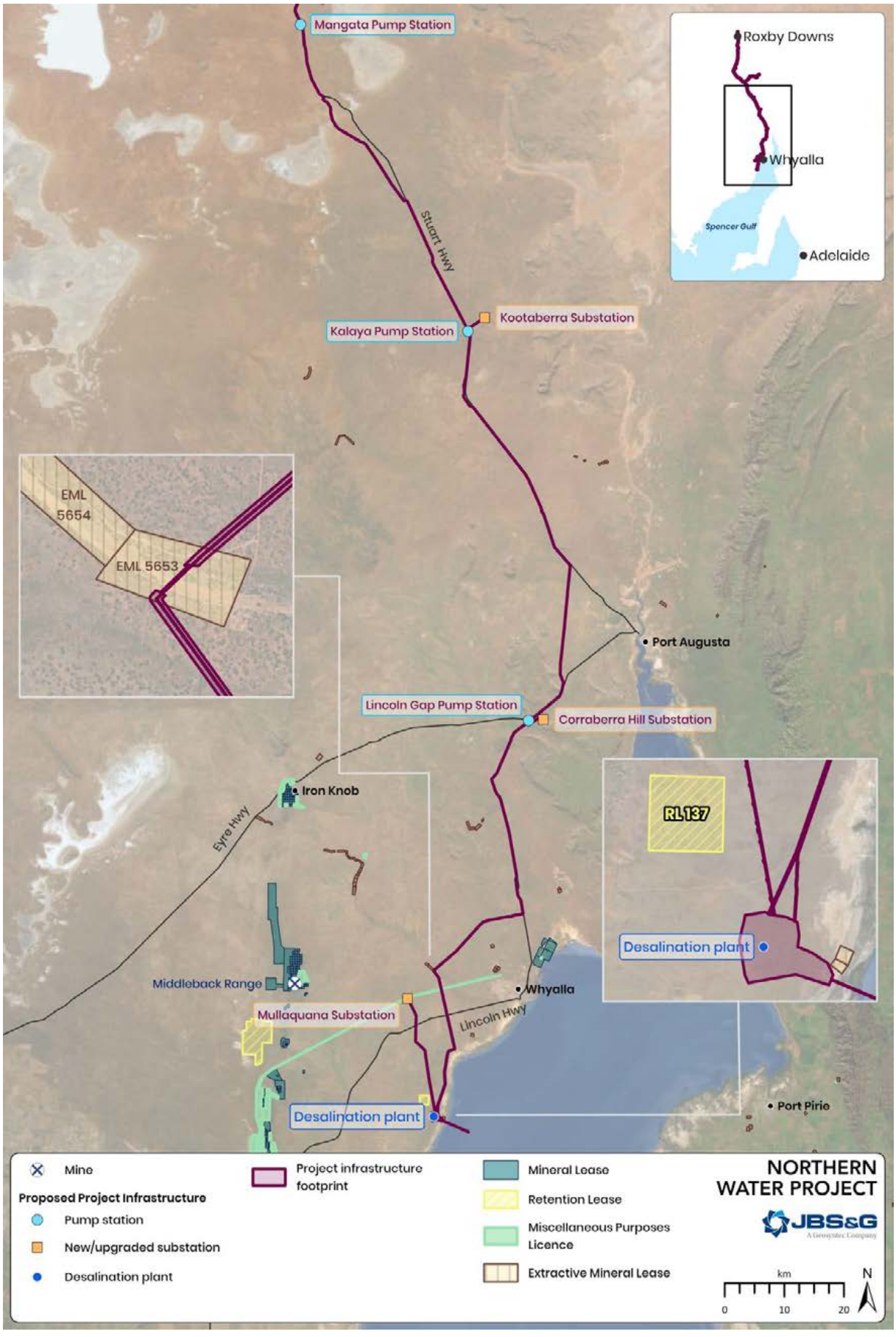


Figure 9-10: Mining tenure in Project Area - southern section

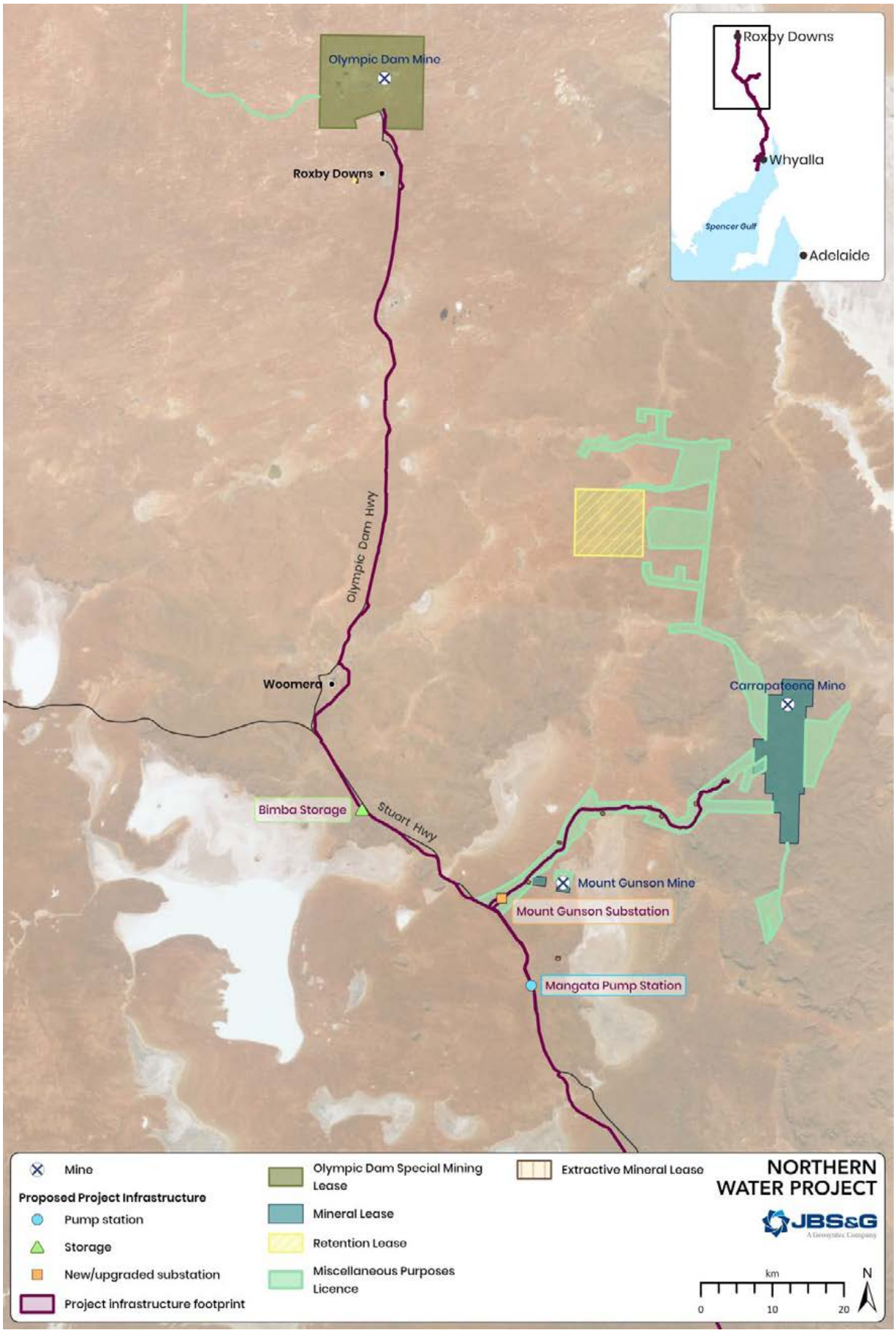


Figure 9-11: Mining tenure in Project Area - northern section

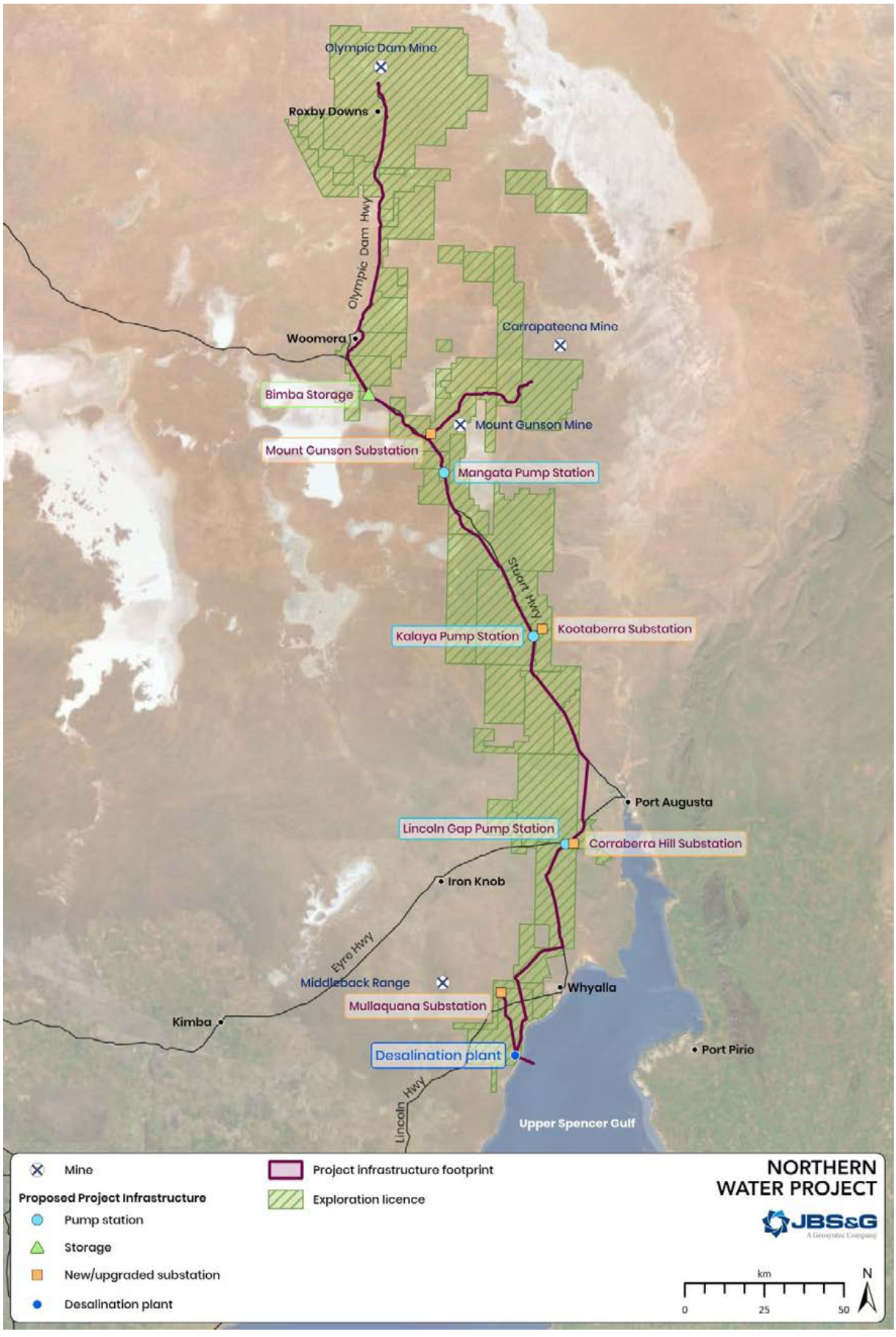


Figure 9-12: Mining exploration licences in the Project Area

9.5.8 Renewable energy

South Australia's renewable energy sector is growing rapidly, with the State potentially becoming a global leader in renewable energy production and supply. The Eyre Peninsula and Far North regions in particular have abundant renewable energy resources (solar and wind), suitable land and connection to national and global energy markets. The availability of these resources is an important driver of the State's plans for the development of green industry.

There are areas of interest under the *Hydrogen and Renewable Energy Act 2023* which intersect the proposed transfer pipeline corridor and Project transmission line alignments:

- an application for a Renewable Energy Infrastructure Licence (REILA 25) (north-west of the desalination plant site) made by Tilt Renewables DevCo Pty Ltd; and
- the 'Whyalla West' Hydrogen and Renewable Energy Act Release Area.

The proposed Mullaquana Station transmission line and substation which will supply electricity to the desalination plant are located within the area of the Nonowie Wind Farm Project proposed by Tilt Renewables. It is understood that a Renewable Energy Infrastructure Licence application for the wind farm project was lodged in July 2025.

Existing large scale renewable energy projects in the vicinity of the Project alignment include:

- Lincoln Gap Wind Farm and battery storage - 212 MW wind farm operated by RATCH Australia Corporation, stage 1 constructed in 2021
- Bungala Solar Project – 135 MW solar PV farm in service.

In addition to these grid-scale projects there are other proposals in the Project Area which either have or are developing smaller-scale renewable energy infrastructure projects suitable for supplying larger facilities, including several solar farm developments in the industrial precinct of Whyalla.



Plate 9-8: Lincoln Gap Wind Farm looking west from the Stuart Highway

9.5.9 Primary production

Land in the southern section of the Project alignment in and around the desalination plant site on Mullaquana Station and the adjoining properties is unsuitable for cropping and is utilised for grazing of stock.

The northern section of the alignment traverses large scale pastoral properties which can only sustain relatively low stocking rates due to the low rainfall (annual average 125 mm to 175 mm). Low rainfall coupled with high evaporation rate means there is no permanent surface water, making the provision of water a limiting factor for stock distribution.



Plate 9-9: Stock grazing - Mullaquana Station and Lincoln Gap

9.5.10 Protected areas

The proposed desalination plant, pipeline and transmission line alignments do not traverse any conservation parks, national parks, Wilderness Protected Areas, conservation reserves or native vegetation heritage agreement areas (refer Figure 9-13). Proposed transfer system infrastructure is not located within an area where the water resource is prescribed under the *Landscape South Australia Act 2019* and is not within a water protection area.

9.5.1 Tourism and recreation land uses

Tourism and recreation-based land uses in the region of the Project are largely centred on appreciation of and recreation in the natural environment.

On a regional level, the east coast of the Eyre Peninsula attracts visitors from the rural hinterland, other parts of South Australia and interstate, with many holiday homes located at coastal settlements near the Project Area. Key attractions include the coastline generally, recreational fishing and boating with inland bird watching and hiking also being popular. Diving with Giant Australian Cuttlefish (which congregate in the waters adjacent Whyalla during winter months to breed) is a key attraction for tourists to Whyalla.

Port Augusta is considered the gateway to the Flinders Ranges outback tourism region, with over half of the total visitors to the region visiting Port Augusta throughout their stay. North of Port Augusta tourism and recreation focuses on camping, hiking and the 'outback' experience of 'wilderness' landscapes, world-renowned landmarks and arid land ecosystems.

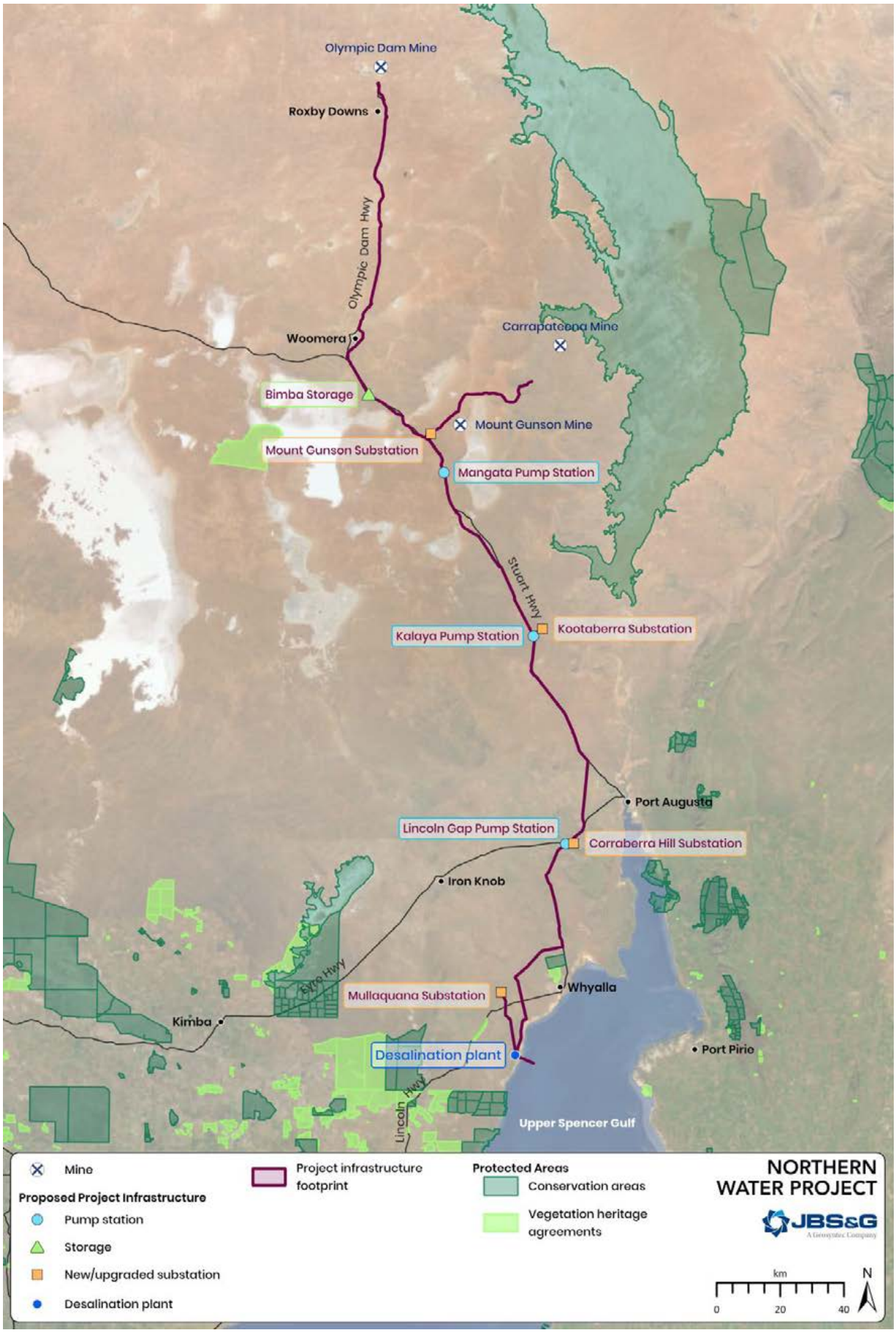


Figure 9-13: Protected areas in the vicinity of the Project Area (terrestrial)

9.6 Existing Use of Marine Waters

This section provides a general description of the existing uses of marine waters offshore from the desalination plant site including protected areas, commercial and recreational uses, and Native Title. It should be read in conjunction with descriptions of existing maritime operations in Chapter 21 Traffic and Transport and the general marine environment in Chapter 11 Marine Environment.

9.6.1 Shipping

Spencer Gulf waters offshore from the desalination plant site are an important shipping lane for export of bulk goods and petroleum products from Whyalla, Port Pirie and Port Bonython. The shipping navigation channel ('the recommended track') is located approximately 7 km east of the likely location of any of the Project's seabed infrastructure (refer Figure 9-14).

Maritime traffic is described in further detail in Chapter 21 Transport and Traffic.

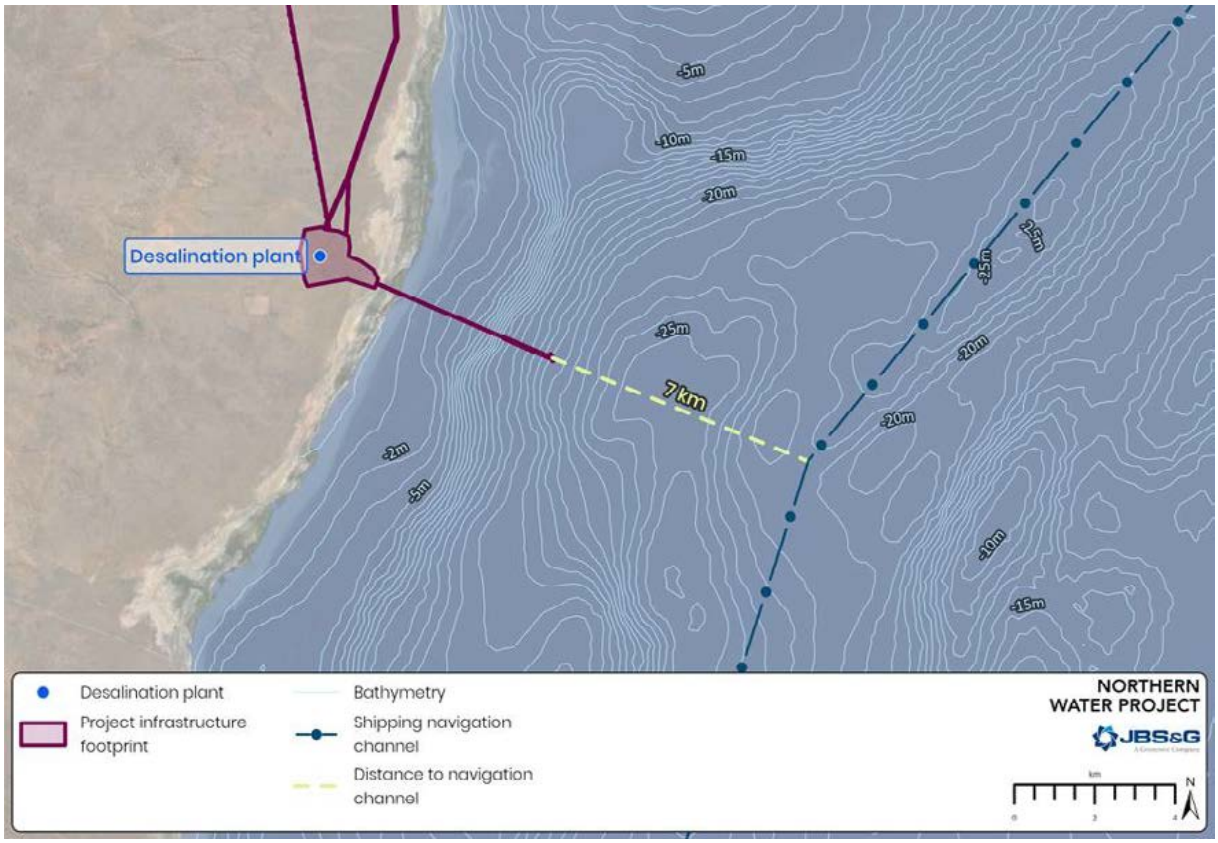


Figure 9-14: Distance of shipping navigation channel from Project seabed infrastructure
[Note: Bathymetry is in mAHD]

9.6.2 Maritime infrastructure

Whyalla Port

Whyalla Port is a deep-water industrial and commercial port, currently owned and operated by OneSteel Manufacturing (under the control of administrators KordaMentha) and is primarily used to export iron ore and steel products from the adjacent Whyalla Steelworks. The port operates several berths including an iron ore berth, deep sea berth and slipway berth which caters for shipbuilding and maintenance needs.

Whyalla Port will be utilised by the Project during construction by vessels moving to and from the jack-up barge and marine construction zone.

Whyalla Marina and Jetty

Whyalla Marina and boat ramp services the local and visiting recreational boating community, as well as marine experience and fishing tour group providers. The iconic Whyalla circular jetty is accessed from the marina. Minimal use of the marina is proposed during Project construction.

Port Bonython

Port Bonython is a deepwater industrial port, hydrocarbon terminal, and proposed clean energy hub located on the Upper Spencer Gulf, north-east of Whyalla. The port is more than 35 km from the marine Project Area and will not be affected by the Project.

Further detail on maritime infrastructure and vessel movements is provided in Chapter 21 Traffic and Transport.

9.6.3 Marine protected areas

Marine conservation

There are no areas protected under the *Marine Parks Act 2007* at or near the location of the desalination plant intake and outfall (refer Figure 9-15).

Upper Spencer Gulf Marine Park

The Upper Spencer Gulf Marine Park is the closest marine protected area to the proposed desalination plant marine infrastructure, located approximately 8 – 10 km north-east. The park spans the Northern Spencer Gulf waters from Port Pirie to Whyalla and up to Port Augusta, encompassing sheltered waters best known for the Giant Australian Cuttlefish breeding (and protected as the Cuttlefish Coast Sanctuary Zone National Heritage Place), wetlands of national importance and nursery areas for large range of fish and crustaceans. The marine park is home to a diverse marine life including dolphins, whales, migratory and resident shorebirds, water birds and fish species (NPWS 2025).

The park also incorporates sanctuary zones which are core conservation areas where fishing is prohibited. The Cowleds Landing Sanctuary Zone and an adjoining Habitat Protection Zone are located approximately 8 – 10 km from the desalination plant outfall diffuser structure.



Plate 9-10: Cowleds Landing Sanctuary Zone
[Source: Eyre Peninsula Landscape Board]

Franklin Harbour Marine Park

The Franklin Harbour Marine Park is located approximately 11.5 km south of the proposed desalination plant marine infrastructure. The mudflats at the entrance to Franklin Harbor support uncommon, slow growing cyanobacteria stromatolites and the sheltered beaches within Franklin Harbor are important habitat for many internationally protected bird species. Unusually large colonies of stony coral can be found offshore outside Franklin Harbor. There are examples of Aboriginal stone barrier fish traps with strong cultural significance also present in the park.

The park supports important nursery areas for King George Whiting, as well as for Prawns, Sardines, Scalefish species and Blue Swimmer Crab.

Non-Aboriginal cultural heritage

National Heritage List - Cuttlefish Coast Sanctuary Zone

The CCSZ near Point Lowly was entered on the National Heritage List in February 2023. The CCSZ protects the Spencer Gulf breeding grounds for the Giant Australian Cuttlefish (*Sepia apama*). The National Heritage Place is located approximately 34 km north-east of the outfall diffuser at the desalination plant and will not be impacted by construction and operation of the Project due to the significant distance.

Further information on the Giant Australian Cuttlefish is provided in Chapter 11 Marine Environment and in the Giant Australian Cuttlefish Assessment (refer Appendix G-16).

Historic shipwrecks

The Spencer Gulf has numerous recorded historic shipwrecks on the Australasian Underwater Cultural Heritage Database, although none are located within 5 km of the Project Area. The closest shipwreck is the 'Mary Ann' which was a wooden cutter abandoned in 1885 after springing a leak. As the wreck location is located more than 11 km south-west of the site of the proposed desalination plant, no impacts from construction and operation of the Project are expected. Further information regarding historic shipwrecks is provided in Chapter 17 Non-Aboriginal Cultural Heritage.

9.6.4 Native Title

The waters of the Spencer Gulf are State waters and while there is no allocated tenure, the Gulf waters are typically treated as Crown Land. Accordingly, any use of the waters for a commercial purpose requires a licence, deed or some other form of agreement from the Minister for Infrastructure and Transport, in addition to any Native Title considerations.

There are no current Native Title claims over the Spencer Gulf although the Barngarla People had initially included part of the Gulf waters in the Barngarla Native Title Claim. When making its determination of that claim, the Federal Court awarded Native Title only to the intertidal waters and waters immediately adjacent to the intertidal zone, thereby excluding the majority of Gulf waters and all of the Spencer Gulf islands (Federal Court of Australia, 2015).

While Native Title has been extinguished over Mullaquana Station and neighbouring properties, it therefore remains from the mean high water mark to approximately 700 m seaward along this section of the coast. The intake and outfall tunnels for the desalination

plant extend underground into the Spencer Gulf, within the intertidal waters and partially Barngarla Native Title land.

As noted in Section 9.5.4, the desalination plant and associated infrastructure, including the intake and outfall tunnels, is currently the subject of ILUA negotiations with BDAC.

9.6.5 Fisheries and aquaculture

Along with agriculture, fisheries and aquaculture are significant contributors to the Eyre Peninsula regional economy. The Spencer Gulf supports important commercial and recreational fisheries targeting species including Western King Prawn, Garfish[6], Snapper[7], King George Whiting, Australian Anchovy, Southern Calamari, Sardine, Abalone, Rock Lobster and Blue Swimmer Crab.

The marine study area[8] (MSA) is known to provide habitat that supports key fishery species including Western King Prawn, Snapper, King George Whiting, Garfish and Blue Swimmer Crab. Detail of these fisheries is provided in Chapter 11 Marine Environment and the Marine Ecology Assessment (refer Appendix G-3).

Prawn Commercial Fisheries Block 12 is located immediately offshore from Mullaquana Station, with juvenile prawn nursery sites identified at 'Cowleds' (5 km north) and 'The Spit' (15 km south). The Spencer Gulf King Prawn fishery is the third most valuable prawn fishery in Australia. Key juvenile Western King Prawn and Snapper nurseries that support these fisheries are found in the sheltered soft sediment habitats of Upper Spencer Gulf (Noell and Hooper 2019, Drew et al. 2022) (refer Figure 9-16). A recognised Snapper nursery area is located offshore from the desalination plant location.

The Charter Boat Fishery is a statewide fishery with 37 active licences in 2023/24. Charter Boat Fishery licence holders are required to complete a logbook for each trip in which they report the Marine Fishing Area (MFA) fished and details of the catch. The fishing area relevant to the Project is MFA 21 located in a region which spans all of Spencer Gulf. Whyalla was used as a port of landing by 1–5 Charter Boat Fishery licence holders in 2020/21 (refer Appendix G-3).

Between 2007/08 and 2020/21, the western portion of MFA 21 yielded up to 5,000 King George Whiting and Southern Calamari and 25,000 Snapper (prior to its closure in 2019/20). In 2023/24, more than 95% of the catches in the Spencer Gulf region were comprised of King George Whiting, Southern Calamari, Red Mullet, and Silver Trevally (refer Appendix G-3 for further detail).

Aquaculture in the broader Spencer Gulf provides the majority of the State's production with the major sectors being Southern Bluefin Tuna, marine finfish (currently all Yellowtail Kingfish), mussels, oysters and abalone. The closest aquaculture zones are at least 40 km from the Project MSA but they currently have either no leases or unstocked leases (which previously

[6] From 1 May 2026 a recreational and charter boat closure was implemented for Garfish in Gulf St Vincent (which is already subject to a commercial closure), however Spencer Gulf remains open to fishing. A total closure was also implemented for Southern Calamari across both gulfs for commercial, recreational and charter boat fishing, due to the impacts of the algal bloom.

[7] The Snapper fishery in the Spencer Gulf has been closed since November 2019 due to depletion of fish stock.

[8] The MSA is broadly defined as a 2.5 km buffer around the Project infrastructure footprint, extending approximately 5 km along the shoreline and out to approximately 7 km offshore (refer Chapter 11 Marine Environment).

held Yellowtail Kingfish). There are land-based aquaculture leases 30 km north of the MSA in False Bay and 40 km south-east at Port Broughton (refer Figure 9-15).

Further descriptions of the economically important marine species are provided in Chapter 11 Marine Environment. The potential economic impacts of the Project on commercial fisheries are addressed in Chapter 22 Economic Environment.

9.6.6 Recreational marine uses

The coastal area of Mullaquana Station and Eight Mile Creek Road is sparsely populated with access to the foreshore and offshore waters restricted by a lack of vehicle access and the large areas dominated by coastal samphire, mangroves and tidal creeks.

Saltmarsh walking trails which access areas of costal mangrove and wetland habitat have been established at Eight Mile Creek beach and Murrippi Beach. The Eight Mile Creek beach parking is also occasionally used for bush camping while Murrippi Beach north of Cowleds Landing is a recognised naturist beach.

There is no southern coastal access from Eight Mile Creek Road beyond Cowleds Landing.



Plate 9-11: Eight Mile Creek beach trailhead (left) and Murninnie Beach (right)

Locations for launching recreational vessels to access deeper gulf waters for fishing and other marine recreation are limited in the vicinity of the desalination plant location and are mainly restricted to Cowleds Landing, Murrippi Beach and Murninnie Beach. Kayaking in the fringing mangrove forests and tidal creeks is popular in the denser, mangroves north of Cowleds Landing and Eight Mile Creek.

Recreational fishing

Fishing activities are prohibited within the Cowleds Landing Marine Sanctuary Zone, located north of Cowleds Landing.

Information on recreational fishery participation and harvest has been collected through recreational fishing surveys between in 2000/01 and is provided in the Marine Ecology Assessment (refer Appendix G-3). Data collected for the fishing region which includes northern Spencer Gulf (between Plank Point and Port Davis) showed that the number of fishers was approximately 21,000 ± 4,000 during 2000/01 and 14,000 ± 3,000 during 2007/08, with approximately 84,000 ± 29,000 and 47,000 ± 10,000 days fished, respectively. The number of fishers in this area represented approximately 6.5% and 6.1% of fishers state-wide in 2000/01

and 2007/08, respectively, and approximately 4.7% and 4.5% of the number of fishing days, respectively. The overall number of fisher days in Spencer Gulf was similar in 2007/08 to 2021/22 (refer Appendix G-3).

The nearest sites to the Project Marine Study Area the RecFish SA Fishing Locations Map (RecFish 2026) are 'Shotgun', approximately 10 km offshore, and Yarraville Shoal, about 16 km offshore

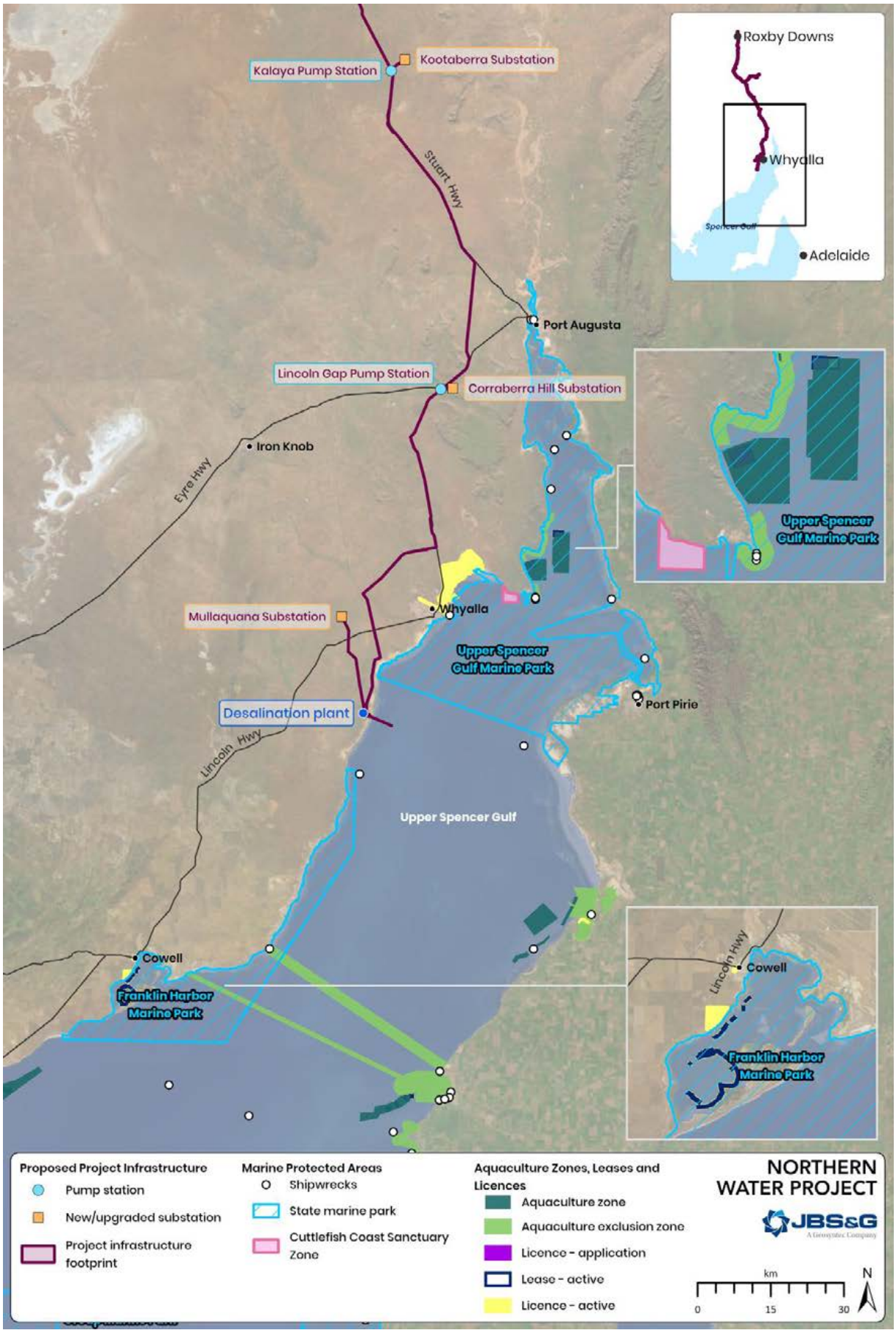


Figure 9-15: Marine protected areas

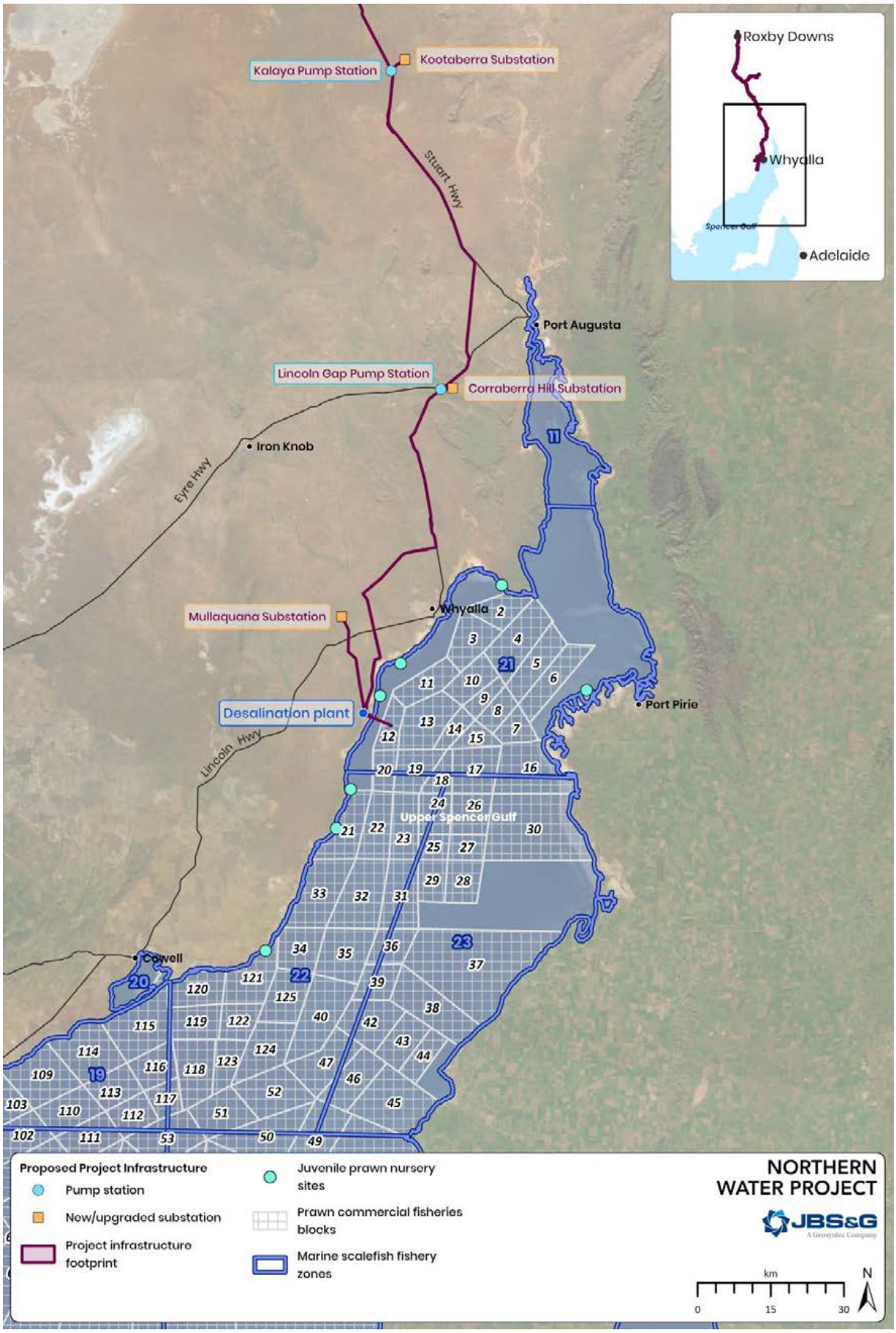


Figure 9-16: Prawn and Marine Scalefish fisheries in Upper Spencer Gulf

9.7 Plans for Future Land Use

9.7.1 Relevant government plans

There are number of State and local strategic plans and policy documents which guide planning and land management in the Project Area.

The regional plans developed for the Eyre and Western and the Far North planning regions provide a long-term vision to guide land use planning over a 15 to 30-year period, with a particular focus on the integration of land use, transport infrastructure and the public realm. Further detail of these plans and alignment of the Project to their principles is provided in Chapter 7 Planning and Design Quality.

The Eyre Peninsula and the South Australian Arid Lands Landscape Boards have regional landscape plans in place which focus on the priority areas of water, sustainable agriculture, pest plants and animals, biodiversity and community. The regional landscape plans, and supporting documents, outline each region's key landscape requirements and the programs that will deliver the aims of the priority areas. The landscape and regional plans and the priorities of the relevant landscape boards and local councils have been considered in the development of management measures for the impacts expected from Project construction and operation activities.

Other overarching plans and strategies that support the development of the Northern Water Project and its objectives are detailed in Chapter 2 Justification and Alternatives. These include the State government's Copper Strategy and the Water Security Statement.

9.7.2 Known plans for future land use at the desalination plant site

As noted in Section 9.5.7, S Uranium Pty Ltd (Alligator Energy) holds exploration interests covering Mullaquana Station and surrounding land and has been granted a Retention Lease (RL 137) located immediately north of Mullaquana Station for a pilot-scale uranium in-situ recovery trial, which has now been completed. In addition, Alligator Energy has executed an Option Agreement with the perpetual leaseholder in respect of Mullaquana Station, providing exploration and assessment access rights and an option to acquire the perpetual lease, subject to the satisfaction of relevant conditions and approvals.

Alligator Energy's interest in the area relates to the potential in-situ recovery of uranium. While no mining operations are currently approved on Mullaquana Station, the Option Agreement facilitates future exploration activities on the property, including within the vicinity of the proposed desalination plant site. Should exploration activities identify an economic mineral resource and ongoing investigations demonstrate the viability of a mining operation, it is anticipated that Alligator Energy may seek the grant of a Mining Lease and any associated approvals required to develop and operate a uranium recovery project.

As noted in Section 9.5.8, the Mullaquana Station transmission line and substation, which will supply electricity to the desalination plant, are located within the area of the Nonowie Wind Farm Project proposed by Tilt Renewables. The transmission line commences at the desalination plant on Mullaquana Station, and traverses the adjoining Moonabie and Nonowie Stations to the Mullaquana substation located on Nonowie Station. Nonowie Station is held by Nonowie Energy.

An application for a Renewable Energy Infrastructure Licence and referral under the EPBC Act for the wind farm project have been lodged by Tilt Renewables and at the time of writing both remain under consideration or assessment by the relevant State and Commonwealth agencies.

Other plans for future land uses or developments on the property at the site of the proposed desalination plant are not known to the Proponent at the time of writing

9.8 Impact Assessment

The following Project aspects have been identified as sources of impacts to land uses and landholders[9]:

- timing and location of construction works
- access to property by construction and operations personnel
- presence of construction crews, vehicles and equipment
- presence of Project infrastructure.

The following Project aspects have been identified as sources of impacts to general users of marine waters:

- marine construction works impact conservation values and uses of Marine Parks
- establishment of marine exclusion zones around intake and outfall infrastructure during construction and operation.
- The potential impact events resulting from these aspects of the Project are discussed below in this Chapter. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Potential impact assessments addressed elsewhere in the EIS

Potential Impacts of construction and operation of the desalination plant on commercially important fishery and aquaculture species, nursery habitat, recruitment and population are discussed in Chapter 11 Marine Environment.

Potential impacts to marine traffic and maritime operations from construction and operation of the Project are addressed in Chapter 21 Traffic and Transport.

Potential impacts to airfields and air operations from construction and operation of the Project (including from the presence of transmission lines) have also been addressed in Chapter 21 Traffic and Transport.

9.8.2 Disruption to landholder operations and activities

Land Access Management Plans and property-specific Land Management Plans will minimise potential for disruption to landholder operations during the construction phase.

If not adequately planned for, there is potential for day-to-day operations of landholders to be temporarily disrupted by the location and timing of construction, particularly pipeline construction.

[9] For the purposes of the impact assessment, the description of 'landholder' makes no distinction between the types of tenure under which land may be held (i.e. freehold or lease).

As described in Chapter 6 Project Description, the pipeline is planned to be constructed at an approximate average rate of 400-700 m per day, with the rate depending on the location and complexity of each pipeline section.

Disruption to landholder operations on pastoral properties will be minimised through location of the pipeline along the edges of paddocks and / or in adjoining road reserves (where practicable). Where the pipeline construction footprint is located within paddocks, impacts of pipeline construction activities will be short-term, as the pipeline construction work front is expected to pass through a location within a short period of time (i.e. over a few weeks). The pipeline trench will be rehabilitated as soon as reasonably practicable to allow landholder operations to resume[10].

Management of land access and landholder interactions will be governed through a Land Access Management Plan (LAMP), which establishes the framework for engagement, access, construction activities and land restoration. While access to land may be enabled through the exercise of statutory powers under the new special purpose legislation (once it has commenced) (refer Section 9.2.1), the LAMP sets out the approach that will be applied in practice to manage those interactions. Consistent with the Project's approach to stakeholder engagement, the LAMP requires early, ongoing and structured communication with all affected landholders, including the provision of regular updates on upcoming activities.

Property-specific Land Management Plans will be developed in consultation with individual landholders to address site-specific constraints, operational requirements and agreed mitigation measures. These plans will incorporate construction restrictions, accommodation works and rehabilitation outcomes tailored to each property, and will be developed in consultation with landholders prior to access wherever practicable. Pre-construction engagement will include detailed condition surveys, undertaken in consultation with landholders, to document existing land conditions and identify sensitive features and improvements requiring protection.

Access to land will be managed through procedures that set out notification timeframes, entry protocols and conduct requirements. These procedures will apply regardless of whether access is secured by agreement or facilitated through statutory powers. Landholders will receive advance notice of planned activities, including formal notification at least 10 business days prior to access and direct contact immediately prior to entry, supporting coordination with property operations.

Where construction activities are short-term and transient (e.g. pipeline construction) minor and temporary disruption to landholder activities from Project construction is expected. The expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Construction at the desalination plant site will be over a longer period (potentially up to 2 years) which will increase the potential for disruption to activities of the Mullaquana Station landholder. Ongoing engagement with the landholder will be undertaken to minimise disruption as far as practicable over this timeframe. The expected impacts are in the **Minor** category. Uncertainty in the expected impact at Mullaquana Station (due to the extended

[10] The potential impact of restrictions on land uses over the pipeline easement is addressed in Section 9.8.8.

timeframe for construction works) has been evaluated in Appendix M and the level of risk is **Low** (refer Appendix M).

9.8.3 Disruption to Department of Defence operations and activities

A Third Party Agreement with the Department of Defence will minimise the potential for disruption to Defence operations and training activities during the construction phase.

Terms of access for construction on Defence land are presently being defined and will be agreed through a Third Party Agreement between the Project and Defence. This agreement will set out all requirements, including limitations to Project access during Defence military training exercises, Defence-specific environmental requirements, security, and WHS requirements. This agreement will ensure construction activities do not impede Defence's capabilities and site access. Once construction commences, the Contractor will be required to meet requirements set by Defence in relation to notice, notifications, access, confidentiality, and all other matters relevant to this project. Further detail on the matters addressed by the Third Pary Agreement is provided in Chapter 25 Hazards and Risks.

Through the construction period there is the potential for access tracks from Woomera (i.e. crossing Defence land) to be used to access the Project alignment (subject to detailed design). The potential access tracks identified for use are already established; however, some minor upgrade or widening may be required for Project purposes.

The expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.4 Loss of access or damage to property infrastructure

Impacts to property infrastructure and access during construction will be managed in consultation with landholders.

Access to transfer system and electricity infrastructure construction areas will generally be via the use of existing public and private roads, and existing tracks on properties traversed by the Project. As the Project is aiming to utilise existing tracks wherever possible, there is potential for disruption to landholder activities at some locations through track closures or damage to tracks caused by additional Project construction traffic (particularly heavy loads) and through unplanned events (e.g. Project vehicle accidents or bogging). The presence of the proposed new access to the desalination plant from the Lincoln Highway is also likely to effectively bisect a paddock on Nonowie Station[11].

The continuous linear nature of the pipeline will require that property fences that cross the pipeline construction corridor will need to be removed and replaced with temporary construction fencing and gates that will remain in place for the duration of the pipeline construction period to ensure public safety and site security. Modifications of existing gates and driveways may also be required to allow access for heavy machinery.

Construction activities may result in disruption to property activities through time delays or the need to use alternative routes. Impacts to property operations from delays to travel times due to short-term closure of property access tracks are generally expected to be negligible, however more extended delays may occasionally occur which may temporarily impact

[11] This location is also within the boundary of the area identified for the Nonowie wind farm.

landholder operations. If full track closures are necessary (e.g. for safety reasons) it is possible that some sections of properties may become temporarily inaccessible if alternate routes are not available. Use of alternate routes may also result in increased travel times for the duration of construction or access track closure. Landholders will be consulted regarding the use of existing access tracks and potential modifications to other property infrastructure to ensure impacts to land uses and landholder operations are minimised.

Local and property access tracks which may be at risk of deterioration from Project transport activities will be identified and measures to mitigate impacts put in place if required. These could include identifying alternative routes, upgrading access tracks prior to Project use, repairing access tracks during and after Project use and managing driver behaviour of Project contractors. Should any unauthorised damage to property assets result from Project activities, this would be rectified by the Design, Build, Operate, Maintain (DBOM) Contractor as soon as practicable, in consultation with the landholder and at the contractor's expense. Landholders may also benefit from the requirement for construction access which could involve the repair and upgrade of existing property tracks both before and after construction activities.

The primary access to the desalination plant for construction will be from the Lincoln Highway via an existing station track on Nonowie Station that will also be utilised for the pipeline alignment. This track will be substantially upgraded to cater for construction heavy vehicle traffic and will eventually form the permanent access to the desalination plant. It is likely that this road will require fencing for public safety and stock exclusion during construction. Due to the longer duration of the construction works and the nature of the construction vehicle traffic, the track upgrade is expected to impact movement across the affected property from early in the construction phase.

The effects of disruption to access and property movements during construction will form part of the engagement with the affected landholders to ensure that impacts to land uses and landholder operations are minimised and that alternative access options are considered. Access will be managed to minimise disruption, with clear processes for periodic occupation, emergency access and safe site management. Upon completion of works, land will be rehabilitated, supported by final condition surveys and post-construction meetings with landholders.

The expected impacts from transfer system and electricity infrastructure construction on property infrastructure and access are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

The expected impacts from construction of the new access for the desalination plant are in the **Minor** category. and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.5 Disruption to landholder amenity

Ongoing engagement with landholders will seek to minimise impacts to lifestyle amenity as a result of construction activities

A temporary loss of amenity may be experienced by some landholders (and in particular the landholders of Mullaquana Station) whose normal lifestyle and usually private property will be exposed to construction activities, vehicles and workforce. Access requirements for

construction activities may lead to concerns about personal privacy and perceptions about safety and property security.

There continues to be engagement directly with landholders about Project activities and the presence of Project infrastructure on the use and enjoyment of their properties and land. Conduct of activities on private property will be determined in consultation with affected landholders and will take into account landholder concerns around access, property security, privacy and similar matters.

Other potential impacts to amenity may be due to dust generation from vegetation clearance and construction earthworks (particularly pipeline trenching and stockpiling), noise from heavy machinery and the temporary visual impact of vegetation clearance, the presence of earthworks, equipment and the construction workforce.

As noted above, the short-term and transitory nature of pipeline construction activities will largely mitigate the extent and duration of impacts to landholder amenity. In the case of the desalination plant, the potential for impacts to landholder amenity is likely to be ongoing to varying degrees (depending on the nature of the works) over the duration of the construction period.

In both cases, engagement with sensitive residential receptors will enable early notification of activities and for input to be provided before works begin, with the aim of minimising the nuisance to receptors. Management measures for dust and air emissions will be incorporated in the Project Construction Environmental Management Plan (CEMP). Visual impacts will be transitory as construction progresses along infrastructure alignments and limited to the duration of the construction period. Impacts from noise and dust and how they will be managed are discussed in more detail in Chapter 18 Air Quality and Chapter 19 Noise and Vibration. Impacts to visual amenity are discussed further in Chapter 20 Landscape and Visual Amenity.

Where construction activities are short-term and transient the expected impacts to lifestyle amenity are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Due to the longer construction timeframe at the desalination plant, the expected impacts to lifestyle amenity on Mullaquana Station are in the **Minor** category. Uncertainty in the expected impact (due to the extended timeframe for construction works) has been evaluated in Appendix M and the level of risk is **Low** (refer Appendix M).

9.8.6 Land and vegetation disturbance

Impacts to land use from land disturbance from pipeline and transmission line construction will be minimised by post-construction reinstatement activities and landholder consultation.

Construction activities will require both temporary and permanent land and vegetation disturbance which has the potential to impact short and long-term land uses. For much of the Project Area, the dominant land use is stock grazing on native vegetation.

Transfer system pipeline

While temporary disturbance of land and vegetation will be necessary on the pipeline alignment, land cleared for pipeline construction will be reinstated after construction

activities have concluded. Generally, this will involve re-contouring of the site to match existing landforms, installation of permanent erosion control structures (if required) and respreading of topsoil and any cleared vegetation to encourage natural regeneration and recruitment (refer Chapter 6 project description for further discussion of the approach to restoration and rehabilitation.)

Appropriate restoration of the pipeline construction corridor which protects the quality and quantity of topsoil is important to future productivity of pastoral land affected by pipeline construction. However, future vegetation regrowth directly above the rehabilitated pipeline would be restricted to shallow rooted species (e.g. no trees) within a 15 m restriction area to avoid future impacts to the pipeline and surrounding engineered fill (refer Section 9.8.8).

Areas of temporary disturbance within the construction corridor for the pipeline would be rehabilitated in accordance with requirements of the CEMP Restoration and Rehabilitation Plan. Rehabilitation will commence following completion of construction activity and will be implemented progressively along the pipeline construction corridor as works are complete. A permanent easement (maximum width 20 m) to allow access to the pipeline for operation and maintenance will be registered post-construction.

A continuous formed road or track is not expected to be necessary for the entire alignment. An allowance of 3 m for an access track along the alignment has been included in permanent disturbance area estimates to account for unformed tracks that may result from occasional vehicle access along the alignment and for established access tracks to infrastructure such as air valves, scour valves and test points.

Transmission lines

There will be land disturbance for transmission line stringing access corridors between tower locations. During stringing, there will be a need to clear or roll a narrow path between structures to enable pulling of the draw wire. Portions of this track may become the long-term maintenance access track, which would also be accessible to landholders.

Vegetation clearance will be avoided for the stringing corridor wherever possible to minimise impacts to existing land uses, particularly stock grazing. As much of the vegetation on the alignments comprises open woodland and scrubland which is relatively low, slow growing and at mature height, it is possible that lines can be spanned across with minimal clearance required. Native vegetation clearance for the Project is discussed further in Chapter 15 Terrestrial Flora and Fauna.

Some permanent clearance of native vegetation within the transmission line easements will be required for tower pads and access tracks. Previously disturbed areas will be utilised in preference to permanently clearing vegetation wherever practicable. New access to the tower locations may be required where there are no existing tracks and will be designed to take the shortest route (potentially using short spur tracks off existing roads or access tracks) to minimise impacts.

Transmission line construction has a significantly smaller construction clearance footprint compared to the pipeline, which will minimise impacts to affected landholders and land uses.

Desalination plant

Extensive land disturbance and clearance of native vegetation will be required at the desalination plant site for the plant, access and other infrastructure. However, land clearance and disturbance will be restricted to those areas defined in the Project design and by relevant approvals, and impacts to existing land uses outside these areas are not expected.

The expected impacts of land and vegetation disturbance on land use from desalination plant, pipeline and transmission line construction are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.7 Introduction or spread of weeds, pests and pathogens

Implementation of best practice vehicle hygiene during Project activities will minimise the risk of introducing or spreading weeds, pests or pathogens.

The movement of Project vehicles and personnel into and within the Project Area and between properties has the potential to introduce or spread weed and pests or pathogens (e.g. stock diseases) in pastoral land and across Landscape Regions.

Liaison with landholders will be ongoing prior to and during construction and the DBOM Contractor will ensure that any specific weed, pest or pathogen requirements are communicated and implemented. Standard weed and pest management practices in the CEMP and OEMP will be implemented to manage potential impacts during construction and operation. Potential weed hygiene measures for construction to prevent weeds from being introduced, establishing or increasing existing populations are provided in Chapter 15 Terrestrial Flora and Fauna.

There will be no regular ground disturbance during operations that would facilitate weed establishment. Ensuring vehicles use existing, hardstand access tracks will reduce the ability of any weeds from vehicles to spread or establish.

Weed or pest management would be carried out in consultation with landholders, the Eyre Peninsula and South Australian Arid Lands Landscape Boards, local councils and PIRSA as required. A specific focus will be on ensuring that weeds, pests and pathogen risks are managed across the length of the pipeline and across Landscape Regions.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on the presence of weeds, pests and pathogens at the time of construction and effective implementation of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

9.8.8 Restrictions on land use and property activities due to the presence of Project infrastructure

Consultation with landholders on location of Project infrastructure has considered potential long-term impacts on landholder activities including mining tenements and Department of Defence.

The presence of the Project infrastructure on affected properties has the potential to impact future land uses, and transmission line clearance requirements may disrupt landholder operations beneath the transmission line.

Pastoral land uses at the desalination plant site, on alignments of linear infrastructure and at locations of pump stations and storages are expected to be relatively unimpacted by the Project, as a wide range of land use activities and infrastructure are generally compatible with the presence and operation of the proposed infrastructure.

Desalination plant, pump stations and storages

Once operational the desalination plant is not expected to impact adjoining pastoral land uses. The site will be securely fenced and all key operational activities will be confined to the site. Pump stations, substations, storage sites and access tracks are generally located within previously disturbed land and will be similarly designed, sited and fenced (if required) to minimise impact to adjoining land uses.

The new access to the desalination plant is expected to permanently impact movement across the affected property, and the desalination plant site and access will also permanently impact minor station tracks on Mullaquana Station. The effects of permanent disruption to access and property movements will form part of the engagement with the affected landholders to ensure that long-term impacts of potential fragmentation on land uses and landholder operations are minimised.

The expected impacts on land use from operation of the desalination plant, pump stations, storages and access are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Transfer system pipeline

Future land uses

The pipeline will be predominantly buried and following trenching, the land over and surrounding the pipeline will be reinstated, noting that the Carrapateena branch lateral pipeline could either be constructed above or below ground. The only aboveground infrastructure will be air and scour valves along the pipeline and warning signage. Given the existing pastoral (stock grazing) activities, minimal ongoing impacts to land use from the presence of the buried pipeline are expected.

Impacts from the pipeline on non-primary production land are generally limited to the crossing of road, rail and other infrastructure. The final configuration of above-ground and below-ground sections will be determined through detailed design and consider the impacts of road and rail traffic over the buried pipeline. Once construction activities are concluded, there will be no ongoing restrictions or constraints to these land uses from operation of the Project.

Mining tenements

The pipeline intersects four Extractive Minerals Leases (EMLs), three Miscellaneous Purposes Licences (MPLs) and many Exploration Licences (ELs) authorised under the *Mining Act 1971* (refer Section 9.5.7). There are also areas of interest under the *Hydrogen and Renewable Energy Act 2023* which intersect the proposed transfer pipeline corridor (refer Section 9.5.8).

Engagement with the owners and operators of these mining, quarrying, exploration and renewable energy activities is being undertaken to ensure that the Project adopts measures and management practices to ensure that the two land uses can co-exist. However, the construction of the pipeline, and its permanent presence within these resource and energy

tenements will inevitably constrain activities in the immediate vicinity of the pipeline (and other Project infrastructure).

Access to land and acquiring permanent interest in land for the Project, where there are existing third-party interests as a result of the above activities (if any), will be managed through application of the new special purpose legislation (once commenced). Impacts to operations under mining and renewable energy tenements (if any) due to construction would generally be temporary, however the presence of the pipeline (for example) may result in permanent impacts to some activities. The Project is proposing to execute third-party agreements where there is a known potential for such an interface of activities to occur.

Beyond the matters described above, there is limited direct interface between the Project and active resource and energy tenements. Should a direct interface and associated issue arise, the Project would again endeavour to execute a third-party agreement with the relevant party.

The transfer system interacts with the Moomba to Port Bonython Liquids line (authorised under the *Energy Resources Act 2000*). The proposed Pandurra transmission line at Lincoln Gap and the transfer system pipeline both cross the Moomba to Port Bonython Liquids line. Ongoing engagement with the owner and operator of the liquids line will ensure there are no impacts to it during construction and operation.

Department of Defence land

Rigorous and ongoing consultation with Defence, specifically the Estate Planning Branch within the Security and Estate Group has been undertaken through the course of the Project's development. This has ensured that all parties who may be affected by the Project are aware and have had the opportunity to provide comment and advice. This has included formal Defence approval processes such as a Site Selection Board for the review and approval of the route through the Cultana Training Area, and consultation on the route around Woomera.

Cultana Training Area

In the southern section of the Project Area, the transfer system alignment enters Defence's Cultana Training Area (comprising the CEA) north-west of Whyalla, at its southern boundary and on the western side of the Lincoln Highway. The alignment traverses approximately 31 km of Defence land before exiting at its northern boundary. Overall the alignment has been selected to minimise encroachment onto Defence land as far as practicable.

The siting of Project infrastructure, as well as its construction and operation, have been, and continue to be thoroughly vetted by Defence to ensure that impact to land, access and operations are minimised, well understood and agreed.

Material impacts to operations at CUTA due to the presence of the pipeline are not expected. This is largely due to the buried nature of the pipeline and distance from Defence operational training areas. The pipeline depth, and burial specification will be sufficient to allow movement of any Defence, or other vehicle over the pipeline as required.

Terms for ongoing access to the permanent easement will be the subject to the Easement Covenants as set out in the Deed between the State and the Commonwealth.

Woomera township and Woomera Prohibited Area (WPA)

In the northern section, the Project has made the deliberate decision, in consultation with Defence, to avoid a physical interface with the Defence Estate entirely by by-passing the WPA to the east. The proposed transfer system alignment follows the eastern side of the Olympic Dam Highway north from Pimba, before diverting further east to avoid the township of Woomera. The pipeline alignment is adjacent to, but does not enter Defence land south, east and north of Woomera, mainly following existing tracks and areas of disturbance. The Project commissioned a professional land boundary survey in 2025, which was verified by Defence to ensure that the pipeline alignment is located outside all Defence land associated with the Woomera air base operations and the WPA.

Once constructed and rehabilitated, no ongoing physical, access-related or operational impacts to Defence land are expected as the permanent easement and access do not interact with the township of Woomera, other Defence land associated with the RAAF Base, or the Woomera Prohibited Area.

The expected impacts on land use from operation of the transfer system pipeline are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Transmission lines

Land uses such as grazing and native vegetation which meet height clearance restrictions, and access tracks, fences and gates are all compatible with transmission lines.

Where grazing is the dominant land use in pastoral regions, native vegetation generally comprises low-lying shrubland which will not be impacted by clearance requirements. As grazing is permitted on transmission line easements, the Project is not expected to lead to a reduction in stocking rates on properties which may be traversed by transmission lines.

Extensive vegetation maintenance on transmission line easements is not expected to be required as vegetation present is generally slow-growing and at mature height and therefore can be considered into the design of the transmission line. Vegetation trimming is typically carried out every three to four years with trimming to allow for a three-year growth period. This may vary depending on the type of vegetation and speed of growth.

Where possible the transmission lines have been aligned with property boundaries, disturbed areas and existing roads and tracks, noting that for some of its length the Mullaquana Station transmission line has been unable to avoid the need to traverse open country. As noted above, the presence of the Project infrastructure (in this case transmission lines) may result in permanent impacts to some activities for third-parties operating under resource or energy tenements (e.g. the Nonowie Wind Farm Project proposed by Tilt Renewables (refer Section 9.5.8). Similar to managing the impacts of the presence of the pipeline, the Project would execute third-party agreements where there is a known potential for an interface of activities to occur.

The expected impacts on land use from operation of the transmission lines are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.9 Ongoing access to infrastructure easements

Engagement with landholders regarding ongoing access requirements will minimise disruption to land use and minimise property access and security impacts.

Ongoing access to the pipeline and transmission line easements will be required for inspections and maintenance and would generally constitute an informal track following the construction alignment.

Existing, upgraded or new access tracks that were used for construction will be selected for ongoing access. Access to the pipeline easement for operation and maintenance will be required where surface infrastructure (e.g. air valves, scour valves and test points) are installed. Where possible, existing gates and tracks will be utilised to access the easement, otherwise new access swing gates and tracks will be installed where necessary. A continuous formed road or track is not expected to be necessary for the entire alignment. Minor improvements to access paths may be necessary between gates and the nearest surface infrastructure, depending on the site conditions following construction.

Access arrangements for planned inspections and maintenance will follow the Land Access Management Plan (as described in Section 9.8.2) including a formal 10-business day notification period for landholders prior to planned access to properties and direct contact immediately prior to entry.

There is potential for increased or unauthorised public access to properties facilitated by the presence of access tracks to the pipeline and transmission line easements established for maintenance purposes. Uncontrolled public access will be restricted via locked gates to prevent potential impacts on land use, property security and landholder amenity. Land access protocols will be established with each landholder during the acquisition of property or easement interests, including landholder access requirements where necessary.

The expected impacts to landholders from the presence of maintenance tracks to access infrastructure easements are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.10 Interference with communication network and radio frequencies

Impacts to communications will be momentary and limited to passing under transmission lines.

Disruption to Ultra High Frequency (UHF) radio and mobile phone reception could potentially impact communications and safety measures for pastoral businesses.

Interference with UHF and AM / FM radios may occur within 20 – 30 m of transmission lines. Most radio usage on locations in the vicinity of transmission lines would be expected to occur outside of this area, with only minor and brief interference occurring while the user passes underneath the transmission line or is in the immediate vicinity of a crossing point beneath the transmission line.

Corona discharge produces an audible noise and can affect television, radio, Citizen Band, broadband and mobile phone reception. It is possible that momentary fading of radio reception in a motor vehicle may occur in areas immediately below a transmission line,

particularly if the radio signal is weak to begin with (SKM, 2002). Corona discharge effects are further discussed in Chapter 19 Noise and Vibration.

Transmission lines will be designed in accordance with all national standards for electromagnetic interference. Regular patrols of transmission lines will occur and any damaged insulators or other hardware which have the potential to cause interference will be repaired or replaced.

Any disruption to communication networks from the transmission line is expected to be transitory and limited to specific locations (i.e. within 30 m of transmission lines).

The expected impacts of the presence of transmission lines on the communications network and devices are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.11 Conservation values and uses of marine parks

Desalination plant design and implementation of a Marine and Coastal Construction Environmental Management Plan will minimise impacts to nearby marine parks.

South Australia has established a network of marine parks to protect its unique marine life and habitats. As discussed above there are no marine parks at or near the location of the desalination plant intake and outfall which are the key marine infrastructure for the desalination plant. The closest marine park areas are the Upper Spencer Gulf Marine Park (8-10km north-east) and the Franklin Harbour Marine Park (approximately 11.5 km south). Both parks support nursery areas for a range of important marine species.

The main potential impact to the values of the marine parks is through changes to water quality (during both construction and operation) due to temporary turbidity from construction activities and return water discharged from the desalination plant outfall. These potential impacts are summarised below discussed in detail in Chapter 11 Marine Environment.

The construction methodology has been selected to minimise coastal and marine impacts. A Marine and Coastal Construction Environmental Management Plan will be implemented to ensure the impacts from construction activity are minimised. Some localised turbidity may occur surrounding construction zones but is not expected to impact on the marine parks due to their distance from construction activities.

Operation of the Project involves seawater extraction and discharge of desalination plant return water into Spencer Gulf waters. Environmental considerations have been critical in driving the design and siting of the desalination plant.

Hydrodynamic modelling of the desalination plant return water demonstrates that the salinity will achieve ambient conditions within close proximity to the marine outfall with no effect on marine parks. Additionally, modelling indicates that 95% species protection levels will also be achieved within close proximity to the marine outfall.

Total suspended solids modelling results conclude that discharging desalination plant filter backwash into the outfall will have no impact on the receiving environment as modelled changes in total suspended solids are small and within natural variation.

The Spencer Gulf-wide assessment undertaken for the Project predicted that far-field salinity changes are within the range of natural salinity variability within the gulf.

The expected impacts of construction and operation of the desalination plant on marine park conservation values are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.12 Marine exclusion zone at Mullaquana Station

Impacts to marine users as a result of the exclusion zone surrounding the desalination plant intake and outfall tunnels are not expected.

During desalination plant construction a marine exclusion zone of approximately 112 ha (subject to final design and alignment) will be established around the location of the intake and outfall infrastructure to ensure the safety of the infrastructure located on the seabed, as well as construction vessels and operators, and other marine users. This exclusion zone will continue once the desalination plant is operating to protect the marine infrastructure and public safety (refer Figure 9-17).

The proposed exclusion zone will result in loss of access to less than 0.006% of the Spencer Gulf marine waters for commercial fishers, divers and recreational users of this part of the USG.

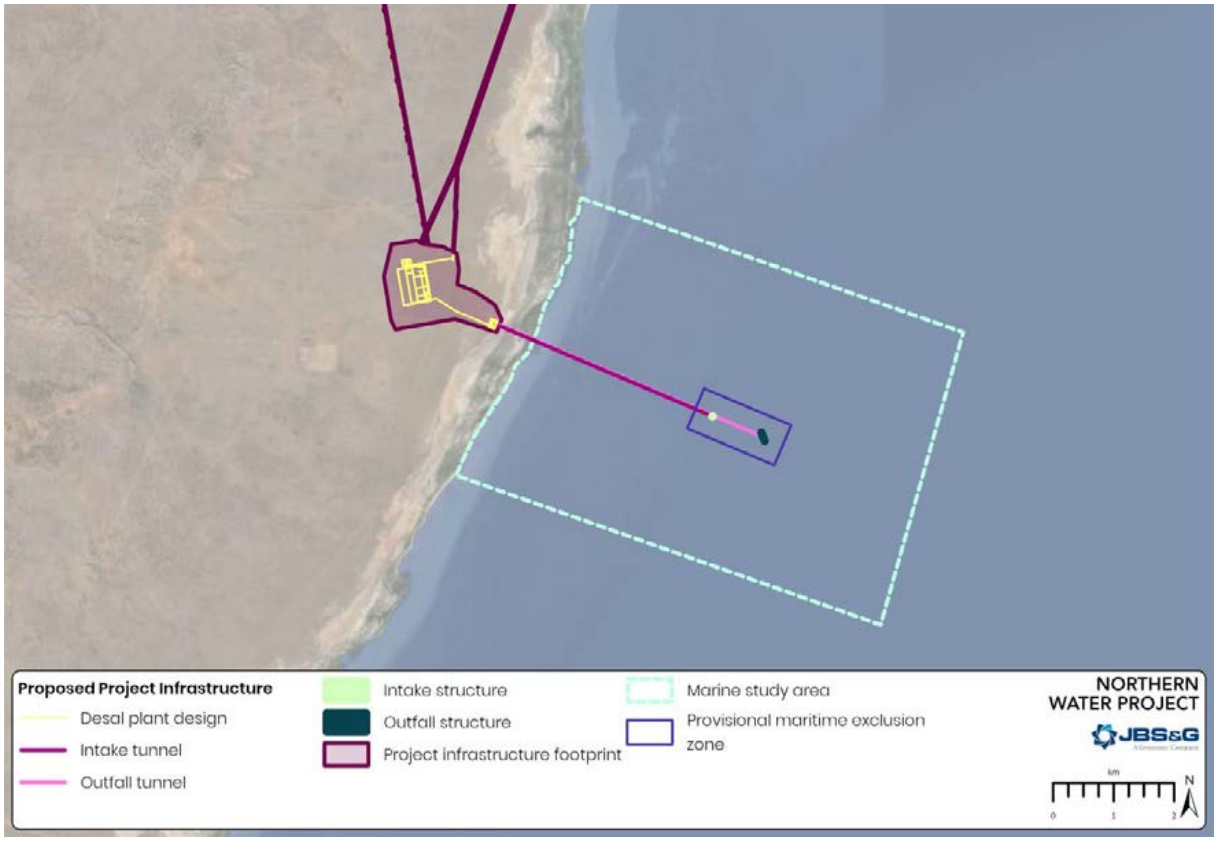


Figure 9-17: Proposed desalination plant intake and outfall exclusion zone (indicative)

Impacts to commercial fisheries from the presence of the exclusion zone are not expected. The Marine Ecology Assessment (Appendix G-3) assessed commercial fishery catch data in and around the EIS MSA (refer Figure 9-17). Spencer Gulf fisheries that overlap spatially with the MSA include the Marine Scalefish, Charter Boat, Spencer Gulf Prawn and Blue Crab

Fisheries. The assessment found historically negligible trawl effort for the prawn fishery within the MSA over recent years and no catch for the Blue Crab Fishery. The Marine Scalefish Fishery reporting area (which is also utilised by the Charter Boat Fishery) surrounds the MSA and covers an area 50 times larger (refer Appendix G-3).

Similarly, in the context of the area of Spencer Gulf waters, loss of access to the area of the exclusion zone, will have a minimal impact on the area available to recreational users of marine waters. The exclusion zone will be clearly identified in accordance with Australian Notice to Mariners requirements and the *Harbors and Navigation Act 1993.* Consultation will also be undertaken with relevant commercial and recreational fishing and boating stakeholders to advise of the nature and requirements for the exclusion zone to ensure that the community is fully informed.

Potential impacts of the marine exclusion zone on non-Project marine operations and vessel movements are also discussed in Chapter 21 Traffic and Transport.

The expected impacts of the marine exclusion zone on marine users are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

9.8.13 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP and other relevant plans).

Table 9-9: Key mitigation measures – Use of land and marine waters

Mitigation measure	Construction	Operation
Linear infrastructure (pipelines and transmission lines) located on or close to property boundaries, disturbed areas and existing roads and tracks where practicable and possible.	✓	✓
Land Access Management Plans developed setting out notification requirements, contractor behaviour whilst on properties, working with landowners to minimise impact from construction activities.	✓	✓
Parcel-specific Land Management Plans established to address site-specific constraints, operational requirements and agreed mitigation measures.	✓	✓
Transmission lines to be designed and constructed to comply with Australian and International Standards for Electromagnetic Interference.	✓	✓
Implementation of a Marine and Coastal Construction Environmental Management Plan.	✓	
Establishment of a marine exclusion zone around intake screen and outfall diffusers.	✓	✓

9.9 Conclusion

The desalination plant, transfer system and electricity infrastructure alignments and construction arrangements will be developed in consultation with landowners to minimise impacts to land use. Implementation of Land Access Management Plans and property-

specific Land Management Plans will establish the frameworks for engagement, access and management of site-specific constraints operational requirements and agreed mitigation measures.

The Project-specific framework proposed under the new *Northern Water Project (Land and Infrastructure) Act 2026* (once commenced) will facilitate land access for investigations and construction and provide for compensation for occupation and disturbance. Land acquisition (if required) and compensation arrangements will be undertaken under the new legislation and will be broadly aligned with established land acquisition frameworks.

A marine exclusion zone will be implemented to protect marine water users and proposed infrastructure during construction and operation. The exclusion zone is not expected to significantly reduce or impede the area of marine waters available for use by commercial fishers and recreational users.



Chapter 10

Coastal Processes

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WATER PROJECT

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TABLE OF CONTENTS

10 COASTAL PROCESSES 10-1

10.1 Key Findings 10-1

10.2 Setting the Context 10-2

10.2.1 Requirements in legislation and other standards 10-2

10.2.2 Views of stakeholders 10-2

10.3 Assessment Method 10-3

10.4 Description of the Existing Environment 10-4

10.4.1 Coastline at Mullaquana Station 10-4

10.4.2 Bathymetry 10-5

10.4.3 Seabed and sediment characteristics 10-7

10.4.4 Hydrodynamics 10-8

10.4.5 Tidal levels 10-12

10.4.6 Wind 10-12

10.4.7 Waves 10-13

10.4.8 Sediment transport 10-14

10.5 Impact Assessment 10-14

10.5.1 Construction Impacts 10-15

10.5.2 Operational Impacts 10-17

10.5.3 Summary of key mitigation measures 10-17

10.6 Conclusion 10-18

LIST OF TABLES

Table 10-1: Tidal levels at Whyalla (Station ID 61840) 10-12

Table 10-2: Key mitigation measures – coastal processes 10-18

LIST OF FIGURES

Figure 10-1: Spencer Gulf bathymetry (m) relative to mean sea level (Axes = latitude / longitude) 10-6

Figure 10-2: Bathymetry (mAHD) at the proposed intake and outfall structures 10-7

Figure 10-3: Locations of two ADCP deployment sites for 2012 and 2023-2024 measurement campaigns at Mullaquana Station 10-9

Figure 10-4: Current rose for depth averaged currents measured at ADCP mooring location NWP3 (left) and SAMUSG (right) 10-9

Figure 10-5: Current speed for spring flood tide (depth contour = mAHD) 10-10

Figure 10-6: Current speed for spring ebb tide (depth contour = mAHD) 10-10

Figure 10-7: Current speed for neap flood tide (depth contour = mAHD) 10-11

Figure 10-8: Current speed for neap ebb tide (depth contour = mAHD) 10-11

Figure 10-9: Wind rose for hourly averaged wind speeds at the Spencer Gulf 10-12

Figure 10-10: Significant wave height (Hs) roses based on NWP3 (left) and SAMUSG (right) 10-13

Figure 10-11: NWP3 ADCP measured significant wave height (top) and peak period (bottom) 10-14

LIST OF PLATES

Plate 10-1: Coastal areas looking west to desalination plant location at Mullaquana Station 10-4

Plate 10-2: Coastal areas adjacent Mullaquana Station looking south 10-5

10 COASTAL PROCESSES

The coastal zone in South Australia comprises diverse marine, estuarine and terrestrial ecosystems which are highly valued by the community. These ecosystems are influenced by a range of dynamic interactions and forces that shape and modify the coastline over time including wave action, tides, currents, sediment transport and storm surges.

These coastal processes collectively influence the physical characteristics of coastlines including beach morphology, dune stability, and overall shoreline evolution. Understanding these processes is crucial for assessing impacts from proposed coastal infrastructure projects.

This chapter describes the existing coastal environment and coastal processes at the desalination plant site, and how the Project may affect the local hydrodynamics and sediment dynamics at the site.

Potential impacts to the coastal environment and the broader marine environment are inter-related. Accordingly, this chapter should be read in conjunction with Chapter 11 Marine Environment.

10.1 Key Findings

- Construction of the Project will not impact coastal processes because there is no construction in the active coastal zone, intertidal areas, coastal dunes, mangroves or *Posidonia* seagrass at the desalination plant site.
- The tunnelling construction methodology for the intake and outfall structures has been adopted to minimise impacts on sensitive coastal systems.
- The preferred tunnel boring machine (TBM) spoil strategy involves dewatering of TBM spoil via retention and sedimentation basins on land adjacent to the Mullaquana Station desalination plant site rather than direct discharge into marine environments.
- Some localised seabed disturbance and turbidity may occur surrounding the marine construction zones but is unlikely to impact upon coastal processes.
- Permanent impacts on the seabed for the Reference Design are confined to the footprint of the marine structures.
- For the Reference Design, there will be no ongoing impact to coastal processes or the coastal environment from the presence of the intake and outfall structures due to their significant distance from the coast and their depth.
- The float and sink pipeline option involves an additional ~1 km submarine conduit for the outfall pipe from 13 m to 17 m depth from lowest astronomical tide (LAT). The pipeline's low profile and minimal lateral width result in a relatively small footprint on the seabed.
- For the float and sink pipeline option there will be no ongoing impact to coastal processes or the coastal environment from the presence of the intake / outfall structures and the ~1 km submarine conduit due to their significant distance from the coast and their depth.

10.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effect of the Project on coastal processes in the vicinity of the desalination plant on Mullaquana Station. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 10.3.

10.2.1 Requirements in legislation and other standards

The primary legislation for the conservation and protection of the State's coasts and beaches is the *Coast Protection Act 1972*. The Act establishes the Coast Protection Board whose key functions are to protect, restore or develop the coast for aesthetic purposes and review and provide advice on proposals for development near the coast to ensure appropriate coastal protection. For projects where the South Australian Minister for Planning has requested an EIS, the Board provides advice to the Minister.

Detailed standards on coastal erosion and flooding hazard are largely written into the Planning and Design Code under the *Planning, Development and Infrastructure Act 2016* as the Coast Protection Act does not directly provide for the enforcement of these or other standards within the coastal zone.

Additional requirements for water quality of marine discharge are set out in the *Environment Protection (Water Quality) Policy 2015* (Water Quality EPP) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

10.2.2 Views of stakeholders

Feedback received during community engagement indicates that the regional community has a strong connection to the coastline and its coastal settlements, campgrounds and beaches.

The primary construction-related concerns raised through Project engagement have been in relation to the potential impacts associated with works at the desalination plant site, particularly installation of the intake and outfall structures, and potential effects on the coastal and marine environment.

Issues raised by stakeholders relating to Project impacts on the marine environment (including flora, fauna and fisheries species) are provided in Chapter 11 Marine Environment.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

10.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The Coastal Processes Impact Assessment report prepared for the EIS is provided at Appendix F-1. The objective of the study was to undertake a qualitative coastal processes impact assessment focusing on potential impacts from construction and operation of coastal and marine infrastructure associated with the Project.

Review of existing information

The coastal processes assessment focuses on the offshore marine environment surrounding the intake and outfall seabed infrastructure, as well as the active coastal zone which lies between the landward boundary (e.g. front dune) to the closure depth (i.e. the depth at which wave action no longer significantly influences the seabed and sediment transport).

The coastal processes assessment reviewed the Project Reference Design (GHD 2025a) with particular focus on the intake and outfall infrastructure, as well as the proposed construction approach (and a potential option case, see below).

Existing publicly available coastal data were reviewed as well as site-specific data including Acoustic Doppler Current Profiler (ADCP) measurements, seafloor characterisation surveys, and hydrodynamic models undertaken for the Project. This provided an understanding of metocean conditions (such as waves and tides), seafloor characteristics and coastal processes in the vicinity of the Project. Key Project data sources included:

- SARDI's ADCP measurement campaigns (2023, 2024)
- Project marine geophysical and hydrographic surveys
- particle size distribution (PSD) and sediment sampling undertaken for the Project
- metocean conditions
- Project hydrodynamic modelling developed by Water Technology (2025, 2026) (refer Appendix G-11 and G-12)
- seasonal marine ecology baseline studies including benthic habitat and health, fish, plankton and invertebrates.

Qualitative assessment

Based on review of the above data, qualitative impact assessment of proposed construction activities and permanent marine works on the coastal processes and sediment transport regime was undertaken. The assessment also incorporates proposed mitigation measures.

This impact assessment considers two potential construction methodologies:

Reference Design: The engineering Reference Design (GHD 2025a) includes two tunnels for the intake and outfall, both constructed using a Tunnel Boring Machine (TBM).

Float and sink pipeline option: The float and sink pipeline option involves tunnelling the outfall to around the same distance from the launch box as the intake location, and continuing offshore via approximately 1,000 m of additional outfall conduit placed on the seafloor to the outfall diffuser manifold using a float and sink method.

Further detail on these construction methodologies is provided in Chapter 6 Project Description.

10.4 Description of the Existing Environment

The description of the coastal environment at the location of the desalination plant site at Mullaquana Station has been provided below and informs the development of the coastal processes impact assessment in Section 10.5, as well as Chapter 11 Marine Environment.

Description of coastal land uses and land tenure is provided in Chapter 9 Use of Land and Marine Waters. Climate and weather information for the Whyalla BOM site (mean temperature, rainfall and general wind conditions) is also provided in Chapter 9 Use of Land and Marine Waters.

10.4.1 Coastline at Mullaquana Station

The coastal zone comprises a low coastal plain which is almost entirely mid-tide level and subject to tidal inundation. Beach ridges appear as small sand spits, suggesting sediment drift from the south, with continued onshore accretion. This accretionary coastline is built during the Holocene and comprises marine sands, and terrestrial clays and silt (Caton et al. 2019).

The area is comprised largely of saltmarsh, with frequent beach ridges and short tidal channels (Caton et al. 2019). The shore is typically covered with mangroves behind extensive low-tide sand and inter-tidal seagrass (refer Plate 10-1 and Plate 10-2).



Plate 10-1: Coastal areas looking west to desalination plant location at Mullaquana Station



Plate 10-2: Coastal areas adjacent Mullaquana Station looking south

10.4.2 Bathymetry

The Spencer Gulf is a semi-enclosed body of water bordered by the Yorke Peninsula to the east and the Eyre Peninsula to the west. It extends for approximately 300 km from Port Augusta in the north to the entrance in the south. It has a maximum width of 130 km, narrowing to less than 1 km in the upper Gulf. The gulf is relatively shallow with a typical depth between 40 m (lower gulf) and 15 m (upper gulf). Bathymetry[1] for the Spencer Gulf is shown in Figure 10-1.

Intake and outfall structures for the desalination plant will be located offshore from Mullaquana Station. A detailed bathymetry survey was conducted for the Project in 2025 by Maritime Constructions near the proposed desalination plant (refer Figure 10-2). The survey data indicates a relative shallow foreshore with the Reference Design intake structure located approximately 3 km offshore at a water depth of ~13 m relative to LAT (or approximately -15 m Australian Height Datum (AHD)), and the outfall structure approximately 4.8 km from shore at depth of 17 m relative to LAT (approximately -19 m AHD).

[1] Bathymetry is the measurement of depth of water in oceans, sea or lakes.

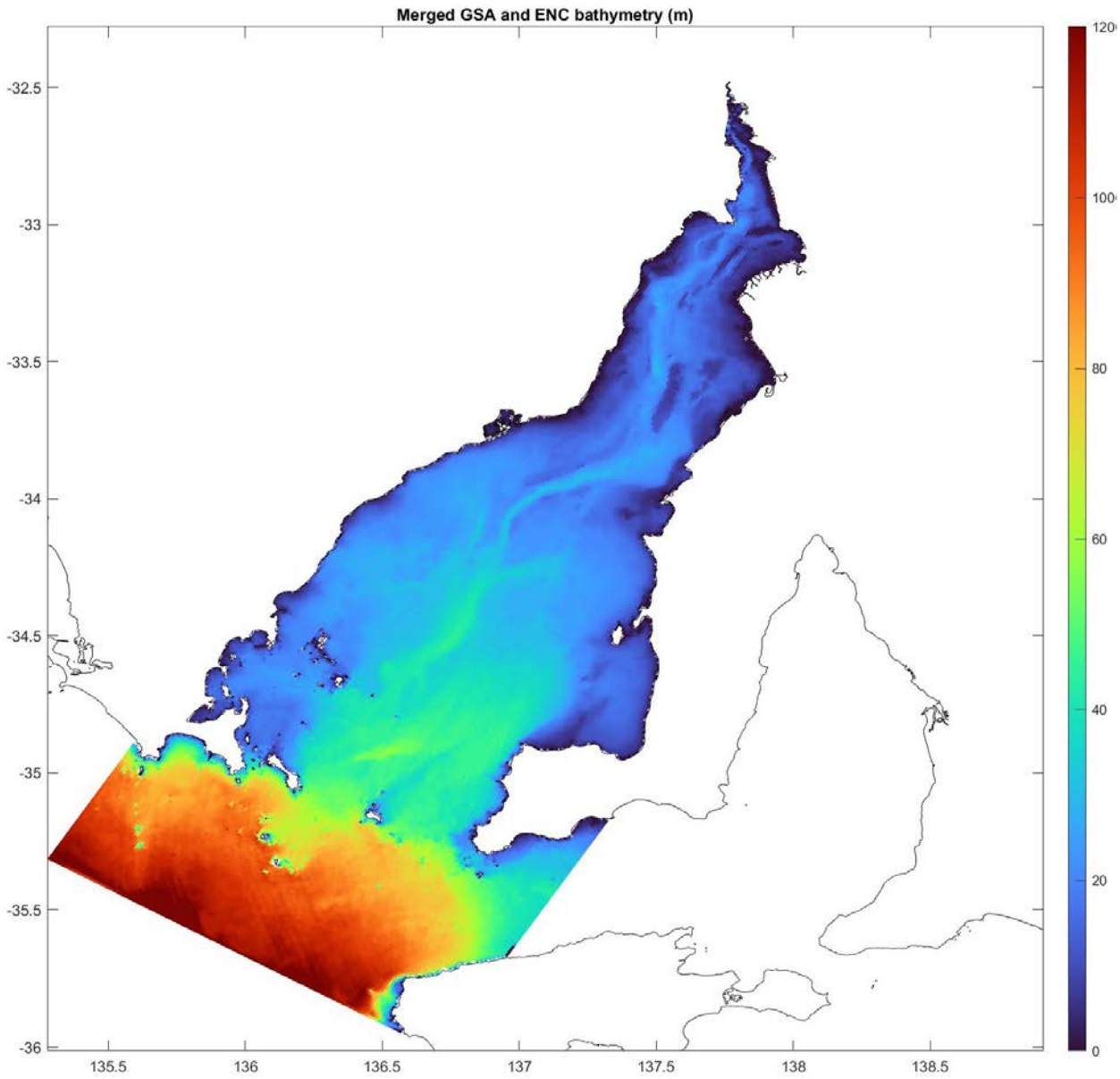


Figure 10-1: Spencer Gulf bathymetry (m) relative to mean sea level (Axes = latitude / longitude)
[Source: SARDI 2024]

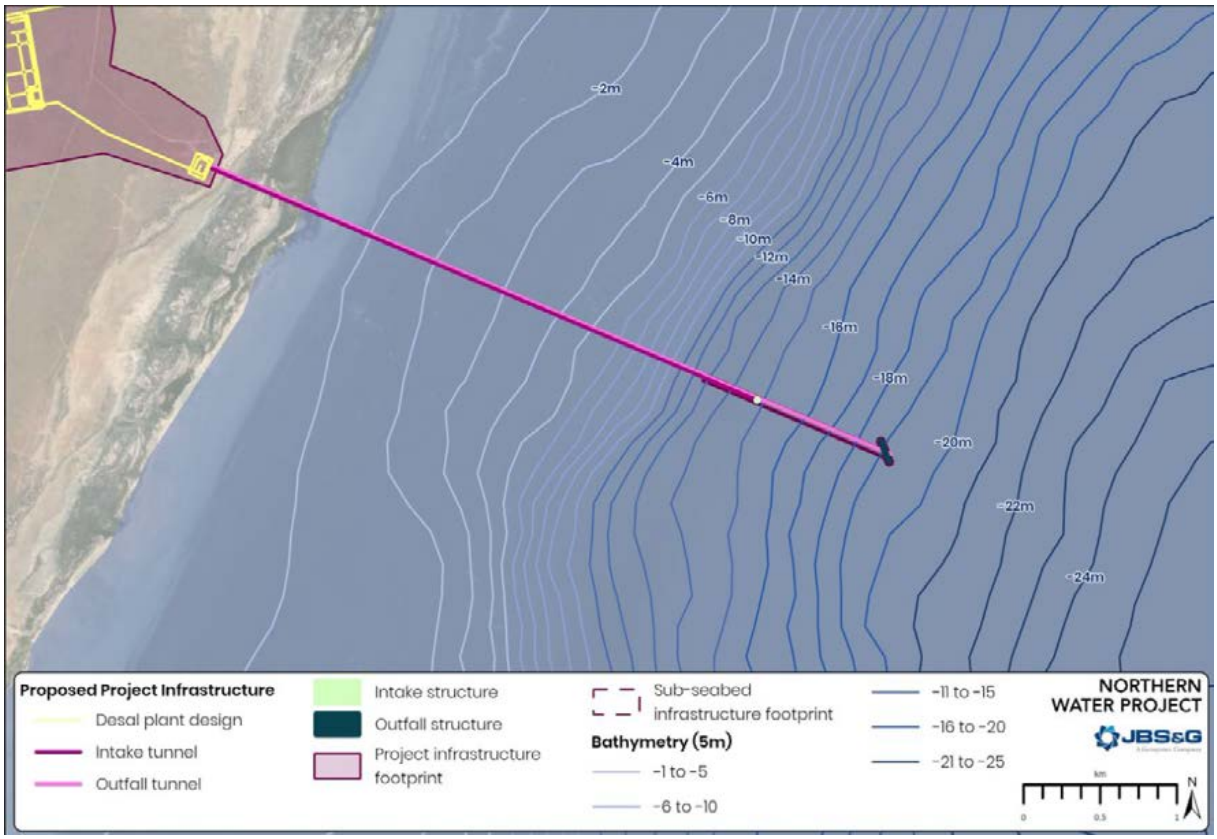


Figure 10-2: Bathymetry (mAHD) at the proposed intake and outfall structures
[Bathymetry data source: Water Technology 2026a]

10.4.3 Seabed and sediment characteristics

Subtidal benthic environment

The subtidal environment at Mullaquana Station is generally sandy and flat with extensive seagrass beds transitioning into sandy habitats with depth. Benthic habitats vary along the depth gradient, with dense *Posidonia* seagrasses dominating shallower areas to approximately -13 m depth (AHD) where the seagrass then transitions to a seasonally driven cover of *Zostera* seagrass out to approximately -16 m depth (AHD). Beyond -16 m (AHD) bare sand dominates. Key habitats are detailed in the Marine Ecology Baseline and Impact Assessment Report (Appendix G-3), and in Chapter 11 Marine Environment.

Seagrass meadows are of environmental value, particularly the slow-growing, deep-rooted, canopy-forming *Posidonia* seagrass. *Posidonia* meadows provide long-term sediment stabilisation and high ecological value. *Zostera* seagrass has a shallower and faster-growing rhizome network, and along with *Posidonia*, plays a valuable role in sediment stabilisation and ecological function. However, *Zostera* is a much more opportunistic coloniser and varies in coverage over shorter timescales.

The intake structure in the Reference Design is located in an area with seasonally fluctuating densities of *Zostera* seagrass. The float and sink pipeline option would also result in the pipeline being located in an area of *Zostera* seagrass. Other seagrasses, including *Posidonia*, are avoided through the use of the tunnel boring methodology.

The outfall in the Reference Design is located in sandy subtidal habitat with variable cover of algae and sparse invertebrates including soft corals, ascidians, bryozoans, some sponges and razor clams. This cover of invertebrates and algae plays a key role in sediment stabilisation as well as serving valuable ecological functions.

Sediment characteristics

Sediment sampling and particle size distribution analysis was undertaken to support the EIS (refer Appendix G-5) which included collecting sediment samples from six locations adjacent to and representative of the intake and outfall locations. Samples of the top 50 cm of sediment were analysed and the median sediment particle sizes across the site ranged from very fine sand in deeper waters, to medium sand in shallower waters where *Zostera* seagrass is located. There was a higher proportion of silts in the deeper sandy sites, and a larger proportion of gravels in the *Zostera* (refer Appendix G-5, Chapter 11 Marine Environment).

The results of sampling undertaken for the Project, indicate that sediments surrounding the intake and outfall infrastructure locations are predominantly sand with a median grain diameter between 125 µm to 560 µm.

10.4.4 Hydrodynamics

Seawater circulation in the Spencer Gulf is driven by tidal, thermohaline, wind and wave driven currents with diffusion in the upper Gulf driving water mixing (Middleton et al. 2013). Evaporation in the upper regions of the Gulf during summer creates highly saline water which sinks below the less dense (i.e. less saline) water flowing up from the lower Gulf, resulting in a net flow of saline water out of the Gulf (Middleton et al. 2013).

Acoustic Doppler Current Profilers (ADCP) were deployed between June 2023 and March 2024 at two locations near the proposed intake and outfall infrastructure at NWP3 station (~2.7 km offshore from the outfall) and SAMUSG (approximately 31.5 km NE of the outfall) (refer Figure 10-3).

The current roses for the depth averaged current speed at ADCP locations NWP3 and SAMUSG are shown in Figure 10-4. Typical current speeds range between 0.05 and 0.4 m/s at ADCP NWP3 and between 0.05 and 0.6m/s at ADCP SAMUSG. The current direction at both ADCPs is found to be predominantly parallel to the shoreline (refer Figure 10-5 to Figure 10-8).

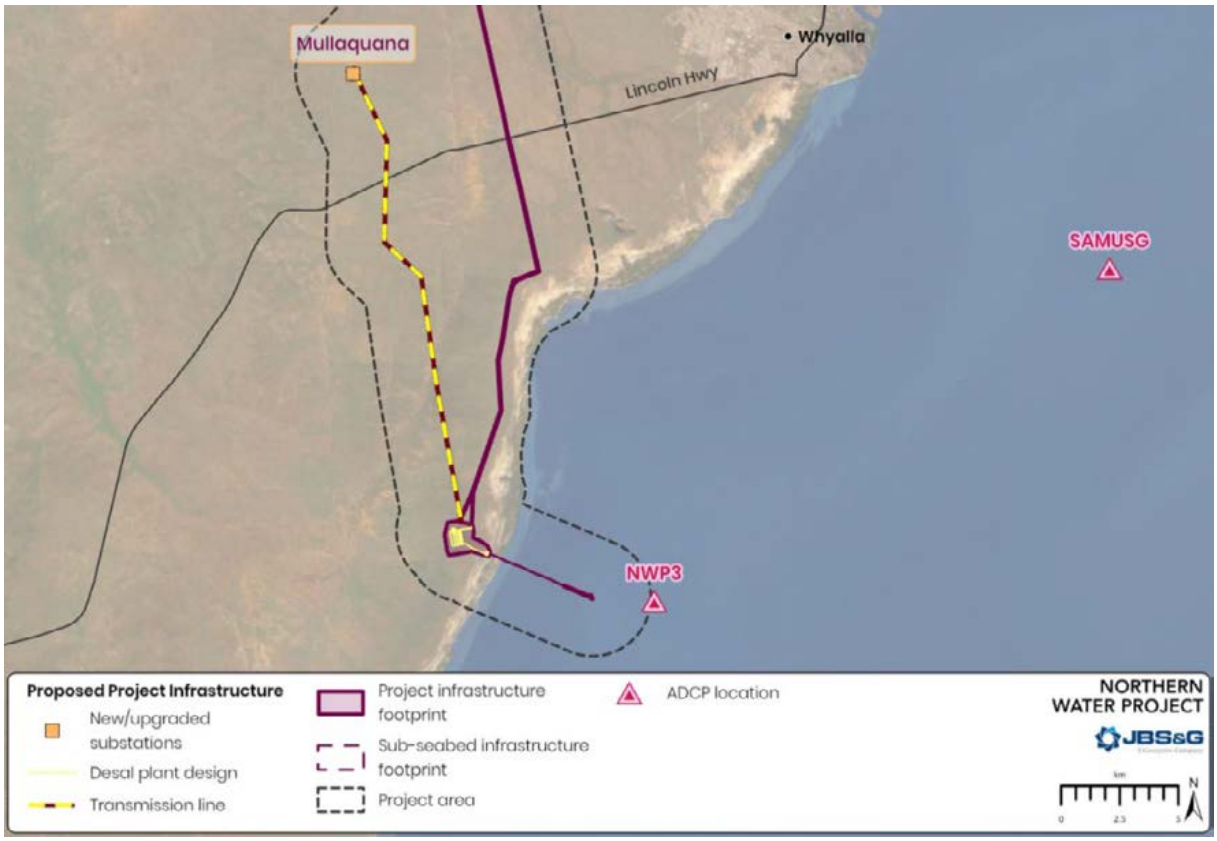


Figure 10-3: Locations of two ADCP deployment sites for 2012 and 2023-2024 measurement campaigns at Mullaquana Station

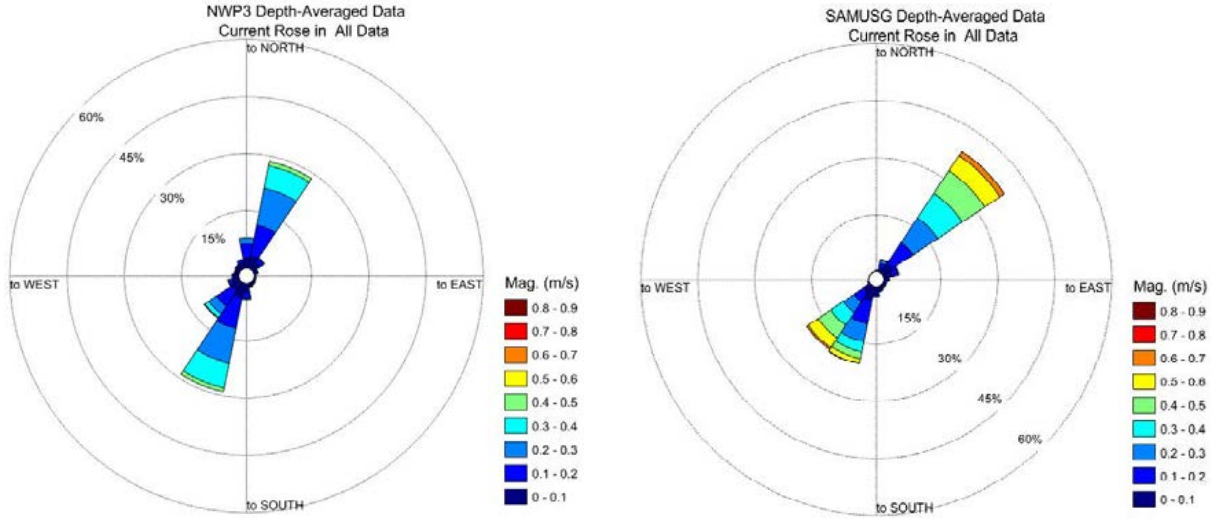


Figure 10-4: Current rose for depth averaged currents measured at ADCP mooring location NWP3 (left) and SAMUSG (right)

[Source: Water Technology 2026a]

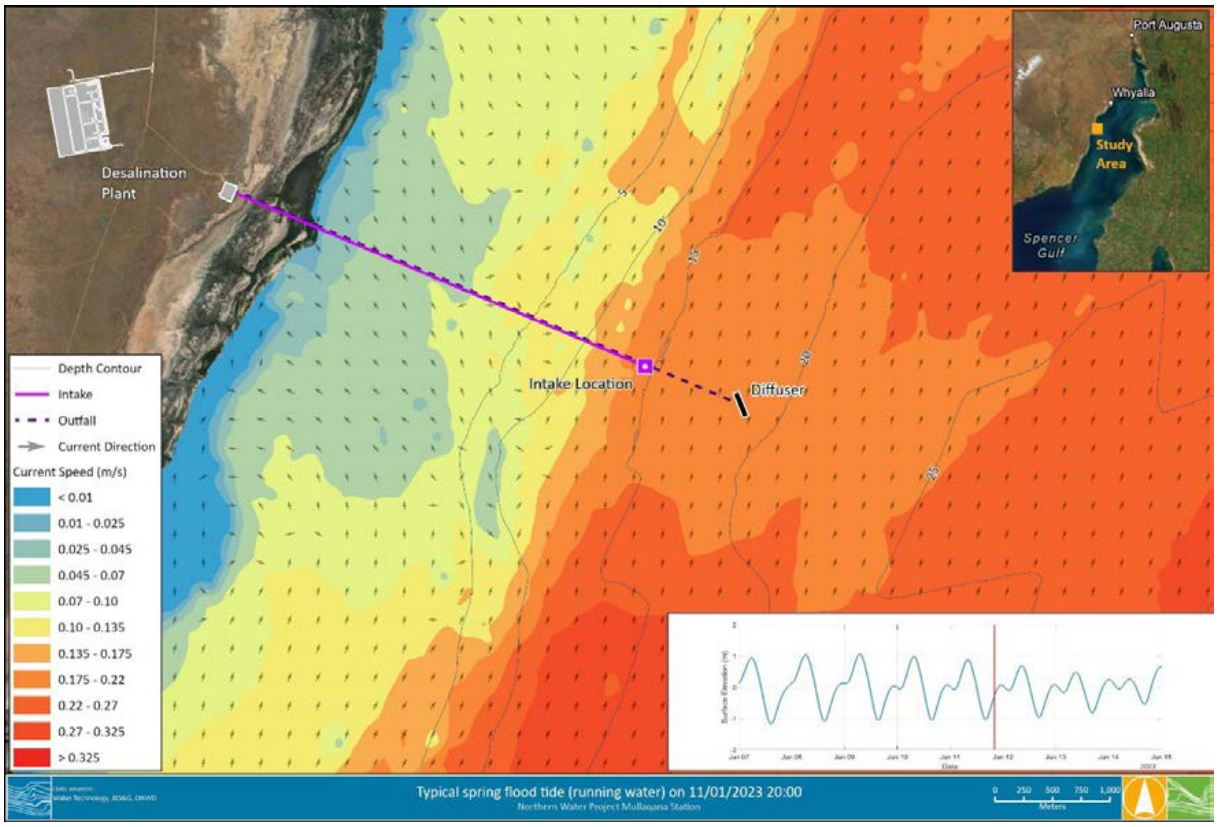


Figure 10-5: Current speed for spring flood tide (depth contour = mAHD)
[Source: Water Technology 2026a]

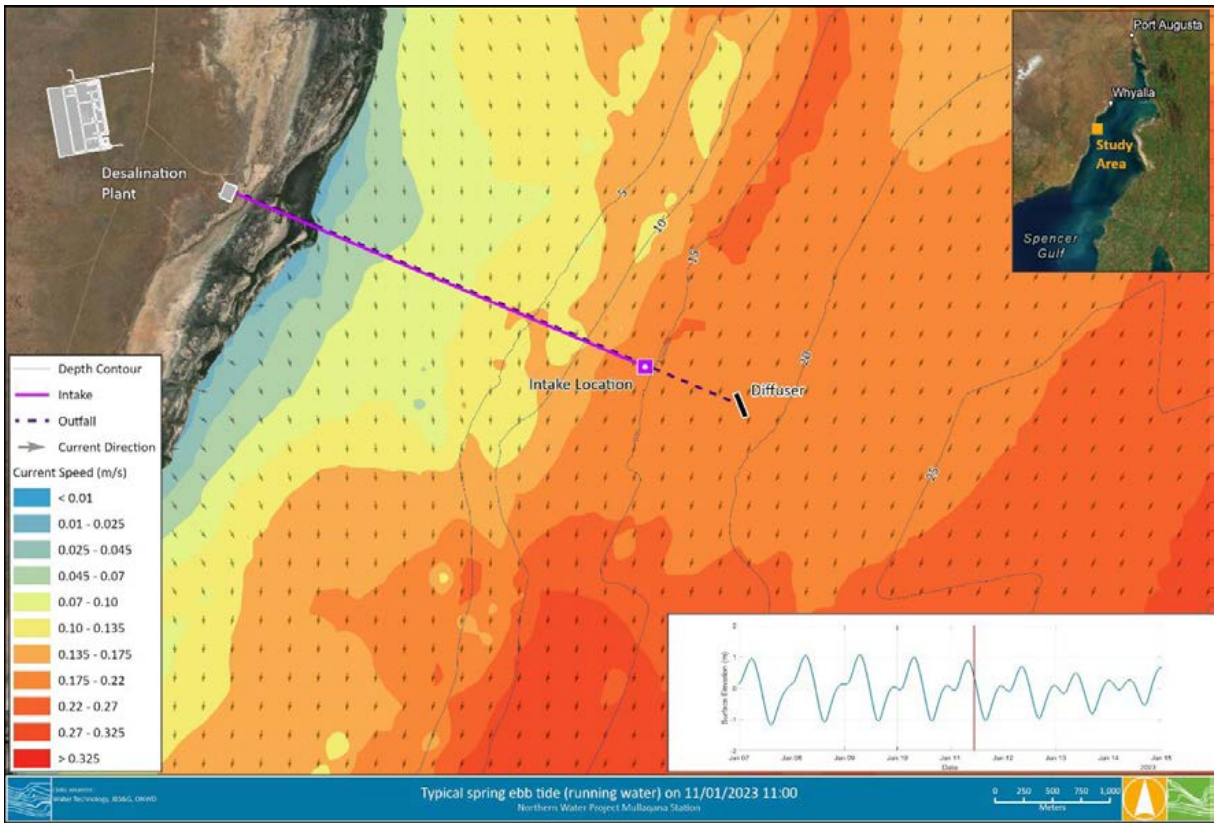


Figure 10-6: Current speed for spring ebb tide (depth contour = mAHD)
[Source: Water Technology 2026a]

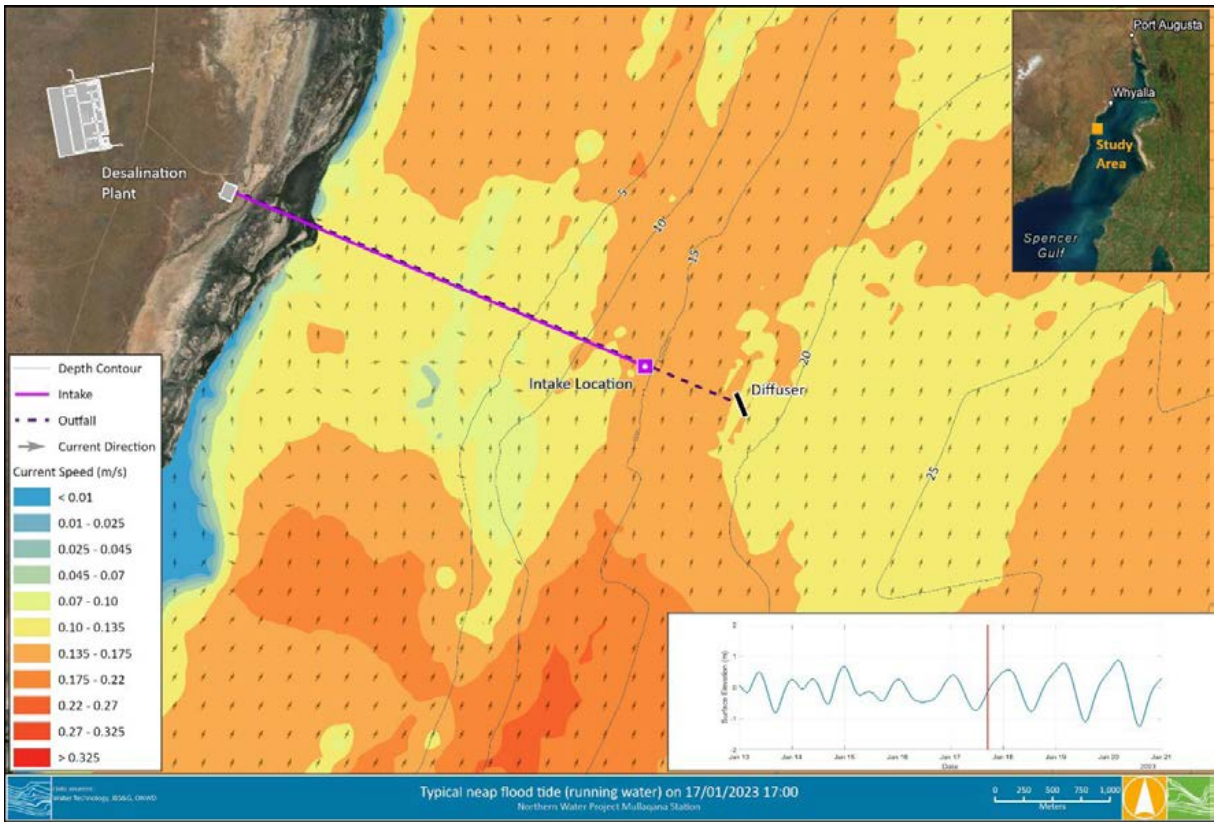


Figure 10-7: Current speed for neap flood tide (depth contour = mAHD)
[Source: Water Technology 2026a]

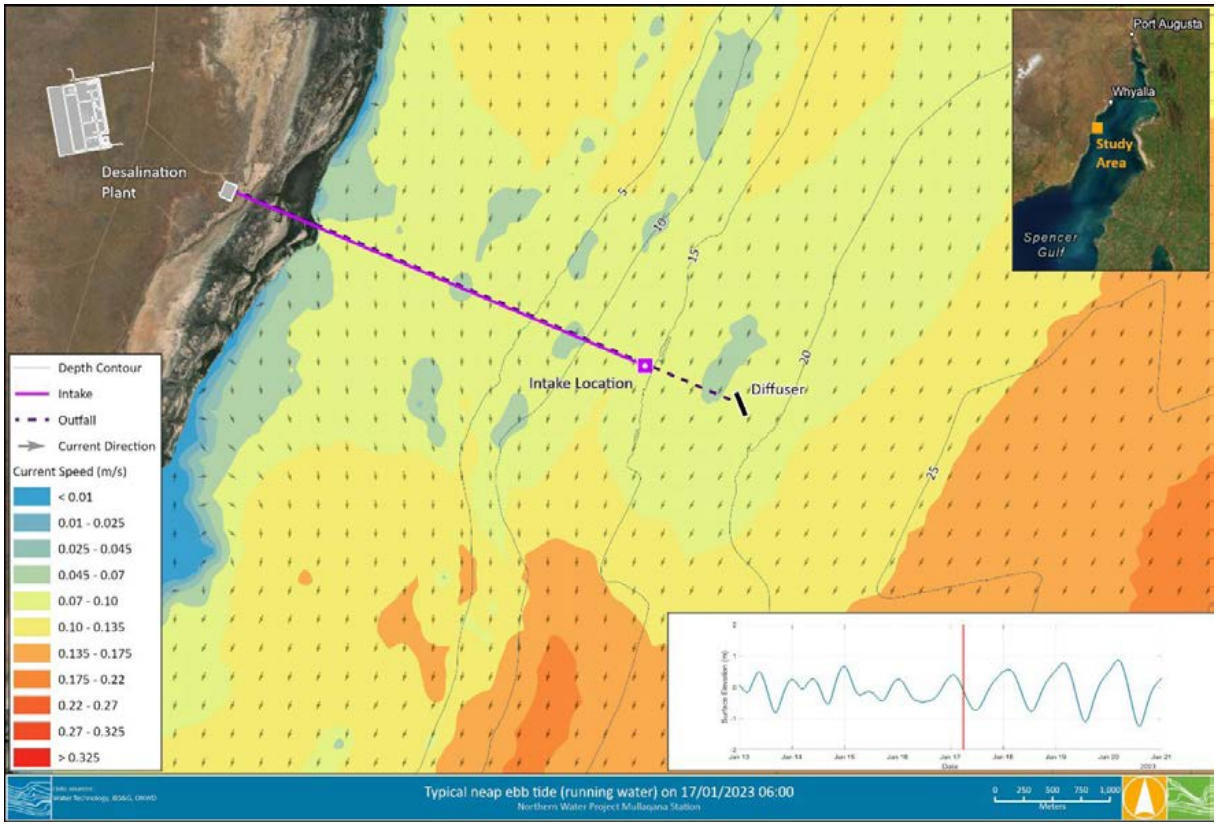


Figure 10-8: Current speed for neap ebb tide (depth contour = mAHD)
[Source: Water Technology 2026a]

10.4.5 Tidal levels

Water levels are predominantly impacted by the tides with two high and two low tides each day. The gulf amplifies tides, especially during major storm events which can raise tides 1.0 to 1.5 m above predicted heights (Jacobs 2014). Tidal range of the area based on the Whyalla tide gauge (Station ID 61840) is approximately 3 m with key tidal levels summarised in Table 10-1 (GHD 2025b).

Table 10-1: Tidal levels at Whyalla (Station ID 61840)

Tidal Level	Levels relative to chart datum (m above LAT)	Levels relative to MSL	Levels relative to AHD
Highest Astronomical Tide (HAT)	3.3	1.65	1.53
Mean High Water Springs (MHWS)	2.8	1.15	1.03
Mean High Water Neap (MHWN)	1.9	0.25	0.13
Mean Sea Level (MSL)	1.65	0	-0.12
Mean Low Water Neap (MLWN)	1.4	-0.25	-0.37
Mean Low Water Springs (MLWS)	0.5	-1.15	-1.27
Lowest Astronomical Tide (LAT)	0	-1.65	-1.77

10.4.6 Wind

Figure 10-9 shows a wind rose with the long-term wind speed and directional data extracted in the Spencer Gulf, approximately 50 km south-east of the Mullaquana Station Project site. Winds are predominantly from the south with the majority of wind events less than 20 m/s. Winds from the westerly quadrants tend to be stronger than winds originating from the east. Data were taken from the Centre for Australian Weather and Climate Research (CAWCR) and includes data between 1979 and 2023 (Jacobs 2026a).

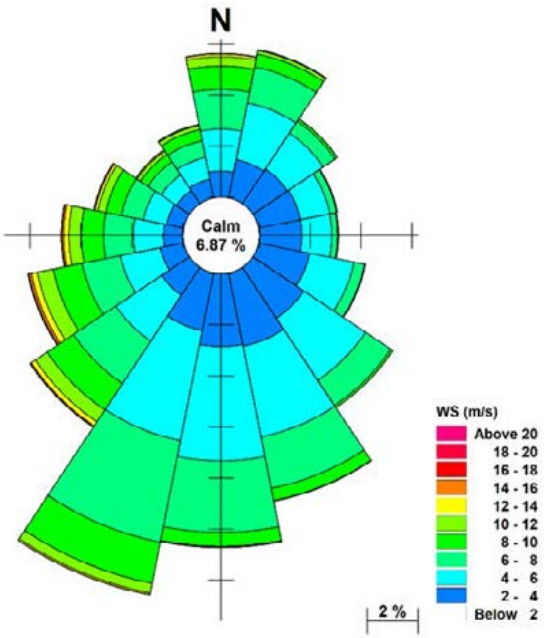


Figure 10-9: Wind rose for hourly averaged wind speeds at the Spencer Gulf
[based on CACWR dataset from 1979 to 2023 (Jacobs 2026a)]

10.4.7 Waves

Wave conditions at the Project site are mainly driven by local winds and the area is fairly protected from offshore swell (refer Appendix F-1). Waves measured at the Project site have significant wave heights (i.e. average height from wave crest to trough of the highest third of the waves) typically below 1.5 m (refer Figure 10-10 and Figure 10-11), and short wave periods (i.e. time between crests) below 6 seconds (refer Figure 10-11).

Figure 10-10 shows the proportion of waves of different significant wave height (Hs) coming from various directions to the NWP3 and SAMUSG ADCP mooring sites, and shows the waves are predominantly from a southerly direction.

Figure 10-11 shows time series data measured at the NWP3 mooring site for both wave height (top time series) and wave period (bottom time series). The short wave period indicates the waves are low energy waves generated by local winds and the wave height indicates slight to moderate sea state (BOM 2026b).

The waves are not expected to significantly influence the local hydrodynamics or sediment transport near the intake and outfall infrastructure locations due to their relatively small size and limited impact at depth in this area.

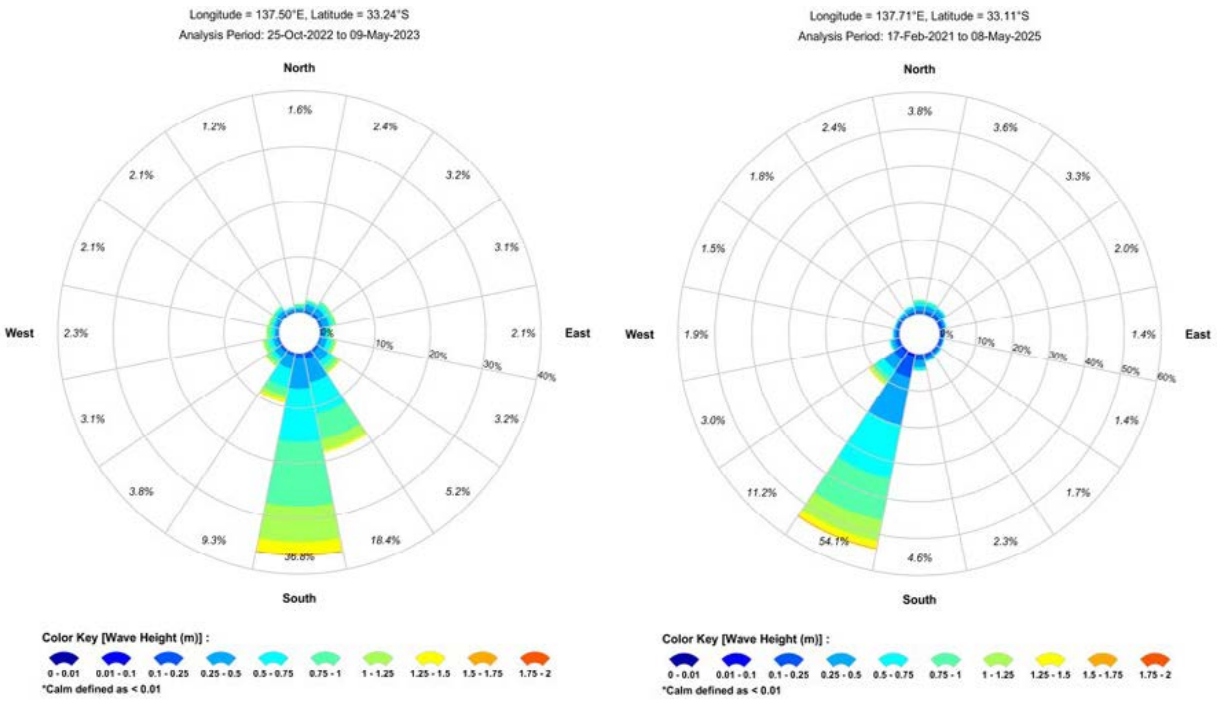


Figure 10-10: Significant wave height (Hs) roses based on NWP3 (left) and SAMUSG (right)
[Source: Jacobs 2026a]

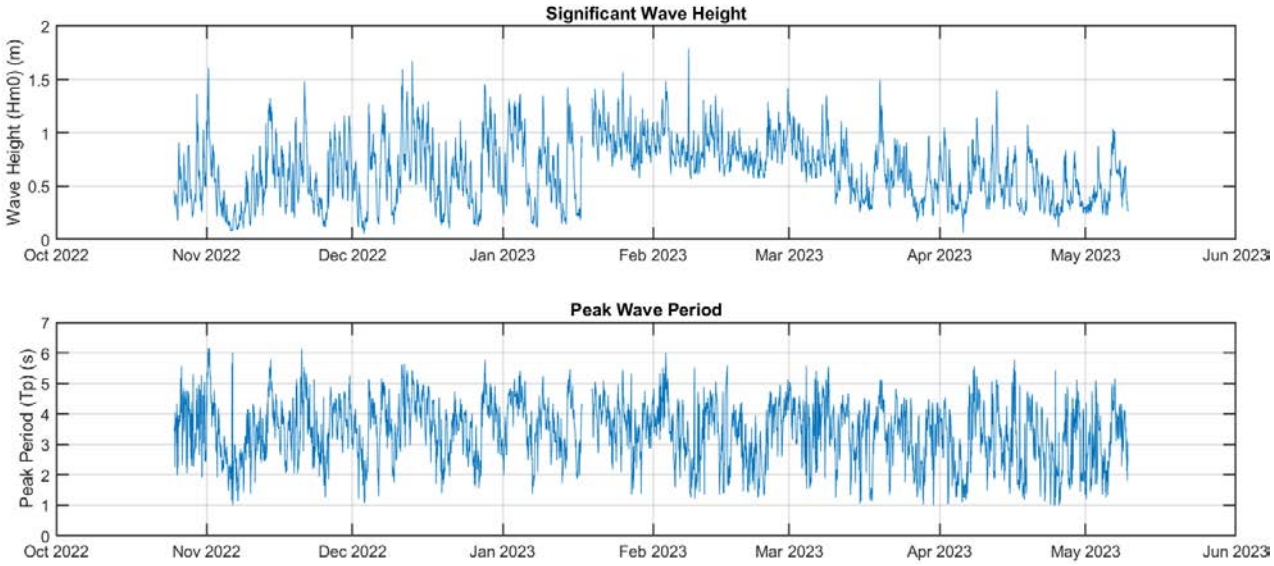


Figure 10-11: NWP3 ADCP measured significant wave height (top) and peak period (bottom)
[Source: Jacobs 2026a]

10.4.8 Sediment transport

Sand is transported through the coastal zone by the combined action of waves, currents and wind within the context of the shoreline shape, alignment and bathymetry. Wave-driven alongshore currents are the dominant current in the littoral zone. Based on the hydrodynamics at the site it is estimated that tide- and wind-driven currents will generally be too small to, in isolation, result in significant sediment transport at the location of the marine intake / outfall structures and for the 1,000 m seabed pipeline option.

The coastal processes assessment estimated that the majority of sediment transport occurs in shallow waters (<7 m depth relative to LAT) (Jacobs 2026a). Sensitivity testing was undertaken for events with a high Annual Recurrence Interval (ARI) (e.g. 500-year ARI) and it was found that the estimated depth of closure was less than the intake location depth (Jacobs 2026a).

10.5 Impact Assessment

The following Project aspects have been identified as sources of impacts to coastal processes:

- construction activities at the desalination plant site (Note: potential impacts relating to this activity are addressed in Chapter 13 Surface Water)
- construction of the marine intake and outfall infrastructure as per the Reference Design
- construction of the 1,000 m seabed pipeline as per the float and sink pipeline option
- presence of intake / outfall infrastructure and 1,000 m seabed pipeline (for option case).

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

10.5.1 Construction Impacts

Selection of tunnel boring construction methodology will avoid construction impacts to the active coastal zone and hydrodynamic environment.

Construction of the Project will not impact coastal processes because there is no construction in the active coastal zone, intertidal areas, coastal dunes, mangroves or *Posidonia* seagrass at the desalination plant site.

The launch shafts for the intake and outfall tunnels and the intake pumpstation will be located on land within the terrestrial desalination plant construction footprint behind the active coastal zone. The construction of intake and outfall tunnels will be via a TBM from the intake pump station location, with the tunnels at a minimum depth of 9 m below the seabed, avoiding impacts to the coastal environment (refer Chapter 6 Project Description).

Marine risers connect the tunnels to the seabed structures beyond the active coastal zone. The potential impacts from seabed disturbance beyond the active coastal zone are covered in the impact event below.

Sediment transport occurs in depths less than 7 m relative to LAT (Jacobs 2026a) and is hence negligible at the depths where the intake and outfall risers will be constructed (which are located deeper than 7m). The Project avoids marine infrastructure on the seabed at depths shallower than the intake (13m LAT / -15m AHD) due to construction below the seabed via TBM. This construction methodology avoids impacting the hydrodynamics in the active coastal zone. Similarly, vessels used for construction of the intake and outfall structures will likely remain beyond the active coastal zone.

The expected impacts to the active coastal zone and hydrodynamic environment from tunnel boring are considered **Negligible**. The level of **certainty** in the assessment of expected impact is **High** due to construction methodology avoiding the active coastal zone (refer Appendix M).

Seabed disturbance for construction of intake and outfall structures will have negligible impacts on coastal processes.

Disturbance of the seabed will occur at the intake and outfall structure locations during construction, however impacts are likely to be negligible and localised around the footprint of the structures.

Marine risers connect the tunnels to the seabed structures (i.e. the intake structure and outfall diffuser array). Construction of the risers will occur prior to the tunnels meeting the riser location. Ground replacement and improvement work at the riser location and drilling and installation of the structures will be undertaken from a jack-up barge. A small amount of dredging will occur using a grab dredge to allow placement of rock armouring for scour protection around the structures.

Sediment transport is expected to be negligible at the depths where the intake and outfall risers will be constructed, as it is beyond the closure depth of 7 m relative to LAT. The limited amount of spoil (approximately 3,000 m^3) generated through ground replacement and dredging works to construct the Reference Design intake and outfall structures will not be returned to the marine environment, but transported to shore where it will be re-used at the desalination plant site. Additionally, measures and strategies to control the spread of

suspended sediments during the offshore construction activities will be incorporated into a Dredge Management Plan. An adaptive management program involving turbidity trigger levels will be implemented as part of the Dredge Management Plan, with 'alarm' and 'hold' triggers and responses set in line with EPA guidance and based on local conditions. This will limit the spread of turbid waters during construction. Accordingly, impacts from the offshore construction activities are expected to be negligible.

For the float and sink pipeline option, disturbance of the seabed will occur at the intake and outfall structures as well as a narrow strip between the structures during construction to stabilise and secure the pipe on the seabed. Approximately 1,000 m of submarine conduit with an estimated diameter of 2 m is proposed to be installed on the seabed beyond the depth of the intake location (i.e. beyond 13 m LAT). This is expected to require a shallow narrow strip of dredging along the length of the pipe and this option would increase spoil generated by approximately 7,000 m^3. As for the Reference Design, the spoil is proposed to be transported to shore and used at the desalination plant site.

Although there is a larger area of seabed disturbance (compared to the Reference Design), as the pipeline is located beyond the closure depth of 7 m relative to LAT (Jacobs 2026a), the consequence of this is considered negligible in terms of coastal processes. The location for the seabed infrastructure remains outside of the active coastal zone, and below the depth of wave influence, implying sediment transport and wave climate will not be affected by construction activities associated with the float and sink pipeline option.

Hydrodynamic impacts associated with the construction of the intake and outfall structures (such as deflection of currents around the structures and construction equipment) are expected to be negligible for both the Reference Design and the float and sink pipeline option. Similarly, vessels used for construction of the intake and outfall structures, and the seabed pipeline will have minimal impact on the hydrodynamic regime due to their small footprint and draught compared to the water depth at the site.

The expected impacts to the seabed, sediment transport and hydrodynamics from installation of the intake and outfall structures and the seabed float and sink pipeline are **Negligible**. The level of **certainty** in the assessment of expected impact is **High** due to construction methodology avoiding the active coastal zone, and commonly used mitigation measures in place (refer Appendix M).

No release of spoil or water produced by the TBM during construction is expected as it will be managed with settling ponds.

Spoil and wastewater produced by the TBM will be transported to the shore where it is proposed to be dewatered and used on site. The preferred strategy for managing discharge of water resulting from the dewatering of TBM spoil is via retention and sedimentation basins adjacent the Mullaquana Station desalination plant site (refer Chapter 6 Project Description). It is expected that the volumes of spoil and water generated by the TBM can be managed on site, and there will be no direct discharge of water or construction spoil to the coastal or marine environment resulting from the TBM process.

The expected impact to coastal processes from spoil and water generated by the tunnel boring process is **Negligible**. The level of **certainty** in the assessment of expected impact is

High due to spoil and water from the tunnel boring process being managed on land (refer Appendix M).

10.5.2 Operational Impacts

There will be negligible impact to coastal processes or the coastal environment from the presence of the intake / outfall structures.

Operation of the Project will have minimal impacts on coastal processes, primarily due to there being no permanent infrastructure in the nearshore active coastal zone and location of the offshore intake / outfall sites and 1,000 m float and sink pipeline option in relatively deep water (over 3 km offshore) where sediment transport is negligible.

Hydrodynamic changes from the proposed infrastructure are expected to be minimal and localised. The intake and outfall structures, and 1,000 m float and sink pipeline option, may cause small changes in current speed where they interact with seabed flows. However, because the structures have a relatively small footprint and low profile relative to the water depth (minimum 13 m from LAT to the seabed), hydrodynamic effects are expected to remain localised to the immediate vicinity of the seabed infrastructure and are not expected to affect far-field hydrodynamics.

The prevailing wave climate in the region is not expected to be impacted due to the low profile of the seabed infrastructure and available water depth above the structure (at least 7 m). The seabed infrastructure is below the depth of wave influence.

The Project is not anticipated to have an effect on sediment transport as the majority of sediment transport occurs in water depths of less than 7 m (transported by the combined action of waves, currents and wind), and the structures are too deep and far from shore to impact upon sediment transport or coastal erosion. Operational impacts associated with the intake and outfall structures are expected to be localised and minor (e.g. localised scour / accretion around the structure). Rock armouring will be installed around the base of the structures to protect against scour.

No active seabed disturbance is anticipated during operation. The routine maintenance of marine infrastructure, such as the removal of marine growth from the intake and outfall structures or seabed pipeline, would be conducted from vessels or using scuba divers and would involve only minor and localised disturbance. Disturbance of the seabed would only be required in the unlikely event of major repairs, with any associated impacts expected to be short term and spatially limited.

The expected impacts on coastal processes and sediment transport from the presence of infrastructure on the seabed during operation of the Project are considered **Negligible** and the level of **certainty** in the assessment is **High** (Appendix M).

10.5.3 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP, Dredge Management Plan and other relevant plans).

Table 10-2: Key mitigation measures – coastal processes

Mitigation measure	Construction	Operation
Intake and outfall tunnels constructed via TBM for the Reference Design. (Note: 1,000m seabed outfall pipeline option is located sufficient distance from the shoreline to not impact coastal processes.)	✓	
Avoidance of active coastal zone, intertidal areas, coastal dunes, mangroves and *Posidonia* seagrass.	✓	✓
TBM spoil transported to shore and re-used at the desalination plant site.	✓	
Sediment disturbing activities will be managed under a Dredge Management Plan and to control suspended sediment. Dredging will require compliance under an EPA licence for dredging of the seabed.	✓	
Turbidity sampling is proposed to monitor suspended sediment caused by the construction works to the marine environment and ensure EPA requirements are met (to be confirmed as part of the CEMP).	✓	
Rock armouring around base of structures to prevent scour.	✓	✓

10.6 Conclusion

Project construction activities have been designed to minimise impacts on coastal processes. Operational structures within the marine environment (related to both the Reference Design and float and sink pipeline option) are too distant and too deep to impact upon the active coastal zone and far field coastal processes.



Chapter 11

Marine Environment

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

11 MARINE ENVIRONMENT 11-1

11.1 Key Findings 11-1

11.2 Setting the Context 11-3

11.2.1 Requirements in legislation and other standards 11-3

11.2.2 Views of stakeholders 11-4

11.3 Assessment Method 11-5

11.3.1 Baseline survey methods 11-10

11.3.2 Assessment studies 11-18

11.4 Description of the Existing Marine Environment 11-23

11.4.1 Overview 11-23

11.4.2 Water quality 11-25

11.4.3 Phytoplankton 11-33

11.4.4 Zooplankton 11-38

11.4.5 Marine sediment 11-40

11.4.6 Benthic habitats and communities 11-42

11.4.7 Key marine fauna 11-48

11.5 Project Marine Infrastructure – Reference Design and Option 11-59

11.5.1 Reference Design base case 11-60

11.5.2 Float and sink pipeline option 11-60

11.6 Return Water Characteristics, Toxicity and Dispersion 11-61

11.6.1 Physical and chemical characteristics 11-61

11.6.2 Toxicity assessment of the return water 11-64

11.6.3 Modelling of return water dispersion 11-67

11.7 Impact Assessment 11-90

11.7.1 Marine environmental values summary 11-90

11.7.2 Potential sources of impact 11-91

11.7.3 Design modifications to protect environmental values 11-91

11.7.4 Effects of return water on marine environment during operation 11-93

11.7.5 Seabed disturbance during construction 11-111

11.7.6 Marine discharge during construction 11-116

11.7.7 Stormwater runoff 11-117

11.7.8 Underwater noise and vibration 11-118
11.7.9 Entrainment 11-124
11.7.10 Light spill from desalination plant 11-126
11.7.11 Invasive marine species 11-127
11.7.12 Waste from spent tunnel boring machine 11-129
11.7.13 Option Assessment: Float and sink seabed pipeline 11-130
11.7.14 Cumulative impact from other development 11-134
11.7.15 Summary of key mitigation measures 11-136
11.8 Discussion 11-138
11.9 Conclusion 11-138

LIST OF TABLES

Table 11-1: Marine Investigations undertaken for the Marine Environmental Assessment for the Mullaquana Station marine study area 11-6
Table 11-2: Seasonal averages (± standard deviations (SD)) for water column profile parameters 11-26
Table 11-3: Zooplankton abundance by taxonomic group and season at Project and reference sites 11-38
Table 11-4: Key habitat features along the depth (mAHD) gradient within the MSA 11-43
Table 11-5: Conservation significant marine and coastal species that may occur in the vicinity of Mullaquana Station 11-49
Table 11-6: Fishery species in Spencer Gulf, reliance on the Marine Study Area and relevance to EIS 11-52
Table 11-7: Comparison of intake seawater and predicted return water characteristics* 11-62
Table 11-8: Typical cleaning chemicals used in reverse osmosis desalination facilities 11-63
Table 11-9: Estimated safe dilutions for return water to achieve different levels of protection 11-65
Table 11-10: Distances from, and areas within, the 95% species protection 10th percentile dilution contour 11-77
Table 11-11: Dilutions achieved at the nearest boundary to receptors and corresponding percentages of species protected 11-86
Table 11-12: Larval tracking and entrainment results based on worst-case (highest entrainment) year modelled 11-89
Table 11-13. Assessment of the effects of return water on relevant fisheries species 11-108
Table 11-14: Estimated disturbance areas for seabed infrastructure (Reference Design) 11-111

Table 11-15: Noise source detail and predicted weighted distance to effects thresholds for fauna hearing groups 11-119

Table 11-16: Summary of operational noise sources 11-124

Table 11-17: Estimated seabed disturbance areas for the Float and Sink Pipeline Option. 11-131

Table 11-18: Key mitigation measures – marine environment 11-136

LIST OF FIGURES

Figure 11-1: Marine study area at Mullaquana Station site with proposed intake / outfall infrastructure. 11-10

Figure 11-2: Water quality monitoring sites and oceanographic mooring location 11-12

Figure 11-3: Mapped benthic habitats of the MSA and representative marine ecology survey sites identified 11-14

Figure 11-4: Midfield entrainment model particle release areas for midfield modelling of Prawns and King George Whiting (yellow), and Snapper (blue) 11-22

Figure 11-5: Temperature (average ± SD) from water column profiles at nine sites 11-26

Figure 11-6: Salinity (average ± SD) from water column profiles at nine sites 11-26

Figure 11-7: Dissolved oxygen (% saturation) (average ± SD) from water column profiles at nine sites 11-27

Figure 11-8: Turbidity (average ± SD) from water column profiles at nine sites 11-27

Figure 11-9: Inferred chlorophyll-a (average ± SD) from water column profiles at nine sites 11-27

Figure 11-10: Temperature profiles through the water column for each survey time depicted by season 11-28

Figure 11-11: Salinity (PSU) profiles through the water column for each survey time depicted by season 11-29

Figure 11-12: Dissolved oxygen (mg/L) profiles through the water column for each survey time depicted by season 11-30

Figure 11-13: Turbidity (NTU) profiles through the water column for each survey time depicted by season 11-31

Figure 11-14: Inferred chlorophyll *a* (mg/m^3) profiles through the water column for each survey time depicted per season 11-32

Figure 11-15: Temporal trends in Phytoplankton abundance and composition (as cells/L) ... 11-34

Figure 11-16: Temporal trends in phytoplankton community composition as % of total abundance 11-34

Figure 11-17: Temporal trends in total phytoplankton cell counts (average ± standard deviation) for surface, bottom, and composite water samples 11-35

Figure 11-18: Temporal trends in diatoms (average ± SD, cells /L) in surface, bottom and composite water samples 11-35

Figure 11-19: Temporal trends in dinoflagellates (average ± SD, cells /L) in surface, bottom and composite water samples 11-36

Figure 11-20: Temporal trends in other phytoplankton (average ± SD, cells /L) (cells /L) in surface, bottom and composite water samples 11-36

Figure 11-21: Temporal trends in *Karenia cristata* relative and all other dinoflagellates 11-37

Figure 11-22: Relative abundance (%) of fish families recorded for the MSA 11-39

Figure 11-23: Particle size distribution (%) in sediment samples in sandy sites with bioturbation (SB), sandy sites with invertebrates (SI) *Zostera* beds (ZO) 11-41

Figure 11-24: Aerial image of mangrove habitat within the 50-hectare Project mangrove study area 11-45

Figure 11-25: Location of the MSA in relation to the Cuttlefish Coast Sanctuary Zone 11-51

Figure 11-26: Spencer Gulf Prawn Fishery footprint, based on 40% of the total effort during 2001/02–2017/18 and distribution of prawn juveniles in Spencer Gulf 11-55

Figure 11-27: Reference Design marine infrastructure diagram (indicative and not to scale) 11-60

Figure 11-28: Float and sink pipeline option case marine infrastructure diagram (indicative and not to scale) 11-60

Figure 11-29: Species sensitivity distribution of preliminary dataset 11-66

Figure 11-30: Spencer Gulf midfield model domain, mesh and bathymetry 11-70

Figure 11-31: Salinity and temperature calibration at NWP3 Station 11-72

Figure 11-32: Salinity and temperature calibration at SAMUSG Station 11-72

Figure 11-33: Examples of ebbing (left) and flooding (right) currents on a dodge tide (top) and spring tide (bottom) 11-73

Figure 11-34: Instantaneous dilution contours (95% and 99% species protection) during an ebbing (top) and flooding (bottom) **spring tide** for the 51 GL/y scenario (left) and turndown scenario (right) 11-75

Figure 11-35: Instantaneous dilution contours (95% and 99% species protection) during an ebbing (top) and flooding (bottom) **dodge tide** for the 51 GL/y scenario (left) and turndown scenario (right) 11-76

Figure 11-36: Dilution plots of the 10th percentile contours for each season for the 51 GL/y scenario (95% and 99% species protection) 11-78

Figure 11-37: Instantaneous salinity change contours during an ebbing (top) and flooding (bottom) **dodge tide** for the 51 GL/y scenario (left) and turndown scenario (right) 11-80

Figure 11-38: Instantaneous salinity change contours during an ebbing (top) and flooding (bottom) **spring tide** for the 51 GL/y scenario (left) and turndown scenario (right) 11-81

Figure 11-39: 24-hour Average Salinity Change for each season for the 51 GL/y design scenario....11-82

Figure 11-40: 51 GL/year Scenario Temperature change (Scenario 50th percentile minus baseline 80th percentile) – Summer....11-84

Figure 11-41: 51 GL/year Scenario Temperature change (maximum scenario minus maximum baseline) – Summer....11-85

Figure 11-42: Sensitive receptors in vicinity of the Project showing location for alignment of vertical curtains....11-86

Figure 11-43: Salinity change curtain profile showing maximum 24-hour average salinity average in relation to the diffuser reference location – Summer 2022-23 (51 GL/y only)....11-88

Figure 11-44: Zone of potential ecological effect (51GL/y - union of the 10th percentile dilution contours for 95% species protection levels for all seasons) 11-94

Figure 11-45: Sensitive receptors in relation to zone of potential ecological effect (51GL/y - union of the 10th percentile dilution contours for 95% species protection levels for all seasons) 11-96

Figure 11-46. Regional Benthic Habitat Associations and sandy habitats 15+m depth.....11-100

Figure 11-47: Discrete seabed disturbance areas associated with intake and outfall structures (based on the Reference Design)....11-112

Figure 11-48: Percentage cover of *Zostera* in the MSA recorded during surveys across all seasons in 2025....11-113

Figure 11-49: Safety zones established for whales during construction impact piling activities 11-121

Figure 11-50: Safety zones established for sealions and dolphins during construction impact piling activities....11-121

Figure 11-51: Potential vibration effects zone for benthic invertebrates from impact piling activities 11-122

Figure 11-52: Potential vibration effects zone for benthic invertebrates from the TBM 11-123

Figure 11-53: Concept of potential marine intake structure design....11-125

Figure 11-54. Seabed disturbance areas for the float and sink pipeline option showing total disturbance and *Zostera* disturbance areas....11-132

Figure 11-55. Cumulative impact maps from Jones et al. (2018) which was based on expert assessment of the effects from 32 threats on eight ecosystems. 11-135

LIST OF PLATES

Plate 11-1: Harvesting of seagrass from within a 30 cm diameter ring....11-15

Plate 11-2: Decapod larvae – examples of species present at Project site Left image shows Brachyuran (true crab); centre image shows Caridea (Shrimps); right image shows Dendrobrachiata (penaeid prawns).....11-39

Plate 11-3: Fish larvae – examples of species present at MSA Left image shows Gobiidae (Gobies); right image shows Tetrarogidae (Soldierfish).....11-40

Plate 11-4: Fish eggs collected at the MSA Left image shows potential Snapper eggs that underwent DNA sequencing; centre image shows mixed eggs of unknown species awaiting DNA-metabarcoding; right image shows Anchovy eggs.....11-40

Plate 11-5: Aerial image of mangroves located approximately 450m south of the tunnel alignment.....11-44

Plate 11-6: Mangrove community at the permanent photo point on Transect 13 - facing east.....11-44

Plate 11-7: Mazy bryozoan *Steginoporella truncata*.....11-48

Plate 11-8: European fan worm in the Marine Study Area (left), and from PIRSA website (right).....11-58

11 MARINE ENVIRONMENT

This chapter describes the existing marine environment within the Project's Marine Study Area (MSA) and assesses the potential impacts of constructing and operating the Project on marine water quality, flora, fauna, and key habitats.

The chapter characterises the desalination plant return water, including its toxicity to marine biota and its hydrodynamic dispersion.

The impact assessment addresses possible habitat disturbance, underwater noise and vibration and potential impacts of the presence and operation of the desalination plant infrastructure including discharge of return water and entrainment of marine biota.

11.1 Key Findings

Understanding how the Project is likely to interact with the marine environment has been a critical focus for the Northern Water Project. Key marine environmental values relevant to the Mullaquana Station site include marine water quality, mangroves and intertidal flats, seagrass beds, some of which provide nursery and recruitment areas for important fisheries (particularly Western King Prawn, Snapper and King George Whiting).

The tunnelling construction methodology has been selected to minimise marine impacts. Disturbance associated with construction of the intake and outfall structures is expected to be minor, localised and temporary.

Operation of the Project fundamentally involves seawater extraction and discharge of desalination plant return water into Spencer Gulf waters. Environmental considerations have been critical in driving the design and siting of the desalination plant.

Potential impacts to the marine environment at Mullaquana Station have been assessed through detailed baseline studies and an impact assessment including desktop ecotoxicology investigations and marine hydrodynamic modelling.

During operation, potential impacts from the discharge of return water (at 51 GL/y) are expected to be localised to the immediate vicinity around the diffuser, over predominantly sandy habitats. Seagrass and mangrove communities will not be affected as a result of operation.

The Project is expected to have negligible impact on marine water quality and flora and fauna because:

During construction

- The tunnelling construction methodology for the intake and outfall has been adopted to minimise impacts on sensitive intertidal and benthic habitats (intertidal mangroves, tidal flats and *Posidonia* dominated seagrass beds are avoided).
- The Reference Design requires a small area (0.25 ha) of *Zostera* seagrass disturbance to allow for construction of the intake (including 0.1 ha of temporary clearance from which this opportunistic species is expected to rapidly recover).

- The float and sink pipeline option increases seabed disturbance from the Reference Design case, and would require an additional 1.85 ha of (1.09 ha infrastructure footprint and 0.76 ha temporary disturbance for construction).
- There may be short-term localised disturbance associated with construction of the intake and outfall structures including intermittent underwater noise, dredging, limited marine construction wastewater discharges and increased construction vessels in the vicinity.

During operation

- The return water has a limited zone of potential ecological effect[1].
- 95% of species would be protected from chronic impacts associated with the return water beyond 370 m of the diffusers (Appendix G-12, Table 4-2).
- Salinity beyond the immediate vicinity of the diffusers would remain within the range of natural seasonal variability (approximately 38 to 41 g/L) for most of the year.
- Fish and other mobile marine fauna generally have the ability to move away from the diffuser or osmoregulate in response to elevated salinity.
- Most of the sessile fauna recorded in the marine study area (MSA) have a tolerance for higher salinity than would be found near the diffuser, as inferred from their distribution in the Upper Spencer Gulf (USG).
- Of the few species that are potentially less tolerant of changes in salinity, most inhabit the seagrass habitat, throughout which more than 99% of species would be protected from chronic impacts associated with the return water.
- Potential stratification as a result of the return water would be transient and localised and would not adversely affect near-bed dissolved oxygen concentrations.
- Total suspended solids modelling results conclude that discharging desalination plant backwash into the outfall/return water will have no impact on the receiving environment as modelled changes in total suspended solids are small and within natural variation.
- The impacts to marine biota from dilutions of return water during dodge tides are considered negligible.
- The nearfield model concludes that return water will not breach the surface.
- The midfield model concludes that there will be negligible short circuiting between the intake and outfall.
- The gulf wide assessment predicted that farfield salinity changes are within the range of natural salinity variability within the gulf.
- Under conservative worst-case modelling scenarios, the proportion of larvae in Spencer Gulf predicted to be entrained into the desalination plant intake is very low: **0.13%** for Prawn, **0.0002%** for King George Whiting, and **0.019% to 0.24%**[2] for Snapper.

[1] The 'zone of potential ecological effect' is defined as the union of the 10th percentile dilution contours for 95% species protection levels for all seasons at 51 GL/y (refer section 11.7.4).

[2] Refer to Table 11-12. Note that 0.019% is the result for modelling including larvae behaviour assumptions, and 0.24% is the modelling result under a passive behaviour assumption.

Key marine aspects of the EIS have undergone an independent peer review process. Each of the independent peer reviewers have provided the results of their review in Appendix G-17.

11.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effect of the Project on marine flora and fauna, ecological communities and populations, that may occur over the life of the development. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 11.3.

11.2.1 Requirements in legislation and other standards

There is a range of State and Commonwealth legislation relevant to the protection of marine and coastal environments during the construction and operational phases of the Project.

State legislation for the protection of coastal areas and marine waters and species includes the *Marine Parks Act 2007* which provides for areas to be reserved for conservation purposes and the *Coast Protection Act 1972* which establishes the Coast Protection Board. The *National Parks and Wildlife Act 1972* provides for the protection of marine mammals while seagrass is protected under the *Native Vegetation Act 1991.*

The *Biodiversity Act 2025* was passed in June 2025 and is relevant as an emerging legal framework, but has not yet come into force. Implementation of the Biodiversity Act will occur in stages as supporting regulations, policies and guidelines are developed. The *National Parks and Wildlife Act 1972* and the *Native Vegetation Act 1991* will continue to apply until the Act is implemented. Compliance with the Biodiversity Act should be reassessed before construction, and as relevant provisions commence.

The *Fisheries Management Act 2007* and *Aquaculture Act 2001* provide the frameworks for protection of aquatic species, fisheries and the State's aquaculture industry. The *Biosecurity Act 2025* passed South Australian Parliament on 6 February 2025 but has not yet commenced. The Biosecurity Act is expected to commence in mid-2028 and would repeal provisions of the *Fisheries Management Act 2007* related to exotic aquatic organisms and diseases, as well as biosecurity matters arising from these[3].

Water quality in South Australia is protected by the *Environment Protection Act 1993* and related environment protection policies. The *Environmental Protection (Water Quality) Policy 2015* (Water EPP) specifies the environmental values that apply to marine waters in South Australia. For the Project, the relevant marine water environmental values are:

[3] https://pir.sa.gov.au/about-us/legislation/legislative_reform/biosecurity_legislation

- Marine water quality
- Aquatic ecosystem
- Recreation and aesthetics and
- Primary industries – aquaculture and human consumption of aquatic foods.

Guidance for management of underwater noise is provided by the Underwater Piling and Dredging Noise Guidelines 2023 developed by the Department for Infrastructure and Transport (DIT), widely adopted for South Australian projects. The guidelines address underwater noise for marine maintenance activities or a marine infrastructure project, and designate safety zones for marine activities based on the potential for hearing injury in marine mammals.

Other State legislation regulating activities in marine waters includes the *Harbors and Navigation Act 1993* and *Protection of Marine Waters (Prevention of Pollution from Ships) Act 1987*.

Relevant Commonwealth legislation includes the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* with respect to nationally threatened species and migratory species and the *Biosecurity Act 2015* which provides for management of biofouling for vessels operating in Australian territorial waters. The Australian Ballast Water Management Requirements (DAWE 2020a) provide guidance on how vessel operators should manage ballast water when operating within Australian seas in order to comply with the *Biosecurity Act 2015*.

Other South Australian and Commonwealth Government legislation and other standards which may relate to the marine and coastal environment in the MSA are described in Chapter 3 Legislative Approvals Framework. Chapter 9 Use of Land and Marine Waters and Chapter 10 Coastal Processes also address marine legislation for coastal and marine environments.

11.2.2 Views of stakeholders

Comprehensive stakeholder engagement has been undertaken for the Project which has included engagement with local councils and communities, Traditional Owners, affected landholders and other stakeholders (including the aquaculture and recreational fishing sector) with an interest in the marine environment.

Feedback received during the community engagement process indicates the community has a strong connection to the marine environment. Protecting the USG's marine and coastal environment, and the industries and communities that depend on it, including commercial and recreational fishing and tourism, remains one of the key priorities amongst stakeholders and the community.

Key concerns raised include:

- Potential impacts to important habitats for marine life including nursery grounds, especially within intertidal flats, mangroves and seagrass meadows during construction and operation of the desalination plant and associated infrastructure.

- Effects of return water discharge from the outfall diffuser, including increased salinity and potential impacts on marine life, particularly juveniles and the Giant Australian Cuttlefish within the sanctuary zone and during migration.
- Entrainment of marine life, especially eggs and juveniles, into the desalination plant intake pipe.
- Cumulative impacts from desalination activities on a marine environment potentially already impacted by the South Australian Harmful Algal Bloom (HAB).
- Accuracy and reliability of marine investigations, including dispersion and dilution modelling, given the region's unique tidal patterns (spring and dodge tides).

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

11.3 Assessment Method

The method of impact assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 Impact Assessment Methodology and is discussed under each impact event where relevant. A summary of the evaluation of certainty for all impact events is contained in Appendix M.

This chapter is based on a comprehensive set of technical marine baseline studies and specialist investigations undertaken for the Project (refer Table 11-1). The methods used to identify environmental values and conduct the impact assessment ranged from desktop literature review to in-field survey or sampling and detailed modelling based upon existing or collected data. Methods used for each technical study are outlined in Sections 11.3.1 and 11.3.2.

Table 11-1: Marine Investigations undertaken for the Marine Environmental Assessment for the Mullaquana Station marine study area

Investigation type	Scope	Dates or timeframe of survey or study	Location of full report
Baseline Studies			
Baseline Larval Fish and Decapod Crustaceans Seasonal Surveys	Four plankton sampling events were undertaken by South Australian Research and Development Institute (SARDI) covering four seasons from November 2024 to July 2025. The surveys quantified the abundance of decapod larvae, fish larvae, and fish eggs at the proposed desalination plant site near Mullaquana Station, and at a reference location 2.5 km to the south. Plankton samples were analysed using combined morphological and DNA-metabarcoding procedures to identify larvae and eggs to the lowest reliable taxonomic level. A subset of samples from the February and July surveys were also screened for 20 priority invasive marine species (IMS) using species-specific quantitative polymerase chain reaction (qPCR) assays.	From November 2024 to July 2025 (November – Spring, February – Summer; May – Autumn, and July – Winter)	Appendix G-6
Prawn Juvenile Recruitment Survey	SARDI surveys of juvenile prawn recruitment in 2025 and 2026.	February and April 2025, February and April 2026.	Appendix G-7
Mangrove Condition Seasonal Surveys	J Diversity and COOE undertook seasonal mangrove condition surveys documenting mangrove structure, health, recruitment and associated fauna across ten sites (across 50 ha) over four seasons.	Summer 2024/2025, Autumn 2025, Winter 2025, Spring 2025	Appendix G-4
Benthic Habitat Survey and Seagrass Health Seasonal Survey	J Diversity undertook habitat mapping as part of five surveys spanning from 2023 to 2025. Surveys events used towed cameras and scuba surveys of sand and seagrass habitats. Scuba surveys used transects and grids to survey the benthic habitat and seagrass within the MSA.	23 January 2023, 20 to 22 November 2024, 3 February 2025, 27 February 2025, 2 May 2025.	Appendices G-2 and G-3
Epibenthic Fish, Invertebrate and Infauna	J Diversity undertook seasonal surveys over a 12 month / four season duration to support the EIS.	Summer 2024/2025, Autumn 2025, Winter 2025, Spring 2025	Appendix G-3

Investigation type	Scope	Dates or timeframe of survey or study	Location of full report
(macro and meiofauna) Seasonal Surveys	Scuba surveys of seagrass habitats to characterise flora cover and fish and invertebrate communities. Towed camera surveys (deep water habitats). Baited Remote Underwater Video (BRUV) surveys (all primary habitats). Macrofauna and meiofauna (Infauna) in sediment core samples taken by scuba divers.		
Marine sediment quality and algal cysts in sediment	Baseline sediment analyses in the vicinity of proposed seabed disturbance, in order to: • Determine the existing abundance and composition of algal cysts and resting cells within sediments (undertaken by Chris Bolch of Microalgal Services) • Characterise sediments for particle size distribution, nutrients, metals and other potential contaminants (undertaken by JBS&G with fieldwork undertaken by J Diversity).	Sediments were sampled on 23 October 2025	Appendix G-5
Site specific seawater quality and oceanographic monitoring	Undertaken by SARDI. Two coastal oceanographic mooring deployments equipped with water quality instruments. Both deployments located at the same location (known as NWP3) which is approximately 2.6km east of the marine outfall/diffuser in water depth of approximately 25m. Integrated Marine Observing System (IMOS) ADCP sites supplement site specific data, including the SARDI IMOS ADCP site known as SAMUSG. SAMUSG is located southeast of Whyalla and approximately halfway between NWP3 and Point Lowly. Refer to Figure 10-3 in Chapter 10 Coastal Processes for the locations of NWP3 and SAMUSG ADCP.	ADCP deployment 1 at NWP3 - November 2022 to May 2023 (6 months including summer) ADCP deployment 2 at NWP3 – 12 months deployment beginning September 2025	Appendix G-1

Investigation type	Scope	Dates or timeframe of survey or study	Location of full report
	Seawater quality sampling and in situ measurements - 2025 sampling commenced in May, ongoing for 12 months. Seawater sampling occurred at 9 sites distributed evenly across the MSA (refer Figure 11-2) (ADCP = Acoustic Doppler Current Profiler)		
Assessment Studies			
Ecotoxicity Desktop Assessment	Rick Van Dam from WQ Advice undertook an ecotoxicology assessment to assess the impact of the return water on the receiving environment. Review of literature and data to compile site-specific toxicity dataset and derive Project specific 'safe' dilutions.	2023 to 2025	Appendix G-10
Marine Hydrodynamic Modelling (Nearfield, Midfield and Farfield)	Nearfield modelling undertaken by Water Technology: to simulate the dispersion of the return water in the immediate vicinity (1-100 m) of the diffusers for a range of ambient flow velocities within the receiving environment.	2024 to 2026	Appendix G-11
	Midfield modelling undertaken by Water Technology to demonstrate that return water dilution is sufficiently high to protect the marine environments and species receptors at the shortest possible distance from the diffusers, including: • Extents of the return water zone of influence near the outfall as defined by the dilution environmental criteria (from the ecotoxicity desktop assessment) • Extents of the return water zone of influence near the outfall in relation to salinity change • Associated TSS change near the outfall • Associated temperature change near the outfall • Stratification • Any potential recirculation between return water and the seawater intake	2024 to 2026	Appendix G-12

Investigation type	Scope	Dates or timeframe of survey or study	Location of full report
	Farfield modelling undertaken by SARDI. A 3D hydrodynamic model was developed by SARDI for Spencer Gulf to examine the effect of hydrodynamics on the farfield dispersal of the return water. The farfield model was also used to assess the cumulative impacts with climate change.	2024 to 2026	Appendix G-13
Larval tracking and entrainment modelling and assessment	Collaboration between SARDI and Water Technology – focused on commercial fishery species (Western King Prawn, Snapper and King George Whiting) in Spencer Gulf. SARDI's farfield gulf-wide model was used to predict the percentage of larvae that would come within ~1 km of the intake. Water Technology assessed larval entrainment into the intake using a particle tracking model within ~1km around the desalination plant intake.	2024 to 2026	Appendix G-12 and G-13
Invasive Marine Species (IMS) Risk Assessment	Aquatic Biosecurity undertook a desktop risk assessment of current and future IMS risks to the MSA with the objective to establish baseline IMS risk assessment data for the Project.	2024 to 2026	Appendix G-15
Giant Australian Cuttlefish Desktop Risk Assessment	Collaboration between J Diversity and JBS&G to assess the risk of impact to the EPBC-listed National Heritage Place, 'Cuttlefish Coast Sanctuary Zone' – as well as to Giant Australian Cuttlefish more broadly.	2024 to 2026	Appendix G-16
Underwater noise and vibration assessment	Baseline underwater noise monitoring by Resonate to identify sources of underwater noise and vibration. Marine species potentially exposed to the Project noise were identified and modelling undertaken to assess short-term and long-term impacts and to determine zones of impact.	2024 to 2026	Appendix G-9
EPBC Significant Impact assessment	JBS&G prepared an assessment of the significance of impacts of the Project on Matters of National Environmental Significance protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* to support an EPBC Act referral and the EIS.	2024 to 2026	Appendix I-6

11.3.1 Baseline survey methods

The aim of the marine baseline surveys was to describe the existing marine and coastal environment to comply with the EIS Assessment Requirements and in sufficient detail to enable potential impacts to be assessed. The baseline surveys undertaken for the Project are listed in Table 11-1 and described below.

Field surveys were undertaken within a defined MSA located off the coast of Mullaquana Station. The MSA is broadly defined as a 2.5 km buffer around the Project infrastructure footprint, extending approximately 5 km along the shoreline and out to approximately 7 km offshore. The MSA and proposed desalination intake and outfall alignments are shown in Figure 11-1. The methods employed in assessing existing values and impacts to the marine environment are outlined in the sections below.

A harmful algal bloom (HAB) in South Australia progressed up Spencer Gulf in late 2025. The marine baseline data collection period for the Project spanned the pre- and post-bloom period for the Mullaquana Station site. The majority of the marine ecology baseline was complete by the time the algal bloom passed through the area, providing a robust pre-bloom baseline. For water quality and prawn recruitment surveys the data were collected both pre- and post-algal bloom. For each of these parameters there are local SARDI / PIRSA data which provides typical historical patterns to strengthen the pre-bloom baseline. The baseline data duration / timing will provide an understanding of the existing marine environment prior, during, and following the 2025-2026 harmful algal bloom as it relates to the Mullaquana Station site.

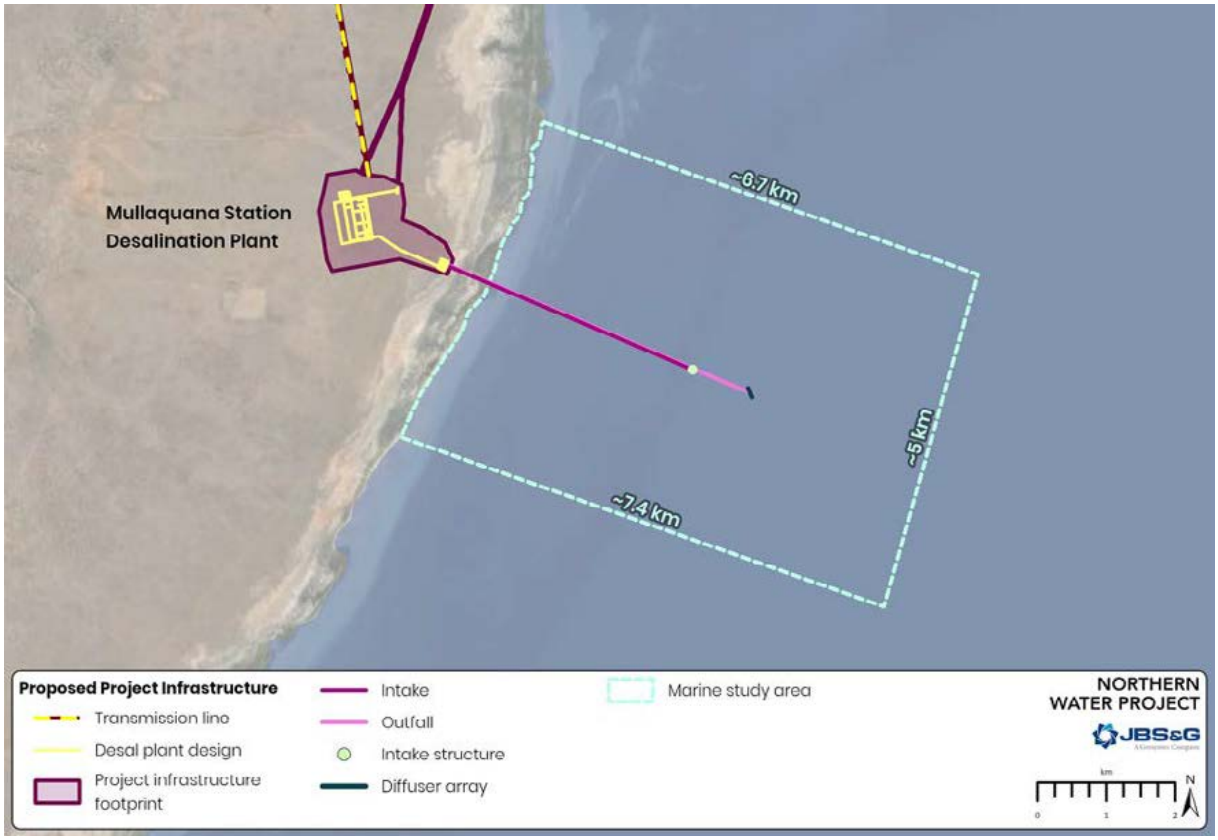


Figure 11-1: Marine study area at Mullaquana Station site with proposed intake / outfall infrastructure.

Site specific seawater quality and oceanographic monitoring

The marine water quality baseline program was developed and undertaken to describe the physical, chemical and biological water quality characteristics and trends at Mullaquana Station. Detailed methodology is described in Appendix G-1 Marine Water Quality Baseline Summary Report and summarised below.

A coastal oceanographic mooring was deployed by SARDI at Mullaquana Station for a total of 18 months. An initial six months of data were collected between November 2022 and May 2023, and then a continuous 12-month period from September 2025. The mooring was fitted with an acoustic doppler current profiler (ADCP) and CTD (conductivity-temperature-depth) instrument for near bottom measurements of temperature (°C), salinity (Practical Salinity Units (PSU)) and pressure (depth in metres (m)). Refer to Figure 11-2 for the location of NWP3 ADCP.

A water quality survey program was undertaken by SARDI to characterise natural spatial and temporal variability within the marine study area over a 12-month period. Nine sites were monitored with monthly water quality surveys conducted between May 2025 and May 2026. Additional sampling was carried out at one site (at MQ05, refer Figure 11-2) on a fortnightly basis from May 2025 to November 2025 and then on a monthly basis until May 2026. The additional sampling was primarily for engineering purposes and has been incorporated into the phytoplankton reporting in Section 11.4.3.

Water column profiles were sampled using a CTD profiler with additional sensors for dissolved oxygen (mg/L), fluorescence (inferred chlorophyll *a*), turbidity (NTU) and photosynthetically active radiation (PAR). The pH was measured at the surface and bottom of the water column using a YSI Sonde (a multiparameter water quality monitoring instrument). Water samples were collected at various depths through the water column, and tested for a suite of physical, chemical and biological analytes.

Data analysis for the water quality baseline monitoring program was undertaken by JBS&G. Where relevant, results were compared to water quality and toxicant default guidelines values (ANZG 2018).

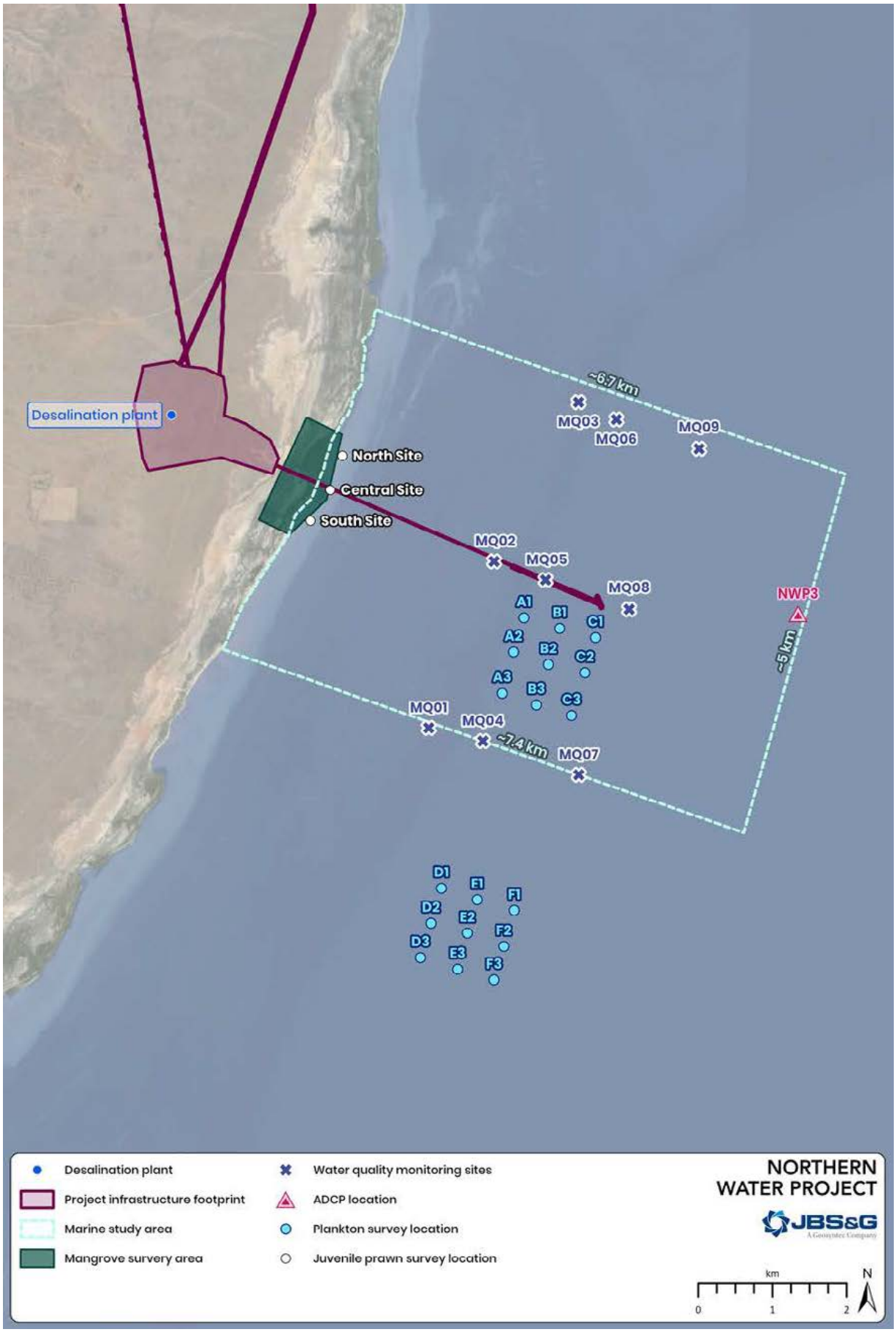


Figure 11-2: Water quality monitoring sites and oceanographic mooring location

Mangrove Condition Seasonal Surveys

Seasonal mangrove condition surveys were undertaken, documenting mangrove structure, health, recruitment and associated fauna across ten sites (across 50 ha of the Project Area), and four seasons (Summer 2024 / 2025, Autumn 2025, Winter 2025, and Spring 2025).

The survey methodology was designed to be robust yet simple and repeatable for future monitoring purposes, and involved:

- surveys of Linear Transects (25 m) recorded epifauna species and infauna presence, canopy cover percentage, leaf condition, and average tree height at five metre intervals. Other metrics collected at each site include mangrove trunk diameter, leaf colour and signs of disease or stress
- measurement of density and size of Mangrove seedlings (as indicators of mangrove recruitment and community succession) and pneumatophores (as indicators of soil conditions, hydrological regimes and mangrove health). They were measured in quadrat counts (three 50 x 50 cm quadrats per transect)
- photos taken seasonally at permanent photo points established for each site surveyed
- determination of Mangrove Health Indices using weighted measurements collected along the transects and additional metrics collected at each site including an Overall Health Score of the habitat and an Enhanced Tree Health Index
- undertaking Statistical Analyses to examine differences or similarities between sites and seasons.

Detailed methodology for the mangrove condition surveys is available in Appendix G-4.

Benthic Habitat Survey and Seagrass Health Seasonal Survey

Habitat identification and mapping

Reconnaissance habitat surveys were undertaken to map the extent of vegetated and non-vegetated habitats in the MSA and identify the primary habitats for further investigations. Mapping of the MSA used multispectral satellite imagery combined with extensive ground truthing, using georeferenced towed video.

Six primary survey habitats were identified:

- *Posidonia australis* seagrass (PA)
- *Posidonia sinuosa* seagrass (PS)
- Amphibolis / *Posidonia* (patchy) seagrass ('*Amphibolis* / *Posidonia*') (AP)
- *Zostera* seagrass (ZO)
- Silty sand with sparse invertebrates and/or macroalgae ('Sand / invertebrates') (SI)
- Silty sand with bioturbation ('Sand / bioturbation') (SB).

Five representative sites were chosen from each of these habitats (refer Figure 11-3) and used for the detailed physical and biological investigations described below, including scuba transects, sediment analysis, towed camera transects and BRUVS deployments.

Additional surveys were also undertaken at one or two sites selected within each of several less extensive habitats including Bryozoan beds, *Posidonia australis* / *Zostera* seagrass, *Amphibolis* / *Posidonia* (mixed) seagrass, *Amphibolis* seagrass.

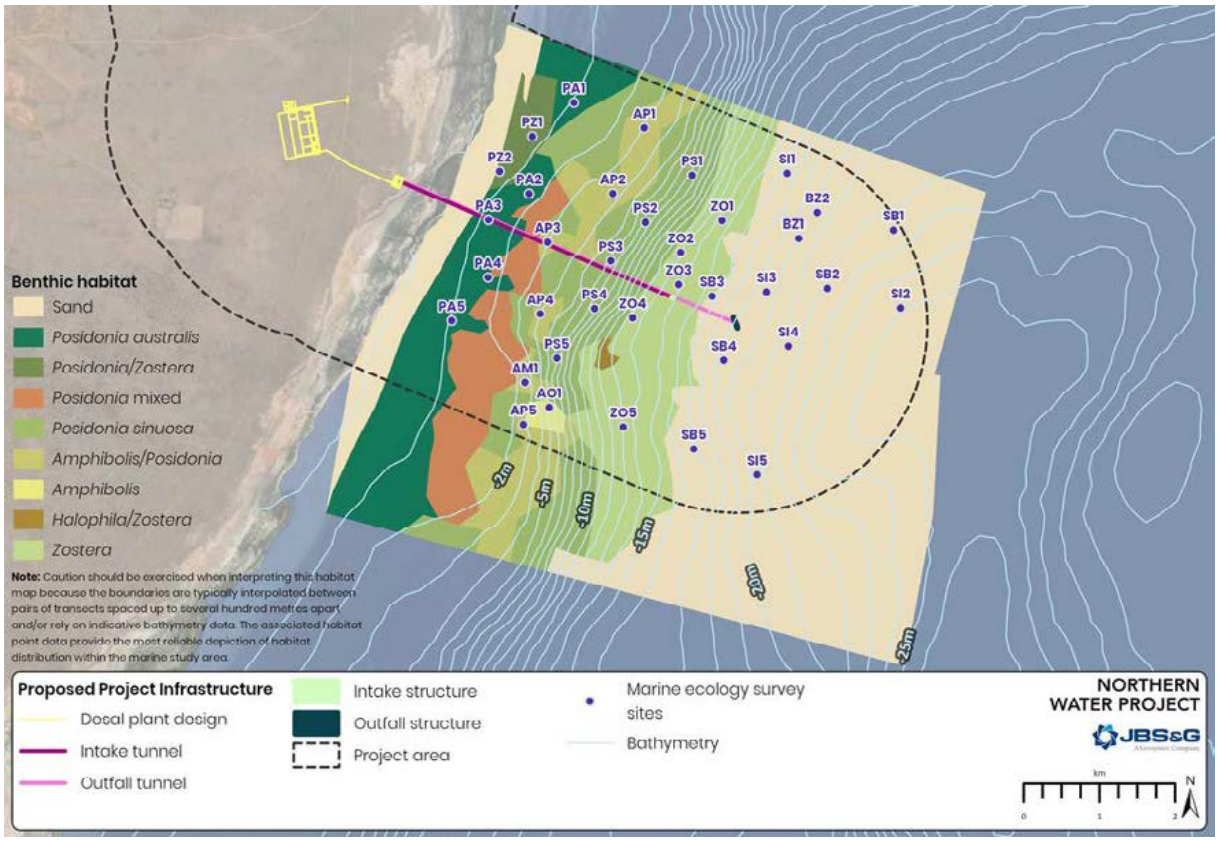


Figure 11-3: Mapped benthic habitats of the MSA and representative marine ecology survey sites identified

[Source: Figure adapted from Appendix G-3 and G-2) (Bathymetry = mAHD)]

Seagrass habitat characteristics

Characteristics of benthic habitats were further refined and confirmed through seasonal surveys in Summer, Autumn, Winter, and Spring 2025. At each seagrass site, photoquadrats were used to estimate percentage cover of seagrass and epiphytes, and in *Posidonia* habitats, seagrass material was core-sampled and measured at several locations along each transect, providing for an assessment of seagrass condition and statistical comparison between seasons.

Post field processing involved estimating percent cover of benthic plants and epiphytes within the photoquadrats. For seagrass habitats, additional characteristics were recorded during the survey to determine canopy height, leaf length and leaf width (refer Plate 11-1).



Plate 11-1: Harvesting of seagrass from within a 30 cm diameter ring

Epibenthic fauna - fish and invertebrates

The occurrence, frequency, and distribution of marine epifauna within the MSA was determined from seasonal surveys undertaken in Summer 2024 / 2025, Autumn 2025, Winter 2025 and Spring 2025. A range of methods were deployed dependent on the type and depth of the habitat.

A BRUV system was used at sites for all six primary habitats, scuba transects at all sites in seagrass habitats, and towed camera (with post-field video analyses) in the deeper-water habitats beyond -15 m (AHD). The survey design provided for description of similarities/differences between survey areas (habitats) and seasons.

Subtidal infauna

Infauna surveys, conducted in Summer 2024 / 2025, Autumn 2025, Winter 2025 and Spring 2025, involved collecting sediment samples for macrofauna (animals greater than 500 µm in size) and meiofauna (animals 53– 500 µm in size) within each of the five representative sites for each of the six primary habitats. Sediment samples were collected by divers using hand-held corers and samples processed in the laboratory with identification to the lowest possible taxonomic resolution.

Prawn Juvenile Recruitment Survey

Prawn recruitment surveys were carried out in February and April 2025 and repeated in February and April 2026 across three sites near the proposed desalination plant intake and outfall alignment within the MSA (refer to Figure 11-2). The methodology for the prawn

recruitment surveys drew from historical surveys around Spencer Gulf (Carrick 1996; Roberts 2005, 2010) to optimise methodology and enable data comparisons.

At each of the three sites, four 100 m transects were established perpendicular to the shore and surveyed during high tide in approximately 1.1 m to 1.4 m water depth.

The surveys were undertaken using a 'jet net', or mesh sledge fitted with a water jet which penetrates the sand / mud substrate to a depth of approximately 5 cm enabling displacement and collection of the juvenile prawns and macrofauna (refer Plate 11-2).

The four transect samples were pooled, sorted to remove and return larger shells, seagrass, and identifiable macrofauna (after being counted). The remaining contents were placed in formalin. In April 2025 an additional transect was completed at each site, to obtain a sub-sample of juvenile prawns, which were preserved in ethanol for DNA analyses.

Detailed methods are presented in Appendix G-7.



Plate 11-2: Mesh sledge use for prawn recruitment surveys

Plankton survey - larval fish and larval decapod crustaceans

Seasonal plankton surveys were undertaken by SARDI in Spring 2024, Summer 2024 / 2025, Autumn 2025 and Winter 2025. Plankton tows were conducted near the proposed intake and outfall, and at a reference location approximately 2.5 km to the south (refer Figure 11-2 / Appendix G-6). Water column conductivity, temperature, depth (CTD) profiles were also recorded at each site.

Plankton samples were collected and sorted to the lowest reliable operational taxonomic unit. Following sorting, samples were recombined for DNA-metacoding and subsequent determination for the presence / absence of larvae of common fish and crustacean species. A subset of the plankton samples was also tested for 20 key invasive marine species using species-specific quantitative polymerase chain reaction (qPCR).

Sediment quality

Surface sediments from six sites within the MSA were sampled by J Diversity in October 2025. Sediment samples were analysed to characterise the sediment quality in terms of physical and chemical properties as well as presence of harmful algal cysts and resting cells. Samples were taken from six marine ecology sampling sites that were in proximity to the intake and outfall location and represented those within the marine construction disturbance footprint (refer Appendix G-5).

Physical and chemical characterisation

Sediments up to 50 cm deep (depending on depth of sediment in some rocky locations) were collected and analysed for contaminants, nutrients and for particle size distribution. Sediment analysis results were compared to screening criteria derived from the National Assessment Guidelines for Dredging (DEWHA 2009), and to toxicant default guidelines values for sediment quality (ANZG 2018).

Harmful algae in sediment

In order to determine the existing abundance and composition of algal cysts and resting cells of harmful algal species within sediments, the following three approaches were applied by Professor Chris Bolch of the University of Tasmania, a phytoplankton specialist:

- **Non-quantitative all species screening of each sample with pre-concentration using sodium polytungstate (SPT) gradients:** This approach provides proportional estimates of abundance as part of the total community. The SPT concentration significantly improves capacity to detect harmful algal bloom species resting stages.
- **Dinoflagellate cyst species relative abundance:** All dinoflagellate cyst species relative abundance (percent of total cyst flora) provides a broad environmental / ecological context within which to interpret the presence of harmful / toxic and introduced taxa.
- **Toxic/harmful algal species confirmation by germination:** To determine whether there were dormant *Karenia* cells present that may pose a serious risk if sediments are remobilised. Detection of *Karenia* resting stages is difficult, as the morphology of these resting stages is not well described and difficult to distinguish from the resting stages of other plankton (C. Bolch, personal communication). However, by undertaking specialised sediment incubations, specialist Chris Bolch has had previous success collecting and identifying *Karenia* and/or other harmful algal cells that are released through germination.

Desktop survey – key marine species

Protected marine species

Marine species listed as threatened under the EPBC Act that have the potential to occur within the Project footprint were identified using the Protected Matters Search Tool[4] (PMST) with a 5 km buffer around the MSA. Likelihood of occurrence for each predicted EPBC-listed marine species was determined using the Biological Databases of South Australia (BDBSA) (accessed via NatureMaps), the Atlas of Living Australia (ALA) records (ALA 2024) and information from the Species Profile and Threats database (DCCEEW 2026). The likely occurrence of marine species within the MSA are described in Appendix I-6 (Significant Impact Assessment and Appendix G-3 (Marine Ecology Assessment).

Syngnathids (seahorses, pipefishes, and seadragons) are protected under the *South Australian Fisheries Management Act 2007* and also listed in the 'Marine' category under the EPBC Act and were identified via the PMST and assessed for likelihood of occurrence in the MSA as for listed threatened, vulnerable, endangered or migratory species as described

[4] Protected Matters Search Tool available at: https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool

above. The likelihood of occurrence of Syngnathid species in the MSA is assessed in Appendix G-3 (Marine Ecology Assessment).

Fisheries and aquaculture

Information related to the occurrence and sensitivity of marine species of economic importance was obtained from fisheries stock assessments undertaken by SARDI Aquatic Sciences, public registers of licences and policy documents.

11.3.2 Assessment studies

Several specialist investigations were undertaken to assess the potential impacts of the Project on the environment. These studies are outlined below and include:

- Marine ecology assessment (Appendix G-3)
- Underwater noise and vibration assessment (Appendix G-9)
- Ecotoxicity assessment (Appendix G-10)
- Hydrodynamic modelling of return water – nearfield, midfield and whole of gulf (Appendix G-11, G-12, G-13)
- Larval tracking and entrainment modelling (Appendix G-12, G-13)
- Invasive marine species risk assessment (Appendix G-15)
- EPBC Significant Impact assessment (Appendix I-6)
- Giant Australian Cuttlefish Assessment (Appendix G-16).

The Coastal Processes impact assessment report is provided at Appendix F-1 and discussed in Chapter 10 Coastal Processes.

Underwater noise and vibration assessment

An assessment of underwater noise and vibration from construction and operation of the Project was undertaken by Resonate Acoustic Consultants. The assessment involved measuring the existing (baseline) underwater noise environment in the vicinity of the MSA, modelling underwater noise sources associated with construction and operation of the Project.

Construction noise and vibration sources considered in the assessment comprise tunnel boring, impact piling, drilling, vibratory piling, support vessels, and dredging. Operational noise sources considered in this assessment included intake and outfall pumps and pipe radiated noise. Noise related to return water diffusing through the outlet discharge nozzles was assessed by Resonate as not being expected to generate underwater noise which is detectable above noise from outlet pumps (taking into consideration the maximum nozzle velocity) (Appendix G-9).

Predicted noise and vibration as a result of the construction and operation of the Project were modelled and used to assess the potential noise impacts on marine fauna. The assessment adopted criteria based on literature and policy including the DIT's Underwater Piling and Dredging Noise Guidelines (DIT 2023) and the National Marine Fisheries Service (NMFS) update to Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 3.0) (NMFS 2024). Further detail on the modelling and assessment method is provided in Appendix G-9.

Ecotoxicity assessment

This section provides an overview of the methodology outlined in the Marine Desalination Plant Ecotoxicity Assessment, prepared by technical expert WQadvice (2025), and attached at Appendix G-10. The desktop ecotoxicity assessment was conducted to assess the potential impact of the return water on marine biota off Mullaquana Station. The key steps in this assessment included:

Literature review and gap analysis

- A comprehensive review of existing desalination plant ecotoxicity studies was completed.
- Ecotoxicity studies from five Australian desalination plants were examined.
- Data deemed to be relevant came primarily from two desalination plant studies (BHP's previously approved Olympic Dam Expansion at Point Lowly in the USG and the Adelaide Desalination Plant were found to be the most relevant to the Project).

Compilation of toxicity datasets (preliminary and final) relevant to the Project

- A preliminary dataset was produced by applying relevance and reliability screening criteria to the data gathered in the literature review.
- This resulted in 17 relevant and reliable chronic toxicity values, covering 12 species from 8 taxonomic groups.
- Relevance was determined primarily by the salinity of the testing brine and diluent / control solutions, and the inclusion of locally relevant species.
- A final dataset was developed by selecting the lowest (most conservative) toxicity value for each species in the preliminary dataset.
- Independent validation of the final dataset by three technical experts, confirming the dataset was highly relevant to the Project.

Determination of the return water 'safe dilutions'

- Dilutions that would protect 95% and 99% of species were estimated.
- Safe dilutions were calculated to achieve the above levels of species protection using the toxicity values for the most sensitive species in the final dataset (i.e. the most conservative data was applied).

Development of future ecotoxicity testing framework

- A future testing framework was developed to test and validate the safe dilution estimates during pre and post commissioning.

Hydrodynamic modelling

Hydrodynamic modelling of return water dispersion was undertaken to inform and support the marine ecological and water quality impact assessments. The modelling focused on the reference design capacity (51 GL/y) but since some aspects of the infrastructure may (largely due to construction techniques) accommodate a production capacity of approximately 73 GL/y, this scenario was included in aspects of the modelling as a hypothetical worst-case. Modelling of return water dispersion involved a three-tiered modelling approach, including:

- A farfield model focusing on Spencer Gulf-wide effects of the desalination plant (from 10's to 100's of km) (undertaken by SARDI).
- A midfield model focused on dispersion of the return water in the local vicinity of the point of discharge (from 50 m to 10 km) (undertaken by Water Technology Pty Ltd)
- A nearfield model focused on effects of the discharge in the immediate vicinity of the point of discharge (from 1 to 100 m from the outfall) (undertaken by Water Technology Pty Ltd).

Whole of Gulf Model (Farfield model)

A 1 km resolution 3D hydrodynamic model was developed by SARDI for Spencer Gulf to examine the effect of hydrodynamics on the farfield dispersal of the return water The farfield modelling report is provided at Appendix G-13. The connectivity of planktonic larvae with the desalination plant intake for entrainment modelling was also undertaken using the farfield model (refer 'Entrainment' section below).

The same model was also used to investigate the return water dispersal under the oceanographic conditions predicted under a conservative future climate change scenario (the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP) scenario 8.5). The farfield modelling climate change scenario report is provided at Appendix G-14.

Return water modelling (Midfield and Nearfield models)

The midfield model was used to run 3-dimensional hydrodynamic and transport simulations to inform and support ecological and water quality impact assessments. The model was calibrated and validated against site-specific and IMOS data demonstrating its ability to represent local hydrodynamic conditions in terms of water levels, currents, temperature and salinity. Model calibration was undertaken against NWP3 ADCP and IMOS SAMUSG ADCP, the locations of which are shown in Figure 10-3 in Chapter 10 Coastal Processes.

This enabled the assessment of:

- extents of the return water zone of influence near the outfall as defined by the dilution environmental criteria
- extents of the return water zone of influence near the outfall in relation to salinity change
- associated total suspended solids (TSS) change near the outfall
- associated temperature change near the outfall
- stratification
- any potential recirculation between return water and the seawater intake
- potential for entrainment of Western King Prawn larvae, Snapper and King George Whiting juveniles in the seawater intake.

The midfield model simulation period between 1 November 2022 and 1 December 2023 covers a full year and provides time for model spin up as well as coverage of most of the NWP3 measurement period (until 9 May 2023). The period also allowed further comparisons with SAMUSG measurements for the remainder of the simulation.

The validated model was subsequently set up to include the effects of the proposed intake and outfall for scenarios based on existing design conditions (average annual capacity of 51 GL/y and turndown capacity of 40 ML/day) as well as a hypothetical highest capacity understood to be 73 GL/y. The following is a summary of the modelled scenarios:

- 51 GL/y or 140 ML/day (at 95% availability)
- turndown (40 ML/day)
- 73 GL/y or 200 ML/day (at 95% availability)- hypothetical case.

The return water assessment in this EIS uses the results of the dispersion modelling for the design capacity scenario (51 GL/y) and the turndown scenario (40 ML/d). The dispersion modelling results for the hypothetical 73 GL/y scenario are provided in Appendix G-12, showing that model outputs meet prescribed environmental criteria at higher capacity levels. This provides confidence that environmental performance would be achieved for the design capacity (i.e. 51 GL/y), and any associated short-term production peaks to meet demand during operation (such as following maintenance activities).

Simulations were undertaken for different seasonal periods, and also for instantaneous scenarios including dodge tides.

Simulations also quantified the extent of the return water discharge footprint in the receiving environment, with emphasis on effects near the seabed. The extents included:

- representation of mixing areas with dilutions below 95% and 99% species protection defined via ecotoxicological tests
- representation of mixing areas with salinity changes in relation to the following contours - 1.1 g/L, 1.3 g/L, 1.5 g/L and 1.8 g/L (note that these salinity change contours have been selected to assist in confirming the relevant threshold for post-approval monitoring).

Nearfield modelling was undertaken by Water Technology (refer Appendix G-11) to simulate the dispersion of the return water in the immediate vicinity (1-100 m) of the diffusers for a range of ambient flow velocities within the receiving environment. The nearfield model was based on the diffuser engineering reference design (GHD 2025a) and was used to assess:

- the effectiveness of the diffusers to provide good mixing conditions
- the distance from the diffusers at which the 95% species protection trigger value would be achieved
- the likelihood of the return water discharge to breach the water surface
- the effects of the return water discharge on TSS.

The Reference Design also incorporates a seawater bypass system, primarily to support diffuser performance during low flow and plant turndown operating conditions where maintaining discharge velocity and achieving required mixing and dilution performance objectives presents the greatest operational challenge (refer Section 11.7.3). The bypass system was not relied on as a primary mitigation measure in the modelling results presented in this section; rather, it provides additional operational flexibility to support dilution and dispersion performance (refer Chapter 6 Project Description for additional detail).

Larval Tracking and Entrainment

Entrainment refers to the process of small marine fauna that are unable to resist (via swimming or other avoidance strategies) being drawn into the seawater intake. Investigations were undertaken using outputs from both the farfield gulf-wide transport model and the midfield particle modelling.

The farfield gulf-wide model was used to undertake biophysical modelling of planktonic larval connectivity for key commercial fishery species (i.e. Western King Prawn, Snapper and King George Whiting) in Spencer Gulf and predict the proportion of larvae that would come within ~1 km of the intake.

Using the midfield model, Western King Prawn, Snapper and King George Whiting larval entrainment was assessed with a particle tracking model and determination of a radius of influence around the desalination plant intake. For the Western King Prawn and King George Whiting assessment, particle releases in a 1 km-side square around the intake were used to obtain the proportion of released particles likely to be entrained into the seawater intake structures. The Snapper particle release distance was based on detail of settlement areas provided by SARDI, and used a 1 km radius from the intake (refer Figure 11-4).

Due to the sensitivity and importance of the site as a juvenile recruitment and nursery area for a number of commercial fishery species, the entrainment modelling took a conservative approach and was based on the highest capacity modelled scenario (i.e. the hypothetical case of 73 GL/y). This provides confidence that predicted entrainment results would likely be lower for the design capacity (i.e. 51 GL/y).

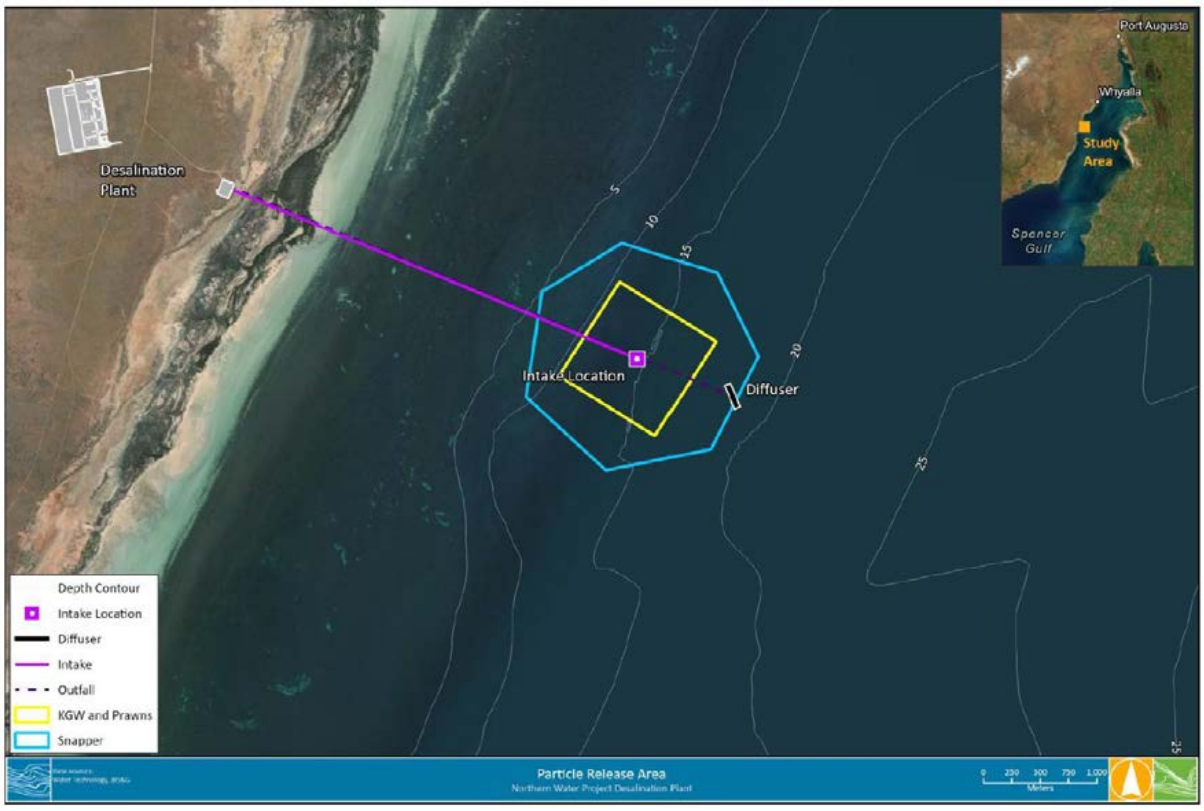


Figure 11-4: Midfield entrainment model particle release areas for midfield modelling of Prawns and King George Whiting (yellow), and Snapper (blue)

[Source: Appendix G-12]

Invasive Marine Species assessment

An Invasive Marine Species Risk Assessment was undertaken for the Project to assess the risks of introducing marine species to the marine construction area as a result of the Project construction and operation activities. The assessment was based on a desktop analysis of available information for existing invasive marine species of concern and infected ports regionally and nationally (refer Appendix G-15).

The Invasive Marine Species Risk Assessment adapted a five-step process as per Hewitt et al. (2011), whilst including new developments in invasive marine species management, research and elements of the National System for the Prevention and Management of Marine Pest Incursions. Species-specific risks and consequences were not considered as part of this risk assessment due to the difficulty of predicting marine species colonisation (Hayes et al. 2019). Instead, the vessel and donor port risk vectors were reasoned to be the quantifiable risk assessed component where mitigation effort can be applied.

EPBC Significant Impact Assessment

A Significant Impact Assessment was undertaken to assess the significance of impact from the Project on EPBC-listed species predicted to occur in the Project footprint.

The Significant Impact Assessment follows the process outlined in the MNES Significant Impact Guidelines 1.1 (DoE 2013). It uses the likelihood of occurrence of each predicted EPBC-listed marine species as determined in the desktop survey of key marine species (refer Section 11.3.1). The full methodology of the Significant Impact Assessment is provided in Appendix I-6.

11.4 Description of the Existing Marine Environment

A detailed description of the physical marine environment is provided for Spencer Gulf and the Mullaquana Station site along with the key marine values that have the potential to be impacted by the Project.

11.4.1 Overview

Spencer Gulf Overview

Spencer Gulf is a large sheltered tidal estuary approximately 7,500 km^2 in area. With minimal freshwater inputs and high evaporation, Spencer Gulf behaves as an inverse estuary where the upper reaches of the gulf can exceed 50 g/L (typical seawater is approximately 35 g/L).

Spencer Gulf is relatively sheltered with low to moderate wave energy, and dynamics are primarily driven by tidal currents. Density driven currents are formed in the USG during autumn, winter and early spring as salinity stratification creates slugs of hypersaline water that move south along the eastern seafloor of the gulf (Nunes Vaz et al. 1990). This influences the whole of gulf circulation including the annual exchange of gulf and shelf waters via a gulf-scale clockwise gyre where ocean waters are generally drawn northward along the western gulf (Middleton et al. 2013). The tides are a major generator of strong horizontal mixing due to the shear dispersion which significantly enhances the flushing and dilution of anthropogenic inputs, including from aquaculture and industry (Middleton and Doubell 2014; Doubell, James and Middleton 2015).

In addition to the typically strong horizontal mixing, the gulf waters of South Australia also experience fortnightly dodge tides (a local term for neap tide periods of limited or no tidal movement for approximately 1-2 days). Extreme dodge tides generally occur in May and November during which times there is minimal tidal movement of the gulf waters and stratification of the water column becomes more intense for a short time (roughly one day).

The USG provides a unique marine environment which supports commercial fisheries, aquaculture, provides nursery grounds for many juvenile fish species and provides habitat for other highly valued marine species including the iconic Giant Australian Cuttlefish.

Current uses and zones for marine areas across USG are described in Chapter 9 Use of Land and Marine Waters. Gulf bathymetry hydrodynamics (current speeds and roses), tides, winds and waves are covered in further detail in Chapter 10 Coastal Processes. Baseline salinity for the USG is detailed in both the midfield (Appendix G-12) and farfield model (Appendix G-13) reports.

Site Overview

The proposed desalination plant at Mullaquana Station is situated approximately 25 km south-west of Whyalla. The nearshore coastal areas are sandy and flat with extensive seagrass and mangrove habitats. Sandy habitats dominate from a depth of approximately 15 m.

At Mullaquana Station, salinity ranges between approximately 38 and 41 g/L, with highest salinities observed in winter, and lowest in summer (refer Appendix G-1 and Figure 11-31). Throughout the year, natural variations of approximately 2 g/L are common.

Marine communities in the USG have adapted to the prevailing high salinities and temperatures. Many of the species found at Mullaquana Station also occur further north in higher salinities. In the upper northern reaches of the gulf, flora and fauna may be particularly susceptible to changes in the environment.

The MSA has a relatively shallow foreshore with the 15 m depth contour approximately 3 km from shore. The area is relatively sheltered with low to moderate wave energy, primarily driven by tidal currents (Middleton et al. 2013).

Local physical marine conditions at the proposed desalination plant intake and outfall sites—such as the coastal land-sea interface, substrate and sediment characteristics, and sediment transport are detailed in Chapter 10 Coastal Processes.

Baseline underwater noise measurements were undertaken for the Project using hydrophones at two locations near the Project site, from 3 July to 17 July 2025. Existing background noise levels within the MSA are typical of a shallow coastal ocean underwater noise environment away from significant anthropogenic noise sources. The ambient noise environment was dominated by snapping shrimp and wind/wave noise (Resonate 2026a-Appendix G-8). A full description of the baseline underwater noise results is provided in Appendix G-8.

There are no marine parks or sanctuary zones at the location of the desalination plant intake and outfall pipelines. The Upper Spencer Gulf Marine Park is located approximately 8 km north and the Franklin Harbour Marine Park is located approximately 11 km south.

11.4.2 Water quality

Temperature and salinity conditions recorded in the MSA as part of the Project baseline surveys are broadly aligned with previous surveys undertaken in Spencer Gulf (Middleton et al. 2013, Messer et al. 2021, Jacobs 2015). Variability across the sampling period for temperature (°C), salinity (in practical salinity units, PSU[5]), dissolved oxygen (as % saturation and mg/L), inferred turbidity (in Nephelometric Turbidity Units, NTU) and inferred chlorophyll *a* (mg/m^3) are shown using monthly averages in Table 11-2, Figure 11-5 to Figure 11-9, and water column profiles in Figure 11-10 to Figure 11-14. The Baseline Water Quality Report is provided at Appendix G-1 and is summarised below.

The waters off Mullaquana Station are characterised by winter lows in temperature, typically around 13°C, and warmer temperatures in late summer, above 23°C (refer Figure 11-5). Salinity ranged between 38.4 PSU and 40.7 PSU (across all site data) with lowest salinities measured in November 2022 (Figure 11-31), and highest salinities measured in June 2025 (refer Figure 11-6). There were limited vertical gradients in temperature (refer Figure 11-10), and salinity gradients evident during early-mid Winter (June and July) and then through most of Summer and Autumn when salinity at depth was up to 1.9 PSU higher than in the upper water column (Figure 11-11 and Appendix G-1).

Dissolved oxygen ranged between ~4.8 mg/L and ~5.6 mg/L, with saturation around 100% for most of the study period, indicating well-oxygenated conditions (refer Figure 11-7). Measured pH was within the typical range of marine waters (7.9 - 8.4) (ANZG 2018).

Turbidity (as NTU), together with measurements of TSS (mg/L) showed waters to be relatively clear for much of the study period, close to or below 1 NTU (Figure 11-8), and TSS generally below 4 mg/L (refer Appendix G-1). At times, peaks above these low background levels occurred, with turbidity exceeding 1 NTU in March and April, and with TSS highest in June 2025 and May 2026 (up to around 7 mg/L).

During late Spring to early Summer, chlorophyll a was slightly higher than has previously been reported in nearby waters by Middleton et al. (2013) but aligned more closely with values reported by Jacobs (2015). Chlorophyll *a* from both the CTD and bulk water samples showed the same overall trends, with highest chlorophyll *a* (1.5 mg/m^3) occurring in November 2025 and remaining elevated through December and into January 2026 (refer Figure 11-9, Figure 11-14). No clear relationship between chlorophyll *a* or turbidity/ TSS was apparent.

Metal concentrations remained low overall; however, exceedances of 95% Default Guideline Values (DGVs) for copper and zinc were observed. Copper and zinc concentrations were however in the range previously reported in waters of Spencer Gulf (Jacobs 2015).

Dissolved nutrient concentrations at Mullaquana Station were overall low, again reflecting previous studies in Spencer Gulf (Middleton et al. 2013). However, peaks in dissolved nutrients were apparent, with nitrate for example exceeding 2.5 µg/L at times in early Spring, late Spring and early Autumn, low ammonia throughout Winter and Spring (generally <2 µg/L), increasing through Summer and early Autumn, while highest Phosphate concentrations (i.e > 3 µg/L) occurred in Winter and into Spring (refer Appendix G-1). Phosphate in particular has

[5] Practical salinity unit (PSU) is a dimensionless measure of water salinity based on its electrical conductivity relative to a standard seawater solution

been hypothesised to be limiting primary productivity in Spencer Gulf waters (Middleton et al. 2013).

In conclusion, Mullaquana Station's marine environment exhibits characteristics and seasonal variability typical of Spencer Gulf waters.

Table 11-2: Seasonal averages (± standard deviations (SD)) for water column profile parameters

Parameter	Unit	Winter	Spring	Summer	Autumn	Min – Max*
Temperature	°C	14.15 ± 1.68	16.09 ± 2.18	21.91 ± 1.62	20.60 ± 1.82	12.4-23.5
Salinity	PSU	39.94 ± 0.25	39.11 ± 0.20	38.90 ± 0.21	39.54 ± 0.31	38.4-40.6
DO	mg/L	5.62 ± 0.23	5.54 ± 0.26	4.96 ± 0.20	4.79 ± 0.15	4.7 - 5.8
Turbidity	NTU	0.72 ± 0.37	0.75 ± 0.35	0.65 ± 0.35	1.40 ± 0.68	0.5 - 1.8
Chlorophyll *a*	mg/m^3	0.44 ± 0.18	0.88 ± 0.54	0.88 ± 0.60	0.56 ± 0.16	0.27 – 1.5

***** Minimum and maximum values are primarily taken from Table 3-1 of Appendix G-1, highest and lowest average from any surveys for each parameter. The salinity minimum is taken from both Figure 11-31 (ADCP Nov 2022) and Appendix G-1.

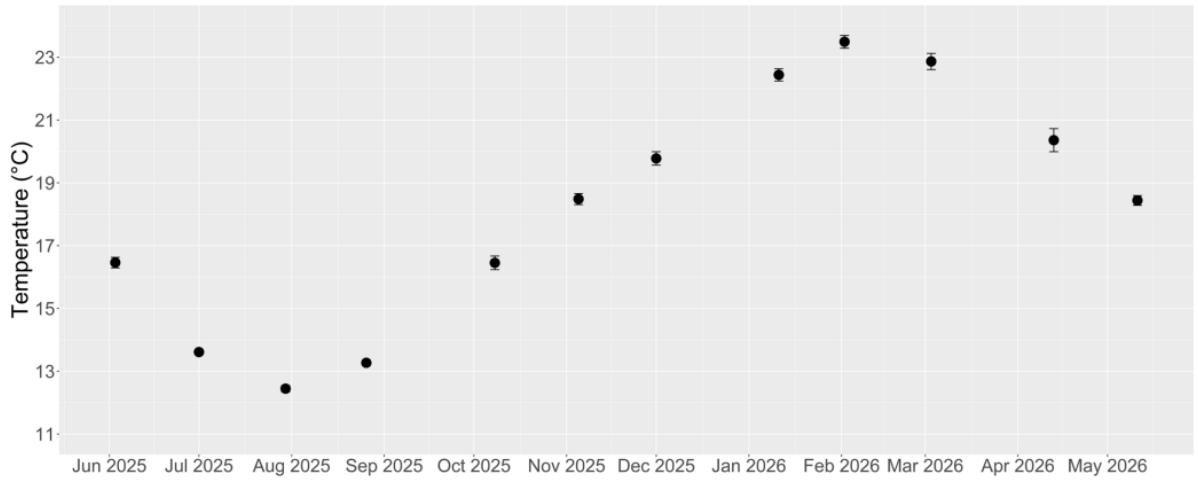


Figure 11-5: Temperature (average ± SD) from water column profiles at nine sites

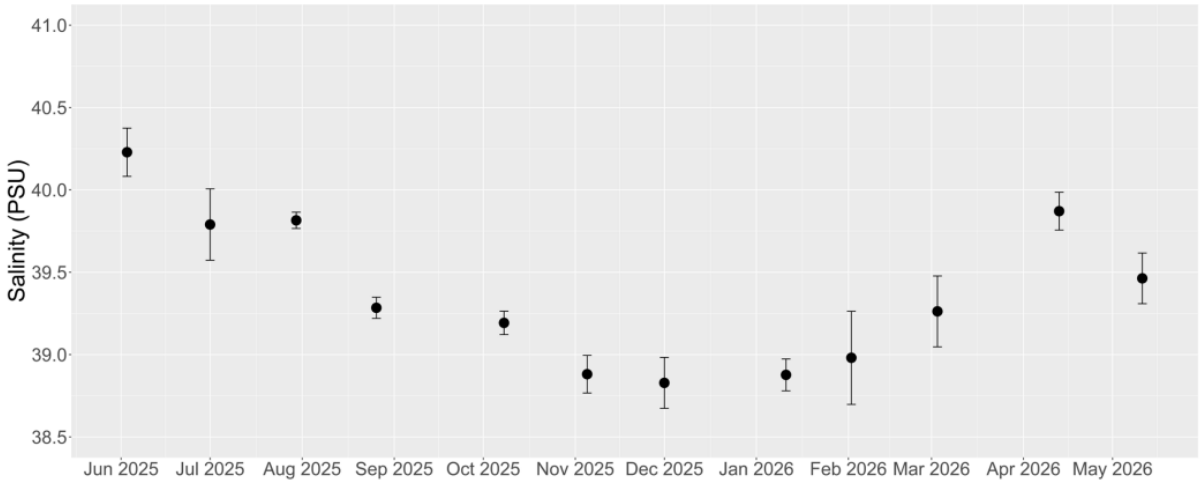


Figure 11-6: Salinity (average ± SD) from water column profiles at nine sites

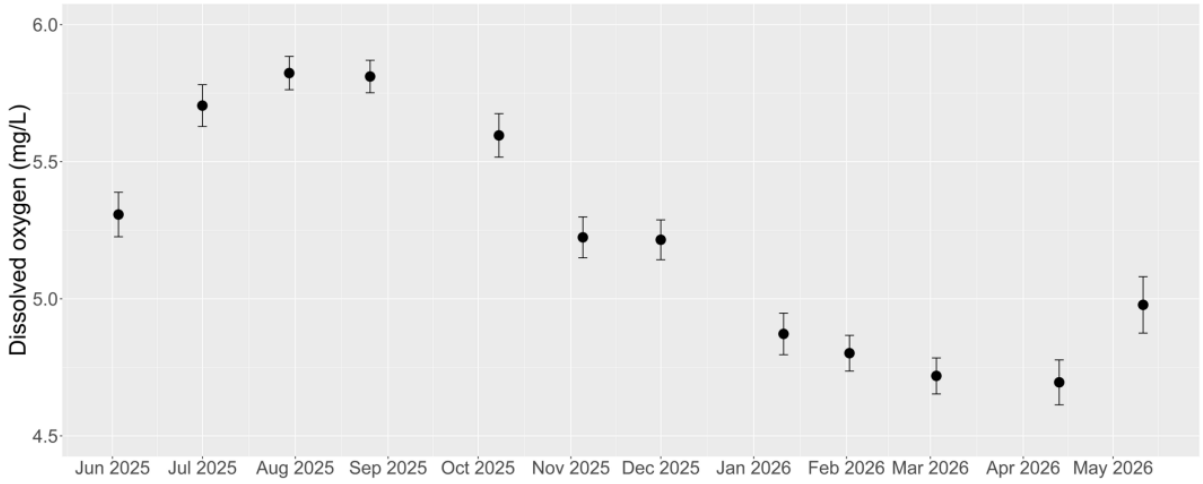


Figure 11-7: Dissolved oxygen (% saturation) (average ± SD) from water column profiles at nine sites

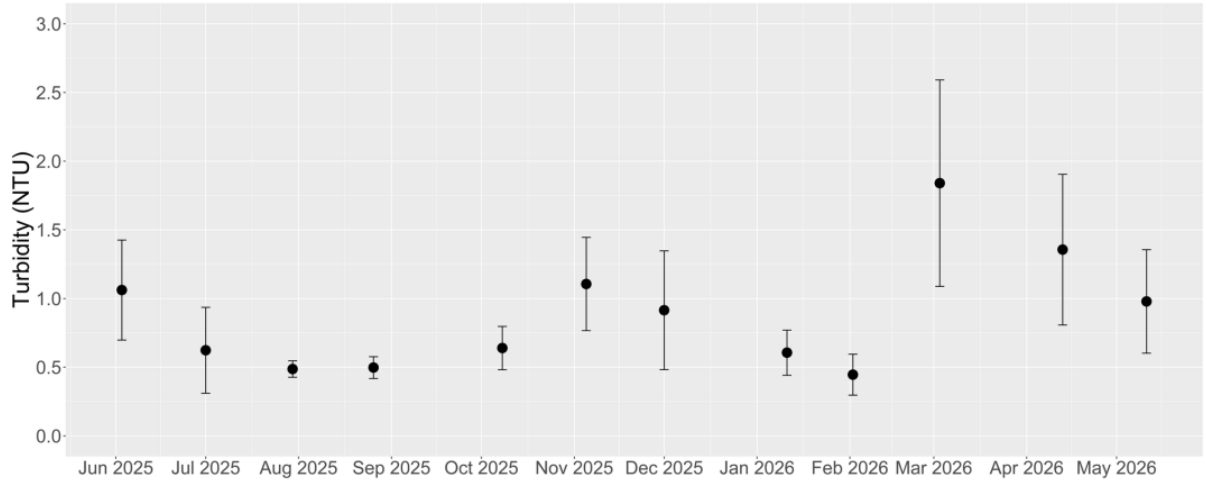


Figure 11-8: Turbidity (average ± SD) from water column profiles at nine sites

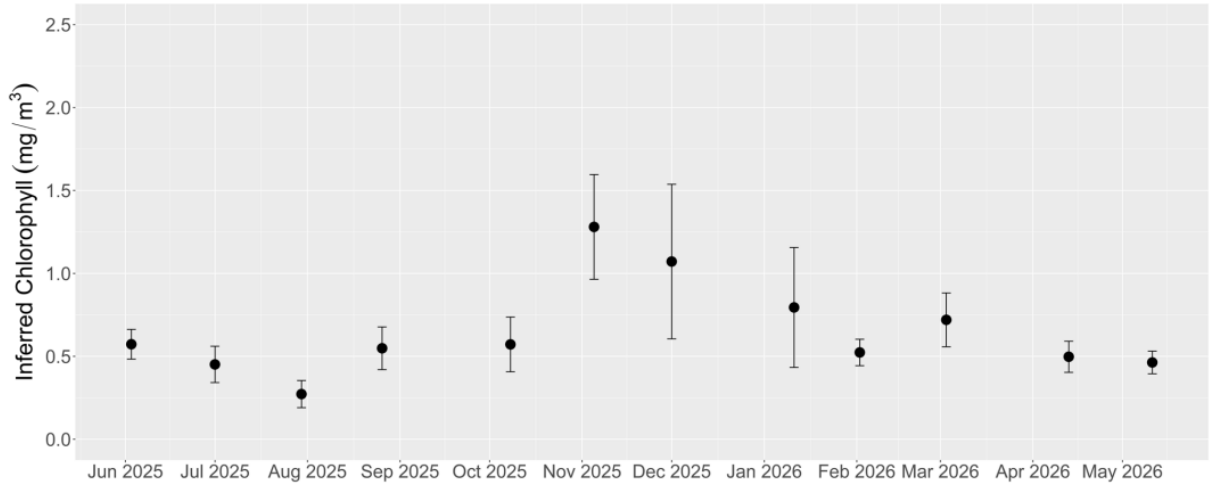


Figure 11-9: Inferred chlorophyll-a (average ± SD) from water column profiles at nine sites

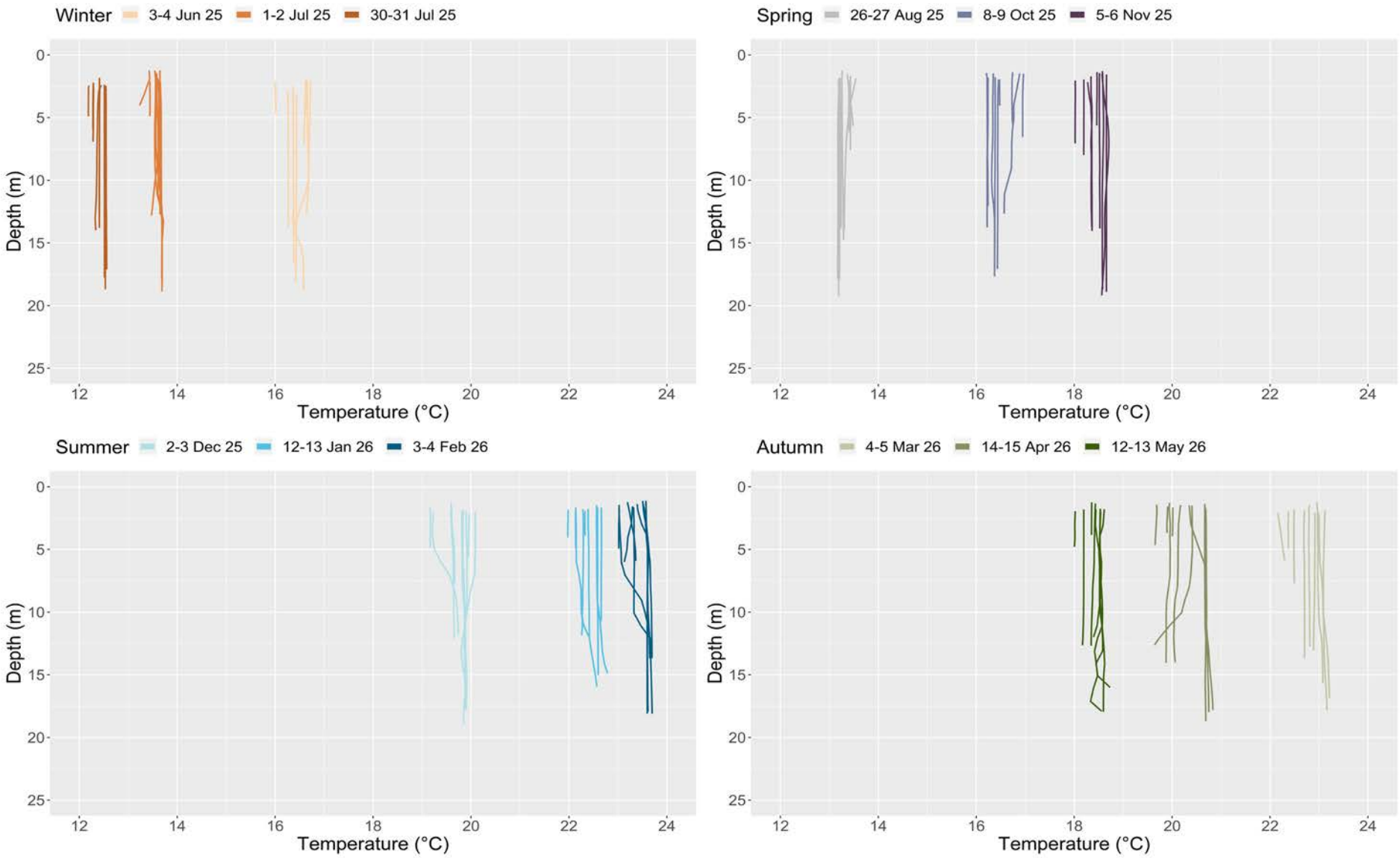


Figure 11-10: Temperature profiles through the water column for each survey time depicted by season

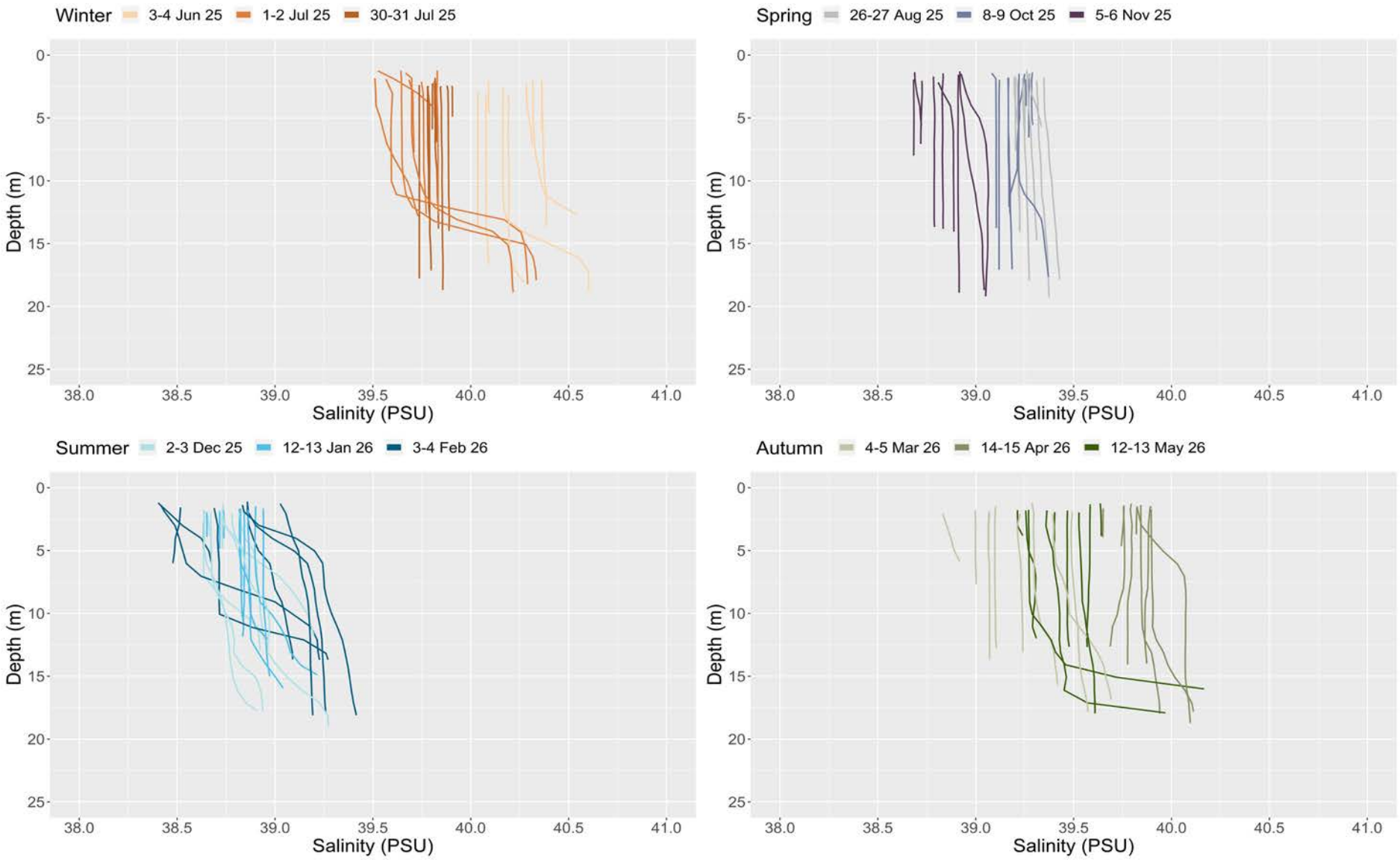


Figure 11-11: Salinity (PSU) profiles through the water column for each survey time depicted by season

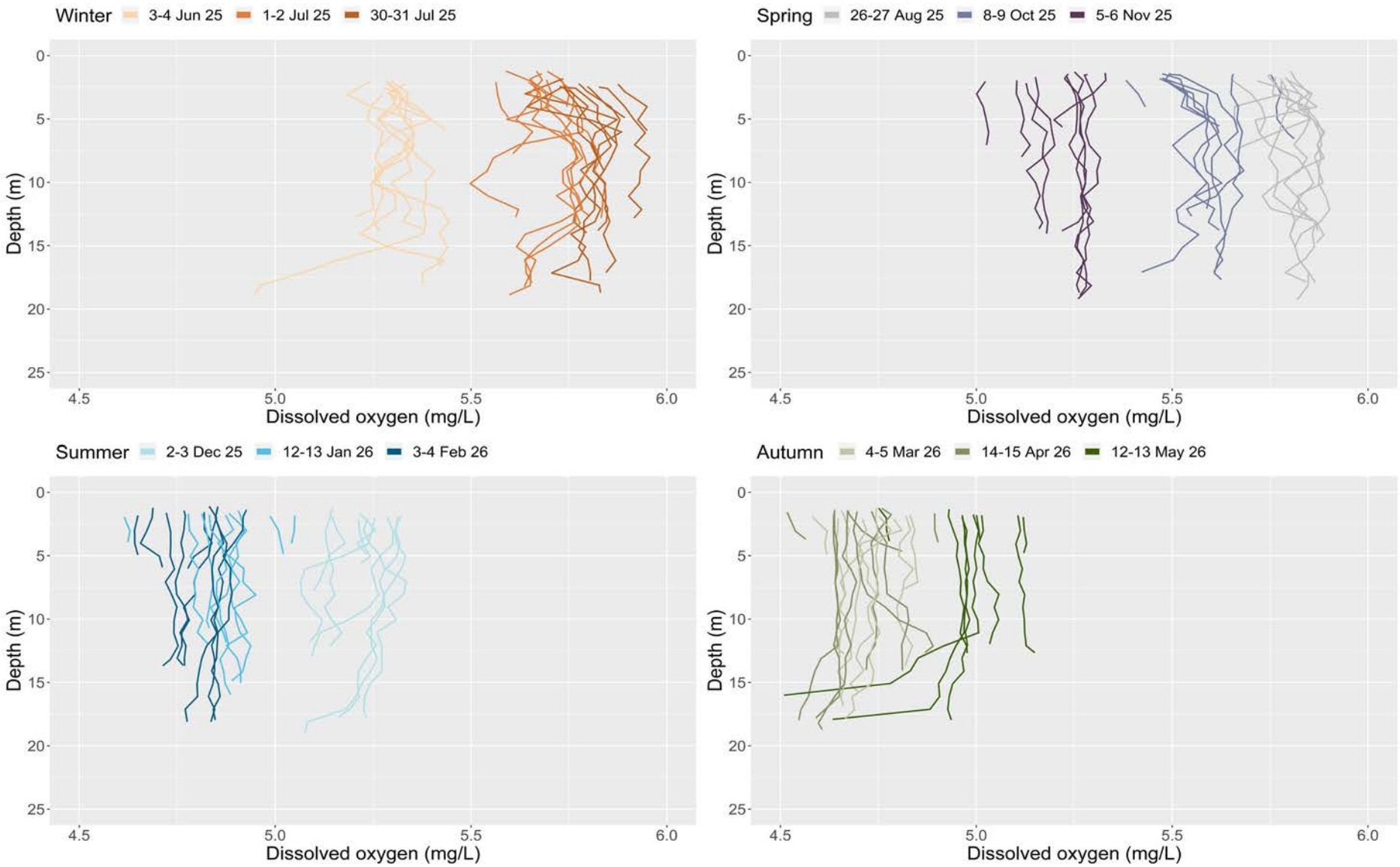


Figure 11-12: Dissolved oxygen (mg/L) profiles through the water column for each survey time depicted by season

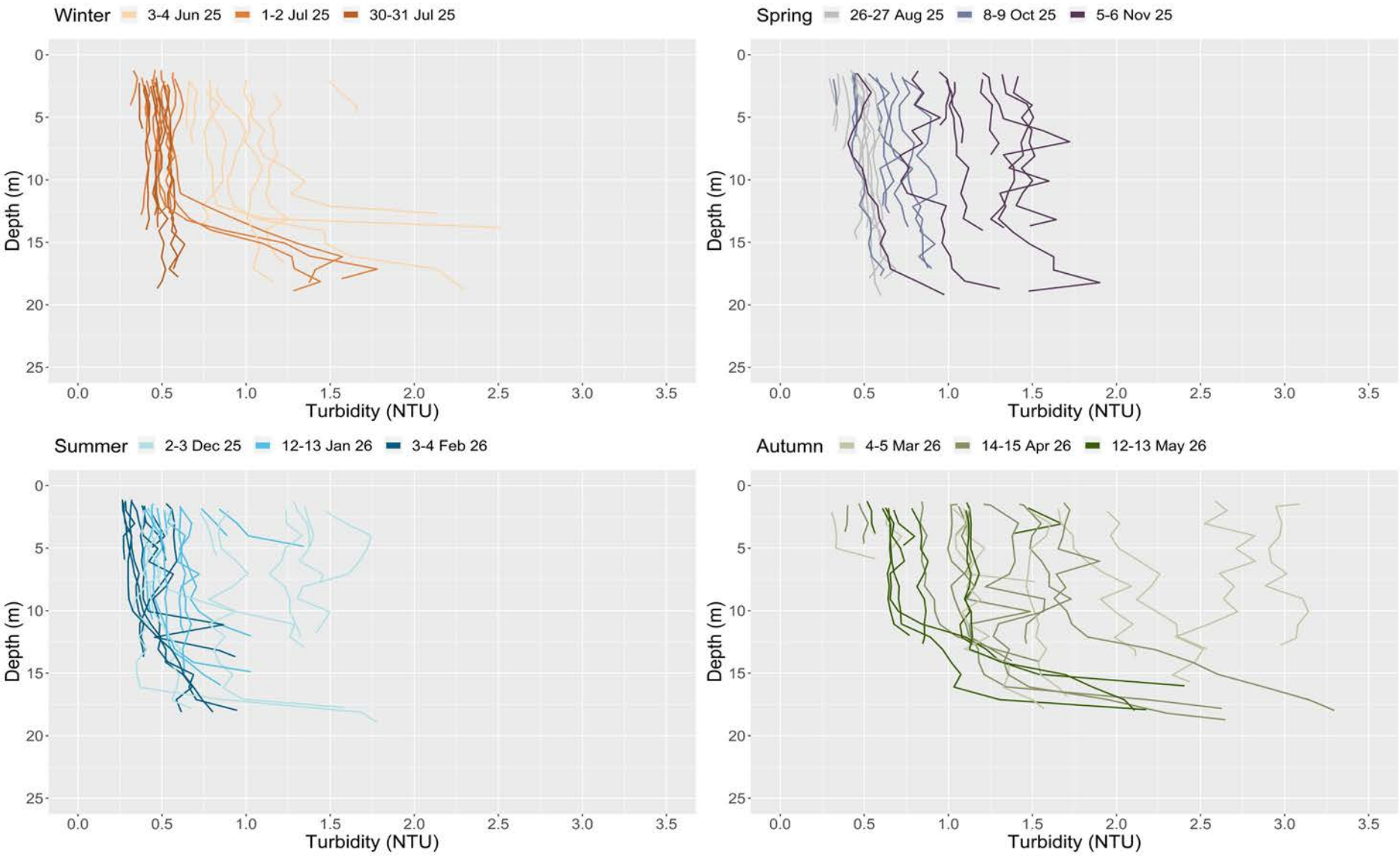


Figure 11-13: Turbidity (NTU) profiles through the water column for each survey time depicted by season

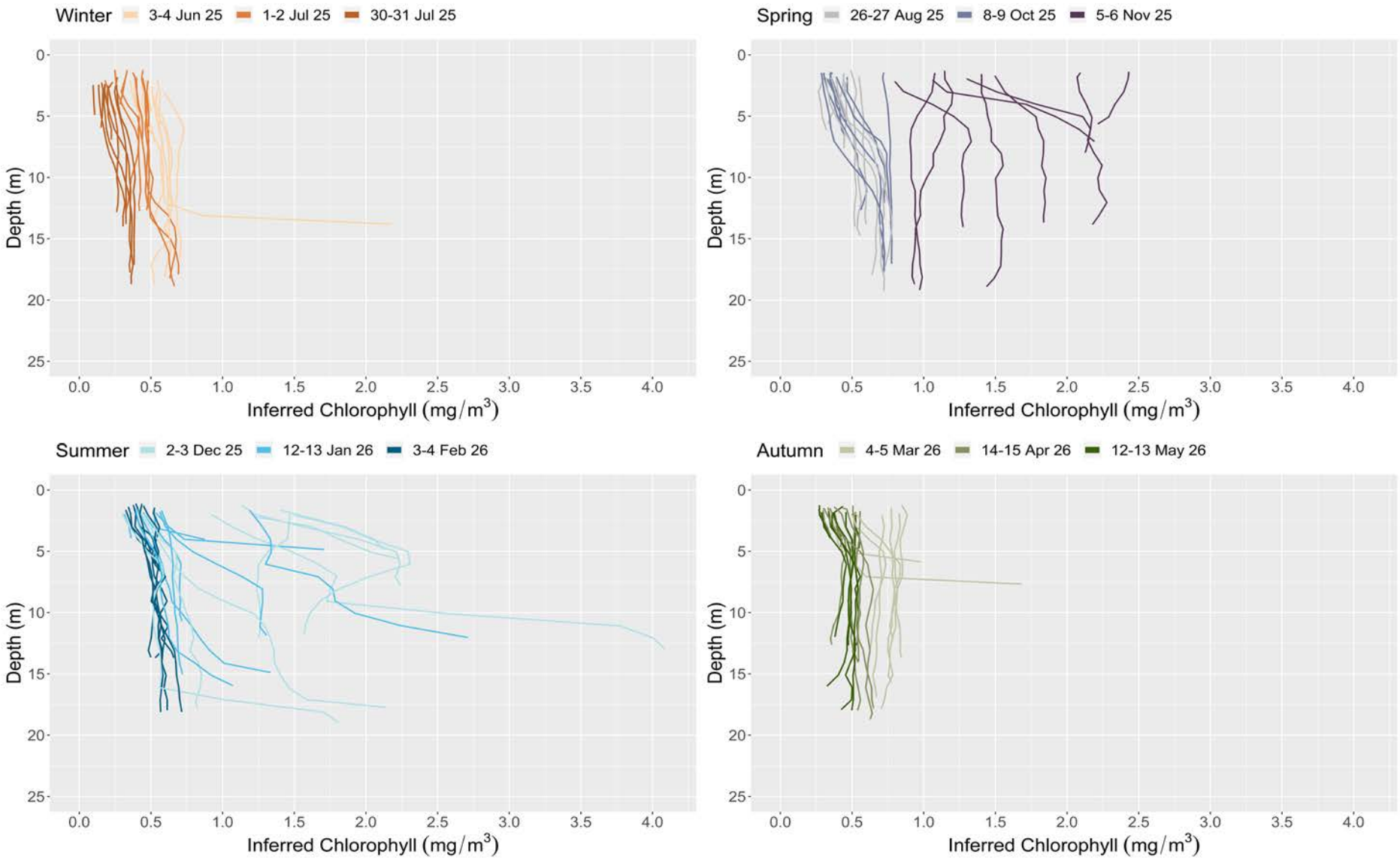


Figure 11-14: Inferred chlorophyll *a* (mg/m³) profiles through the water column for each survey time depicted per season

11.4.3 Phytoplankton

Phytoplankton communities were diverse and showed marked temporal dynamics. The observed increase in chlorophyll *a* biomass (refer Figure 11-9) coincided with a peak in phytoplankton abundance (almost 3,000,000 cells/L during November and 1,500,000 cells/L in December 2025, refer Figure 11-15). These higher cell counts are indicative of a phytoplankton bloom (note a phytoplankton bloom is typically an ecological response to a change in conditions including sunlight, nutrients, temperature and stratification).

Prior to the bloom conditions, dinoflagellates and diatoms were low in numbers compared to 'other phytoplankton' from June to October 2025 (refer Figure 11-15 and Figure 11-16). During November through December, diatoms generally dominated phytoplankton cell counts.

The highest phytoplankton cell counts were driven primarily by elevated numbers of diatoms, however peaks in dinoflagellates were also evident (refer Figure 11-15 and Figure 11-16). Notably, the dinoflagellate *Karenia cristata* was recorded at higher numbers during November to January (up to around 90,000 cells/L) and comprised the largest proportion of the dinoflagellate cell counts during this time (refer Appendix G-1).

As part of investigations into the harmful algal bloom, research undertaken by the South Australian EPA in conjunction with SARDI has shown that a peak or bloom of dinoflagellates (*Karenia* sp.) is often associated with a shift in the phytoplankton community and a spike in diatom abundance, particularly in the bottom waters (SARDI 2026e). Data from SARDI (as well as anecdotal evidence) indicates that the harmful algal bloom was moving up Spencer Gulf at the time and peaked off the coast near Mullaquana in December 2025 (GoSA 2026). It is possible that the monthly sampling events missed a potentially higher peak in dinoflagellates. Temporal trends in component groups of the phytoplankton assemblage are shown in Figure 11-15 to Figure 11-20.

Approximately 90 dinoflagellate taxa (resolved to species or genus level) were recorded during the study period (refer Appendix G-1 for species list). Dinoflagellates in the genus *Karenia* (*K. cristata*, *K. mikimotoi, K. cf. concordia*, *K.cf. longicanalis* and *K. papilionacea*) were recorded throughout the study period at varying densities, and largely at densities typical of most marine environments (i.e. between 0 and 500 cells/L). *Karenia cristata* was recorded at higher numbers during November to January (up to around 90,000 cells/L) and comprised the largest proportion of the dinoflagellate cell counts during this time

During the peak concentrations recorded within the marine study area *K. cristata* was the dominant species present within the *Karenia* genus representing almost 40% of the dinoflagellate community (refer Figure 11-21) and less than 3% of the total phytoplankton community.

The 12-month sampling period covers both pre-bloom and post-bloom conditions in the MSA.

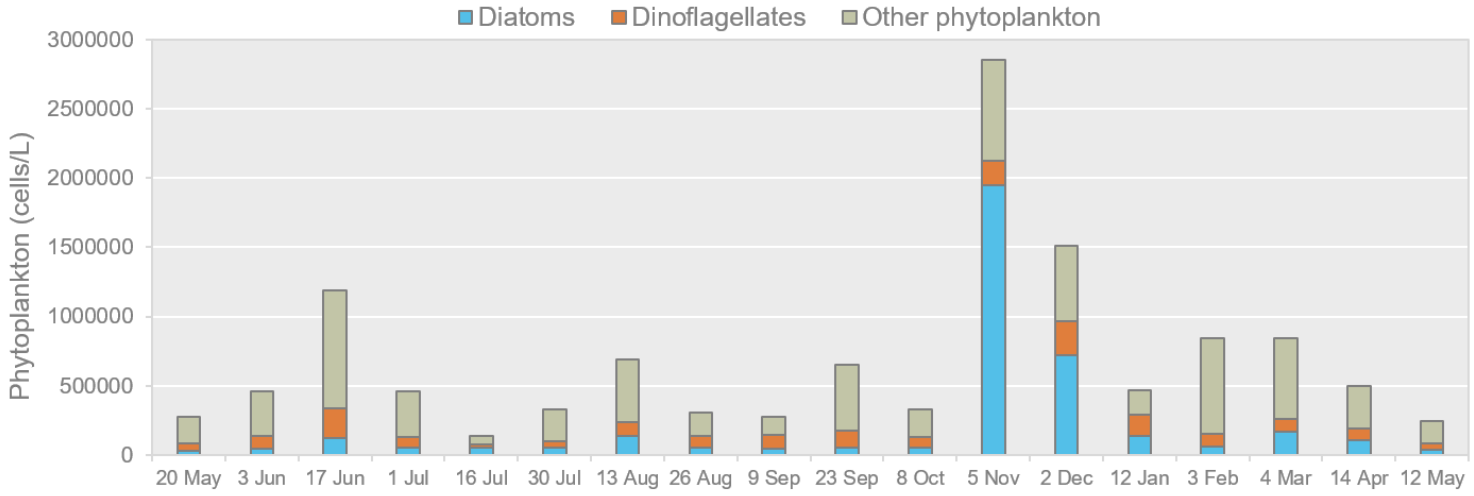


Figure 11-15: Temporal trends in Phytoplankton abundance and composition (as cells/L)

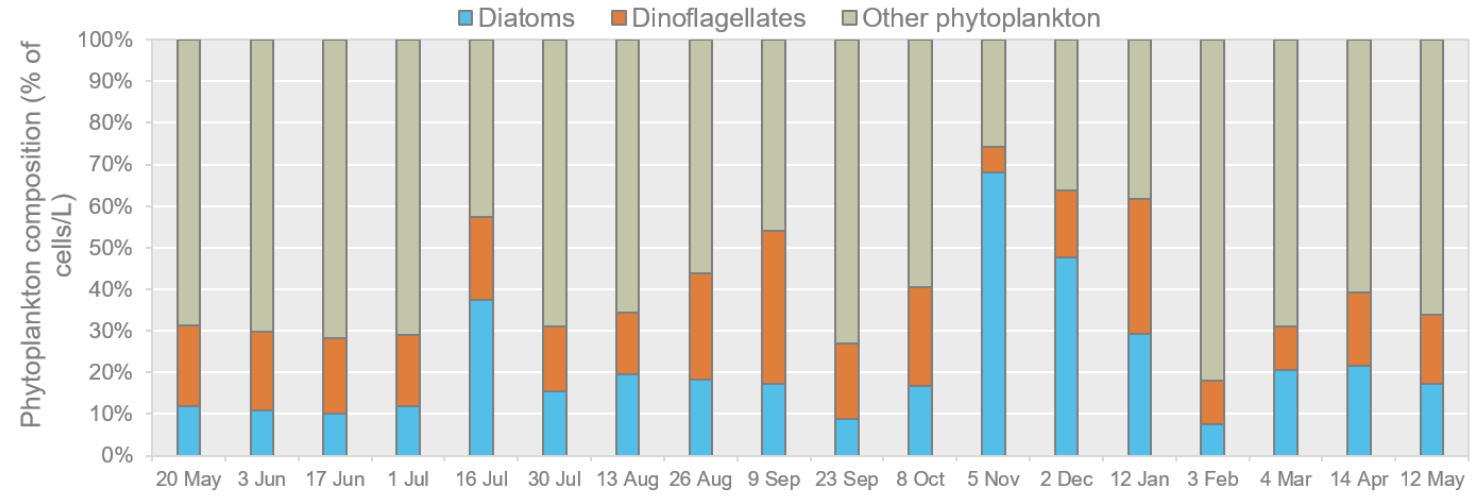


Figure 11-16: Temporal trends in phytoplankton community composition as % of total abundance

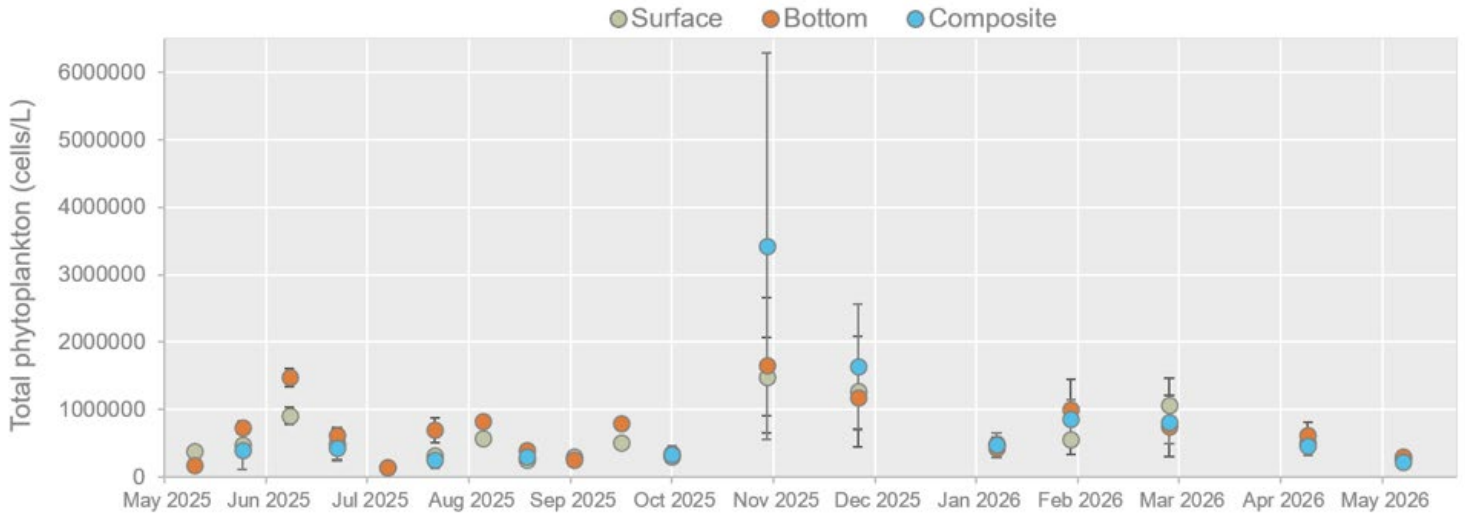


Figure 11-17: Temporal trends in total phytoplankton cell counts (average ± standard deviation) for surface, bottom, and composite water samples

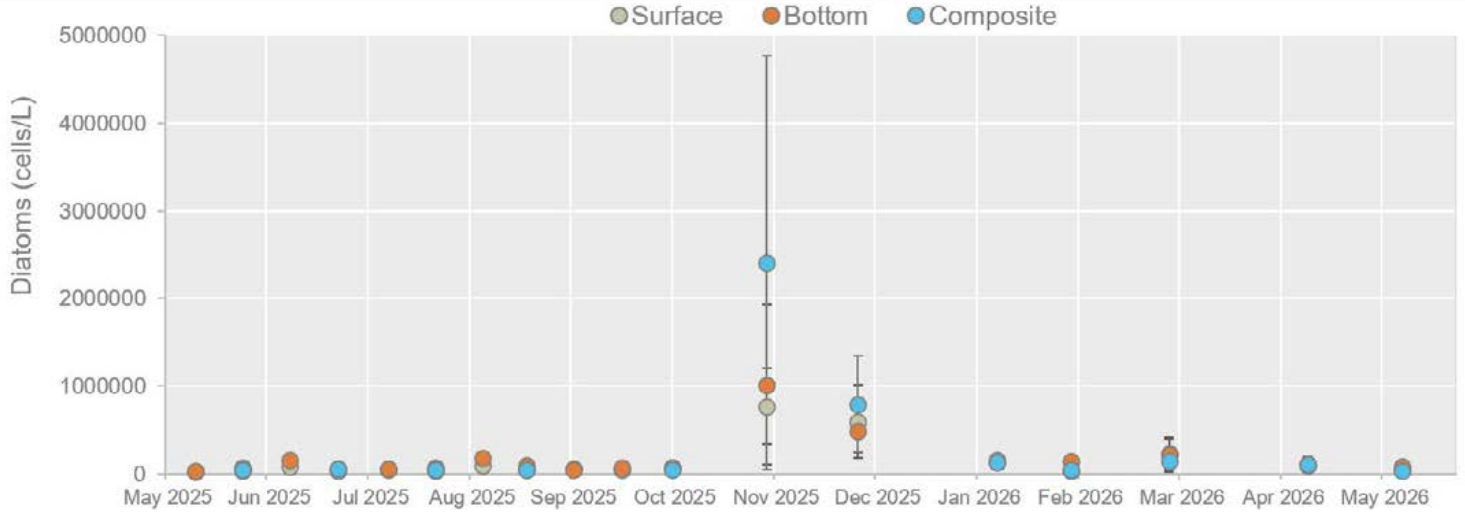


Figure 11-18: Temporal trends in diatoms (average ± SD, cells /L) in surface, bottom and composite water samples

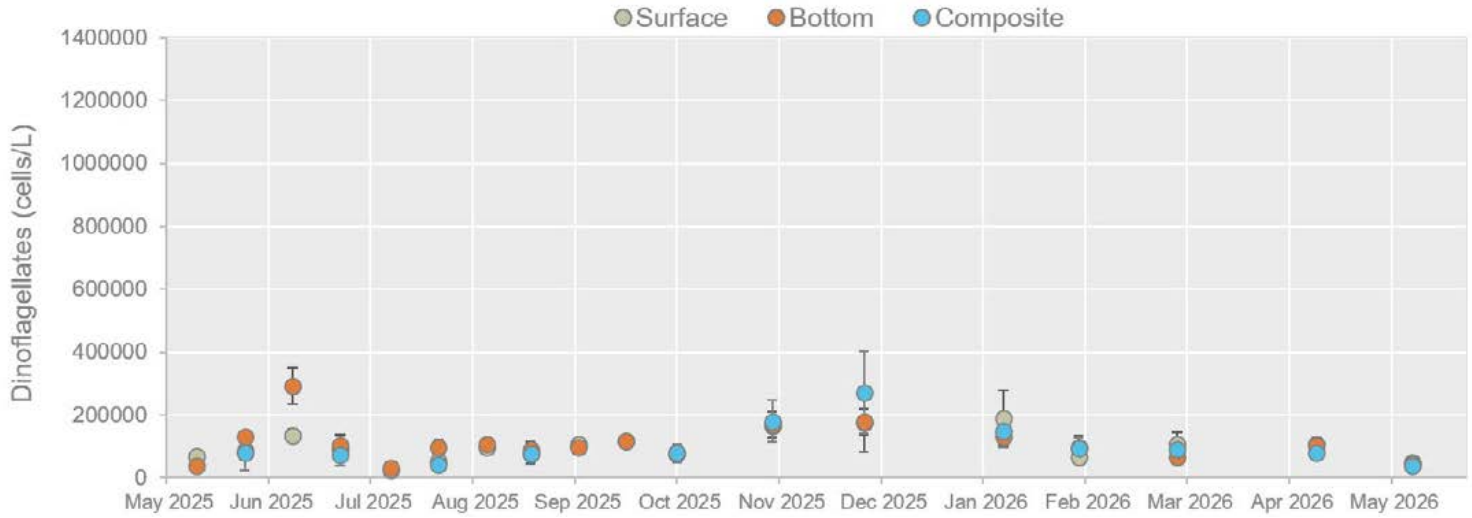


Figure 11-19: Temporal trends in dinoflagellates (average ± SD, cells /L) in surface, bottom and composite water samples

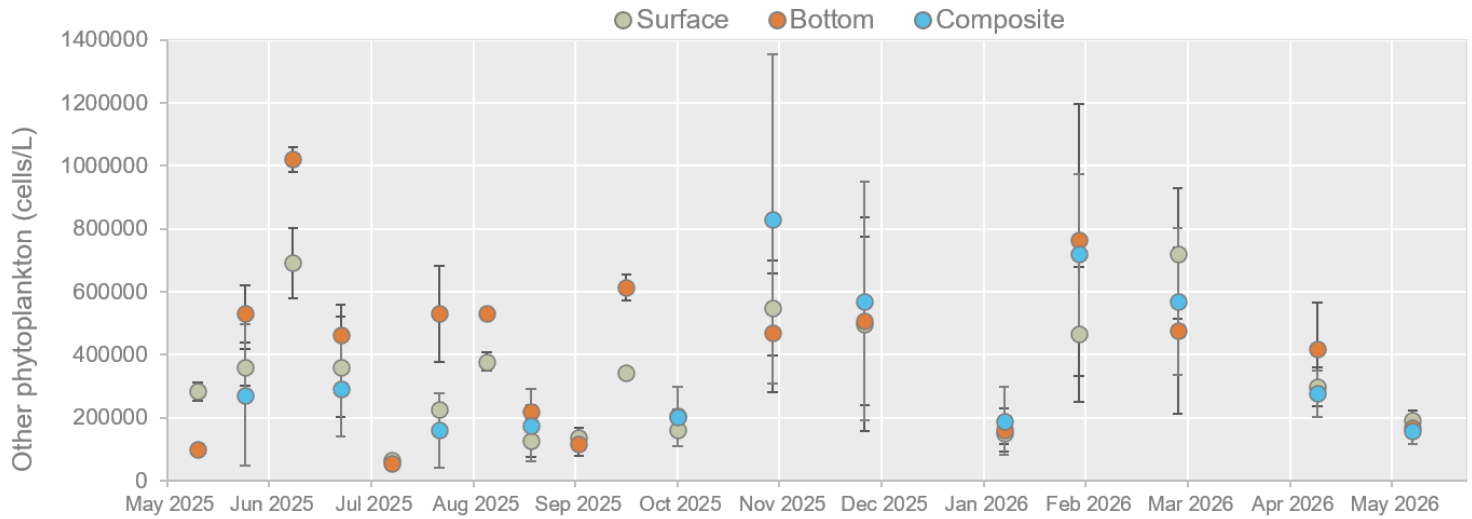


Figure 11-20: Temporal trends in other phytoplankton (average ± SD, cells /L) (cells /L) in surface, bottom and composite water samples

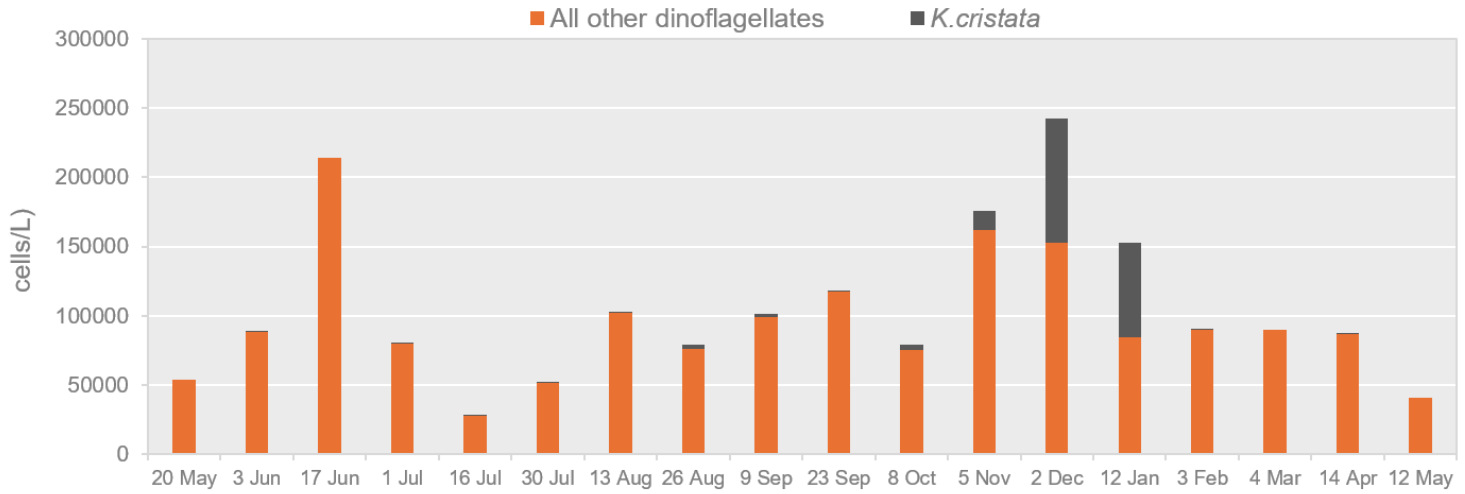


Figure 11-21: Temporal trends in *Karenia cristata* relative and all other dinoflagellates

11.4.4 Zooplankton

Zooplankton are small aquatic animals, or the larval and egg stages of many larger aquatic animals, that drift passively or swim weakly through the water column. This section summarises baseline species composition and abundance for the MSA and a comparative reference site, covering two taxonomic groups: decapods (crabs, lobsters, prawns and shrimp) and fish, as well as key invasive marine species (IMS).

Abundance across all groups peaked in spring and summer, coinciding with the main spawning period of multiple species in Spencer Gulf (refer Table 11-3). Concentrations of decapod larvae and fish eggs were highest in summer and spring, while concentration of fish larvae peaked in summer. Generally similar species compositions were observed between the reference and Project sites, likely due to their comparable habitat characteristics and oceanographic connectivity (refer Table 11-3).

Table 11-3: Zooplankton abundance by taxonomic group and season at Project and reference sites

	Location	No. of samples	Decapod larvae	Fish larvae	Fish eggs	Total (All)
Spring (Nov 24)	Project Site	18	4,077	89	**2,725**	6,891
	Reference	18	2,076	34	**2,341**	4,445
Summer (Feb 25)	Project Site	18	**4,714**	**1,135**	1,493	**7,342**
	Reference	18	**5,105**	**801**	2,026	**7,932**
Autumn (May 25)	Project Site	18	1,432	23	2	1,457
	Reference	18	968	18	2	988
Winter (July 25)	Project Site	18	638	92	30	760
	Reference	18	573	63	23	659
Annual Total (all sites)		**144**	**19,583**	**2,255**	**8,642**	**30,474**

The decapod species composition was dominated by the infraorder Caridea (shrimps - 43.5%), followed by Brachyura (true crabs - 28.9%) and Dendrobranchiata (prawns - 13.5%). Anomura (hermit and porcelain crabs), Axiidea (ghost shrimps) and Gebiidea (mud lobsters) were represented in smaller numbers.

Larvae of Western King Prawn (*Melicertuss sp.,* Penaeidae) and Blue Swimmer Crab (*Portunus armatus*) were detected in spring and summer surveys, consistent with the reproductive periods of these species. These taxa represented a relatively small proportion of the decapod species composition, with Western King Prawn comprising 1.4% (spring) and 22% (summer), and Blue Swimmer Crab conservatively comprising 7.8% (spring) and 4% (summer).

The larval fish species composition was dominated by the families Gobiidae (Gobies - 48%) and Engraulidae (Anchovies - 31%), with Tetrarogidae (Soldierfish – 6%), Pinguipedidae (Grubfish – 4%), and Terapontidae (Grunters – 4%) occurring in low numbers (Figure 11-22).

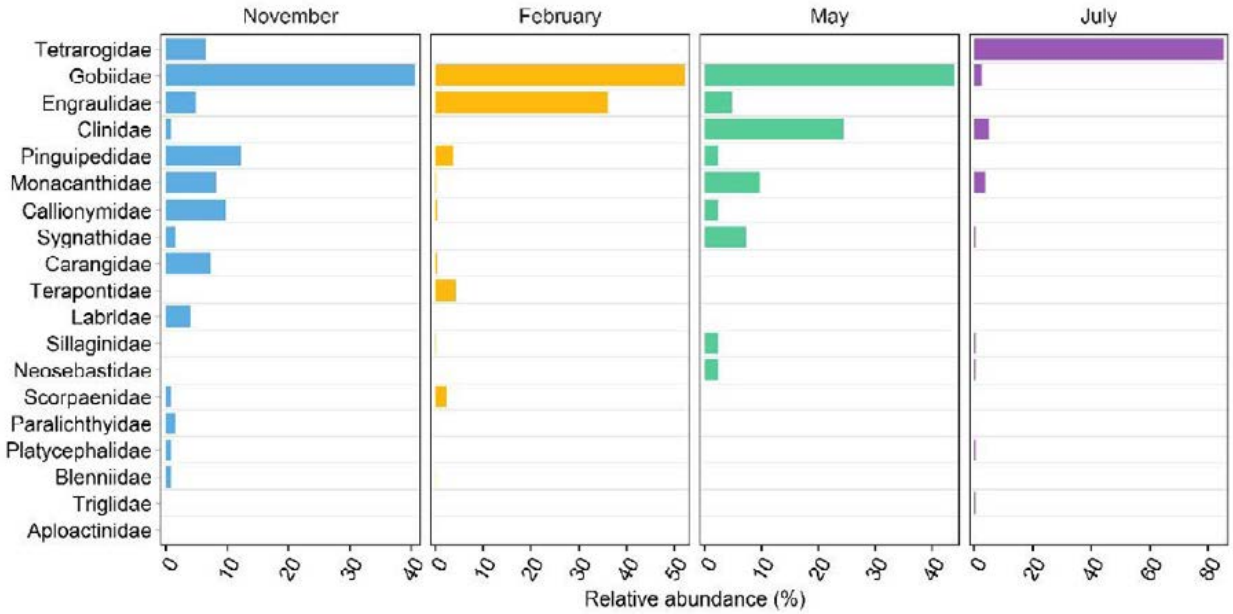


Figure 11-22: Relative abundance (%) of fish families recorded for the MSA

Commercial and recreational fishery species larvae (including Skipjack Trevally, Yellowfin Whiting, King George Whiting, Bluespotted Flathead and Sand Flathead,) were recorded in low numbers (1% in total). No Snapper larvae or eggs were detected in any season. By contrast Anchovy larvae and eggs were abundant in summer (36%).

Protected species larvae (including Syngnathidae, Seahorses and Pipefishes) were also recorded in low numbers (0.3%).

None of the 20 priority invasive marine species tested as part of the baseline survey (refer to Appendix G-6) were detected in either the sampling sites or reference location. The following plates are photographic examples from the three zooplankton groups assessed during baseline surveys of the sampling sites.



Plate 11-2: Decapod larvae – examples of species present at Project site
Left image shows Brachyuran (true crab); centre image shows Caridea (Shrimps); right image shows Dendrobrachiata (penaeid prawns).



Plate 11-3: Fish larvae – examples of species present at MSA
Left image shows Gobiidae (Gobies); right image shows Tetrarogidae (Soldierfish).

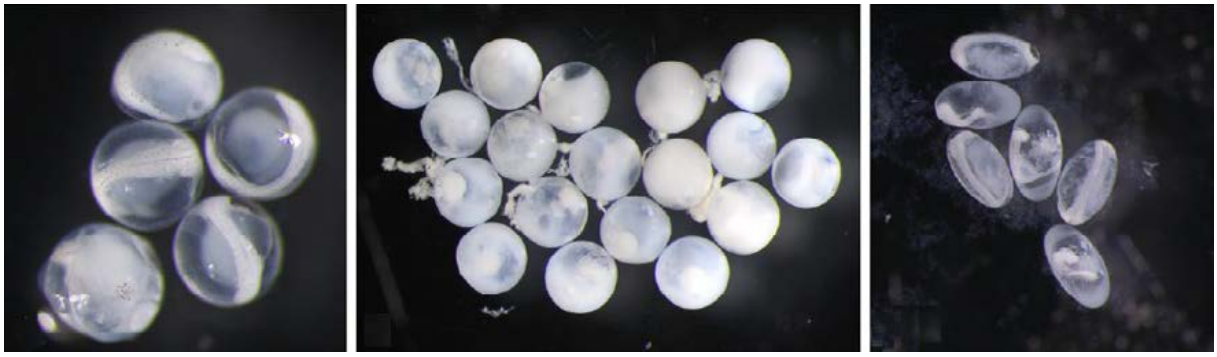


Plate 11-4: Fish eggs collected at the MSA
Left image shows potential Snapper eggs that underwent DNA sequencing; centre image shows mixed eggs of unknown species awaiting DNA-metabarcoding; right image shows Anchovy eggs.

11.4.5 Marine sediment

Sediments in the MSA, from within habitats representative of the seabed disturbance area, were analysed for particle size distribution, nutrients, metals and other potential contaminants, as well as for presence and composition of dinoflagellate cysts / harmful algae (refer Appendix G-5).

Particle size distribution

Sediments around the seabed disturbance area vary in composition, ranging from fine silt to coarse gravel as illustrated in Figure 11-23[6]. Bathymetry and the presence of *Zostera* seagrass appear to correlate with grain size; samples within shallower *Zostera* beds predominantly contain higher proportions of coarse sand and gravel, whereas deeper unvegetated areas have a greater percentage of finer materials.

The median grain sizes across different benthic habitats vary and range from very fine sand at the 'Sand with invertebrates' (SI) sites to fine sand at the 'Sand with bioturbation' (SB) sites, and medium sand at the *Zostera* beds.

Baseline sediment analytes

The chemical analysis showed that there are low concentrations of heavy metals and metalloids in the sediments tested. The baseline sediment analysis concluded that there

[6] The bar chart in this figure shows the finest particles at the bottom and the coarsest particles at the top of the chart

were minimal detected concentrations of analytes reported and no exceedance to environmental criteria.

Specifically, all results for nutrients, heavy metals and metalloids, and other potential inorganic and organic contaminants were reported below the National Assessment Guidelines for Dredging (NAGD) Screening Levels, the ANZG Toxicant default guideline values. Most analyte concentrations were below the laboratory limit of reporting, and the notable analytes reported to have detectable concentrations included: Total nitrogen (421 to 1,300 mg/kg) and four heavy metals; Arsenic (2.0 to 3.5 mg/kg), Chromium (III+VI) (6.8 to 10 mg/kg), Lead (single detected concentration for SI4 (5.4 mg/kg)), and Zinc (8.7 to 12 mg/kg). These detected concentrations reflect the background concentrations within the area, and do not exceed relevant environmental criteria (Appendix G-5).

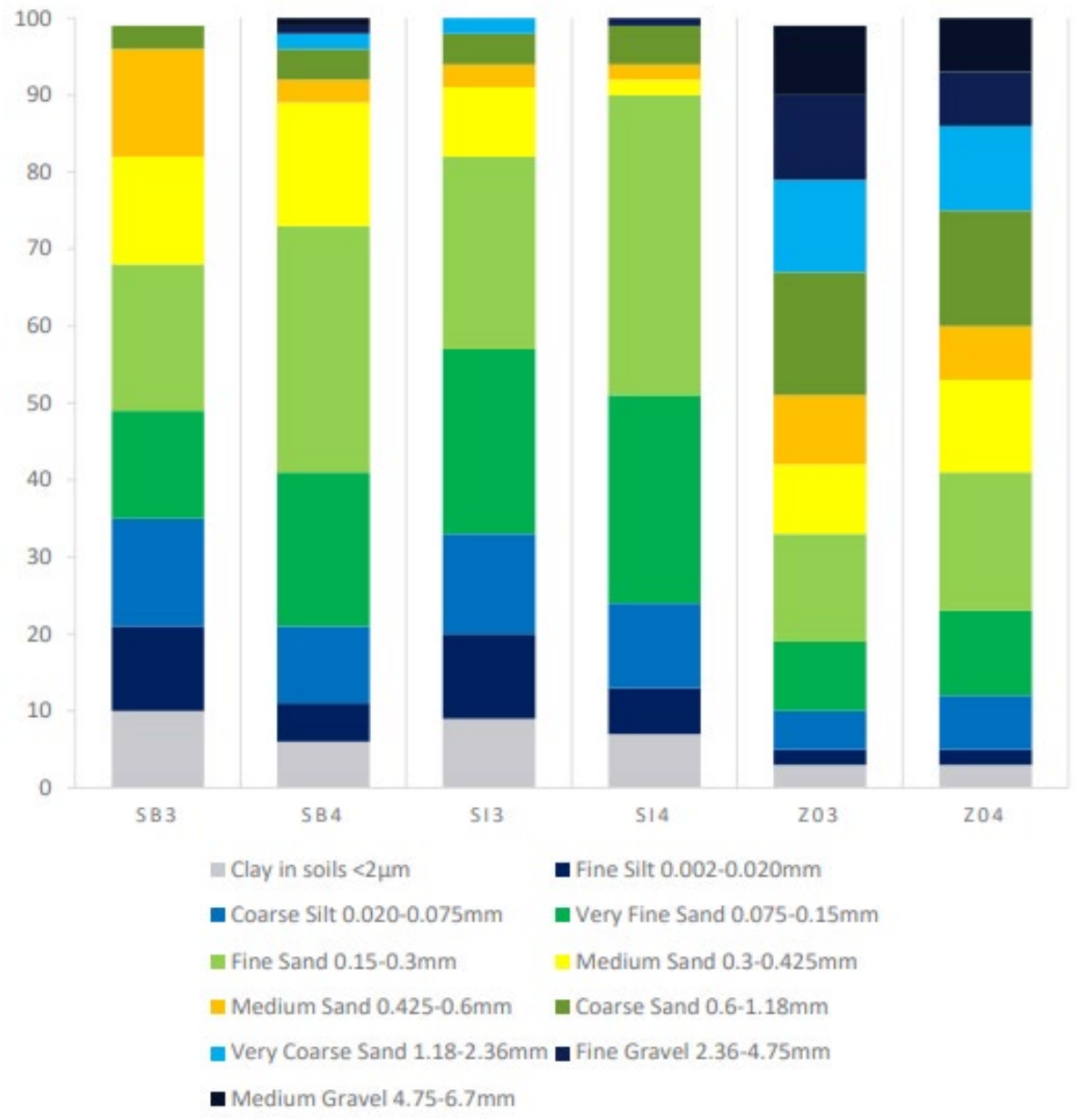


Figure 11-23: Particle size distribution (%) in sediment samples in sandy sites with bioturbation (SB), sandy sites with invertebrates (SI) *Zostera* beds (ZO)

[Refer Appendix G-5 for site locations]

Harmful algal bloom species in sediments

Algal cysts and resting cells are dormant stages in the life cycle of certain algae (such as dinoflagellates and chrysophytes) that settle into marine and freshwater sediments.

These cysts can function as a seed bank, capable of germinating when environmental conditions become favourable. This germination can lead to the onset of HABs. For example, dinoflagellates may form cysts in response to stressors like nutrient depletion or temperature shifts.

The distribution and abundance of algal cysts in sediments are influenced by sediment characteristics and the activity of bioturbating infauna, which disturb and mix sediment layers. This bioturbation can cause vertical movement of cysts, affecting their potential to germinate.

The existing abundance and composition of algal cysts and resting cells was examined to assess habitat quality and predict the likelihood of future HABs.

Key findings of the investigation into dinoflagellate cysts in sediments (based on sample sites in the MSA[7]) include:

- Overall low numbers of harmful algal bloom species were identified and germination experiments showed low viability. The species composition and relative abundance was relatively typical of marine sediments.
- There were no confirmed *Karenia* species found in sediments in the MSA. Fragile resting stages resembling those described for *Karenia mikimotoi* were observed in some surface core samples; however, germination experiments did not detect any germling cells belonging to the genus *Karenia*. This suggests that either these cysts were not *Karenia* species, or that these cysts were no longer viable.
- Cyst concentrations were generally low across all sites, with only a few potentially harmful dinoflagellate species detected at low to moderate relative abundance. All harmful algal bloom species identified in the MSA sediments are known to be widely distributed in southern Australian waters. Further information regarding the identified species that have the potential to be harmful are described in Appendix G-5.

11.4.6 Benthic habitats and communities

Benthic habitats at the site are generally sandy and flat with extensive seagrass beds and intertidal mangroves.

Local coastal, intertidal and benthic habitat distribution is largely determined by tidal regimes, salinity, nutrient inputs, water depth (light availability), temperature and currents. Habitat mapping has been undertaken for the Project MSA and is described in Table 11-4 and shown in Figure 11-3 and Plate 11-1. Habitats within the MSA vary along a depth gradient and were generally consistent within each depth range, characterised with:

- mangroves in the intertidal zone with areas of bare sand

[7] Refer Appendix G-5 for sample site locations.

- *Posidonia* seagrasses which dominate the subtidal area to depth of - 13 m (AHD) where the seagrass then transitions to seasonally driven cover of *Zostera* sp. out to approximately - 15 m depth (AHD) whereafter bare sand dominates
- Bryozoans, algae and other invertebrates within sandy areas at deeper depths.

The key habitats identified and used for detailed marine ecology investigations are:

- intertidal mangrove (*Avicennia marina*)
- *Posidonia australis* seagrass
- *Posidonia sinuosa* seagrass
- *Amphibolis* / *Posidonia* (patchy) seagrass ("*Amphibolis*/*Posidonia*")
- *Zostera* seagrass
- silty sand with sparse invertebrates and/or macroalgae ('Sand / invertebrates')
- silty sand with bioturbation ('Sand / bioturbation').

Small areas comprising Bryozoan beds, mixed *Posidonia australis* and *Zostera* seagrass, and *Amphibolis* seagrass were also present within the MSA.

Appendix G-2 and G-3 provide a detailed description of benthic habitats and communities within the MSA.

Table 11-4: Key habitat features along the depth (mAHD) gradient within the MSA

Distance from high tide mark / depth (AHD)	Key benthic habitat features
0-400m (to 1 m depth)	Grey mangrove (*Avicennia marina*) to approximately 150 m then bare sand from eastern edge of mangrove stand.
400 m – 1.5 km (to 2 m depth)	Dense Tape weed (*Posidonia australis*) seagrass in shallow subtidal with one patch mixed with dense *Zostera*. With depth is a transition to mixed *P. australis*/ *Posidonia sinuosa.*
1.5 km to 3 km (to 13 m depth)	Along with a sharp increase in depth observed the species composition of seagrass also changed to predominantly *P. sinuosa*. Seagrass *Amphibolis* was observed in 3 - 4 m depth, very dense, often alternating with *P. sinuosa*, then dense *P. sinuosa* to 13 m depth.
2.8 – 3.6 km (to approximately 15 m depth)	Abrupt change to seagrass (*Zostera nigricaulis*) extending from approximately 13 m to approximately 15 m depth (up to 16 m depth in some areas of the MSA). Density of *Zostera* varies with season.
Beyond 3.6 km (15+m depth)	Silty sand with some bioturbation (burrowing infauna) and sparse invertebrates including soft corals, ascidians, bryozoans, sponges and razor clams.

Mangroves

Intertidal habitats are dynamic systems that support species adapted to periodic inundation and fluctuating conditions. The intertidal zone within the MSA is characterised by extensive tidal flats intersected by tidal creeks, supporting the Grey mangrove, *Avicennia marina*.

Mangrove distribution is highly variable across the intertidal zone, with dense, relatively young stands dominating the upper intertidal and less dense, large, older trees occurring in the lower intertidal flats and creek margins. Stunted, gnarled mangroves occur along supratidal creek edges, and some areas support a samphire and saltbush understorey, highlighting a range of hydrodynamic and sedimentary environments across the site (COOE 2026, Appendix G-4).

The mangroves in the Project Area were generally in good condition, with condition scores ranging from moderate to excellent. Mangrove health did not significantly differ between sampling events (covering four seasons). Some fluctuations most likely reflecting short-term environmental factors including storm-driven branch loss, seasonal crab activity, and varying tidal influence were noted.

Recruitment was limited across most of the study area. Seedling densities were very low and highly patchy. Pneumatophore density and height varied predictably with hydrodynamic setting, reflecting sediment oxygen conditions and inundation frequency. The mangrove community in the Project Area is structurally diverse, largely healthy, and subject to natural seasonal fluctuations.

Plate 11-5, Plate 11-6 and Figure 11-24 include a survey photo and aerial imagery from the mangrove survey (refer Appendix G-4 for transect locations).



Plate 11-5: Aerial image of mangroves located approximately 450m south of the tunnel alignment



Plate 11-6: Mangrove community at the permanent photo point on Transect 13 - facing east

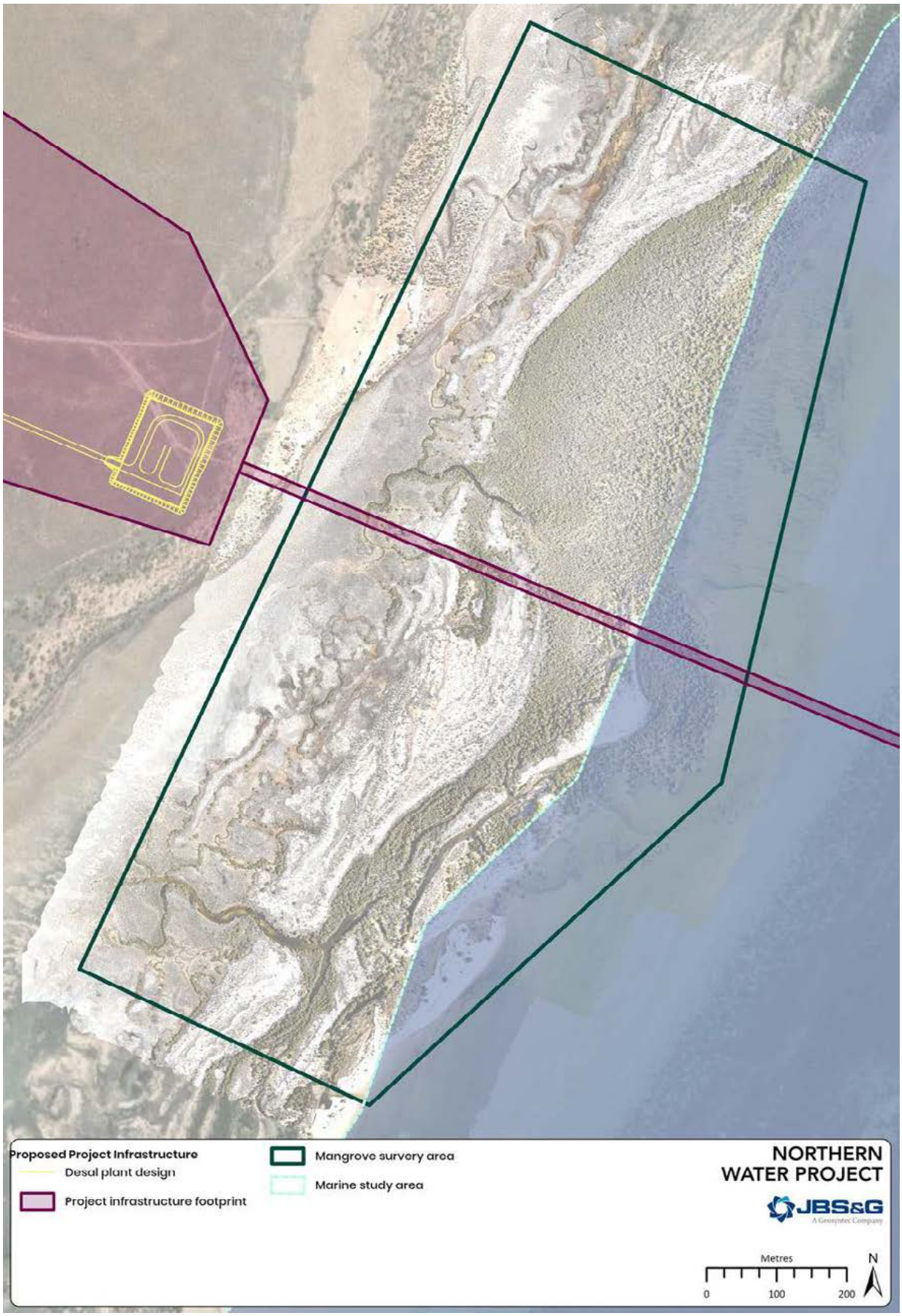


Figure 11-24: Aerial image of mangrove habitat within the 50-hectare Project mangrove study area
[Note: Project infrastructure footprint within the survey area relates to tunnels located beneath mangrove habitat]

Seagrass habitat and communities

The subtidal area of the MSA is dominated by seagrass extending to approximately 3.6 km from shore, to approximately -15 m depth (AHD). Marine flora plays a critical role in primary production, nutrient cycling, stabilising sediments and providing habitat for a variety of fauna. The primary seagrass habitats in the MSA are described below, with fauna-related observations grouped under each habitat type.

Posidonia australis seagrass

Posidonia australis is a slow-growing, deep-rooted, canopy forming seagrass which grows in dense beds across much of Spencer Gulf. *Posidonia* meadows provide long-term sediment stabilisation and high ecosystem value.

Project surveys of the MSA found that dense *P. australis* dominated the shallow subtidal (to approximately -2 m depth AHD) and comprised a monoculture of *Posidonia australis* with generally dense seagrass cover and moderate to dense epiphyte cover.

There was some variation in seagrass structure and biomass between survey events, but no seasonal patterns were evident in surveys of the MSA. Fauna associated with this habitat will be further described under the epibenthic and infauna summaries, but dense *Posidonia australis* meadows provide structurally complex habitat for small fish, mobile invertebrates and cryptic species such as syngnathids.

Posidonia sinuosa seagrass

This habitat comprised a moderate to dense (but generally dense) monoculture of *Posidonia sinuosa* with sparse to moderate epiphyte cover. PS5 survey site (refer Figure 11-3) differed from the other sites with greater cover of epiphytes, greater epiphyte mass, longer leaves, generally less shoots and leaves and some seasonal differences in canopy height. Like other *Posidonia* habitats, this habitat provides cover, foraging area and refuge for epibenthic fish and invertebrates, and is likely to support fauna assemblages associated with dense seagrass structure.

Amphibolis/Posidonia (patchy) seagrass ('Amphibolis/Posidonia')

This habitat comprised a patchy mix of *Amphibolis antarctica* and *Posidonia sinuosa* with generally dense seagrass cover and moderate to dense epiphyte cover. The proportion of *Amphibolis* varied from 100% to 25% at some sites during particular seasons. Seasonal differences in the mix of seagrass species may reflect fine-scale spatial variability associated with transect placement in patchy habitat, despite fixed starting points. The patchy but structurally diverse nature of this habitat is likely to support a range of epibenthic fauna, with canopy-forming seagrass providing shelter and foraging substrate for fish and mobile invertebrates.

Zostera seagrass

Zostera is a shallow rooted, shorter-lived species compared to the species mentioned above. *Zostera* is an opportunistic coloniser and plays an important role in rapid sediment stabilisation and is often the first to colonise disturbed areas. *Zostera* is easily disturbed, including by natural disturbance such as storms, but has the ability to build up a seed bank from which they can recover rapidly (Edgar 2008, Kilminster et al. 2015). *Zostera* varies in

coverage over shorter timescales than the longer-lived, slower growing *Posidonia* and *Amphibolis* beds.

Within the MSA, this habitat comprised a monoculture of *Zostera nigricaulis* with coverage variable across the sites surveyed. There were distinct seasonal differences in coverage, which was generally low in autumn, increased in winter and spring, then reduced again in summer (refer Figure 11-48). Shallow *Zostera* habitat is likely to provide nursery or juvenile habitat for species such as King George Whiting and Garfish, and also supports smaller mobile invertebrates and other fauna that rely on sheltered, shallow seagrass beds.

Sandy habitats

Bare sand habitats are widespread across the USG and include sandy beaches, intertidal sand and mud flats, and subtidal soft-sediment habitats. The outfall in the Reference Design is located within subtidal sandy habitat. Marine habitat surveys in the vicinity of the outfall recorded sparse sessile invertebrates including soft corals, ascidians, bryozoans, some sponges and razor clams, together with evidence of burrowing infauna. These habitats are also regularly used by fish and crustaceans, including commercially important species such as Western King Prawn.

Within the MSA, the sandy habitats were divided into 'Sand / invertebrates', comprising silty sand with a sparse cover of sessile invertebrates and or macroalgae, and 'Sand / bioturbation', comprising generally bare silty sand with evidence of bioturbation such as mounds and holes. Surveys using towed camera, BRUV systems and infauna sampling showed little distinction in fauna community structure, abundance or richness between these two habitats, and they were therefore considered together as a single habitat type for the assessment.

Minor differences were evident, with slightly greater macrofauna abundance and richness in the 'Sand / bioturbation' habitat across all seasons, and a marked increase in meiofauna abundance and richness in the 'Sand / invertebrates' habitat in autumn.

The overall infauna community structure showed no obvious seasonal pattern in richness or community structure.

Bryozoans

A small patch in the MSA exhibited a monoculture of the bryozoan *Steginoporella truncata*, which had a distinct community structure compared with other deep sand habitats. Diversity at this site was low (<2), in keeping with its description as a monoculture. As for the other deep sand habitats, there was a pattern of increasing seasonal abundance from summer to winter followed by a decrease in spring.



Plate 11-7: Mazy bryozoan *Steginoporella truncata*

Sponge communities

No dense sponge communities were found within the MSA, but some sponges were recorded in all habitats and were a significant component of the fauna in several seagrass habitats (refer Appendix G-3).

11.4.7 Key marine fauna

To further support the findings of the marine surveys, a desktop study was undertaken to determine species of conservation significance, including but not limited to those listed under the EPBC Act, South *Australian National Parks and Wildlife Act 1972* or *Fisheries Management Act 2007*, which may potentially interact with the Project.

Conservation significant species

There were no national or state-based conservation significant species recorded in seasonal surveys of the MSA.

An assessment of the potential for significant impact on EPBC-listed marine fauna has been undertaken for the Project as part of the EPBC referral (2025/10397). Species identified in a search of protected matters under the EPBC Act were assessed for their likelihood to occur and potential to be impacted.

Key nationally threatened marine species that may occur in the vicinity of the Project include Southern Right Whale, Australian Sea-lion, seabirds, marine turtles, and White Shark. Their likely occurrence and potential to be impacted by construction or operation of the desalination plant at Mullaquana Station is described in Table 11-5. Other conservation significant fauna including syngnathids and the Giant Australian Cuttlefish are included in Table 11-5 as they are of State or local significance.

Table 11-5: Conservation significant marine and coastal species that may occur in the vicinity of Mullaquana Station

Species	Description
Southern Right Whale *Eubalaena australis* **(Cth - EN, MM; State - V)**	The nearest breeding ground is at the Head of Bight[8], on the western side of Eyre Peninsula. Species is seasonally present along the South Australian coast between late April and early November, with peak abundances in July and August (Charlton et al. 2019). Biologically important seasonal habitat is present along the whole southern Australia coastline between Perth and Encounter Bay. This represents an area that may be used for whale movement between regions that support biologically important behaviours such as the movement of whales along the coast with their calves, and movement between offshore feeding and nearshore breeding grounds. Occasional presence in Spencer Gulf as whales move between Southern Ocean feeding grounds and breeding areas (Izzo and Gillanders 2015). There have been 34 records in USG, 13 in the last 20 years (ALA 2025). This species is known to occasionally occur in/near the MSA. May be present between April and November (most likely in July and August).
Australian Sea-lion (*Neophoca cinerea*) (Cth – EN)	The Australian Sea-lion does not rely on habitat in the MSA. The nearest breeding site is off the south-east coast of Eyre Peninsula approximately 180 km south of the desalination plant and there are no additional documented haul out sites north of this (DSEWPC 2013). Important foraging habitat spans much of the continental shelf. Preferred depth for foraging is over 20 m depth, and outside the Project footprint. There are two previous records in the vicinity of Whyalla (ALA 2025). It is possible that the Australian Sealion will occur in the MSA.
White Shark (*Carcharodon carcharias*) (Cth – VU)	Great White Sharks are commonly sighted in southern Spencer Gulf, with most historical records around the Neptune Islands (ALA 2024). Great White Sharks are found throughout temperate and subtropical regions in the northern and southern hemispheres and occur close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. Within Spencer Gulf, the species has been recorded once near Cowell, while all other records are from the south of the gulf, with most records around the Neptune Islands (ALA 2025). This species is considered likely to be a transient visitor in the MSA.
Marine Turtles	Three nationally and state-threatened marine turtles, the Loggerhead Turtle, Green Turtle and Leatherback Turtle, were identified in a search of protected matters under the EPBC Act. There are very limited occurrence records of these species in Spencer Gulf (ALA 2025), and all three species are considered unlikely to be encountered at the site, but their occurrence is possible. Spencer Gulf does not provide important habitat for these species (DEE 2017).

[8] The Head of Bight Lookout and Whale Watching Centre is approximately 300km west of Ceduna.

Species	Description
Hooded Plover	Discussed in Chapter 15 Terrestrial Flora and Fauna.
Seabirds	Listed threatened seabird species would visit the MSA very rarely, if ever and are therefore very unlikely to be encountered. These species are primarily marine based and generally breed offshore in higher latitudes than the MSA. They are not dependent on habitat present at the Project footprint or its surrounds. The Project area is within biologically important foraging areas for the Short-tailed Shearwater and Fairy Tern, which extend throughout and beyond Spencer Gulf.
Syngnathids (Listed as "Marine" under the EPBC Act, and protected under the South Australian *Fisheries Management Act 2007*.)	Seagrass beds and other soft bottom habitats provide important habitat for several protected species of seahorses and pipefish from the *Syngnathid* family. It is likely several species exist at the site. Because of the cryptic nature of Syngnathids, the absence of records is generally not a good indicator of their absence at a specific location. The marine ecology assessment considered habitat preferences, distribution and likely interaction with the Project for the 26 species identified from the PMST and ALA searches of the northern portion of Spencer Gulf, as well as field observations. Of the 26 species, ten species were considered likely to occur at the site, and a further five considered possible (refer Appendix G-3 for detail). Minimising impacts to seagrass has been a key consideration of the Project through intake and outfall pipeline design.
Giant Australian Cuttlefish (*Ascarosepion apama*[9])	Refer to the section below for description.

Giant Australian Cuttlefish

The Cuttlefish Coast Sanctuary Zone National Heritage Place lies ~34 km north-east of the desalination plant (refer Figure 11-25) and is highly valued as it attracts the only known mass aggregation of spawning Giant Australian Cuttlefish (*Ascarosepion apama*) in the world. A National Heritage Significant Impact Assessment was undertaken as part of the Project EPBC referral (2025/10397), which concluded there would be no impact to the heritage values as it is ~34 km from the MSA.

When not breeding, it is understood that individuals of the Point Lowly Giant Australian Cuttlefish aggregation disperse throughout northern Spencer Gulf and generally remain solitary (Gillanders et al. 2016, Gillanders and Payne 2014). Cuttlefish are short-lived, and aggregate to breed once at the end of their lifecycle, and there is little buffer to impacts related to reproductive output or recruitment capacity. Maintaining high survival rates of embryos and adults is important to support the ongoing viability and resilience of the population. The species is susceptible to changes in their environment, particularly at their breeding grounds where their eggs are fixed to the rocky substrate (and thus, unable to

[9] Species name has recently changed from '*Sepia apama*' to '*Ascarosepion apama*' (MolluscaBase 2025a).

move away from intolerable conditions). It is noted that the breeding grounds are ~34 km away from the MSA.

No Giant Australian Cuttlefish were recorded in Project baseline surveys of the MSA (refer Appendix G-3). The site does not provide suitable habitat for Cuttlefish egg attachment; there is no suggestion of a migration pathway and no evidence of Cuttlefish aggregation at the site. Therefore, the MSA is not considered to provide important habitat for the species. Any potential for impact to cuttlefish relates to solitary individual cuttlefish as transient visitors near the desalination plant.

Giant Australian Cuttlefish abundance at the Point Lowly breeding aggregation has fluctuated markedly since annual monitoring began in 1998, declining to a low in 2013 before recovering to consistently exceed 100,000 individuals between 2015 and 2023. Numbers then declined from 2023 to 2025, but remained above 63,000 individuals. The 2026 survey (SARDI 2026g) indicated fewer than 2,000 individuals in the aggregation, with the harmful algal bloom in South Australian waters being a likely contributing factor (SARDI 2026g). Note that the lack of records in the Project MSA survey is representative of the typical pre-bloom situation as the bloom had not yet reached the area.

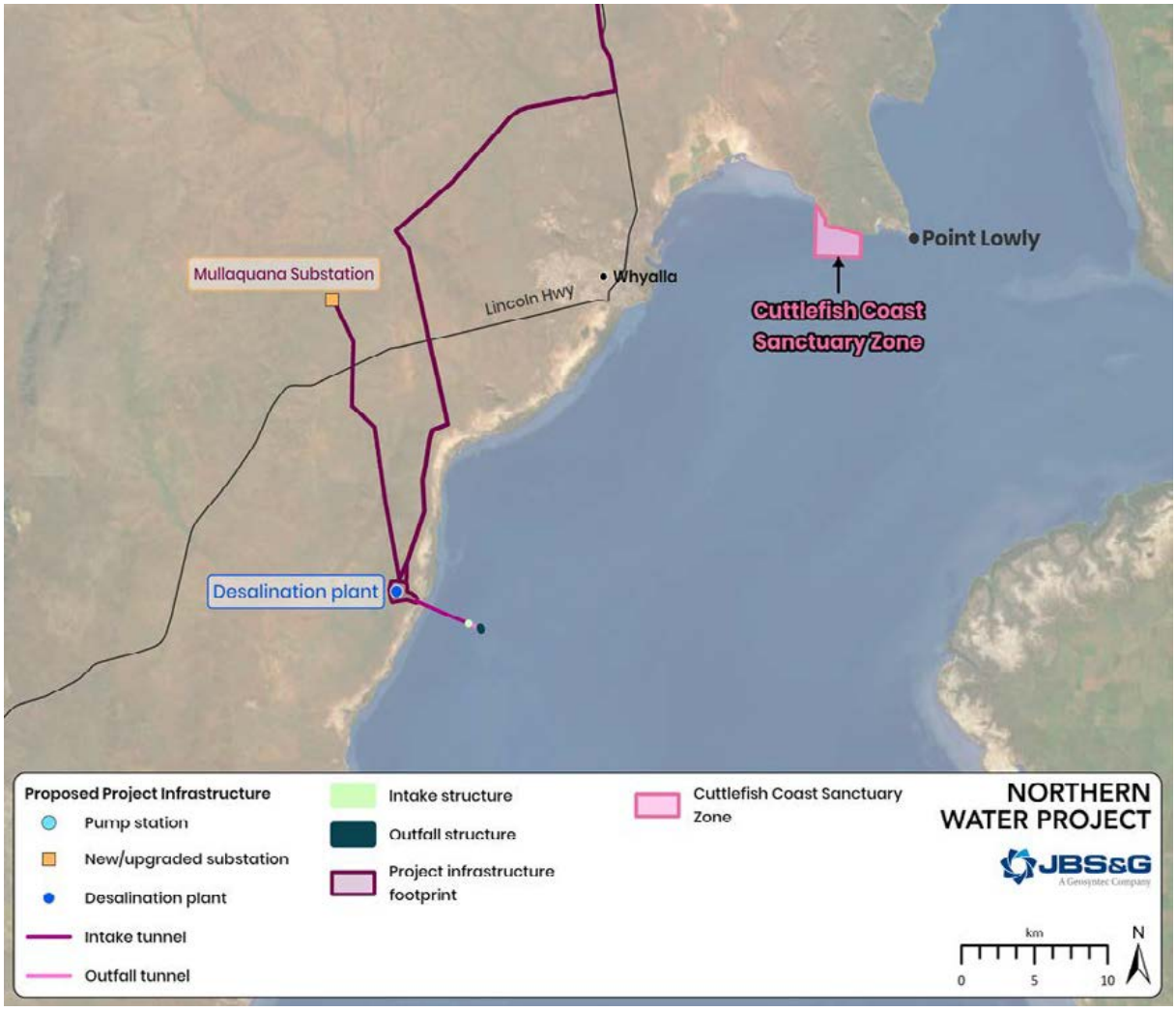


Figure 11-25: Location of the MSA in relation to the Cuttlefish Coast Sanctuary Zone

Fisheries species

Fishing and aquaculture have a significant commercial role in the Spencer Gulf region. The USG provides a unique marine environment which supports key commercial fisheries and provides nursery grounds for many commercially important species. There are no aquaculture leases in the Gulf waters within 40 km of the desalination plant marine infrastructure.

Spencer Gulf supports a number of important commercial fisheries as discussed in Chapter 9 Use of Land and Marine Waters. Some of these fisheries depend on the habitats provided by the USG for at least part of the life cycle including mangroves, seagrass, unvegetated soft bottom, sheltered beach, tidal flat, tidal creek and saltmarsh habitats (Bryars 2003).

The MSA off Mullaquana Station is known to provide habitat that supports key fishery species including Western King Prawn, Snapper, King George Whiting, Garfish and Blue Swimmer Crab. Of particular interest to stakeholders is the potential impact to the long-standing Spencer Gulf Prawn and Snapper fisheries. Table 11-6 describes key fishery species, their reliance on habitat within the MSA and if they are assessed further in the EIS.

Further detail on Spencer Gulf fisheries is presented in the Marine Ecology Assessment in Appendix G-3, including Table 20 within this appendix, which summarises spawning and nursery habitats within the MSA.

Table 11-6: Fishery species in Spencer Gulf, reliance on the Marine Study Area and relevance to EIS

Fishery Species	Reliance on habitat in the Marine Study Area	Assessed further in EIS?
Spencer Gulf Prawn	Western king prawn *Melicertus latisulcatus* is the target species for this fishery. There has been negligible fishing intensity in the vicinity of the MSA over the past 10 years with no reported catch since 2016. MSA is within a region of significant spawning and / or nursery habitat provided by the nearshore unvegetated soft bottom, tidal creeks and tidal flats (Bryars 2003).	Y (including quantitative larval entrainment modelling)
Marine Scalefish: Snapper	Snapper typically spawn in dense aggregations around structures with relief such as large banks, ledges or shipwrecks. There are several Snapper aggregation sites around the USG. Snapper nursery grounds in northern Spencer Gulf are relatively small areas characterised by soft, muddy benthic substrate, of which the one near Western Shoal (adjacent the MSA) has consistently provided the highest abundances of juvenile Snapper in northern Spencer Gulf (Fowler & Jennings 2003, Rogers 2025 (Appendix G-8)).	Y (including quantitative larval entrainment modelling)
Marine Scalefish: King George Whiting	King George Whiting spawn in the southern Spencer Gulf. Larvae disperse northwards and settle in sheltered bays within *Zostera* seagrass such as the known nursey at	Y (including quantitative larval

Fishery Species	Reliance on habitat in the Marine Study Area	Assessed further in EIS?
	Cowleds Landing (approximately 20 km south-west of Whyalla). Shallow *Zostera* within the MSA has the potential to provide nursery or juvenile habitat (noting that within the MSA, the shallow seagrass is predominantly *Posidonia*, with only a small amount of *Zostera* located in waters shallower than 10 m AHD – which is avoided by the Project infrastructure).	entrainment modelling)
Marine Scalefish: Garfish	Considered likely that the MSA lies within a region of important spawning and nursery habitat provided by presence of shallow *Zostera* (Steer et al. 2009) (as above, noting that within the MSA, the small amount of shallow *Zostera* located in the MSA i.e. shallower than 10 m, is avoided by the Project infrastructure).	Y (qualitative)
Marine Scalefish: Southern Calamari	Fishery targets Southern Calamari which typically have offshore nursery and inshore spawning grounds. Two egg clutches were recorded in the Project summer 2024 / 2025 survey, but the MSA is not considered a significant spawning habitat for the species. A fishery closure was implemented in May 2026 following evidence of broadscale catch decline following SA algal bloom (PIRSA 2026, SARDI 2026f).	Y (qualitative)
Blue Crab Fishery (Spencer Gulf Sector)	Fishery targets Blue Swimmer Crab *Portunus armatus*, using pots. Seagrass meadows, unvegetated soft bottom, tidal flats utilised as spawning and nursery habitat, and tidal creeks in the area as nursery habitat (Bryars 2003).	Y (qualitative)
Western Zone Abalone Fishery	No abalone catch has ever been recorded from within the MSA. Fishery operates over 50 km south of MSA, and targets Blacklip Abalone *Haliotis rubra*, Greenlip Abalone *H. laevigata* and Roe's Abalone *H. roei*. Abalone have limited dispersal and it is considered unlikely that MSA provides habitat for life stages that disperse elsewhere (refer Appendix G-3).	N
Northern Zone Rock Lobster Fishery	Fishery targets Southern Rock Lobster *Jasus edwardsii* using pots. No suitable habitat and no recorded catch history at or near the MSA. Considered unlikely that the MSA is a significant source of larvae for the broader fishery (refer Appendix G-3).	N
Sardine Fishery	Fishery targets Australian Sardine *Sardinops sagax* using purse seine nets. No catch recorded north of Arno Bay, and surveys of sardine eggs over the past 30 years suggest that the MSA is not	N

Fishery Species	Reliance on habitat in the Marine Study Area	Assessed further in EIS?
	within a significant Australian sardine spawning ground (Grammer et al. 2024).	
Charter Boat Fishery	Addressed in Chapter 9 Use of Land and Marine Waters.	Y
Recreational Fishery	Addressed in Chapter 9 Use of Land and Marine Waters.	Y

Western King Prawn

Western King Prawns have an offshore adult phase and an inshore larval phase. Adult prawns spawn in waters >10 m and the larvae move inshore to settle in nursery areas generally comprising intertidal sand and mud flats (Kangas and Jackson 1998). There is 750 km of unvegetated soft bottom, tidal flats and mangroves in Spencer Gulf appropriate for use as nursery habitat for Western King Prawn (Bryars 2003, Heldt et al. 2025).

Key juvenile prawn nursery sites are found throughout northern Spencer Gulf (refer Figure 11-26), where salinity levels can exceed 50 g/L, i.e., approximately 30% above the ambient summer levels at the proposed Mullaquana Station desalination plant site.

The Spencer Gulf Prawn Fishery maintains historical baseline data which can be used to assess changes to abundance in relation to future impacts. The results of historical SARDI surveys of prawn larvae and juvenile prawns suggest that the MSA is within a region of significant spawning and/or nursery habitat (refer Figure 11-26).

One of the transects used to survey prawn stocks twice annually (to measure prawn biomass and inform fishing strategies) is within the MSA (Noell & Hooper 2019), approximately 2 km east of the outfall location (refer Appendix G-3). One of 120 sites surveyed for bycatch in 2007 and 2013 is approximately 2 km offshore from the MSA (Currie et al. 2009, Burnell et al. 2015, Appendix G-3).

An assessment as part of the extensive SARDI Algal Bloom Response in South Australia concluded that there was no evidence to suggest a negative impact from the algal bloom on Western King Prawn in Spencer Gulf, with catches per unit effort above the 10-year annual mean (SARDI 2026f).

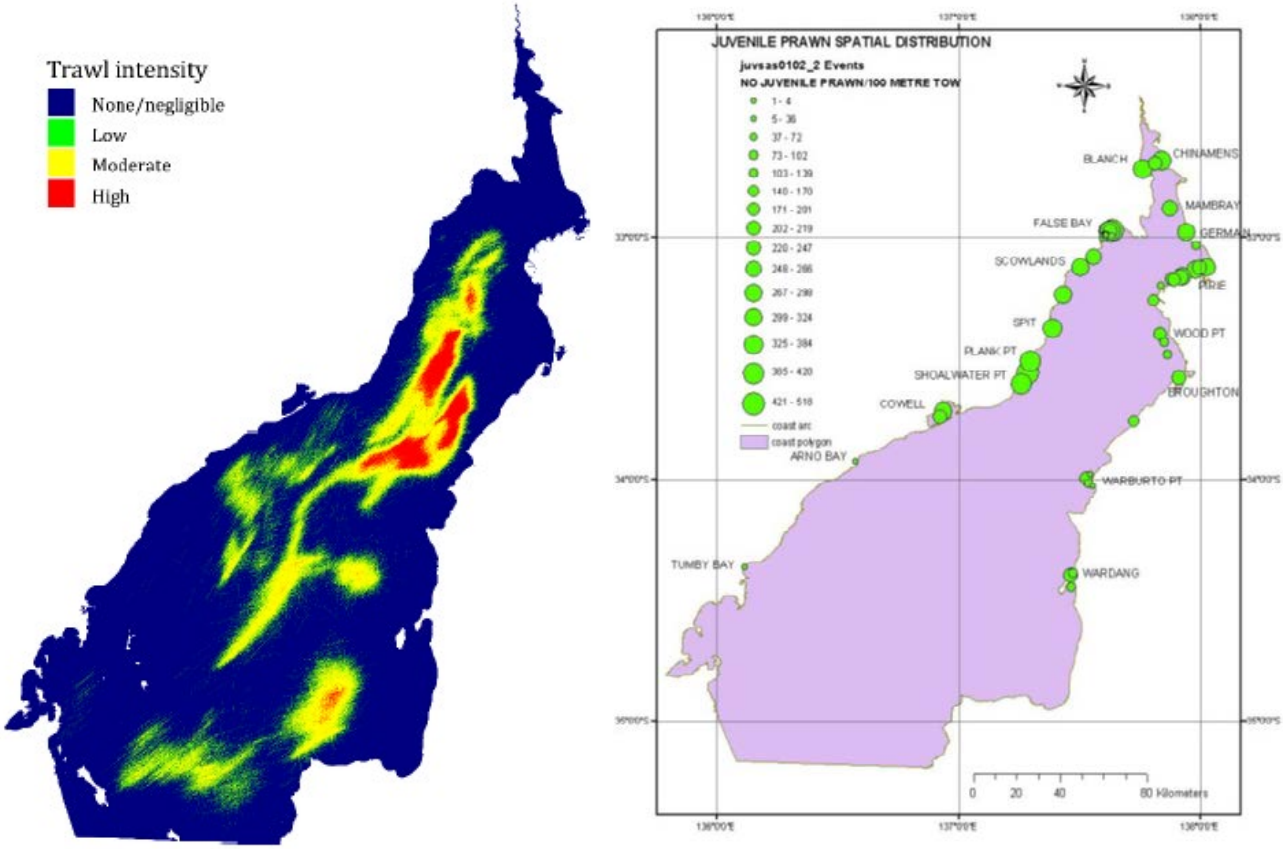


Figure 11-26: Spencer Gulf Prawn Fishery footprint, based on 40% of the total effort during 2001/02–2017/18 and distribution of prawn juveniles in Spencer Gulf

[Sources: Noell & Hooper (2019) (left); Carrick (2003) (right)]

Snapper

Snapper utilise the soft bottom and seagrass areas for spawning (Bryars 2003). The Snapper industry has been (and will be) heavily reliant on the recruitment of juvenile Snapper to nursery areas in the northern Spencer Gulf. The primary spawning areas, larval dispersal pathways, and juvenile recruitment areas for Snapper are in northern Spencer Gulf in the vicinity of the Mullaquana Station desalination plant location. The primary nursery areas for Snapper are near Western Shoal (about 20 km south of Whyalla) and Ward Spit (about 20 km north of Port Pirie) (refer Appendix G-8). There has been a decline of Snapper stocks that has been attributed to extended periods of poor juvenile recruitment. SARDI is working on Snapper recovery with annual releases of juvenile Snapper in South Australia's gulfs since 2021 (PIRSA 2025c). There are total fishing closures in place for the targeting, take and possession of Snapper until 30 June 2027 (PIRSA 2026c).

Low numbers of Snapper were recorded in epibenthic fish surveys in sandy and *Zostera* sites (refer Appendix G-3 Marine Ecology Assessment) and no Snapper larvae were recorded in Project plankton surveys (Appendix G-6 SARDI plankton Report).

King George Whiting

The only recognised spawning area for Spencer Gulf King George Whiting stock is in southern Spencer Gulf and Investigator Strait (Rogers 2025 in Appendix G-8). The pelagic larval phase occurs over Winter and Spring and lasts up to 130 days (Rogers 2025 in Appendix G-8). Larvae

disperse generally northwards from this spawning area to nursery areas throughout Spencer Gulf, typically in protected bays with shallow beds of *Zostera* seagrass (Drew et al. 2020, Rogers 2025). These nursery areas support juvenile development for two to three years before individuals move offshore to join the spawning adult population.

Northern Spencer Gulf supports important inshore nursery areas for King George Whiting. There is a known nursery area at Cowleds Landing which is adjacent (approximately 6 km north of the MSA) the proposed desalination plant site (Rogers 2025). There are areas of shallow *Zostera* within the MSA (Appendix G-2) - noting that within the MSA, the shallow seagrass is predominantly *Posidonia*, with only a small amount of *Zostera* located in waters shallower than 10 m AHD – which is avoided by the Project infrastructure. Further information is provided in Appendix G-8.

SARDI stock assessments following the algal bloom suggest King George Whiting stocks remain stable in Spencer Gulf (SARDI 2026f). In response to declines in Gulf St Vincent and Kangaroo Island associated with the algal bloom (SARDI 2026f) the SA government has implemented a spawning closure from 2027 in relation to King George Whiting in the southern Spencer Gulf (near the bottom of Yorke Peninsula) which prohibits taking and possessing King George Whiting during the peak reproductive and spawning period between 1 March and 30 June (PIRSA 2026c). Low numbers of whiting were recorded in Project epibenthic fish and plankton surveys (Appendix G-3 Marine Ecology Assessment and Appendix G-6 SARDI plankton Report).

Blue Swimmer Crab

Blue swimmer crab occurs in a wide range of algal and seagrass habitats and on both sandy and muddy substrates, from the intertidal zone to the deepest areas of the gulf (Beckmann and Hanamseth 2024). Smaller crabs are found in shallow waters, while adults are found in comparatively deeper waters.

Blue crab larvae spend up to 45 days between hatching and settlement in the USG, with dispersal and survival influenced mainly by wind and temperature (Bryars 1997). Juveniles inhabit mangrove creeks and mud flats (Beckmann 2025), which are represented within the MSA. Bryars (2003) identified seagrass meadows, unvegetated soft bottom, tidal flats between Murninnie Beach (8 km south of the MSA) and Whyalla as spawning and nursery habitat for blue crabs, and tidal creeks in the area as nursery habitat.

Within South Australia, there is a distinct seasonal pattern of adult crab movements into shallow inshore waters during the warmer months of September to April and to deeper offshore waters during the colder months of May to August (Smith 1982 in Dixon and Hooper 2009).

SARDI stock assessments have found no evidence of negative impacts of the algal bloom on Blue Swimmer Crabs in Spencer Gulf (SARDI 2026f).

Garfish

Southern Garfish has a broad range in the coastal waters of South Australia, spawning between Spring and Autumn in shallow inshore waters. Shallow seagrass, tidal flats and creeks provide nursery habitat, particularly in northern parts of both South Australian gulfs (Bryars 2003). The MSA likely lies within a region of important spawning and nursery area, but

there is no information to suggest that the MSA is in an area of greater importance than elsewhere in the northern Gulf.

In response to the South Australian algal bloom, on 1 May 2026 a recreational and charter boat closure was implemented for Garfish in Gulf St Vincent, which is already subject to a commercial closure (PIRSA 2026a). Spencer Gulf remains open to fishing, as catches remain largely consistent with historical baseline data (SARDI 2026f).

Southern Calamari

Southern Calamari typically have offshore nursery and inshore spawning grounds that can span hundreds of kilometres (Steer et al. 2007). Two separate egg clutches were recorded in the mixed *Amphibolis*/*Posidonia* seagrass in the Project summer 2024 / 2025 survey, but there is no evidence to suggest that the MSA has any special significance as a spawning habitat.

Southern Calamari is a key target species of the Marine Scalefish Fishery, and Marine Fishing Area 21 is typically a productive zone of the fishery, yielding 10–20% of Southern Calamari catch from 2016–2020. Widespread Southern Calamari stock declines following the 2025 / 2026 algal bloom (SARDI 2026f), have prompted a total closure was implemented on 1 May 2026 for Southern Calamari across both gulfs in SA for commercial, recreational and charter boat fishing (PIRSA 2026a, PIRSA 2026c).

Culturally significant species

Traditional Owner groups have emphasised the need to protect Aboriginal cultural heritage and culturally significant water resources, including the USG which is recognised as an important cultural water source for multiple Aboriginal groups.

Engagement undertaken through the ILUA process and cultural heritage surveys with the Traditional Owners (Kokatha and Barngarla People) has highlighted the cultural, spiritual and intergenerational significance of the land, water and sky within the Project Area and the expectation that the Project avoid impacts to culturally important areas.

Of particular importance is the protection of the marine environment including the Giant Australian Cuttlefish and ensuring that the operational aspects of the desalination plant do not have adverse impacts to the USG.

Invasive marine species

Invasive marine species (IMS) are plants, animals (or pathogens) that can become established in an area outside of their natural range, alter marine habitats and threaten fisheries, aquaculture, and tourism.

Invasive marine species can spread unintentionally through pathways such as vessel ballast water or attachment to vessel hulls. They are opportunistic species which can establish quickly particularly in disturbed or artificial habitats, including marine construction sites, as they provide suitable settling habitat for invasive marine species. Once established, invasive marine species can either directly prey upon, displace or outcompete native species. Invasive marine species also have the potential to carry diseases which can eliminate native species.

Mullaquana Station is a relatively sheltered and shallow site, appearing to be rarely visited by vessels with the exception of occasional visits by commercial research vessels or recreational line and pot fishermen. Existing levels of sea traffic would be expected to be negligible and residence time at Mullaquana Station would be expected to be short, as it is not a suitable harbor or anchorage.

One invasive marine species, the European fan worm *Sabella spallanzanii* was identified in marine ecology baseline surveys undertaken for the Project. Its consistent presence across seasons and sites suggests that it is well established within deep sand habitats of the MSA (refer Appendix G-3). The Project baseline survey results of the plankton qPCR test for 20 target invasive marine species also recorded the presence of European Fanworm. No other IMS species were identified (refer Appendix G-6).



Plate 11-8: European fan worm in the Marine Study Area (left), and from PIRSA website[10] (right)

The European Fanworm is the only IMS recorded at Mullaquana Station, however, there are several IMS identified near the Port of Whyalla and at other locations around Spencer Gulf. The European Fanworm is a known resident of adjacent Whyalla waters (Wiltshire et al 2010) as is the Sea Vase (*Ciona intestinalis*) (Wiltshire et al. 2017). The worm species *Myxicola infundibulum* has been recorded at Whyalla and Port Bonython based on unpublished BHP Billiton data (cited in Wiltshire et al. 2010). *Magallana* (*Crassostrea*) *gigas* (Pacific oyster) adults and DNA of *Corbula gibba* (European clam) have also been detected at Whyalla (Wiltshire et al. 2017).

The Pacific oyster, Sea Vase and European Fanworm were detected in Tumby Bay about 220 km from Mullaquana Station (Wiltshire et al. 2010). The Asian Date Mussel *Arcuata (Musculista) senhousia* was recorded at Port Spencer (Lipson) on the Eyre Peninsula over 90 km from Mullaquana Station during an underwater survey (Golder 2012). The European Fanworm has also been found in Port Lincoln at the Jetty and Naval Shipworm (*Toredo navalis*) are resident in the Port Lincoln marina (Appendix G-15 Invasive Marine Species Risk Assessment).

[10] https://pir.sa.gov.au/fishing-and-aquaculture/recreational-fishing/rules/species-limits/pest-profile/european_fan_worm

Pacific Oyster Mortality Syndrome (POMS) is a disease affecting Pacific oysters which causes high mortality rates and leading to severe economic losses for the aquaculture industry. POMS was first identified in France in the 1990s and has since spread to oyster farming regions worldwide, and was first recorded in Australia in NSW in 2010. In South Australia, POMS is contained to the Port River in Port Adelaide and has not been recorded in Spencer Gulf (PIRSA 2024).

Abalone Viral Ganglioneuritis (AVG) is a highly contagious viral disease that affects abalone. AVG poses significant challenges to the abalone aquaculture industry, as outbreaks can result in substantial economic losses and also impact wild abalone populations. AVG was first reported in wild stocks in Victoria in 2005 and has since been detected in other regions where abalone aquaculture or wild abalone populations exist (Dang and Miller 2016). AVG has been detected in Southeastern Australia in Portland in 2021 and there are current management measures in place aiming to decrease the risk of further spread.

Ballast water risks in Australia are managed by the Australian Quarantine Inspection Service (AQIS) using the Maritime Arrivals Reporting System (MARS). The ballast water management system includes pre-arrival, and domestic measures to limit the introduction and spread of invasive marine species.

11.5 Project Marine Infrastructure – Reference Design and Option

Based on the key engineering and performance requirements discussed in Chapter 6 Project Description, the marine intake and outfall structures are likely to be located between 13 m and 17 m water depth (from the LAT, which equates to approximately -15 m to -19 m AHD), and between 3 km and 5 km from the on-shore intake pump station. The intake structure is likely to be located in shallower water and closer to shore than the outfall structure. The positioning, design and construction methodology for the seabed infrastructure is expected to be refined through detailed design.

The EIS assessment is broadly based on the engineering Reference Design for the Project (GHD 2025a). Regarding marine structures, the Reference Design includes:

Reference Design: Two tunnels (one each for the intake and outfall) for conveying seawater to the seawater desalination plant site and return water from the plant to the outfall diffusers. The intake structure(s) includes a riser, precast concrete structure and screened intake head. The outfall diffuser structure includes a riser, manifold pipe and series of nozzles attached to the end of the outfall pipe.

For marine structures, the following option also forms part of the EIS assessment:

Float and sink pipeline option: The float and sink pipeline option involves tunnelling the outfall to around the same distance from the launch box as the intake location, and continuing offshore via approximately 1,000 m of additional outfall conduit placed on the seafloor to the outfall diffuser manifold using a float and sink method. The outfall diffuser manifold would also be placed using a float and sink method.

The float and sink pipeline option assessment is presented in Section 11.7.13, and highlights only the elements that have a material divergence from the Reference Design assessment.

11.5.1 Reference Design base case

The Reference Design contemplates construction of separate intake and outfall tunnels via tunnel boring from shore under the seabed to the proposed intake and outfall diffuser structure locations (refer Figure 11-27). Vertical risers are then installed to connect the tunnels to the seabed. The outfall diffuser structure (series of nozzles on a manifold) is then attached to the outfall riser. It is assumed the intake structure and the diffuser structure would be floated into position before sinking into place and securing to the seafloor.



Figure 11-27: Reference Design marine infrastructure diagram (indicative and not to scale)

11.5.2 Float and sink pipeline option

An alternative construction method may be considered, incorporating a 'float and sink' method for the outfall pipeline. In this instance, the tunnel section of the outfall would likely terminate with a riser around the same distance from the launch box as the intake tunnel terminates, with the riser connected to the float and sink section. The Float and Sink Pipeline Option assessment assumes that the intake and outfall are at the same depths as in the Reference Design base case.

The float and sink technique involves floating the outfall pipeline into position from beyond the outfall tunnel riser, then lowering and securing it to the seabed using permanent anchoring methods (assumed to be piled collars / weights) (refer Figure 11-28). Shallow dredging the footprint of the 'float and sink' section may be required to ensure level and secure anchoring to the seabed, as well as hydraulic performance and asset protection (subject to detailed design).



Figure 11-28: Float and sink pipeline option case marine infrastructure diagram (indicative and not to scale)

11.6 Return Water Characteristics, Toxicity and Dispersion

This section summarises the findings of the Marine Desalination Plant Ecotoxicity Assessment, prepared by WQAdvice (2025) and attached in Appendix G-10, and the outcomes of hydrodynamic modelling undertaken by Water Technology and SARDI and presented in Appendix G-11, G-12 and G-13.

To better understand the potential impacts of the return water on marine organisms, the following characteristics of the return water were defined:

Physical and chemical qualities (Section 11.6.1):

- temperature – can cause thermal effects if different from ambient seawater
- salinity - can impact marine organisms that are sensitive to changes in salinity
- pH level (acidity or alkalinity) – can affect the health of marine organisms if different to ambient seawater
- chemical additives – antiscalants or cleaning chemicals used in the desalination process can impact marine organisms if present in return water at toxic concentrations (Section 11.6.2).

Toxicity to local marine organisms (Section 11.6.2):

- acute and chronic toxicity – short and long-term exposure tests to determine immediate and long-lasting effects on growth, reproduction and survival
- sublethal effects - assessment of non-lethal impacts such as changes in behaviour, reproduction, and growth
- bioaccumulation – assessment of ability for toxins to accumulate in the tissues of marine organisms over time, potentially affecting the organism and the food chain.

Dispersion patterns from the outfall at the local and regional scale (Section 11.6.3):

- hydrodynamics – determining how water currents, tides, and wave actions will affect return water dispersion, including seasonal variations
- modelling – simulating the dispersion of return water and predicting concentrations at various distances from the outfall
- dilution - assessment of how quickly and effectively the return water is expected to dilute in the surrounding seawater
- benthic habitat impact- determining whether the return water settles on the seafloor, and impacts benthic communities.

11.6.1 Physical and chemical characteristics

Water properties – intake vs outfall

The desalination facility is designed to achieve a 40% freshwater recovery rate (based on the overall plant recovery[11]). This means that 40% of the seawater extracted from the ocean ('intake water') will be converted to freshwater, and the remaining 60% returned to the ocean as 'return water'. As seawater salinity in the MSA ranges from approximately 38-41 grams per

[11] Note, whilst the Reference Design plant overall recovery is 40%, this is based on a reverse osmosis recovery rate of 45%.

Litre (g/L) (based on ADCP data from 2022-2023 (refer Figure 11-31) and water quality / ADCP data from 2025-2026 (refer Appendix G-1), the return water is expected to have a salinity range of 66-71 g/L.

Intake water ('ambient seawater') has a high oxygen content, with saturation levels varying seasonally between 88 and 108%. This seasonal variability is largely driven by changes in water temperature. Throughout the desalination process, re-aeration will occur and dissolved oxygen levels in the return water are expected to be greater than 80% saturated. Section 11.6.3 provided the results of dispersion modelling and Section 11.7.4 provides assessment regarding stratification and dissolved oxygen.

Table 11-7 compares the physical and chemical properties of the seawater and return water streams.

Table 11-7: Comparison of intake seawater and predicted return water characteristics*

Characteristic	Seawater (intake)	Return water (outfall)
Flow rate (ML/d)	368 ML/d	228 ML/d
Temperature (°C)	12 to 24	13 to 29
Salinity (g/L) or PSU**	38.4 to 40.7	66 to 71
pH (units)	7.7 – 8.3	+/- 1.0 of intake water (return water is neutralised before discharging)
Dissolved Oxygen (% saturation)	88-109 (Av. 100)	> 80
Total Suspended Solids (mg/L)	<1 to 26 (Av. 3.65)	TSS is generally expected to be lower than seawater due to the filtration process. An increase in TSS of 2 to 52 mg/L may occur during backwashing event.
Total Dissolved Solids (mg/L)	31,000 -49,000 (Av. 41,712)	<79,000

* Return water data is sourced from Table 15 and Table 50 of the Reference Design Report (GHD 2025a) and Nearfield modelling report (Appendix G-11); Seawater data is sourced from Section 11.4.2. and associated Baseline Water Quality Report (Appendix G-1).

**grams per litre (g/L) and PSU are approximately equivalent units. Since PSU (Practical Salinity Unit) is a dimensionless measure of water salinity based on its electrical conductivity relative to a standard seawater solution, the conversion depends on water density and how salinity was determined, and not an exact equivalence. For the purposes of this EIS PSU is considered to be approximately equivalent to g/L.

Chemical additives

Several chemical dosing systems are required for the desalination plant to operate effectively:

- Routine cleaning of the pre-treatment and reverse osmosis (RO) systems using anti-scalants and other Clean-in-Place (CIP) chemicals is necessary to maintain performance. During cleaning of the pre-treatment system, water is pumped backwards through the filters to remove accumulated silt, sand and organic matter. The resulting wastewater (backwash water) is blended with the return water stream

and discharged to the marine environment. Backwashing is expected to occur at regular intervals during each day. The Reference Design includes 30 trains of UF membranes with one backwash sequence occurring each hour, meaning that backwashing is a relatively constant process.

- Subject to detailed design and choice of pre-treatment technology, the desalination plant pre-treatment process may include the use of chemicals including coagulants for operating scenarios where the seawater has higher organic load or suspended solids to maintain operability and effectiveness. These are typically ferric or aluminium based coagulants.
- The shut down and cleaning of the RO system (using CIP chemicals) is expected to occur twice per year. Cleaning wastewaters are directed to a neutralisation tank then discharged with the return water stream.

Although the CIP chemicals are neutralised during the cleaning process, and although use of coagulants in a pre-treatment system will result in waste being diverted to a land-based solution and not via outfall, trace amounts may remain in the return water. While these remaining trace amounts are expected to be below analytical detection limits and effectively unmeasurable, CIP chemicals and associated additives must be considered in any ecotoxicity testing program for the desalination plant.

In 2008 and 2009, ecotoxicity studies undertaken for the Adelaide Desalination Plant (ADP), investigated four antiscalant products: Flocon 295, Flocon 285, Nalco PC1020T and SpectraGuard. EPA subsequently approved the use of these and one additional antiscalant product (Genesys-MP) at ADP. It is planned to seek EPA approval for these same CIP and antiscalant products. Should a future operator of the desalination plant wish to use an alternative product, it will need to obtain prior approval from the EPA.

Table 11-8 lists the types of cleaning chemicals used in RO desalination facilities and likely to be used for the Project. It also lists the five antiscalant products currently licensed for use at ADP and likely to be used for the Project.

Table 11-8: Typical cleaning chemicals used in reverse osmosis desalination facilities

Type	Chemical
Antiscalants	Flocon 190 Flocon 295 Flocon 285 SpectraGuard Nalco PC1020T Genesys-MP
Chlorination	Sodium hypochlorite
Dechlorination **Disinfectant**	Sodium metabisulphite Sodium bisulphite
Acids	Citric acid, Hydrochloric Acid
Base	Sodium hydroxide
Chelating agent	Ethylenediamine tetraacetic acid (EDTA)

Type	Chemical
Surfactant	Sodium dodecylbenzenesulfonate
Biocide	Dibromonitrilopropionamide (DBNPA)

11.6.2 Toxicity assessment of the return water

This section outlines the toxicity assessment of the return water, based on the expected return water characteristics provided in Table 11-7. It outlines how safe dilutions (also known as Species Protection Trigger Values (SPTVs)) were used to determine the toxicity of the return water to local marine biota, and therefore, what dilution of return water would protect these species from harm.

Salinity toxicity

The tolerance of marine biota to salinity was the subject of the literature review undertaken in the initial stage the ecotoxicity assessment. Data from Australian based laboratory whole effluent toxicity (WET) studies were used to estimate the toxicity of the return water to a range of marine species and the required safe dilutions of return water.

Sub-lethal effects of salinity

Marine species must be able to tolerate some degree of salinity change to survive the natural salinity fluctuations in their environment. However, species' ability to withstand or adapt to elevated salinity levels will vary depending on factors such as mobility (fixed, active or passive), life stage (egg, larvae, juvenile or adult) and duration of exposure.

Mobile species like fish, crabs, prawns and squid are able to avoid high salinity by swimming away to areas with more favourable salinity levels. This can alter feeding, breeding and predator-prey interactions, leading to shifts in species distribution. Some mobile species may also experience stress that impairs their swimming ability, making them more vulnerable to predation.

Immobile species, such as mussels, clams, seagrass and macroalgae, are unable to relocate and must endure the salinity changes in their environment. Increased salinity can induce stress that impairs their feeding, growth and reproduction, and ultimately their survival rates.

Safe dilutions

A safe dilution is the dilution rate of a return water discharge in the aquatic environment that is predicted to protect the aquatic ecosystem, it can be expressed in terms of the percent of return water or a ratio of return water volume to receiving water volume (refer Appendix G- 10).

Safe dilutions are informed by tests conducted in controlled laboratory settings that measure a species sensitivity to a particular environmental stressor. This is done by exposing the species to different concentrations of the stressor (e.g. salt) and observing the dose / effect relationship as measured by changes to its survival, growth and reproduction.

As outlined in Section 11.3.2, a dataset of toxicity values relevant to the Project was developed through an extensive literature review and validation process.

The preliminary dataset contained 17 ‘relevant and reliable’ toxicity values, covering 12 test species from eight different taxonomic groups (refer Table 9, Appendix G-10). To ensure the

most conservative approach (i.e. protective) was adopted, only the lowest toxicity value for each species was retained in the final dataset (refer Table 10, Appendix G-10), which comprised chronic toxicity values for 12 marine species. The lowest toxicity value of all 12 species became the benchmark toxicity on which the return water safe dilutions were calculated.

Dilution of the return water will occur naturally as waves, currents and tides cause it to disperse and mix with the surrounding seawater, until it eventually reaches ambient salinity levels.

In accordance with the Assessment Requirements, the safe dilution levels were predicted using locally representative species, for a 95% protection level and chronic exposure impacts (whole effluent toxicity[12]).

The return water safe dilution estimates for 95% and the more conservative 99% species protection are provided in Table 11-9. These were derived using the final dataset (logarithmic) species sensitivity distribution graph (refer Figure 11-29).

Table 11-9: Estimated safe dilutions for return water to achieve different levels of protection

Species protection	Safe dilution	
	% Return water	Dilution factor
99%	1.9	1 in 53
95%*	3.9	1 in 26

*The 95% protection level has been specified in the EIS Assessment Requirements for the Project desalination plant at Mullaquana Station.

These results indicate that 95% of species will not be affected by the return water salinity once it is diluted to one part return water in 26 parts seawater. This dilution is achieved as the return water disperses through the surrounding waters aided by the force of the outfall diffusers and the natural currents, waves and tides.

Hydrodynamic modelling has predicted where the 95% safe dilution is likely to be achieved relative to the outfall discharge point – refer to Figure 11-36 for dilution plots of the 10th percentile contours for each season for the 51 GL/y scenario. Dilution and dispersion of return water, and the zone of ecological impact is explained in detail in Section 11.7.4.

[12] Whole Effluent Toxicity (WET) refers to the combined effect of all substances potentially present in the return water (as opposed to the singular effect of each individual substance). This ensures a more realistic measurement of potential toxicity impacts of the return water stream.

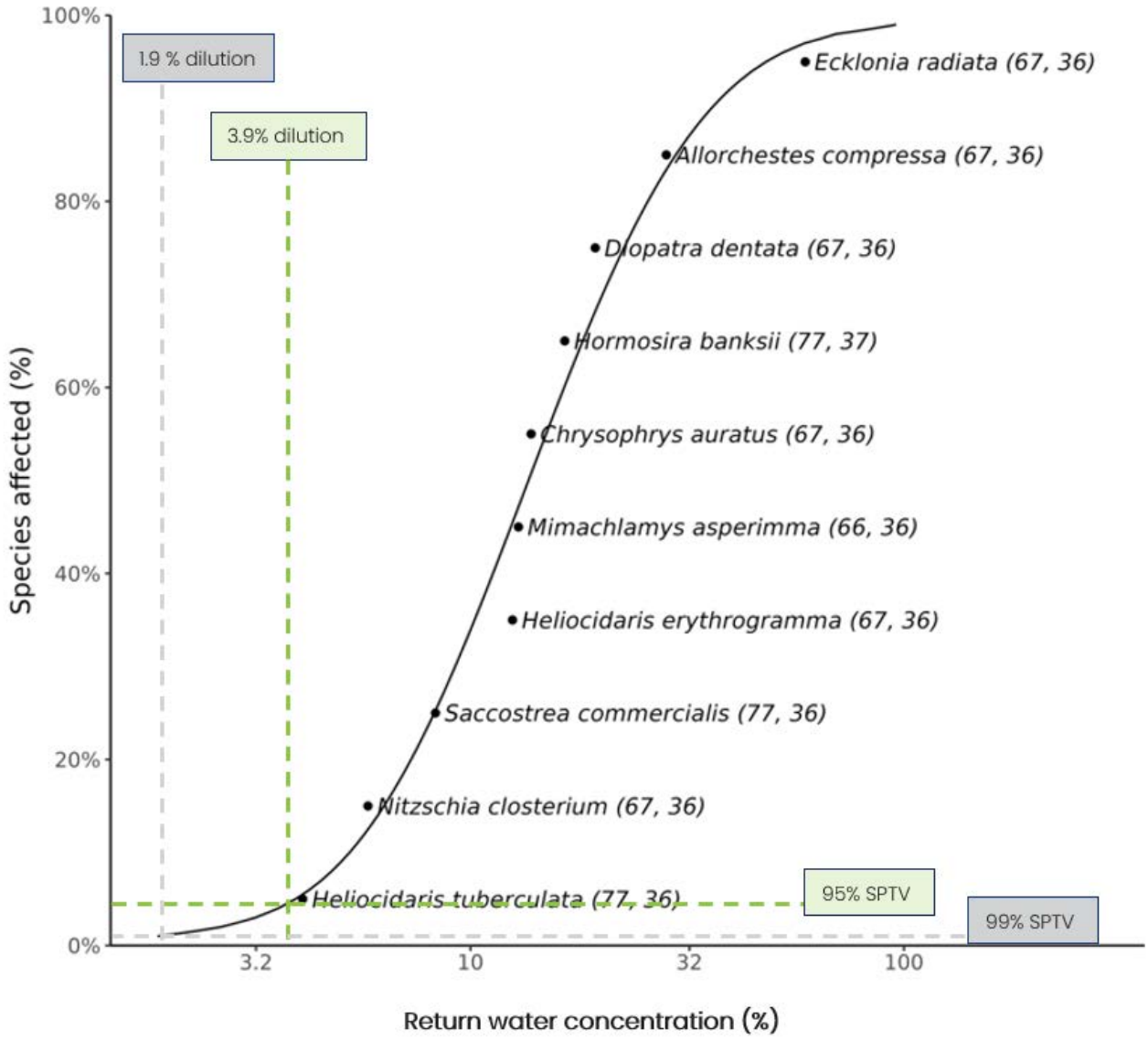


Figure 11-29: Species sensitivity distribution of preliminary dataset

Antiscalant and CIP toxicity

Several Australian desalination plant studies reviewed for this assessment investigated / compared the ecotoxicity of saline concentrates with that of some common antiscalants and CIP chemicals. With some minor exceptions – these studies found that the primary cause of toxicity was the high salt concentration. Antiscalants and CIP chemical toxicity was deemed either low or not toxic at the concentrations expected in the return water discharge. Therefore, the safe dilution rates derived for salinity ecotoxicity are likely to also be protective for antiscalant and CIP chemical toxicity.

However, to account for site and Project specific factors or any potential exceptions, pre-commissioning and operational ecotoxicity testing for the Project desalination plant is recommended to include testing of typical antiscalant and CIP chemicals.

11.6.3 Modelling of return water dispersion

To assess potential impacts of the return water, hydrodynamic dispersion modelling was used to look at the hydrodynamics and dispersion potential of Spencer Gulf, and establish the extent of the return water zone of influence near the outfall as defined by the safe dilution environmental criteria.

For modelling of the desalination plant operation, a conservative approach was taken to establishing intake water and return water salinities. Intake water was based on the upper-end ambient site salinity at 41 PSU, and the associated upper-end predicted return water salinity was 71 PSU (rounded up from 70.95 PSU), calculated based on the overall plant freshwater recovery rate of 40%.

Whole of Gulf farfield model

SARDI examined the effect of Spencer Gulf hydrodynamics on the farfield dispersal of return water discharges and connectivity of planktonic larvae with the Project desalination plant. The conservative hypothetical high-capacity scenario with a production of 200 ML/day (73 GL/y) was used as the basis of the farfield modelling.

The farfield hydrodynamic model was developed for the whole of Spencer Gulf and was validated against long-term mooring measurements collected by IMOS and the baseline data collected by the Project. Extensive comparisons with field data at sites around the Gulf showed that the model was able to reproduce tidal and lower-frequency variations in currents, sea level temperature and salinity. The model therefore had predictive capability for determining the circulation within Spencer Gulf that affects the long-term and farfield transport and dispersal of return water and planktonic larvae.

Using a 12-year model hindcast, farfield predictions of the salinity increases (anomalies) indicated maximum seasonally-averaged anomalies (>0.05 PSU) were confined to within approximately 5 km of the outfall site. At these spatial scales the return water plume is transported parallel to the shore to the south and north by tides. At distances greater than 5 km from the outfall, smaller seasonally-averaged positive and negative anomalies (<0.05 PSU) were predicted to occur within the Gulf. North-eastward transport is enhanced during spring and summer under prevailing south-easterly winds. In spring, small salinity anomalies of ≤ 0.02 PSU are predicted to extend up to 40 km away from the outfall in spring. During autumn and winter, winds are typically from the north and west, and density-driven exchange between the gulf and open shelf is enhanced. Under these conditions, the northern extent of the brine footprint is reduced and transport is directed southward.

The 12-year simulations indicate that return water would be rapidly diluted by tidal mixing and dispersed by wind- and density-driven circulation. Predicted long-term salinity trends indicate that salt would not accumulate within Spencer Gulf over the 12-year simulation period (refer Appendix G-13.).

At scales greater than a few kilometres from the outfall, the predicted farfield salinity increases are within the range of natural salinity variability determined from the measured data (1-2 PSU) and below environmental or ecological tolerance limits of 1 PSU for flora and fauna reported in the desalination literature (Lattemann and Höpner 2008; Panagopoulos and Haralambous 2020; Tanner and Drabsch 2021; Omerspahic et al. 2022).

Plume dispersion – nearfield

The nearfield model quantifies discharge behaviour from the port to where the return water meets the seabed, while the midfield model assesses subsequent transport, temporal variability and the broader extent of the return water plume.

Nearfield modelling showed that the current location and proposed outfall design will create sufficient mixing conditions to achieve compliance with prescribed environmental criteria (species protection safe dilutions). At the edge of the nearfield mixing zone, dilutions were generally above the 99% species protection criterion for the lowest current cases and flow rates. Dilutions below the criterion occurred at distances considerably shorter than the edge of the nearfield mixing zone (i.e. closer to the diffuser structure, well within 100 m from the outfall). As a result, the proposed discharge is expected to comply with environmental criteria, indicating an acceptable outfall design for ambient conditions at Mullaquana Station.

Nearfield model set up

Ther nearfield modelling undertaken by Water Technology (refer Appendix G-11) used VISJET 2.5 to simulate return water dispersion in the immediate vicinity of the diffusers (1–100 m) under stagnant conditions and ambient currents from 0.00 to 0.50 m/s. The model used the Reference Design diffuser geometry and simulated the minimum (turndown) and design (51GL/y) capacity discharge cases. The assessment specifically determined the point of initial dilution, defined as the location where the descending plume first contacts the seabed, together with the average plume dilution achieved at that point and its centreline distance from the diffuser port. This nearfield assessment addresses the jet-dominated mixing and initial seabed interaction that are not resolved by the midfield model.

Nearfield model scenario results

Under stagnant conditions, the plume first contacted the seabed 14 m from the port at the minimum turndown capacity, and at 17 m at design capacity. Average dilution at initial seabed contact was 35:1 (turn-down) and 39:1 (51 GL/y) respectively. Each modelling result at initial contact had better dilution than the 26:1 dilution required for the 95% species protection trigger value. The stagnant case provides the zero-current assessment condition and is conservative for initial mixing.

Ambient currents generally increased dilution at the point of seabed contact, although the distance differed between ports directed with and against the flow. For the representative 0.10 m/s current case, the minimum turndown plume contacted the seabed 22 m from the port in the flow direction and 9 m against the flow, with average dilutions of 65:1 and 55:1, respectively. At design capacity, the corresponding distances were 23 m and 13 m, with average dilutions of 59:1 and 47:1, respectively. Across the modelled current range to 0.50 m/s, initial seabed contact remained within the 100 m nearfield mixing zone and the 95% species protection dilution criterion was achieved for all scenarios. At current speeds of 0.20 m/s and above, predicted dilution at seabed contact was generally greater than 100:1.

Detailed results for all flow and current combinations, including point of initial dilution where the plume first interacts with the seabed, the level of dilution achieved at that point, or the distance from the diffuser, are provided in Section 5 of Appendix G-11 (and in particular Tables 5-2, 5-3, 5-4 and 5-5).

According to the modelling results, surface breaching will not occur, as most ebb tides present a surface elevation above LAT. As the water is unlikely to be completely still for long periods, folding of the plumes by currents should provide further clearance from the surface.

Assessment of the effects of the discharge on TSS were shown to be relatively small in comparison to the range in existing in-situ observations. Integration of the nearfield modelling within the midfield modelling of the same discharge scenarios confirmed that this would be the case (refer Appendix G-12).

Plume dispersion – midfield

Midfield modelling simulated the dispersion of the return water in the marine environment for the reference design scenario (51 GL/y, or 140 ML/d with a turndown scenario of 40 ML/day).

A model mesh[13] was developed to incorporate large-scale meteorological and oceanic forcing. This allowed for the accurate prediction of water levels, currents, salinity, and temperature at the outfall intake and discharge locations. The mesh resolution was refined sufficiently to determine the discharge footprint and evaluate potential recirculation between the outfall and intake. The model domain, mesh and bathymetry adopted for the present assessments are shown in Figure 11-30.

These extents were used to derive oceanic boundary conditions from the Spencer Gulf farfield model (refer Appendix G-13.). Model bathymetry was sourced from a combination of the following sources:

- Geoscience Australia bathymetric grid of Australia (Whiteway 2009)
- Australian Hydrographic Office (AHO) for near coastal areas (i.e., < 30 m depth)
- Bathymetry collected in the MSA for the Project (provided by Maritime Constructions in June 2025).

[13] A model mesh is a geometric grid that divides a body of water into discrete cells and provides the framework for the hydrodynamic model, translating complex data into a digital structure where water flow, waves, and tides can be calculated.

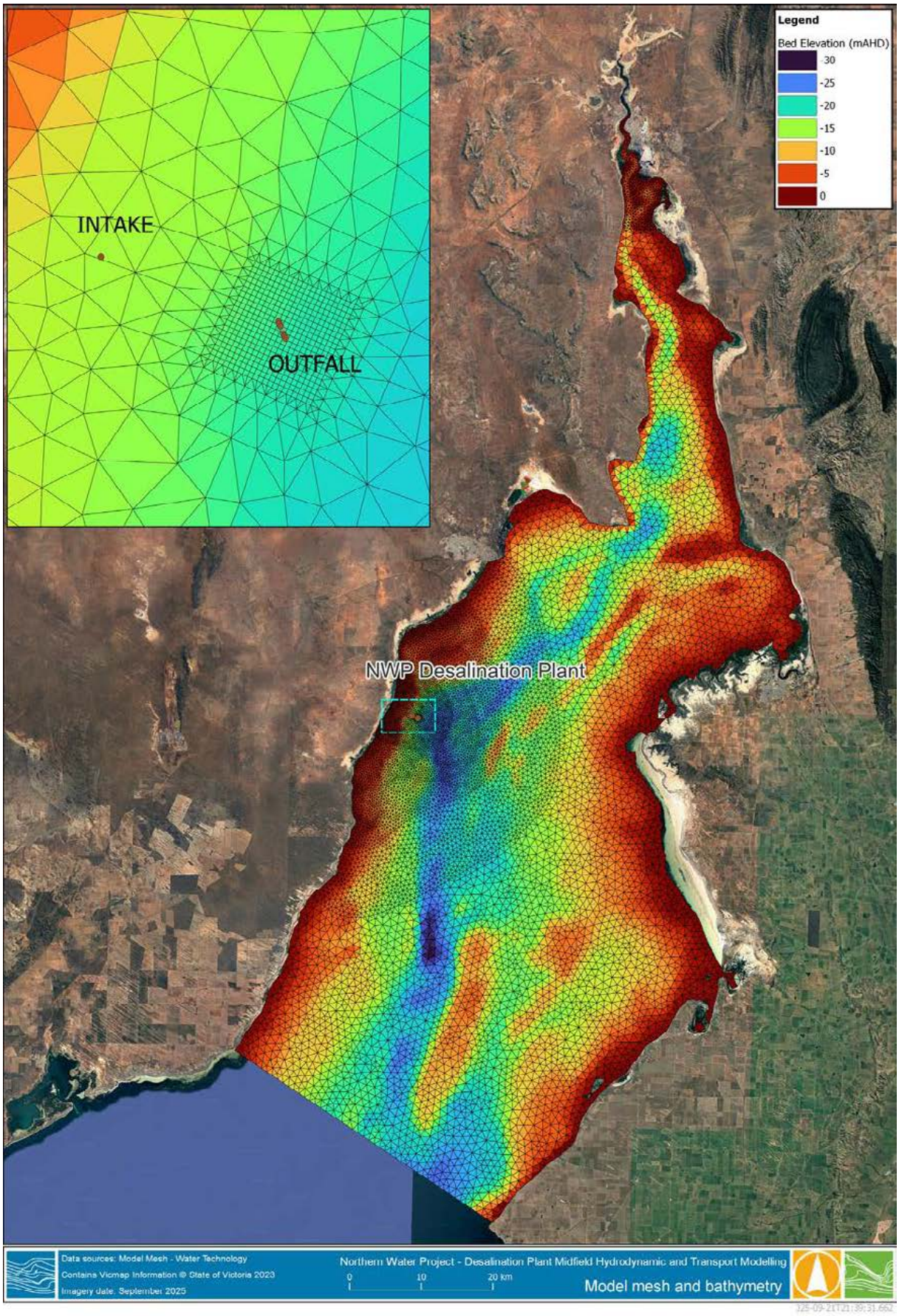


Figure 11-30: Spencer Gulf midfield model domain, mesh and bathymetry
[Source: Appendix G-12 – Midfield modelling report]

Model calibration

Model calibration was performed against water levels, currents, temperature and salinity available at NWP3 (refer Figure 11-2 for location) and SAMUSG (approximately 31.5 km north-east of the outfall and refer Figure 10-3 for location) for the simulation period from 1 November 2022 to 1 December 2023 (refer Figure 11-31 and Figure 11-32). The model successfully matched measured water levels, currents (tidal and residual), salinity, and temperature trends with the following results:

- Water levels showed agreement between the model and measurements, with measure of errors (MAE) and root mean square error (RMSE) being respectively ~4% and ~7% (or less) of the measured level range. A high level of correlation was also demonstrated for the tide-dominated water level signal.
- Currents also showed good correlation, with MAE and RMSE being respectively <7% and <9% of the measured current magnitude range. Excellent correlation for full and tidal signals was achieved, indicating phase correspondence between model and measurements in the tide-dominated signal.
- Temperature data showed minimal bias, accurately capturing seasonal trends of cooling in winter and progressive heating throughout spring into summer (refer Figure 11-31 and Figure 11-32).
- Salinity at NWP3 indicated a good level of correlation between model and measurements (refer Figure 11-31). Correlation was lesser at SAMUSG partly owing to difficulty in defining initial conditions due to complex oceanographics in the USG (refer Figure 11-32). While the model did not predict the same extent of ambient salinity increase over salinity pulse events, the comparisons against background levels were based on the highest ambient salinity recorded, and therefore a higher discharge salinity than would generally occur in reality. It is therefore anticipated that the model predictions in terms of both dilutions and salinity changes are conservative, as they would be respectively lower (dilution) and higher (salinity change) than what would be expected for the measured conditions. The predictions are therefore considered conservative and the model was considered adequate for prediction of the effects of the discharge.

Because the model overall closely mirrors in-situ measurements, it was deemed fit-for-purpose to predict the effects of the discharge.

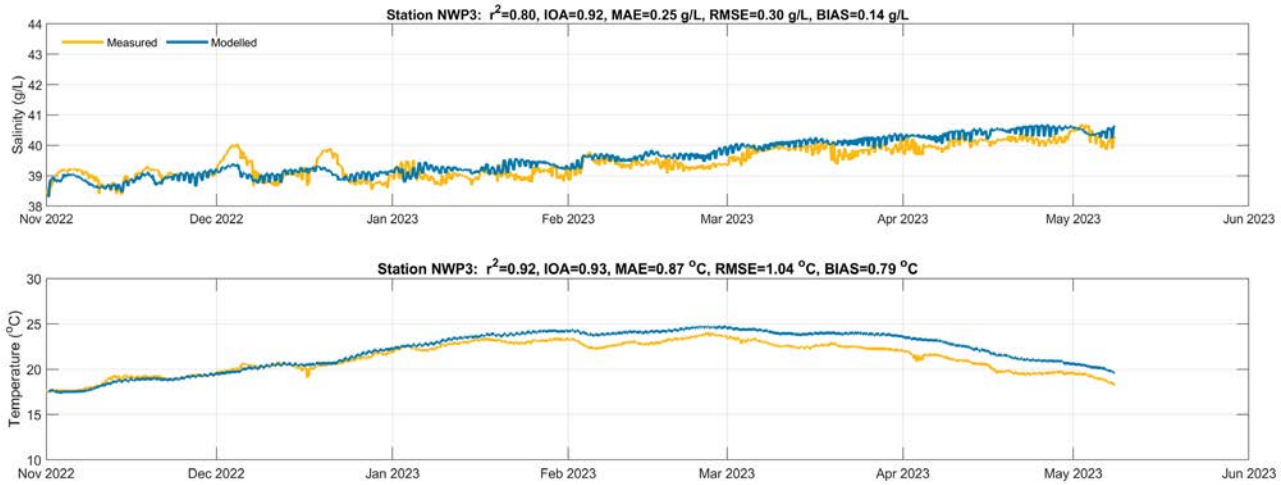


Figure 11-31: Salinity and temperature calibration at NWP3 Station

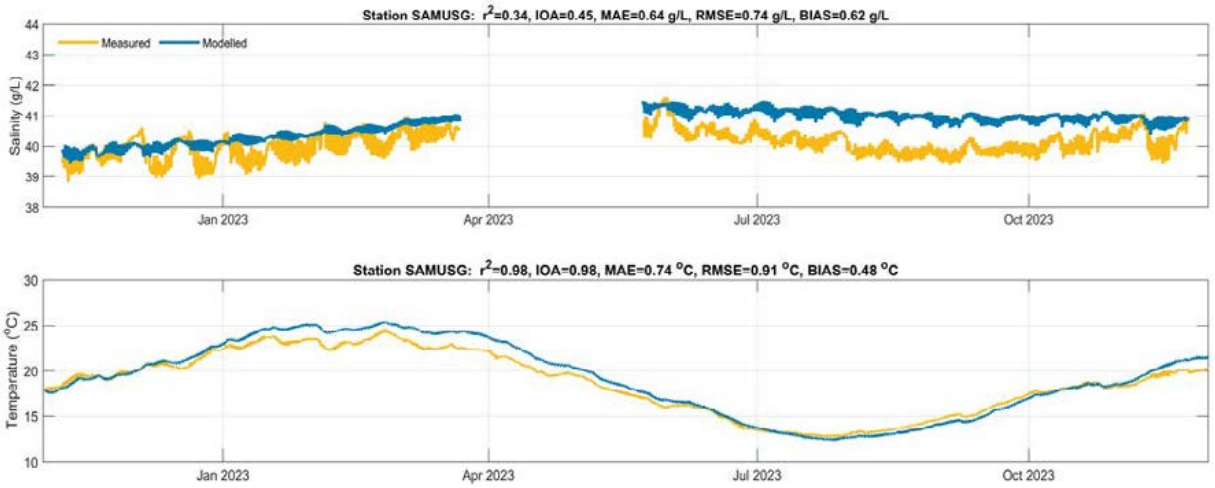


Figure 11-32: Salinity and temperature calibration at SAMUSG Station

Current patterns

Results of the calibrated (2022-2023) model were used to derive maps of currents under different tidal conditions. Of relevance are typical tidal periods (floods vs. ebbs, low vs. high water, springs vs. neaps) and dodge tide periods in which water currents remain low for longer durations. An example of the range of currents across the MSA can be shown by the flood (towards the coast) and ebb (away from the coast) of the Spring (high tidal range) and dodge tides (low to no tidal range) as presented in Figure 11-33. The full set of current maps are provided in Appendix G-12 (Midfield modelling report).

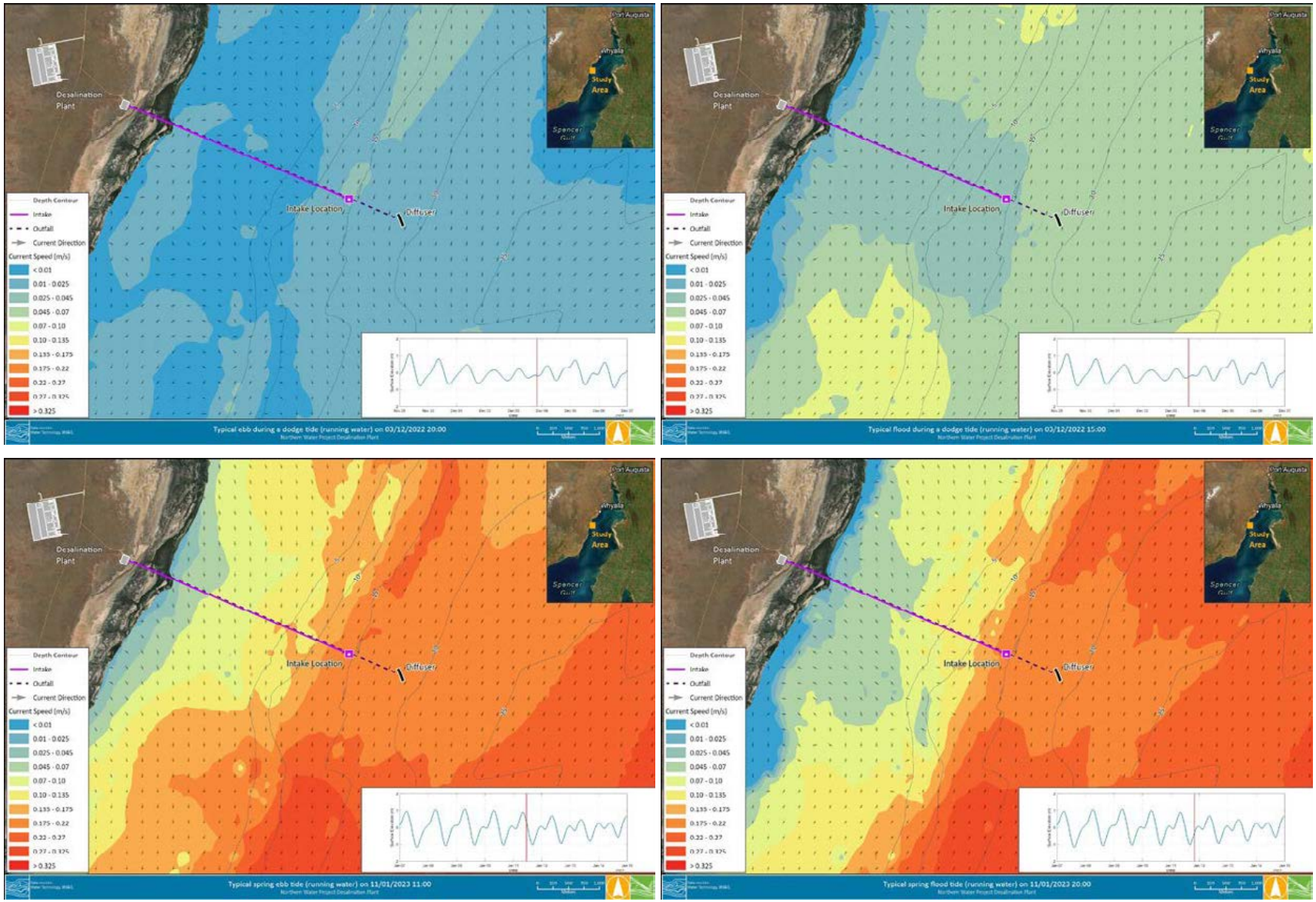


Figure 11-33: Examples of ebbing (left) and flooding (right) currents on a dodge tide (top) and spring tide (bottom)

Model scenario results

Scenarios varied not only in terms of flow rates but also configuration of the diffuser, with 51 GL/year operating 10 outfall ports and Turn-Down operating 6 outfall ports.

Simulated plumes were shown to vary significantly with oceanographic conditions, displaying periods of intense mixing over spring tides (refer Figure 11-34), and some degree of (short-lived) accumulation during neap and dodge tides (refer Figure 11-35).

Simulations also quantified the extent of the return water footprint in the receiving environment, with emphasis on effects near the seabed. The extents included:

- representation of mixing areas with dilutions below 95% and 99% species protection defined via ecotoxicological tests; and
- representation of mixing areas with salinity changes above the selected specified thresholds (1.1 g/L, 1.3 g/L, 1.5 g/L and 1.8 g/L).

Dilutions

Given the strong influence of the tides on the local hydrodynamics in USG, instantaneous dilution maps were prepared to illustrate the shape of the discharge under different tidal regimes. Instantaneous dilution maps are shown for the summer season (refer Figure 11-34 and Figure 11-35).

The contours also approximately indicate salinity and TSS changes – instantaneous dilution calculated by the near-bottom cells in the midfield model was used to show plume mixing and movement across different stages of the tide. The maps show dilution contours associated with 95% and 99% species protection obtained from WET results tests (Van Dam 2026) superimposed on benthic community habitat maps.

Of the instantaneous plots explored, the largest plume sizes occurred during 'dodge' tides (i.e. 1-2 days of limited tidal movement every fortnight) as dictated by mixing conditions (refer Figure 11-35), with limited movement over the transition from flooding to ebbing conditions. Flow rate consistently influenced plume size across all scenarios with the turndown (low flow) scenario creating a much smaller plume.

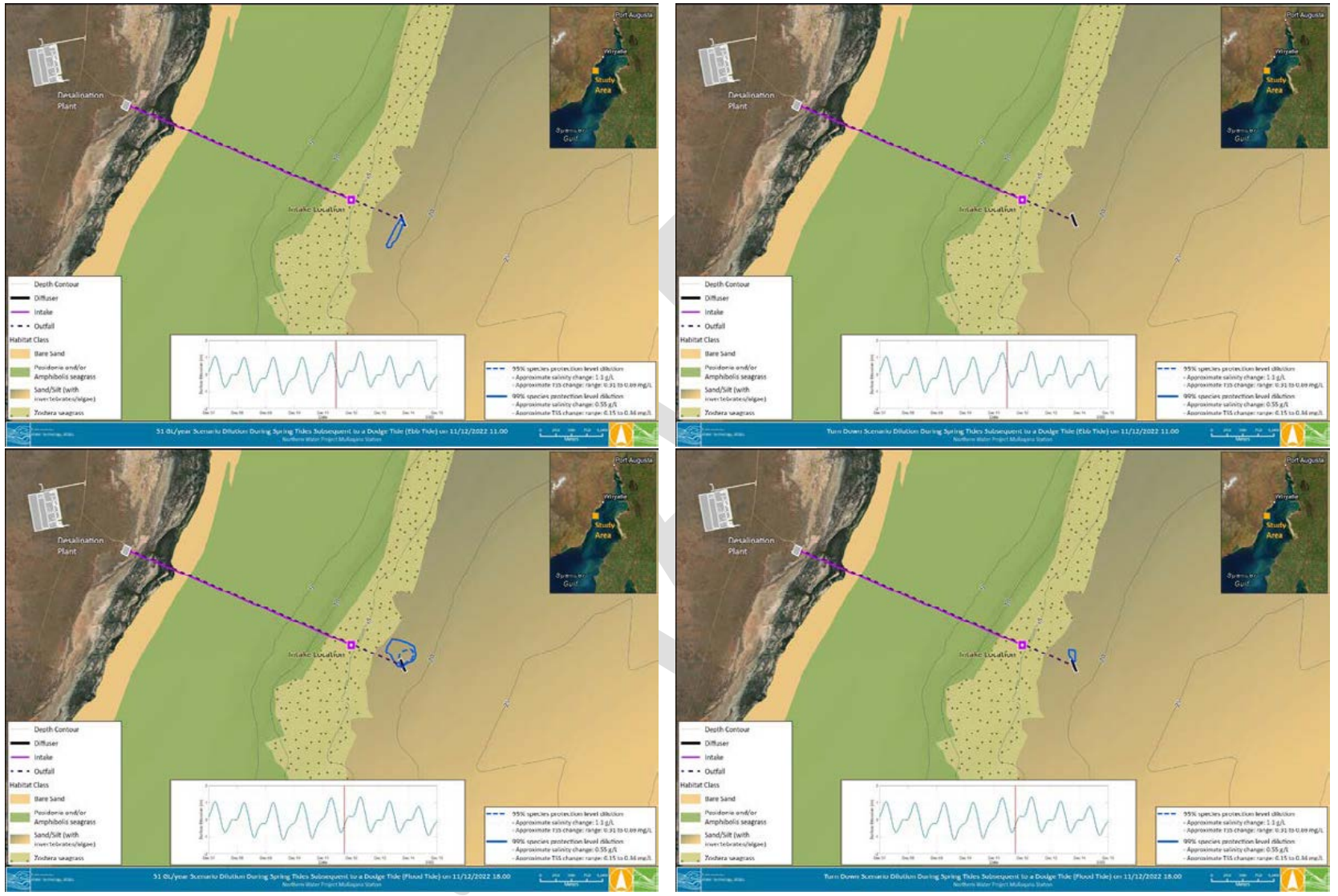


Figure 11-34: Instantaneous dilution contours (95% and 99% species protection) during an ebbing (top) and flooding (bottom) spring tide for the 51 GL/y scenario (left) and turndown scenario (right)

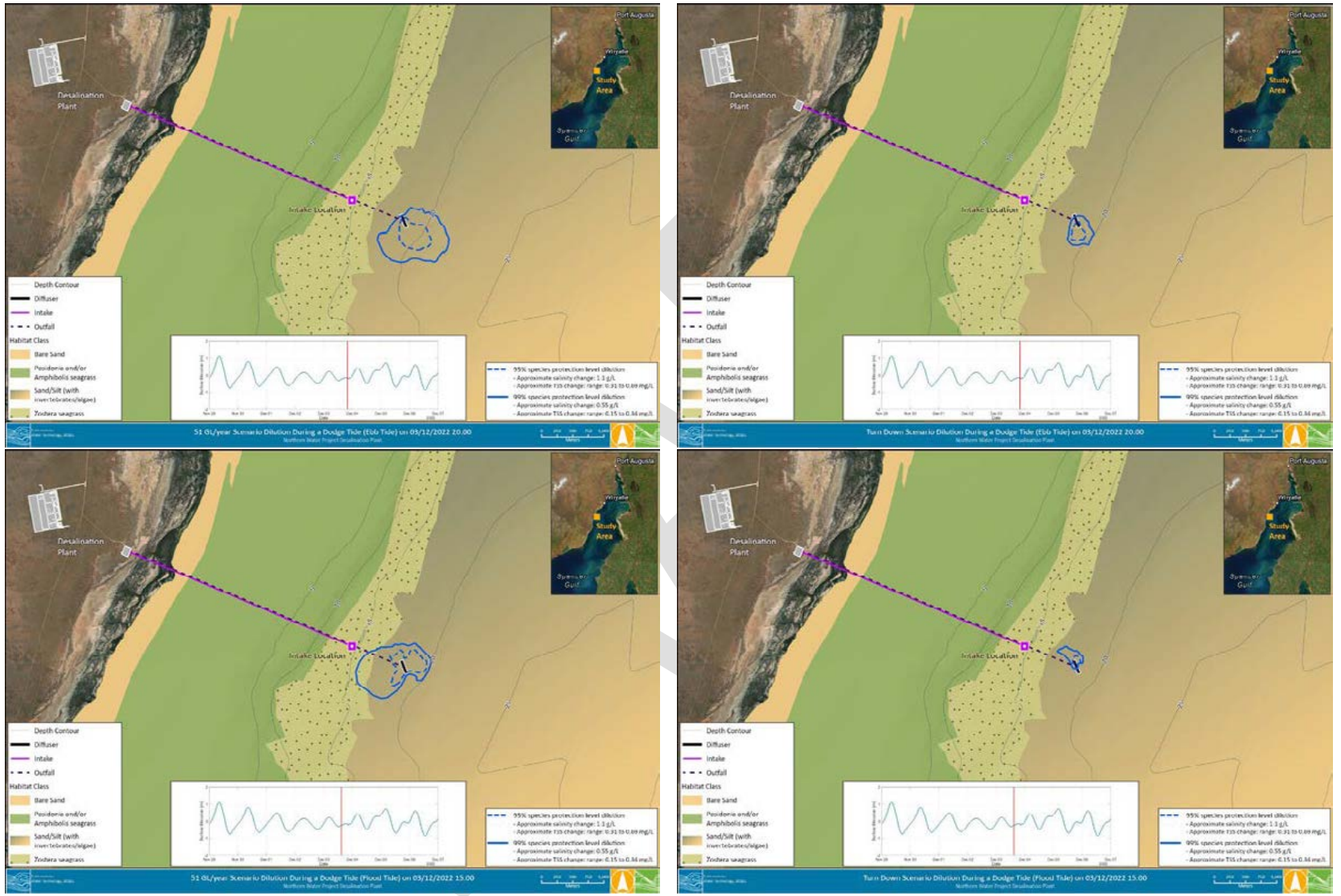


Figure 11-35: Instantaneous dilution contours (95% and 99% species protection) during an ebbing (top) and flooding (bottom) dodge tide for the 51 GL/y scenario (left) and turndown scenario (right)

In order to quantify impacted areas, 10th percentile dilutions were plotted displaying 95% and 99% species protection contours for all scenarios across each season. The interpretation of a 10th percentile dilution is equivalent to a model location experiencing dilution levels lower than (worse than) the given species protection for up to 10% of the time over the simulation period. This equates to approximately 3 days out of a month and is not continuous as the plumes move around.

Results were influenced by return water flow rates and to a lesser extent by season. For 51 GL/year, areas based on 10th percentile dilutions below 95% species protection level were between 10 Ha and 13 Ha, depending on season (refer Appendix G-3 and Table 11-10). For turndown scenarios, areas varied between 0.2 Ha and 1.4 Ha.

Areas with 10th percentile dilutions below 99% species protection level were more extensive, varying between 60 ha and 79 ha (51 GL/year), and 5.7 ha and 12 ha (turndown).

Average distances from the edge of the 95% species protection areas to the outfall (10th percentile dilution, refer Table 11-10) varied between ~190 m and ~230 m (51 GL/year), and ~30 m and ~70 m (turndown).

Given the irregular shape of the plumes, comparisons are better made using area than distance, and this will be applied for the impact assessment where relevant in Section 11.7. Both distances from and areas within the 95% species protection 10th percentile contours (i.e. areas of influence) are presented in Table 11-10.

Table 11-10: Distances from, and areas within, the 95% species protection 10th percentile dilution contour

Scenario	Period	Maximum distance (m) to outfall*	Average distance (m) to outfall	Area within 10th percentile dilution contour
Design capacity (51 GL/y)	Summer 2022-23	369	226	12.8 ha
	Autumn 2023	325	205	9.6 ha
	Winter 2023	299	190	9.6 ha
	Spring 2023	350	214	10.8 ha
Turndown (minimum capacity scenario (40 ML/d)	Summer 2022-23	92	67	1.4 ha
	Autumn 2023	56	32	0.2 ha
	Winter 2023	68	40	0.4 ha
	Spring 2023	57	37	0.5 ha

*Distance measured from the diffuser port closest to the outfall alignment

Dilution plots of the 10th percentile contours for the Reference Design case (51 GL/y) are presented for each season below in Figure 11-36, and all scenarios are presented in Appendix G-12. Dilution contours remain fairly consistent across seasons (refer Figure 11-36).

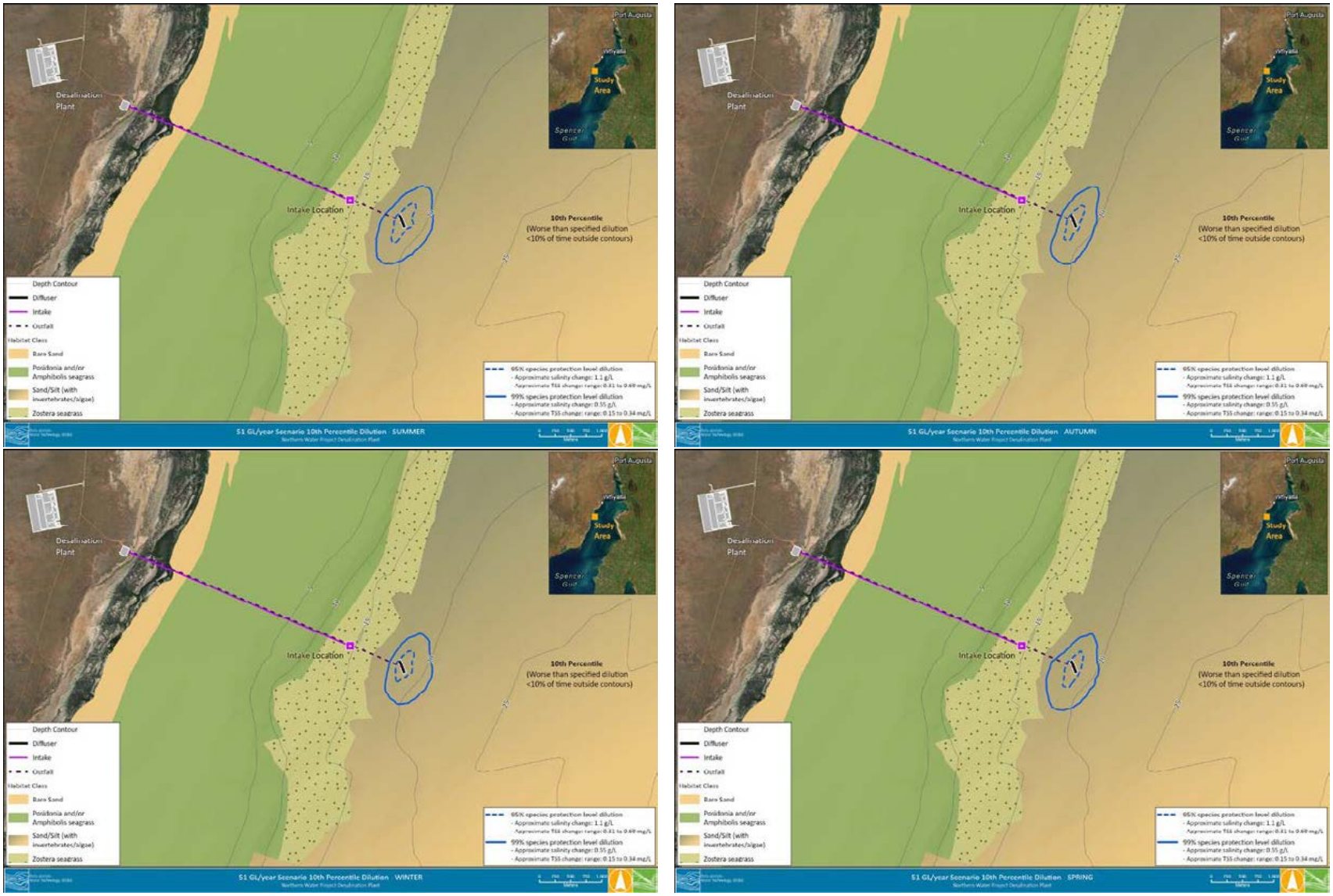


Figure 11-36: Dilution plots of the 10th percentile contours for each season for the 51 GL/y scenario (95% and 99% species protection)

Salinity change

Similar to dilution, instantaneous salinity change was assessed for dodge and subsequent spring tides for 51 GL/y and turndown scenarios (refer Figure 11-37 and Figure 11-38). Salinity change contours show the modelled instantaneous change in salinity (as a result of the return water) relative to measured salinity at a local reference point (i.e. change relative to 'natural' conditions). Similar patterns to the instantaneous dilution plots were evident with dodge tides showing the largest plume sizes and the spring tide plume covering a smaller area.

Seasonal patterns of salinity change were examined using maximum 24-hour averages of the salinity change contours (refer Figure 11-39).

A seasonal pattern was evident with salinity change contours covering the largest area in Summer and Autumn.

Areas based on salinity changes were derived using a composite of model results across the simulation periods using 24-hour maximum salinity averages (refer Figure 11-39). Areas with salinity changes over 1.3 g/L varied between 1.5 Ha and 3.0 Ha (51 GL/y), and 0.0 Ha and 0.044 Ha (turndown). It is noted that a 1.3 g/L contour forms the basis of the conditions within Adelaide Desalination Plant (ADP) EPA licence and does not apply to the Northern Water Project. A salinity change of 1.3 g/L would represent a conservative criterion for the Mullaquana Station site, as it experiences a comparatively higher ambient salinity range than at ADP. Average distances from the edge of these areas to the outfall varied between ~65 m and ~95 m (51 GL/y), and 0 m and ~35 m (turndown), though again due to the irregular shapes of the contours, areas of influence are better expressed in area (and are assessed as such in Section 11.7).

The full set of results and scenarios are provided in Appendix G-12 (Midfield modelling report).

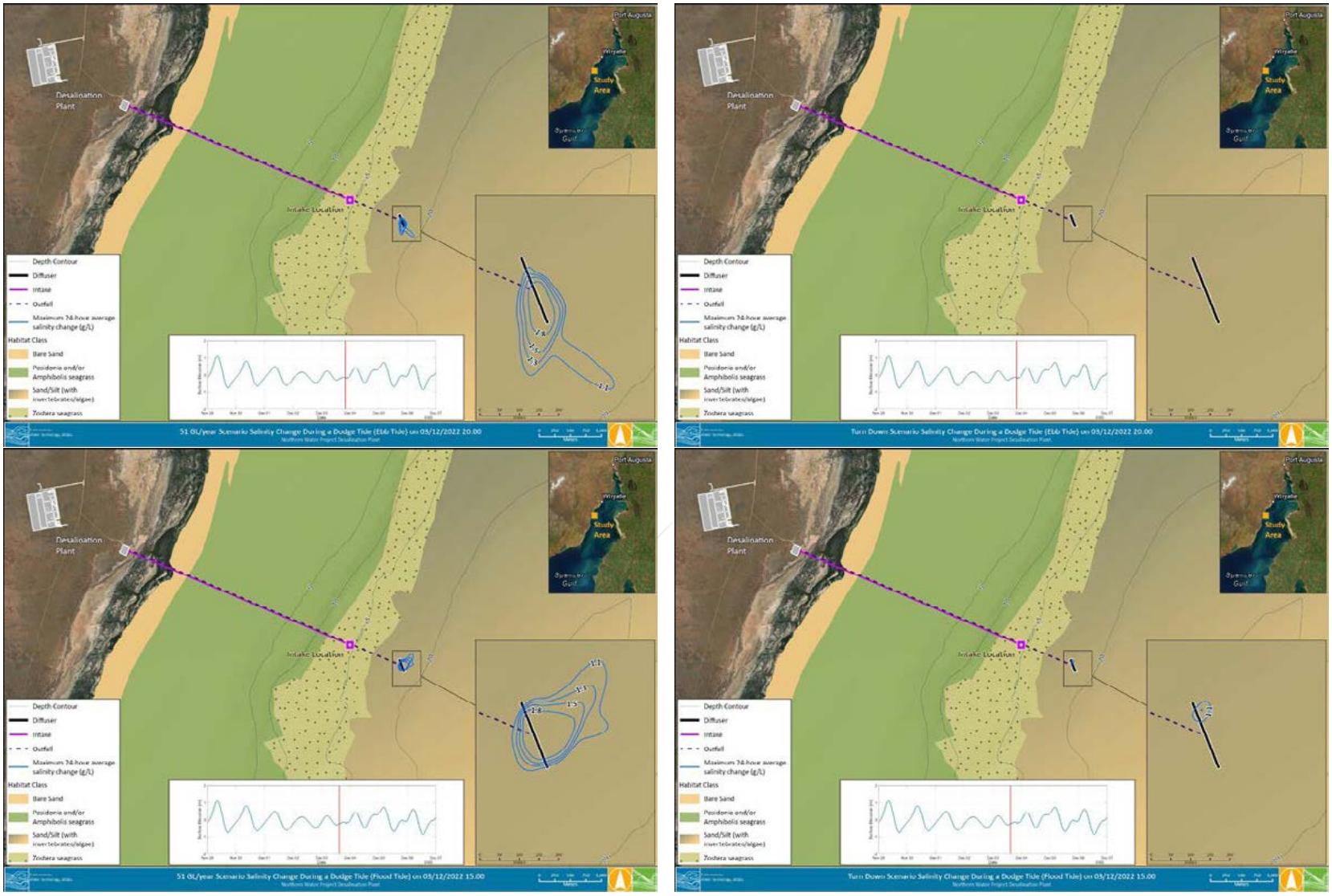


Figure 11-37: Instantaneous salinity change contours during an ebbing (top) and flooding (bottom) dodge tide for the 51 GL/y scenario (left) and turndown scenario (right)

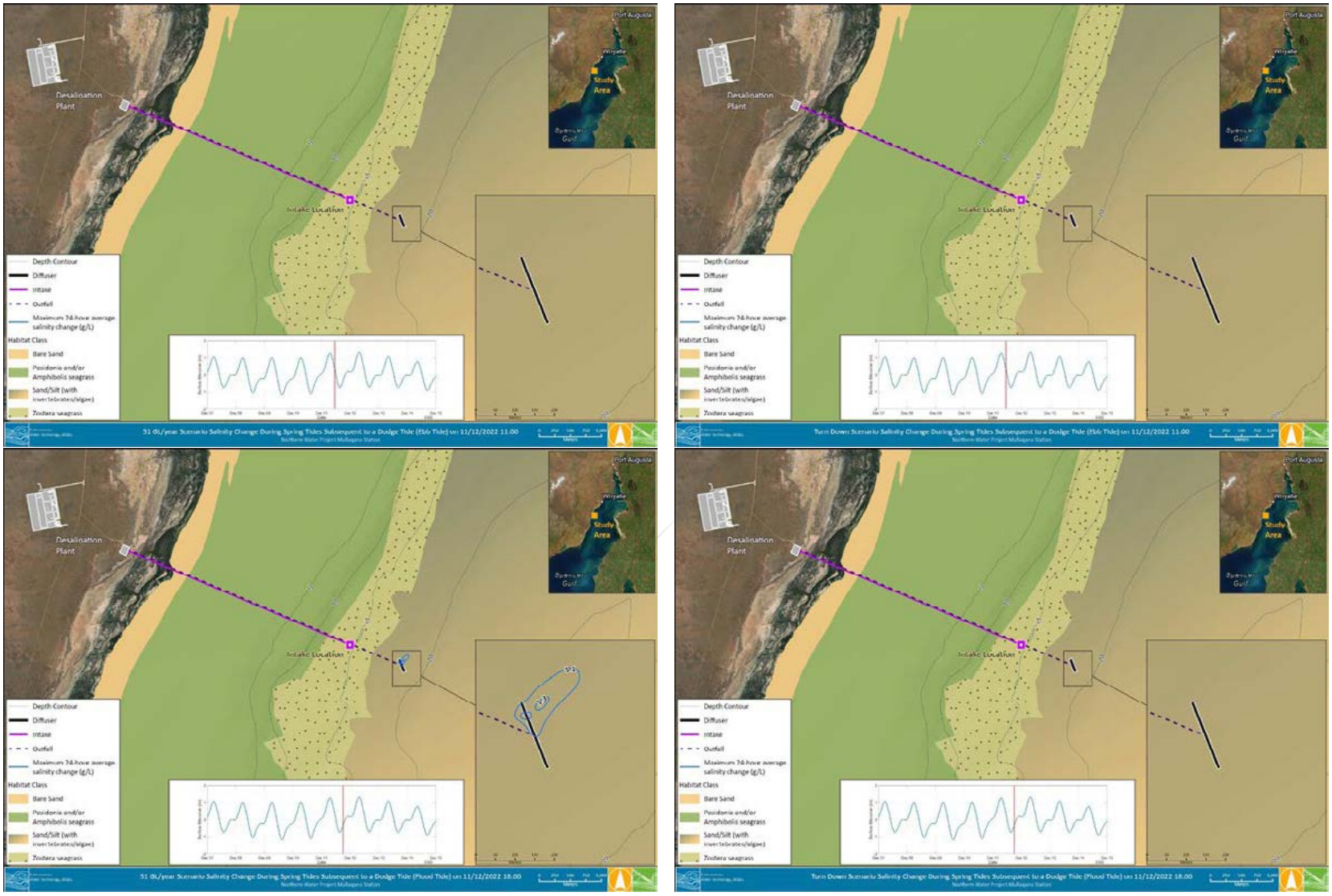


Figure 11-38: Instantaneous salinity change contours during an ebbing (top) and flooding (bottom) spring tide for the 51 GL/y scenario (left) and turndown scenario (right)

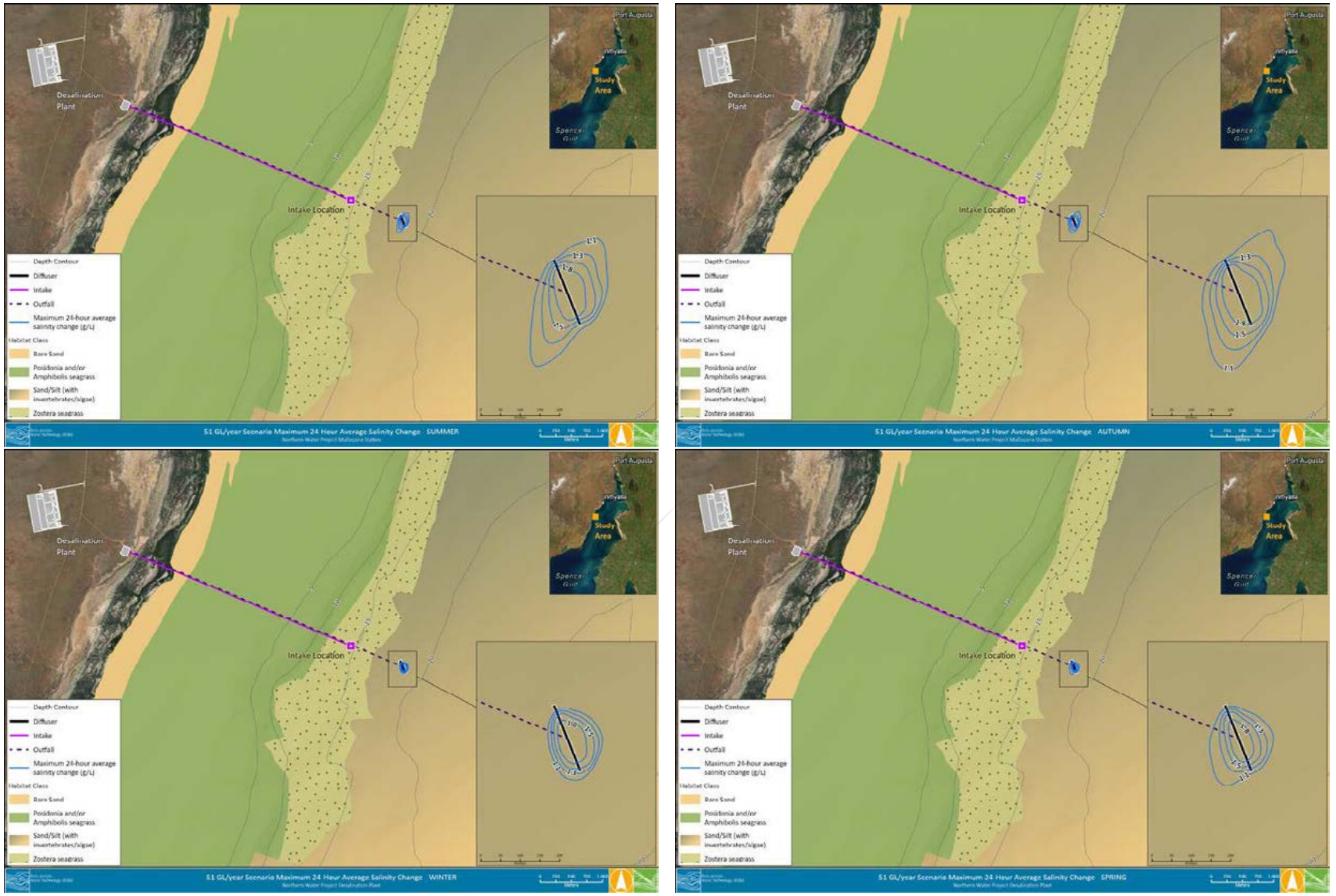


Figure 11-39: 24-hour Average Salinity Change for each season for the 51 GL/y design scenario

Total suspended solids (TSS)

TSS change was calculated based on dilutions, and assumed ambient TSS range of 7-17 mg/L and discharge TSS range of 12 - 35 mg/L.

The results of TSS modelling are displayed on the dilution scenarios figures above (Figure 11-34, Figure 11-35 and Figure 11-36). The TSS change at the 95% species protection contour is approximately 0.31-0.69 mg/L, and for the 99% species protection contour is 0.15 – 0.34 mg/L. The full set of TSS result maps are provided in Appendix G-12 (Midfield modelling report).

TSS model results indicate that suspended solids from the desalination plant backwash process have no impact on the receiving marine environment, as the modelled TSS changes are small and within natural variation.

The Project will utilise pre-treatment to address seawater quality scenarios with higher than normal suspended solids and organic matter. The desalination plant pre-treatment configuration will be confirmed as part of the detailed design. Adaptive management measures will be developed and set out in the Project OEMP (refer Chapter 6 Project Description for more information about pre-treatment).

In the case of high suspended solids and organic matter (including an algal bloom), pre-treatment (as described in Chapter 6) will result in the management of the filtered solids on land rather than backwashing to the marine outfall. In this instance there would be a reduction in the amount of suspended solids and organic matter from back wash in the return water as it is removed and not returned to the marine environment.

Temperature

Temperature differences between scenarios including and excluding the desalination plant discharge were examined by the modelling. The modelling of return water temperature assumed the return water (as it exits the diffuser ports) was 3°C higher than the intake water temperature (GHD 2025a). For each season, figures presented in Appendix G-12 show differences between the following:

1. **Median temperature from return water scenarios and the 80th percentile temperature in the baseline scenario**[14]
2. **Maximum temperature difference between return water and baseline scenarios.**

The figures presenting (1) above followed the similar process adopted to derive guideline values using reference-site data for slightly to moderately disturbed ecosystems (ANZG 2018). In this case, if median results of impacted sites do not exceed 80th percentile values of unimpacted sites, impacts may be considered acceptable.

The figures presenting (2) above were produced to demonstrate effects of temperature associated with the desalination plant discharge were minimal.

The difference between the median temperature under the scenarios and the 80th percentile temperature under the baseline ranged from -0.1 to -2.8 °C across different scenarios and seasons. The contours were practically identical across scenarios, indicating

[14] The baseline scenario in this context refers to the midfield model without simulation of the desalination plant return water (i.e. the baseline midfield model scenario).

that the differences were the same when taking the difference between median and 80th temperature percentiles of the baseline.

For the near bed maps, differences were closer to zero near the outfall, albeit still displaying negative values (>-0.1°C). For near bed contours >-0.2°C, differences between scenarios could not be readily discerned, indicating the effect of the desalination plant was minimal.

Figure 11-40 presents the 50th percentile of discharge minus 80th percentile baseline temperature for the Summer scenario.

The differences in maximum temperature between the scenarios and the baseline were small for all scenarios and seasons, generally less than 0.15 °C (being even lower near the surface), indicating that the impact on water temperature was minimal. Such small temperature differences would be difficult to distinguish from other environmental influences such as momentary solar heating, cloud cover, rainfall, upwelling and depth influences. Therefore, no further detailed analysis was undertaken.

The modelling results predict that the changes in temperature resulting from the Project return water discharge are very small and hence will not materially affect the ambient temperature conditions at the outfall.

Figure 11-41 presents the temperature difference between maxima for the Summer scenario.

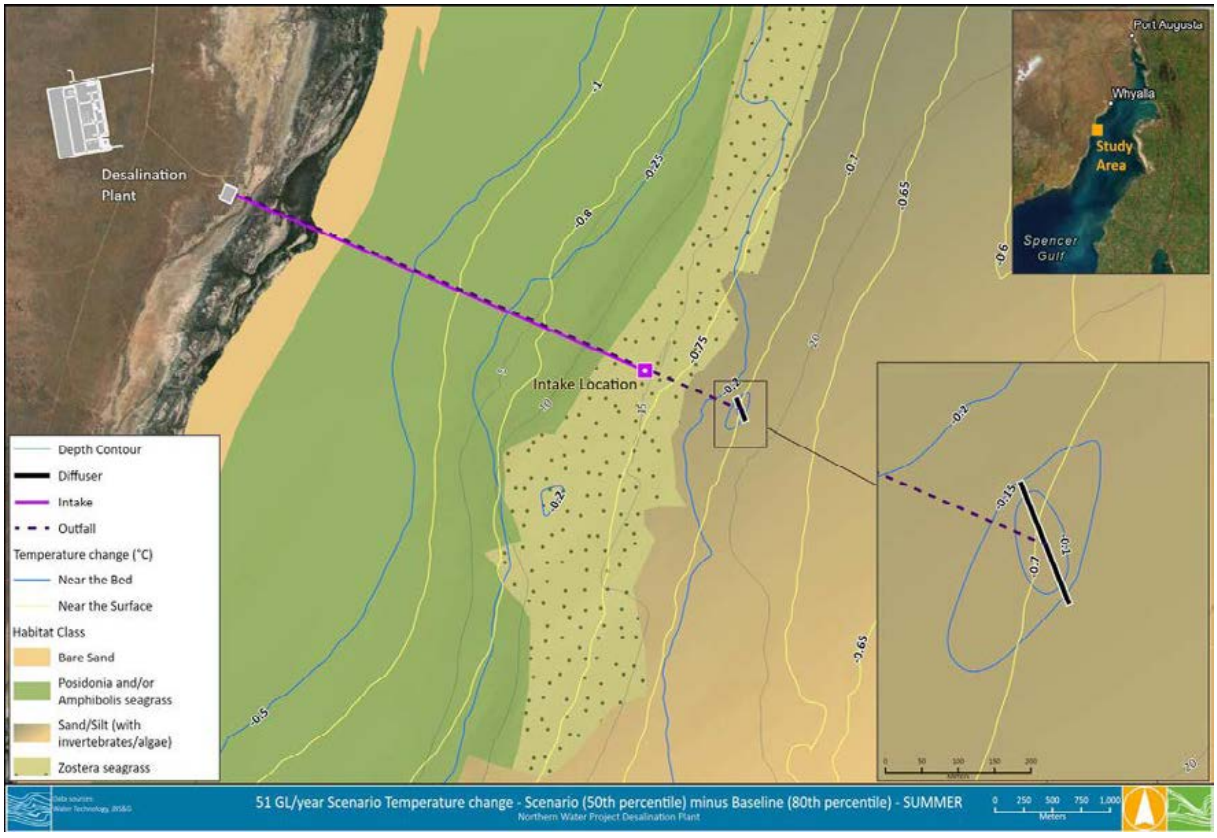


Figure 11-40: 51 GL/year Scenario Temperature change (Scenario 50th percentile minus baseline 80th percentile) – Summer

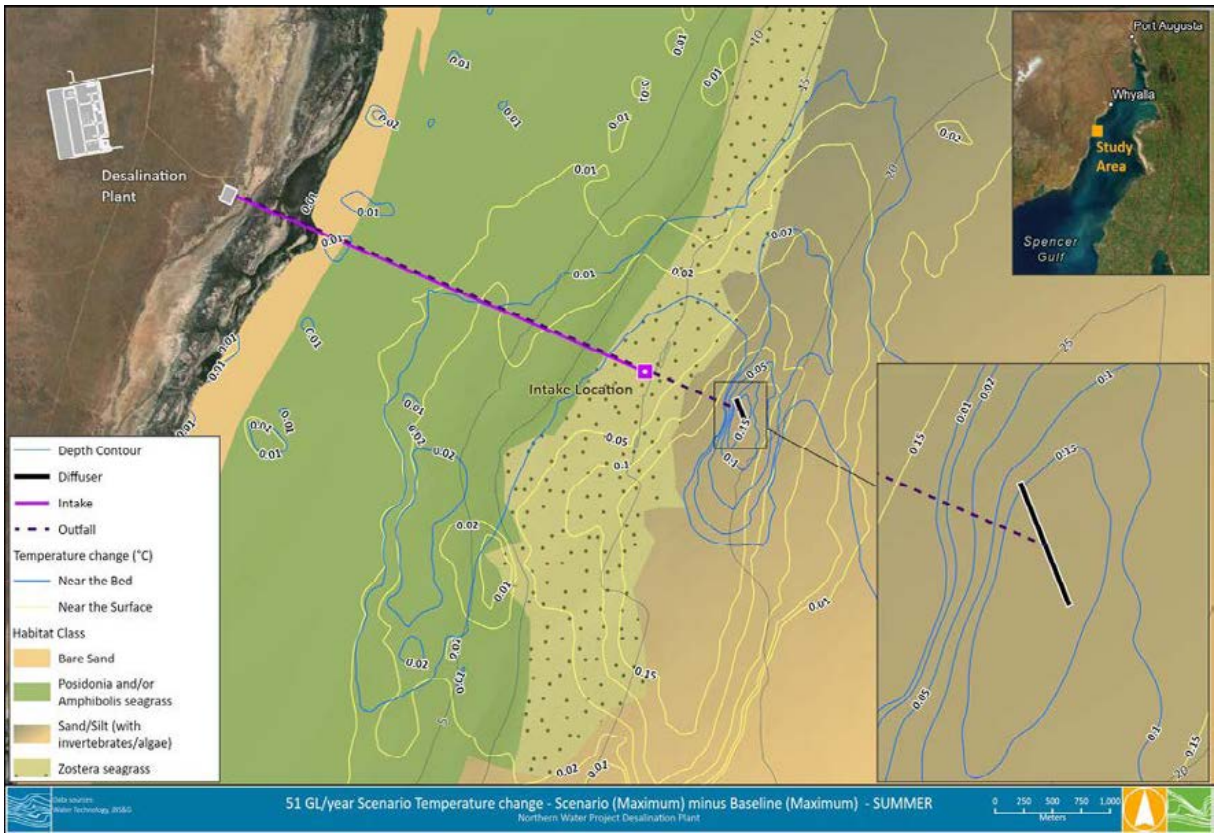


Figure 11-41: 51 GL/year Scenario Temperature change (maximum scenario minus maximum baseline) – Summer

Sensitive Receptors

At identified sensitive receptors (refer Figure 11-42), two locations in close proximity to the outfall ('Sand / bioturbation' and 'Sand / invertebrates / algae') showed 10th percentile dilution results lower than the 99% and 95% species protection level, while all other locations had dilutions well above the 99% criteria (refer to Table 11-11 below).

The 10th percentile dilution (minimum from all seasons[15]) for the 'Sand / bioturbation' location was 1 in 55. This location is very close to the diffusers and still represents a species protection level better than 95% (refer to location 6 on Figure 11-42).

The 10th percentile dilution (minimum from all seasons) 'Sand / invertebrates / algae' location was 1 in 21 which represents a species protection level only slightly below 95% (1 in 26). This is to be expected, as the sensitive receptor point is located extremely close to the diffuser (effectively co-located) (refer location 7 on Figure 11-42).

The following sensitive receptor locations all exceeded a 99.7% species protection level (refer Appendix G-3 Table 21) – nearby *Posidonia*, *Amphibolis* and *Zostera* seagrass habitat boundaries, intertidal mangrove boundary, Bryozoan beds, Upper Spencer Gulf Marine Park and Franklin Harbour Marine Park.

[15] Note, that the dilution values stated are the 'minimum from all seasons', which represents a worst case.

Table 11-11: Dilutions achieved at the nearest boundary to receptors and corresponding percentages of species protected

Receptor	10th percentile dilution (minimum from all seasons[16])	Corresponding approximate species protection level (%)
Intertidal mangrove boundary	319	>99
Posidonia sinuosa habitat boundary	212	>99
Zostera habitat boundary	105	>99
Posidonia / *Amphibolis* habitat boundary	249	>99
Sand / bioturbation	55	Slightly lower than 99[17]
Sand / invertebrates / algae	21	Slightly lower than 95[18]
Bryozoan community	152	>99
Posidonia australis habitat boundary	305	>99
Upper Spencer Gulf Marine Park	286	>99
Franklin Harbour Marine Park	597	>99

[adapted from Appendix G-3 Table 21]

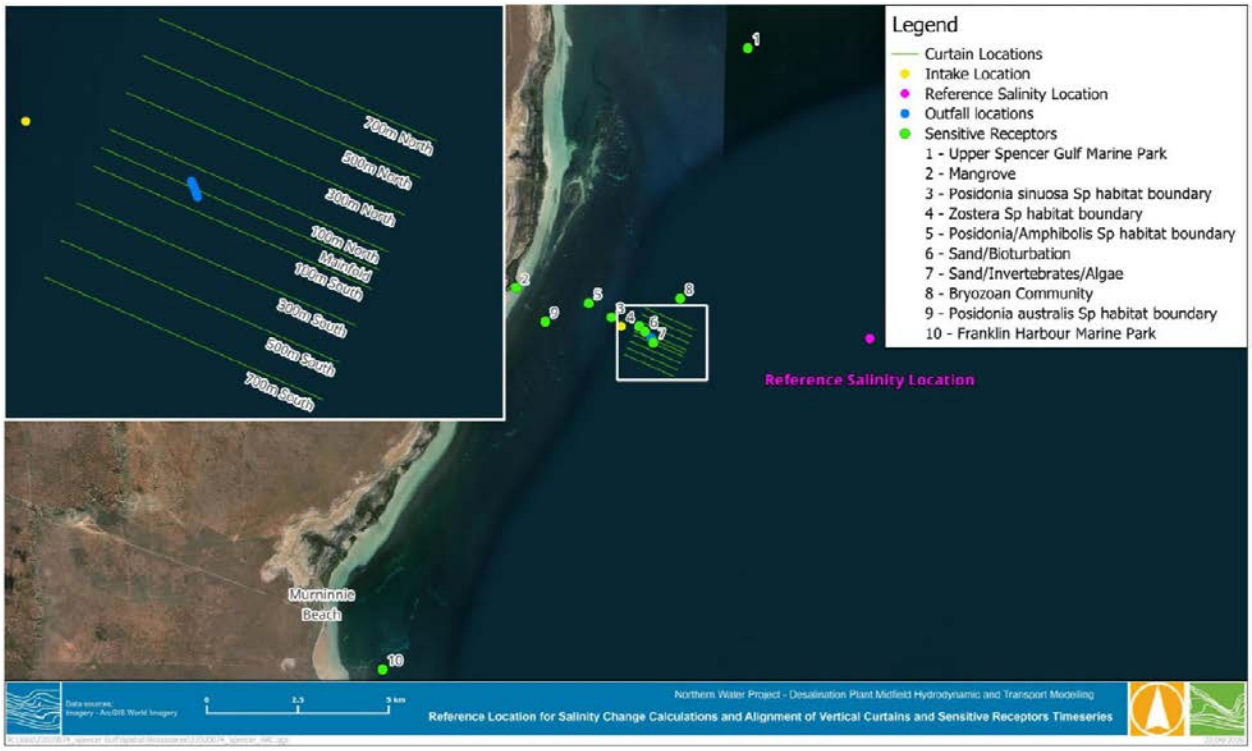


Figure 11-42: Sensitive receptors in vicinity of the Project showing location for alignment of vertical curtains

[16] Note, that the dilution values stated are the 'minimum from all seasons', which represents a worst case.

[17] 99% species protection is equal to a dilution factor of 1 in 53 (refer Table 11-9).

[18] 95% species protection is equal to a dilution factor of 1 in 26 (refer Table 11-9).

Stratification and dissolved oxygen

Midfield modelling presented salinity-change curtains across a range of segments parallel to the diffuser arrangement (as shown in Figure 11-42). These segments extended from 500 m inshore to 1.0 km offshore of the diffuser (first riser centreline). The curtains show the salinity stratification in proximity to the discharge.

The salinity curtain figures (refer example in Figure 11-43 below) display the composite maximum 24-hour average salinity average in relation to a reference location, and as such, they exacerbate the impacts of the discharge by creating a composite of worst 24-hour average simulated conditions (i.e. the figures present a conservative worst-case).

The return water discharge was shown to influence stratification up to 500 m from the outfall for brief periods of time. No clear differences were observed between seasons. An example from summer is presented below in Figure 11-43. The suite of figures for each scenario and each season is presented in Appendix G-12.

Stratification in terms of top to bottom difference was approximately ~0.4 g/L at 300 m to ~0.8 g/L at 100 m. Maximum difference of 0.9 g/L (for 73 GL/y scenario), noting that differences between the 73 GL/y and 51 GL/y scenarios in these curtains were not significant (the 73 GL/y showed higher salinities further up in the water column, and extending further offshore as the plumes moved downslope).

The near-bed saline layers away from the diffuser were of the order of 3 to 7 m from the bed. Beyond 500 m from the diffuser, salinities in the plume were dispersed throughout the water column and barely discernible at around 0.1 g/L or less than background.

The level of salinity change and associated salinity stratification was significantly reduced for turndown scenarios. At the manifold location, the stratification was confined near the seabed with bottom-to-top salinity differences of ~0.2 g/L.

A desktop analysis indicated that the duration and extent of the stratified layer was deemed insufficient to impact near-bed dissolved oxygen concentrations. The modelling results indicate that dissolved oxygen depletion is unlikely to happen as a result of the return water discharge (refer Impact Assessment Section 11.7.4 and Appendix G-12 for further details).

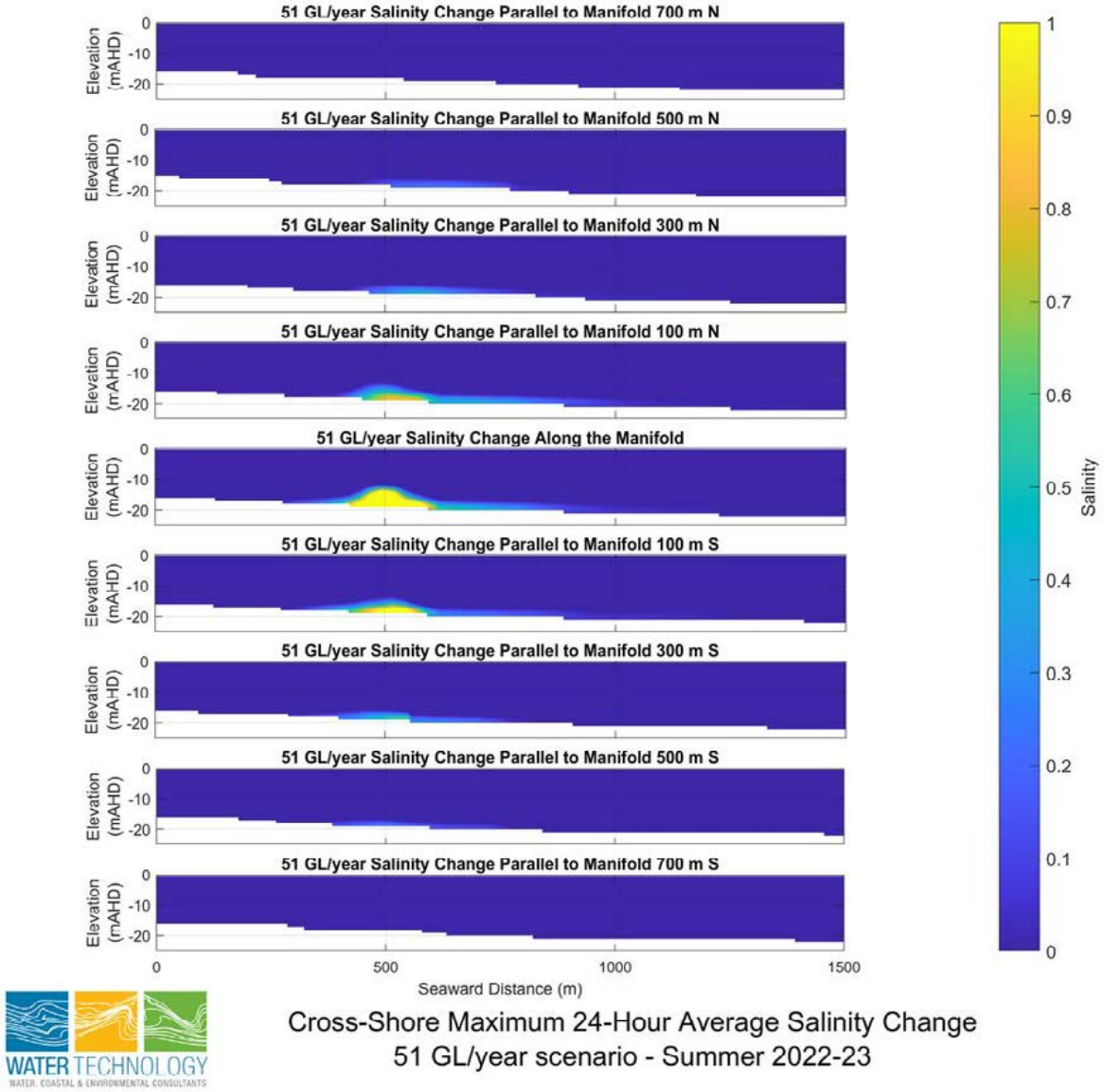


Figure 11-43: Salinity change curtain profile showing maximum 24-hour average salinity average in relation to the diffuser reference location – Summer 2022-23 (51 GL/y only)

Intake Connectivity

Assessment of salinity changes at the intake location indicated a negligible increase in the feed water salinity. Timeseries and cumulative distributions for each of the simulations are shown in Appendix G-12 (refer Figures 4-42 and Figure 4-43). Differences to the baseline were generally small with the largest differences associated with the transition from neap tides to spring tides during ebb tides. The maximum change to the baseline for the 51 GL/y scenario was approximately 0.25 g/L (corresponding to a single predicted data point in Spring, with other maximum peaks typically well below 0.2 g/L). Median changes were less than 0.075 g/L for the 51 GL/y scenario (occurring in Spring, with other seasons substantially lower). The maximum and median changes of the turndown scenario were below 0.2 g/L and well below 0.05 g/L, respectively.

The ambient salinity range for the Project site is 38 to 41 g/L, hence median salinity changes at the intake of less than 0.075 g/L (for the 51 GL/y scenario) are considered negligible.

Larval entrainment at desalination plant intake

Using the farfield model as described in Section 11.3.2, biophysical modelling of planktonic larval connectivity for key commercial fishery species indicated that for Western King Prawns (*Penaeus (Melicertus) latisulcatus*, WKP) less than 2.7% and King George Whiting (*Sillaginodes punctatus*, KGW) less than 0.0029% of the released larvae were likely to be at risk of coming within ~1 km of the desalination plant intake. For Snapper (*Chrysophrys auratus*), less than 7.4% were likely to come within ~1 km of the intake. These percentages are conservative as they take the highest predicted value from three model years (2020, 2021 and 2022).

To find out what fraction of these particles will actually be at risk of entrainment, the midfield particle tracking model simulated regular particle releases in a 1-km-side square (for Prawns and KGW) and a 2-km diameter heptagon (for Snapper) around the intake, and obtained the proportion of released particles likely to be entrained into the seawater intake structures.

The model determined that entrainment proportions were mostly below 4.68% for the Prawn larvae, below 6.31% for King George whiting, and below 0.26% for Snapper larvae (with behaviour).

Lower entrainment proportions were observed for Snapper with behaviour (active movement) incorporated into the model than for Snapper without behaviour (i.e. passive). The difference is largely attributed to the tendency of the juvenile Snapper to preference the upper water column in the earlier days of development (<11.5 days), that keeps the juvenile Snapper away from the intake which is situated in the lower half of the water column. Entrainment results for both Snapper 'with behaviour' modelled and 'passive' behaviour are presented in Table 11-12.

Table 11-12: Larval tracking and entrainment results based on worst-case (highest entrainment) year modelled

Larval Taxa	Far to Midfield	Midfield to intake	Proportion entrained
Prawn	2.7%	4.68%	**0.13%**
King George Whiting	0.0029%	6.31%	**0.0002%**
Snapper	7.4%	0.26% (with behaviour) 3.23% (passive)	**0.019% (with behaviour)** **0.24% (passive)**

The particle releases, and associated proportion of entrained particles, did not correspond to the broader Spencer Gulf spawning areas and were in fact, assumed over a significantly smaller area with scales relatively similar to the farfield model scales. Hence, the results assessed in Section 11.7.9 are presented in conjunction with the population-wide assessment undertaken as part of the farfield modelling simulations (refer Appendix G-13.).

The entrainment modelling takes a conservative approach, using the hypothetical highest capacity scenario of 73 GL/y, providing confidence that predicted entrainment results would likely be lower for the design capacity (i.e. 51 GL/y).

11.7 Impact Assessment

Understanding how the Project will interact with the marine environment has been a key focus of the Project planning and design phase. Fundamentally, the Project involves seawater extraction and discharge of desalination return water into Spencer Gulf. The environmental considerations that have helped to drive the design and siting of the desalination plant include local geology, ecology, oceanography and marine water quality.

The impact assessment will describe how the desalination plant construction and operation interact with the marine environment and assess potential impact to marine environment values.

11.7.1 Marine environmental values summary

The environmental values have been a key consideration in Project planning and design and have formed the basis for the impact assessment and mitigation for the Project.

The key marine environmental values relevant to Mullaquana Station are described in detail in Section 11.4. Key ecological values of USG and the marine environment off Mullaquana Station include:

- **Unique marine environment of USG:** Spencer Gulf is a large, sheltered tidal estuary with minimal freshwater inputs, leading to high salinity levels, especially in the upper reaches. The USG supports important habitat for key commercial fisheries, aquaculture, provides nursery grounds for many juvenile fish species and provides habitat for other highly valued marine species including the Giant Australian Cuttlefish breeding grounds off Point Lowly.
- **Water quality:** Water quality is a critical factor for ecological health, influencing species survival and habitat integrity.
- **Habitats within the MSA:** The marine environment adjacent Mullaquana Station supports diverse marine habitats including mangroves, seagrass beds, bare sand, algae and habitat-forming invertebrates.
- **Commercial and Recreational Fisheries:** The habitats represented at the Mullaquana Station MSA provide important habitat for fisheries species including Western King Prawn, Snapper, King George Whiting, and Blue Swimmer Crab.
- **Biodiversity:** Species of conservation significance with the potential to occur within the MSA include Southern Right Whale, Australian Sea Lion, Loggerhead Turtle, Green Turtle, Leatherback Turtle, White Shark, and other protected species such as syngnathids.
- **Cultural Significance:** Indigenous connections to the marine environment are strong and culturally significant.

The marine baseline studies undertaken for the Project provide a robust understanding of the existing environment and includes data pre, during and post the 2025 / 2026 South Australian HAB passing through the MSA. An assessment of commercial fishery stocks as part of the extensive SARDI Algal Bloom Response in South Australia concluded that the algal bloom has had the strongest negative effects in Gulf St Vincent, and Spencer Gulf fisheries appear to be less affected, except for Southern Calamari (SARDI 2026f). In relation to marine environmental values, it is acknowledged that habitats and species effected by the HAB will require time to recover from those effects.

11.7.2 Potential sources of impact

The following Project aspects have been identified as potential sources of impact on the marine environment.

Key sources of potential impact during **construction:**

- seabed disturbance, dredging and suspended sediments at marine construction locations
- minor *Zostera* seagrass clearance at the intake location (and for the float and sink pipeline option case)
- underwater noise and vibration (from the tunnel boring machine (TBM), dredging and marine construction)
- introduction and spread of invasive marine species from presence of construction vessels
- waste – including the buried TBM head/s upon completion of construction.

Key sources of impact during **operation:**

- return water salinity, TSS, temperature and other constituents
- entrainment at the marine intake
- underwater noise
- light spill from the desalination plant
- stormwater runoff from desalination plant site
- maintenance vessels - introduction and spread of invasive marine species
- new substrates/infrastructure in the marine environment.

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of certainty in the assessment are also provided for each impact event, as per the Impact Assessment process described in Chapter 8 Impact Assessment Methodology.

Potential impacts to the marine environment and its values have been assessed through detailed baseline studies and an impact assessment including ecotoxicology investigations and marine hydrodynamic modelling, as described in Section 11.5.

As mentioned in Section 11.5, an option to the Reference Design is being considered for construction of the marine intake and outfall.

The impact assessment will focus on the Reference Design, and where the impact differs for the Option case, the impact assessment is presented in Section 11.7.13 Options Assessment.

11.7.3 Design modifications to protect environmental values

Desalination plant location

The siting process for the desalination plant involved careful consideration of environmental impacts and stakeholder input. Further detail is provided in Chapter 5 Project Siting, Alignment and Optimisation, and key factors include:

- **location selection:** sites were evaluated based on potential water users / offtake, potential impacts on local ecosystems, and community concerns
- **engagement with stakeholders:** ongoing discussions with Traditional Owners and local landowners helped identify and address environmental and cultural values
- **impact assessments:** preliminary assessments were conducted to evaluate potential effects on the marine environment, leading to informed decisions about the most suitable location for the plant.

Overall, the siting aimed to balance operational needs with environmental protection and community/stakeholder interests.

Design modifications

The design modifications for the desalination plant focused on enhancing environmental protection following the outcomes of stakeholder engagement and initial impact assessment. Key changes included:

- **tunnel construction method:** The decision to use a TBM minimised seabed disturbance, protected intertidal mangroves, tidal flats and slow growing *Posidonia* seagrass, and minimised ongoing seabed obstruction.
- **diffuser design adjustments**: Initial diffuser designs were refined based on preliminary modelling to improve performance to meet 95% and 99% species protection levels. Improvements included alignment of the diffuser array aimed at enhancing environmental outcomes.
- **seawater bypass flows to optimise dilution:** The Reference Design includes a seawater bypass system that allows unprocessed seawater to be blended with return water before discharge. This provides an operational contingency during low-flow or turndown conditions, when dilution and dispersion performance may be more challenging. By reducing return water salinity and density, and maintaining discharge velocity through the diffuser ports, bypass flows can improve initial mixing and reduce the potential for dense plume formation near the seabed.
- **flexible pre-treatment design in the desalination process:** Flexibility and optionality is required in the desalination plant pre-treatment design to ensure high turbidity events (including potential algal blooms) can be appropriately managed.

Overall, these modifications were made to better safeguard local ecosystems while ensuring the operational efficiency of the desalination plant.

Management of Uncertainty and Diffuser Performance Validation

The hydrodynamic and dispersion modelling undertaken for the Project has adopted conservative assumptions and has informed the development and optimisation of the Reference Design diffuser configuration. The diffuser design will be further refined through detailed design processes, including additional modelling and independent peer review where appropriate.

Following construction, commissioning and operational monitoring will be undertaken to verify diffuser performance and confirm the assumptions adopted during the modelling and

design process. Monitoring results will be used to assess compliance with diffuser performance criteria and relevant environmental performance objectives.

Where monitoring indicates diffuser performance criteria are not being achieved, adaptive management measures described in Chapter 6 Project Description will be implemented. These may include operational optimisation, use of seawater bypass flows where applicable, implementation of adaptive diffuser design measures and, where required, further engineering assessment and modification of marine infrastructure.

11.7.4 Effects of return water on marine environment during operation

Natural variability in salinity in the marine study area

Salinity in Spencer Gulf is influenced by multiple factors, including evaporation, water stratification, density-driven water movement, and freshwater inputs from creeks and runoff. Consequently, the north-south salinity gradient within the Gulf is significantly affected by seasonal variations and weather patterns, resulting in salinity differences of up to 15 PSU between the entrance and the northern reaches of the gulf.

At Mullaquana Station, salinity measurements from ADCP data in 2023, and water quality monitoring in 2025 to 2026 revealed notable seasonal variability, ranging from approximately 38 to 41 g/L. The highest salinities were recorded in winter, while the lowest were in late spring through summer (refer Appendix G-1). Natural variation in salinity over the course of a year is typically around 2 g/L. Summer months exhibited the greatest variability, with significant fluctuations in measured salinity (refer Figure 11-6).

In perspective, the predicted salinity increase at an average distance of 100 m from the diffuser, is less than 1.3 g/L, well below the site's natural seasonal variability (refer to Appendix G-12, Table 4-5).

Zone of potential ecological effect

Localised ecological effects may be discernible for a limited distance around the outfall location as the plume of return water dissipates to background levels, or to levels where WET testing shows that representative local species are protected from chronic impacts from the return water.

The Assessment Requirements stipulate that the degree of dilution must ensure that '95% protection level' of representative local species are protected from any chronic impacts from the discharge. The mixing area with dilutions below the 95% protection level (i.e. worse than) may therefore be considered the return water zone of potential ecological effect for any single scenario.

In order to interrogate potential impacts of the Project, this EIS will refer to the zone of potential ecological effect that overlays the 95% species protection dilution contours for the 51 GL/y scenario and the turndown scenario across all seasons, providing a worst-case "footprint" for the Project (based on the Reference Design) (refer to Figure 11-44). The modelled 73 GL/y high-capacity case is not included in the return water zone of ecological effect as it is a hypothetical scenario (though some comparisons are made to provide confidence in the assessment). In addition, assessment of dodge tide scenarios is provided in a specific impact event analysis.



Figure 11-44: Zone of potential ecological effect (51GL/y - union of the 10th percentile dilution contours for 95% species protection levels for all seasons)

Impact event analysis

Return water dilution and dispersion

Return water dilution and dispersion will achieve 95% marine species protection in close proximity to the diffuser.

The hydrodynamic modelling results for the desalination plant return water discharge conclude that dispersion and diffusion will be effective to ensure marine species protection as per Assessment Requirements (i.e. at the 95% species protection trigger value distance from the diffuser).

The return water zone of potential ecological effect is shown in Figure 11-44 which shows that the area potentially affected by dilutions below the 95% protection level was approximately 13 ha, across all seasons combined. The 95% footprint extends up to about 12 m inshore from the diffusers, 190 m offshore, 330 m alongshore to the north-east and 370 m to the south-west, which is its furthest distance from the diffusers (refer Appendix G-3 and Appendix G-12, Table 4-2).

At identified sensitive receptors (Figure 11-42), two locations in close proximity to the outfall ('Sand / bioturbation' and 'Sand / invertebrates / algae') showed 10th percentile dilution results lower than the 99% and 95% species protection level, while all other locations had dilutions well above the 99% criteria (refer to Table 11-11 and section 11.6.3).

The following sensitive receptor locations all exceeded a 99.7% species protection level (refer to Appendix G-3, Table 21): nearby *Posidonia*, *Amphibolis* and *Zostera* seagrass habitat boundaries, intertidal mangrove boundary, Bryozoan beds, Upper Spencer Gulf Marine Park and Franklin Harbour Marine Park.

Figure 11-45 shows the identified sensitive receptor locations in relation to the zone of potential ecological effect (union of 10th percentile contours for 95% protection levels across all seasonal simulation).

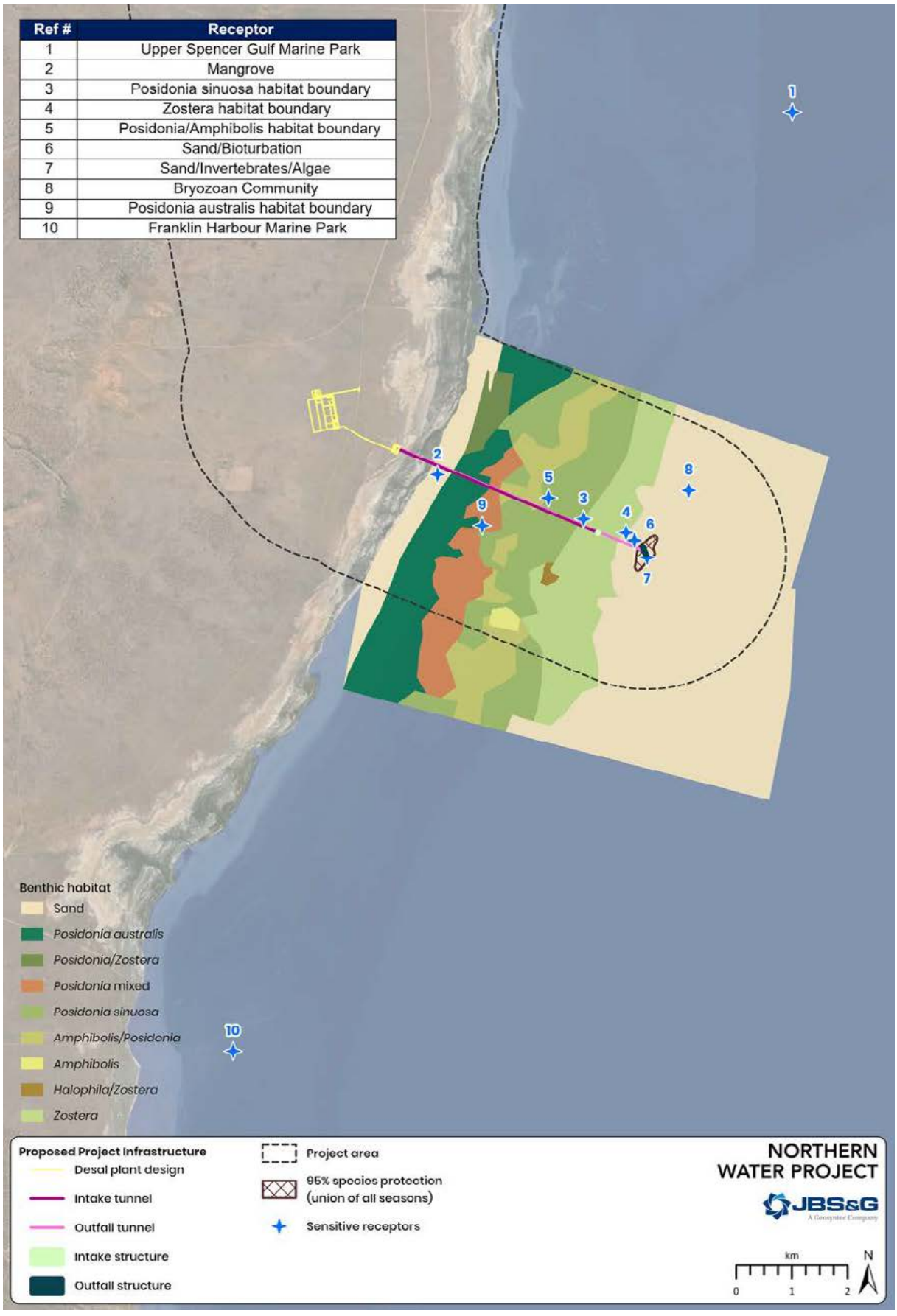


Figure 11-45: Sensitive receptors in relation to zone of potential ecological effect (51GL/y - union of the 10th percentile dilution contours for 95% species protection levels for all seasons)

The seawater bypass system described in Section 11.7.3 provides an additional operational control during low-flow or turndown operating conditions where maintaining discharge velocity and achieving required mixing and dilution performance objectives presents the greatest operational challenge.

The return water dilution and dispersion will be effective to achieve 95% marine species outside the zone of potential effect shown in Figure 11-44. The expected impacts within the highly localised zone of potential effect are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** due to the tested, validated model based on quality datasets, and conservative assumptions providing accurate or over-estimated predictions (refer Appendix M).

Potential accumulation of salinity during dodge tides will be short-term and is not expected to lead to significant stratification

Mixing conditions during dodge tides (i.e. 1-2 days of limited tidal movement every fortnight) may lead to short-term and temporary accumulation of salinity in marine waters during neap and dodge tides, especially during the transition from high tide to ebbing conditions. Model scenario results for dodge tides and stratification are presented in Section 11.6.3 and specifically Figure 11-35, Figure 11-37 and Figure 11-43.

Figure 11-35 shows the instantaneous dilution changes during a dodge tide with 95% species protection contours only extending over sandy habitats and no contact with the boundary of the *Zostera* seagrass.

The modelled return water discharge was shown to influence stratification up to 500 m from the outfall for brief periods of time only (refer Appendix G-12 and Figure 11-43). A desktop analysis indicated that the duration and extent of the stratified layer was deemed insufficient to impact near-bed dissolved oxygen concentrations. The modelling results indicate that dissolved oxygen depletion is unlikely to happen as a result of the return water discharge (refer Appendix G-12 for further details).

The expected impacts to marine biota from stratification and dilutions of return water during dodge tides are in the **Negligible** category and the level of **certainty** in the expected impact is **High** (refer Appendix M).

Temperature of the return water will not impact on the marine environment

The desalination plant return water as it exits the outfall is expected to be approximately 2 to 3°C higher than the sea water intake temperature (GHD 2025a). The increase in temperature is mainly attributed to the process of pumping the return water. The baseline data indicates significant temporal natural variation in marine water temperature.

As discussed in Section 11.6.3, the return water modelling showed minimal difference between scenarios with and without the desalination plant operation due to the effective mixing achieved by the diffusers. Negligible changes to temperature were well within the natural variability at close proximity to the diffusers, and expected to have no impact on the receiving environment.

The expected impacts of the temperature of return water during operation of the desalination plant are in the **Negligible** category and the level of **certainty** in the assessment of expected is **High** (refer Appendix M).

Impacts to benthic habitats and communities

The return water is not expected to impact on habitat-forming mangrove, seagrass and Bryozoan communities

Seagrass, bryozoans and mangroves are the key habitat-forming species in the MSA and are not expected to be impacted by the desalination plant return water. Modelled return water dilution at the boundary with these habitats are adequately high to protect these habitats from chronic impact, as presented above in Table 11-11.

Table 11-11 sets out the 10th percentile dilutions achieved at the nearest boundary to receptors and corresponding percentages of species protected (adapted from Appendix G-3 Table 21). The following sensitive receptor locations all exceeded a 99.7% species protection level – nearby *Posidonia*, *Amphibolis* and *Zostera* seagrass habitat boundaries, intertidal mangrove boundary, Bryozoan beds, Upper Spencer Gulf Marine Park and Franklin Harbour Marine Park.

The return water zone of potential ecological effect is shown in Figure 11-44, showing no effect is expected within these habitats.

The instantaneous model scenario[19] for flooding dodge tide is the only instance where the return water reaches the *Zostera* seagrass for the 99% species protection contour (Figure 11-35). Importantly, there are no scenarios where the 95% species protection contour reaches the *Zostera* seagrass boundary (for all instantaneous and 10th percentile scenarios, and for both 51 GL/y and 73 GL/y).

The distance from the diffuser to the boundary of the mangrove and Bryozoan communities are substantially larger than for *Zostera* seagrass – indicating that impact is not expected at all of these receptors.

The mangrove and seagrass communities have a demonstrated tolerance for higher levels of salinity than would be experienced as a result of return water discharge as inferred from their distribution higher in the gulf. Each of the habitat-forming seagrass species, *Avicennia marina*, *Posidonia australis*, *Posidonia sinuosa*, *Amphibolis antarctica* and *Zostera nigricaulis* have been recorded near Red Cliff Point in USG (Shepherd 1973, 1983, Shepherd & Branden 1974), suggesting that they can tolerate salinities up to at least 45 g/L (Johnson 1981).

The expected impact to the habitat-forming mangrove, seagrass and Bryozoan communities from the return water are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

The zone of potential ecological effect may have minor, localised, and intermittent impact on sand habitat

Impacts on sand habitats and communities are expected to be highly localised (refer Figure 11-44), minor and intermittent. Spatial predictions suggest that 95% of species would be

[19] Note that instantaneous model scenarios are different to 10th percentile dilution scenarios.

protected from chronic impacts associated with the return water beyond an area of 13 ha in sandy habitats surrounding the diffuser (across all seasons).

The zone of potential effect is situated over sand habitat (refer Figure 11-44). The sandy habitat beyond approximately -15 m (AHD) was consistent with the regional benthic Association described by Grammer et al. (2025), characterised by silty sand with habitat typically composed of medium and sparse algae, bivalve shell, low amounts of sparse bryozoans (refer Association 1 in Figure 11-46). The most abundant sessile taxa in this association were ascidians and sponges, with low numbers of holothurians and bivalves. The area within Association 1 that is deeper than 15 m, and likely to have similar habitat to the area within the safe dilution contours, is estimated to be between 69,200 ha (Appendix G-3) and 88,700 ha, refer blue hatching in Figure 11-46 (inset). The 95% species protection dilution footprints (or zone of potential ecological effect) for the 51 GL/y scenario represents less than 0.02% of this area.

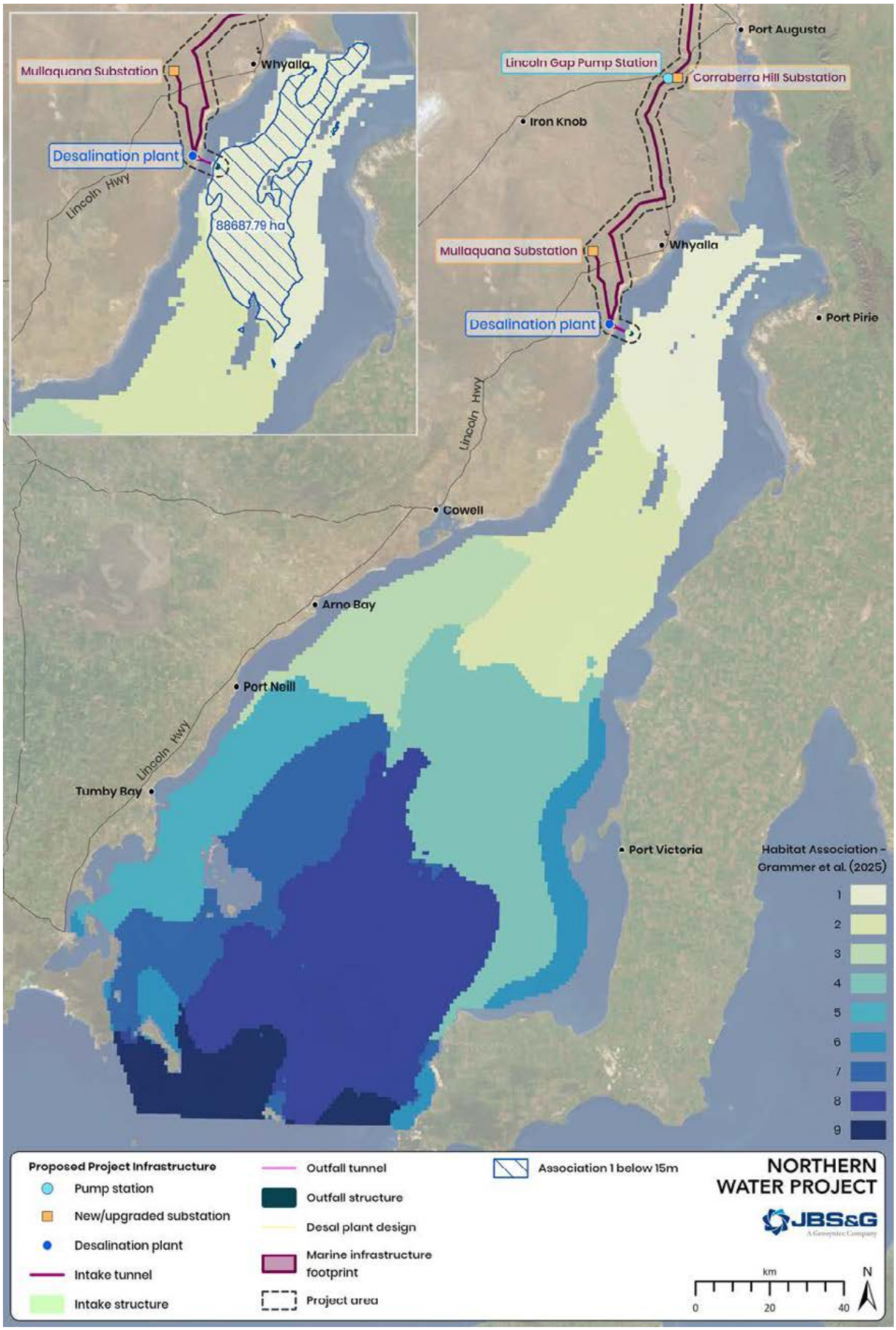


Figure 11-46. Regional Benthic Habitat Associations and sandy habitats 15+m depth

[Adapted from sources: Grammer et al. 2025 (for benthic habitat association spatial data) and Appendix G-3]

The sessile habitat forming species that inhabit the sandy areas are well represented throughout Spencer Gulf within defined depth ranges (refer Figure 11-46). Most epibenthic species present have a tolerance for higher salinity than would be experienced as a result of return water discharge, often occurring in salinities well above 40 g/L. The presence of these tolerant species in USG indicates that the subtidal invertebrates in the area can adapt to salinity levels higher than those expected from the return water discharge.

Salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability within the MSA for most of the year (refer Section 11.6.3 and Appendix G-3). Therefore, potential impacts on sandy habitat within the zone of potential ecological effect are expected to be minor and localised.

The expected localised impacts to sand habitats from the desalination plant return water are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** due to the robust model used to predict impact, along with the conversative approach to modelling and high representation of the impacted habitat throughout USG (refer Appendix M).

Dilution of the return water would be effective and ensure protection of epibenthic fish and invertebrates

Plume dispersion modelling predicts that return water mixing and dilution would be effective to protect fish and invertebrates from chronic impact as the 95% species protection level is achieved in close proximity to the diffusers (outside a 13 ha area, across all seasons).

For most of the year salinities beyond the immediate vicinity of the diffusers would be within the range of ambient seasonal variation at the site. The following sensitive receptor locations all exceeded a 99.7% species protection level – nearby *Posidonia*, *Amphibolis* and *Zostera* seagrass habitat boundaries, intertidal mangrove boundary, Bryozoan beds, Upper Spencer Gulf Marine Park and Franklin Harbour Marine Park.

As mentioned above, the zone of potential ecological effect covers 13 ha in sandy habitat around the outfall location, representing less than 0.02% of that habitat available through the USG. It is likely that fish and other mobile invertebrates will move away from localised unfavourable water quality conditions immediately adjacent the diffusers (such as elevated salinity), avoiding chronic or enduring physiological or behavioural impacts. There is substantial alternative deep water silty sand habitat available adjacent to the zone of potential ecological effect.

Fish are also able to osmoregulate. Long-term reliance on this may be at the expense of energy for growth or reproduction (Gillanders & Stockbridge 2022), but for most of the year salinities near the diffusers would be within the range of ambient seasonal variation. Mobile species are expected not to be affected.

There is some evidence in the literature that sessile sponges may be adversely affected by desalination return water in the immediate vicinity of diffusers[20], while other invertebrates were not affected (Kelaher and Coleman 2022).

[20] Note, no dense sponge communities were found within the MSA, but some sponges were recorded in all habitats and were a significant component of the fauna in several seagrass habitats, but unlikely to be present within the zone of potential ecological effect.

The discharge of return water is expected to have negligible impact on fish communities because:

- no examples were found in the literature of a desalination plant negatively impacting epifauna communities
- salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability for most of the year
- most of the epibenthic fauna recorded within the MSA have a tolerance for higher salinity than would be found near the diffuser, as inferred from their distribution in the USG
- of the few species that are potentially less tolerant to changes in salinity, most are likely to inhabit seagrass habitat, throughout which more than 99% of species would be protected from chronic impacts associated with the return water
- return water dilution would be sufficiently high often enough to protect, from chronic impacts, aside from limited area around diffuser as discussed
- fish have the ability to move or osmoregulate in response to elevated salinity, noting that long-term reliance on the latter option could potentially be at the expense of energy for growth or reproduction (Gillanders & Stockbridge 2022).

The expected impacts of the desalination plant return water salinity on epibenthic fish and invertebrates are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Dilution of the return water would be effective and ensure protection of infauna

Plume dispersion modelling predicts that return water mixing and dilution would be effective to protect infauna outside of a 13 ha area around the outfall. For most of the year salinities beyond the immediate vicinity of the diffuser would be within the range of ambient seasonal variation for the site.

The diffusion and dispersion of return water is expected to be adequate to have negligible impacts on infauna communities in seagrass habitat and short-term, minor, temporary but recurring impacts in deep silty sand habitats because:

- no examples were found in the literature of a desalination plant negatively impacting infauna communities provided a diffuser was used to facilitate return water dispersion
- salinity beyond the immediate vicinity of the diffuser is predicted to remain within the range of natural seasonal variability near Mullaquana Station for most of the year
- many of the infauna taxa recorded near Mullaquana Station are likely to tolerate salinities higher than those predicted from return water discharge, as inferred from their distribution in USG
- plume dispersion modelling predicts that return water dilutions would exceed species protection levels, determined from ecotoxicology studies, often enough to protect more than 99% of species within most habitats, including seagrass habitats
- in deep silty sand habitats, return water dilutions are predicted to exceed species protection levels often enough to protect more than 95% of species beyond the zone of potential ecological effect, representing 0.02% of that habitat type in USG.

The expected impacts of the desalination plant return water salinity are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Chemical content of the return water will not impact marine biota

Discharge of chemicals (used as part of the desalination plant process) in the return water is not expected to affect marine biota (through introduction of toxicants).

Several Australian desalination plant studies reviewed for this assessment investigated / compared the ecotoxicity of saline concentrates with that of some common antiscalants and CIP chemicals. With some minor exceptions – these studies found that the primary cause of toxicity was the high salt concentration. Antiscalants and CIP chemical toxicity was deemed either low or not toxic at the concentrations expected in the return water discharge. Therefore, the safe dilution rates derived for salinity ecotoxicity are likely to also be protective for antiscalant and CIP chemical toxicity. Examples from other desalination plants suggest that antiscalants and other cleaning chemicals generally make a negligible contribution to the toxicity of the return water (refer Appendix G-10).

Subject to detailed design, the desalination plant pre-treatment process will include the use of chemicals such as coagulants should operating scenarios where the seawater has higher organic load or suspended solids be experienced. This is to maintain operability and effectiveness. Coagulants are typically ferric or aluminium based coagulants. Should use of coagulants be required, the pre-treatment waste will be managed for disposal on land in accordance with legislative requirements, and will not be backwashed to the marine outfall (as per normal sweater condition operating scenarios). Management of the waste associated with use of these chemicals will be subject to the specific chemicals used, frequency of use and concentrations.

Notably, however, the coagulants, cleaning chemicals and antiscalants likely to be used in the pre-treatment process will be in line with those approved by the South Australian EPA for use at the Adelaide desalination plant.

The expected impacts to marine biota from the chemical content of the desalination plant return water are in the **Negligible** category. Uncertainty (due to chemical usage still being subject to detailed design) has been evaluated in Appendix M and the level of risk is **Low.**

Total suspended solids from the desalination plant return water will not impact the receiving environment

As discussed in Section 11.6.3, suspended solids from the desalination plant backwash process are predicted to have no impact on the receiving marine environment, as the modelled changes in total suspended solids are small and within natural variation.

In the case of a high turbidity event or algal bloom, pre-treatment processes as described in Chapter 6 Project Description will manage the increased suspended solids and organic matter in the intake water, with the pre-treatment waste managed on land. In this instance there would be a material reduction in the concentration of suspended solids and / or organic matter from back wash in the return water as it is removed and not returned to the marine environment. Further assessment and detail on mitigation and management in the case of an algal bloom event is provided in Chapter 25 Hazards and Risks.

Upwelling events are common and well documented within Spencer Gulf. TSS changes exhibited during regular natural upwelling events indicate that variation in regard to TSS is an existing feature of the marine environment.

The expected impact to the marine environment from TSS from the desalination plant backwash process is in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Although stratification may be influenced by the return water for up to 500 m from the outfall, the limited duration and extent of the stratified layer would not be sufficient to impact near-bed dissolved oxygen concentrations

Return water is not expected to lead to water column stratification that would last long enough to cause anoxic conditions near the sea floor and associated impacts to marine biota.

The intake water has a high oxygen saturation near 100%. The process of cleaning and flushing has the potential to reduce dissolved oxygen levels in return water for short periods of time. Dissolved oxygen levels in the return water are expected to be greater than 80% saturated.

Without adequate mixing of return water, stratification can occur and lead to dense saline plumes forming on the seabed resulting in localised reduction in benthic oxygen.

Dispersion modelling suggests stratification may be influenced by the return water for up to 500 m from the outfall, however, given the return water will be greater than 80% saturated, the limited duration and extent of the stratified layer would be insufficient to impact near-bed dissolved oxygen concentrations.

The stratified layer thickness (3 - 7 m) and time scale of salinity changes in the curtain plots (24 hours) were used to provide a high-level estimate of the potential for DO depletion in the stratified layer.

Using sediment oxygen uptake rates from nearby sites (Lauer et al. 2009) and assuming an 80% oxygen saturation in the returning water, along with a conservative estimate of 5.0 mg/L for dissolved oxygen, it is projected that a stratified layer with a thickness of 3-7 metres could take from 6 to 20 days to decrease dissolved oxygen levels to a threshold of 3.0 mg/L. Below this level biological impacts may occur (Diaz and Rosenberg 1995). Over a 24-hour period, dissolved oxygen levels would therefore reduce to between 4.7 and 4.9 mg/L. As the plume moves, advection, dispersion and vertical mixing of higher concentration dissolved oxygen would help alleviate any local oxygen deficits caused by the stratification induced by the plume (refer Appendix G-12).

The oxygen levels and oxygen demand in the return water will be confirmed during the detailed design phase of the Project. Given the uncertainty surrounding the sediment oxygen uptake rate at the Project desalination plant site, the calculations presented above are based on reasonable assumptions (BHP 2009a) and suggest that dissolved oxygen depletion is unlikely to occur as a result of return water discharge.

The expected impacts of stratification and dissolved oxygen levels in the MSA from operation of the desalination plant are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Desalination plant return water will not materially alter local conditions in a manner that could contribute to the initiation or persistence of a harmful algal bloom

Toxic dinoflagellate species are typically present, in low numbers, in the phytoplankton community of coastal and marine waters. Plankton communities are dynamic and can respond to changes in environmental conditions. The plankton community characterised in the Mullaquana Station marine survey area is typical of Southern Australian waters.

In a 2010 SARDI study to provide initial characterisation of the plankton community at Adelaide Desalination Plant (van Ruth 2010) the typical swathe of plankton species was identified (including low numbers of harmful algal bloom species). A comprehensive monitoring program has been ongoing at the Adelaide Desalination Plant site since 2010, which has confirmed there is no evidence to support a causal link between the desalination plant and the onset of HABs[21]. It is believed a period of prolonged environmental preconditioning, and an unprecedented heatwave across the state's coastal waters contributed to the onset and persistence of the 2025-2026 South Australian algal bloom (PIRSA 2026a, SARDI 2026e).

Identifying the specific environmental drivers of Harmful Algal Blooms (HABs) remains highly complex and uncertain, even in well-studied systems. Because different HAB taxa respond to unique ecological triggers they cannot be treated as if they behave identically (SARDI 2026e). However, HABs generally arise during favourable physical conditions (such as warmer conditions, stratification and low to moderate wind stress) and when there is sufficient nutrient supply. These physical conditions are influenced by local geography and climate (SARDI 2026e).

In the MSA, local physical conditions are not considered to be favourable to contribute to the onset of an algal bloom, as there is an effective tidal, current and flushing system. Hydrodynamic modelling of the Project outfall and return water shows that the marine environment quickly returns to ambient salinity, TSS and temperature within close proximity to the diffuser. There is minimal area of potential ecological effect and a low stratification potential. Dodge tides briefly reduce mixing but these conditions would not be prolonged enough to lead to conditions suitable for the onset of a HAB. Harmful algal blooms are covered in the Chapter 25 Hazards and Risks as HABs are not considered to be an expected impact as a result of the Project.

There will be negligible long-term effects to the salinity of Spencer Gulf from the desalination plant return water (including interactions with climate change)

The farfield modelling concludes that signs of long-term salinity accumulation associated with the desalination plant were not detected in the Gulf and the predicted seasonally-averaged salinity anomalies were within the range of natural salinity variability (Appendix G- 13).

From the findings of the midfield modelling the return water will be well mixed and dispersed and no impacts would occur at a whole of gulf scale. No broader ongoing water quality impacts in Spencer Gulf are expected as a result of the Project.

[21] https://www.epa.sa.gov.au/environmental_info/water_quality/harmful-algal-blooms

Climate change scenarios were assessed using the farfield model (Appendix G-14) and are summarised in Chapter 24 Climate Change and Sustainability. The assessment concludes that, while regional salinity and temperature in Spencer Gulf are expected to increase under climate change, the desalination plant return water would provide a localised and secondary contribution only. Under the climate change scenario, the discharge itself increases bottom salinity at Mullaquana Station by less than 0.5 PSU confined mostly within two to eight km around the outfall, diluting to less than 0.03 beyond this. The climate change scenario is broadly consistent with those predicted under present-day conditions, although it may extend further north-east and closer to the coast (refer Appendix G-14).

The expected impacts on the long-term salinity of Spencer Gulf from operation of the desalination plant are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Impacts to key marine species

Desalination plant operation will not result in impacts to conservation significant marine species.

An assessment of the potential for significant impact on conservation significant marine fauna was undertaken for the Project. A number of species were assessed for their likelihood to occur and potential to be impacted. Key nationally protected marine species that may occur in the vicinity of the Project include marine mammals, marine turtles, the White Shark and oceanic birds. Migratory shorebirds are assessed with terrestrial birds in Chapter 15 Terrestrial Flora and Fauna. The likely occurrence and EPBC Act significant impact assessment for marine species are described in Appendix I-6 (Significant Impact Assessment) which concludes that there is no likely significant impact to marine species.

Megafauna:

Twelve mammals, three turtles and two sharks, all listed under the EPBC Act and / or South Australian legislation, were identified as having possible or likely interaction with the Project.

The discharge of return water is expected to have negligible impact on listed megafauna because:

- salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability at the MSA for most of the year
- most of the megafauna species recorded at the MSA have a tolerance for higher salinity than would be experienced as a result of return water discharge, as inferred from their distribution in the USG
- return water dilution would be sufficiently high often enough to protect from chronic impacts within 13 ha of the outfall
- these species are highly mobile and expected to be transient through the MSA which does not represent spatially important habitat for any these species.

Syngnathids

Based on their habitat preferences and the sufficiently high predicted dispersion of desalination return water, no notable impact to Syngnathids is expected.

The discharge of return water is expected to have negligible impact on Syngnathids because:

- salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability within the MSA for most of the year
- most of the Syngnathids recorded at the MSA have a tolerance for higher salinity than would be experienced as a result of return water discharge, as inferred from their distribution in the USG
- plume dispersion modelling predicts that return water dilutions would exceed species protection levels, determined from ecotoxicology studies, often enough to protect more than 99% of species within most habitats, including seagrass habitats
- the few species that are potentially less tolerant to salinity inhabit seagrass (noting that seagrasses are outside the zone of potential ecological effect), although javelin pipefish may also inhabit deep-water sand habitat (Reef Watch 2014)
- in deep water silty sand habitats, return water dilutions are predicted to exceed species protection levels often enough to protect more than 95% or 99% of species except within about 13 ha around the outfall, representing 0.02% of that general habitat type
- Syngnathids have the ability to move or osmoregulate in response to elevated salinity, noting that long-term reliance on the latter option could potentially be at the expense of energy for growth or reproduction (Gillanders & Stockbridge 2022).

Giant Australian Cuttlefish

The Giant Australian Cuttlefish assessment is provided in Appendix G-16.

The discharge of return water is expected to have negligible impact on Giant Australian Cuttlefish from the northern Spencer Gulf population because:

- the CCSZ lies 34 km from the MSA and is therefore well beyond the Project's zone of potential ecological effect; no direct interaction is therefore expected, and EPBC Act National Heritage values will remain unaffected
- Project specific marine ecology surveys conducted over a 12 month period during 2025 (Appendix G-3 Marine Ecology Assessment) recorded no Giant Australian Cuttlefish individuals at the MSA, which is not a known high-use area for the species
- while foraging or resting individuals have the potential to occur within the MSA occasionally, construction impacts are expected to be short-term and localised
- operational impacts are predicted to be limited to less than 13 ha around the outfall (within 370 m from diffusers), with negligible risk to individual cuttlefish or the broader population. The discharge of return water is expected to have negligible impact on the Giant Australian Cuttlefish population because:
    - salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability in the MSA for most of the year
    - the Giant Australian Cuttlefish has a tolerance for higher salinity than would be experienced as a result of return water discharge, as inferred from its distribution in the USG

- ecotoxicity testing suggested that Giant Australian Cuttlefish would be resilient to salinities likely to be experienced as a result of return water discharge in the waters off Mullaquana Station within 370 m of the outfall
- return water discharge is not anticipated to materially affect Giant Australian Cuttlefish movement
- return water discharge is not anticipated to have any impact on Giant Australian Cuttlefish breeding, as there is no breeding habitat in the MSA and the breeding aggregation is 34 km away.

The construction and operation of the Project desalination plant are expected to have no direct or indirect impacts on the Giant Australian Cuttlefish population or the EPBC Act National Heritage listed CCSZ.

The expected impacts on conservation significant marine species from operation of the desalination plant are in the **Negligible** category and the level of **certainty** in the expected impact is **High** (refer Appendix M).

Desalination plant return water will not result in impacts to commercially important (aquaculture or fishery) species.

The vast areas of seagrass, mangroves and tidal flats across the USG support commercial fisheries through providing nursery and recruitment areas for several species. The MSA incorporates areas of this important fishery habitat.

The Project design has specifically avoided disturbance to coastal and intertidal areas and to long established dense *Posidonia* seagrass beds.

The commercially important species that are known to or likely utilise the habitats within the MSA (refer Section 11.4.7) are widespread through the USG, and all have been recorded north of Point Lowly where salinity is naturally elevated. This implies these species have a high tolerance for elevated salinity.

Plume dispersion modelling of the 51 GL/y Reference Design capacity predicts that return water dilution would be sufficient to protect the important seagrass and mangrove habitats, and the species within them (dilutions are above the 99% species protection level).

The zone of ecological effect outside of which the 95% protection level of representative local species are protected from any chronic impacts from the discharge is predicted to move within a 13 ha area extending in a north-east to south-west elliptical area (dilutions at habitat receptor boundaries are provided in Table 11-11).

Assessment of potential impacts of the return water on the fisheries species likely to occur in the MSA (refer Section 11.4.7) is presented in Table 11-13.

Table 11-13. Assessment of the effects of return water on relevant fisheries species

Fishery Species	Assessment
Western King Prawn	Project infrastructure will avoid the nearshore unvegetated soft bottom habitats, tidal creeks and tidal flats that support spawning and nursery grounds for Western King Prawn (Bryars 2003).

Fishery Species	Assessment
	Adult Western king prawn *M. latisulcatus* is expected to occur in the deeper parts of the MSA. The species is considered to be highly mobile and able to tolerate salinities above those predicted outside the immediate vicinity of the diffuser (based on their distribution in USG) (Carrick 2003). The habitat within the zone of potential effect is extensive across USG with an estimated 69,200 – 88,700 ha of similar and continuous benthic habitat (refer Figure 11-46 and Appendix G-3). The 13 ha zone of potential effect represents less than 0.02 % of the benthic habitat 'Association 1' identified in Grammer *et al* 2026 that is deeper than 15 m (refer Appendix G-3, and Figure 11-46). The results of larval entrainment modelling are presented in Section 11.6.3 and assessed in Section 11.7.9.
Snapper	Northern Spencer Gulf supports the key Snapper spawning and nursery areas and there is the potential for all life stages of Snapper to interact with the MSA. The proposed site at Mullaquana Station is adjacent to the primary nursery area near Western Shoal and the area is utilised by sub-adult and adult Snapper at various times of the year (Rogers 2026, Appendix G-8). The zone of potential effect from the return water is a small area (13 ha) within a widespread habitat type within northern Spencer Gulf (i.e. the estimated 69,200-88,700 ha of benthic of Association 1 from Grammer et al 2026 that is deeper than 15 m (Figure 11-46 and Appendix G-3). The results of larval entrainment modelling are presented in Section 11.6.3 and assessed in Section 11.7.9.
King George Whiting	King George Whiting spawn in the southern Spencer Gulf and hence would not be affected. The larvae disperses north and settles in sheltered areas primarily within *Zostera* seagrass. Shallow *Zostera* within the MSA has the potential to provide nursery or juvenile habitat. The potential nursery habitat of *Zostera* located in waters shallower than 10 m AHD is avoided by the Project infrastructure. There is the potential for some interaction between the larval, juvenile, and sub-adult life stages of King George Whiting and the zone of potential effect as larvae disperse in, and sub-adults move out of the nursery areas. The return water zone of potential effect represents a small portion of available similar habitat. The results of larval entrainment modelling are presented in Section 11.6.3 and assessed in Section 11.7.9.
Garfish	MSA likely to be within a broad region of key spawning and nursery habitat provided by the presence of shallow *Zostera* (Steer et al. 2009) throughout the northern gulf (Bryars 2003). Garfish is likely to be present in the MSA, however the small amount of shallow *Zostera* located in the MSA (i.e. shallower than 10 m), is avoided by the Project infrastructure. Therefore, spawning and nursery areas are not expected be impacted.
Southern Calamari	Southern Calamari typically have offshore nursery and inshore spawning grounds. Two egg clutches were recorded in the Project Summer 2024/2025 survey, but the MSA is not considered a significant spawning habitat for the species.

Fishery Species	Assessment
	There was broadscale catch decline following SA algal bloom (SARDI 2026f). Although stocks are depleted the SA Government has implemented a total fishing closure for Southern Calamari (PIRSA 2026a & c). The species habitat is widespread throughout Spencer Gulf and the 13 ha zone of potential ecological effect is not expected to materially impact upon the population now or into the future.
Blue Crab Fishery (Spencer Gulf Sector)	Important nearshore nursery habitats will be avoided by the Project. Blue Crabs are likely to be present in the MSA (Bryars 2003). Their widespread presence throughout Spencer Gulf implies that the 13 ha zone of potential effect would not adversely impact upon the population.

There are no aquaculture leases and zones in Gulf waters within 40 km and no impact to aquaculture is expected from the desalination plant return water.

The discharge of return water is expected to have negligible impact on fisheries or aquaculture species because:

- salinity beyond the immediate vicinity of the diffuser would remain within the range of natural seasonal variability near Mullaquana Station for most of the year
- all of the species most relevant to fisheries near Mullaquana Station have a tolerance for higher salinity than would be experienced as a result of return water discharge, as inferred from their distribution in the USG
- dilution of the return water within all seagrass and mangrove habitats would be sufficiently high often enough to protect more than 99% of species from chronic impacts, resulting in negligible risk to these ecosystems
- chronic impacts to species within silty sand habitats near Mullaquana Station would be limited to 13 ha for 95% of species (for 51 GL/y capacity), representing a small fractional percentage of similar habitat mapped in the area
- fish have the ability to move or osmoregulate in response to elevated salinity, noting that long-term reliance on the latter option could potentially be at the expense of energy for growth or reproduction (Gillanders & Stockbridge 2022)
- aquaculture leases and zones are too far from the outfall to be impacted by return water. The microalgae aquaculture lease at the top of False Bay is also too far away to be impacted by the return water and in any case relies on hypersaline water.

Impact events related to entrainment of larvae within the seawater intake is covered in Section 11.7.9.

The expected impacts from desalination plant return water on commercially important species are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Impacts related to fishery access restrictions and any associated economic effects due to the presence of the infrastructure are covered in Chapter 9 Use of Land and Marine Waters and Chapter 22 Economic Environment.

11.7.5 Seabed disturbance during construction

Marine construction works will result in the direct loss (permanent and temporary) of a small area of benthos (subtidal *Zostera* seagrass and sandy habitats).

Impacts to marine habitats are largely dependent on the methodology adopted for the construction of the intake and outfall pipes and intake and outfall structures. Seabed disturbance has been minimised through constructing the tunnel(s) below the seabed via a TBM to avoid impacts to coastal dunes, mangroves, tidal flats and *Posidonia* seagrass.

Marine intake and outfall structures are likely to be located in a minimum approximate water depth of 13 m to maximum of 17 m from Lowest Astronomical tide (LAT) (approximately -15 m to -19 m in Australian Height Datum (AHD)), and no less than 3 km and no more than 5 km from the onshore intake pump station.

The proposed methodology using TBMs means that there are no seabed impacts shoreward of the intake (i.e. intertidal mangroves, tidal flats and *Posidonia* dominated seagrass beds are avoided). Underground tunnelling for the intake and outfall will be a sufficient distance beneath the seabed to meet engineering design requirements and this distance is not expected to impact the marine environment of the MSA (including being deep enough to not affect the root zone of seagrasses or other marine flora).

Beyond 3 km from the shore, impacts to the seafloor will be limited to the construction footprint of the intake and outfall structures (Table 11-14). The Reference Design intake structure is located within the *Zostera* seagrass and the footprint would require a small area of permanent seagrass clearance. The Reference Design outfall structures (including the diffuser manifold) are to be located in sandy habitat only.

Table 11-14: Estimated disturbance areas for seabed infrastructure (Reference Design)

Seabed infrastructure component	Estimated total disturbance (ha)	Estimated breakdown (ha)	
		Permanent	Temporary
Intake (*Zostera* habitat)	**0.25**	0.15	0.10
Outfall (Sandy habitat)	**0.92**	0.50	0.42
TOTAL	**1.17**	**0.65**	**0.52**

Note: The values in this table reflect the Reference Design (GHD 2025a). The approach conservatively allows an approximate 30 m width for all permanent seabed infrastructure footprints with an additional approximate 10 m buffer (on each side) for temporary disturbance.

Disturbance to accommodate the marine seabed infrastructure for the Reference Design includes:

- 0.25 ha to allow for construction of the intake structure in *Zostera* seagrass habitat (including up to 0.15 ha considered "permanent" footprint and 0.10 ha temporary construction disturbance)
- 0.92 ha for outfall structure and diffuser manifold in sandy habitat (with algae/invertebrates/bioturbation) (including 0.50 ha permanent footprint and 0.42 ha temporary construction disturbance).

For the Reference Design, the maximum (worst case) permanent loss of habitat would be 0.65 ha, including 0.15 ha of *Zostera* seagrass and 0.50 ha of sandy habitat (refer Figure 11-47).

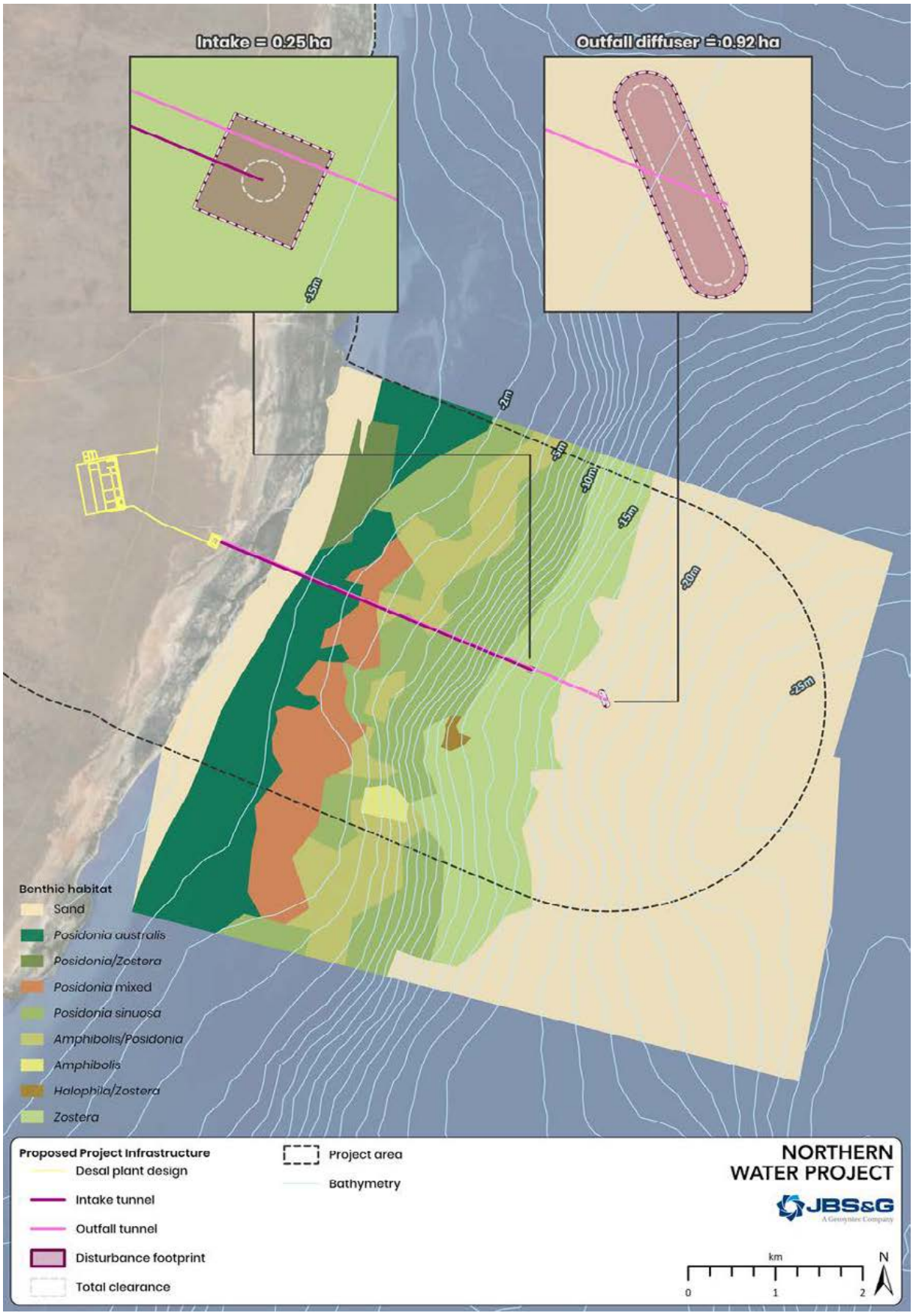


Figure 11-47: Discrete seabed disturbance areas associated with intake and outfall structures (based on the Reference Design)

[Bathymetry = mAHD]

The temporary construction estimate is conservative to accommodate various small areas of temporary impact such as the legs of the jack-up barge that would be used during construction.

There will be no direct disturbance to intertidal mangroves, tidal flats, or *Posidonia* seagrass, as part of the construction or operation of the Project.

There are extensive areas of coastal and marine habitats similar to that at the Mullaquana Station site, some of which are protected in nearby Marine Parks. As mentioned in Section 11.7.4, the sandy habitat association represented in deeper areas at the site extends an estimated 69,200 – 88,700 ha across the gulf (refer Appendix G-3 and Figure 11-46). The area of permanent seabed disturbance of sandy habitat (0.50 ha) represents less than 0.001% of the sandy habitat available.

Zostera is widespread throughout USG which infers a tolerance for higher levels of salinity than would be experienced as a result of return water discharge. The small area (0.25 ha) of total disturbance associated with the Project includes 0.10 ha of temporary disturbance within which this opportunistic species is expected to rapidly recover. The existing coverage of *Zostera* within the MSA is highly variable across the MSA and over seasons, as shown in Figure 11-48.

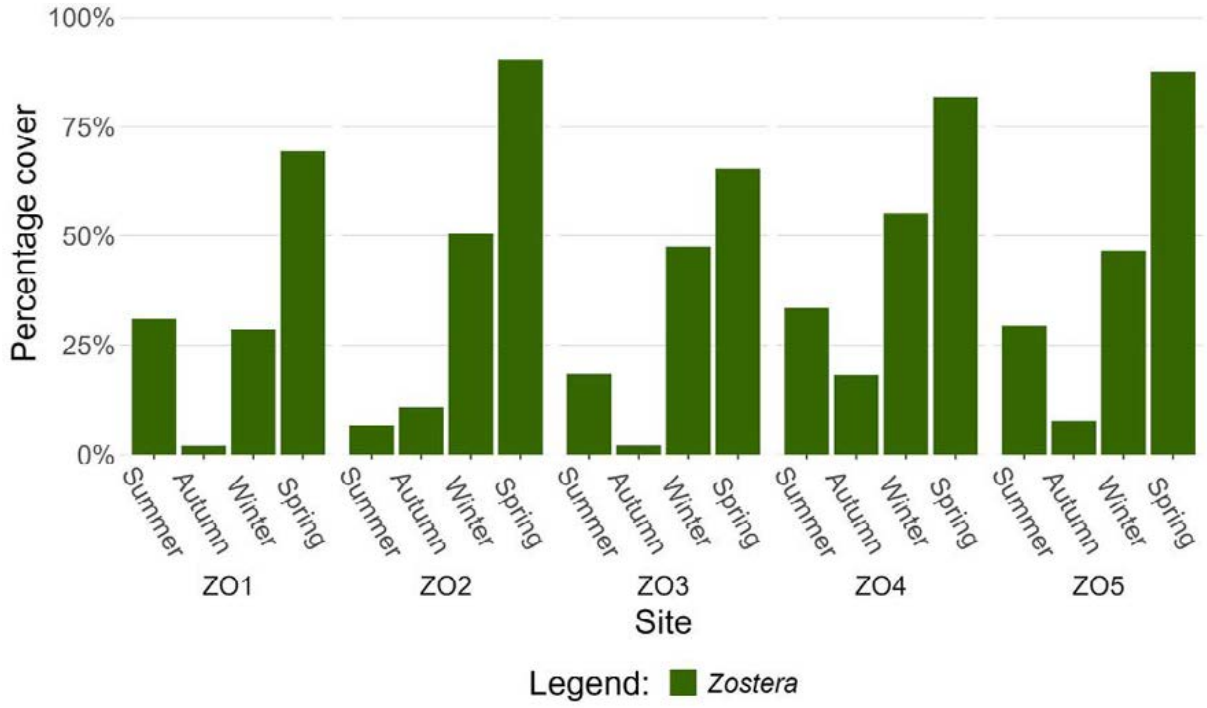


Figure 11-48: Percentage cover of *Zostera* in the MSA recorded during surveys across all seasons in 2025

[Source: Appendix G-3].

The habitats present at the desalination plant site are well represented in Spencer Gulf. Potential impacts to *Zostera* and sandy habitats are considered to be predominantly short-term and localised, and any permanent loss of habitat from disturbance of the seafloor would not be substantial when considered in the context of the broader area.

For the intended removal, clearance or damage to seagrass as part of Project construction, approval is being sought through the EIS process (along with clearance of terrestrial vegetation as discussed in Chapter 15 Terrestrial Flora and Fauna and the Draft Native Vegetation Clearance Data Report in Appendix I-5. The Project will seek to avoid and minimise damage to these sensitive habitats, and a Significant Environmental Benefit (SEB) would offset any unavoidable native vegetation removal. Estimates of the SEB requirements for the Project are provided in the Draft Native Vegetation Clearance Data Report (refer Appendix I-5).

The expected impacts to the marine seabed are in the **Negligible** category and the level of **certainty** in the assessment of the expected impacts is **High** (refer Appendix M).

Increased turbidity and sedimentation from marine construction works will have short-term localised impacts on benthic habitats

Construction methods for installation of the underwater infrastructure have the potential to include jack-up barge operations, dredging, piling, grouting, rip rap placement, tunnel boring and floating and sinking. These construction activities will disturb seabed sediments, causing them to mix into the water column where they may be carried by subsurface currents before resettling on the seabed elsewhere. Without proper construction management practices, increased turbidity and sedimentation may adversely impact benthic habitats and species, sediment profiles and water quality around the site. The key potential effects are:

- Reducing the light penetration of the water column (shading effects), causing harm to the health of photosynthetic flora (i.e. seagrass)
- Localised effects on water composition due to the particularly fine sediment in some areas of the MSA; suspended soils may be abrasive and cause clogging (e.g. of gills)
- Fine sediments or clay deposition smothering flora and fauna.

Shading

The vulnerability of seagrasses to shading from increased turbidity during construction varies based on their life history traits; slower-growing species are more vulnerable to impacts. *Posidonia* seagrass, known for slow growth, struggle to recover from prolonged light reductions exceeding three months (Fraser et al. 2017). In contrast, *Amphibolis* seagrass can withstand similar durations of shading but fail if the shade persists beyond six months (Mackey et al. 2007; Collier et al. 2009; McMahon et al. 2011; Fraser et al. 2017). *Posidonia australis* can tolerate several weeks of shading, though genetically less diverse populations are more vulnerable (Evans et al. 2017). The impact on *Amphibolis griffithii* is season-dependent, with greater harm observed when light levels are reduced at the end of summer rather than winter (Lavery et al. 2009).

The expected short-term and localised nature of elevated turbidity in the water column during construction is expected to have no long-term effects.

Suspended sediments in water column

Filter feeding invertebrates are especially sensitive to suspended sediment loads, with feeding potentially compromised by settled sediment (Turner et al. 2006). However upright

filter feeders such as Razor Clam or fauna growing on them (Turner et al. 2006) are less sensitive to deposition of sediment.

As the sediments around the intake and outfall locations are predominantly sandy, comprising only five to twenty percent clays and fine silts (refer Figure 11-23), potential smothering of filter-feeders or seagrasses from resuspended sediments are not expected to be significant. The area expected to be affected by elevated turbidity is limited and effects are expected to be short-term in duration.

Sedimentation

Disturbance to the seafloor will occur within the construction footprint of the intake and outfall structures. Most turbidity and sedimentation generated during installation of these structures is expected to occur over a short period and to stay largely within close proximity of the approved construction footprint.

The area expected to be affected by sedimentation is highly localised and short-term. A marine silt and sediment management plan would be prepared to minimise turbidity and silt deposition arising from installation of the intake and outfall risers.

Appropriate and industry standard strategies would be adopted to mitigate turbidity and sedimentation (to be confirmed as part of detailed design and in management plans). Sediment disturbing activities (i.e. dredging) would be managed under a Dredge Management Plan and would require compliance with EPA licence conditions. An adaptive management program involving turbidity trigger levels will be implemented as part of the Dredge Management Plan, with 'alarm' and 'hold' triggers and responses set in line with EPA guidance and based on local conditions. This will limit the spread of turbid waters during construction.

The expected impacts of turbidity and sedimentation are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Disturbance of sediments is not expected to remobilise resting harmful algal bloom cysts / cells and lead to the onset of algal bloom

Harmful algal blooms are covered in Chapter 25 Hazards and Risks as harmful algal blooms are not expected to occur as a result of the Project.

To summarise, some harmful algal bloom species are present at the site at low abundances and species compositions typical of normal coastal sediments.

Even if re-suspended in sediments during construction, the typical local oceanographic conditions at the Mullaquana Station outfall location are not considered to be favourable conditions to contribute to the onset of an algal bloom (as a result of the Project), as there is an effective tidal, current and flushing system (refer Chapter 10 Coastal Processes for additional information about tides). This is further mitigated by the low viability of the species in germination experiments (refer Appendix G-5). Chapter 25 Hazards and Risks provides a risk and impact assessment in relation to sediment disturbance.

The investigation into dinoflagellate resting cells and cysts in marine sediment (and Sediment Characterisation Appendix G-4) concluded that while some toxin-producing species were present, their composition and abundance was typical of southern Australian

waters (outside of HAB conditions), and many were not viable in germination experiments. This sediment characterisation baseline survey was undertaken prior to the South Australian HAB potentially effecting the Project area. Hence, the observations from this study are representative of a pre-HAB baseline environment.

Based on the current Project baseline sediment survey results, the likelihood that sediment disturbance from marine construction could lead to a harmful algal bloom is unlikely due to the local hydrodynamic conditions, and further mitigated by the low abundance, low viability and typical distribution of HAB species at the site.

It is recommended that prior to construction, a subsequent investigation into dinoflagellate resting cells and cysts in marine sediments is undertaken to provide a second baseline survey for comparison with the pre-HAB survey. If viable cysts or cells are identified in marine sediments, additional mitigation and management strategies may be considered and adopted as part of the CEMP and Dredge Management Plan. Any dredging of the seabed will require an EPA licence and require compliance with licence conditions.

Introduction of new hard substrate / infrastructure in the marine environment encourages settlement by opportunistic species leading to localised ecological changes

The introduction of new hard substrates / infrastructure in the marine environment promotes settlement by opportunistic species including invasive species, effectively functioning as artificial reefs and altering the local habitat composition and ecology.

The intake and outfall structures are expected to create artificial habitats that may enhance local productivity. However, they could also draw mobile species away from adjacent natural environments, potentially harming those ecosystems (Higgins et al. 2022, Bracho-Villavicencio et al. 2023). A common result of aggregating mobile species at artificial reefs is increased catchability by fishers (Bracho-Villavicencio et al. 2023). However, this is unlikely to occur in this Project due to the exclusion zone to be established around the intake and outfall structures.

The presence of new hard substrate also provides an opportunity for invasive marine species to settle. Invasive marine species and the risk of their introduction or spread is covered separately in Section 11.7.11.

Appropriate and industry standard strategies would be adopted to mitigate harmful colonisation of new substrates during construction and operation (to be confirmed as part of detailed design and in management plans).

The expected impacts to local ecology from the colonisation of new substrates are in the **Negligible** category, or beneficial. Uncertainty in the assessment due to the requirement for ongoing regular maintenance and management has been evaluated in Appendix M and the level of risk is **Low.**

11.7.6 Marine discharge during construction

Temporary marine construction discharges are not planned and hence will not impact water quality, seagrass or intertidal communities

There will be no marine discharge from land-based construction activities including water generated by tunnel boring activity.

Wastewater produced on the marine jack-up barge will be collected and temporarily stored in wastewater tanks. Wastewater will then be pumped out onto another tank on the supply vessels for transport back to the nominated port facilities (most likely being Whyalla Port) and then discharged on land according to the relevant approval processes. Should marine discharge of water from jack-up barge operations be required, it would likely be limited to stormwater from the barge surface (or similarly innocuous wastewater sources), and would be collected and treated to ensure they meet marine water standards before release.

Sediment disturbing activities will be managed under a Silt and Sediment Management Plan to limit the spread of turbid waters during construction. Dredging will be managed under a Dredge Management Plan and EPA licence conditions.

Marine construction discharge will be avoided and hence will have no effect on water quality and marine flora and fauna.

The expected impacts of temporary marine discharges during construction are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

The potential for accidental spills during construction will be appropriately managed and mitigated to ensure protection of the local marine ecology.

While the potential for accidental spills during the construction of the marine infrastructure exists, effective management strategies can significantly reduce the likelihood and potential severity of a spill. By implementing comprehensive emergency preparedness, infrastructure integrity maintenance and adaptive management techniques the Project will minimise potential ecological impacts during the construction phase.

Marine spills are covered in the Chapter 25 Hazards and Risks and are not considered to be an expected impact as a result of the Project.

11.7.7 Stormwater runoff

Natural landform and active stormwater management measures will be effective to protect the marine environment

Stormwater runoff can impact marine ecosystems and commercial fisheries by introducing freshwater and increased levels of nutrients, chemicals, and turbidity into coastal waters.

To mitigate against this a terrestrial detention basin at the desalination plant is proposed as a key component of the stormwater management strategy. The basin is designed to capture and manage stormwater runoff, allowing sediments and pollutants to settle out prior to any discharge to the environment. By effectively reducing the volume and pollutant load of stormwater prior to any discharge occurring, the detention basin plays a crucial role in safeguarding the local ecosystem.

In turn, stormwater from the plant's detention basin is directed towards natural flow paths leading to a low-lying claypan south-east of the plant, flanked by coastal dunes. The natural topography of the site, including dunes seaward of the detention basin, suggest no stormwater would reach the marine environment.

Flows from areas not within the plant footprint are treated as runoff from undeveloped areas and diverted around the plant area without detention. Again, the natural topography of the site suggest this natural stormwater would not reach the marine environment.

Desalination plant process areas, chemical delivery, handling, and storage areas are bunded in accordance with EPA guidelines and roofed to prevent rainfall collecting in bunds. Bunded areas drain to on-site storage tanks with the ability to be pumped out for off-site disposal.

Rainfall runoff from hard surfaces like roads and car parks will be directed through oil-water separators and into the detention basin.

The effectiveness of these basins is contingent on proper design, maintenance, operation and monitoring to ensure they function as intended during storm events. Ongoing assessment and adaptive management are essential to ensure that stormwater management measures continue to protect the marine environment from potential adverse impacts. This approach will help maintain the health of marine ecosystems and support their resilience against pollution and climate variability. A site-specific soil erosion and drainage management plan (SEDMP) will be developed for the desalination plant site.

With the proposed stormwater management measures in place as detailed in Chapter 13 Surface Water (and Appendix N-2 Stormwater Management Plan), no discharge is expected. The expected impacts to marine ecosystems and fisheries are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

11.7.8 Underwater noise and vibration

Anthropogenically generated underwater sounds have the potential to elicit behavioural or physical responses in marine species.

During the proposed desalination plant's construction phase, underwater noise levels are not expected to be significant due to the nature and scale of construction activities involved. With most construction via TBM under the seabed, the primary source of noise in the marine environment would be impact piling for intake and outfall risers and structures (should this construction method be adopted) and to a lesser extent drilling, support vessels, and vibratory piling. Construction noise associated with the marine structures will be temporary and of limited duration.

Existing background noise levels within the MSA are typical of a shallow coastal ocean underwater noise environment dominated by wind and wave noise with sound pressure levels between 115 and 130 dB rms re 1 µPa (Resonate 2026a, Appendix G-8).

Marine mammals, sharks or turtles potentially present in the vicinity are considered highly mobile species with the ability to move away from an impact source, and unlikely to be impacted by the Project. Southern Right Whales occasionally occur in Spencer Gulf and the entire Spencer Gulf coastline (and beyond) has been identified as biologically important seasonal habitat that may be used for whale movement between regions that support biologically important behaviours. Australian Sea-lions possibly occur in the area, though typically occur further south in Spencer Gulf. If occasionally present, sea-lions are known to be less sensitive to noise than other marine mammals.

Construction

Underwater noise from construction (tunnelling, boring, and piling) will be short-term and localised and, with management measures in place, are not expected to cause injury/behavioural response in marine fauna

Project construction in the marine environment will involve a series of discrete activities and will by their nature be short-term in duration. Key Project construction noise sources include the tunnel boring and piling for the construction of the risers for the intake and outfall, and presence of support vessels (note, the activity of drilling (should it be required) has been assessed as well).

Underwater noise and vibration can affect marine organisms' behaviour, communication, and predation success, especially for species like fish and marine mammals that rely on sound for navigation and social interactions. High noise levels underwater can also lead to physiological changes in the form of auditory injury or temporary shifts in hearing as detailed in Appendix G-8.

Results of underwater noise modelling are presented as noise contour plots in Appendix G- 8. Assessment of the potential noise impacts in Appendix G-8 shows the weighted distances to the various effects thresholds for faunal groups (i.e. organ damage, temporary or permanent hearing damage, behavioural response). Impacts are summarised for impacted fauna hearing groups in Table 11-15 for each construction noise source.

The Project activity with the most potential to impact marine fauna is the impulsive noise from underwater impact piling. In the absence of mitigation measures, piling could lead to auditory injury to low-frequency (LF) cetaceans (Southern Right Whale) within approximately 900 m of the activity, and potential for temporary threshold shift (TTS) and / or behavioural response within approximately 2,750 m, based on 1,500 pile strikes within a 24-hour period. For cuttlefish and prawns, there is potential for physiological and/or behavioural impact within approximately 3,750 m of impact piling. The weighted distances for other species groups are lower, i.e. there is a reduced radius of potential impact for other species

Noise emission into the water column from tunnel boring beneath the seabed is expected to be largely masked by shallow water ambient noise from wind and waves. Vessels are not expected to have any physiological effects on marine fauna although there may be minor behavioural response in the immediate vicinity. Fauna in Spencer Gulf would be well accustomed to vessel activity and are likely to move away from any unpleasant vessel noise.

Other noise sources such as drilling (if adopted for the Project), vessels and dredging have the potential to impact fauna in a localised area within a radius of 510 m or less (which is different for each fauna group per noise source, refer Table 11-15).

Table 11-15: Noise source detail and predicted weighted distance to effects thresholds for fauna hearing groups

Noise source (and type)	Noise source level at 1m, dB re 1 µPa (RMS*)	Detail regarding frequency and character of noise source	Potential impact [Source: Appendix G-9 Table 14]
Tunnel boring (continuous)	N/A	Minimal noise emission expected, likely to be masked by noise from	No impact expected

Noise source (and type)	Noise source level at 1m, dB re 1 µPa (RMS*)	Detail regarding frequency and character of noise source	Potential impact [Source: Appendix G-9 Table 14]
		wind and wave activity. Vibration energy is predicted to be low at the seabed.	
Vessels (continuous)	150–170 dB_{rms} re 1 µPa at 1 m	Low-mid frequency dominated. Levels are based on small-medium (5 to 25 m) vessels	Potential for cetacean behavioural response within 150 m
Vibratory piling (continuous)	160–200 dB_{rms} re 1 µPa at 1 m	Generally between 100 Hz and 2 kHz with strong tones. Typically lower noise compared to impact piling	Potential for cetacean behavioural response within 350 m LFC – TTS @200m, PTS @120m HFC – TTS @140m, PTS @25m Pinnipeds - TTS @140m, PTS @25m Fish with swim bladder – TTS @<10m Invertebrates – behavioural response within 140m
Impact piling (impulsive)	SEL_{SS} 170–225 dB re 1 μPa^2s	Low frequency tones	Potential for cetacean behavioural response within 750 m LFC – TTS @2750m, PTS @900m HFC – TTS @750m, PTS @90m Pinniped - TTS@1400, PTS @280 Fish all – TTS @700m Invertebrates – behavioural within 3.75km
Dredging (continuous)	<190 dB_{rms} re 1 µPa at 1 m	Frequencies below 1,000 kHz, character similar to commercial shipping	Potential for cetacean behavioural response within 510 m LFC – TTS @70m, PTS @<10m Fish with bladder TTS @<10m Invertebrates – behavioural response within 140m

*Root mean square (rms) sound pressure over the measurement period, expressed in dB re 1 µPa.

** LFC = Low Frequency Cetaceans, HFC = High Frequency Cetaceans, re = relative to a reference level, SELss = single-strike sound exposure level, TTS = temporary threshold shift, PTS = permanent threshold shift

Mitigation and management measures for underwater noise from construction will include "soft start" procedures and establishing safety zones (also referred to as shut-down zones) for marine mammals during piling (and drilling if required). Activity-specific safety zones (detailed in Appendix G-9) have been established for implementation during impact piling during construction (refer Figure 11-49 and Figure 11-50). These measures will help to ensure noisy activities cease as marine mammals approach and do not cause injury/behavioural response in marine fauna.

The expected impacts of underwater noise during construction are in the **Minor** category and the level of **certainty** in the expected impact is **High** (refer Appendix M).



Figure 11-49: Safety zones established for whales during construction impact piling activities
[Source: Appendix G-9]



Figure 11-50: Safety zones established for sealions and dolphins during construction impact piling activities
[Source: Appendix G-9]

Vibration from construction (tunnelling, boring, dredging, piling) will be short-term and localised and, with management measures in place, may elicit a minor behavioural response in benthic invertebrates

The fauna considered in this assessment are limited to benthic invertebrates since vibration of the substrate does not directly affect pelagic animals. There may be a temporary behavioural response to construction vibration-generating sources typically within 950 m of impact piling and within 30 m of the centre of the TBM cutter head.

Vibration impacts from tunnelling are expected to be temporary and localised to the area of seabed immediately above the intake and outlet tunnels (refer Appendix G-9). The zone of potential effect for impact piling and for tunnelling are shown in Figure 11-51 and Figure 11-52.

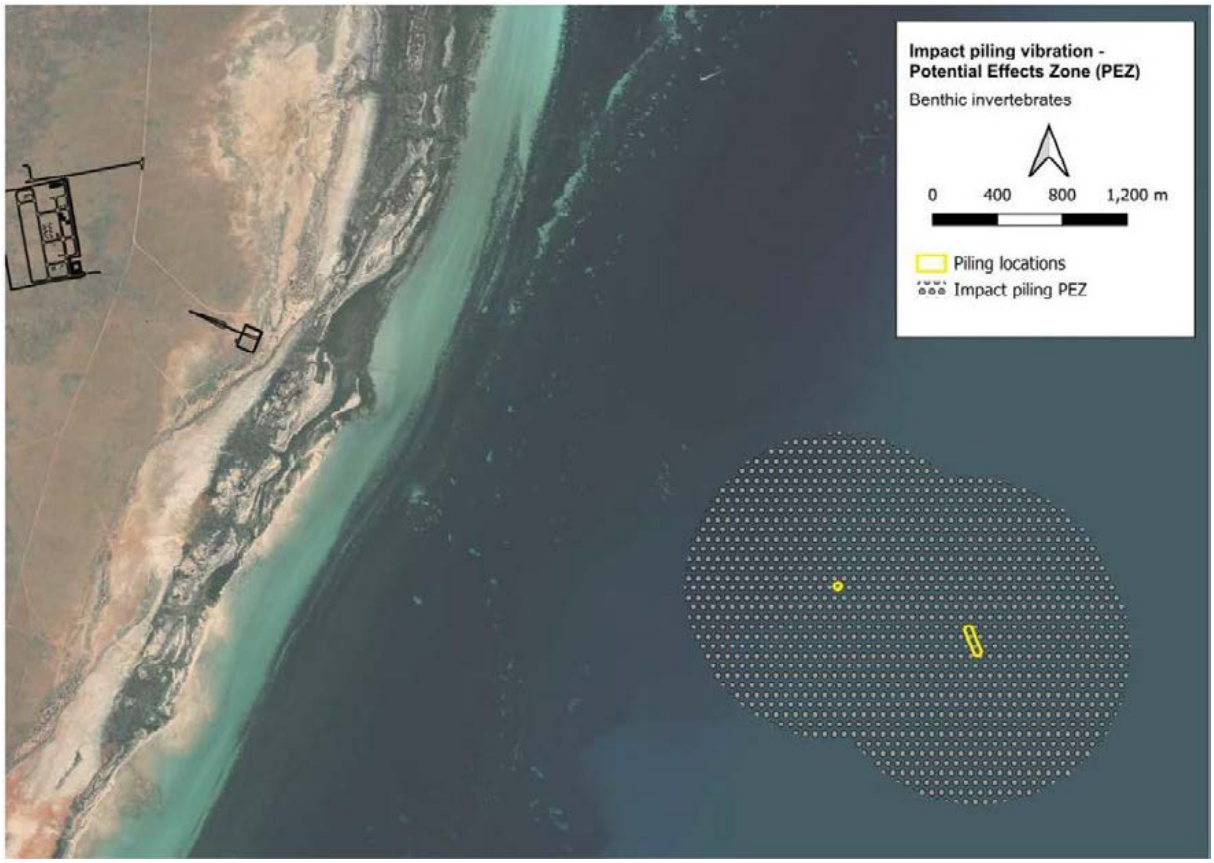


Figure 11-51: Potential vibration effects zone for benthic invertebrates from impact piling activities
[Source: Appendix G-9]

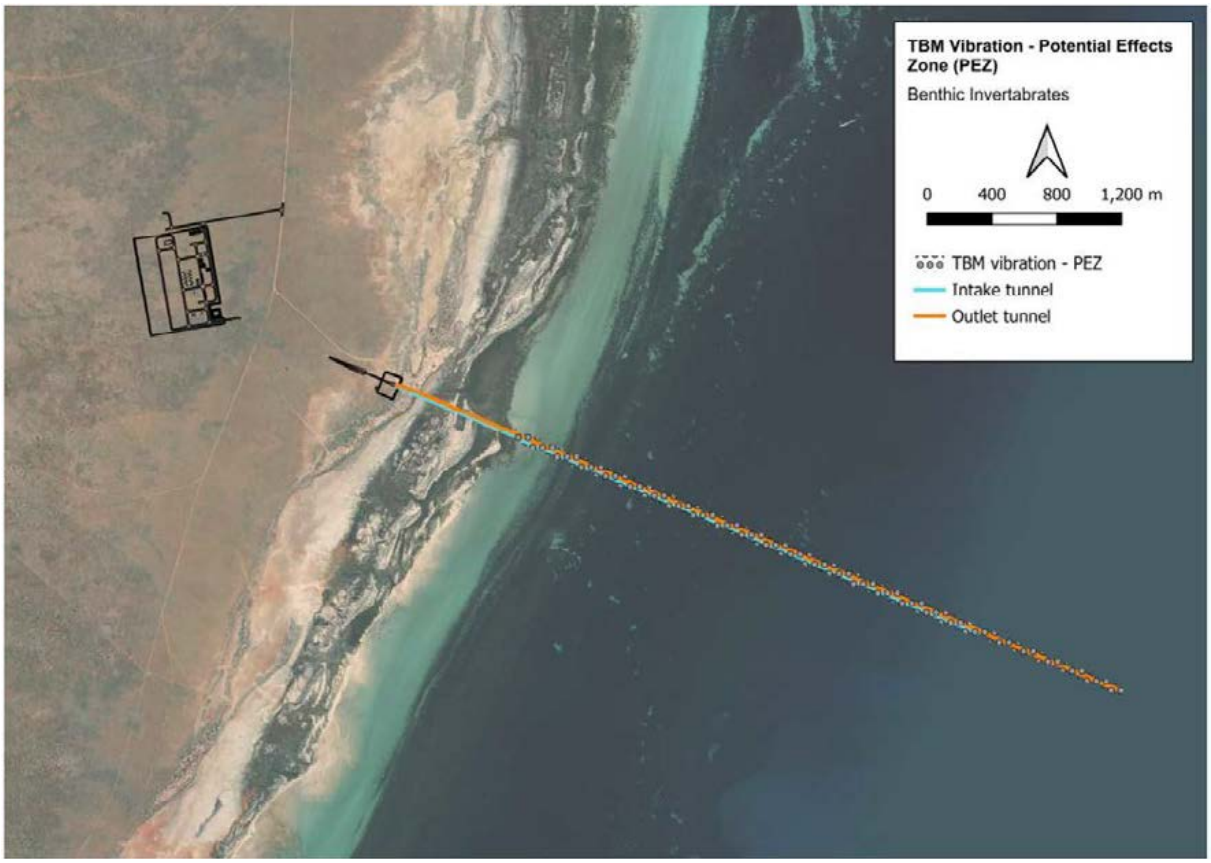


Figure 11-52: Potential vibration effects zone for benthic invertebrates from the TBM
[Source: Appendix G-9]

Vibration mitigation and management measures could include consideration of construction equipment and methodology to minimise vibration.

The Construction Noise and Vibration Management Plan (CNVMP) (or similar), as a sub plan of the Construction Environmental Management Plan (CEMP) will consider the assessment criteria, sensitive receptors, and relevant mitigation and management measures.

The expected impacts of vibration during construction on benthic invertebrates are in the **Minor** category. Uncertainty in the expected impact (due to the fact that impact of piling vibration on benthic invertebrates is not well understood, and may affect invertebrates in the vicinity temporarily) has been evaluated in Appendix M and the level of risk is **Low**.

Operation

Underwater noise and vibration from operation (noise from pumps) will not lead to injury / behavioural response in marine fauna

An assessment has been undertaken to determine the potential effects from operational noise generated by the desalination plant. Key noise sources are listed in Table 11-16.

Existing background noise levels within the MSA are typical of a shallow coastal ocean underwater noise environment away from significant anthropogenic noise sources. The ambient noise environment was dominated by snapping shrimp and wind / wave noise (Resonate 2026a- Appendix G-8).

Noise impacts on fauna from day-to-day operation (i.e. from intake and outlet pumps) are expected to be contained within 40 m of the intake and outfall risers. This limited range significantly reduces the potential for broader impacts on marine life, particularly species sensitive to underwater noise. Marine maintenance activities during the operation phase may include vessels and maintenance dredging (if required) and are expected to generate equivalent or similar noise levels as the same sources used during the construction phase. However, it should also be noted that these activities are expected to be infrequent and short-term in nature.

Table 11-16: Summary of operational noise sources

Noise source	Noise source type	Noise source level at 1m, dB re 1 µPa (RMS*)	Detail re frequency and character
Intake pumps**	Continuous	150–160 dB re 1 µPa rms at 1 m	Frequencies at pump operating speed harmonics (i.e. exhibiting discrete tonal characteristics associated with pump operation).
Outfall pumps**	Continuous	150–160 dB re 1 µPa rms at 1 m	Frequencies at pump operating speed harmonics (i.e. exhibiting discrete tonal characteristics associated with pump operation)
Outfall diffuser nozzle flow noise	Continuous	N/A	Based on maximum velocity of 6.7 m/s (expected velocity for 51 GL/y is 5.9 m/s in reference design)
Maintenance vessels	Continuous	150–170 dB_{rms} re 1 µPa at 1 m	As per construction phase - Low-mid frequency dominated. Levels are based on small-medium (5 to 25 m) vessels

*Root mean square sound pressure over the measurement period, expressed in dB re 1 µPa.

**Based on examples of similar pumps and considering transmission losses through the pipe.

Underwater noise modelling results, detailed in Appendix G-9, provide a comprehensive overview of the anticipated noise levels and their spatial distribution. Noise contour plots illustrate the areas affected by operational noise, indicating that sound levels will diminish rapidly beyond the immediate vicinity of the intake and outfall structures.

Overall, while the intake and outlet pumps do generate noise, due to the localised nature of this emission and the design of the pumping system the expected operational impacts on the marine environment are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

11.7.9 Entrainment

Entrainment of larvae via desalination plant intake during operation will not impact regional populations of ecologically / commercially / culturally important species

The intake is raised off the seabed to avoid entrainment of sand or benthic organisms. With a maximum intake screen velocity of 0.15 m/s, entrainment is limited and allows mobile organisms to swim away.



Figure 11-53: Concept of potential marine intake structure design

Investigations into the entrainment of larvae was undertaken using outputs from both the gulf-wide larval tracking model and the midfield entrainment modelling.

Gulf-wide biophysical modelling of planktonic larval connectivity for Prawn larvae indicated that 2.7% of the released larvae were likely to come within 1 km of the desalination intake. For King George Whiting (*Sillaginodes punctatus*, KGW), only 0.0029% of the released larvae were anticipated to come within 1 km of the intake. For Snapper, less than 7.4% were at risk of coming within 2 km of the intake.

Prawn, Snapper and King George Whiting larval entrainment was assessed with a particle tracking model using the radii of influence around the desalination plant intake as provided by SARDI as a result of the Gulf-wide model (refer Section 11.3.2).

For the assessment, regular particle releases within the particle release areas (~1 km (Prawns and KGW) and ~2 km (Snapper) around the intake shown in Figure 11-4) were used to obtain the proportion of released particles likely to be entrained into the seawater intake structure. The larval entrainment model determined that entrainment proportions (based on each release period) were mostly below 4.68% for the prawn larvae, and below 0.26% for Snapper, and 6.31% for King George Whiting juveniles. Lower entrainment proportions were observed for Snapper with behaviour incorporated into the model than for Snapper without behaviour (i.e. passive). The difference is largely attributed to the tendency of the juvenile Snapper to prefer the upper water column in the earlier days of development (<11.5 days), that keeps the juvenile Snapper away from the intake which is situated in the lower half of the water column. Entrainment results for Snapper 'with behaviour' modelled are adopted for the purpose of the EIS.

In order to determine what fraction of larvae from the Gulf that reach the intake area that may actually be at risk of entrainment, the outputs from both the gulf-wide transport model and the midfield particle modelling above are combined. The results indicate that the operation of the proposed intake structure will result in minor / negligible entrainment of Prawn, Snapper and King George Whiting larvae. The percentage of larvae released in the gulf that has the potential to be entrained into the proposed Mullaquana Station desalination plant (under a conservative hypothetical 73GL/y scenario, and using most conservative time period) is predicted to be **0.13%** (calculated as 4.68% of 2.7%) for Prawn, **0.0002%** (calculated as 6.31% of 0.0029%) for King George Whiting, and **0.019%** for Snapper (with behaviour)

(calculated as 0.26% of 7.4%). As these percentages are calculated at the 73 GL/y scenario, there is confidence that these results would be overestimating entrainment for the design capacity (i.e. 51 GL/y).

The expected impacts of entrainment of larvae of ecologically / commercially important species during desalination plant operation are in the **Minor** category. Uncertainty in the expected impact has been evaluated in Appendix M and the level of risk is **Low.**

Entrapment of marine species in desalination plant intake structure during operation is not expected to occur, and will not impact regional species populations of ecologically/commercially/culturally important species

The seawater intake is positioned and designed to minimise entrainment of fish and other pelagic biota. The intake is raised 3 m from the seabed to avoid entrainment of sand or benthic organisms, and the presence of intake grills / screens would prevent the likelihood of larger animals entering. The intake has been designed with a low intake velocity (<0.15 m/s) to allow for fish to safely swim away from the intake structure, and the intake screen (with velocity cap) will be designed to exclude larger materials.

The expected impacts of entrapment of marine fauna during desalination plant operation are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

11.7.10 Light spill from desalination plant

Night lighting at the desalination plant will be designed to meet best practice standards as not to create light spill into the marine environment, and will not impact marine fauna

The desalination plant is approximately 2 km away from the coast. The intake pump station is over 700 m from the coast. The Mullaquana Station site has a large intertidal and shallow zone, with marine infrastructure (intake and outfall structures) to be located no less than 3 km and no more than 5 km from the onshore intake pump station. This means that there are significant distances between the marine environment and terrestrial sources of night lighting at the desalination plant and intake pump station.

Exterior area lighting will be required at the desalination plant for security and personnel safety reasons. The exterior lighting will be angled / shielded to adequately illuminate required areas (avoiding unnecessary light spill) and automatically controlled with motion sensors and / or timers. External lighting at the desalination plant will be designed in line with Australian Standards and best practice lighting design as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023b).

Artificial light can disturb migrating species or disrupt important wildlife behaviours if the lighting is not appropriately designed. The DCCEEW guidance (2023b) recommends species-specific impact assessment from artificial lighting if important habitat for listed species is located within 20 km. The marine area adjacent the desalination plant site is not a highly utilised location for threatened or migratory species. It is not a known regular migration pathway for whales, turtles or the Giant Australian Cuttlefish (refer Section 11.4.7).

Although the entire southern coastline, including the MSA, is considered biologically important habitat for Southern Right Whales as they move between important foraging and breeding areas, the area is seldom utilised by the species (refer Appendix I-6 Significant

Impact Assessment). Light spill into the marine environment during operation of the desalination plant is not anticipated, and is not expected to disrupt or displace Southern Right Whales from important habitat, and will not interrupt critical behaviours such as foraging, reproduction and dispersal.

Key design and operational mitigations will be confirmed as part of detailed design and will include shielding and angling where necessary to avoid potential light spill, as well as applying best practice lighting design principles from the National Light Pollution Guidelines for Wildlife (DCCEEW 2023b), for example:

- only lighting areas necessary for purpose (i.e. for security and personnel safety)
- using adaptive light controls to manage light timing, intensity and colour
- using the lowest intensity lighting appropriate for the task
- using non-reflective dark surfaces where possible
- using lights with reduced or filtered blue, violet and ultraviolet wavelengths.

Incorporating effective design and mitigation measures is expected to minimise light spill such that marine fauna will not be adversely exposed to lights from the desalination plant operation.

There may be limited instances where night lighting is required during the construction phase. Desalination plant construction is expected to be undertaken during the daytime and night lighting would be minimal and for safety purposes only and angled away from marine areas. As the TBM will operate 24 hours per day, lighting in the vicinity of the launch box / shaft is expected to be utilised continuously. The launch box / shaft is over 700 m from the seaward edge of the mangroves, and lighting will be shielded or angled to avoid light spill where required.

Lighting from the marine jack-up barge (likely operating 24 hours per day) will be short-term and localised, and will be managed in an artificial light management plan as part of the CEMP.

With best practice lighting design principles implemented as above, marine species behaviour, survivorship or reproduction are not expected to be affected by the temporary lighting during construction.

The expected impacts to marine fauna from artificial lighting at the desalination plant are in the **Negligible** category. Uncertainty in the expected impact (as it will depend on final detailed design) has been evaluated in Appendix M and although there is a lack of certainty around the lighting in the final detailed design, incorporating the lighting design principles will ensure the level of risk is **Low.**

11.7.11 Invasive marine species

The impact to marine ecology from the introduction, establishment or spread of marine invasive species during construction will be effectively mitigated and managed

Disturbed habitats, including marine construction sites, are particularly suitable settling habitat for invasive marine species (Avila-Turriago et al. 2026). The introduction of new artificial habitat with the intake and outfall structures provides suitable settling substrate for these opportunistic species (also covered under an impact event for operations below).

Vessels as vectors

One invasive marine species is present within the MSA, the European fan worm (refer Appendix G-15). There is potential for biofouling of vessels at the site leading to further spread of this IMS elsewhere; however, this is considered unlikely due to limited anchoring / docking time at the MSA at any one time, and vessel management measures mentioned below.

Other new invasive species may be introduced to the site via biofouling of Project vessels and equipment, or via external sources such as infected vessels.

Although the AQUIS and MARS national and domestic ballast water management system includes measures considered adequate to limit the introduction and spread of invasive marine species, there remains the risk of ballast waters containing invasive species.

The construction vessels with highest risk of introducing invasive species are considered to be the large, slow, water-berthed vessels including barges, jack-up barges, mobile drilling rigs and survey ships coming from Australian ports. Trailerable vessels that are regularly cleaned and removed from the water are considered to have a lower risk of carrying invasive species.

Mitigation techniques to reduce risk of transferring invasive marine species involve but are not limited to:

- individual vessel biofouling risk assessments according to the appropriate set of National Biofouling Guidelines
- vessel inspections by qualified biofouling inspectors before vessels leave donor locations to ensure clean hulls
- journey tracing to minimise idle time in donor locations for in-water vessels
- setting up quarantine zones for checks on vessels before entry to the area where marine construction activities are proposed.

The IMS study recommends that all vessels should be confirmed to have clean hulls, appropriate biosecurity hygiene maintenance applied and regular checks of ballast water and biofouling management plans where appropriate based on vessel type.

Addition of available settling habitat

Disturbed marine areas and the addition of artificial hard surfaces provides suitable settling substrate for IMS species.

The European fan worm, which is already established across the site, prefers hard surfaces to settle on (including shells, rocks, and artificial surfaces). In an otherwise predominantly soft bottom habitat, the presence of the intake and outfall structures[22] will likely provide a key opportunity for this species to settle. The initial colonisation of the infrastructure will be considered prior to construction and suitable industry standard strategies would be adopted and set out in management plans. This will encourage local species to dominate the artificial habitat assemblage and support a productive natural ecosystem, and ensure opportunistic

[22] Noting that the marine intake and outfall structures are likely to be located between 13 m and 17 m water depth (from the LAT, which equates to approximately -15 m to -19 m AHD), and between 3 km and 5 km from the on-shore intake pump station.

invasive species do not outcompete the local species, and lead to ecosystem damage. Additionally, the new underwater structures could be preconditioned with local species which will be further considered as part of the construction environmental management plan and operations environmental management plan.

The Invasive Marine Species Risk Assessment is presented in Appendix G-15.

The likelihood of Project construction leading to the introduction or establishment of new invasive marine species was considered to potentially occur but only in **Rare** and exceptional circumstances. It is considered unlikely that vessels will further spread the existing European fan worm away from the site. The European fan worm is already established at the site, but if it proliferates, or if new invasive marine species were to become established the consequences could be **Major** so overall there remains a **Medium** risk.

The impact to marine ecology from the introduction, establishment or spread of marine invasive species during operation will be effectively mitigated and managed

Marine traffic and use of temporary submersible equipment will be limited during the Project operation activities. Vessels to be used during the operation phase would typically include maintenance, monitoring and research vessels. Temporary submersible equipment may occasionally be used during maintenance activities.

Maintenance vessels will be required to comply with the national requirements regarding biofouling and ballast water management to comply with the *Biosecurity Act 2015*.

Project operation will require limited vessel movements for the duration of the Project. Although every vessel movement has an associated risk, with adequate vessel management in place, there is a low likelihood that new invasive species are introduced, become established at the site, or spread outside the site due to the Project's operation.

The European fan worm is already established across the site, and may proliferate if not appropriately managed. The long-term presence of the intake and outfall structures in an otherwise soft bottom environment is likely to provide ongoing opportunity for invasive marine species, such as the European fan worm to settle. Appropriate and industry standard strategies would be adopted to mitigate invasive marine species (to be confirmed as part of detailed design and in operational management plans). Management plans may involve a combination of active monitoring, anti-fouling strategies, and physical management to avoid establishing dense, mature populations. Management plans will also describe the response procedure that will be followed in the event of a new exotic organism being detected and the system of surveillance monitoring.

Regular ongoing monitoring of colonised surfaces during routine intake grill cleaning / checks will maintain integrity of the marine communities on the intake and outfall structures. Due to the **major** potential consequences, there remains a **Medium** level of risk.

11.7.12 Waste from spent tunnel boring machine

There will be no ongoing contamination risk associated with the TBM remaining in the marine environment

Due to the complexities and potential impacts of removing the TBM(s) from the end point of the tunnel(s), the TBM head would be buried upon completion. Once the intake and outfall

tunnels have been constructed the TBM(s) will be drained of all lubricants, hydraulic fluids and other chemicals (such as ground conditioning additives and grout additives) and where possible machine parts may be salvaged for reuse or recycling. The TBM 'shell' will then be grouted / concreted in place, rendering the structure 'inert'. This is a standard practice for TBMs and has been used in various tunnelling projects associated with desalination plants and urban development.

The expected impacts of the TBM head remaining buried in-situ would be localised and are in the **Negligible** category. **Certainty** in the assessment of expected impact is **High** (refer Appendix M).

11.7.13 Option Assessment: Float and sink seabed pipeline

This section relates to the **Float and Sink Pipeline Option,** which employs the **float and sink construction methodology** for the sections of the outfall pipeline beyond the outfall riser structure (likely to be constructed at a similar location as the termination of the intake tunnel). The option assumes the intake and outfall structures are in the same location as the Reference Design with the final ~1 km outfall pipe being **laid on the seabed** and secured with pipe collars (refer Section 11.5).

This assessment only covers aspects that are materially different to the Reference Design and warranted a separate assessment, including seabed disturbance during construction, underwater noise and vibration, invasive marine species, waste from spent TBM. Impacts to coastal processes are covered in Chapter 10.

Seabed disturbance

The Float and Sink Pipeline Option would involve a greater extent of seabed disturbance to install and accommodate the pipeline on the seabed than the Reference Design and impacts are assessed as Minor.

Key departures from the Reference Design in terms of seabed disturbance in relation to the Float and Sink Pipeline Option include:

- the extent of dredging (between intake and outfall) to partially house the pipe on the seabed and to ensure hydraulic performance and asset protection requirements are met (subject to detailed design)
- construction footprint area to accommodate JUB/s and install the ~1,000 m of pipeline and pipe collars
- the presence of the pipe on the seabed would create a larger permanent footprint than the Reference Design with 1,000 m of pipeline and collars on the seabed.

The estimated seabed disturbance areas for the Float and Sink Pipeline Option are described in Table 11-17 and shown in Figure 11-54.

This option case increases seabed disturbance from the Reference Design case to 5.45 ha (from 1.17 ha) to allow for the pipe on the seabed. This includes an additional 1.85 ha of *Zostera* seagrass clearance (1.09 ha permanent and 0.76 ha temporary) compared to the Reference Design.

Table 11-17: Estimated seabed disturbance areas for the Float and Sink Pipeline Option

Project component	Estimated total disturbance (ha)	Estimated breakdown (ha)	
		Permanent	Temporary
Intake structure – in *Zostera* habitat (as per Reference Design)	0.25	0.15	0.10
Outfall riser and diffuser array in sandy habitat (as per Reference Design)	0.92	0.50	0.42
Pipeline and collars (float and sink) in *Zostera* habitat	**1.85**	**1.09**	**0.76**
Pipeline and collars (float and sink) in sandy habitat	**2.43**	**1.47**	**0.96**
TOTAL	**5.45**	**3.21**	**2.24**

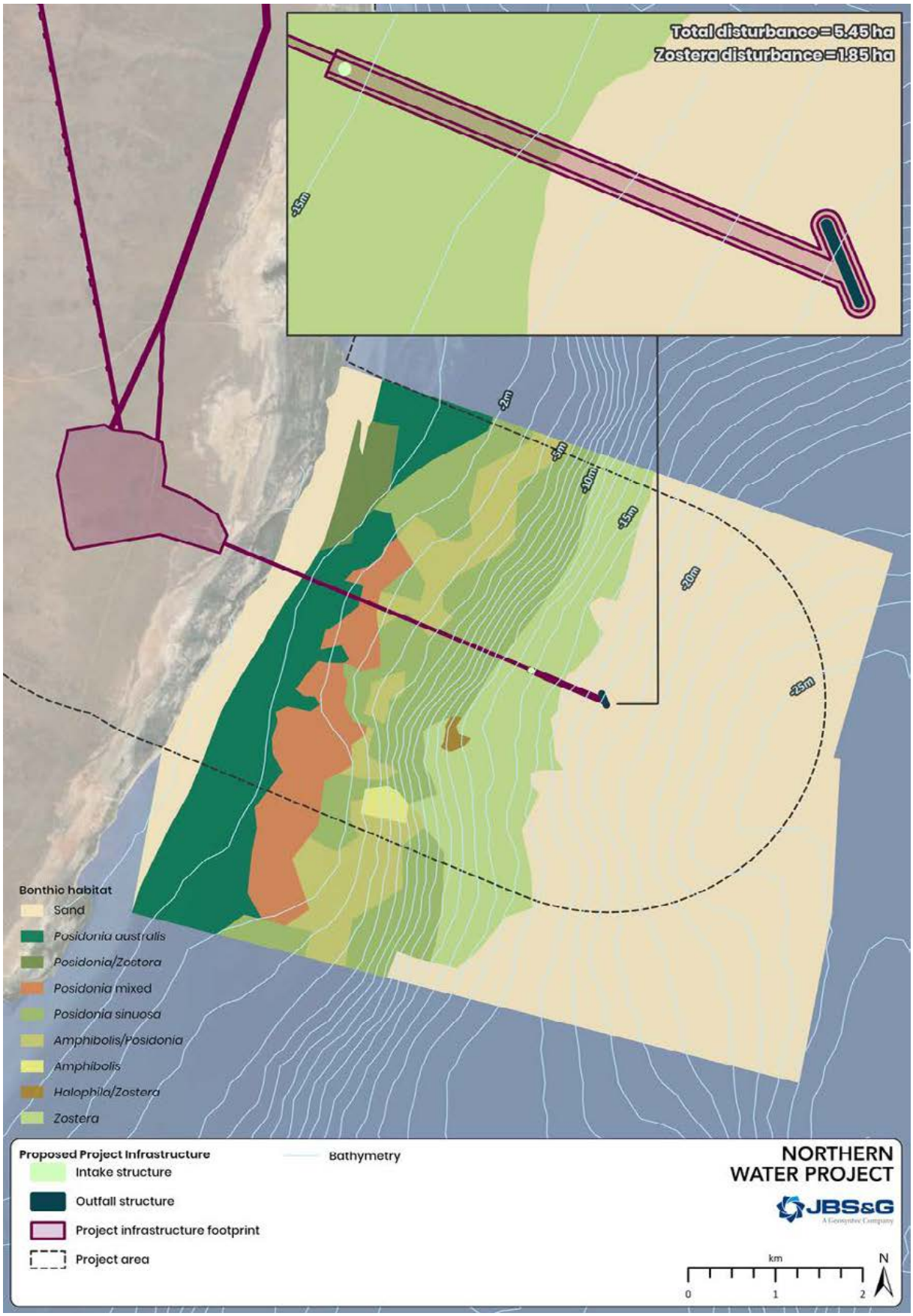


Figure 11-54. Seabed disturbance areas for the float and sink pipeline option showing total disturbance and *Zostera* disturbance areas

[Bathymetry = mAHD]

The sandy and *Zostera* habitats present at the desalination plant site are well represented in Spencer Gulf (refer Section 11.7.5). The loss of habitat from disturbance of the seafloor would not be substantial when considered in the context of the broader area.

For the intended removal or damage to seagrass as part of Project construction, approval is being sought through the EIS process. The Project will seek to avoid and minimise damage to these sensitive habitats, and a Significant Environmental Benefit (SEB) would offset any unavoidable native vegetation removal.

The increased extent and duration of dredging may increase the extent and duration of suspended sediments associated with construction. Dredging of the seabed would be managed under a Dredge Management Plan and would require compliance with EPA licence conditions. Potential impacts to *Zostera* and sandy habitats are considered to be predominantly short-term and highly localised to the disturbance areas shown in Figure 11-54.

The expected impacts to the marine seabed from the Float and Sink Pipeline Option are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Underwater noise and vibration

Construction noise and vibration

Construction of the Float and Sink Pipeline Option will increase Project underwater noise generation compared to the Reference Design, and the impacts on marine fauna of underwater noise generated by this Option are considered Minor.

The Float and Sink Pipeline Option will increase the underwater noise generation through:

- increases the duration of dredging days during construction / float and sink of the pipe
- increases amount of piling to install pipe collars into the seabed.

Impacts of underwater noise during construction and operation were considered in the Underwater Noise and Vibration Assessment (refer Appendix G-9). Expected impacts from the option case are considered to be comparable to the Reference Design case.

The amount and duration of vibration generated by the increased dredging and piling required to construct the Float and Sink Pipeline Option was considered in the Underwater Noise and Vibration Assessment (refer Appendix G-9). Expected impacts of vibration during construction are considered to be comparable to the Reference Design case

Operational noise and vibration

Operation of the desalination plant with the Float and Sink Pipeline Option implemented would have a negligible increase in the potential for Project underwater noise generation compared to the Reference Design from the noise emitted through the seabed pipe.

The only source of operational noise for the Float and Sink Pipeline Option that is different to the Reference Design case in Section 11.7.8 is noise transmission through the HDPE (or similar) pipe wall from outfall pumps, or flow-induced noise from the pipe on the seabed.

The mechanism for this would be noise from outlet pumps or flow-induced noise from within the pipe causing pipe walls to vibrate, which in turn could cause underwater noise to be radiated into the surrounding water.

The Noise and Vibration Assessment (refer Appendix G-9) assumed that for engineering purposes, the sunk pipe would need to be relatively stiff and thick-walled. Such a pipe would substantially limit vibration of the pipe and therefore significantly reduce underwater noise radiation into the surrounding water column, making adverse impacts on marine fauna from outlet pump or flow-induced underwater noise radiated from the pipes unlikely.

The expected impacts of underwater vibration during operation are considered to be in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Invasive marine species

The impact to marine ecology from the introduction, establishment or spread of marine invasive species during construction and operation will be effectively mitigated and managed and the expected impact remain similar to the Reference Design.

Construction

The Float and Sink Pipeline Option increases the level of construction vessels, seabed disturbance and the availability of hard surfaces in the otherwise soft bottom habitat providing opportunities for settlement of IMS. Appropriate and industry standard strategies would be adopted to mitigate invasive marine species (to be confirmed as part of detailed design and in management plans). The impact and risk remain similar to Reference Design.

Operation

The Float and Sink Pipeline Option increases the availability of hard surfaces in the otherwise soft bottom habitat providing opportunities for settlement of IMS during operations. Appropriate and industry standard strategies would be adopted to mitigate invasive marine species (to be confirmed as part of detailed design and in management plans). Regular ongoing maintenance and monitoring for pipeline infrastructure would be required. The impact and risk remain similar to Reference Design.

11.7.14 Cumulative impact from other development

The USG has a strong industrial history with existing iron and steel making facilities and port infrastructure. Heavy industry and resources (i.e. mining, steel, energy) support the coastal cities of Whyalla, Port Pirie and Port Augusta, alongside significant commercial and recreational fishing activities and tourism operations. With the heavy focus on USG as an industrial hub, there are several proposed developments in the area.

The flora and fauna of USG has co-existed with industry in the USG for a long time, particularly near Whyalla and Port Bonython where there are existing ports and shipping, ecotourism, commercial fishing (with restrictions) and the Whyalla Steelworks. There are plans for the Whyalla Steelworks to be upgraded, supported by a significant investment from the State and Commonwealth Governments. A hydrocarbon import / export terminal at Point Lowly has been operating for over 40 years.

Coastal marine environments adjacent to these populated and industrial areas are likely to be at a greater risk of cumulative impact than other areas within the gulf (Jones et al. 2018, refer Figure 11-55). The Project MSA is a significant distance away from the Whyalla and Port Bonython/Point Lowly locations meaning that cumulative impact considerations are not significant for these locations.

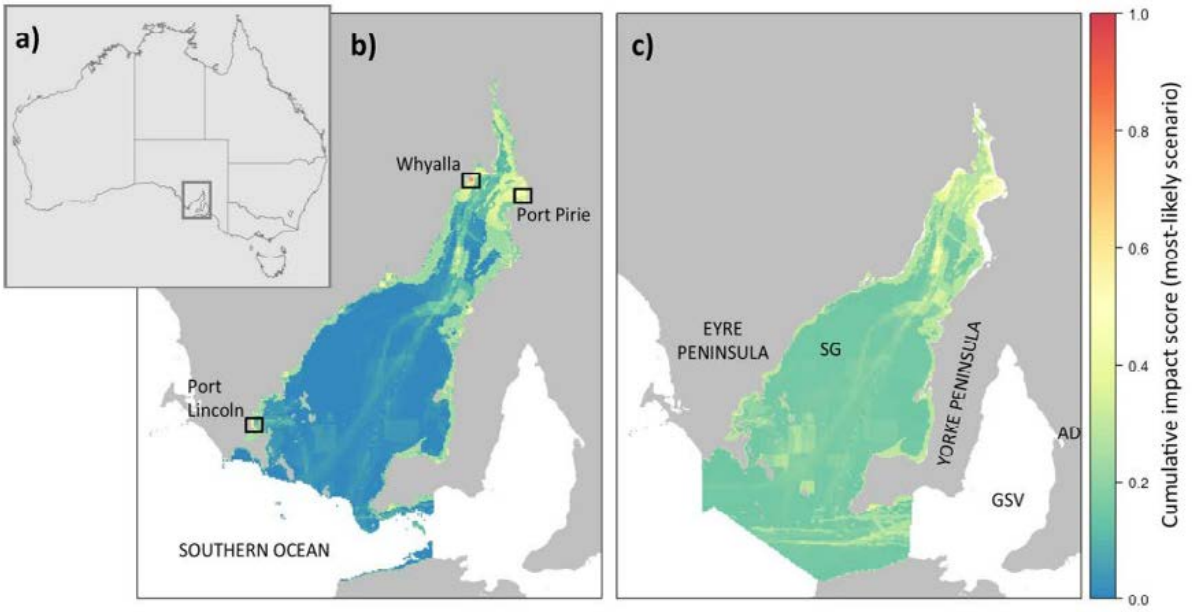


Figure 11-55. Cumulative impact maps from Jones et al. (2018) which was based on expert assessment of the effects from 32 threats on eight ecosystems.

[Figures show a) map context, and scaled cumulative impact scores for the most likely scenario for (b) benthic and (c) pelagic ecosystems.]

Nearer to the MSA, Alligator Energy has recently completed a Field Recovery Trial (FRT) approximately 1.4 km north-west of the desalination plant site at Mullaquana Station for its Samphire Uranium Project (S Uranium Pty Ltd, RL 137). As there is not expected to be any interaction with the marine environment from Alligator Energy's activities (Alligator Energy 2023), there will be no cumulative marine impact from the Project and the Samphire Uranium Project.

Projects in the vicinity of the MSA around the USG that have been referred or approved under the EPBC Act but are yet to be developed include:

- Nonowie Wind Farm (Tilt Renewables DevCo Pty Ltd, EPBC 2025/10164 & REILA 25)
- Middleback Ranges MEP 2 Project (GFG / SIMEC, EPBC 2024/09878)
- Hydrogen Jobs Plan[23] (including all approved ancillary infrastructure) (DEM, EPBC 2023/09759)
- Whyalla Hydrogen Pipeline (EPIC Energy, EPBC 2024/09873)
- Cultana Solar Farm (Cultana Solar Project Company Pty Ltd, EPBC 2023/09658)
- Yoorndoo Ilga Solar Project (Yoorndoo Ilga Solar, Cultana | SA: Yoorndoo Ilga Solar)

[23] The Hydrogen Jobs Plan project is currently deferred and not being progressed beyond electricity transmission infrastructure which is now installed.

- Eyre Peninsula Transmission Line upgrade (ElectraNet, Eyre Peninsula Upgrade | ElectraNet).

Activities associated with the Project's marine construction and operations at Mullaquana Station are not expected to interact with these projects. The Project desalination plant operation would not add to any marine cumulative effect of existing and proposed industry due to the geographical separation of the Project and its limited zone of ecological effect.

11.7.15 Summary of key mitigation measures

Design mitigation

Several Project elements have been optimised or refined through the design phase, either through engagement or in response to modelling and impact assessment, or progression of Project engineering. These are discussed in Chapter 5 Project Siting, Alignment and Optimisation, Chapter 6 Project Description, and in Section 11.7.3 above.

Selection of construction methodology

The TBM was the preferred methodology selected for tunnel construction as it minimises seabed disturbance, avoids disturbance to *Posidonia* seagrass, limits disturbance to *Zostera* seagrass and limits the extent of ongoing seabed obstruction.

Key construction and operation mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP and other relevant plans).

Key mitigation measures in relation to marine impacts are presented in Table 11-18.

Table 11-18: Key mitigation measures – marine environment

Mitigation measure	Construction	Operation
Intake and outfall tunnels predominantly constructed via TBM to avoid mangrove, intertidal and seagrass habitats	✓	
Diffuser designs optimised to ensure effective mixing and dispersion of the return water plume		✓
Seawater bypass system (refer to Chapter 6 Project Description for more detail) – note that the seawater bypass system is not intended to function as a general operational tool for modifying discharge characteristics when the plant is operating at or near full design capacity given the intake, outfall and associated hydraulic systems are not designed to accommodate additional bypass flows under full-capacity operating conditions		✓
Intake sea water velocities and flow rates to be appropriately low to mitigate entrainment and entrapment		✓
Avoidance of intertidal mangroves / tidal flats, and slow growing *Posidonia* seagrass habitats and limited impact to *Zostera* seagrass habitats	✓	✓

Mitigation measure	Construction	Operation
Desalination plant pre-treatment measures to remove high organic matter and high suspended solids outside of normal seawater conditions		✓
Prior to construction, a subsequent investigation into dinoflagellate resting cells and cysts in marine sediments to be undertaken to provide a second baseline survey for comparison with the pre-bloom survey. If viable cysts or cells are identified in marine sediments, additional mitigation and management strategies may be considered and adopted as part of the CEMP.	✓	
Develop of site specific (terrestrial) SEDMP for desalination plant including: • Staging of construction works • Temporary sediment control structures • Early establishment of operational drainage management structures • Reduce or suspend activities during periods of heavy rainfall when unable to control run-off • Erosion management for stockpiles • Rehabilitation plan	✓	
Periodic cleaning of the detention basins to ensure sediment build up does not compromise effectiveness		✓
Marine silt and sediment management plan and Dredge Management Plan	✓	
Establish accidental spill protocols	✓	✓
Construction Noise and Vibration Management Plan	✓	
Establish safety zones during impact piling	✓	
Establish navigational exclusion zones around the intake and outfall diffusers		✓
Individual vessel biofouling risk assessments according to the appropriate set of National Biofouling Guidelines	✓	✓
Vessel inspections by qualified biofouling inspectors before vessels leave donor locations to ensure clean hulls	✓	✓
Journey tracing to minimise idle time in IMS donor locations for in-water vessels	✓	✓
Set up quarantine zones for checks on vessels before entry to the Mullaquana Station vicinity	✓	✓
Recommendation - all vessels should be confirmed to have clean hulls, appropriate biosecurity hygiene maintenance applied and regular checks of ballast water and biofouling management plans where appropriate based on vessel type.	✓	✓

11.8 Discussion

As mentioned in Section 11.5, the intake and outfall locations may be refined during detailed design but will be located between 13 m and 17 m water depth (from LAT), and between 3 km and 5 km from the on-shore intake pump station. The final location of the intake and outfall structures would be subject to the outcomes of detailed hydrodynamic modelling and additional impact assessment, and meeting the functional and operational requirements of the Project. Final hydrodynamic modelling (to be undertaken post approval) would need to show that there would be no impact to key environmental receptors from the final infrastructure locations, including *Posidonia* seagrass.

Figure 11-44 shows the zone of potential ecological effect for the 51 GL/y capacity, which is the union of the 10th percentile dilution contours for 95% species protection levels for all seasons. Resulting from the significant body of assessment and analysis in this Chapter, the following are relevant observations and discussion in relation to the location of the intake and outfall structures:

- the zone of potential ecological effect in Figure 11-44 shows a significant distance between the edge of the 95% species protection contour and the boundary of the *Zostera* seagrass
- it is possible for the location of the outfall / diffuser location to be shortened in relation to the coastline by a distance that ensures the 95% species protection contour (zone of potential ecological effect) does not intersect with the boundary of the *Zostera* seagrass
- this would result in no greater or additional impact from what has already been impact assessed in this chapter.

11.9 Conclusion

In conclusion, the Northern Water Project has prioritised understanding the potential interactions between the Project and the marine environment at Mullaquana Station, particularly regarding sensitive areas such as mangroves, seagrass beds, threatened species, and commercially important fisheries. Assessment conclusions consider the current condition of the marine environment, including information collected before, during and after the HAB event.

By selecting construction methodologies designed to minimise marine impacts, including underground tunnels and careful management of disturbance, the Project aims to ensure that effects on the local ecosystem remain localised, minor, and temporary.

During operation, the discharge of desalination plant return water is expected to have negligible impacts on marine flora and fauna, particularly due to the limited ecological effect zone and the natural variability of salinity levels in the area. Comprehensive assessments, including baseline studies and hydrodynamic modelling, confirm that the operation of the desalination plant can be undertaken in a responsible manner that protects sensitive marine habitats while fulfilling the Project's objectives.



Chapter 12

Soils, Landform and Geology

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

12 SOILS, LANDFORM AND GEOLOGY 12-1

12.1 Key Findings 12-1

12.2 Setting the Context 12-1

12.2.1 Requirements in legislation and other standards 12-2

12.2.2 Views of stakeholders 12-2

12.3 Assessment Method 12-3

12.3.1 Desktop assessment and field survey 12-3

12.3.2 Risk assessment 12-4

12.3.3 Preliminary site investigation 12-4

12.4 Description of the Existing Environment 12-4

12.4.1 Topography, landform and land systems 12-4

12.4.2 Surface geology 12-10

12.4.3 Soils 12-13

12.4.4 Risk factors for impacts to soils 12-18

12.5 Impact Assessment 12-21

12.5.1 Soil erosion and sedimentation 12-22

12.5.2 Soil inversion 12-23

12.5.3 Soil compaction 12-23

12.5.4 Disturbance of potential acid sulfate soils (PASS) and saline soils 12-24

12.5.5 Soil contamination 12-25

12.5.6 Soil stability and subsidence 12-28

12.5.7 Summary of key mitigation measures 12-29

12.6 Conclusion 12-31

LIST OF TABLES

Table 12-1: Landform of the Project Area 12-6

Table 12-2: Land systems within the Project Area 12-6

Table 12-3: Geology of desalination plant site 12-10

Table 12-4: Regolith units in the Project Area 12-12

Table 12-5: Mapped soil types along the transfer system alignment 12-14

Table 12-6: Areas of PASS and saline soils identified at watercourse crossings* 12-21

Table 12-7: Key mitigation measures – soils, landform and geology 12-29

LIST OF FIGURES

Figure 12-1: Land systems in the Project Area - southern section 12-8
Figure 12-2: Land systems in the Project Area - northern section 12-9
Figure 12-3: Geological cross-section 12-11
Figure 12-4: Soil types in the Project Area - southern section 12-16
Figure 12-5: Soil types in the Project Area - northern section 12-17
Figure 12-6: Regional mapping of ASS probability at the desalination plant site 12-20

LIST OF PLATES

Plate 12-1: Soils at the desalination plant site (left) and Mangata pump station (right) 12-15

12 SOILS, LANDFORM AND GEOLOGY

This chapter describes the existing topography, geomorphology and geology of the Project Area and the potential for construction and operation of the Project to affect soils, landform and geology.

Potential impacts to landform, soils and water are often inter-related. Accordingly this chapter should be read in conjunction with Chapter 13 Surface Water and Chapter 14 Groundwater.

Potential for soil contamination from Project activities is addressed in this chapter. Existing soil contamination including the identification and management of contaminated sites is addressed in Chapter 25 Hazards and Risks.

Description of seismic hazard and implications for design of the Project have been assessed in Chapter 25 Hazards and Risks.

12.1 Key Findings

- Best practice erosion and sedimentation control measures will be implemented to minimise risk to soils and surface waters, maintain soil viability and minimise loss of topsoil.
- Soil compaction will be limited to areas of temporary disturbance and compacted soils will be rehabilitated post-construction to maintain soil viability.
- Pipeline construction methodology and appropriate management will prevent mobilisation of known and encountered acid sulfate soils.
- Impacts from disturbance of saline soils are not expected due to habituation of surface water and vegetation in existing saline environments.
- Implementation of appropriate storage and handling of fuels and chemicals and proactive spill management will minimise risks of soil contamination during construction and operation.
- Previously contaminated soil will be appropriately managed and reused where permitted in accordance with the waste management hierarchy and applicable legislation.
- Design of the transfer system and the desalination plant intake and outfall box cut and tunnels has considered risks of soil stability and ground subsidence over infrastructure design life.

12.2 Setting the Context

The EIS Assessment Requirements require a description and assessment of the effects of the Project on the soils, landform and geology in the area of the Project including the potential for water and wind erosion, soil salinity, acid sulfate soils and soil contamination. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken.

It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 12.3.

12.2.1 Requirements in legislation and other standards

The *Environment Protection Act 1993* (EP Act) sets out a general duty to prevent pollution of the environment and minimise any resulting environmental harm as a result of activities. A range of policies and guidelines under this Act set out guidance for best practice management of potential impacts to soils and land which include:

- *Construction environmental management plan* (EPA 1095/24) (EPA 2024)
- *Guidelines for the assessment and remediation of site contamination* (EPA 2019a)
- *Bunding and spill management* (EPA 080/16) (EPA 2016a)
- *Environmental management of dewatering during construction activities* (EPA 1093/21) (EPA 2021)
- *Site contamination – acid sulfate soil materials* (EPA 638/07) (EPA 2007)
- *Standard for the production and use of Waste Derived Fill* (EPA 2013)
- *Guideline for stockpile management* (EPA 2020).

The Commonwealth Department of Climate Change Energy, the Environment and Water (DCCEEW) has published guidelines in relation to acid sulfate soils including:

- *Guidance for the dewatering of acid sulfate soils in shallow groundwater environments* (Shand et al. 2018)
- *Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management* (Simpson et al. 2018).

The *Landscape South Australia Act 2019* (LSA Act) provides for the protection and management of the State's natural resources including provisions relating to management of soils and water.

The LSA Act provides for the establishment of regional landscape boards with responsibility for management of land and water resources within a region and development of regional landscape plans setting out the priorities for achieving sustainable landscape management. The Eyre Peninsula Landscape Board and the South Australian Arid Lands Landscape Board are the relevant boards for the purposes of the Project.

In the northern extent of the Project, the *Pastoral Land Management and Conservation Act 1989* also plays a role in the management of soil, water and land productivity on pastoral leases.

12.2.2 Views of stakeholders

Stakeholder engagement has included engagement with communities and businesses, local councils, Traditional Owners and affected landholders. Further engagement with

landholders in particular will include discussions about minimising temporary and permanent impacts to pastoral operations from construction and operation of the Project.

Specific concerns in relation to the impacts of the Project on soils and landform have been raised in general engagement with the community, including:

- management of acid sulfate soils where present
- ensuring effective erosion and sediment control during construction.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

12.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology and considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The Topography, Geology and Soils Assessment report is provided at Appendix H-1 (Jacobs 2026b). The geomorphic assessment in the report also informed the Surface Water Assessment report provided at Appendix H-3 (Jacobs, 2026c).

Existing site contamination was the subject of a Project-specific preliminary site investigation (PSI) which is provided at Appendix H-2 (JBS&G, 2026d[1]). Potentially contaminating activities (PCA) and existing site contamination that were identified are described in Chapter 25 Hazards and Risks.

12.3.1 Desktop assessment and field survey

A desktop assessment was undertaken using LIDAR data and regional topographic and geological mapping available from CSIRO, South Australian Resources Information Geodatabase (SARIG) and Geoscience Australia. These included:

- Interim Biogeographic Regionalisation for Australia (IBRA), Version 6 (associations) and 7 (regions and subregions) (DEW 2024b)
- South Australia Regolith Map (Geological Survey of South Australia / GSSA 2012)
- South Australia Geological Map (GSSA 2020)
- South Australian Resources Information Gateway (drillhole information)
- The Atlas of Australian Soils (CSIRO, 1991)
- Soil and Landscape Grid National Soil Attribute Maps – Depth of Regolith (CSIRO, 2015)
- The Australian Neotectonic Features Database (NFD) (Geoscience Australia, 2019).

[1] Note this report was completed in 2025, and finalised for the EIS in 2026.

- National Seismic Hazard Assessment (NSHA) Earthquake Epicentre Catalogue (Geoscience Australia, 2018).

Geotechnical information utilised to assess the sub-surface conditions in the Project Area included data from other Northern Water Project reports and published literature including technical reports prepared for the Samphire Uranium Retention Lease Application (Alligator Energy 2023), Olympic Dam EIS Project Soil Investigation (URS, 2006) and the BHP Olympic Dam Expansion Environmental Impact Statement (BHP 2009a).

The desktop assessment informed a targeted field survey by a qualified geomorphologist of the proposed desalination plant site and the transfer system alignment. The survey supported the assessment of the current geomorphological condition of the landforms, the nature of erosion and deposition processes and interactions with vegetation, to inform potential construction approaches and operational management.

Baseline geotechnical investigations were undertaken along the transfer system alignment including a combination of borehole and test pits (Kleinfelder 2026b, CMW Geosciences 2025). This investigation was undertaken in a staged approach from 2024 to 2026. In addition, a detailed site analysis for the desalination plant was undertaken in 2025 (Kleinfelder 2025) with groundwater loggers installed in bores for ongoing monitoring.

12.3.2 Risk assessment

Based on the desktop review and the fieldwork, a risk assessment was undertaken focussing on identifying and describing the key risks and effect pathways from the construction and operation of the Project, and the likelihood and consequence of changes to geomorphic stability and erosion.

Current geomorphological condition of the landforms / land systems, the nature of erosion and deposition processes and their potential influence on construction and operations were identified. The significance of potential adverse effects was evaluated and measures to avoid or limit the adverse effects to acceptable levels were identified.

12.3.3 Preliminary site investigation

A preliminary site investigation (PSI) was undertaken to identify the reasonable likelihood of human health or environmental risks which may be encountered during Project construction activities by identifying PCAs within the proposed construction areas (JBS&G 2026d[2]).

The assessment included a desktop assessment for potential acid sulfate soils for all aspects of the proposed construction.

12.4 Description of the Existing Environment

12.4.1 Topography, landform and land systems

Topography

Topography over the Project Area is generally of low to moderate relief with ground surface elevation along the transfer system alignment ranging from a minimum of 6 m AHD at KP 8.5

[2] Note this report was completed in 2025, and finalised for the EIS in 2026.

(north-west of Cowleds Landing), to a maximum of approximately 204 m AHD at KP 251 (near Bimba storage, south-east of Pimba). Along the Carrapateena lateral branch pipeline, elevations range from 64 m AHD (approximately KP CA 21) to 222 m AHD (approximately KP CA 46).

Ground surface levels at the Mullaquana Station desalination plant site range from approximately 3 m AHD at the proposed intake and outfall / TBM box cut and launch point in the south-east of the site (adjacent to the coast), to 11 m AHD at the western boundary of the desalination plant site.

The desalination plant site is situated on the coastal plains east of the Middleback Ranges and the transfer system alignment follows the coastline for approximately 12 km before turning inland and passing west of Whyalla. The Middleback Ranges represent the highest topographic feature in the vicinity of the Project Area, reaching approximately 420 m AHD in elevation. The pipeline in this area traverses sandy plains, gentle slopes and dune / swale systems.

The Project Area corridor between Whyalla and Pimba consists of sand and gibber plains and hills of varying steepness. The hills generally form shallow valleys with clearly defined drainage features and low-lying areas often contain clay pans and salt lakes. Between Pimba and Olympic Dam, the alignment landscape is generally flat with localised undulations, swales and shallow drainage features that dissect the landscape. There are some more extensive channel and escarpments where the land drops away to the salt lakes that form in closed or partially closed catchments. The landscape around Olympic Dam is dominated by low undulating dunes, swales and clay pans.

Example images of the landscapes and topography of the Project Area are provided in Chapter 9 Use of Land and Waters and Chapter 20 Landscape Character and Visual Amenity.

Landform

Landform within the Project Area is described by the underlying physical geological processes which have resulted in the current day landform and will continue to influence the Project Area in the future.

The dominant landforms within the Project Area are characterised by aeolian[3] and erosional processes. Depositional plains are dominant in the northern section of the Project including the main transfer pipeline north of KP 197 and the Carrapateena lateral branch pipeline, where the terrain is typically of extremely low relief.

Alluvial landforms (associated with the presence of ephemeral creeks and flow paths), account for less than 3% of the Project Area. The drainage lines in these areas vary from large, braided and well-defined creeks to smaller, less defined flow paths. Although erosion is not extensive, it is evident in areas where concentration of flow has occurred.

[3] Aeolian processes are the erosion, transportation, and deposition of sediment by wind. Distinctive landforms such as sand sheets and sand dunes are some of the major deposits and landforms formed by aeolian processes.

Lacustrine environments (i.e. relating to or associated with lakes) are generally influenced by groundwater and surface water run-off, with the salt lakes north of Lincoln Gap being predominantly dependent upon rainfall and runoff for any water to be present.

Coverage of the Project Area by these landforms is summarised in Table 12-1.

Table 12-1: Landform of the Project Area

Landform	Description	% coverage (Project Area)
Aeolian landforms	Landform pattern built up or locally excavated, eroded or aggraded by wind. Predominantly in the northern section of the Project Area.	30.4%
Alluvial landforms	A complex landform pattern on valley floors with active, inactive or relict erosion and aggradation by channelled and overbank stream flow. Concentrated along waterways in the Project Area.	2.9%
Depositional plain	Level landform pattern with extremely low relief formed by unspecified depositional processes. Typically associated with the northern section of the Project Area.	25.5%
Erosional landforms	Landform pattern of very low to high relief and very gentle to steep slopes. The pattern is eroded by continuously active to slightly active or inactive geomorphic processes. Occurs along the entire Project Area and includes gibber plains in the northern section.	41.0%
Lacustrine and playa plains	Sediment deposited from solution and suspension in still water in an inland lake, playa or pan. Associated with salt lakes along the entire water delivery pipeline alignment.	0.2%

Land systems

The key land systems[4] and IBRA subregions at the desalination plant site and along the transfer system alignment are described in Table 12-2 and shown in Figure 12-1 and Figure 12-2. Further detail of the IBRA subregions traversed by the Project is provided in Chapter 9 Use of Land and Marine Waters.

Table 12-2: Land systems within the Project Area

Land system	Description	Project infrastructure
Southern section (KP 0 – 195)		
Whyalla	Easterly sloping calcreted plain with occasional hills on outcropping conglomerate, and with mangrove flats along the coastal margin.	• Desalination plant site • Transfer system

[4] Land systems described in this chapter are based on IBRA Associations of SA, which provide an additional level of mapping below IBRA Subregions within the nested IBRA hierarchical framework (DEW 2024b).

Land system	Description	Project infrastructure
		• Mullaquana Station transmission line and substation.
Red Rock	Hills on conglomerate with long dissected footslopes.	• Transfer system
Tregolana	Undulating plain with occasional low sand dunes and pans and some samphire or mangrove flats.	• Transfer system
Simmens	Plateau with steep escarpments, and long footslopes partly mantled by aeolian sand.	• Transfer system • Lincoln Gap pump station • Corraberra Hill substation and Pandurra transmission line
Hesso	Gently undulating sandy plain with isolated silcrete-capped rises and salt lakes.	• Transfer system • Multiple laydown areas • Kalaya pump station • Kootaberra substation and Bookaloo transmission line
Northern section (KP 195 - 359)		
Mt Gunson	Low hills with long slopes and broad floodplains.	• Transfer system • Mangata pump station • Oakden Hills transmission line • Carrapateena lateral branch
Oakden	Undulating plain with some dunes and low hills on outcropping sandstones.	• Transfer system • Carrapateena lateral branch • Oakden Hills transmission line • Mount Gunson substation
Andamooka	Gibber covered plateau with irregular surface and steep bounding slopes.	• Carrapateena lateral branch
Woomera	Plateau with an undulating to hilly surface and steep marginal slopes in the south.	• Transfer system • Bimba storage
Moondiepitchnie	Undulating plain with sand sheets, dunes and occasional low silcrete-capped rises.	• Transfer system

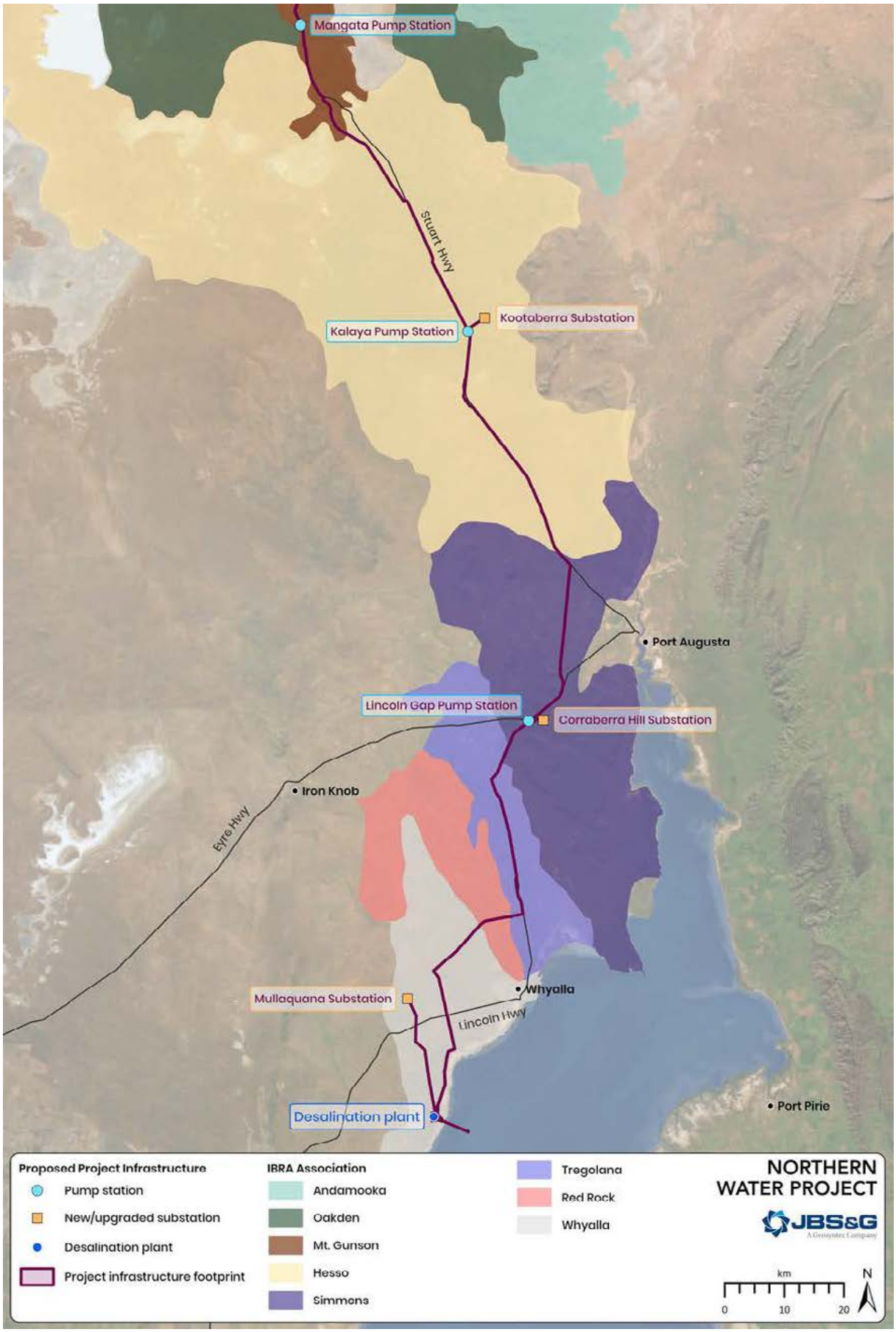


Figure 12-1: Land systems in the Project Area - southern section

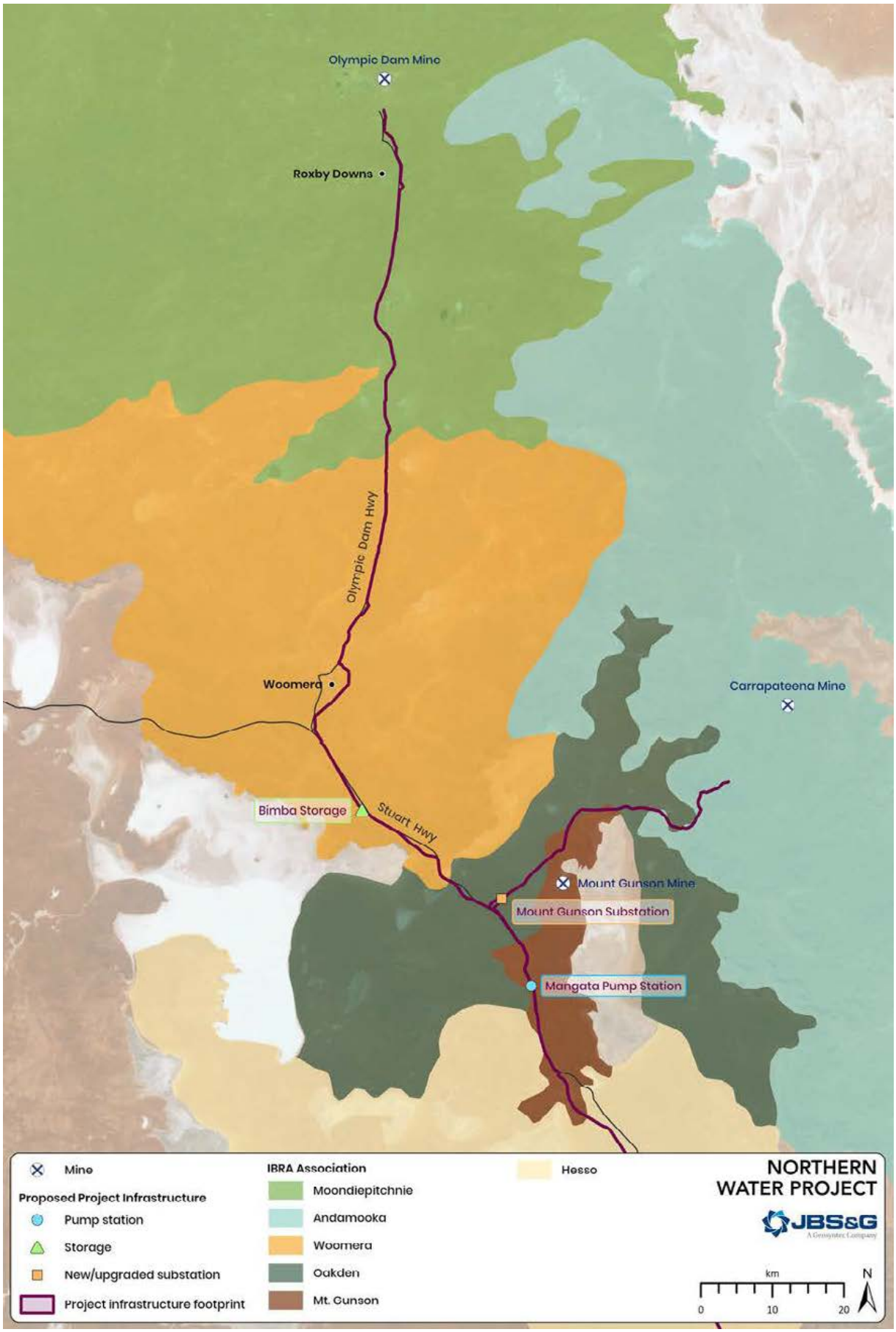


Figure 12-2: Land systems in the Project Area - northern section

12.4.2 Surface geology[5]

Desalination plant site

The surface geology at the desalination plant is dominated by transported Quaternary deposits; soil and sand / calcrete layers of Holocene age at the location of the intake and outfall pump station which gives way to the underlying Pleistocene clay / fluvial gravels at the desalination plant site. Beneath the Quaternary cover lies the Gibbon Beds consisting of plastic clay of Pliocene age to a depth of ~ 30 m below ground level (bgl). Stratigraphy of the desalination plant site is described in Table 12-3 and shown in Figure 12-3.

Table 12-3: Geology of desalination plant site

m bgl	Lithology	Description	Project footprint
0 - 4 m	Quaternary cover	Undifferentiated sand, soil, calcrete and clay.	Surface foundations will be built into this layer
4 – 22 m	Gibbon Beds	Mottled clayey sand, sandy clay and conglomerate. Non-marine origin. Sand, clay and gravel. Minor limestone from 18 m bgl.	Intake / outfall tunnels (including box cut and TBM launch site)
22 – 38 m	Melton Limestone	Bryozoal limestone, sandy and gritty with Lepidocyclina.	N/A
38 – 59 m	Kanaka beds	Carbonaceous siltstone, shale and sand with minor lignite.	N/A

[Source: SARIG 2025, drillhole 146659]

Surface geology mapping shows several linear features in the area of the desalination plant (labelled as 'fault – position approximate') that may represent existing areas of instability. The National Seismic Hazard Assessment mapping (Geoscience Australia 2018) indicates that the Project is not in an area of elevated seismic hazard. The closest recorded earthquakes to the desalination plant site were 11.5 km north-east with a magnitude of 2 (recorded in 2005) and 7 km south-east with a magnitude of 1.4 (recorded in 1984) (SARIG 2025).

[5] Further detail on regional geology is provided in Chapter 14 Groundwater.

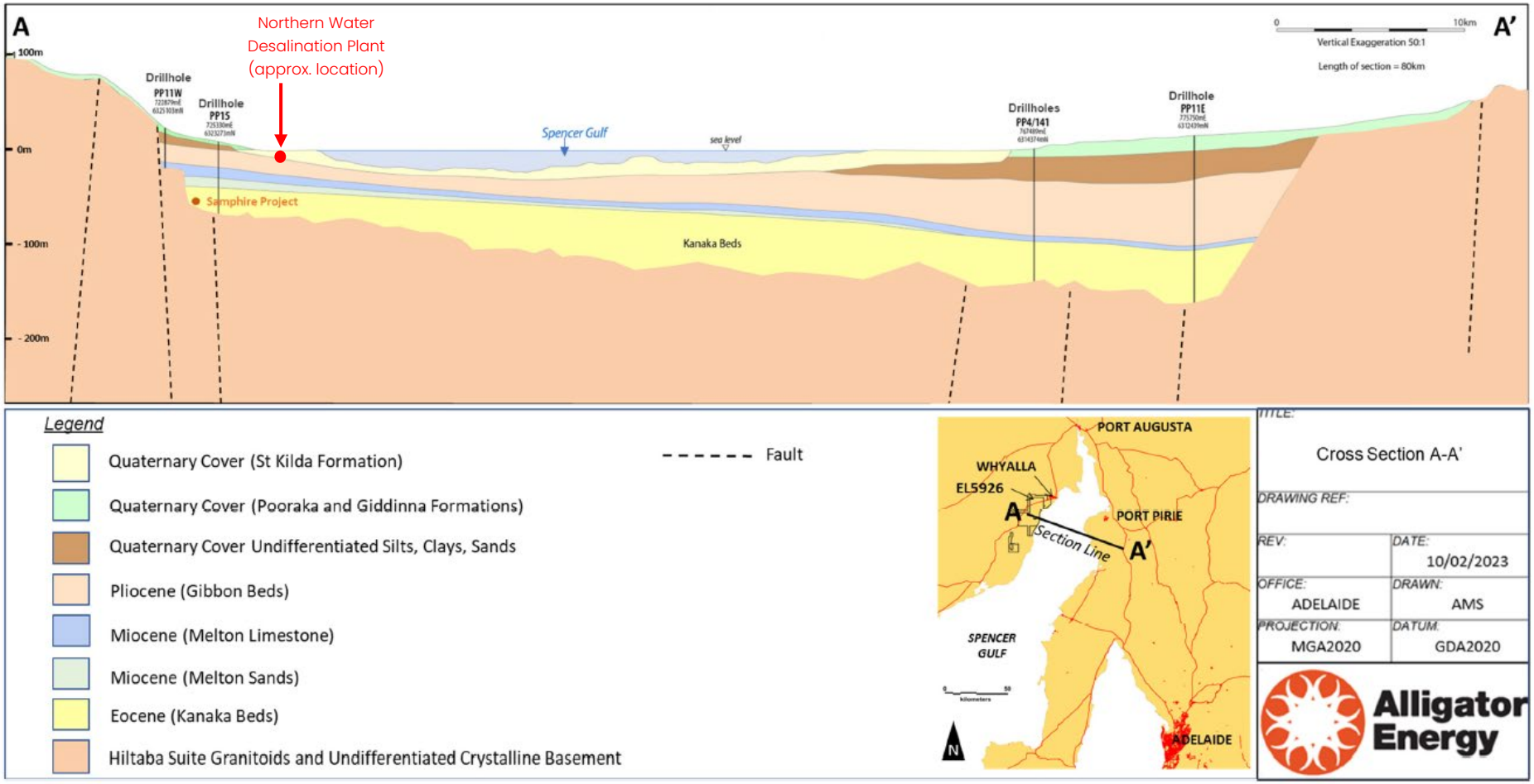


Figure 12-3: Geological cross-section
[Source Alligator Energy 2023]

Transfer system infrastructure

As the construction of transfer system will only impact the first 3-4 m of soil and rock, the coverage of geology in this chapter has been confined to describing the regolith (i.e. soil and loose unconsolidated rock that overlies bedrock). A full description of surface geology in the Project Area is provided in Appendix H-1.

Regolith is described in terms of the mechanism by which sediments were deposited: aeolian (wind), alluvial (river), colluvial (land), lacustrine (lakebed), bedrock and residual (weathering of underlying rock) and transported (origin unknown). Aeolian and colluvial sediments, and to a lesser extent transported sediments are the dominant regolith units along the pipeline alignment. A summary of the key regolith units in the Project Area is provided in Table 12-4.

Table 12-4: Regolith units in the Project Area

Regolith unit	Description and location / landscape	% coverage (Project Area)
Aeolian sediments	Sediment deposited from transport by wind, forming inland and coastal dunes, dune fields, sandsheets and interdunal areas. Predominantly found in the dunefields north of Port Augusta.	29.7%
Alluvial sediments	Sediments deposited by channelled and over-bank stream flow confined to a channel or valley floor. Forms in valleys usually within watercourses along the alignment. Most commonly noted on wide, braided streams.	2.9%
Colluvial sediments	Heterogeneous (i.e. a mix of different materials) variable grain size accumulated on slopes by gravity, creep, sheet flow, rain-wash, mudflows or solifluction (movement downslope of soil from freezing and thawing cycles). Tend to occur on the lower portion and below sloping land.	16.8%
Lacustrine sediments	Sediment deposited from solution and suspension in still water in an inland lake, playa (salt lake) or pan. Occurs in salt lakes and depressions in the northern section (near Mangata Pump Station and Bimba storage)	0.2%
Moderately to highly weathered bedrock	Moderately to highly weathered bedrock on erosional plains, rises, low hills, hills, mountains and plateau surfaces. Exposure of (weathered) bedrock occurs mostly at higher locations including the top of hills and plateaux.	3.3%
Residual material	Material derived from in situ weathering of bedrock of undifferentiated origin without significant lateral movement of solid weathered products and material volume loss. Includes residual clay and sand. Occurs near Whyalla and south of Kalaya pump station.	1.9%

Regolith unit	Description and location / landscape	% coverage (Project Area)
Sheet flow deposits	Distal slope (outer part of the area) sediments deposited by unconfined sheet flow or a network of shallow channels. Are a subunit of colluvial sediments. Tend to occur on the lower portion and below sloping land, predominantly along the upper central and northern sections of the Project Area.	19.9%
Transported sediments	Materials deposited by terrestrial geomorphic processes, including undifferentiated sediments of mixed colluvial, alluvial, aeolian, lacustrine or unknown origin, some Cenozoic formations and paleochannel sediments. Dominant land unit north of Oakden Hills PS and along the Carrapateena lateral branch pipeline.	25.3%

12.4.3 Soils

Descriptions of the soil landscapes in the Project Area are summarised in Table 12-5. The soil landscape descriptions are based on the Atlas of Australian Soils (CSIRO 1991).

Soil types

Desalination plant site

Soils at the desalination plant site have been characterised as heterogeneous with a relatively balanced composition of sand and fines (38% and 52% respectively) and subordinate gravel (Kleinfelder 2025). Test pits showed a thin surface layer (up to 0.4 m bgl) of clayey sand or silty sand, underlain with sandy clay or clayey sand to ~3 m bgl. Below this, boreholes encountered clay to the maximum depth of 25 m (Kleinfelder 2025).

Acid sulffate soils (ASS) were tested for during the site investigations and decreases in pH were shown over the site, typically around depth of groundwater with the lowest pH being <5. Soil plasticity varies onsite with low plasticity dominating the upper layers and increasing with depth. There was no site contamination observed onsite in the bore holes nor test pits (Kleinfelder 2025).

Historical records, desktop assessment in the PSI (JBS&G 2026d) and the prevailing topography, groundwater and surface water conditions[6] indicate that the potential for ASS at the desalination plant site is extremely low. However, a low-lying area subject to periodic inundation, with high potential for ASS lies east of the first line of sand dunes. This area will not be disturbed as a result of construction or operation of the desalination plant as the only infrastructure proposed is the intake and outfall tunnels which will be located underneath this area, avoiding surface disturbance.

The PSI report identified areas of the desalination plant site that potentially have been used for chemical storage and use, and waste disposal in the northern sections of the site. These are activities typically associated with agricultural land use (JBS&G 2026d).

[6] ASS usually occur in low lying, periodically inundated areas.

Regional mapping of soil erosion potential does not cover the desalination plant site. The nearest available mapping shows low potential for landslides, scalding erosion and gullying and water erosion with high potential for wind erosion along the coastline (DEW 2024b).

Transfer system infrastructure

Soils on the alignment along the Upper Spencer Gulf coast (between KP 0 and KP 13) are characteristic of coastal aeolian soil landscapes. The predominant soil landscapes in this area are A2 along the coastal cliffs, and Ya9, DD2 and Lb5 in inland areas where soils are commonly calcareous throughout, with concentrated calcium carbonate at depth.

In the Lincoln Gap area, the predominant soil landscapes are BB2 and Na1 with friable soils commonly calcareous throughout. The soil landscape between Lincoln Gap and Roxby Downs is typically calcareous (DD1) with concentrated calcium carbonate horizons at varied depths. Across the Arcoona Ranges, (approximately between KP 197 and KP 331), soils are typically crusty loamy soils and red clayey subsoils with readily separable thin crusts (Nb41 and Nb42 soil landscapes).

Soil sampling undertaken every 1 km along the transfer system did not identify signs of site contamination (CMW 2024, Kleinfelder 2025).

Soil types are summarised in Table 12-5 and shown in Figure 12-4 and Figure 12-5. Full descriptions are provided in Appendix H-1.

Table 12-5: Mapped soil types along the transfer system alignment

Soil type	Description	Project infrastructure
Southern section (KP 0 - 195)		
DD2	Plains with more or less isolated tracts of dunes: broad plains of brown calcareous earths with areas of exposed caliche and crusty loamy soils with claypans, unclassified saline soils, swamps, and intermittent lakes in the lower-lying portions; dunes of brown sands and brown calcareous earths.	• Transfer system • Mullaquana Station transmission line and substation
A2	Coastal dunes and plains with some swamps: dunes of calcareous sands and siliceous sands; plains of various unclassified saline soils and lesser areas of brown calcareous earths.	• Desalination plant • Transfer system
Na1	Dissected tableland: undulating stony plains of crusty loamy soils which may form gilgais and gilgai complexes with cracking brown clays; interspersed with mesas and buttes capped by shallow calcareous loamy soils and / or residues of past weathering cycles such as remnants of sandstone, gypsum, silcrete, laterite; traversed by broad shallow valley plains of deep calcareous loamy soils with saline flats, gypsum mounds, and swamps. Some brown sands and brown calcareous earths may also occur.	• Transfer system • Pandurra transmission line • Corraberra Hill substation
BB2	Hills, dissected tablelands, and valleys: hills of shallow calcareous loamy soils; crusty loamy soils on tableland	• Transfer system

Soil type	Description	Project infrastructure
	remnants; and small valleys of crusty loamy soils with brown calcareous earths.	• Lincoln Gap pump station
DD1	Dune formations with relatively small plains between dunes of brown calcareous earths, small areas of brown sands; plains of brown calcareous earths with crusty loamy soils in the lower-lying portions. Minor areas of soils common to other DD map units occur too. Yellow clayey subsoil may occur in small areas in proximity to the boundary with unit AA1.	• Transfer system • Kalaya pump station • Bookaloo transmission line • Kootaberra substation
Northern section (KP 195 - 359)		
DD1	See description above	• Transfer system • Carrapateena lateral branch • Oakden Hills transmission line
Nb41	Rolling stony downs mantled by a strew of stones and gravels; some mesas and buttes; shallow valleys; lakes: chief soils are crusty loamy soils, which may form gilgais and also gilgai complexes with cracking brown clays. Associated soils include shallow loams on mesas and buttes, together with residues of past weathering cycles, sandstone, gypsum, silcrete, and laterite.	• Transfer system • Carrapateena lateral branch • Bimba storage
Nb42	Remnants of stony downs often with prominent hills, mesas, and buttes: chief soils are crusty loamy soils, with cracking brown clays in gilgai complex on the rolling downs areas; shallow calcareous loams on the hills, mesas, and buttes; and areas of calcareous soils on areas of gentler relief. Any of these may be dominant locally.	• Transfer system • Carrapateena lateral branch • Mangata pump station



Plate 12-1: Soils at the desalination plant site (left) and Mangata pump station (right)

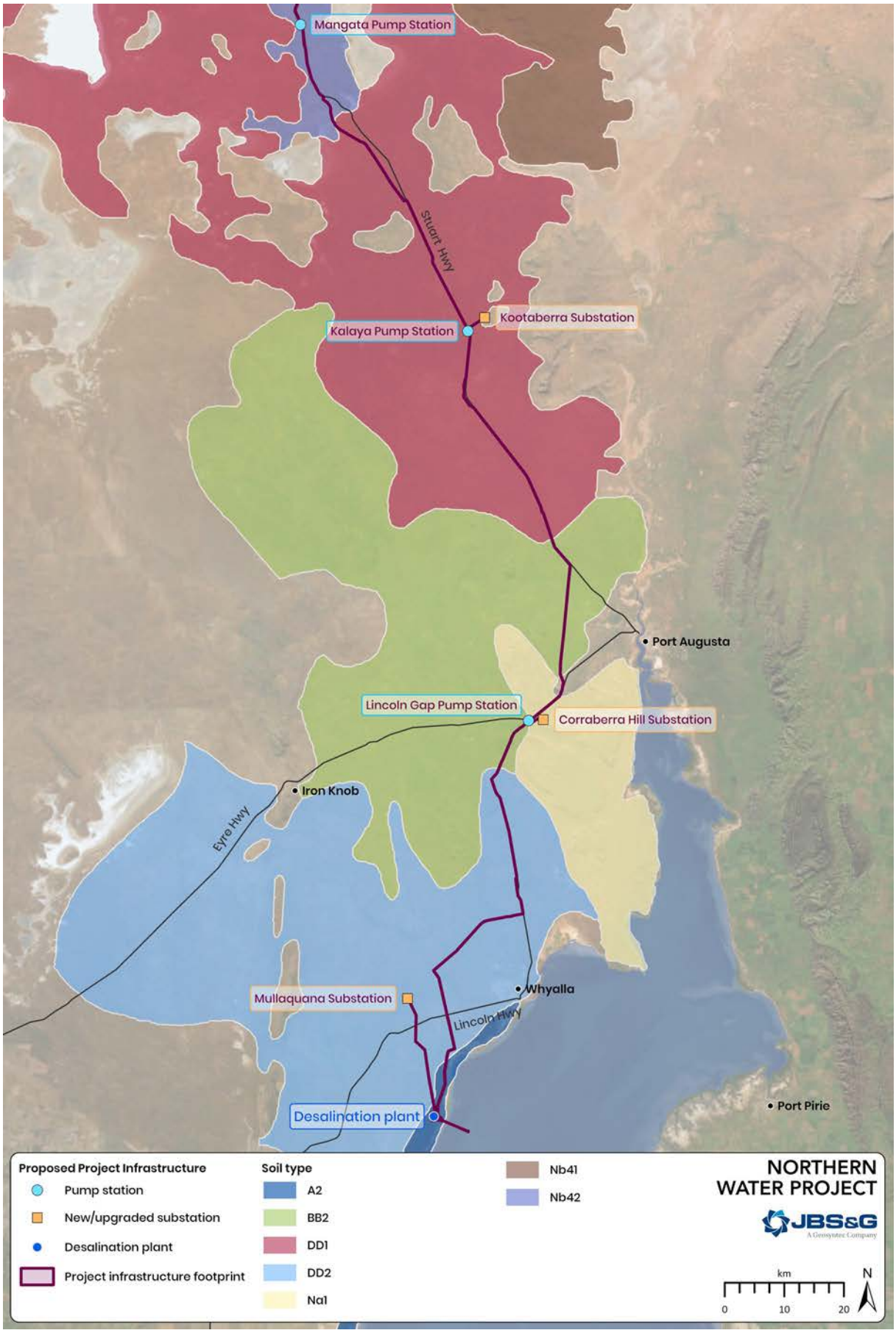


Figure 12-4: Soil types in the Project Area - southern section

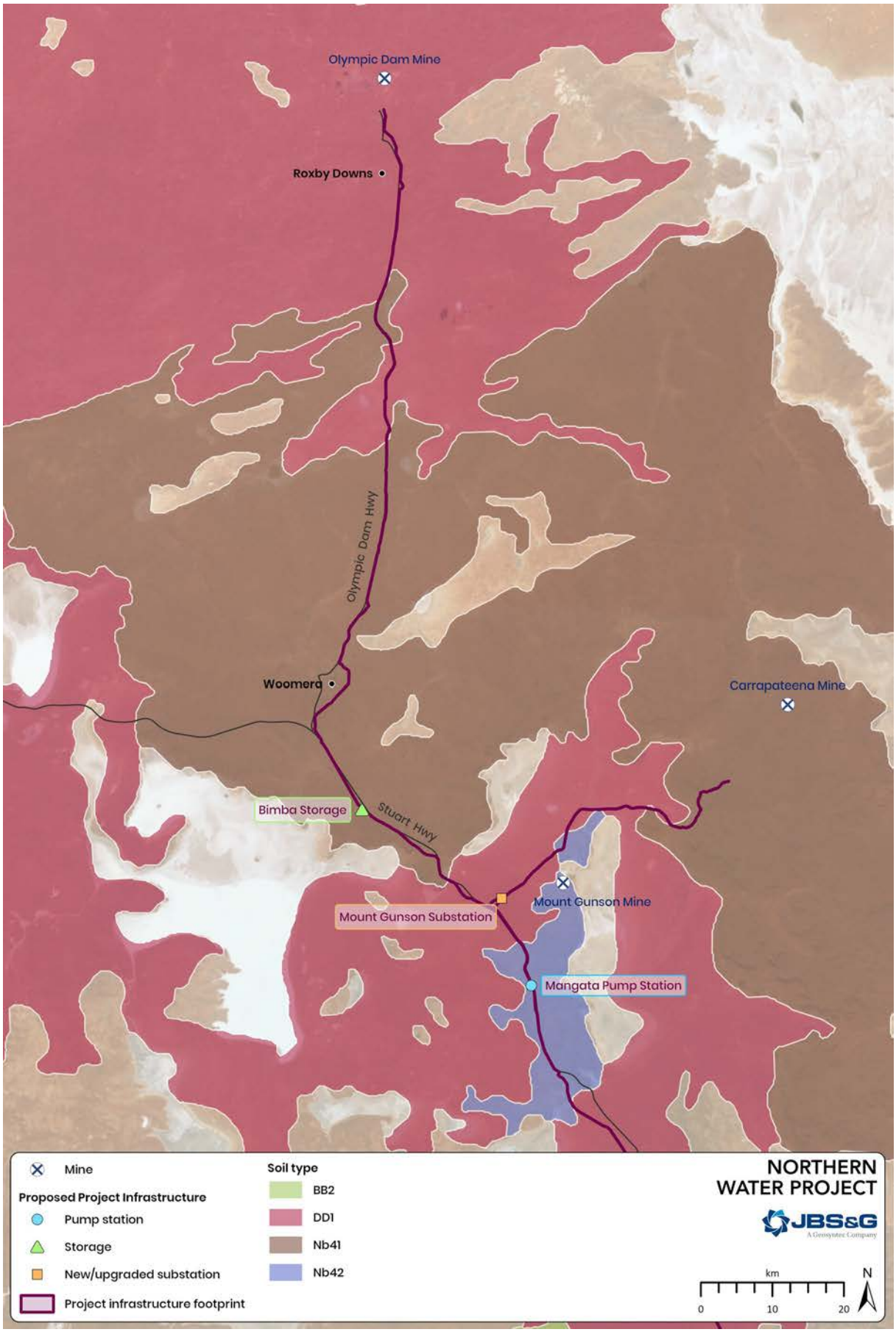


Figure 12-5: Soil types in the Project Area - northern section

12.4.4 Risk factors for impacts to soils

Several specific risk factors for impacts both to soils from the Project, and from soil characteristics on Project design and construction were identified in the technical study and are summarised below. Further detail is provided in Appendix H-1.

Shallow bedrock

There is potential for shallow bedrock to be encountered during pipeline trench excavation and site earthworks, and foundations at the pump stations, substations and transmission lines. Site investigations to a depth of 25 m bgl at Mullaquana Station did not identify bedrock (only clay) and thus is not considered a risk for the desalination plant site.

If encountered at these locations, substantial earthworks in soil and rock and the formation of rock slopes may be required. Potential impacts for the Project include need for specialised equipment such as hydraulic breakers, blasting which generates noise and dust and unsuitability of excavated rock for backfilling of pipe trenches requiring import of suitable backfill materials.

Indurated materials

Regolith induration (i.e. hardening of sediments through cementation or compaction) is common in the Project Area, affecting approximately 59.5% of the length of the pipeline alignment. The potential influence of indurated materials on construction and the environment can be similar to those described for shallow bedrock above. However, as indurated materials are typically weaker and of limited thickness compared to bedrock, the influence is expected to be less.

Periodic test pits were dug approximately every 1 km along the alignment and pits where rock breakers were unable to excavate below 3 m (and thus may require hydraulic breakers or minor blasting to trench) were identified (CMW 2024) at the following locations:

- KP 159 (north of Kalaya PS)
- KP 195-199 (Lake Dutton, Pernatty Lagoon)
- KP 330 – 335 (Coorlay Lagoon).

Collapsible and expansive soils

Collapsible and expansive soils have the potential to impact on the stability of foundations and pipelines and will require consideration during detailed design. Collapsible soils that are typically aeolian in nature (i.e. wind deposited) have considerable dry strength but are weakened upon wetting. These soils are unable to support the weight of overburden or imposed load and thus have a tendency to collapse.

Soil units with potential to be collapsible include Quaternary aeolian unit 1 which is common from KP 106 to KP 350 onwards in the northern section of the Project alignment (refer soil landscapes BB2 and DD1 in Table 12-5).

Expansive clays are soils that undergo volumetric change as a result of variations in soil moisture, and are linked to cracking clay soils which are common but not dominant in the Project Area. Relevant soil landscapes are described in Table 12-5 and include Na1 (KP 61 – 86 on the pipeline alignment between Whyalla and Port Augusta), Nb42 (KP 168 – 221 on the

pipeline alignment south of Pimba), NB41 (KP 235 – 331 on the pipeline alignment north-east of PImba, and KP CA 28 – CA 56 on the Carrapateena lateral branch). These soils are also common within gilgais[7] on the dissected tablelands and other weathered rock formations.

Backfilled soils are also prone to being collapsible if not appropriately compacted during backfill. Areas of identified compactible soils will be treated by pre-wetting and compaction of soil.

Karst features

Karst features are areas of water-soluble limestone where existing but unknown sink holes can collapse suddenly as a result of prolonged dry periods or severe storm events, impacting infrastructure and pipelines. Directed or increased water infiltration due to Project construction activities also has the potential to cause new sink holes and instability. For pipelines, where the depth to limestone is below the pipeline trench depth, the likelihood of karst features impacting construction is reduced by minimising stormwater infiltration into the trench.

In the Project Area, geological mapping indicates that the Andamooka Limestone is present between KP 330 and 337 of the Project alignment.

Steep slopes

Steep and long slopes are indicative of slope instability risks (i.e. landslides). The assessment in the technical report of slope angles in the Project Area using Lidar digital terrain data did not identify any risks of slope instability or landslide (refer Appendix H-1 for further detail).

Erosion

Soil erosion can occur as a result of rainfall and surface water run-off and also strong winds. Where ground disturbance removes vegetation cover or the existing soil crust, the risk of erosion increases. The extent of erosion is influenced by the erosion potential of the soil type to wind, rain and overland flow, as well as the vegetation cover and the slope of the terrain.

Acid sulfate soils

The potential for encountering acid sulfate soils (ASS) was assessed in the Surface Water Assessment report (refer Appendix H-3) and the PSI report (refer Appendix H-2).

Coastal ASS are known to occur between Mullaquana Station and Port Augusta, while inland ASS are known to occur near salt lakes in the northern section of the Project. Watercourses with potential for ASS were identified (refer Appendix H-3) and are listed in Table 12-6. The potential for ASS at the desalination plant and intake pump station sites was rated as low to extremely low probability. Regional mapping identifies an area east of the intake pump station is an area of high probability of ASS with medium confidence (refer Figure 12-6). No surface disturbance is anticipated in this area. The risk of groundwater drawdown leading to acidification of ASS is assessed in Chapter 14 Groundwater.

Soil sampling undertaken at the desalination plant site was undertaken with indications of PASS in boreholes DP-BH7, DP-BH8 and DP-BH9 (located at the western extent of desalination

[7] Gilgais are repeated mounds and depressions formed on shrink-swell and cracking clay soils.

plant site) (Kleinfelder, 2025). However, these samples were located at depths of 5-10 m bgl and are not expected to be disturbed during construction or operation activities.



Figure 12-6: Regional mapping of ASS probability at the desalination plant site
[Source: Geoscience Australia]

Exposure of ASS during construction can pose a risk if not appropriately managed and may lead to oxidation and cause acid leachate formation either in situ or in excavated stockpiles during construction. Acid leachate may contain elevated heavy metals that can be transferred to downstream watercourses following rainfall and can cause corrosion of construction materials such as concrete, iron, and steel. Exposure to ASS can also impact aquatic and terrestrial ecosystems.

The locations along the proposed transfer system alignment assessed as having a high potential of encountering ASS are summarised in Table 12-6.

Saline / aggressive soils

Salinity refers to the concentration of salt in soils. High levels of salinity can have negative impacts including reducing the ability of plants to grow, changing the taste and odour of water, and causing corrosion in pipes and other infrastructure.

Areas of highly saline soils at various salt lakes and unnamed watercourses in the northern extent of the Project Area were identified (refer Appendix H-3) and are listed in Table 12-6. Excavation of these soils has the potential to impact receiving waters and the surrounding vegetation if not appropriately managed. Impacts can occur when wind and stormwater runoff come into contact with exposed areas including stockpiles, dispersing sediment and runoff across the surrounding vegetation.

Aggressivity refers to corrosive potential, which can be influenced by the types and levels of minerals present. Aggressive soils may cause damage to buried steel structures through corrosion where moisture within the soils or groundwater acts as an agent for steel corrosion.

The steel exposure classification undertaken in the technical report indicates a severe steel exposure classification at the following locations:

- KP 147-153 which is characterised by Quaternary aeolian deposits and the DD1 soil landscape (refer Table 12-5).
- KP 194-200 adjacent to Pernatty Lagoon which is characterised by Quaternary aeolian deposits or Pandurra Formation and the Nb42 soil landscape (refer Table 12-5)
- KP 276 – 278 which is characterised by Quaternary aeolian deposits or Corraberra Sandstone Member and the DD1/Nb41 soil landscape (refer Table 12-5).

Table 12-6: Areas of PASS and saline soils identified at watercourse crossings*

Kilometre point	Location	Potential ASS	Saline soils
KP 90 - 106	Lake Dempsey	X	
KP194 - 198	Black Oak Creek	X	X
KP 191 - 201	Lake Dutton	X	X
KP CA21	Elizabeth Creek	X	X
KP CA29	Carra A Creek		X
KP CA34-CA39	Yeltacowie Creek	X	X
KP 238	South of Lake Windabout	X	X

* Refer Appendix H-3

12.5 Impact Assessment

The following Project aspects have been identified as potential sources of impacts to soils and landform:

- earthworks and vegetation clearance (including pipeline clear-and-grade operations, trenching, backfilling and reinstatement)
- use of temporary camps and laydown areas
- trenching watercourses and roads or trenchless crossing of watercourse, or rail crossings for the pipeline
- storage and handling of fuel, oil and chemicals
- construction of intake and outfall shafts at the desalination plant using a Tunnel Boring Machine (TBM).

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Other potential impact events arising from the Project aspects listed above (e.g. impacts to surface water and groundwater) are addressed in the relevant chapters.

12.5.1 Soil erosion and sedimentation

The potential for soil erosion due to Project activities is low and will be readily managed through best practice erosion and sediment controls.

Soil erosion can occur as a result of rainfall, surface water run-off or winds with increased risk where vegetation cover or the existing soil crust is removed. The extent of erosion is largely influenced by the erosion potential of the soil type and topography.

Construction activities with potential to cause soil erosion include vegetation clearance, earthworks and stockpiling of soils, particularly if disturbed areas or soil stockpiles are exposed to surface water flows or are located in areas of higher wind erosion potential. The effects of soil erosion include transport of sediment to watercourses or surface and groundwater dependent ecosystems, loss of productive soils in pastoral land, and impacts to landform.

Higher erosion risk areas in the Project footprint include aeolian landforms and soils which are present along the coastal and northern sections of the Project alignment, areas with steeper slopes and potentially dispersive soils[8] which are more prone to erosion when they are exposed.

Erosion and associated sedimentation will be addressed through Project-specific Construction Environmental Management Plans (CEMP) that address specific construction activities at the desalination plant site and on the transfer system alignment. The CEMPs will consider best practice as outlined in IECA[9] (2008) and describe erosion and sediment control measures appropriate to the relevant soil types and landform. Management measures are likely to include installation of sediment fences and diversion berms to prevent the mobilisation of runoff and sediment into the surrounding environment, particularly in proximity to waterbodies. Other measures include minimising the area to be cleared at any one time and reinstating the soil profile as soon as reasonably practicable.

Specific methodologies will be developed for different landforms with flexibility to adjust for specific conditions such as proximity to sensitive areas e.g. gibber plains. If dispersive soils were encountered during construction, additional mitigation measures would be put in place following best practice guidance (IECA 2008 and amendment 2015) prior to reinstatement of the soil profile.

Longer term construction sites, including the desalination plant, pump stations, storages and substations, will have site specific erosion control plans developed and will use longer term management strategies (e.g. temporary berms rather than silt fencing). Sediment basins may be used to contain stormwater runoff at the longer-term construction sites (refer to stormwater management in Chapter 13 Surface Water).

Rehabilitation of temporary disturbance areas and operational monitoring and remediation (if required) will prevent any ongoing impacts from soil erosion.

Following implementation of the above controls, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on the potential for minor adjustments

[8] No areas of dispersive soils were identified in the technical study assessment (Appendix H-1), but may be the subject of further geotechnical investigation as part of detailed design.

[9] International Erosion Control Association.

to the placement of infrastructure resulting from detailed design and the amount site-specific data for entire transfer system alignment) has been evaluated in Appendix M and the level of risk is **Low.**

12.5.2 Soil inversion

Pipeline construction will be appropriately managed to maintain soil viability and minimise loss of topsoil.

Preservation of topsoil is important to the restoration of the pipeline construction corridor and to future productivity of land affected by pipeline construction. Topsoil may be 'lost' during the construction process through being buried beneath or mixed with excavated pipeline trench spoil during stockpiling, covered with sediment washed in from adjacent areas or when trench spoil and topsoil are not returned to the trench in accordance with the original profiles.

The loss of topsoil can reduce the effectiveness of pipeline corridor restoration and revegetation by limiting the amount of available nutrients, biomass and productivity and changing the soil's permeability and water holding capacity. While this is an issue for the effective restoration of the pipeline construction corridor generally, it is of particular importance in areas where land use may be more sensitive to reduction in topsoil quality or quantity.

Best practice pipeline construction methodology requires that separate topsoil and trench stockpiles are created when the trench is excavated. In areas where ground disturbance is proposed, the top 100 - 200 mm of topsoil will be excavated and preserved separately. The trench is then systematically backfilled from the trench spoil stockpile with the separated topsoil placed as the final layer of backfill.

Separation of topsoil and trench spoil is also important in areas of gibber which are particularly susceptible to gully erosion, where gibber stones are similarly preserved separately during excavation and returned as the final layer. Appropriate measures for stockpiling and backfilling to avoid loss of topsoil will be incorporated in a CEMP for the Project.

Following implementation of the above controls, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

12.5.3 Soil compaction

Compacted soils in areas of temporary disturbance will be rehabilitated following construction.

Compacted soils can occur under hard stand areas at temporary construction, laydowns and camp areas, and from heavy vehicle traffic on the pipeline construction corridor. Soil compaction increases the difficulty of re-establishing vegetation and without mitigation may result in changed drainage patterns, decreased infiltration and increased surface water runoff and erosion risk in these areas.

Pipeline construction requires compaction of the backfilled trench to prevent the disturbed soil from subsiding. However, rehabilitation will include (where appropriate) deep ripping or

scarification of compacted or hard stand areas to break up soil compaction and encourage vegetation regrowth through natural regeneration.

Following implementation of the above controls, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on the potential for minor adjustments to the placement of infrastructure resulting from detailed design and construction methodology through sand dune areas) has been evaluated in Appendix M and the level of risk is **Low.**

12.5.4 Disturbance of potential acid sulfate soils (PASS) and saline soils

Pipeline design will consider the potential presence of acid sulfate soils and impacts will be prevented by appropriate construction methodology.

Areas with a high risk of PASS are identified in Table 12-6 . These areas are largely associated with salt lakes in the northern section. Excavation or dewatering of sediments with confirmed ASS can result in oxidation and production of sulphuric acid that, if not correctly handled, can lead to contamination of soil and water, damage to infrastructure and potentially pose a risk to ecosystems and human health[10].

Further geotechnical investigations and field screening to determine the presence of ASS may be required during the finalisation of design by the DBOM Contractor in accordance with the EPA's *Site Contamination – acid sulfate soil materials* guideline (EPA 2007). If ASS are identified in an area to be excavated, detailed engineering design would ensure that the pipeline is appropriately designed for the prevailing soil conditions.

If ASS are present at an excavation site, the relevant CEMP will include an ASS Management Plan incorporating measures consistent with national and EPA guidance on management of PASS which would include:

- sediment characterisation
- preventing or minimising exposure of the sediments to oxygen
- separation, containment or treatment / neutralising of sediments
- management acid drainage and stockpiled materials.

The CEMP will also contain appropriate construction methodologies and standard management measures to address unexpected disturbance of ASS. Measures would include placement of any intercepted soils identified as PASS in an isolated bunded stockpile area, and treating any identified ASS with agricultural lime in accordance with the EPA guideline prior to backfill.

The potential for ASS at pump station sites was rated as low to extremely low probability. Should areas of high-risk PASS be identified or ASS are encountered on the transmission line alignments, the potential for tower footings to be micro-sited would be investigated, allowing these areas to be spanned and avoid disturbance of the soils.

[10] Note, potential for dewatering at the desalination plant oxidising ASS has been assessed in Chapter 14 Groundwater due to the mechanism for potential impact.

Following implementation of the above controls, the expected impacts are in the **Negligible to Minor** category. Uncertainty in the expected impact (based on existing level of study and investigation into the presence of ASS) has been evaluated in Appendix M and the level of risk is **Low**.

Pipeline construction has considered areas of saline soils and disturbance will be managed to prevent impacts to soils, surface water and vegetation.

Saline soils are likely to be encountered at many locations along the pipeline corridor, particularly where the alignment is in the vicinity of saline clay pans and salt lakes in the northern section. The key impact of excavation of saline soils is from saline run-off and seepage from exposed and stockpiled soils impacting non-saline soils, surface water and salinity sensitive vegetation.

Impacts to saline surface water in the Project Area from excavation and stockpiling of saline soils are not expected as most occurrences of saline soils are in environments which are habituated to existing saline impacted surface water flows (e.g. salt lakes).

There is potential for impacts from saline run-off and seepage where saline subsoil is stockpiled adjacent to areas of non-saline topsoil or vegetation that may be sensitive to salinity. Implementation of best practice sediment and erosion controls set out in the CEMP, as discussed in Section 12.5.1, will minimise potential impacts. The short period that soil stockpiles will be in place (expected to be less than one week) further reduces the potential for impact.

Following implementation of the above controls, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on detailed design confirming construction methodologies in areas of potential saline soils) has been evaluated in Appendix M and the level of risk is **Low**.

12.5.5 Soil contamination

Spills of fuels and chemicals

Contamination of soil is not expected to occur as result of Project activities due to implementation of appropriate storage and handling of fuels and chemicals.

As soils would generally be the first receptor in an event involving contamination, this section provides the primary description of proposed management of accidental spills to soil, surface water and groundwater from land-based activities.

As construction of water pipeline projects involve relatively small quantities of chemicals and fuels, volumes of spills are likely to be small and risks to soils, surface water and groundwater are generally low. Larger quantities of chemicals and fuels would be stored and handled at the desalination plant during operations. Impacts are not expected from the transport, storage and handling of fuels and chemicals, however there is potential for accidental spills which may result in contamination of soils, surface and groundwater, if inappropriately managed.

Strategies, controls and management measures discussed in this section will be confirmed as part of detailed design and set out in post approval Project management plans (e.g. CEMP and OEMP).

During construction, it is expected that any spills would be limited to small amounts of leakage from equipment or overtopping of bunding if a spill occurred at the same time as a large rainfall event.

Machinery will be regularly inspected for fuel and oil leaks to ensure good working order is maintained, and standard operating procedures will be developed for correct use of equipment to minimise the potential for spills. Drip trays and spill mats will be used during truck refuelling operations and there will be no vehicle refuelling within 50 m of watercourses, wetlands or the coast.

Spill kits will be located at all construction sites and laydown areas with daily inspections of equipment and chemical storage (including fuel storage) to ensure all spills are remediated immediately.

At temporary facilities (e.g. construction camps and laydown areas) storage of fuel and chemicals will be restricted to designated areas. Chemical storage areas at the desalination plant site will be roofed to prevent contamination of stormwater runoff.

If a spill occurs, it will be contained, reported and clean up actions initiated. Any contaminated soil resulting from a spill will either be treated in-situ or removed for treatment / disposal at an EPA SA licensed facility. Assessment and remediation of spills would be consistent with the National Environment Protection (Assessment of Site Contamination) Measure and relevant EPA SA guidelines.

Fuel, oil and chemicals on construction sites and at the operational desalination plant site will be stored and handled in accordance with relevant standards and guidelines (e.g. AS 1940, EPA guideline 080/16 Bunding and Spill Management (EPA 2016a), the Australian Dangerous Goods Code, and relevant Safety Data Sheet requirements). This would incorporate storage in product containers with appropriate secondary containment (e.g. lined, bunded areas or on self-bunded pallets).

Once operational, personnel will be present at the desalination plant 24 hours / day and 7 days / week, to respond to any spills. Small spills would be treated onsite using spill kits while larger spills would be pumped from the bunded area into a tanker and transported to an appropriately licensed EPA facility. Process areas will be separated from clean stormwater run-off areas and covered to prevent rainfall ingress.

Chemicals, oils and other hazardous waste substances will be stored in designated waste storage areas for collection by an authorised contractor and disposed of off-site in accordance with EPA requirements.

A spill and emergency response plan and procedures (including training of personnel) will be developed and included in the CEMP and OEMP to ensure mechanisms are in place to respond to any spill, leak, or unplanned emergency.

The measures that will be implemented for storage and handling of fuels and chemicals are well established and widely used. Following implementation of the above controls, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Existing contamination

Previously contaminated soil will be appropriately managed and reused where possible in accordance with the waste management hierarchy.

A PSI undertaken for the Project identified areas where there is potential for previously contaminated soil to be present. The desalination plant site has been subject to historical and long-standing agricultural activity, hence it's likely that potentially contaminating activities have taken place (e.g. chemical use and animal / waste burial).

Soil sampling for potential contaminants of concern associated with identified PCAs was completed at the proposed desalination site and along the pipeline (1 km spacings). These investigations did not identify any signs of site contamination. If known, management strategies will focus on avoiding disturbance of existing areas of contamination. If disturbance is required, management measures will prevent uncontrolled reuse of contaminated soil. If contaminated material is identified, the Project Construction Environmental Management Plan (CEMP) will address management of these potential hazards and unexpected finds during construction works.

Measures for managing unexpected contamination may include segregation and containment of different types of spoil to prevent cross contamination, testing to confirm potential for re-use and treatment, if appropriate. Following the waste hierarchy and legislation requirements, spoil will be reused where possible with treatment where appropriate. Disposal at an EPA licensed facility would be the least favoured approach.

The measures that will be implemented for management of previously contaminated soil are well established and widely used. Following implementation of the above controls, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on data availability for soils along the transfer system) has been evaluated in Appendix M and the level of risk is **Low**.

Spoil from desalination plant earthworks

Spoil from Project earthworks will be assessed for appropriate re-use in accordance with the waste management hierarchy.

Project earthworks will produce spoil from construction of the pipeline, civil earthworks at the desalination plant site and construction of the intake and outfall shafts, tunnels and marine risers. In accordance with the waste hierarchy, this material will be reused onsite to the maximum extent practicable.

The launch shafts and majority of spoil from the tunnels will consist of inert (unreactive) clays which can be reused either in cut and fill to form a flat surface for the construction of the desalination plant or for constructing the walls of an earth bunded storage (EBS). The construction will likely use an Earth Pressure Balance (EPB) TBM with the spoil brought to the surface at ~ 55-75% solids. The spoil will be dried in stockpiles before reuse on site. Further description of how the waste hierarchy and principles for a circular economy have been incorporated into the Project are detailed in Chapter 24 Climate Change and Sustainability.

As the tunnel progresses, pockets of high nutrient or lower strength sediments and rock are likely to be encountered, resulting in spoil that may require drying in settlement and evaporation ponds, and treatment (if required) prior to reuse on site where possible. If this

spoil cannot be reused onsite, it will be disposed of in accordance with relevant EPA guidelines (EPA 2013a).

Spoil from construction of the marine risers will undergo an initial dewatering process either on the jack-up barge (JUB) or an adjacent barge before being transferred to land at Whyalla and transported back to the desalination plant for beneficial reuse on site. If this spoil cannot be reused onsite it will be disposed of in accordance with relevant EPA guidelines (EPA 2013a).

The measures that will be implemented for identifying, testing, storing and appropriately re-using or disposing of potentially contaminated spoil are well established and widely used (refer to guidelines set out in Section 12.2.1). Following implementation of the above controls, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Use of saline water for dust suppression

Negligible impacts are expected from the use of saline water for dust suppression.

Saline water may be used for dust suppression on pipeline soil stockpiles and access tracks and has the potential to cause a minor and temporary increase in the salts in the soil or deposition on the leaf surface of plants in the immediate vicinity of areas where dust suppression is undertaken.

The impact of saline water use is expected to be confined to the construction disturbance footprint. Even within the footprint, effects are likely to be very minor given the short-term nature of pipeline construction activities at any given location.

Following implementation of the above controls, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

12.5.6 Soil stability and subsidence

Impacts to the pipeline from ground movement due to the presence of collapsible soils, expansive clays and karst features will be minimised through pipeline design.

Where the pipeline is located in collapsible and expansive soils or karst features, changing soil conditions over time have the potential to cause cracking or a break in the pipeline. This is a well-known and understood risk in pipeline and infrastructure construction industries. The Project has identified high-risk areas for soil shrink and swell where additional engineering consideration may be required for finalisation of the design prior to construction.

Standard mitigations include identification of high-risk areas and soil testing to ensure shrink / swell type soils are not used for backfill, appropriately engineered foundations and pipeline design that allows for some soil movement, and backfill compacted to an appropriate engineering standard.

Mitigation measures to reduce the risk of pipeline failure from existing karst features (that may be identified during construction or site walkover) include minor realignments and ground treatment to support pipeline spanning features. Clay seals may be considered during trench backfill to prevent surface water ingress through the trench and thus prevent new karst features forming immediately under the pipeline.

The consequence of a break in the pipeline as a result of changing ground conditions would be loss of desalinated water to the soil, and potential erosion at the pipe break location. Regular inspections of the pipeline and pressure detection at key locations will allow leaks in the pipe to be identified quickly and repaired. Any erosion of soils would be remediated following repair of the pipeline.

Following implementation of the above controls, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (which is based on the current level of survey work / assessment and proposed construction methodology) has been evaluated in Appendix M and the level of risk is **Low**.

Desalination plant design has considered risks of ground subsidence over the 100-year design life of the Project.

The desalination plant intake / outfall tunnels have been designed for a 100-year design life for which a rehabilitation plan would be developed to manage the future risk of ground subsidence in the longer term.

The National Seismic Hazard Assessment mapping (Geoscience Australia 2018) indicates that the Project is not in an area of elevated seismic hazard with seismic risk at Mullaquana Station identified as 0.02 mm/s peak ground acceleration which is lower than the Project average (refer Chapter 25 Hazards and Risks). Geotechnical surveys undertaken for the Project indicate a thick clay layer through which the TBM launch shafts and tunnels for the intake and outfall will be constructed.

Engineering reference design for the box cut utilises secant piling to reinforce the walls of the box cut and reduce groundwater inflow during construction. Ground support structures for the intake pump station and tunnels over the 100-year design life. Ground support structures will comply with all applicable Australian Standards to ensure the Project will not contribute to ground subsidence during its 100-year design life.

Prior to decommissioning, it is anticipated that geotechnical investigations will be conducted and a rehabilitation plan developed for the desalination plant site. This plan will comply with relevant legislation at the time of decommissioning and consider potential options to prevent ground subsidence due to the intake and outfall shafts and tunnels in the long term, taking into account potential future land uses.

Following implementation of the above controls, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

12.5.7 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval Project management plans (including the CEMP and OEMP).

Table 12-7: Key mitigation measures – soils, landform and geology

Mitigation measure	Construction	Operation
Minimise the area cleared of native vegetation and area of ground disturbed at any one time.	✓	
Retain topsoil and cleared vegetation to cover cleared areas	✓	

Mitigation measure	Construction	Operation
Strip and stockpile topsoil, subsoil and trench spoil separately.	✓	
Backfill the trench in the appropriate soil horizon order as soon as possible following disturbance.	✓	
Soil stockpiles to be located on flat ground where possible, away from watercourses or other areas with increased erosion risk.	✓	
During periods of heavy rainfall, assess the potential to suspend activities likely to result in erosion and sedimentation if their effects cannot be adequately controlled and may result in impact to the environment.	✓	
Install and maintain erosion and sediment control structures in accordance with the CEMP and OEMP (e.g. diversion berms and cross ditches on slopes to divert water off the right-of-way to adjacent stable ground).	✓	✓
Silt fencing around short-term construction sites as appropriate, bunding developed around longer-term construction sites with sediment basins as appropriate (i.e. the desalination plant).	✓	
Compact backfilling of the trench to a level consistent with surrounding soils.	✓	
Promote rapid restoration by conserving and re-spreading topsoil and ripping / scarifying compacted areas where necessary to facilitate vegetation growth through natural regeneration.	✓	
Ensure that windrows or changes in the level between the pipeline construction corridor and adjacent land are removed during reinstatement to prevent water channelling along the construction corridor.	✓	
Water suppression used on stockpiles to prevent wind erosion. Longer term stockpiles (e.g. surrounding the desalination plant site) encouraged to 'grass over' to assist in stabilising it.	✓	
Monitor soil stockpiles following significant rain events to determine if further controls are necessary.	✓	
Identify access tracks and turn-around points for vehicles prior to construction.	✓	
Minimise the number of planned tracks and use existing tracks as far as practicable.	✓	
Restrict all vehicles and equipment movements to the construction easement or designated access tracks and roads.	✓	✓
Undertake field screening to determine presence of acid sulfate soils if excavating in a risk area in accordance with the South Australian Environment Protection Authority (SA EPA) Site Contamination – acid sulfate soil materials (November 2007) guideline.	✓	
Implement procedures to manage ASS encountered during construction, which may include:	✓	

Mitigation measure	Construction	Operation
- placing any intercepted soils identified as Potential ASS in an isolated bunded stockpile area - treating any identified acid sulfate soils with agricultural lime in accordance with the EPA guideline prior to backfill.		
If unexpected contamination is identified, site specific management plans will have an unexpected finds protocol outlining: - how to investigate the nature and extent of the impacted material - separation and containment of materials to prevent contamination from loss of material or run off and seepage. - treatment (if appropriate), testing and replacement; or - disposal at licensed facility.	✓	
Management of spoil and wastewater, including treatment, storage and reuse, in accordance with EPA guidelines.	✓	
Management of fuels and chemicals, including bunding, equipment maintenance and use of spill kits, in accordance with EPA guidelines.	✓	✓
Spill kits kept onsite and key mobile equipment.	✓	✓
Vehicle refuelling will not occur near (<50 m) watercourses, wetlands or the coast.	✓	

12.6 Conclusion

Project construction or operation activities will not have a significant impact on soils, landform and geology within or adjacent the Project Area. Potential impacts such as erosion and sedimentation, contamination from disturbance of acid sulfate, saline and previously contaminated soils can be readily managed with appropriate location of infrastructure and application of standard management measures.



Chapter 13

Surface Water

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

13 SURFACE WATER 13-1

13.1 Key Findings 13-1

13.2 Setting the Context 13-1

13.2.1 Requirements in legislation and other standards 13-2

13.2.2 Views of stakeholders 13-2

13.3 Assessment Method 13-3

13.4 Description of the Existing Environment 13-4

13.4.1 Mullaquana Station desalination plant site 13-4

13.4.2 Alignment of transfer system infrastructure 13-6

13.4.3 Surface water cultural heritage values 13-16

13.4.4 Aquatic ecology 13-16

13.4.5 Surface water users 13-18

13.5 Impact Assessment 13-18

13.5.1 Surface water quality - transfer system and electricity infrastructure construction 13-19

13.5.2 Surface water quality – desalination plant 13-24

13.5.3 Alteration of drainage patterns and surface water flows 13-27

13.5.4 Contamination of surface water 13-28

13.5.5 Surface water users 13-29

13.5.6 Impacts to aquatic ecology 13-29

13.5.7 Summary of key mitigation measures 13-31

13.6 Conclusion 13-32

LIST OF TABLES

Table 13-1: Key mitigation measures – surface water 13-31

LIST OF FIGURES

Figure 13-1: Surface water features at the Mullaquana Station desalination plant site 13-5

Figure 13-2: Surface water basins in the Project Area 13-7

Figure 13-3: Salt Creek proposed alignment crossing on EML 5653 13-9

Figure 13-4: Watercourses and surface water basins in the Project Area - southern section 13-11

Figure 13-5: Watercourses in the Project Area – northern section 13-15
Figure 13-6: Preliminary stormwater management plan 13-26

LIST OF PLATES

Plate 13-1: Land subject to inundation east of the intake / outfall pump station location 13-4
Plate 13-2: Intake / outfall pump station site looking east towards coastal sand dunes 13-5
Plate 13-3: Salt Creek proposed pipeline crossing location 13-8
Plate 13-4: Myall Creek proposed pipeline crossing 13-9
Plate 13-5: Lake Dempsey from Stuart Highway 13-10
Plate 13-6: Black Oak Creek 13-13
Plate 13-7: Mason Creek 13-14
Plate 13-8: Wirra Wirralu Creek from the Olympic Dam Highway 13-14
Plate 13-9 Example of above-ground pipeline on supports at Black Oak Creek 13-28

13 SURFACE WATER

This chapter describes the existing hydrological environment of the Project Area and the potential for the Project to affect surface water features and resources (including aquatic ecology).

Potential impacts to water, landform and soils are often inter-related. Accordingly this chapter should be read in conjunction with Chapter 12 Soils, Landform and Geology and Chapter 14 Groundwater and the associated technical reports.

An evaluation of the flood risk at the desalination plant site, substations, pump stations and water storages is provided in Chapter 25 Hazards and Risks.

13.1 Key Findings

- There are no watercourses within the desalination plant site. Topography is generally sloping towards the east and clean runoff from upstream of the Project site will be diverted around the desalination plant and directed to a clay pan south-east of the site.
- Stormwater management at the desalination plant site is designed to separate stormwater catchments by potential contaminants to allow the most appropriate treatment for each catchment.
- Stormwater management for substations and pump stations will be developed through detailed design following the same principles as those proposed at the desalination plant.
- Impacts from dewatered groundwater will be avoided through reuse (where possible) or discharge or disposal in accordance with EPA requirements.
- All of the more than 200 watercourses crossed by the pipeline are ephemeral allowing construction to be undertaken while dry to prevent impacts to surface water and aquatic ecosystems. Control strategies are proposed to prevent run-off from impacting upon surface water if present.
- Best practice erosion and sedimentation measures and implementation of appropriate storage and handling of fuels and chemicals and proactive spill management will be implemented to minimise impacts to surface waters and aquatic ecosystems.

13.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effect of the Project on surface water features (waterbodies, watercourses, drainage channels, wetlands and floodplains), uses and users including stormwater management. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards

- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 13.3.

13.2.1 Requirements in legislation and other standards

The *Landscape South Australia Act 2019* promotes the sustainable and integrated management of landscapes and natural resources. This legislation provides for the management of the State's water resources (i.e. surface water and groundwater) including defining water affecting activities, water licensing and water allocation rights and entitlements. The triggers for Water Affecting Activities permits are set out in the relevant Water Affecting Activities Control Policy for each landscape board. The Project will likely require a number of licences for construction of transfer system infrastructure.

The *Environment Protection Act 1993* sets out the general environmental duty to prevent pollution. Subsidiary legislation (i.e. the *Environment Protection (Water Quality) Policy 2015*) (Water Quality EPP) sets the standards to be achieved for discharge of waters to natural systems. The requirement for a dredge permit (or otherwise) would form part of a discussion with the EPA based on the detailed design and specifics of the activities.

The Water Quality EPP in turn references the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) which sets out a framework for maintaining existing environmental values and uses of waters with default guideline values provided for situations where there is no existing baseline data.

The *Planning, Development and Infrastructure Act 2016* (PDI Act) establishes the Planning and Design Code (the Code) which addresses water resources through spatially applied planning Overlays and General Development Policies (GDPs). Relevant Overlays include the Water Resources and Hazards (Flooding) Overlays. Outside of specific overlays, general provisions, such as Infrastructure and Renewable Energy Facilities apply state-wide rules for wastewater and stormwater, ensuring that sites are adequately serviced, erosion is minimised during construction, and pollutants do not enter local waterways.

State Planning Policy 14: Water Security and Quality mandates that development must not compromise the long-term sustainability of the State's water supplies, catchments, and dependent ecosystems. Further detail of the application of the State planning system is provided in Chapter 7 Planning and Design Quality.

13.2.2 Views of stakeholders

Surface water features in the semi-arid and arid regions of the Project Area such as creeks, salt lakes and watercourses are often places of Aboriginal heritage significance and cultural and spiritual importance to Traditional Owners. General information on how places of Aboriginal cultural significance will be addressed in the design, location and conduct of Project activities is provided in Chapter 16 Aboriginal Cultural Heritage.

Concerns about the environmental impact on surface water flows, drainage lines, large watercourses and salt lakes have also been raised by stakeholders during Project engagement activities.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

13.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The Surface Water Assessment (SWA) report is provided at Appendix H-3 (Jacobs 2026c) and Stormwater Management Plan (GHD 2026b) is provided at Appendix H-7.

Desktop assessment

A desktop assessment of climatic conditions for the surface water basins traversed by the Project and a description of the existing conditions of the major watercourses crossed by the Project are set out in the SWA report. Sensitivities (if any) were identified, considering publicly available information on water quality, aquatic ecosystems, history of flooding and likely flood flow velocities as well as potential soil conditions which could impact on surface water including saline soils and potential Acid Sulfate Soils (ASS). Publicly available information sources included:

- State of the Environment Reports (EPA 2008, 2013b and 2023b)
- Aquatic ecosystem condition reports (EPA 2010)
- Atlas of Living Australia (ALA 2024)
- Nature Maps (DEW 2024a)
- BHP Olympic Dam Expansion EIS – surface water assessment (BHP 2009c)
- Carrapateena Mining Lease Proposal (Oz Minerals 2017).

Flooding assessments involved a review of topography to identify upstream catchments, direction of flow and potentially impacted infrastructure.

Stormwater assessment

Stormwater assessment for the desalination plant was undertaken using the following methodology:

1. Review of topography (Project-specific LIDAR) to identify catchments and flow directions.
2. Mapping of internal site catchments from the Reference Design (GHD 2025a) to identify pollutant sources present in each catchment requiring treatment.
3. Modelling surface water flows using DRAINS modelling software and calculated rainfall intensity using the Australian Rainfall and Runoff (ARR) 2019 methodology for a 1% AEP. Modelling also included consideration of climate change with appropriate

factors for 7.0 Representative Concentration Pathway (RCP) climate model applied in accordance with ARR 2019 methodology.

4. Modelling surface water quality using MUSIC modelling software over a 10-year period of rainfall data (2011 – 2021) available from Whyalla Aero Bureau of Meteorology (BOM) site.

Field assessment

The desktop assessment was supported by a field assessment undertaken in November-December 2023 along the transfer system alignment with focus on the major watercourses, to provide additional information particularly around site specific erosional conditions.

13.4 Description of the Existing Environment

13.4.1 Mullaquana Station desalination plant site

The desalination plant construction footprint is located on Mullaquana Station where the primary land use is livestock grazing over native vegetation. There are no drainage lines identified within the vicinity of the construction footprint. The nearest surface water features are a farm dam approximately 1.7 km south-west of the desalination plant.

The desalination plant site is located within the Spencer Gulf Basin which consists of shallow hills with small, ephemeral drainage lines which drain directly to the coast. There is a small upstream catchment at the site, where existing surface water run-off is directed east towards the coast before heading south along the sand dunes to a natural clay pan.

The desalination plant site is not within a Prescribed Water Resource Area under the Landscape South Australia Act.

Land subject to inundation (in the form of a samphire intertidal swamp) has been identified 800 m east of the intake and outfall pump station location (refer Plate 13-1 and Figure 13-1). A line of sand dunes separates the intake and outfall pump station location and the inundation area (refer Plate 13-2).



Plate 13-1: Land subject to inundation east of the intake / outfall pump station location



Plate 13-2: Intake / outfall pump station site looking east towards coastal sand dunes

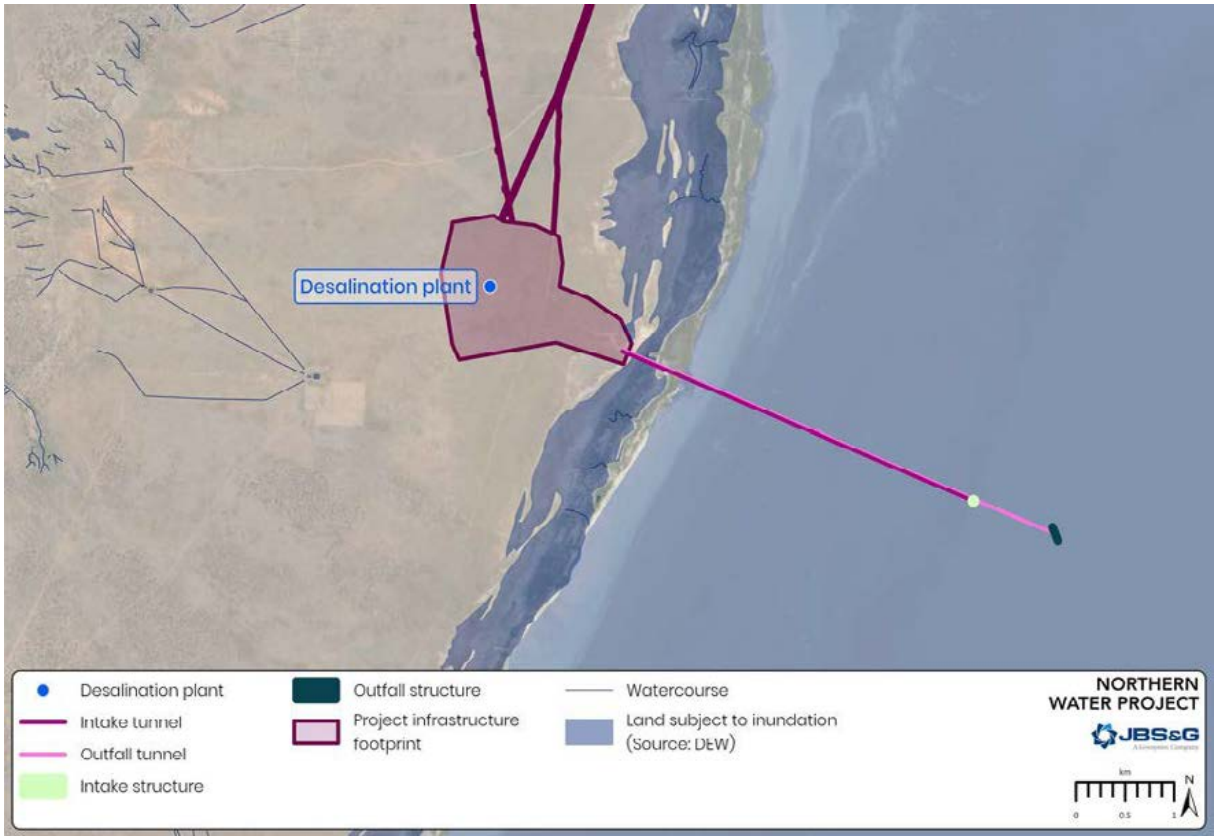


Figure 13-1: Surface water features at the Mullaquana Station desalination plant site

Surface water quality

Due to the lack of surface water features, there is no surface water quality data available for Mullaquana Station. The nearest surface water quality data available is ~50 km south-west for a creek in a different environment and thus is not comparable (EPA 2023b).

Surface water onsite would generally constitute run-off following large rainfall events and would be turbid and reflective of the local soils, which are a mix of sandy clays to sands. Sampling of surface material identified a few locations where arsenic and manganese were above levels specified for waste-derived fill but below NEPM limits for health and ecosystem screening levels for commercial and industrial areas (Kleinfelder 2025). Soil samples within this area were also noted for being slightly alkaline (pH 8-9 for all soil samples <1 m bgl) (Kleinfelder 2025).

13.4.2 Alignment of transfer system infrastructure

The transfer system alignment (including the Carrapateena lateral branch) is currently mapped as crossing over 200 watercourses through the Spencer Gulf, Mambray Coast and Gairdner Basins. A small section at the eastern end of the Carrapateena lateral branch is located within the Lake Torrens Basin (refer Figure 13-2).

There are no Prescribed Water Resource Areas that intersect the transfer system alignment. Water quality information for these basins is provided in Appendix H-3 and summarised below.

Climate data, IBRA subregions and generalised environmental descriptions for the Project Area are also provided in Chapter 9 Use of Land and Marine Waters.

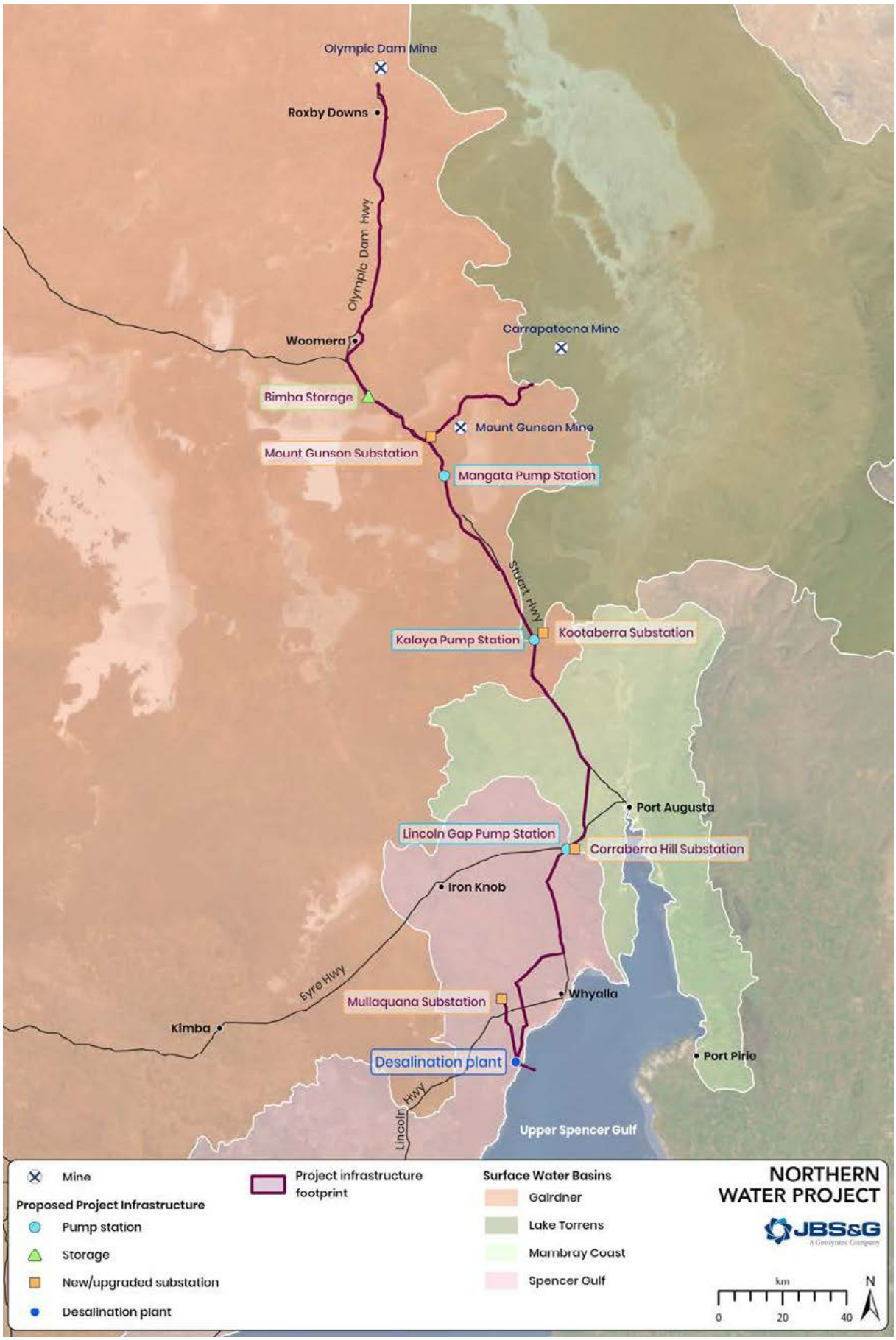


Figure 13-2: Surface water basins in the Project Area

Spencer Gulf Basin

The Spencer Gulf Basin is located on the eastern Eyre Peninsula, extending north from Tumby Bay to west of Port Augusta (refer Figure 13-2). This basin is characterised by alluvial plains and valleys, with catchment sizes typically smaller in size (less than 100 km^2), longer and narrower catchment shapes and steeper slopes.

Climate and rainfall vary significantly between the north and south of the basin. The southern area of the basin experiences a wetter climate, where land use is primarily focussed on cropping. Further north in the basin (i.e. Mullaquana Station and north) land use is predominantly livestock grazing.

Water quality

Assessments of water quality in creeks on the Eyre Peninsula were conducted by EPA in 2010 and 2015. In 2015 40% of sites were assessed as fair, 40% as poor and 20% as very poor condition. This was a decline from the 2010 survey where a larger number of sites were assessed as 'fair' and 'poor', and fewer as 'very poor'.

Key surface water features within Spencer Gulf Basin

Salt Creek[1]

The proposed alignment crosses the ephemeral Salt Creek in an existing disturbed area (refer Plate 13-3). The crossing location is also subject to an Extractive Minerals Lease (EML) 5653 for the purpose of mining for gravel and sand within the creek bed (refer Figure 13-3).

The main transfer pipeline construction corridor width has been reduced across the watercourse as it has been identified as an environmentally sensitive location (notwithstanding the existence of the EML).



Plate 13-3: Salt Creek proposed pipeline crossing location
[Source: JBS&G 2026]

[1] Also known as Nonowie Creek in some reports and studies.

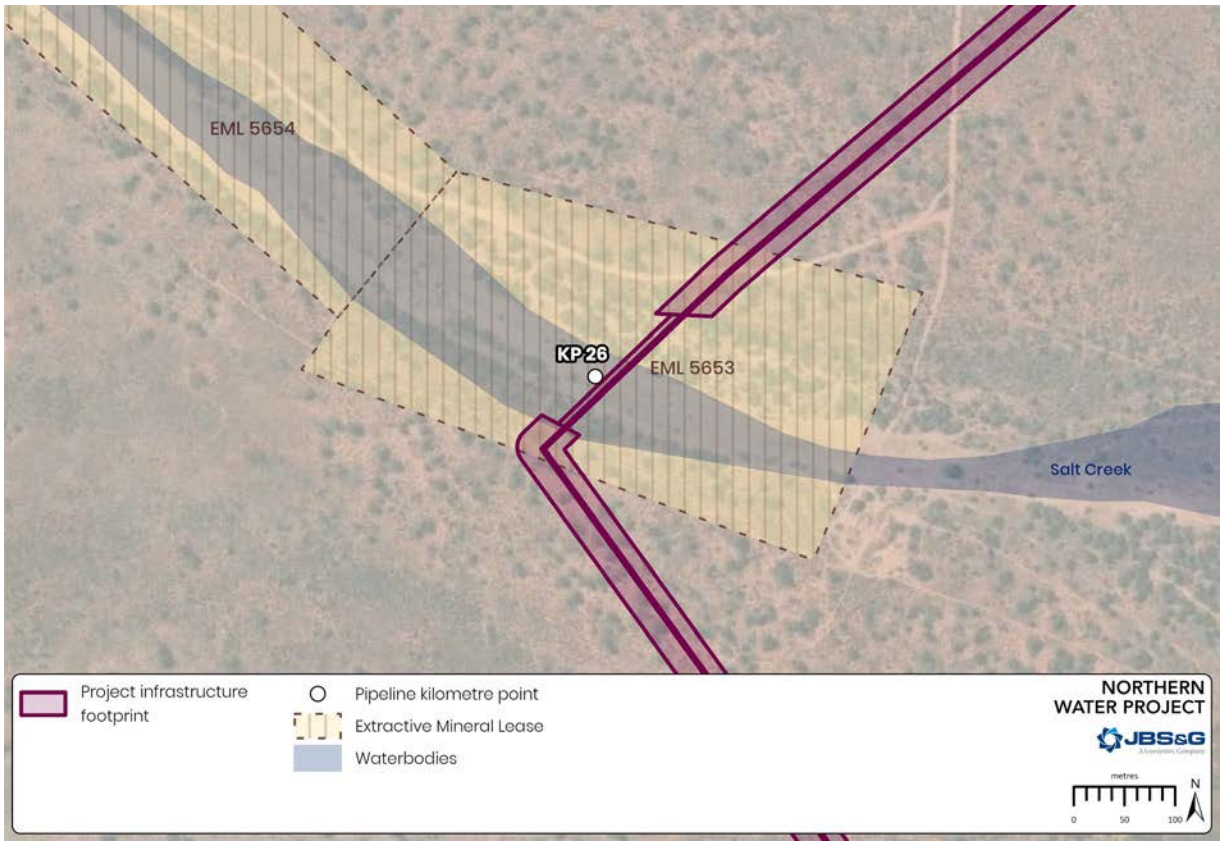


Figure 13-3: Salt Creek proposed alignment crossing on EML 5653

Myall Creek

The proposed transfer system alignment crosses Myall Creek which includes tributaries which run both sides of the proposed Lincoln Gap Pump Station. Field surveys in 2023 identified the large bed load in this stream, indicating a high level of stream power (Jacobs 2026c).



Plate 13-4: Myall Creek proposed pipeline crossing
[Source: JBS&G 2026]

Mambray Coast Basin

The Mambray Coast Basin is the smallest of the basins in the Project Area, extending north from Port Bonython and Port Augusta, and around the Upper Spencer Gulf to Port Pirie (refer Figure 13-2).

This section is primarily characterised by steep escarpments and plateaux, divided by alluvial plains (BHP 2009c). The drainage lines crossed by the transfer system pipeline in this part of the proposed alignment are well defined and weathered with active bed loads. Stormwater flow typically traverses the minor channels before joining into larger incised creeks and into the wider floodplain. Bed load varies in size and profile and can include alluvial scree, finer sands, and silty sands.

Key surface water features within the Mambray Coast Basin

Lake Dempsey and tributaries

The proposed transfer system alignment crosses an area of vegetated sandy braided channels west of the ephemeral Lake Dempsey through KPs 90 - 106 (refer Figure 13-4). Groundwater in this area is shallow with regional mapping identifying a number of potential groundwater dependent ecosystems (GDEs) along tributaries and the lake as well as a high acid sulfate soil (ASS) risk area within the lakebed (Geoscience Australia, 2018, JBS&G 2026d[2]).



Plate 13-5: Lake Dempsey from Stuart Highway
[Source: Google Earth]

[2] Note this report was completed in 2025, and finalised for the EIS in 2026.

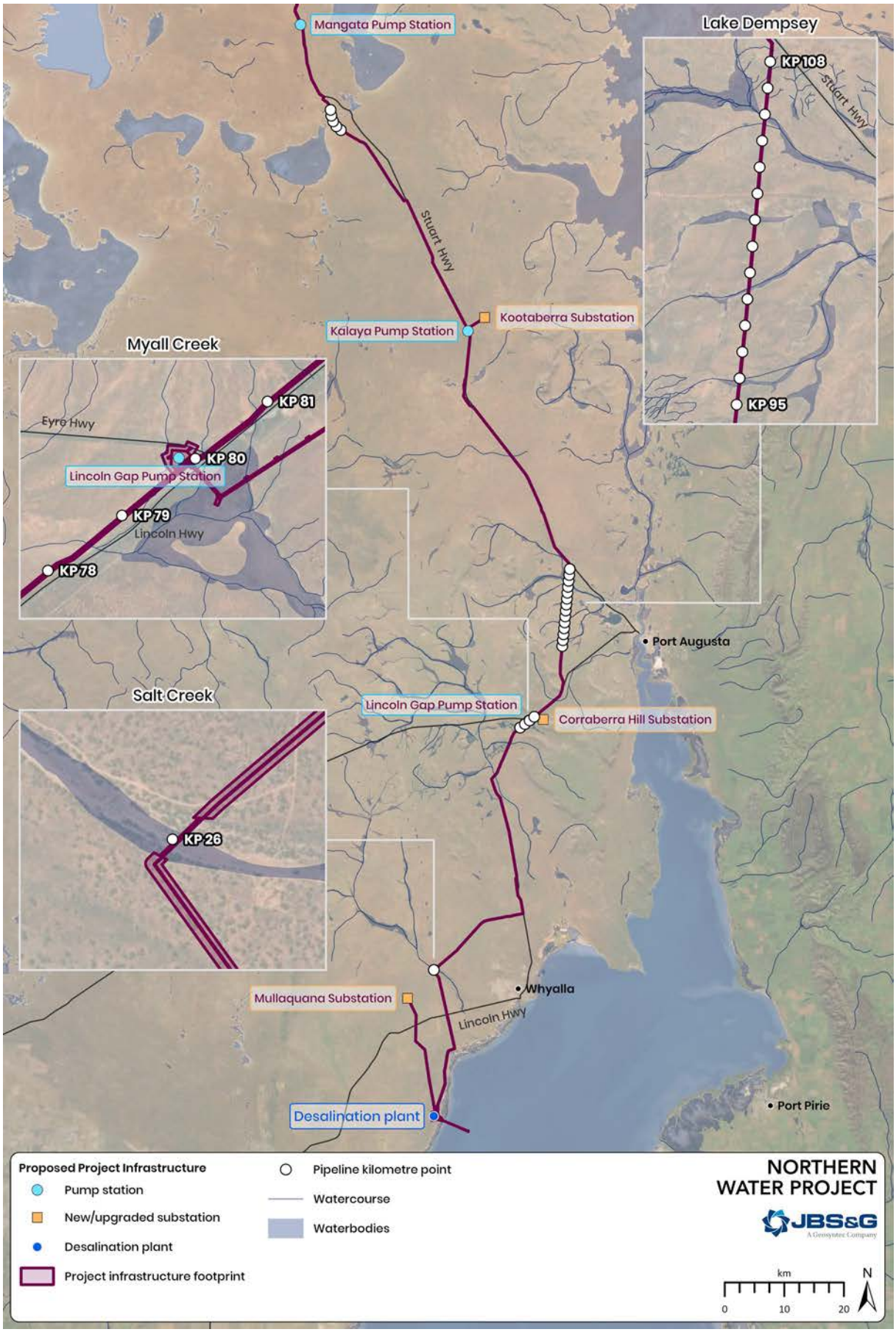


Figure 13-4: Watercourses and surface water basins in the Project Area - southern section

Gairdner and Lake Torrens Basins

The Gairdner Basin is the most extensive of the basins traversed by the Project, extending north from Cummins on the Eyre Peninsula to north of Coober Pedy and west beyond Ceduna. The Project Area is on the eastern margin of the basin (refer Figure 13-2). A 10 km section of the Carrapateena lateral branch is located in the Lake Torrens Basin. Almost half of the transfer system is located within these two basins.

The watercourses of the Gairdner and Lake Torrens Basins are semi-arid to arid with highly variable rainfall which dictates the episodic wet and dry cycles of this area. Prolonged dry periods are broken by high intensity rainfall with ephemeral watercourses, flood plains and braided channels filling with water before draining into large terminal salt lakes from where it will evaporate. During these flooding periods access to parts of the landscape is frequently cut off as roads are impassable. Water can remain in a few, isolated watering holes and lakes for a few months to a few years following major rainfall events which are important areas for wildlife and ecological functioning (SAALLB 2021b).

The Gairdner Basin south of Pimba is defined by extensive sandy and clayey plains, salt pans and more defined drainage lines. Vegetation is often more highly concentrated around drainage lines. Although erosion is limited, it is visible in areas where flows are concentrated around conveyance structures, such as along roadside drainage systems and culvert features.

Salt pans are notable in the northern section of the Project Area. Rainfall events and water quality are highly variable ranging from fresh water in the system during rain events, to highly saline when evaporation results in concentrated salts in the remaining surface water. The flatter terrain results in widespread surface ponding and evaporation leading to concentration of salt and minerals. Vegetation in this area is also noted to comprise salt-tolerant species.

The Gairdner Basin north of Pimba to Olympic Dam is characterised by extensive dunes, interdunal swales, clay pan depressions and low-lying, sparse vegetation, with areas of gibber plain, treeless low stony hills with clay soils supporting chenopod and samphire low open shrubland. Topography is relatively expansive, with generally larger catchments and flatter slopes when compared to the southern of the Project Area. Where catchments are bound by the crest of the sand dunes they can often be smaller in size and have steeper slopes.

The sandy dunes are highly permeable with relatively quick infiltration through the initial sandy profile, before reaching the thicker clayey soil under the dunes. Stormwater flows are then drained into the nearby swales and clay pans which are less permeable due to their clayey soil profile. Infiltration through surface cracks of the clay soils can result in swelling, reducing the capacity of infiltration and leading to surface water ponding (BHP Billiton 2009a).

Broad networks of watercourses are observed along the Carrapateena lateral branch and consist of large, ephemeral braided streams, with multiple sandbars and channels. Drainage lines in this section are partially vegetated with heavy scouring due to concentration of flows from culverts and road drainage.

The intensity of rainfall can heavily impact the duration of surface water ponding, with total duration of inundation in the region spanning from hours to weeks and even months. Overall, drainage lines in this region are less defined with flows occurring at lower velocities and shorter distances due to the low relief of the terrain.

In the vicinity of Roxby Downs there are no defined watercourses and the area is defined by highly permeable sand dunes underlain by thick clay soils. As such, rainfall infiltrates quickly, with water only ponding following significant rainfall events when water reaches the clay soils which are less permeable.

Key surface water features within the Gairdner and Lake Torrens Basins

The following are key surface water features in the northern section of the Project that have the potential to be impacted by Project construction and operation activities (refer Figure 13-5).

Black Oak Creek

The pipeline crosses an ephemeral tributary and channel connecting the salt lakes known as Ironstone Lagoon (southern extension of Pernatty Lagoon) and Lake Dutton at KPs 195 - 200. Potential for aggressive soils has been identified at this location (refer Appendix H-1 Topography, Geology and Soils Assessment).

Water samples taken here in 2009 indicated a pH of 6.76 (relatively neutral) and total dissolved solids (TDS) of 140,000 mg/L (salinity greater than seawater).



Plate 13-6: Black Oak Creek
[Source: Google Earth]

Lake Windabout

The pipeline crosses Mason Creek, a saline depression south of Lake Windabout between KPs 235 and 240. Water samples taken in 2009 for Lake Windabout (BHP 2009c) measured a pH of 6.84 (relatively neutral) with TDS of 22,300 mg/L which is too saline for stock water. Analysis showed that the predominant salt type present was sodium chloride. Potential for aggressive soils at this location was identified in Appendix H-1.



Plate 13-7: Mason Creek
[Source: Google Earth]

Wirra Wirralu Creek

This is an ephemeral drainage line and area of shallow groundwater north of Woomera, crossed by the pipeline between KPs 276 - 277. Soils at this location are likely to be highly saline and salt is present on surface. The Topography, Geology and Soils Assessment identified potential for aggressive soils at this location (refer Appendix H-1).



Plate 13-8: Wirra Wirralu Creek from the Olympic Dam Highway
[Source: Google Earth]

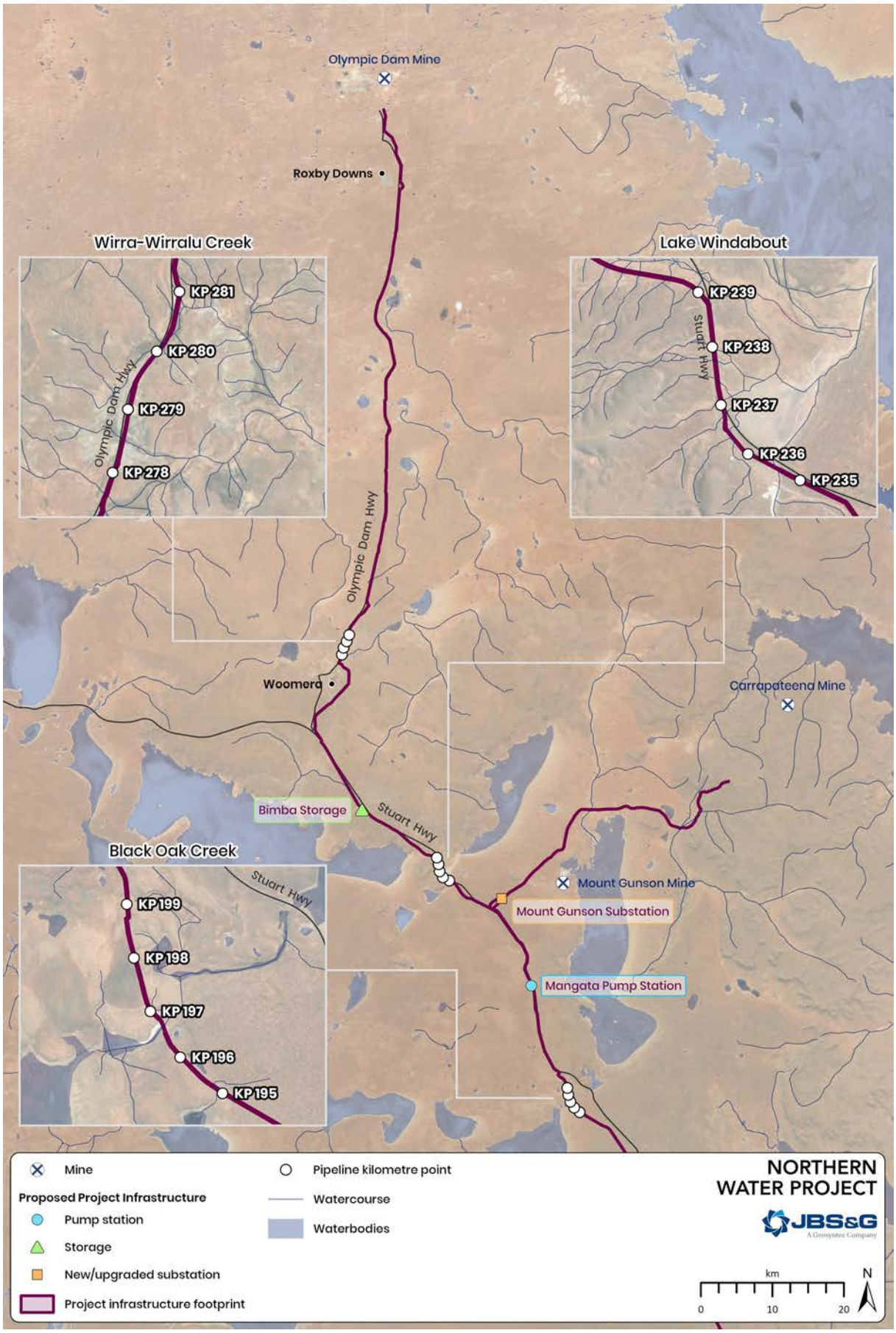


Figure 13-5: Watercourses in the Project Area – northern section

13.4.3 Surface water cultural heritage values

Landscape features of the Project Area are diverse, ranging from expansive flat plains to steep escarpments descending towards large salt lakes. These landforms contain surface water features of cultural significance to the Traditional Owners such as salt lakes, watercourses, springs, rockholes and other water sources, which intertwine with cultural stories and the passage of Aboriginal people across the landscape. Accordingly Traditional Owners in the arid regions retain strong and enduring cultural, social and spiritual connections with these water resources and the ecological communities and landscapes they support.

Traditional knowledge of the type and location of fresh water sources was of central importance to the survival of Aboriginal people living in these areas. Surface water features utilised by Aboriginal people in desert regions include flooded rock-holes, soakage wells, flooded claypans, riverine waterholes and mound springs (Bayley 1999). Where there are no permanent rivers, creeks or significant streams, these sources of water are essential for survival. For Traditional Owners, reliable water sources such as rock-holes and groundwater springs can also hold important cultural significance, for example forming a part of story lines and being a source of healing. Salt lakes can also hold significant cultural heritage values and strong connections remain today.

One such site in the vicinity of the Project Area is Lake Mary which is a freshwater lake located on Purple Downs Station, managed by Kokatha Pastoral Pty Ltd. Lake Mary can hold substantial water for several years after good rain and is an important mythological site for the Kokatha People, with archaeological camp sites from the large traditional gatherings held in the past located on the lake margins[3].

The Project has been designed to avoid known Aboriginal cultural heritage places and sites. Extensive engagement has been undertaken with the Kokatha People and Barngarla People as the primary Traditional Owner groups in the Project Area. Surveys have been and will continue to be undertaken as the Project design is finalised to ensure there is no harm to cultural heritage, including archaeological and ethnographic sites.

13.4.4 Aquatic ecology

An assessment of aquatic ecology was included in the Surface Water Assessment (refer Appendix H-3). Available information on aquatic flora and fauna is described below for the basins along the transfer system alignment. As there are no watercourses on the desalination plant site at Mullaquana Station, a description of aquatic ecology has not been provided for this location.

Riparian vegetation across the Project Area more generally is described in Chapter 15 Terrestrial Flora and Fauna. GDEs in the Project Area have been described in Chapter 14 Groundwater.

There are no recorded aquatic Matters of National Environmental Significance (MNES) within 5 km of the Project alignment (refer Appendix I-6), and monitoring records of aquatic ecosystems discussed below have only identified common, salt tolerant species.

[3] https://kokatha.com.au/important-information-about-lake-mary/

Water quality indicators for aquatic ecosystems

A number of indicators of water quality that are important to the protection of aquatic ecosystems may be impacted by the Project if not appropriately managed. These include:

- **nutrients** which promote the growth of algae and increase turbidity which in turn reduces light and may affect plant growth.
- **total suspended solids (TSS)** which are a measure of the fine particles suspended in water. High concentrations of sediment can reduce the light available for aquatic organisms and the fine particles that comprise of TSS carry nutrients, metals and other pollutants from a variety of sources such as agricultural runoff, leaching of soil contaminants and point source pollution.
- **pH** which is a measure of the acidity or alkalinity of a waterbody. Changes in pH can impact on the ability of aquatic organisms to maintain basic functions such as respiration. Acidity also controls the bioavailability of metals, nutrients, and other organic molecules.
- **heavy metals** which include metals and metalloids present in total or dissolved forms that may be directly toxic to instream organisms. Certain heavy metals can bioaccumulate in aquatic ecosystems and biomagnify through food chains.

Spencer Gulf and Mambray Coast Basins

Aquatic flora and fauna within the southern, coastal catchments is predominantly comprised of fish and invertebrate species which are able to tolerate saline environments. All watercourses in the Project Area are ephemeral and were dry during field inspections. No aquatic flora or fauna was observed. While there is potential for some fish or invertebrate species to use these watercourses following periods of rainfall they do not rely upon the watercourses for their lifecycle.

Gairdner and Lake Torrens Basins

The transfer system does not cross any permanent waterbodies in the Gairdner and Torrens Basins. Surface water features would only be occupied temporarily by migrating freshwater fish species during flood events, if at all.

The aquatic ecology assessment (refer Appendix H-3) indicates the potential for Lake Eyre Hardyhead in this region (*Craterocephalus eyresii*), which is an endemic Australian arid zone species with a relatively small range. The nearest record to the Project is approximately 25 km distant and the location is not within a watercourse and so may have errors with location detail (ALA 2024).

The species exists in moderate to low numbers when persisting in refuge habitat, but breeds prolifically during floods and spreads widely before experiencing mass mortality as water levels recede. It should be assumed that the species would use the ephemeral tributaries of Lake Torrens that may intersect with the proposed pipeline on rare occasions during major flood events.

There is limited data on macroinvertebrate species within these catchments. Previous studies on salt lakes in Australia (Williams 1985, Williams et al. 1998) have identified a number of macroinvertebrates common to salt lakes, which are likely to disperse during times of

heavy rainfall and flooding between lakes with dominant species varying over time in response to changes in salinity.

No aquatic pests have been recorded.

13.4.5 Surface water users

In the northern Spencer, Gairdner, Lake Torrens and Mambray Coast Basins, rainfall is rare and sporadic with high evaporation rates, meaning surface water is an unreliable resource. Small dams on pastoral stations have been established to capture surface water during rainfall events. Rain falling on roofs is collected in rainwater tanks for domestic water supplies.

Waterholes along ephemeral creek lines allow surface water to persist for a few months following rainfall which are used by sheep, cattle and native fauna for drinking water (BHP 2009c). The gathering of native fauna (particularly birds) at watering holes and salt lakes following periods of rainfall provides tourism opportunities, although, the more popular lakes are outside the Project Area (BHP 2009c, Oz Minerals 2017).

Lake Mary, which is located between Woomera and Roxby Downs and is nearly 2 km upstream of the proposed main transfer pipeline, has been used for recreational activities by Roxby Downs and Andamooka communities. As noted above, it is also known to be an important cultural site for the Kokatha People.

13.5 Impact Assessment

The following Project aspects have been identified as sources of impacts to surface water and aquatic ecology:

- pipeline construction across and near watercourses (by either trenching or trenchless construction methods)
- discharge of saline groundwater from dewatering during trenchless construction
- discharge of hydrotest or chlorinated water during testing, commissioning or maintenance of the pipeline
- stormwater run-off from Project sites
- above-ground pipeline through sensitive watercourses and as an option along the Carrapateena lateral branch changing surface water flow
- discharge of groundwater from dewatering during TBM development and dewatering of spoil from TBM
- accidental spills and leaks from construction equipment.

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also discussed for each impact event.

Project activities with the potential to impact surface water and aquatic ecology have also been addressed in other chapters:

- impacts to GDEs from dewatering of excavations during trenching or trenchless construction methods of watercourse, road and rail crossings (addressed in Chapter 14 Groundwater)

- exposure of saline soils and potential acid sulfate soils (PASS) (addressed in Chapter 12 Soils, Landform and Geology and Chapter 14 Groundwater)
- potential for infrastructure to change flow regimes or alter flooding regimes (addressed in Chapter 25 Hazards and Risks)
- disturbance or removal of riparian vegetation (Chapter 15 Terrestrial Flora and Fauna)
- flood assessment for the desalination plant, substations, pump stations and water storage sites (Chapter 25 Hazards and Risks).

13.5.1 Surface water quality - transfer system and electricity infrastructure construction

Sedimentation of watercourses

Pipeline construction methodology and other infrastructure siting will be designed to avoid sedimentation of watercourses.

Construction of transfer system infrastructure will occur through watercourses either via trenching or trenchless construction methods. Trenchless methodology (i.e. excavation of launch shafts for underboring or micro-tunnelling) avoids disturbance of soils within the watercourse and is described in Chapter 6 Project Description. All watercourses are expected to be dry during construction with trenchless construction only proposed for watercourses identified as sensitive for cultural heritage reasons.

Trenching will involve soil disturbance within the watercourse and has the potential to result in sedimentation of the watercourse and impact upon biota if water is present. However, for access and logistical reasons, as well as reducing environmental impacts, trenching is anticipated to occur through watercourses only when they are dry.

Once the pipeline is in place the soil will be returned to the trench and the soil profile will be reinstated to the natural ground level. While there is potential for some minor short-term sedimentation of watercourses following the first rainfall after construction, this would be common across the catchment with dry creek beds filling following the first major rainfall.

Control of sedimentation will be addressed through the Project Construction Environmental Management Plan (CEMP). Topsoil and subsoil stockpiles will not be located within watercourses and temporary stockpiles and construction areas near watercourses will be enclosed by sediment fencing. These areas will be rehabilitated as soon as reasonably practicable with cleared vegetation replaced over rehabilitated sites to reduce erosion. Further detail on management measures for erosion and sedimentation during construction activities on the pipeline alignment is provided in the impact assessment in Chapter 12 Soils, Landform and Geology.

Pump stations, storages and substations have all been sited to avoid watercourses and transmission lines will be micro-sited to span sensitive areas (including watercourses) and thus avoid impacts.

Following implementation of the management controls set out above and those discussed in Chapter 12 Soils, Landform and Geology, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty in the potential for minor

adjustments to placement of infrastructure resulting from detailed design or application of construction methodologies) has been evaluated in Appendix M and the level of risk is **Low.**

Disposal of dewatered groundwater

Dewatered groundwater from construction of watercourse, road and railway crossings will be reused where possible or discharged or disposed of in accordance with EPA requirements.

Dependent on the location, construction across watercourses may involve trenching or trenchless construction below the groundwater table. Pipeline crossings of railways and major roads will also be undertaken via trenchless construction. At these locations, groundwater (which is expected to be saline) is likely to flow, albeit at low volumes, into the excavation, and will require removal and management. As discussed in Chapter 14 Groundwater, trenching is not expected to yield significant volumes of groundwater inflow due to the shallow nature of the trenches, short exposure period, and limited storability of perched aquifers that may be encountered.

The following approach will be adopted to manage dewatering of groundwater inflows in accordance with the EPA waste hierarchy:

- shallow pipeline construction to avoid groundwater disturbance where possible
- testing to determine suitability for reuse
- if suitable, reuse of extracted groundwater for dust suppression or water requirements for trenchless construction methodology
- if unsuitable for re-use, discharge to environment where water quality meets EPA requirements for discharge
- where water quality parameters do not meet EPA requirements for discharge, disposal at a licenced facility (particularly if there is a potential contamination risk).

Discharge of groundwater to a drainage line may occur during construction for once-off periods which are anticipated to be up to 72 days during trenchless construction. As all groundwater which may be encountered is from shallow groundwater aquifers (likely <3.3 m below ground level), once-off discharge of this water is not anticipated to impact upon vegetation or surface water quality as the vegetation would already be accessing this water. For example, discharge of saline groundwater from trenching or trenchless launch shafts into the salt lake environment at Pernatty Lagoon is not expected to significantly increase salinity or impact receptors.

Discharge of water in an area with potential susceptibility for scouring or erosion would utilise erosion control methods such as temporary pipe lain in rip rap swale.

If dewatering is required at a location where a potentially contaminating activity has occurred or where potential acid sulfate soils (PASS) are present, additional testing would be required prior to construction commencing. The purpose of testing would be to identify the need for water treatment prior to reuse or discharge to ensure the quality standards set out in the Water Quality EPP are met. Alternatively, should discharge not be possible, water would be collected and disposed of at a licenced facility.

Details of construction through watercourses will be provided to support an application for a Water Affecting Activities (WAA) permit under the Landscape South Australia Act (if required and following confirmation with the relevant landscape board). Detailed construction methodology and strategies will be provided for each watercourse crossing including a dewatering management plan in accordance with EPA guideline *Environmental management of dewatering during construction activities* (EPA 2021). The activity of discharging dewatered groundwater to creeklines would also require an EPA licence if the water contains chemical water treatments, or high levels of turbidity and is at a rate above 50 kilolitres per day.

The measures that will be implemented for testing and appropriately reusing, discharging or disposing of dewatered groundwater are well established and widely used. Following implementation of the management controls set out above, the expected impacts are in the **Minor** category. Uncertainty in the expected impact (based on uncertainty about the presence or quality of groundwater at specific locations) has been evaluated in Appendix M and the level of risk is **Low.**

Disposal of hydrotest or chlorinated water

Release of hydrotest or chlorinated water will be in accordance with appropriate industry standards to avoid impacts to sensitive environments.

Routine maintenance activities may require water to be discharged from the pipeline to facilitate safe worker access. While discharge is not expected during testing and commissioning, the following discussion outlines the approach that would be adopted should such a requirement arise in either scenario.

Hydrotesting is undertaken to determine the soundness of piping systems and other pressure vessels. The system is filled with water, pressurised and monitored for leaks or other integrity issues. Water from hydrotesting may contain low levels of corrosion inhibiting chemicals or biocides, depending on the water source and total time required for the test. Inappropriate disposal of hydrotest water may result in localised soil or surface water contamination.

Hydrotest water

Investigations of hydrotest water undertaken by the CSIRO (Tjandraatmadja et al. 2005) indicated that where hydrotest source water is not contaminated and biocides are not added, the quality of the discharge water causes no increase in environmentally hazardous compounds from either the pipe or any treatment added to the water (e.g. oxygen scavengers).

While hydrotest water did not have elevated nutrient levels, there were elevated levels of turbidity, sodium or ammonium sulfate and low levels of dissolved oxygen. However, the study concluded that current industry treatment methods are effective in raising the quality of disposal water sufficiently for it to be disposed by irrigation or evaporation or into watercourses, depending on their characteristics. These include removal of solids by sedimentation and / or filtration and neutralising residual oxygen scavenger and restoring dissolved oxygen levels by aeration.

The study also noted that special planning is required when specifying treatment programs for hydrotest water containing biocides (in order to deactivate residues prior to discharge to

the environment), and when using water that may cause disposal problems (e.g. containing high salinity or the presence of sulfate–reducing bacteria).

Chlorinated water

As discussed in Chapter 6 Project Description, the Project Reference Design has adopted chlorination as the disinfection method for the desalinated water. However, as the detailed design process progresses this will be investigated further. For the purposes of this assessment chlorination has been assumed.

Chlorine has been used in South Australia since the 1980s to disinfect drinking water (SA Health 2024). As it persists in the water supply for a long time chlorine is useful for longer pipe networks which is an advantage in regional areas.

Chlorinated water has the potential to be toxic to fish, aquatic animals, reptiles and amphibians if water released from the pipeline (via scour valves or leaks) reached aquatic ecosystems (CDC 2024). Watercourses in the vicinity of the pipeline are ephemeral and thus aquatic ecosystems are expected to be only periodically present following periods of heavy rainfall. As chlorine dissipates within days and would be diluted by the rainfall required to allow the watercourses to flow (CDC 2024), in the event of a failure of management measures and an unplanned release occurred, impacts would be short-term and confined to a small area.

The engineering design of the pipeline incorporates chambers to contain overflows from controlled and uncontrolled releases of water for scour valves located near sensitive environments. This allows an operator to visit sites and manually de-chlorinate the water prior to release. Scour valves will be located at low points along the pipeline alignment and will discharge into a dechlorination chamber which can store appropriate volumes of water until an operator can attend the site, to adjust the pH and dechlorinate the water before opening the scour valve.

Water will be discharged slowly over rock scour to prevent scouring of surrounding soils. As scour valves are located at low points many are likely to be located in proximity to watercourses but will not be located within the watercourses themselves. As any release of water is of potable quality and dechlorinated, impacts to nearby watercourses are not expected.

Controlled release of water from the pipeline is only anticipated during testing, commissioning and maintenance occurring during operations. Mitigation measures including capture in scour chambers, water treatment to dechlorinate, and standard erosion control measures implemented on release.

Measures that will be implemented to manage the release of hydrotest and chlorinated water are well established industry practice and widely used. Following implementation of management controls set out above, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Stormwater management at pump stations and substations

Stormwater structures at pump stations and substations will be designed to ensure post-development discharge does not exceed pre-development, and all discharge meets required water quality targets.

Stormwater management plans will be developed for all pump stations and substations through the detailed design phase. The stormwater management plans will be developed to meet the following objectives:

- upgradient diversion of surface water runoff (e.g. using a bund and swale system) to reduce the surface water onsite
- no increase in peak flow discharge from site under the 1 in 100 ARI (1% AEP) and 1 in 5 year ARI (18% AEP)
- each site will be divided into internal catchments depending on the activities and likely sources of contamination -
    - all areas of the chemical storage areas (including oils and hydrocarbons) will be bunded in accordance with EPA guidelines
    - water falling on roads, hard stand areas or car parks will be directed to an oil-water separator[4] before being directed to a detention basin
    - where there is no infrastructure or risk of contamination, permeable surfaces (such as gravel) will be considered to reduce run off
- water from the detention basins may be reused onsite, e.g. irrigation of revegetation and landscaped areas or will otherwise evaporate. Periodic cleaning of the sediment basins when dry will be undertaken to ensure sediment build up does not reduce their capacity.

Any stormwater discharge from detention basins would have come from roadways or hardstand areas within the site, via an oil water separator and thus is only expected to contain increased sediment loads (all chemicals are contained within bunds).

Where oil-filled electrical equipment is installed, standard industry controls such as bunded containment, oil-water separation and / or equivalent drainage controls would be provided as required through detailed design and in accordance with applicable utility standards, environmental requirements and approval conditions. Clean stormwater runoff would be directed to site drainage systems incorporating water quality treatment measures and water sensitive urban design principles where appropriate.

Industry standard control measures will be used in developing site specific stormwater management plans during detailed design for each of the pump stations and substations within the Project. Sizing of stormwater management infrastructure will be in accordance with DIT guidelines and Australian Standards.

Following implementation of management controls set out above, the expected impacts are in the **Negligible** category. Uncertainty in the expected impact (due to uncertainty in design) has been evaluated in Appendix M and the level of risk is **Low**.

[4] Exact model will be chosen through detailed design to ensure a treatment performance specification of <5 mg of hydrocarbon per litre of water.

13.5.2 Surface water quality – desalination plant

Erosion and sediment control

Potential impacts to surface water quality during construction will be minimised by implementing best practice management of stormwater.

During construction, run-off from disturbed land at the desalination plant and other surface infrastructure, is likely to contain levels of sediments higher than the existing environment which has the potential to impact the quality of water leaving the site. While there are no surface water features at the desalination plant site, run-off will naturally flow towards the east before running behind the dune system to the south to a natural clay pan.

Prior to construction, a site-specific Soil Erosion and Drainage Management Plan (SEDMP) will be prepared in accordance with Best Practice Erosion and Sediment Control (IECA 2008) and EPA stormwater management guidelines (EPA 1999). The SEDMP will include:

- staging of construction activities to minimise the disturbance area at any one time
- early establishment of operational drainage system and basins to be used throughout construction phase
- temporary sediment control structures to be used before the operational drainage system is established or in temporary disturbance areas (e.g. berms, swales, sediment fencing)
- sediment controls to be implemented on slopes while establishing terraces such as diversion berms or cross-contour swales
- reduce or suspend activities during period of heavy rainfall if unable to control sediment run-off
- erosion control measures for topsoil, subsoil and spoil stockpiles
- rehabilitation plan for temporary disturbance areas once they are no longer required.

Management of stormwater during construction will focus on establishing longer term control measures early to reduce the requirement for temporary control measures. Pump stations and substations will have similar plans developed during detailed design and implemented during construction. Third party auditing with regular reporting and a detailed water quality monitoring plan will be undertaken during construction.

Following implementation of management controls set out above, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Stormwater management at the desalination plant

Stormwater structures at the desalination plant will be designed to ensure post-development discharge does not exceed pre-development and all discharge meets required water quality targets.

Stormwater management onsite has been designed to meet the following objectives:

- No increase in peak flow discharge from site under the 1 in 100 ARI (1% AEP) and 1 in 5 year ARI (18% AEP). These levels consider increased rainfall intensity under Shared Socioeconomic Pathway (SSP) 3 – 7.0 in accordance with Australian Rainfall and Runoff

Guidelines (ARR 2019). This will be reviewed regularly to determine if additional stormwater management is required in line with that described in Chapter 24 Climate Change and Sustainability.

- All areas of the process and chemical storage areas will be covered to prevent rainfall into these areas. Any spills within these areas will be managed in accordance with spill management procedure (refer Chapter 12 Soils, Landform and Geology).
- Water falling on roofs will be collected in rainwater tanks and reused onsite such as grey water systems, irrigation of revegetation and landscaping areas.
- Water falling on roads, hard stand areas or car parks will be directed to an oil-water separator[5] before being directed to a detention basin.
- Water from the detention basins may be reused onsite, e.g. irrigation of revegetation and landscaped areas or will otherwise evaporate.
- Run off from the non-bunded areas of site will be directed to a retention basin which has been modelled (Appendix H-7 Stormwater Management Plan) to meet water quality targets for Water Sensitive Urban Design. As the areas containing process chemicals will be internal catchments all catchments with potential to discharge are similar impacts to urban catchments hence this standard is considered acceptable.
- Upgradient diversion of surface water runoff will be achieved via a bund and swale system with engineered discharge points both northeast and southeast of the site to safely reduce the flow rate of the diverted clean water.

The preliminary stormwater management plan for the desalination plant (refer Figure 13-6) includes a series of swales and culverts which are sized to direct the 1% AEP 2-hour peak flow (determined through modelling to be the largest flow volume) to the south-east detention basin with overflow being directed via a rock lined channel to the clean water discharge point south-east of the site.

With time, the sediment will settle out of the stormwater, allowing the water to be reused for landscaping or other similar uses onsite. Periodic cleaning of the sediment basins when dry will be undertaken to ensure sediment build up does not reduce their capacity.

The stormwater management plan will be finalised through detailed design while maintaining the same objectives and principles.

[5] Exact model will be chosen through detailed design to ensure a treatment performance specification of <5 mg of hydrocarbon per litre of water.

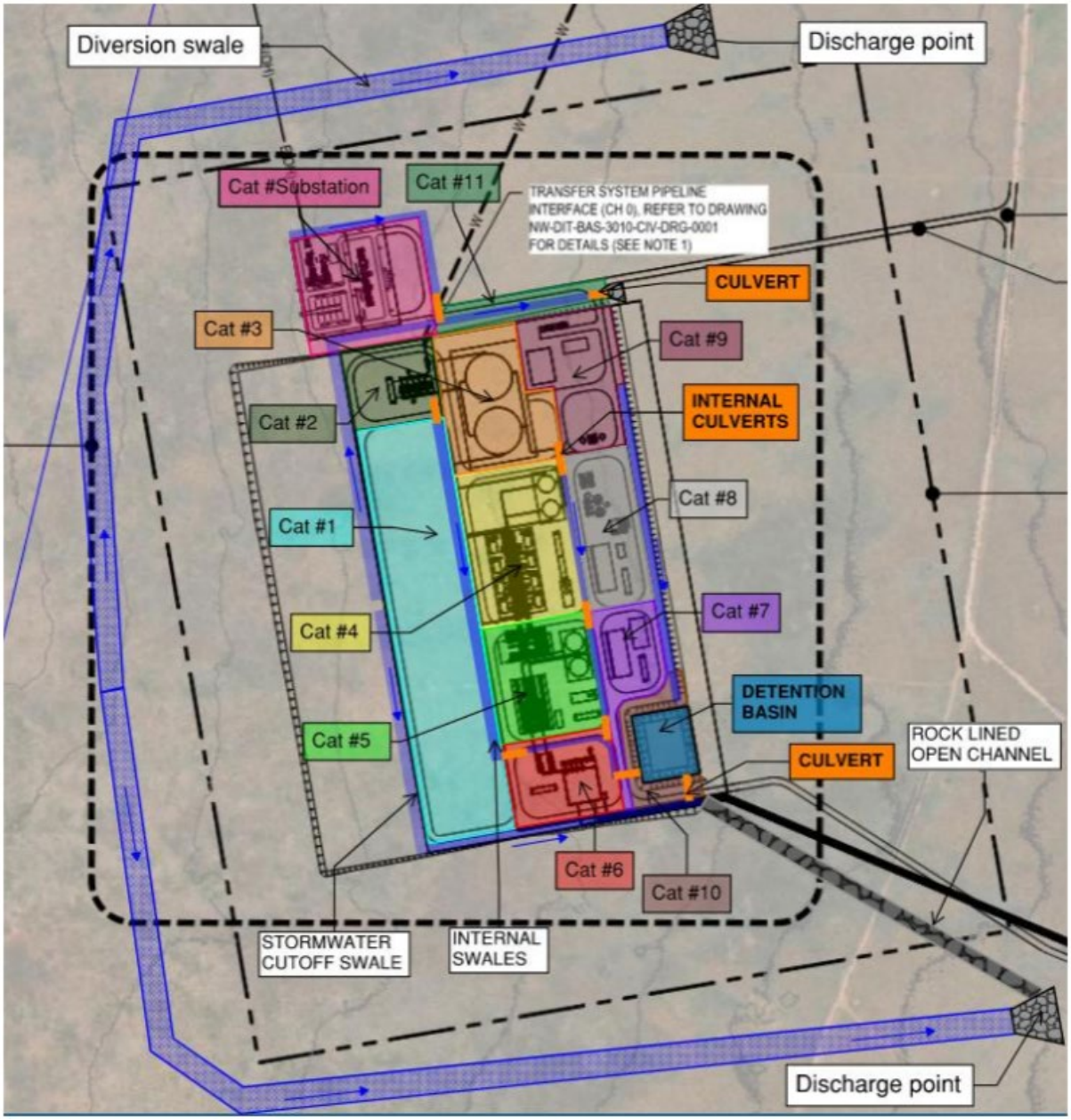


Figure 13-6: Preliminary stormwater management plan
[Source: Appendix H-7]

Any stormwater discharge from detention basins would have come from desalination plant roadways, via an oil water separator and thus is only expected to contain increased sediment loads (all chemicals are contained within bunds and under roofs). MUSIC modelling of stormwater was run using the Whyalla Aero (BOM station 0018120) climate data from 2011 – 2021 (10-year period) during which time all water quality parameters were met (refer to the Project Stormwater Management Plan at Appendix H-7).

Pump stations and substations will have similar plans developed during detailed design and implemented during construction.

Modelling has been used extensively to predict run-off from roadways and other hard surfaces and has been conducted over a range of scenarios for both existing conditions and climate modelling to guide design of drainage and retention structures. The stormwater

management measures proposed are established industry standard and proven to be effective.

Following implementation of management controls set out above, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

13.5.3 Alteration of drainage patterns and surface water flows

Transfer system and electrical infrastructure construction and operations will not alter drainage patterns and surface water flow regimes.

Activities involving earthworks and installation of infrastructure have the potential to alter drainage patterns and surface water flows, which can impact vegetation and downstream water features and users following rainfall events.

Construction of the pipeline will either be via trenching (to an approximate depth of 3 m) or trenchless construction. Trenchless construction involves no surface disturbance of the bed of a watercourse (and therefore no change to surface water flow regimes), as the launch shafts are located on the banks on each side.

Trenching of watercourses will generally take place in ephemeral drainage lines when they are dry, trenching when surface water is present will be avoided. Impacts to surface water flows are therefore not expected, as once the dry bed has been trenched and the pipe has been laid, the excavated spoil will be returned and the trench reinstated immediately to the same grade and substrate as prior to construction.

As the pipeline is buried, once operational, there will be no impacts to drainage patterns and surface flows. Scour valves, air valves and other above-ground infrastructure will be located away from water courses to prevent impacts to surface water flow.

In several locations (refer Appendix H-6 Watercourses of Interest Table) as well as along the Carrapateena lateral branch, above-ground pipeline installation is being considered as an option. Along the main pipeline any above-ground installations will be on supports which will be designed to avoid impacts to drainage patterns, including both watercourse and sheet flow. This is a commonly used strategy throughout the Project Area, as shown in Plate 13-9.

Along the Carrapateena lateral branch a smaller HDPE pipeline is proposed to run alongside the mine access track. If the above-ground option for the lateral branch is selected, the pipeline will be constructed under watercourses either by trenching or trenchless construction methods. The areas above-ground will not be on supports but the ground will be prepared to avoid thermal expansion and contraction, and the pipeline designed to withstand an appropriate flood scenario.

While some surface water may be directed along the pipeline, it is proposed to be laid alongside the access track which also has the potential to impact upon sheet flow after large rainfall events. The pipeline may trap leaf litter and debris following smaller rainfall events, potentially encouraging the establishment of small plants or an increase in the organic matter content in the soil, but this is not expected to have a significant impact on terrestrial ecology.



Plate 13-9 Example of above-ground pipeline on supports at Black Oak Creek
[Source: Jacobs 2026c]

New or existing access tracks will be at the natural surface level and channel flows will be maintained at watercourse crossings by construction at natural surface level or using pipes or culverts if required. Water affecting activity permits will be obtained for watercourse crossings on access tracks if required.

Transmission lines will span across watercourses, with towers are located on each side, avoiding construction within the watercourse and preventing impacts to surface water flows.

The impacts to surface water flows from the Project are expected to be in the **Negligible** (buried pipe) to **Minor** (above-ground) category. Uncertainty in the expected impact (due to uncertainty in construction methodology) has been evaluated in Appendix M and the level of risk is **Low**.

13.5.4 Contamination of surface water

Contamination of surface water is not expected to occur as a result of Project activities due to appropriate storage and handling of fuels and chemicals.

As soils would generally be the first receptor in the event of a spill or leak, the primary assessment of the management of accidental spills and leaks from land-based activities is provided in Chapter 12 Soils, Landform and Geology.

Construction of water pipeline projects typically involves relatively small quantities of chemicals and fuels. The volume of any spill is therefore likely to be small and the potential to impacts surface water generally low.

Larger quantities of chemicals and fuels would be stored and handled at the desalination plant meaning that there is a greater potential for accidental spills which will need to be managed to prevent contamination of surface water.

Measures for management of spills of fuels and chemicals will be included in the Project CEMP and OEMP.

As discussed in Chapter 12 Soils, Landform and Geology, the measures that will be implemented for storage and handling of fuels and chemicals are well established and widely used. Following implementation of the above controls, the expected impacts are in

the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

13.5.5 Surface water users

Impacts to surface water users from Project construction and operation will be negligible.

If not managed appropriately, construction activities have the potential to impact the quality or quantity of water for downstream users and operations which rely on surface water.

There are no known surface water users down gradient of the desalination plant site and due to the quality of surface water, unpredictable rainfall and high evaporation rates in the Project Area, there are no known users who are reliant upon surface water more broadly along the transfer system.

Construction will mostly occur when watercourses are dry. In the event of rain, drainage patterns and surface flows may be temporarily altered through the erosion and sediment controls implemented to prevent sediment-laden waters leaving site. These impacts would be short-term, likely lasting for less than two weeks due to the rate of pipeline construction (approximately 400-700 m per day).

The expected impacts to surface water users are in the **Negligible** category. Uncertainty in the expected impact (due to desktop assessment of surface water users) has been evaluated in Appendix M and the level of risk is **Low**.

13.5.6 Impacts to aquatic ecology

Management of potential impacts to surface water quality from construction of transfer system infrastructure will avoid impacts to aquatic ecology.

Aquatic ecosystems intersected by Project infrastructure or located in proximity to Project infrastructure include ephemeral watercourses and salt lakes. Potential impacts to these ecosystems are largely driven by potential impacts to the quality of surface water, soils and landform (as discussed in the impact assessment above and in Chapter 12 Soils, Landform and Geology).

Project construction activities with the potential to impact on aquatic ecology include:

- trenching resulting in sedimentation of watercourses, alteration to flow regimes and disturbance of riparian vegetation
- inappropriate management of soils and spoil adjacent to watercourses resulting sedimentation
- spills from construction equipment
- dewatering from trenchless construction causing oxidisation of acid sulfate soils
- dewatering from trenchless construction impacting upon groundwater dependent ecosystems (GDEs)
- discharge of dewatered groundwater or other wastewater.

The assessment of impacts from Project construction on aquatic ecology has considered the surface water impacts discussed in this chapter, and impacts to soils assessed in Chapter 12 Soils, Landform and Geology.

All watercourses within the Project footprint are ephemeral and thus aquatic communities are limited to species that migrate readily from nearby permanent water bodies (i.e. refuge sites) or those who can adapt to a period of dormancy in the sediments of a watercourse during their life cycle.

There are also no recorded aquatic threatened species within 5 km of the Project alignment and available records of aquatic ecosystems have only identified common, salt tolerant species.

The primary consideration for impacts to aquatic ecological values is the presence of water, and as noted above, watercourses which will be crossed by the pipeline are largely ephemeral and would only present temporary pathways for aquatic fauna such as fish, if water is flowing. As it is anticipated most ephemeral watercourses will be trenched when dry due to the logistics associated with trenching in wet conditions, impacts to aquatic species will be avoided.

There is potential for minor sedimentation of surface water for the first flush of water following rainfall (for ephemeral creeks that are trenched). However, as ephemeral watercourses typically experience high sediment loads in the initial flush following rainfall, impacts to water quality due to the Project would be negligible.

Utilising the trenching construction methodology (rather than trenchless) also reduces the period within which impacts to groundwater could occur, however trenches are not expected to be open for periods sufficient to allow groundwater drawdown outside the construction footprint. However, trenchless methodology will involve construction of launch shafts which would be open for longer periods of time near the banks of creeks which has the potential to allow the groundwater in the area to temporarily lower and reduce availability to groundwater dependent vegetation outside the construction area. Groundwater discharged from these areas will be tested to ensure water quality will not impact downstream ecosystems if discharged, if required wastewater from construction will be treated or disposed of in accordance with the waste hierarchy.

As noted in the assessment in Chapter 14 Groundwater, there remains some uncertainty as to the extent of groundwater dependence of the potential GDEs which have been mapped and the potential for impact on the health of groundwater dependent vegetation surrounding creeks that may have launch shafts for trenchless construction for a temporary period (up to 2 months). A conservative assumption has been applied to this uncertainty and potential impacts to groundwater dependent vegetation have been accounted for as part of native vegetation clearance calculations (i.e. a 40 m wide corridor would assume over 15 m of clearance either side of launch shafts), with appropriate significant environmental benefits to be applied as per legislative requirements (refer Chapter 15 Terrestrial Flora and Fauna).

Impacts to aquatic ecological values from dewatered groundwater, sedimentation, accidental spills and leaks, exposure of saline and acid sulfate soils will be managed through surface water impact mitigation measures set out above and in Chapter 12 Soils, Landform and Geology.

With implementation of the proposed mitigation measures, as described in this chapter and other relevant chapters, the expected impacts are in the **Negligible** category. Uncertainty in

the expected impact (based on uncertainty in potential for minor adjustments to the placement of infrastructure resulting from detailed design or application of construction methodologies) has been evaluated in Appendix M and the level of risk is **Low**.

13.5.7 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval Project management plans (including the CEMP, OEMP, SEDMP and other plans).

Table 13-1: Key mitigation measures – surface water

Mitigation measure	Construction	Operation
Pump stations, water storage and substations have been sited to avoid watercourses	✓	✓
Micro siting of transmission lines to avoid watercourses	✓	✓
Reinstatement of trench following pipeline burial including cleared vegetation and topsoil to be respread.	✓	
Topsoil and subsoil stockpiles not to be located within watercourses. Those near watercourses will be surrounded with sediment fencing.	✓	
Testing of dewatered groundwater to determine potential reuse or whether discharge to environment is possible (disposal at a licenced facility if groundwater poses a contamination risk).	✓	
Any discharge of water (both temporary from construction dewatering or surrounding scour valves) will have appropriate erosion control methods depending on the frequency of discharge (e.g. rip rap swale, rock scour).	✓	✓
WAA permits (and EPA licences) to be obtained where required for discharge of groundwater to a surface water body or crossing of watercourses.	✓	
Additional testing of areas identified where there is potential for PASS present.	✓	
Scour valves near watercourses are designed with containment chambers and will be dechlorinated prior to release of water.	✓	✓
Develop of site specific SEDMP for construction including: • staging of construction works • temporary sediment control structures • early establishment of operational drainage management structures • sediment control on slopes • reduce or suspend activities during periods of heavy rainfall when unable to control run-off • erosion management for stockpiles • Rehabilitation Plan.	✓	

Mitigation measure	Construction	Operation
Operational stormwater management plan including the following desalination plant measures: • diversion of upgradient flow • bunding and roofs for all chemical storage areas, process areas • spill management plans • collection of rainwater from roofs • oil water separators for road and carpark catchments (treatment standard <5 mg hydrocarbon per litre of water) • detention basins sized to retain and treat a 1% AEP storm event to appropriate water quality targets • regular inspection and cleaning of sediment basins		✓
Operational stormwater management plan to be developed for pump stations and substations.		✓
Regular review of stormwater management against changing climate requirements.		✓
Pipeline above ground (if required) - detailed design will ensure no change in surface water flow regimes as a result of above-ground infrastructure).	✓	

13.6 Conclusion

Potential impacts to surface water from construction of the Project predominantly relate to crossing of watercourses by pipelines and runoff from the desalination plant site. These impacts can be readily managed by implementation of industry standard control strategies set out in Project-specific CEMPs.

As all of the more than 200 watercourses crossed by the pipeline are ephemeral this will allow construction to be undertaken while dry to prevent impacts to surface water and aquatic ecosystems. Control strategies are proposed to prevent run-off from impacting upon surface water if present.

Management of impacts to surface water will also assist in avoidance and minimisation of impacts to aquatic ecology.

During operations the primary surface water risk is from runoff from the desalination plant site which will be managed as set out in the draft Project Stormwater Management Plan (refer Appendix H-7) (which will be confirmed post-approval).



Chapter 14

Groundwater

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

14 GROUNDWATER 14-1

14.1 Key Findings 14-1

14.2 Setting the Context 14-1

14.2.1 Requirements in legislation and other standards 14-2

14.2.2 Views of stakeholders 14-2

14.3 Assessment Method 14-3

14.3.1 Desktop assessment (transfer system) 14-3

14.3.2 Preliminary site investigation 14-4

14.3.3 Groundwater impact model (desalination plant site only) 14-5

14.4 Description of the Existing Environment 14-5

14.4.1 Regional geology 14-5

14.4.2 Regional hydrogeology 14-7

14.4.3 Groundwater depth, yield and geochemistry 14-15

14.4.4 Groundwater users 14-17

14.4.5 Groundwater dependent ecosystems 14-18

14.5 Impact Assessment 14-26

14.5.2 Summary of key mitigation measures 14-32

14.6 Conclusion 14-32

LIST OF TABLES

Table 14-1 Groundwater intersections from geotechnical drilling program (1 km spacing along transfer system) 14-4

Table 14-2: Summary of stratigraphy and lithology for Project Area 14-6

Table 14-3: Transfer system regolith and groundwater environments 14-7

Table 14-4: Description of shallow groundwater environments 14-11

Table 14-5: Desalination plant site groundwater quality 14-16

Table 14-6: Transfer system groundwater quality 14-16

Table 14-7: Groundwater bores within 500 m of transfer system alignment 14-18

Table 14-8: Potential groundwater dependent ecosystems along transfer system alignment 14-20

Table 14-9: High potential GDEs on the transfer system alignment 14-21
Table 14-10: Key mitigation measures – groundwater 14-32

LIST OF FIGURES

Figure 14-1: Shallow groundwater environments - southern section 14-9
Figure 14-2: Shallow groundwater environments - northern section 14-10
Figure 14-3: Groundwater monitoring well locations at the desalination plant site 14-15
Figure 14-4: Groundwater users and GDEs in the Project Area – southern section 14-24
Figure 14-5: Groundwater users and GDEs in the Project Area - northern section 14-25
Figure 14-6: Phase 3 groundwater modelling contours at desalination plant site 14-27

14 GROUNDWATER

This chapter describes the existing hydrogeological environment of the Project and how construction and operation of the Project have the potential to affect groundwater resources, including groundwater dependent ecosystems (GDEs).

Potential impacts to soil and water are often inter-related. Accordingly, this chapter should be read in conjunction with Chapter 12 Soils, Landform and Geology and Chapter 13 Surface Water, particularly in relation to management of spills, stormwater and wastewater.

This chapter also addresses potential impacts of dewatering of Potential Acid Sulfate Soils (PASS) on surface water, groundwater and ecology in the vicinity. Areas of PASS which could be impacted by groundwater drawdown are described in Chapter 12 Soils, Landform and Geology.

Potential for groundwater contamination from Project activities is assessed in this chapter. The identification and management of existing contaminated sites is addressed in Chapter 25 Hazards and Risks.

14.1 Key Findings

- There is potential for short-term groundwater inflows and drawdown during installation of construction shafts (for pipeline trenchless construction) and pipeline trenching activities at some watercourses, highways and railway crossings.
- Short-term groundwater drawdown is expected at the desalination plant site during construction of the box cut, decline and tunnel boring machine (TBM) launch facilities. Impact to GDEs, threatened ecological communities or registered groundwater users is expected to be avoided through implementation of proposed mitigation measures.
- Dewatering for construction of the box cut, decline and TBM launch facilities, at Mullaquana Station is unlikely to lead to oxidation of potential acid sulfate soils.
- Any short-term reduction in groundwater levels due to dewatering from pipeline excavations is not expected to impact GDEs or registered groundwater users.
- Implementation of appropriate storage and handling of fuels and chemicals and proactive spill management will minimise risks of contamination to groundwater.

14.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effect of the Project on groundwater and groundwater users (including GDEs). Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- the relevant EIS Assessment Requirements
- relevant requirements in legislation and other standards

- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment in Section 14.3.

14.2.1 Requirements in legislation and other standards

The key legislation relevant to groundwater includes the *Landscape South Australia Act 2019* (Landscape SA Act) and the *Environment Protection Act 1993* (EP Act).

The Landscape SA Act includes provisions for managing groundwater use and understanding groundwater systems to maintain water quality and quantity for a sustainable future.

The Project Area crosses two regional landscape management regions - Eyre Peninsula (EP) and the South Australian Arid Lands (SAAL). While there are prescribed water resources or prescribed well areas under the Landscape SA Act in the Project Area, water users are known to access the groundwater within the surficial and basement aquifers. Water affecting activities such as excavating material below the water table, drilling and backfilling wells and bores must be undertaken in accordance with the principles outlined in the water affecting activity control policies for the relevant landscape board.

The EP Act and associated *Environment Protection Regulations 2023* outline the requirements and standards within the Environmental Protection Policies, as well as creating a general environmental duty to take all reasonable and practicable measures to prevent or minimise any resulting environmental harm.

The Environment Protection (Water Quality) Policy 2015 (Water Quality EPP) provides the structure for regulation and management of water quality of surface and ground waters and specifies relevant environmental values to be protected. The Water Quality EPP refers to the Water Quality Guidelines (*Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018*) for environmental values of waters.

14.2.2 Views of stakeholders

Groundwater has been raised as a matter of interest during stakeholder engagement, including concerns related to the potential for terrestrial environmental impacts to groundwater and hydrogeological systems.

More specifically, impacts on local groundwater resources and the Great Artesian Basin (GAB) from the current and potential ongoing reliance by mining and other industries have been raised during stakeholder engagement. The impacts of continued extraction from the GAB on culturally significant desert mound springs are also understood to be of concern to Traditional Owners in the north of the State.

The Project's potential to contribute to the preservation of the mound springs, the GAB and other groundwater resources by providing a new water supply is discussed further in Chapter 2 Justification and Alternatives. However, direct impacts to the GAB due to the Project are not considered further in this chapter as there is no direct interface of the GAB with the Project.

Further details of stakeholder engagement and community consultation are set out in Chapter 4 Community and Stakeholder Engagement.

14.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The impact assessment reports addressing groundwater are provided at Appendix H-4 (JBS&G 2026e) and Appendix H-5 (Kleinfelder 2026a).

14.3.1 Desktop assessment (transfer system)

A desktop review was undertaken to describe the existing environment likely to be affected by the Project within a conceptual hydrogeological site model. The review included assessment of publicly available groundwater data from the following sources:

- South Australian (SA) Government Location SA MapViewer
- Department for Energy and Mines, SA Resource Information Gateway (SARIG)
- Department for Environment and Water, SA WaterConnect Groundwater Data database
- Environment Protection Authority, SA (EPA), Public Register and Site Contamination Index.

Groundwater information utilised to assess the sub-surface conditions in the Project Area included data from Northern Water Project baseline reports and published literature. This included technical reports prepared for the BHP Olympic Dam Expansion (BHP 2009a) Environmental Impact Statement).

The transfer system assessment has been undertaken as a desktop hydrogeological assessment based on available regional geological, hydrogeological and groundwater information. Given the linear nature of the Project, the large geographic extent of the alignment and the limited availability of groundwater data across some sections of the corridor, the assessment has focused on identifying locations where groundwater may potentially be encountered and evaluating plausible potential impact pathways and receptors. The desktop groundwater assessment determined an approximate depth to water every 5 km along the pipeline by reviewing the nearest groundwater or mineral bore information, including:

- depth of the aquifer
- the confining nature of the aquifer
- yield of groundwater
- hydraulic parameters
- salinity of groundwater.

Wells used as part of the assessment are identified in Table 3-4 of Appendix H-4 (JBS&G 2026e). As no well data provided details regarding seasonal variability, a conservative approach was undertaken by applying an additional 1 m allowance to the estimated average groundwater depth. This information combined with on-ground vegetation assessment was used to identify potential GDEs that may be impacted by the construction of the pipeline infrastructure.

Many of these wells were screened in deeper aquifers (> 5 m bgl) or did not record salinity or yield data, as such shallow aquifers were unable to be described in detail. The available data was insufficient to support quantitative groundwater drawdown modelling for the transfer system. As the primary potential impact relates to construction of a 3 m deep trench that would remain open for only 2 to 14 days, the expected volumes of groundwater inflow and extent of groundwater drawdown is not considered to present a sufficient risk to warrant installation of investigation wells, pump testing or quantitative groundwater modelling.

Deeper excavations may be required at selected trenchless crossings, pump station infrastructure or other localised locations. Where deeper excavations are proposed, groundwater conditions will be assessed as part of detailed design and site-specific construction planning. Appropriate groundwater management measures will be implemented where required.

Geotechnical investigation has been undertaken every 1 km along the transfer system between 2024 and 2025. Test pits were excavated to a target depth of 3 m with occasional drilling advancing to greater depth. Only 5 groundwater intersections were recorded with three occurring within 3 m of surface (expected depth of trenching). These locations identified as part of the geotechnical investigations align with locations identified as having potential for shallow groundwater in the desktop assessment (refer Table 14-1).

Table 14-1 Groundwater intersections from geotechnical drilling program (1 km spacing along transfer system)

Borehole / test pit ID	Depth to groundwater	KP	Landform	Date	Source
BH02	1.8 m bgl	236	Lake Windabout	17/8/22	Tonkins 2023
TP122	1.8 m bgl	196.5	Black Oak Creek	16/5/24	CMW Geosciences 2025
TP135	2 m bgl	CA21	Elizabeth Creek	20/5/24	CMW Geosciences 2025
BH025	7.8 m bgl	102	Tributary of Lake Dempsey	5/12/25	Kleinfelder 2026b
BH061	8 m bgl	237	Lake Windabout	22/6/24	CMW Geosciences 2025

14.3.2 Preliminary site investigation

A preliminary site investigation (PSI) was undertaken to identify current and historical potentially contaminating activities (PCAs) (as defined in Schedule 3 of the *Environment Protection Regulations 2023*), that may have been undertaken within or adjacent to Project

construction areas (JBS&G 2026d[1], refer Appendix H-2). A preliminary assessment of potential risks to human health and the environment, including to surface and groundwater, from the PCAs identified was also presented in the PSI.

Areas of Potential Acid Sulfate Soils (PASS) which could be impacted by groundwater drawdown are described in Chapter 12 Soils, Landform and Geology and areas of potential contamination are described in Chapter 25 Hazards and Risks.

14.3.3 Groundwater impact model (desalination plant site only)

A numerical groundwater impact model was developed for the Mullaquana Station desalination plant site to support the EIS. Site specific data was obtained from 26 groundwater monitoring wells drilled onsite for the Project. The key objectives for the groundwater impact model were to provide a screening level assessment of the dewatering and other potential impacts to groundwater from construction of the project. Pressure transducers were installed to evaluate temporal variations and refinement of the groundwater model.

The groundwater impact model was constructed using a combination of Leapfrog Works® (3D data visualization of geology) and Groundwater Vistas® (construction of steady-state and transient groundwater flow) using MODFLOW-USG. The model consisted of three layers of geology; differentiated and unconsolidated alluvial deposits, confining unit and weathered basement rock. Full methodology for the model can be found in section 8.3 of Appendix H-5 (Kleinfelder 2026a).

Model calibration used the site-specific groundwater data collected to date. The available data from groundwater monitoring undertaken up to the time of developing the model showed that there is limited variability in the aquifers onsite.

A sensitivity analysis of the model identified changes in horizontal hydraulic conductivity, increased recharge and evapotranspiration as key sensitivity parameters. Three scenarios for construction methodology were modelled to understand how timing of construction of the box cut, decline and TBM launch facilities, as well as number of groundwater wells, impact the groundwater drawdown.

14.4 Description of the Existing Environment

14.4.1 Regional geology

This section describes the surface geology along the Project alignment.

The surface geology of the Project is dominated by Quaternary aged sandy soil and dune fields, with pockets of fluvial and alluvial sediments present along the boundaries of ephemeral watercourses.

The Stuart Shelf geological province comprises a relatively thin sequence of sedimentary rocks, significant rock units including the Andamooka Limestone and the Tent Hill Formation (refer Table 14-2).

[1] Note this report was completed in 2025, and finalised for the EIS in 2026.

A summary of regolith[2] is described in Chapter 12 Soils, Topography and Landform.

Table 14-2: Summary of stratigraphy and lithology for Project Area

Age	Stratigraphic Unit	Extent and thickness	Description
Quaternary	Undifferentiated Sediments	Regional (northern, central). Typically, 0 – 10 m in thickness.	Clayey sands, sand plains and dune fields, playa and drainage lakes.
Tertiary	Undifferentiated Sediments (including Andamooka Limestone)	Up to 25 m in thickness.	Channel fill and fluvio-lacustrine sediments, isolated cappings of silcrete and laterite.
Neoproterozoic	*Tent Hill Formation*		
	Arcoona Quartzite,	20 to 150 m in thickness.	Fine to coarse grained, well-sorted quartzite with shale interbeds in its upper extent.
	Corraberra Sandstone	20 to 150 m in thickness.	Fine to medium grained micaceous sandstone with interbedded shale and siltstone.
	Tregolana Shale	150 to 300 m in thickness.	Laminated shale, dominated by fine detrital quartz.
	Whyalla Sandstone	20 to 100 m in thickness.	Cross bedded, coarse grained, well rounded, quartz sandstone.
Mesoproterozoic	Pandurra Formation	Within Carriewerloo Basin, north-eastern (central Eyre Peninsula and north overlying Gawler Craton) 200 to up to 1500 m in thickness.	Unmetamorphosed, relatively undeformed, dominantly fluvial red bed sediments. Medium to coarse grained poorly sorted sandstone, occasional granular to pebble conglomerates, mudstones and siltstones.
Archean	Basement Rock	Regional	Archean igneous and high-grade metamorphic rocks.

[2] Regolith is the soil and underlying weathered rock that sits above surface geology

14.4.2 Regional hydrogeology

Mullaquana Station

The findings from the hydrogeological investigation undertaken on Mullaquana Station in relation to the Project concluded:

- There is only a single quaternary aquifer that is likely to be encountered through construction activities based on the proposed depth of infrastructure to be constructed by the Project.
- The quaternary aquifer lithology is variable with layers of clay and sandy, gravelly clay.
- Groundwater was observed from 2.5 metres below ground level (m bgl) / 0.436 mAHD in the east to 10.2 m bgl / 1.026 mAHD in the west. The groundwater levels dip towards sea level at the coast.

Transfer System

The predominant aquifers along the transfer system are the Andamooka Limestone sedimentary aquifer and Tent Hill fractured rock aquifer. The Whyalla Sandstone and Pandurra Formation aquifers also occur along the transfer system, although less commonly.

At the northern end of the transfer system, a groundwater divide separates the Andamooka Limestone and Tent Hill aquifers from the Eromanga artesian aquifers of the GAB (BHP 2011). The aquifers of the GAB would not be affected by the activities associated with pipeline infrastructure due to the groundwater divide and the shallow nature of pipeline construction[3].

Due to the largely shallow nature of transfer system construction activities the impacted groundwater environment comprises shallow sediments and rock known as regolith. The regolith environment can be grouped into four key areas with different groundwater environments associated with each as set out in Table 14-3.

Locations of these areas are shown in Figure 14-1 and Figure 14-2 with descriptions of the shallow sediments and characterisation of the groundwater environments summarised in Table 14-4.

Table 14-3: Transfer system regolith and groundwater environments

Regolith	Groundwater environment
Aeolian sediments (sand dunes)	Shallow perched aquifers at the base of sand dunes
Alluvial, coastal, lacustrine and playa sediments (rivers, creeks and drainage lines)	Underlying aquifers that may contribute to stream flow and potential for perched aquifers in stream beds.
Bedrock outcropping	Potential for large aquifers near surface
Colluvial sediments	Shallow groundwater table

[3] The anticipated approximate depth for construction is 5 m bgl, however it is possible that the depth of pipeline construction could be deeper at specific locations (if required).

Perched Aquifers

As noted in Table 14-3, perched aquifers commonly occur at the base of sand dunes and in stream beds. Perched aquifers are small, discontinuous areas of groundwater formed on top of a small area of clay or similar low permeability sediment or rock. These areas differ from standard aquifers in that they are extremely limited in volume, tend to have lower salinity as are mostly fed by rainwater. They are frequently temporal in nature as use of the groundwater by bores or vegetation will use up all water and have periods with no water in the aquifer.

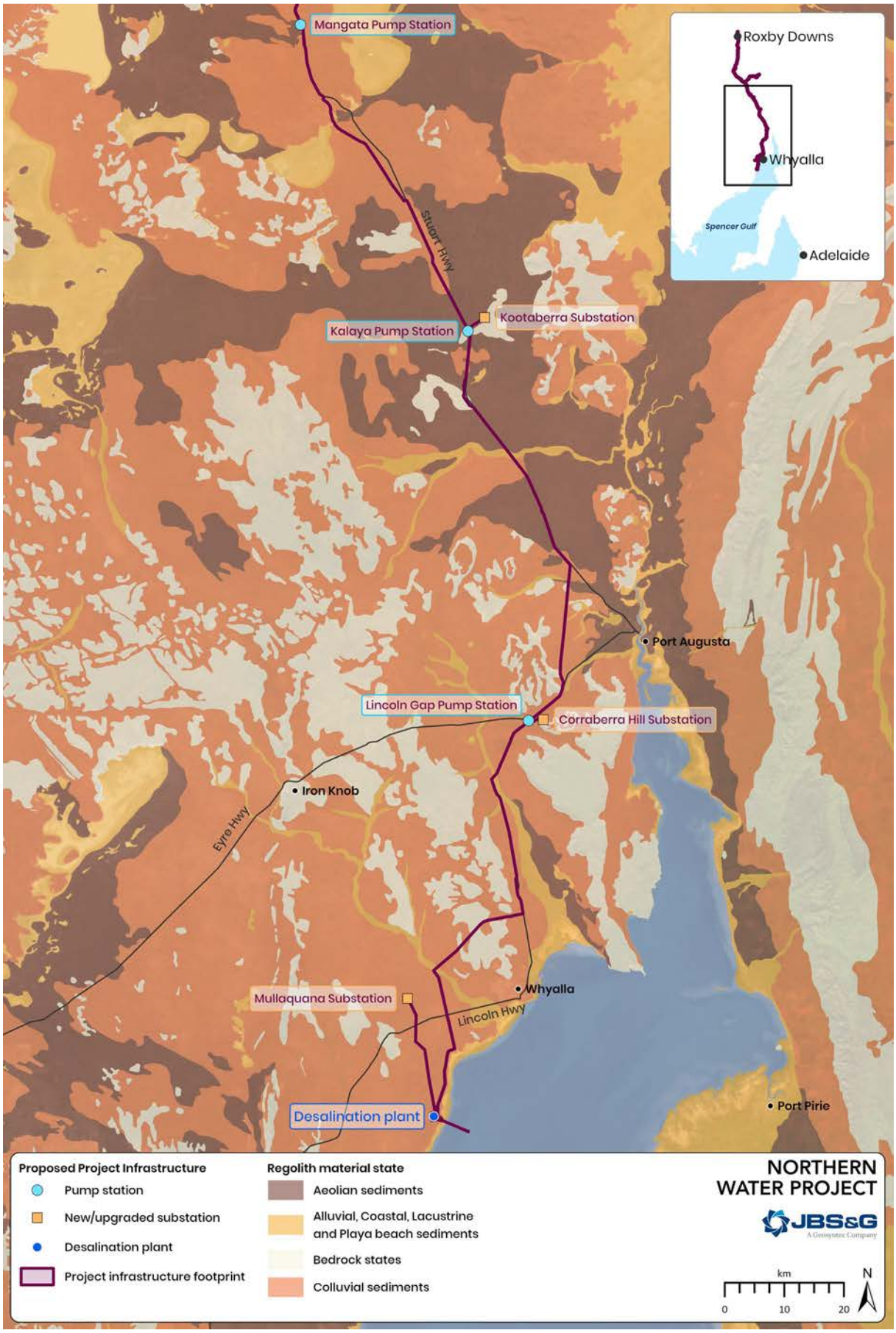


Figure 14-1: Shallow groundwater environments - southern section

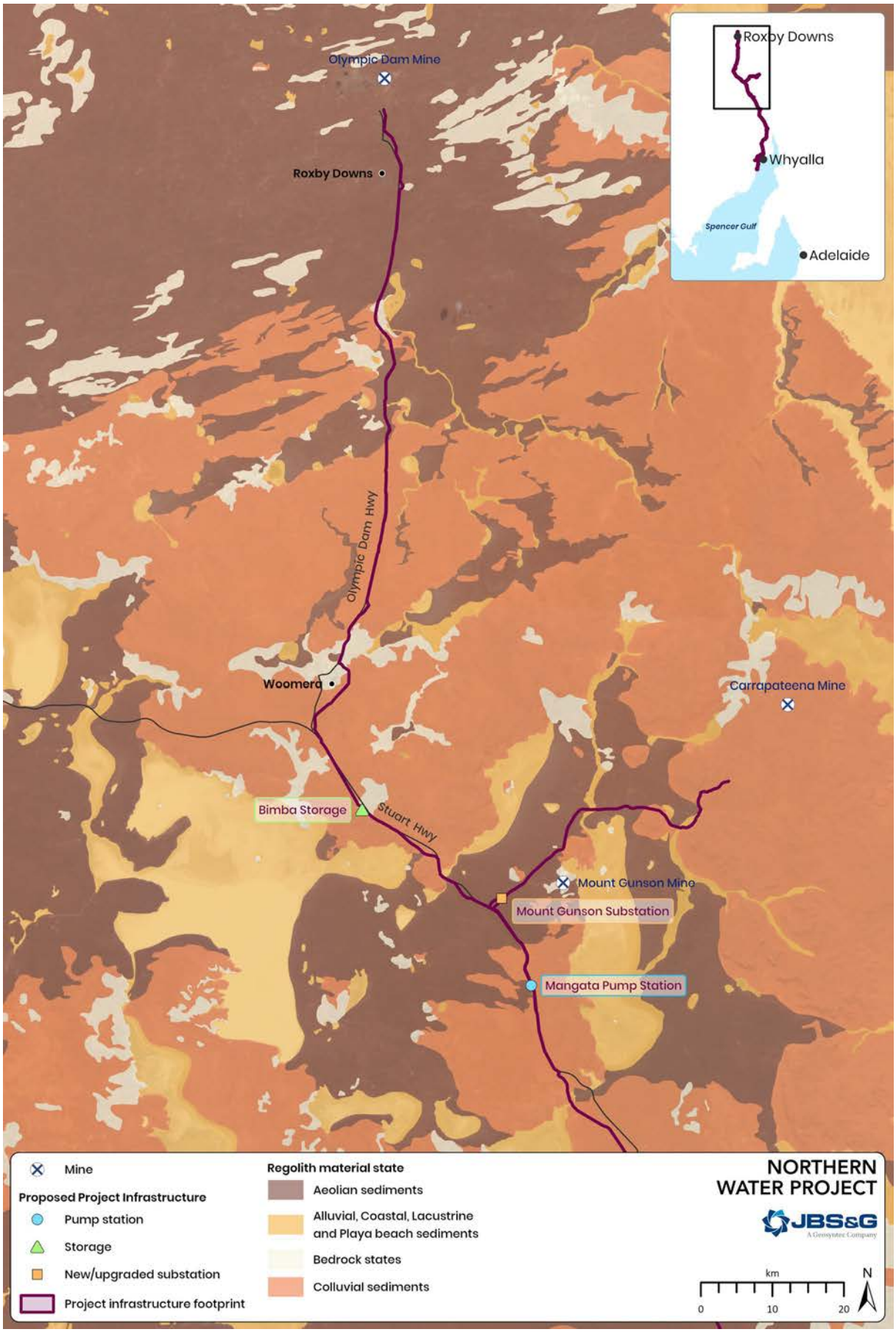
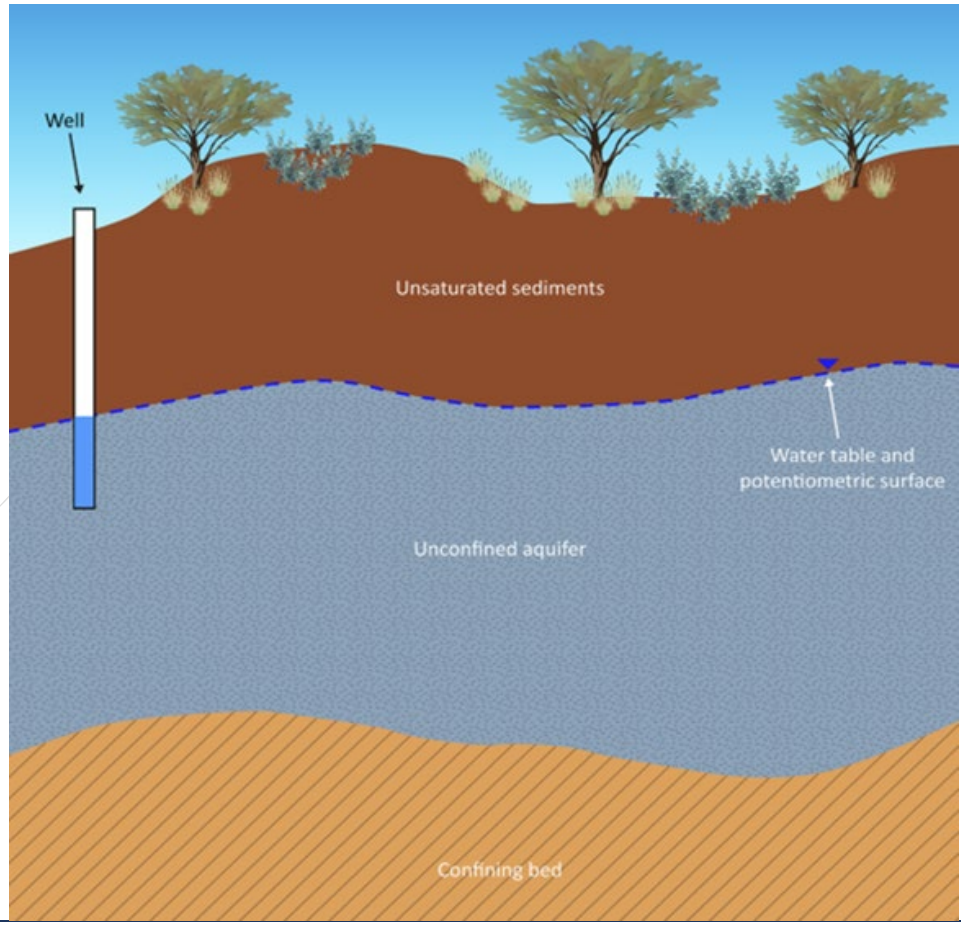
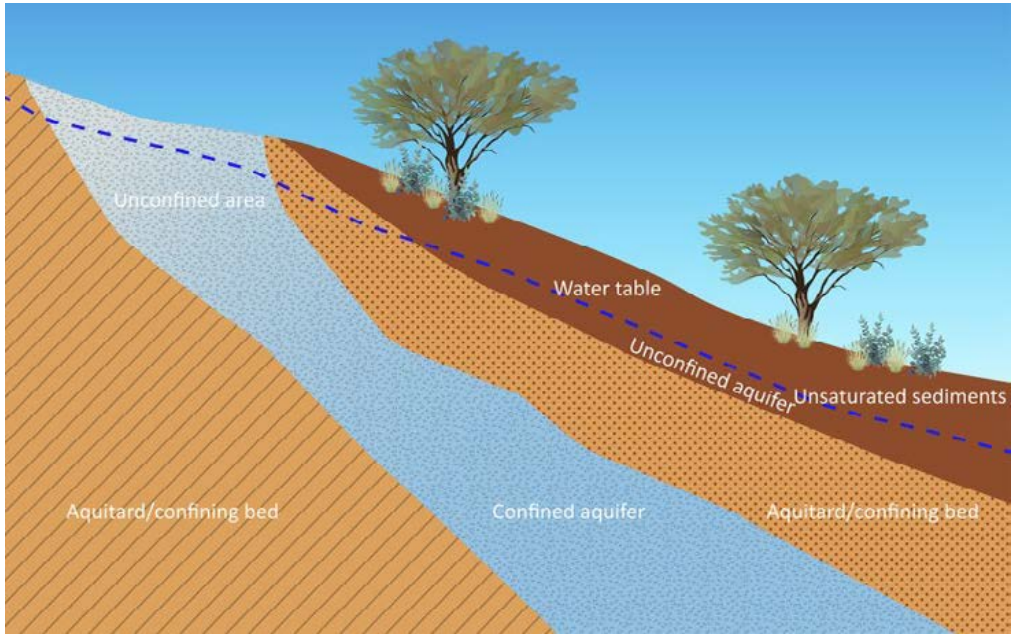
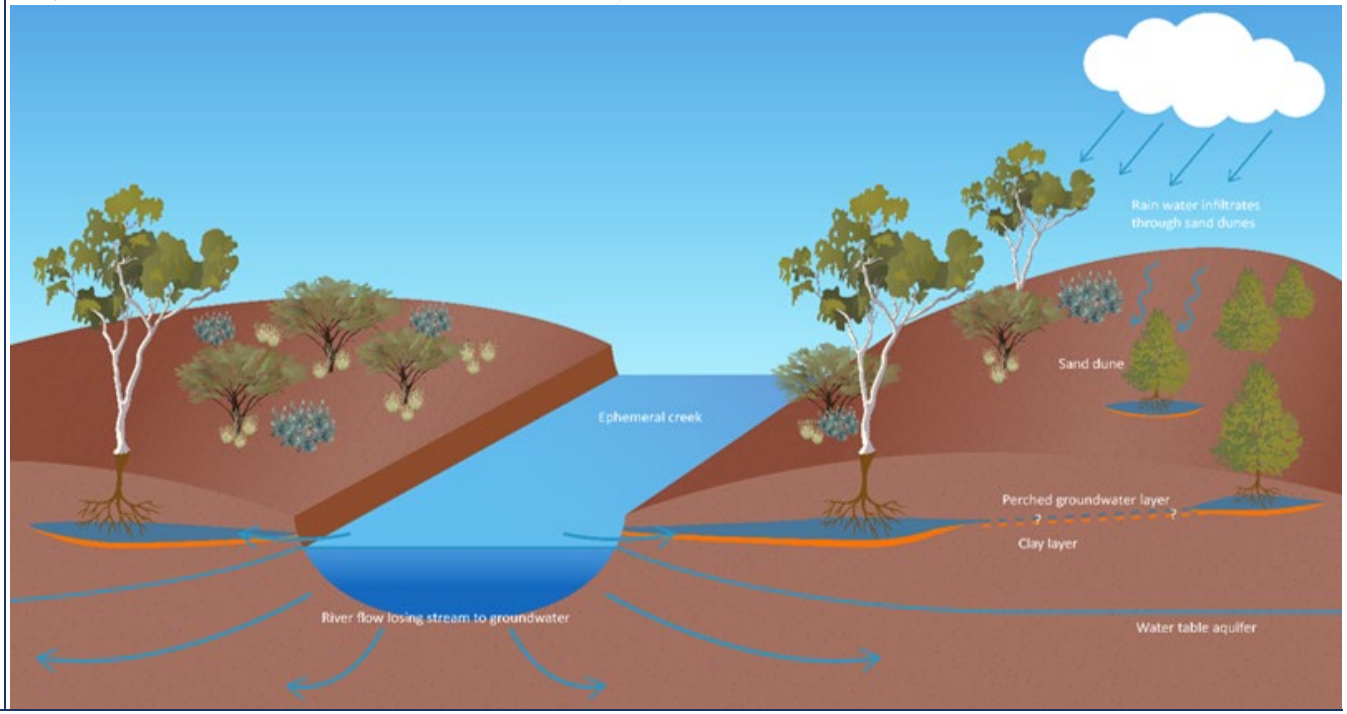


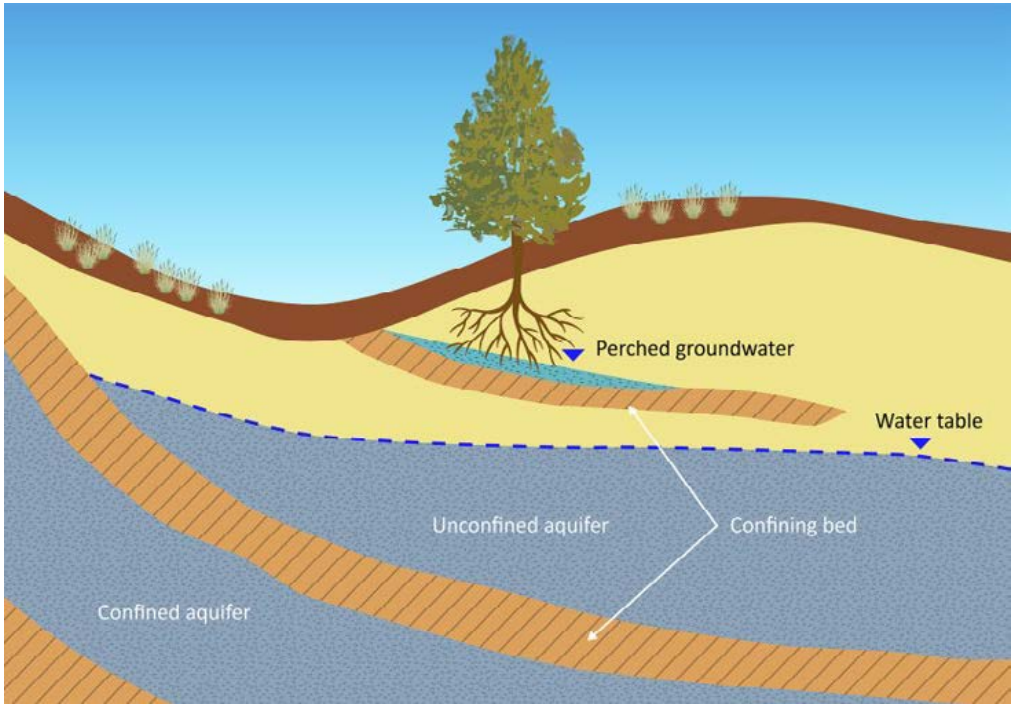
Figure 14-2: Shallow groundwater environments - northern section

Table 14-4: Description of shallow groundwater environments

IBRA Region (Location)	Shallow sediments	Characterisation of shallow groundwater environment	Conceptualisation
Myall Plains (Mullaquana Station to Lincoln Gap)	Colluvial sediments (i.e. deposited from sheet flow down a hillside). There is some outcropping of bedrock near the Project Area, however, the alignment avoids these areas.	**Shallow groundwater table** Shallow groundwater is generally held within undifferentiated quaternary and tertiary sediments. Water quality is generally lower salinity compared with elsewhere on the pipeline alignment and where present, yields are generally low. Some groundwater in this area is suitable for domestic and stock water supply. Ephemeral drainage lines are common through the Project Area carrying run-off from the hills to the west. Terrestrial GDEs are found where groundwater is close to drainage lines (e.g. Lake Dempsey)	

IBRA Region (Location)	Shallow sediments	Characterisation of shallow groundwater environment	Conceptualisation
Gawler Lakes / Arcoona Plateau (Lincoln Gap to Lake Mary)	Transported sediments with outcropping of bedrock.	**Surface expression of deeper aquifers** Groundwater is generally held in the larger aquifers (e.g. Tent Hill Aquifer) with overlying aquitards (e.g. Arcoona Quartzite Aquitard). Shallow groundwater expression of generally confined aquifers is a combination of outcropping of aquifer hosting geological formations (e.g. Corraberra Sandstone of the Tent Hill Formation) and an absence of confining beds, which have the potential to express near Lake Windabout and within the Arcoona Lakes Wetlands. Note that the pipeline alignment avoids Lake Windabout and Lake Mary which is the closest lake of the Arcoona complex to the alignment. Groundwater quality from surface expressions of deeper aquifers is generally more saline with a higher yield.	

IBRA Region (Location)	Shallow sediments	Characterisation of shallow groundwater environment	Conceptualisation
Myall Plains (South of Port Augusta) and Gawler Lakes (Elizabeth Creek and Yeltacowie Creek)	Braided ephemeral riverbeds with a surface water connection to riverbank sediments.	<u>Perched aquifers</u> Within the unconsolidated sediments of creek beds and riparian zones, lenses of water can be captured and retained by clay material acting as localised confining beds. Known as perched groundwater or aquifers, these areas capture the seepage of rainwater through the overlying unsaturated sediment. These aquifers can support terrestrial GDEs by providing an ongoing water source for longer periods following rainfalls. The water in these perched aquifers is generally of low salinity, but with limited specific yield. Historically these aquifers have been accessed by shallow pastoral wells for domestic and stock watering requirements.	

IBRA Region (Location)	Shallow sediments	Characterisation of shallow groundwater environment	Conceptualisation
Roxby Region (Lake Mary to Olympic Dam)	Aeolian sediments Sand dunes are frequently underlain with clay beds and inter-swale locations).	<u>Sand dunes</u> Sand dunes will drain rapidly, but if underlain by a confining clay material, small volumes of water can be captured and stored. This water can be retained similarly to a perched aquifer. Like a perched aquifer this groundwater, which is generally of low salinity, can support vegetation by providing a water source for a longer period of time following rainfall events. However, like perched aquifers has a limited specific yield.	

14.4.3 Groundwater depth, yield and geochemistry

Desalination plant

Site-specific data for the desalination plant was obtained from 26 groundwater wells drilled onsite for the Project (refer Figure 14-3). All wells were tested for water quality and slug testing was conducted. Pump testing was undertaken at PW01 and observed at 3 separate groundwater wells (refer Kleinfelder 2026a, Appendix H-5 Figure 2).

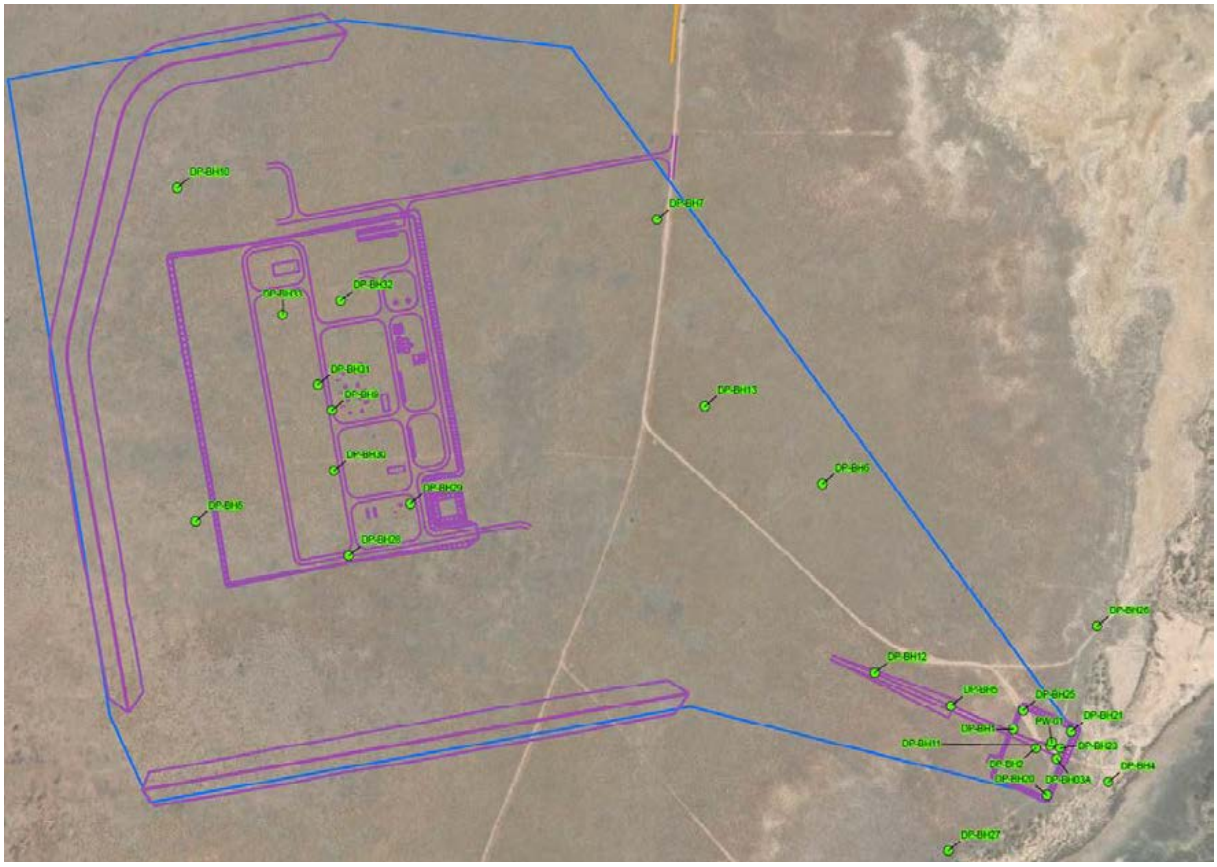


Figure 14-3: Groundwater monitoring well locations at the desalination plant site
[Source Appendix H-5 Figure 2]

Depth to groundwater ranged from 2.58 m below top of collar (mbtoc) to 9.5 mbtoc, corresponding to 0.4 mAHD in the east to 1.0 mAHD in the west of the site. Pressure transducers were placed within all 26 wells for a period of up to 45 days with the greatest variation in groundwater depth measured over that time as 0.175 m variation, suggesting a very shallow groundwater slope which flows towards the sea with minor variation or recharge following rainfall. Monitoring is ongoing to identify seasonal variation in the groundwater table.

At the desalination plant site a numerical model was developed and calibrated against the site specific data obtained from drilling. This model has been used to calculate groundwater drawdown associated with construction of the box cut, decline and TBM launch facilities, three scenarios for groundwater drawdown have been modelled for dewatering. Once the TBM launch facilities have been completed the ground will be treated to prevent water inflows (e.g. using concrete or grout).

Table 14-5: Desalination plant site groundwater quality

Parameter	Units	Minimum	Maximum
Temperature	°C	19.9	27.5
Dissolved Oxygen	mg/L	0.55	1.36
Electrical Conductivity	µS/cm	38,424	45,883
Total Dissolved Solids	mg/L	25,007	29,776
pH	-	4.37	7.23
Oxidation – Reduction Potential	mV (millivolts)	-127	-34.9

Groundwater monitoring at the desalination plant site commenced as part of the hydrogeological investigations undertaken to support project planning and assessment and is continuing beyond preparation of this EIS. Monitoring is intended to continue through the design phase and, where practicable, up to commencement of construction to improve understanding of seasonal and inter-annual groundwater level variability and to further refine the hydrogeological conceptual model for the site.

Additional monitoring data collected after completion of the EIS technical investigations will be reviewed alongside the existing dataset and incorporated into detailed design, dewatering planning and construction environmental management processes. The ongoing monitoring program will also assist in validating assumptions adopted for groundwater impact assessment and inform the development of the Groundwater and Dewatering Management Plan prior to construction.

Transfer system

Over the transfer system alignment multiple hydrostratigraphic units are crossed (refer Table 14-6). As the transfer system disturbance is relatively shallow in most cases, any groundwater encountered is in the shallow quaternary sediments. Generally, the groundwater wells are between 1 m bgl and 10 m bgl in the southern section of the Project, with access to deeper multiple aquifers 40 - 250 m bgl in the north along the pipeline infrastructure towards the Olympic Dam and Carrapateena mine sites.

Table 14-6: Transfer system groundwater quality

Hydro stratigraphic units	Lithologies	Recorded yields (kL/d)	Salinity (TDS, mg/L)
Quaternary sediments	Pooraka formation	2.5 to 43	3,000 to 52,000
	Quaternary sand dunes and clay pans	0.8 to 130	500 to 3,500
Tertiary sediments	Sandy white clays	-	15,000
Coorikiana Sandstone / Bulldog Shale	Carbonaceous, clayey fine grained sandstone and siltstone.	3	3,000
Tent Hill Aquifer	Arcoona quartzite, Corraberra Sandstone, and Woomera Shale transition zone	11 to 1080	4,000 to 30,000

Hydro stratigraphic units	Lithologies	Recorded yields (kL/d)	Salinity (TDS, mg/L)
Tapley Hill Formation	Siltstone, dolomite	43 to 520	23,000 to 120,000
Crystalline Basement	Moonabie Formation	53	6,500

Aquifers that are likely to be impacted from pipeline construction will be shallow unconfined aquifers (i.e. within 3 - 4 m of ground surface), usually rainfall dependent and possibly temporal. These are also the aquifers that would provide support to GDEs.

A qualitative assessment of potential impacts from groundwater dewatering along the transfer system during Project construction is provided in Appendix H-4. Quantitative assessments could not be provided as the storage ability of shallow perched aquifers which may be encountered is not available from Project data or literature. The conceptual hydrogeological model focuses on summarising the existing hydrogeological environment from the desktop assessments undertaken.

14.4.4 Groundwater users

Desalination Plant

There are 458 groundwater bores registered within 2.5 km of the proposed desalination plant. Of these, 58 have been identified as investigation or monitoring bores, the others do not have a listed use. Groundwater samples taken during the site investigations recorded salinity (measured as TDS) as between 25,007 to 29,776 mg/L in the field. Laboratory analysis of groundwater samples recorded higher salinity for the samples of between 53,000 and 100,000 mg/L. The salinity prevents use for domestic, irrigation or stock watering and thus is only suitable for industrial uses or use by saline tolerant plant species.

Transfer system

As shown in Table 14-6, groundwater quality along the transfer system alignment is highly saline, restricting use for stock water, or domestic water sources. Salinity thresholds for livestock drinking water depend upon the tolerance of the stock but range from 4,000 mg/L for dairy cattle to 10,000 mg/L for sheep (ANZG 2023). Some industrial users can tolerate the high salinity from groundwater in this area, however, the low groundwater yields can limit industrial uses.

A review of registered groundwater wells was undertaken as part of the groundwater assessment (Appendix H-4) and has identified 12 registered groundwater bores within 500 m of the transfer system alignment (refer Table 14-7). As the maximum depth[4] of the pipeline trench is anticipated to be approximately 5 m (with a conservative inclusion of areas where water is encountered <5 m bgl), there are only a few locations where the groundwater is anticipated to be intercepted near a bore - Myall Creek and Phillips Ponds.

It is noted that the salinity of Myall Creek is too high to support stock watering use and that there is no known industry user. Well records indicate it was a well drilled for exploration (in

[4] Note, it is possible that the depth of pipeline construction could be deeper at specific locations (if required).

accordance with the *Mining Act 1971*). As such any impacts on third party groundwater users are anticipated to be restricted to the Phillips Ponds bores where groundwater is extremely shallow, fresh and has the potential to support stock watering.

The wells at Phillips Ponds are recorded as domestic wells drilled in 1947 (WaterConnect 2026). It is not clear whether these wells are still in use, however, the homestead they are located adjacent to is a ruin (as described in Chapter 17 Non-Aboriginal Cultural Heritage).

Locations of wells are shown in Figure 14-4 and Figure 14-5, however it is possible there are other, unregistered, wells in this vicinity.

Table 14-7: Groundwater bores within 500 m of transfer system alignment

Location	Well ID	Water cut (m bgl)[5]	Standing Water Level (m bgl)	Yield (l/s)	Salinity (µg/L)	Metres (m) from alignment
Mullaquana Station	6331-561	7	7	0.03	not recorded	380
Mullaquana Station	6331-563	7	7	0.05	not recorded	330
Salt Creek	6331-383	12	14	0.5	6,579	230
Salt Creek	6332-56	12	15	not recorded	not recorded	130
Myall Creek	**6432-21**	**2**	**6**	**0.5**	**22,593**	**270**
Myall Creek	**6432-38**	**5**	**5**	**not recorded**	**not recorded**	**170**
Lake Windabout	6235-70	10	10	2.2	27,584	460
Phillips Ponds	**6235-30**	**0.6**	**0.6**	**0.03**	**3,066**	**120**
Phillips Ponds	**6235-31**	**0.6**	**0.6**	**0.03**	**3,066**	**50**
Phillips Ponds	6235-71	6	4	7	16,509	300
Lake Dutton	6334-27	10	5	0.07	not recorded	30
Mt Gunson	6335-35	10	10	0.01		610
Yeltacowie	6335-554	7	5	12.5	not recorded	50

14.4.5 Groundwater dependent ecosystems

GDEs in the Project Area can be broadly categorised as:

- aquatic ecosystems comprising -
  - surface water ecosystems which may have a groundwater or baseflow component, such as rivers, wetlands and springs

[5] **Bold** text indicates bores where water cut is <5 m.

    - estuarine and near-shore marine ecosystems, such as coastal mangroves, salt marshes and sea-grass beds, that rely on submarine discharge of groundwater
- terrestrial ecosystems that rely on the presence of groundwater (plant roots accessing groundwater and biota), which includes all vegetation ecosystems (BoM 2024).

In semi-arid and arid zones, groundwater dependence ranges from entirely groundwater dependent through to no dependence (surface water and / or rainfall only), with transitional categories from highly dependent, proportional dependence and limited dependence (EBS Ecology 2017a). Surface water ecosystems utilising baseflow and groundwater within ephemeral or permanent creeks and wetlands, are the predominant GDE identified in the Project Area (BoM 2024).

Desalination Plant

At the desalination plant site there are three mapped, low potential terrestrial groundwater dependent ecosystems (GDEs). These GDEs are listed as Melaleuca shrubland >1 m tall, chenopod shrubland and samphire shrubland. Groundwater drilling undertaken in the vicinity has indicated that groundwater is shallow (approximately 1 m AHD) in the vicinity of this area.

The samphire shrubland was mapped as intertidal samphire flats with potential for subtropical and temperate coastal saltmarsh, vulnerable Threatened Ecological Community (TEC) (Jacobs 2026d, Appendix I-1). The soils in this area have also been mapped as high risk of containing Coastal Acid Sulfate Soils with a moderate level of confidence. No soil sampling of this area was included in site investigations as it is located outside the Project disturbance footprint.

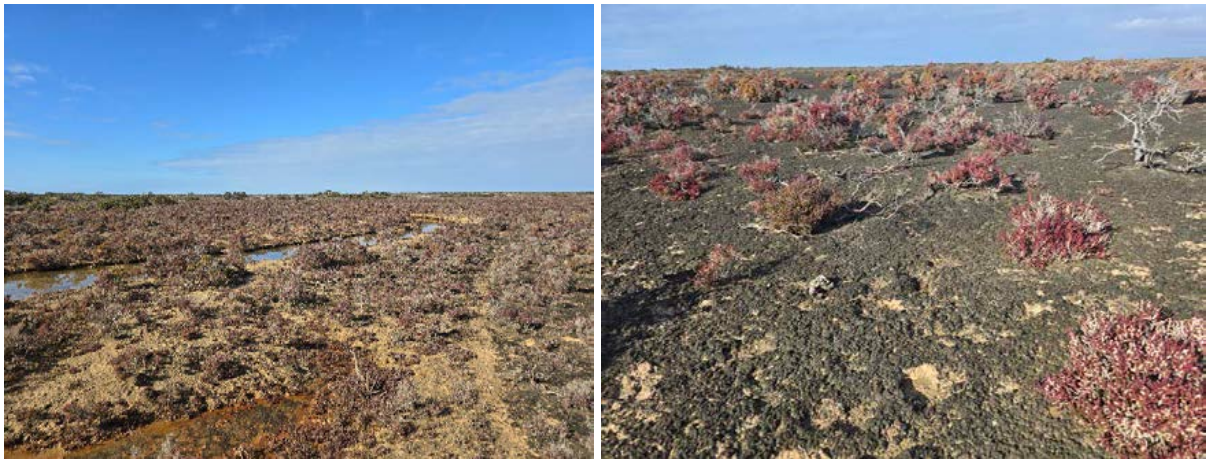


Plate 14-1: Samphire intertidal flats east of desalination plant site

Transfer System

Desktop review of the transfer system alignment (including vegetation mapping) identified aquatic and terrestrial environments known to be reliant on groundwater along the alignment. The extent of reliance of these ecosystems on groundwater varies depending on vegetation type, vegetation associations, groundwater salinity and temporal availability of groundwater (Doody et al. 2024). Ecosystems developed around groundwater dependence

can be permanent or ephemeral depending on the meteorological environment and groundwater recharge regimes (Doody et al. 2017).

The location of aquatic and terrestrial GDEs with high potential for reliance on groundwater (as identified from national assessment), within 500 m of the transfer system alignment are described in Table 14-8 and Table 14-9. Groundwater users and GDEs in the Project Area are mapped in Figure 14-4 and Figure 14-5.

The only potentially groundwater dependent species with possibility of impacts is the samphire intertidal flats identified above, which are identified as having low potential for groundwater dependence.

Table 14-8: Potential groundwater dependent ecosystems along transfer system alignment

GDE type and area	Potential reliance on groundwater		
	Low	Medium	High
Aquatic GDE	8	1	• Wetland near Myall Creek (KP 64) • Lake Dempsey Tributaries (KP 96 - 111) • Lake Dutton and Pernatty Lagoon (KP 195-214) • Lake Mary tributary (KP 315)
Terrestrial GDEs	6		• Chenopod shrublands near Phillip Ponds (KP 275 – 281)

Table 14-9: High potential GDEs on the transfer system alignment

GDE name	KP	Likely groundwater type (JBS&G 2026e)	Proposed construction methodology	Image[6]
Wetland near Myall Creek	64	Perched aquifer	Trenching	
Lake Dempsey Tributaries	96 - 111	Regional aquifer	Trenching with reduced disturbance footprint (25 m width)	

[6] Images sourced via Google earth unless otherwise stated.

GDE name	KP	Likely groundwater type (JBS&G 2026e)	Proposed construction methodology	Image[6]
Lake Dutton and Pernatty Lagoon	196 - 214	Regional aquifer	Trenching (Reduced disturbance footprint ; 25 m width at KP 196)	 
Phillips Ponds – chenopod shrublands	275-281	Regional Aquifer	Trenching (Reduced disturbance footprint ; 25 m width in places)	 [Source: JBS&G]

GDE name	KP	Likely groundwater type (JBS&G 2026e)	Proposed construction methodology	Image[6]
Lake Mary tributary	315 (adjacent, not intersecting)	Perched aquifer	Trenching (not within disturbance footprint)	

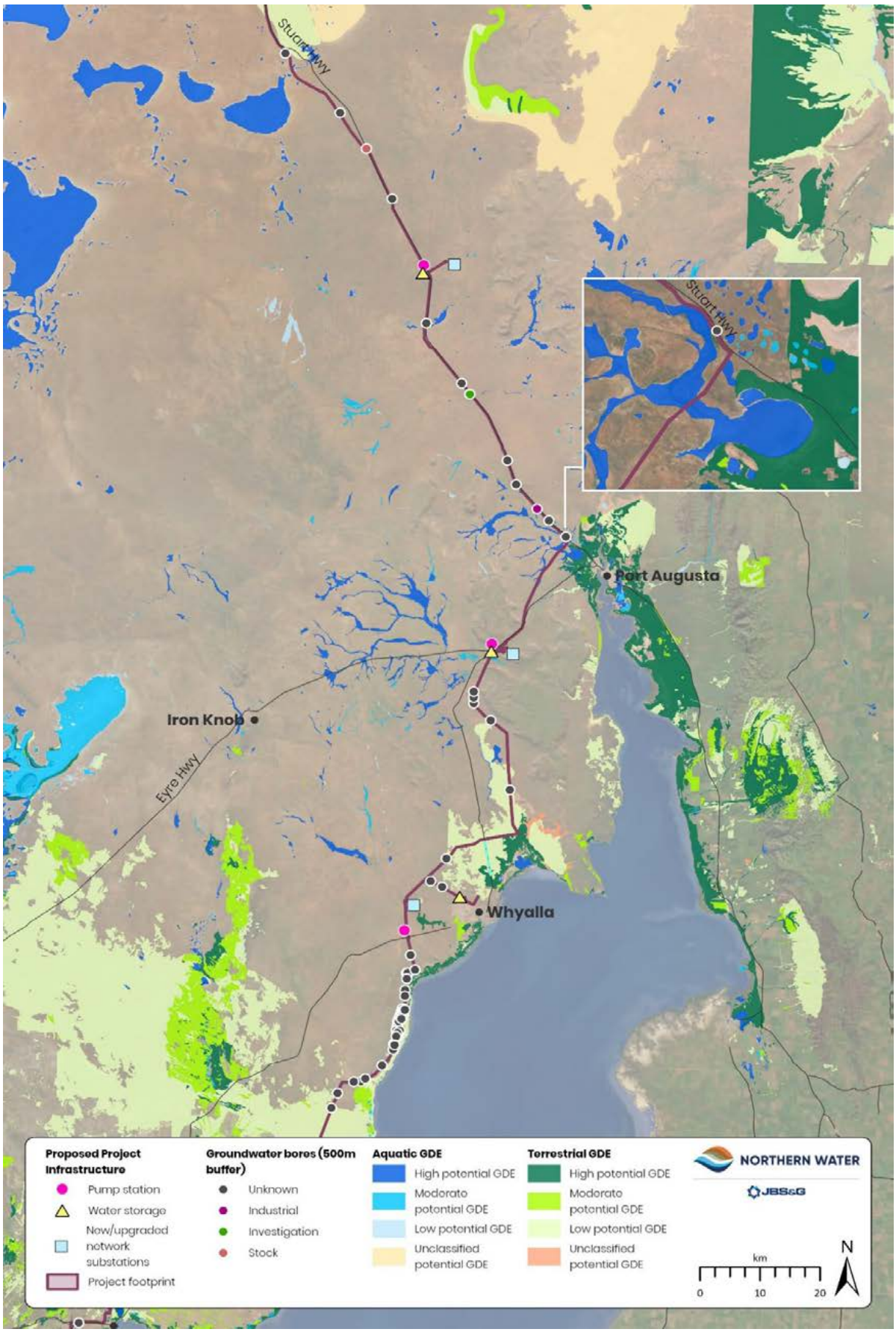


Figure 14-4: Groundwater users and GDEs in the Project Area – southern section

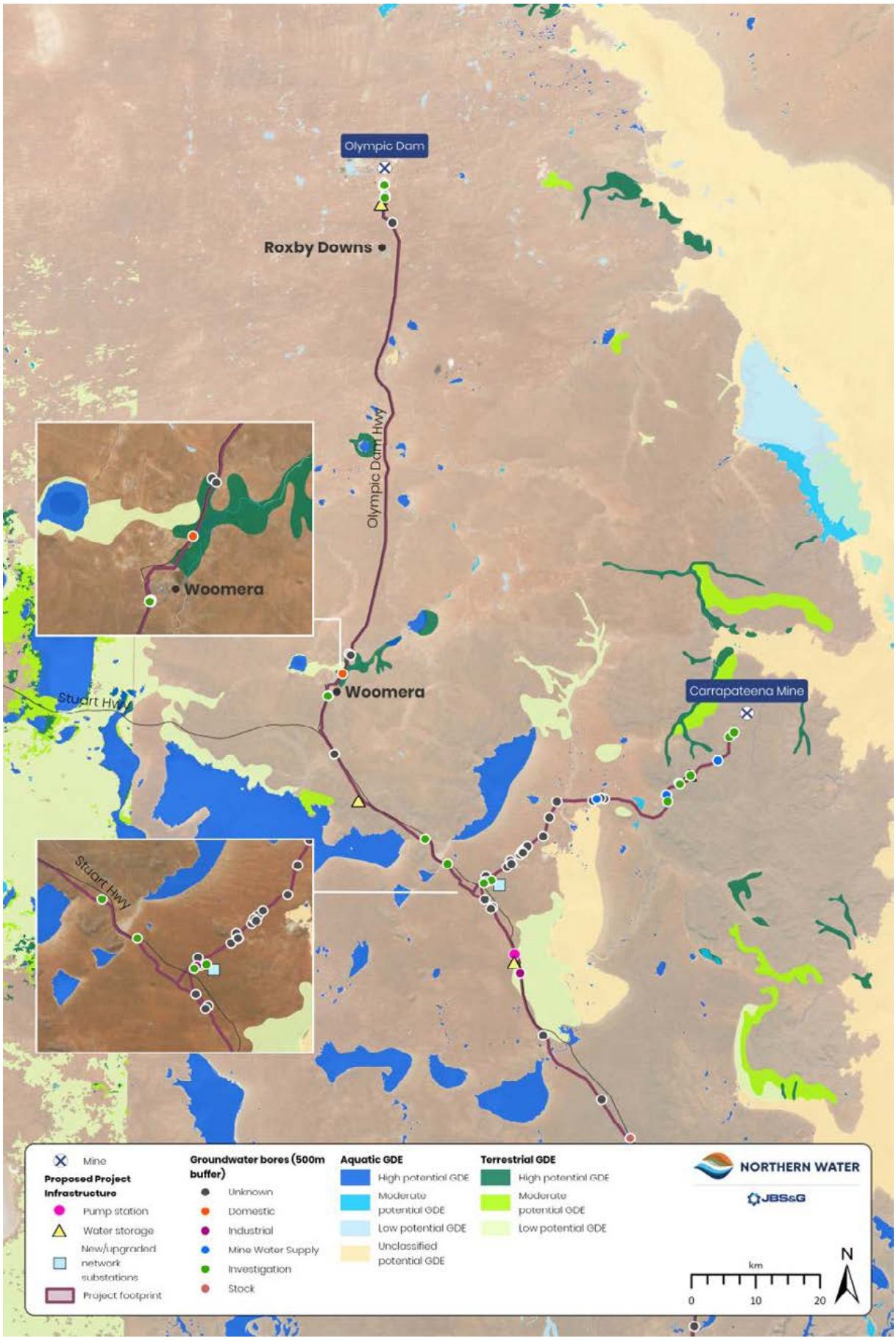


Figure 14-5: Groundwater users and GDEs in the Project Area - northern section

14.5 Impact Assessment

The following Project aspects have been identified as sources of impacts to groundwater:

- excavation and dewatering of the box cut, decline and TBM launch facilities, at the desalination plant site
- dewatering of excavations during trenching or trenchless construction of watercourse, road and rail crossings for the pipeline
- storage and handling of fuel, oil and chemicals.

The potential impacts resulting from these aspects of the Project are discussed below. Expected impact categories and an evaluation of uncertainty are also discussed for each impact event.

The potential impacts to the environment from disposal of wastewater from dewatering are addressed in Chapter 13 Surface Water.

Groundwater drawdown

Short-term groundwater drawdown is expected at the desalination plant site during construction of the box cut, decline and tunnel boring machine (TBM) launch facilities. Impact to GDEs, threatened ecological communities or registered groundwater users is expected to be avoided through implementation of proposed mitigation measures.

The box cut, decline and TBM launch facilities, will intersect the groundwater table at the desalination plant site. Inflows of groundwater into the excavation or active dewatering during construction has the potential to lower the groundwater table and reduce the water available to surrounding users, including GDEs. In addition, unmitigated reduction in groundwater levels from areas of potential acid sulfate soils (PASS) have the potential to allow oxidation leading to formation on sulphuric acid in these soils. (Note: this potential impact has been assessed separately below).

The excavation will occur in a staged manner with the highest impact stage (Phase 3 – complete excavation prior to sealing of walls and floor with concrete[7]) anticipated to occur for approximately 10 months This represents the largest impact with approximately 0.5 m of drawdown at the location of the low potential GDE (0 m AHD).

Groundwater drawdown at the desalination plant has been estimated using conservative assumptions and based on groundwater parameters obtained from the 2025 groundwater drilling and pump testing undertaken for the Project (Figure 14-6). As the modelled scenario showed minor drawdown within a low potential GDE that was identified as a TEC and zone of high potential PASS, additional control measures will be applied.

[7] Refer to Appendix H-5 for more details about the phases that have been modelled.

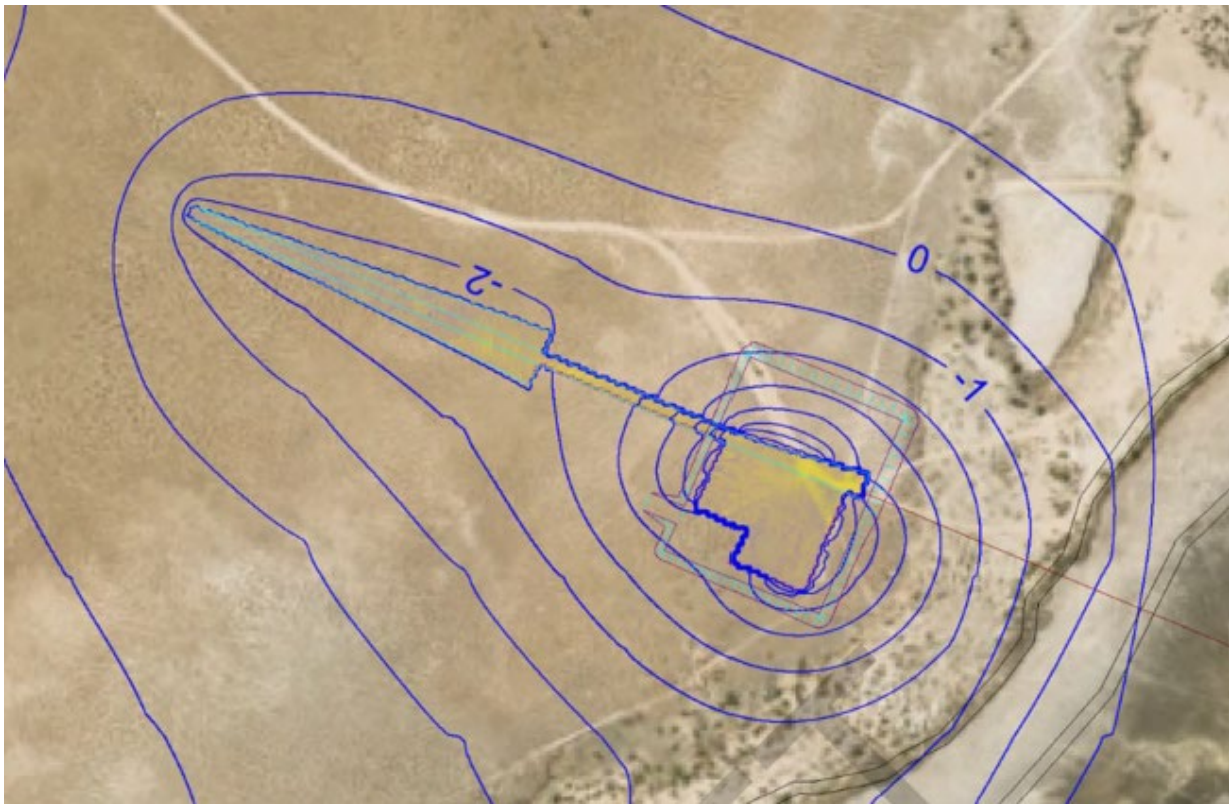


Figure 14-6: Phase 3 groundwater modelling contours at desalination plant site
[Source: Appendix H-5]

Mitigation measures applied include the use of secant piles to prevent groundwater inflows into the box cut and thus reduce groundwater drawdown. There are no groundwater bores for domestic, stock or industrial use in the area of proposed drawdown.

To reduce uncertainty in the groundwater model resulting from limited temporal data, groundwater monitoring of the established monitoring well network will continue. The groundwater model will then be reviewed and refined to confirm the extent of potential groundwater impacts, assess predicted changes to the groundwater regime, and evaluate the effectiveness of proposed mitigation measures. Mitigation measures will be further developed during detailed design and may include initiatives to minimise groundwater extraction, facilitate groundwater reuse, and manage temporary or long-term changes to groundwater conditions.

Prior to construction, a detailed Groundwater and Dewatering Management Plan will be prepared. The plan will incorporate the updated groundwater model and detail proposed dewatering methods, groundwater capture and reuse measures, management of surplus groundwater, monitoring requirements, environmental protection measures to prevent impacts to waterways, groundwater, soils and groundwater-dependent ecosystems, and any additional mitigation measures required (such as recharge trenches). The plan will also identify and provide for all approvals required for groundwater reuse or disposal to the environment.

The predicted impacts are expected to be **Negligible** given that effective strategies would be adopted to mitigate impact to receptors**.** Uncertainty in the predicted impact (related to

limited temporal data availability and uncertainty in strategies / dewatering methodology) has been evaluated in Appendix M and the level of risk is **Medium**.

Dewatering for construction of the box cut, decline and TBM launch facilities at Mullaquana Station is unlikely to lead to oxidation of potential acid sulfate soils.

The area of samphire intertidal flats on Mullaquana Station was identified in regional mapping as having a high risk of PASS. No soil sampling from this area was undertaken during site investigations as it was outside the disturbance footprint and also in an exclusion area defined for the Project. DP-BH07 and DP-BH08 groundwater wells were located in the western portion of the site (most distant from the PASS location) and recorded pH readings of ~4 indicating groundwater in this area is already acidic. Groundwater sampling taken from the area of mapped high potential for PASS recorded a pH of 6.71 which is very close to neutral (DP-BH04) (refer Appendix H-5).

The unmitigated worst-case scenario for dewatering at Mullaquana Station (scenario 1) shows groundwater drawdown of between 0 and 1 m for approximately 5 ha of this area (refer Appendix H-5). Dewatering of PASS can result in oxidation of soils and generation of acid and mobilisation of heavy metals in the soil impacting surface water, groundwater and ecology in the vicinity. The National ASS guideline (Shand et. al. 2018) promotes the use of mitigation hierarchies with avoidance and minimisation as the most preferred options. While dewatering has been phased to reduce the time period within which the cone of depression may interact with the area of PASS (minimisation), interaction is possible during the approximately 10-month period of Phase 3.

To avoid the need for impact mitigation measures, the Reference Design has included the use of secant piles to prevent groundwater drawdown propagating horizontally through this area. However, groundwater is still expected to enter through the floor of the excavation until it is sealed (Phase 4 of groundwater modelling – refer Appendix H-5).

Other options which could be used to manage potential dewatering impacts to PASS include the use of recharge trenches between the box cut and mapped PASS to enable recharge so groundwater drawdown is restricted in extent.

There is a moderate level of uncertainty in this assessment due to groundwater baseline monitoring only being undertaken for a short period of time which does not include seasonal variation and characterisation of mapped PASS. Dewatering methodology for the excavation is also subject to refinement during detailed design. The following is proposed to be undertaken to minimise uncertainty in this impact:

1. Collect additional groundwater data from the established monitoring well network and update the groundwater model to inform an updated baseline and confirmed construction methodology.
2. Identify and implement further mitigation measures as necessary to reduce the groundwater drawdown around the area of PASS.
3. Develop a detailed Groundwater and Dewatering Management Plan (as discussed in the previous section) which is integrated with an ASS Management Plan to address the requirements outlined in national guidelines for dewatering of PASS (Shand et al. 2018). This will be developed and implemented prior to construction.

The Project would represent level 2 management requirements under national guidelines.

The predicted impacts are expected to be **Negligible** given that effective strategies would be adopted to mitigate impact to receptors. Uncertainty in the predicted impact (related to limited temporal data availability and uncertainty in strategies / dewatering methodology) has been evaluated in Appendix M and the level of risk is **Medium**. To manage this risk the above work program is proposed to reduce uncertainty.

A short-term reduction in groundwater due to dewatering from pipeline excavations is not expected to impact groundwater dependent ecosystems.

Trenching of the pipeline and excavation of shafts for trenchless construction have the potential to intersect areas of shallow groundwater, most likely near watercourses, however intersection can occur in other areas. Where this occurs, groundwater will flow into the excavation. This may cause a temporary, local decrease in the groundwater table depending on how long the water table is exposed and potentially reducing the groundwater availability for surrounding users. Groundwater users are identified in Sections 14.4.4 and 14.4.5.

The transfer system assessment has been undertaken as a desktop hydrogeological assessment based on available regional geological, hydrogeological and groundwater information. Given the linear nature of the Project, the geographic extent of the alignment and the limited availability of groundwater data across some sections of the corridor, the assessment has focused on identifying locations where groundwater may potentially be encountered and evaluating plausible potential impact pathways and receptors. The desktop assessment has been supplemented by geotechnical investigations with boreholes and test pits every 1 km along the alignment (CMW Geoscience 2025, Kleinfelder, 2026b). Field investigations only identified 3 locations where groundwater was shallower than 3 m.

At the EIS stage, the final location, dimensions and detailed construction methodology for individual trenchless crossings and ancillary infrastructure are not yet confirmed. Consequently, it is not possible to reliably estimate groundwater inflow volumes at specific locations across the full alignment. A conservative assessment approach has been adopted based on available groundwater information, anticipated excavation depths, likely construction methodologies and the temporary nature of construction activities.

Where groundwater is encountered during detailed design or construction, site-specific assessment and management measures will be implemented through the Groundwater and Dewatering Management Plan, including investigation of groundwater inflows, dewatering requirements, discharge management and monitoring requirements.

Groundwater drawdown is not expected due to the short period of time that trenches would be open (from 2 – 14 days) as this is considered insufficient time for groundwater drawdown to propagate any significant distance and impact upon potential adjacent GDEs (refer Appendix H-4). Trenchless installation will involve the shaft for equipment to be open for a longer period, however review of the proposed locations of trenchless construction shows no GDEs within 500 m. Should updated project design identify the requirement for trenchless construction within 50 m of a mapped potential GDE, then additional site investigations will be undertaken to determine depth of groundwater, whether mapped GDEs are dependent on groundwater (either intermittently or long term) and appropriate plans made. It is noted

the clearance footprint for trenching is 40 m and it is likely any groundwater drawdown would remain within this area.

Groundwater drawdown will not propagate over 500 m during a 14-day period. Trenching has been selected as the nominated construction methodology for all GDEs that are proposed to be intersected by the pipeline (refer to Table 14-9). For GDEs that rely on the regional groundwater table, trenching is not expected to result in adverse impacts. The trench will remain open for only a limited period which is considered insufficient time for drawdown to propagate outside the zone of disturbance. The aquifer has sufficient capacity to quickly replenish groundwater volume lost through passive dewatering of the trench. Trenching has the potential to drain small, perched aquifers that are intersected. However, as discussed above, small, perched aquifers tend to store water intermittently and vegetation accessing these aquifers has adapted to be able to survive without constant access to the water until the aquifer is recharged.

Given the Project design (~3 m deep trenches which will be backfilled within 2 – 14 days of excavation) the following potential impacts are expected:

- Potential intersection of a perched aquifer, most likely at locations where the pipeline crosses a watercourse. In this scenario, the water is assumed to be predominantly fresh (due to high recharge rate from rainfall) and the extent of inflows will be determined by the storability of the perched aquifer. Some vegetation or unregistered groundwater bores may depend on this water intermittently but due to the ephemeral nature of these lenses, the extent of water loss until the next large rainfall / recharge event would be considered similar to the existing natural system.
- Potential intersection of a shallow, regional aquifer. The water may be more saline, and due to the larger storability of these aquifers, inflows may be greater. This also decreases the potential for drawdown to propagate as there would be more inflows to the area from the surrounding aquifer.

Transfer system infrastructure is expected to comprise predominantly shallow excavations associated with pipeline installation. Deeper excavations may be required at selected trenchless crossings, pump station infrastructure or other localised locations. Where deeper excavations are proposed, groundwater conditions will be assessed as part of detailed design and site-specific construction planning. Appropriate groundwater management measures will be implemented where required.

The Transfer System Groundwater and Dewatering Management Plan (part of the Construction Environmental Management Plan (CEMP)) will be developed which will include contingency measures for larger than expected inflows. These plans will be developed through detailed design and to be provided with applications for Water Affecting Activity Permits (WAAPs) where required. Given the distance from proposed groundwater intersections to sensitive groundwater receptors is large, the shallow (~3 m) depth of the trench, and the temporary exposure period - there is expected to be minimal change to groundwater outside the disturbance footprint (i.e. the 40 m corridor). Based on the low impact of Project design, mitigations have focused on managing uncertainty with contingency plans for unexpected volumes of water being encountered.

The predicted impacts are expected to be **Negligible.** Uncertainty in the expected impact (associated with a desktop assessment) has been evaluated in Appendix M and the level of risk is **Low**.

Groundwater drawdown during construction of the pipeline is not expected to impact registered groundwater users.

Groundwater drawdown from dewatering of excavations has the potential to create a reduction in groundwater availability for a bore (well) accessing the aquifer. While the groundwater quality along the Project pipeline alignment is generally of poor quality with low yields, there are some groundwater bores being used for a beneficial use, as described in Section 14.4.4.

The majority of the pipeline infrastructure will be constructed using a trenching methodology with trenchless construction proposed under major highways and railway lines and in some cases as an alternative option at some watercourses. As discussed above, trenching is not expected to expose the groundwater table for a period of time sufficient to allow groundwater drawdown to propagate.

A review of areas where trenchless construction is proposed and thus drawdown may occur has not identified any registered bores within 500 m. If there are unregistered bores accessing shallow groundwater within the modelled drawdown area, it is likely that the salinity of these wells would be too high for drinking, agricultural use and stock watering (refer Table 14-5). Should trenchless construction be proposed within 100 m of groundwater bores further investigations will be undertaken to confirm whether the bore is in use and which aquifer the bore is accessing. If there is potential for impacts, alternative water supplies can be negotiated for the period of time when construction would impact water availability at the bore.

The expected impacts are expected to be **Negligible.** Uncertainty in the expected impact (associated with a desktop assessment) has been evaluated in Appendix M and the level of risk is **Low**.

Spills of fuels and chemicals

Contamination of groundwater is not expected to occur as a result of Project activities due to implementation of appropriate storage and handling of fuels and chemicals.

As soils would generally be the first receptor in the event of a spill or leak, the primary assessment of the management of accidental spills from land-based activities has been provided in Chapter 12 Soils, Landform and Geology.

Construction of water pipeline projects typically involves relatively small quantities of chemicals and fuels. The volume of any spill is therefore likely to be small and risks to groundwater are generally low. Measures for management of spills of fuels and chemicals will be included in the Project CEMP and OEMP.

As discussed in Chapter 12 Soils, Landform and Geology, the measures that will be implemented for storage and handling of fuels and chemicals are well established and widely used. Following implementation of the above controls, the expected impacts are in

the **Negligible** category and the level of **Certainty** in the assessment of the expected impact is **High** (refer Appendix M).

14.5.2 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval Project management plans (including the CEMP, OEMP and other plans).

Table 14-10: Key mitigation measures – groundwater

Mitigation measure	Construction	Operation
Minimise the area and duration of disturbance at creek crossings and watercourses	✓	
Obtain water affecting activity permits (if necessary) for creek crossings and watercourse crossings where required	✓	
Locate camps and temporary facilities away from creek crossings, watercourses and lakes	✓	
Develop a protocol for dealing with groundwater interception, which includes a dewatering management plan	✓	✓
Develop a site-specific dewatering management plan / ASS management plan for the desalination plant site that includes consideration of CASS	✓	

14.6 Conclusion

Project construction and operational activities will not have a significant impact on groundwater quality, groundwater users and groundwater dependent ecosystems. Potential impacts can be readily managed with appropriate siting of infrastructure, application of standard management measures and application of appropriate management plans and the requirements of relevant approvals for groundwater reuse or disposal to the environment.

The detailed Groundwater and Dewatering Management Plan(s) that will be prepared prior to construction (based on updated modelling and monitoring data), will set out proposed dewatering methods, measures to capture and reuse groundwater, manage surplus groundwater and monitoring requirements to ensure the Project avoids or minimises impacts to waterways, groundwater, soils and groundwater dependent ecosystems.



Chapter 15

Terrestrial Flora and Fauna

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

15 TERRESTRIAL FLORA AND FAUNA 15-1

15.1 Key Findings 15-1

15.2 Setting the Context 15-3

15.2.1 Requirements in legislation and other standards 15-3

15.2.2 Views of stakeholders 15-4

15.3 Assessment Method 15-5

15.3.1 Overview of ecological assessments 15-5

15.3.2 Terrestrial Ecology Assessment 15-7

15.3.3 Plains Mouse Habitat Assessment 15-12

15.3.4 Plains Mouse Targeted Survey Spring 2024 15-12

15.3.5 Migratory Birds Impact Assessment 15-12

15.3.6 Native Vegetation Clearance Data Report 15-13

15.3.7 Significant Impact Assessment 15-13

15.3.8 Draft EPBC Act offset strategy 15-13

15.3.9 Preliminary SEB offset strategy 15-14

15.3.10 Threatened Species Management Strategy 15-14

15.4 Description of the Existing Environment 15-14

15.4.1 Regional context 15-14

15.4.2 Native vegetation 15-19

15.4.3 EPBC-listed threatened ecological communities 15-25

15.4.4 EPBC-listed threatened flora 15-26

15.4.5 State-listed flora and vegetation communities 15-29

15.4.6 Other species of interest 15-30

15.4.7 Native fauna and habitats 15-33

15.4.8 EPBC-listed threatened fauna 15-38

15.4.9 EPBC-listed migratory fauna 15-57

15.4.10 State-listed fauna 15-64

15.4.11 Pest flora and fauna 15-69

15.4.12 Pathogens 15-71

15.5 Mitigation Hierarchy 15-71

15.6 Impact Assessment 15-72

15.6.1 Clearance of vegetation and habitat 15-73

15.6.2 Habitat fragmentation 15-78
15.6.3 Indirect effects on vegetation and fauna habitats 15-79
15.6.4 Disturbance to fauna 15-80
15.6.5 Pests and weeds 15-86
15.6.6 Fire 15-88
15.6.7 Impacts to Threatened Ecological Communities 15-89
15.6.8 Impacts to EPBC-listed threatened flora 15-90
15.6.9 Impacts to EPBC-listed threatened fauna 15-90
15.6.10 Impacts to EPBC-listed migratory species 15-114
15.6.11 Impacts to State-listed threatened flora and fauna 15-115
15.6.12 Impacts to other flora and fauna 15-121
15.6.13 Affected flora / fauna vulnerability under climate change scenarios 15-122
15.6.14 Cumulative impact considerations 15-122
15.6.15 Summary of key mitigation measures 15-124
15.7 Conclusion 15-126

LIST OF TABLES

Table 15-1: Relevant third-party surveys and assessments 15-7
Table 15-2: Likelihood of Occurrence classification 15-8
Table 15-3: IBRA subregions and associations traversed by the Project 15-15
Table 15-4: Summary of vegetation condition scores at BAM / RAM sites 15-20
Table 15-5: Broad vegetation communities - Eyre Peninsula LMR 15-20
Table 15-6: Broad vegetation communities - SAAL LMR 15-22
Table 15-7: State-listed rare or threatened flora - possible, known or likely to occur 15-29
Table 15-8: Key fauna habitat within or near the disturbance footprint 15-34
Table 15-9: EPBC-listed threatened fauna - possible, likely or known to occur 15-38
Table 15-10: EPBC-listed migratory fauna (non-threatened) - possible, known or likely to occur 15-58
Table 15-11: State-listed rare or threatened fauna - possible, known or likely to occur 15-64
Table 15-12: Declared weeds identified during field surveys 15-69
Table 15-13: Relevant Buffel Grass management zones and management aims 15-70
Table 15-14: Summary of estimated clearance by Project component 15-74
Table 15-15: Summary of estimated vegetation clearance by Major Vegetation Group 15-75
Table 15-16: Estimated clearance in each IBRA subregion 15-75

Table 15-17: Fauna criteria exceedance distances for expected typical worst-case sources 15-83
Table 15-18: Summary of impact assessment for known or likely EPBC-listed fauna 15-92
Table 15-19: Summary of impact assessment for other species listed in ARs 15-98
Table 15-20: Western Grasswren habitat disturbance areas 15-103
Table 15-21: Summary of impacts to State-listed threatened flora and fauna 15-116
Table 15-22: Relevant proposed projects in the vicinity of the Project Area 15-122
Table 15-23: Key mitigation measures – terrestrial ecology 15-124

LIST OF FIGURES

Figure 15-1: Vegetation assessment (RAM/BAM) sites for the Project 15-11
Figure 15-2: IBRA subregions and general vegetation descriptions 15-17
Figure 15-3: Landscape Management Regions 15-18
Figure 15-4: Subtropical and Temperate Coastal Saltmarsh TEC - desalination plant 15-26
Figure 15-5: Records of EPBC-listed flora in the Study Area – southern section 15-27
Figure 15-6: Records of EPBC-listed flora in the Study Area – northern section 15-28
Figure 15-7: Records of State-listed flora in the Study Area – southern section 15-31
Figure 15-8: Records of State-listed flora in the Study Area – northern section 15-32
Figure 15-9: Records of EPBC-listed mammals in the Study Area – southern section 15-40
Figure 15-10: Records of EPBC-listed mammals in the Study Area – northern section 15-41
Figure 15-11: Records of EPBC-listed birds in the Study Area – southern section 15-42
Figure 15-12: Records of EPBC-listed birds in the Study Area – northern section 15-43
Figure 15-13: Western Grasswren habitat mapping and records in the Study Area 15-47
Figure 15-14: Southern Whiteface habitat mapping and records in the Study Area 15-50
Figure 15-15: Plains Mouse habitat mapping and records within the Study Area 15-55
Figure 15-16: Important shorebird habitat areas 15-61
Figure 15-17 Migratory species records - southern section 15-62
Figure 15-18 Migratory species records - northern section 15-63
Figure 15-19: Records of State-listed fauna in the Study Area – southern section 15-67
Figure 15-20: Records of State-listed fauna in the Study Area – northern section 15-68
Figure 15-21: Area of Western Grasswren habitat in the disturbance footprint 15-104
Figure 15-22: Area of Plains Mouse habitat in the disturbance footprint 15-111

15 TERRESTRIAL FLORA AND FAUNA

This chapter describes the terrestrial flora and fauna of the Project region and assesses how Project construction and operation will affect ecological values including vegetation communities, flora and fauna habitat, nationally listed threatened and migratory species and species protected under State legislation.

15.1 Key Findings

General

- The Project has used the mitigation hierarchy (avoidance, minimisation, rehabilitation, offset) as a driving principle to minimise impacts on terrestrial flora and fauna.
- Site and alignment selection, and Project design have sought to avoid or minimise impacts to native vegetation and habitats as far as possible.
- Areas of high conservation value have been avoided and there are no areas in the disturbance footprint protected under the *National Parks and Wildlife Act 1972* or under *Native Vegetation Act 1991* heritage agreements.
- Approximately 1,992 hectares of native vegetation will be cleared during construction along the approximately 406 km length of the Project. The majority (over 80%) of this is temporary and represents a very small proportion of native vegetation in the region traversed by the Project. This clearance will be offset by achieving a 'Significant Environmental Benefit' (SEB) in accordance with the *Native Vegetation Act 1991*.
- A Preliminary SEB Offset Strategy has been prepared and investigations are underway to secure on-ground biodiversity offsets consistent with Native Vegetation Council requirements.
- Progressive rehabilitation of temporary disturbance following construction in accordance with the Project's rehabilitation framework and management plans will reduce the long-term impact of vegetation clearance.

Threatened species and ecological communities

- There are no Critically Endangered or Endangered TECs (i.e. MNES under the EPBC Act) present and there is no expected impact to TECs listed as Vulnerable under the EPBC Act.
- The Project will not impact any State-listed TECs.
- There are no impacts expected to any EPBC-listed flora.
- The Project is not expected to have a significant impact on any species of EPBC-listed threatened fauna except Western Grasswren (Vulnerable). It may have a residual significant impact on Western Grasswren, which will be compensated for through implementation of offsets. No long-term impacts to EPBC-listed fauna are expected.
- No significant impacts to EPBC-listed migratory fauna are expected.
- No significant or long-term impacts to State-listed flora and fauna are expected.

- The Project will not have a significant impact on other flora and fauna species, including Rare or regionally listed species.
- The Project will not have a significant impact on any culturally significant species.

Indirect impacts

- The Project will not significantly increase habitat fragmentation.
- Indirect impacts to vegetation and fauna habitats will be short-term and limited in extent.
- Lighting effects at camps and other sites during construction will be short-term and localised and will not have a significant impact on fauna.
- Lighting at the desalination plant during operation will not have a significant impact on fauna.
- Noise disturbance during construction will be temporary and localised and will not have a significant impact on fauna.
- Noise generated during operation at the desalination plant and pump station sites will be localised and will not have a significant impact on fauna.
- Measures will be implemented to minimise the incidence of fauna injury or mortality during construction. Any impacts would be short-term and localised to the work front and are not likely to have a significant impact on any species.
- Potential for collision with transmission line infrastructure is not expected to have a significant impact on any species.
- Construction activities may temporarily displace fauna species, with no expected long-term population impacts.

Weeds, pests, pathogens and fire

- Project activities and the presence of access tracks and other operational infrastructure are not expected to result in an increase in the existing level of pest species.
- Project activities are not expected to result in an introduction, increase or spread of weeds above existing levels.
- Project activities are not expected to result in introduction or spread of pathogens.
- The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.

Climate change

- As the expected impacts are largely short-term and related to the construction phase, there is limited vulnerability of affected terrestrial flora and fauna under climate change scenarios.

Cumulative impacts

- The potential for cumulative impacts with other proposed projects is limited. There is some potential for cumulative impact on Western Grasswren, however with rehabilitation and implementation of offsets, any impact is likely to be short-term.

15.2 Setting the Context

The EIS Assessment Requirements (ARs) require an assessment of the effect of the Project on terrestrial flora and fauna, ecological communities and populations that may occur over the life of the development, including EPBC-listed threatened flora, fauna and communities. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 15.3.

15.2.1 Requirements in legislation and other standards

Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas. The Project was referred under the EPBC Act and was determined to be a controlled action on 4 February 2026. The relevant protected matters are listed threatened species and communities, listed migratory species and Commonwealth land.

The South Australian *Planning, Development and Infrastructure Act 2016* (PDI Act) EIS process has been accredited by the Commonwealth Environment Minister for assessment of the Project. Information required in the assessment is set out in the ARs. After the completion of the EIS assessment process, the Commonwealth Minister will make a (separate) decision whether or not to approve the proposed action under Part 9 of the EPBC Act.

A number of EPBC Act policies and guidelines have been considered in the preparation of this EIS, including the significant impact guidelines (DoE 2013a) (which have been used in the assessment of impacts on listed threatened and migratory species), relevant recovery plans and conservation advice and the Environmental Management Plan Guidelines (DCCEEW 2024).

State legislation

The *National Parks and Wildlife Act 1972* (Schedules 7, 8 and 9 of the Act) (NPW Act) provides for the protection of habitat and wildlife through the establishment of parks and reserves and provides for the use of wildlife through a system of permits allowing certain actions, i.e. keeping, selling, trading, harvesting, farming, hunting and the destruction of native species. This Act also assigns species to State conservation categories Endangered (Schedule 7), Vulnerable (Schedule 8) and Rare (Schedule 9).

The *Native Vegetation Act 1991* and associated *Native Vegetation Regulations 2017* establish the framework for the protection and management of native vegetation in South Australia,

including controls on the clearance of native vegetation, incentives in relation to the preservation and enhancement of native vegetation, and the establishment of vegetation Heritage Agreements between the State and landholders. Approval is generally required under the Act to clear native vegetation unless the clearance falls within a prescribed exception or activity under the Regulations.

Under Regulations 12 and 13 of the Native Vegetation Regulations, clearance associated with a major development (now referred to as an impact assessed development under the PDI Act) may be undertaken where the development has been assessed through an EIS process, has been referred to the Native Vegetation Council (NVC) for comment, and development approval has been granted under the PDI Act. Native vegetation clearance may then occur in accordance with the development approval, provided the required Significant Environmental Benefit (SEB) has been secured through either an NVC-approved SEB Management Plan or payment into the Native Vegetation Fund. The NVC's assessment determines the SEB requirements associated with the proposed clearance.

A number of guidelines and policies have been developed by the NVC to provide methods for vegetation assessment and calculation of SEB requirements (NVC 2024a, b, c, d, e). These have been used in the preparation of this chapter and supporting appendices.

The *Biodiversity Act 2025* was passed in June 2025 but has not yet come into force. The Act consolidates native vegetation and wildlife protection legislation to better protect native plants, animals and ecosystems, while also helping to address the impacts of climate change. Once fully operational it will replace the *Native Vegetation Act 1991* and the wildlife elements of the *National Parks and Wildlife Act 1972*. However, as implementation of the Act will occur in stages to allow supporting regulations, policies and guidelines to be developed, these Acts will continue to apply until the new Biodiversity Act comes into operation.

The *Landscape South Australia Act 2019* (LSA Act) provides for the protection and management of the State's natural resources including land and water resource management and pest plant and animal control. The Act sets up the framework for landscape boards which oversee landscape management regions and provide plans and policies to guide management of soil, water and biological assets for their region.

The Project passes through two landscape management regions: Eyre Peninsula (EP LMR) and South Australian Arid Lands (SAAL LMR). The Act also legislates control requirements for 'declared' plants (specific to each region or statewide), and controls the movement of declared plants, requires landowners / managers to destroy or control infestations of certain declared plants and requires further notification of authorities when an infestation of certain declared plants is detected. A permit or notification to the relevant landscape board representative may be required if movement or relocation of cleared vegetation containing declared plants will be undertaken (as per sections 186 and 197 of the Act).

Further detail on legislation and the approvals required for the Project is provided in Chapter 3 Legislative Approvals Framework.

15.2.2 Views of stakeholders

Key issues related to the terrestrial environment raised by stakeholders included the need to minimise native vegetation clearance and habitat fragmentation; protect threatened

species and Threatened Ecological Communities; maintain ecological connectivity and biodiversity corridors; avoid impacts to surface water flows, drainage lines and groundwater systems; manage acid sulphate soils where present; protect wetlands and migratory bird habitats; and ensure effective erosion and sediment control during construction.

Issues raised by Traditional Owners included the importance of minimising the impact to mature vegetation (trees), protecting Plains Mouse (*Pseudomys australis*) habitat and managing weeds.

Regulators and agencies particularly emphasised the importance of managing native vegetation clearance, preventing impacts to watercourses, controlling sediment and runoff, and avoiding the spread of invasive species, including Buffel Grass (*Cenchrus ciliaris* and *Cenchrus pennisetiformis*) and other declared weeds.

Stakeholders also stressed the importance of using existing disturbed corridors where practicable, reducing the footprint of construction activities, and ensuring that rehabilitation is undertaken to an appropriate standard following construction. Environmental agencies highlighted offset requirements, EPBC Act listed species and communities, water affecting activities, wastewater and stormwater management, weed and pest management and the need to assess cumulative terrestrial impacts in combination with other proposed regional developments.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

15.3 Assessment Method

The method of assessment of impacts in this chapter has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The assessment of impacts in this chapter is supported by a suite of ecological assessments that are described in the following sections.

15.3.1 Overview of ecological assessments

A range of ecological assessments (including desktop assessments and multiple field surveys) have been undertaken for the Project between 2021 and 2025. These ecological assessments have been prepared by appropriately qualified specialists, and are contained in the following appended reports:

- Terrestrial Ecology Assessment (Appendix I-1)
- Plains Mouse Habitat Assessment (Appendix I-2)
- Plains Mouse Targeted Survey (Appendix I-3)
- Migratory Birds Impact Assessment (Appendix I-4)
- Draft Native Vegetation Clearance Data Report (Appendix I-5)

- Significant Impact Assessment (Appendix I-6).

The Terrestrial Ecology Assessment contains the majority of the baseline ecological assessment for the Project, with the other assessments providing additional detail to support the EIS (e.g. for particular areas or species).

The scope and methodology for each of these appended assessments is summarised in Sections 15.3.2 to 15.3.7.

The scope and methodology of these assessments was developed with the ecology specialists that undertook the work. It was guided by early consultation with the Department for Environment and Water (DEW) regarding appropriate methodology to survey a linear project with a largely temporary disturbance footprint. Survey methods aimed to align with relevant guidelines (e.g. DEWHA 2010; DSEWPC 2011) where possible, however the large geographic extent and linear nature of the Project meant that this was not always feasible or warranted by the potential level of impact from the Project and the potentially limited value that the additional information might provide. Initial planning identified several key species where a higher level of survey effort was prioritised, including Western Grasswren (*Amytornis textilis myall*) and Plains Mouse *(Pseudomys australis)*, as described in Sections 15.3.2, 15.3.3 and 15.3.4 and Appendix I-1, I-2 and I-3. Survey effort for key species is also discussed further in Sections 15.4.8 and 15.4.9.

A Draft EPBC Act Offset Strategy (Appendix I-7), Preliminary SEB offset strategy (Appendix I-9) and Threatened Species Management Strategy (Appendix I-8) have also been developed for the Project. These have been used to support the impact assessment in this chapter and are summarised in Sections 15.3.8 to 15.3.10.

Other ecological assessments

DEW biodiversity values mapping

DEW is developing biodiversity values mapping for the region including values for native vegetation coverage, threatened ecological communities and listed threatened species. This mapping generates spatially continuous interpreted information on environmental values covered by legislation and policy to produce useful spatial synthesis on biodiversity values related to landscapes, ecosystems and species. DEW provided spatial data for biodiversity values mapping for the Project Area, along with a list of species of interest that was generated from an interpretation of the species' potential exposure to the Project and its sensitivity. All species interpreted by DEW as having a moderate or high level of concern have been included in the coverage of this chapter.

Ecological assessments for third party projects

A significant amount of survey and assessment work that is directly relevant to the Project has also been undertaken by third parties within the Project Area, as detailed in Table 15-1. The results of this work are publicly available and have been utilised in this chapter and supporting assessments.

Table 15-1: Relevant third-party surveys and assessments

Report / Data	Survey Area	Type of survey undertaken
Olympic Dam Expansion EIS (BHP 2009a and 2011)	Pipeline corridor (Whyalla to Olympic Dam)	Vegetation assessments and fauna surveys.
Hydrogen Jobs Plan EPBC referral and Preliminary Documentation (JBS&G 2024)	North of Whyalla	Flora and fauna surveys including targeted fauna surveys for Western Grasswren.
Oz Minerals Carrapateena Mining Lease Application and ecology monitoring compliance reports (EBS Ecology 2013; EBS Ecology 2017b; Jacobs 2023).	Carrapateena lateral pipeline	Vegetation mapping; flora and fauna monitoring from 2012 to present.

15.3.2 Terrestrial Ecology Assessment

The Terrestrial Ecology Assessment (Appendix I-1) involved a desktop assessment, likelihood of occurrence assessment for threatened species and field survey including vegetation mapping, targeted threatened flora and fauna surveys and habitat mapping. Assessment methodology is summarised below and discussed in more detail in Section 3 of Appendix I-1.

Desktop assessment

The desktop assessment was conducted over the Study Area, which is defined as the disturbance footprint[1] plus a 5 km buffer for sections of the Project that fall within the EP LMR and a 50 km buffer for sections of the Project that fall within the SAAL LMR (Figure 15-3). The different buffers align with requirements of the Native Vegetation Council's Bushland and Rangeland assessment methods for determining likelihood of threatened species.

The desktop assessment and was used to inform field survey preparation and site selection as well as the Likelihood of Occurrence (LoO) assessment for threatened and migratory species. The following sources were used (filtered for currency (post-1995) and spatial reliability (1 km or better)[2]):

- EPBC Protected Matters Search Tool (PMST)
- Biological Database of South Australia (BDBSA)
- Atlas of Living Australia (ALA)
- Pre-feasibility field surveys undertaken by Jacobs and GHD in 2021
- Species Profile and Threats Database (SPRAT)
- Nature Maps tool
- Information provided during liaison with local stakeholders.

[1] The term 'disturbance footprint' is defined in Section 1.12 in Chapter 1 Introduction. It is equivalent to the 'construction footprint' which is used in supporting ecology assessments.

[2] In accordance with NVC requirements (NVC 2024a and b), database records (including those shown on maps in this chapter) were filtered to exclude records before 1995 or with locational reliability of more than 1 km.

Likelihood of occurrence assessment

A likelihood of occurrence (LoO) assessment was undertaken for species listed under the EPBC and NPW Acts for each landscape management region, across multiple broad habitat categories (which were based on Major Vegetation Groups). These assessments incorporate the results of field surveys. The LoO is based around the standard definitions used by the South Australian Native Vegetation Council (NVC) and are defined in Section 4.6 of Appendix I-1 and summarised in Table 15-2.

The LoO assessment is used throughout this chapter as a screening tool with only threatened species identified as 'possible', 'likely' or 'known' to occur being discussed further in this chapter. For further information regarding the assessment of 'unlikely' species please refer to Appendix I-1 and Appendix I-6 (SIA).

Table 15-2: Likelihood of Occurrence classification

Likelihood status	Definition
Unlikely	Recorded recently (since 1995), but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter; and / or Recorded historically (prior to 1995); however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area; or No records despite adequate survey effort.
Possible	Recorded recently (since 1995), the area falls inside the known distribution of the species, but the area provides only limited habitat or feeding resources for the species; or Species is only represented by historical records (prior to 1995) but suitable habitat and feeding resources are present in the area, and species of similar habitat needs have been recorded in the area.
Likely	Recorded recently (since 1995) in the Study Area, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
Known	Recorded in the last 10 years within the project footprint or multiple records within ~1 km of the project footprint; and the species does not have highly specific habitat requirements and/or suitable niche habitat is present, and the area falls within the known range of the species distribution; or The species was recorded as part of field surveys for the project.

Field surveys

The report covers twelve field surveys conducted between Spring 2021 to Winter 2025 described as follows:

- Spring 2021 (Oct) – broad scale vegetation and threatened species habitat mapping (area – Mullaquana to Roxby Downs) conducted on foot and in vehicle by ecologists.
- Spring 2022 (Oct) – vegetation survey (BAM / RAM requirements), targeted EPBC Act listed species including habitat survey, bird surveys and song meter deployment, targeting Western Grasswren, Thick-billed Grasswren (*Amytornis modestus*

indulkanna), Malleefowl (*Leipoa ocellata*, now outside of the Project Area), Plains Mouse and Subtropical and Temperate Coastal Saltmarsh threatened ecological community (TEC).

- Summer 2022 (Dec) – vegetation mapping, bird surveys and song meter deployment (gap filling) and habitat survey – Whyalla surrounds.
- Summer 2023 (Feb) – vegetation mapping, habitat surveys for revised pipeline alignments and now superseded desalination site location (Cape Hardy). Included targeted survey for Bead Glasswort ((*Tecticornia flabelliformis,* EPBC Act VU) in areas of suitable habitat between Mullaquana Station and Whyalla).
- Winter 2023 (Jul) – vegetation and habitat survey, northern section of Munyaroo Conservation Park (now outside of Project Area).
- Spring 2023 (Sep) – vegetation and habitat survey, alignment (now superseded) from Cowell to Lincoln Highway north of Whyalla.
- Spring 2023 (Nov) – vegetation and habitat survey, alignment from Cape Hardy to Cowell (now outside of Project Area).
- Autumn 2024 (Mar) – vegetation survey around the Carrapateena lateral.
- Autumn 2024 (Mar) – vegetation survey for Lake Dempsey, Kootaberra and several sites south of Mullaquana Station.
- Summer 2025 (Feb) – vegetation, habitat and bird survey, included song meter deployment and targeted Bead Glasswort survey, at Mullaquana Station.
- Autumn 2025 (May) – gap-fill vegetation and habitat survey (target species only) for revised pipeline alignment and surrounds for a large section between the Mullaquana Station desalination plant and Woomera township.
- Winter 2025 (Aug) – targeted Western Grasswren survey including song meter deployment and call playback at the Mullaquana Station site. Vegetation, habitat and bird survey along proposed Mullaquana Station transmission line and within the Cultana Training Area.

Field survey teams comprised two ecologists, including an experienced NVC accredited consultant and an experienced fauna consultant.

Further detail on components of the field surveys is provided below.

Vegetation assessment

Vegetation assessment was undertaken using Native Vegetation Council methodology (NVC 2024a and 2024b). Under these guidelines separate assessment methodologies are used for the EP LMR (Bushland Assessment Methodology (BAM), NVC 2024a) and SAAL LMR (Rangeland Assessment Methodology (RAM), NVC 2024b). The Terrestrial Ecology Assessment (Appendix I-1) includes 32 BAM and 56 RAM sites that are located within the Project Area. These sites cover all vegetation types as shown in Figure 15-1 and described in Table 15-5 and Table 15-6.

The standard BAM / RAM assessment methods involve vegetation description of overstorey and understorey, observation of presence, cover and abundance of flora species (both exotic and native) at each site, consideration of fauna habitat characteristics, opportunistic recording of threatened species (including EPBC Act and NPW Act listed), recording of weed

species presence, disturbance indicators and existing site condition and collection of spatial data.

Rapid mapping points were also used in areas where full BAM / RAM assessments were not undertaken. Data collected at rapid mapping points included one or more of the following: photographs, high level vegetation descriptions, bird surveys or ground-truthing of historical vegetation mapping.

Vegetation and habitat mapping

Vegetation was mapped initially in the field using 'stop-start' mapping points and finalised via desktop. This incorporated collation of existing DEW data, aerial imagery, BAM / RAM site data and rapid mapping points.

Broad habitat mapping for targeted threatened fauna species was also undertaken, largely based on vegetation mapping coupled with habitat assessments undertaken in the field. Habitat mapping used suitability criteria based on published information as described in Appendix I-1. This habitat mapping is incorporated in the vegetation mapping dataset.

Targeted threatened flora and fauna surveys

Targeted threatened fauna surveys were undertaken as part of the initial assessment with additional surveys being undertaken (refer to below methodology for additional surveys), and focused on Bead Glasswort, Western Grasswren, Plains Mouse and listed migratory shorebirds. Survey methodology included the following:

- Bead Glasswort surveys involved surveying suitable habitat (coastal saltmarsh adjacent to the desalination plant site) by foot in search of the species.
- Bird surveys – 97 bird survey sites (including 57 within the Project Area, of which 22 are within the disturbance footprint) including timed searches (~50 hours), song meter deployment and analysis at 33 sites (total 640 hours of recorded data). Within the known species range of Western Grasswren (the southern section of the Project Area), targeted timed area searches (often using call playback) and song meter deployment were aligned with suitable habitat and previous known records. Three surveys in 2025 around the Mullaquana Station desalination plant site also specifically targeted this species. Southern Whiteface (*Aphelocephala leucopsis leucopsis*) was not listed under the EPBC Act during initial surveys and was therefore not initially a target species. However, the species was recorded (where present) in all baseline timed area searches prior to the 2023 EPBC Act listing of the species, and all surveys since then have targeted Southern Whiteface.
- Plains Mouse survey involved observations for signs (including burrows, tracks and scats) as part of RAM assessments or bird surveys in representative habitats.
- Migratory shorebirds were targeted during field surveys around the Mullaquana Station desalination plant site, in February 2025 utilising timed area searches, song meter recordings and opportunistic observations.
- Opportunistic sightings of threatened species and exotic and pest species were also noted at field survey sites.

Further detail including location of survey sites is provided in Figures 3-3 to 3-7 in Appendix I-1.

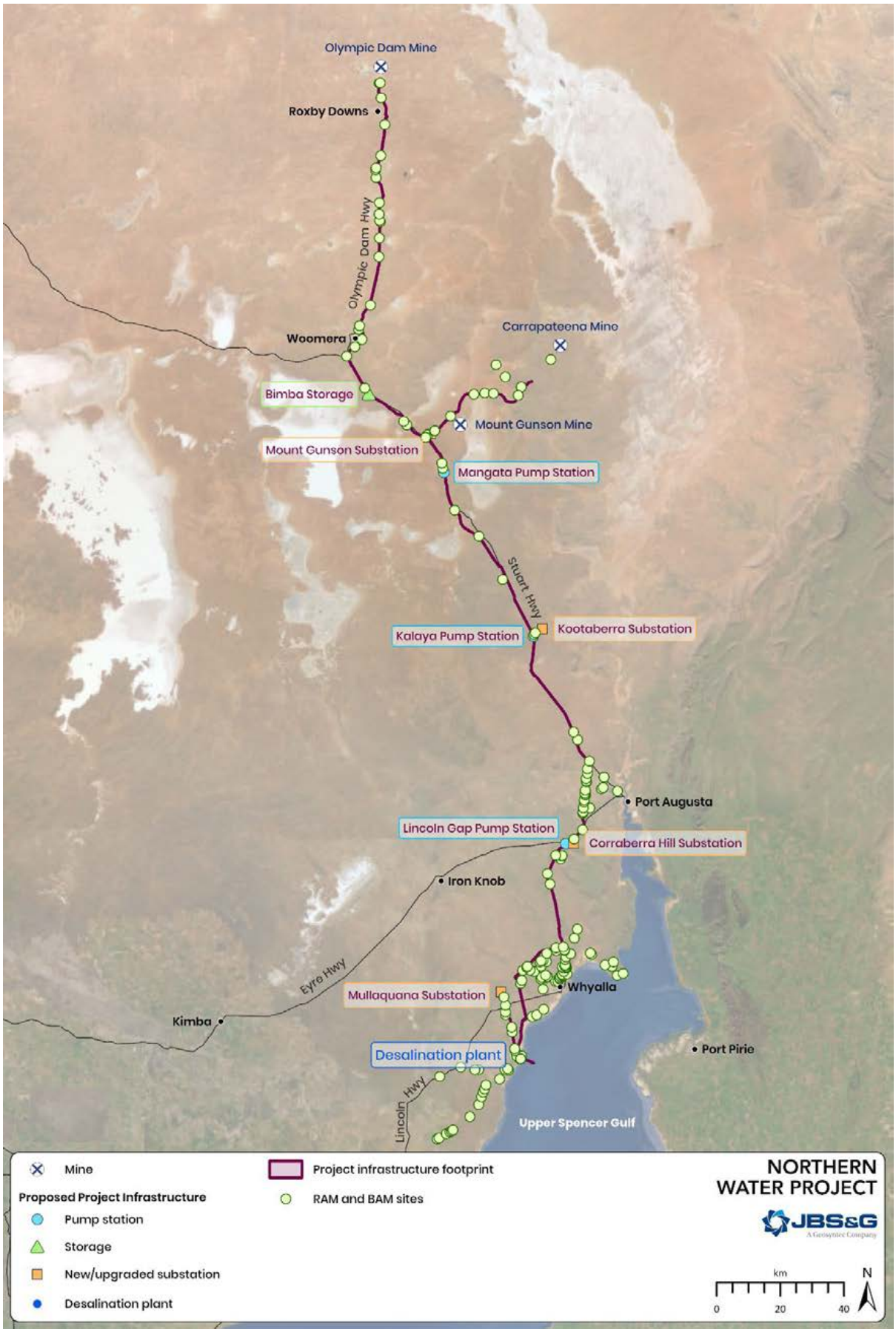


Figure 15-1: Vegetation assessment (RAM/BAM) sites for the Project

15.3.3 Plains Mouse Habitat Assessment

The Plains Mouse Habitat Assessment (Appendix I-2) undertook detailed mapping of important refuge habitat for Plains Mouse for the northern section of the Project Area. The assessment included desktop and field components.

A desktop assessment was undertaken to identify areas of possible, likely and suitable habitat for ground-truthing. The desktop assessment of the main transfer pipeline (along the Stuart and Olympic Dam highways) used initial high-level habitat mapping from the Terrestrial Ecology Assessment (Appendix I-1), which was based on the suitability of vegetation associations, in conjunction with aerial imagery. Desktop habitat assessment using aerial imagery had previously been undertaken for the Carrapateena lateral branch by EBS (2017b; 2017c) and this was used for ground-truthing of the lateral.

Field surveys (both point surveys and linear stretches) were undertaken in Autumn 2024 to ground-truth habitat mapping. Habitat suitability was categorised as 'suitable', 'low suitability' or 'not suitable', based on habitat characteristics (including vegetation type and presence and size of gilgais) described by Moseby (2012) and based on experience from surveys undertaken at Carrapateena between 2018 and 2023. Habitat mapping was refined following the ground-truthing to produce detailed mapping of refuge habitat.

15.3.4 Plains Mouse Targeted Survey Spring 2024

The targeted Plains Mouse survey was conducted by Lathwida at eight sites from 3 September 2024 to 23 October 2024 (Appendix I-3). Baited camera traps were placed in habitat which was considered most suitable to Plains Mouse, including areas of Cane-grass swamps or particularly large gilgais (or clusters of gilgais). All camera traps were placed within, or in close proximity to, the disturbance footprint of the proposed pipeline alignment.

Cameras were deployed onsite for 50 days which well exceeds the upper limit of 14 days recommended in the Survey Guidelines for Australia's Threatened Mammals (DSEWPC 2011). Survey effort is therefore considered to exceed requirements for targeted survey of the species.

Images from the camera traps were assessed to determine presence of any Plains Mouse based on size and physiological proportions of individual mammals in the images.

15.3.5 Migratory Birds Impact Assessment

The Migratory Birds Impact Assessment (Appendix I-4) undertook a desktop review of publicly available data and the Project specific data collected in ecological assessments as described above. Likelihood of presence of migratory bird species was assessed based on historical records, presence of suitable habitat and identified important migratory bird habitats within the Study Area.

The report includes a significant impact assessment for migratory birds following the process outlined in the MNES Significant Impact Guidelines 1.1 (DoE 2013). Species that were listed as both migratory and threatened species under the EPBC Act were assessed against the threatened species significant impact criteria as the more stringent criteria.

15.3.6 Native Vegetation Clearance Data Report

The draft Native Vegetation Clearance Data Report (Appendix I-5) provides an assessment of proposed vegetation clearance and 'significant environmental benefit' (SEB) requirements for the Project. It utilises vegetation assessment data provided in the Terrestrial Ecology Assessment and associated vegetation mapping. The report has been prepared in accordance with relevant Native Vegetation Council guidelines and is the basis of vegetation clearance areas presented in this chapter.

The draft Native Vegetation Clearance Data Report (and this chapter) utilise spatial files for an indicative disturbance footprint (Revision 5.2) to calculate vegetation clearance. The disturbance footprint incorporates estimated areas for permanent and temporary disturbance for all Project components and is discussed further in Chapter 1 Introduction (Sections 1.11 and 1.12) and in Section 2.5 of the native vegetation clearance data report.

The Native Vegetation Clearance Data Report included in Appendix I-5 is a draft document, based on the Project alignment and design at the time of EIS preparation. A final version of the clearance calculations based on the detailed design would be resubmitted after PDI Act approval, for approval of the final proposed SEB. The updated SEB calculations would reflect the formulae that are in place under NVC guidelines at the time[3].

15.3.7 Significant Impact Assessment

The Significant Impact Assessment (SIA) (Appendix I-6) presents an assessment of the significance of impacts on listed threatened species and communities and listed migratory species that were predicted to occur in the disturbance footprint (refer to desktop assessment in Appendix I-1).

The SIA follows the process outlined in the MNES Significant Impact Guidelines 1.1 (DoE 2013).

The SIA uses the likelihood of occurrence of each predicted EPBC-listed species and community as determined in the Terrestrial Ecology Assessment (Appendix I-1) or Migratory Birds Impact Assessment (Appendix I-4). The SIA also uses findings from all the surveys and assessment works that were undertaken for the Project, including all flora and fauna surveys for the Terrestrial Ecology Assessment (Appendix I-1), Plains Mouse Habitat Assessment (Appendix I-2), Plains Mouse Targeted Survey (Appendix I-3) and a Migratory Birds Impact Assessment (Appendix I-4).

The Significant Impact Assessment (and other impact assessments in this chapter) utilise the Revision 5.2 spatial files for the disturbance footprint.

15.3.8 Draft EPBC Act offset strategy

The Draft EPBC Act offset strategy (Appendix I-7) documents the overarching high-level strategy for delivery of environmental offsets for listed threatened species that are potentially required under the EPBC Act, and the alignment with associated guidance. The Strategy also demonstrates a reasonable level of feasibility under Part 7 of the EPBC Act Environmental Offsets Policy (DSEWPC 2012) as required by Assessment Requirement MNES1-9.1.

[3] SEB calculation formulae were updated in September 2024 and subject to ongoing change until July 2027. The formulae in place at the time of preparation (i.e. from 1 July 2025 to 30 June 2026) have been used in calculations for the EIS.

15.3.9 Preliminary SEB offset strategy

The Preliminary SEB offset strategy (Appendix I-9) outlines the overarching high-level strategy to be applied for delivery of the potential environmental offsets required under the Native Vegetation Act.

15.3.10 Threatened Species Management Strategy

A Threatened Species Management Strategy (TSMS) has been prepared for the Project by Lathwida Environmental and is provided in Appendix I-8.

The TSMS provides a framework for management of key threatened species listed under the EPBC Act that are known or likely to occur and which may be at risk of impacts arising from the Project's activities. The management measures outlined in this strategy have been considered in the impact assessment in this chapter (refer Section 15.6).

15.4 Description of the Existing Environment

15.4.1 Regional context

Bioregion

The Project is located in the Gawler IBRA[4] region, as described in Chapter 9 Use of Land and Marine Waters.

The Gawler IBRA region is characterised by semi-arid to arid flat topped to rounded hills, rocky quartzite hills, sandstone plateaus, depositional plains, gibber plains and salt-encrusted lake beds. Typical vegetation includes open woodlands of Black Oak and wattles, open mallee scrub, chenopod shrublands (bluebush) / saltbush and tall Mulga shrublands. Native vegetation across the area is generally relatively intact, but highly disturbed in some areas, particularly near stock watering points. The environment of the region has been influenced by pastoral activities, mining and Department of Defence operations (including the Cultana Training Area and the Woomera Test Range).

The Gawler IBRA region is further divided into IBRA subregions and IBRA associations. The subregions and associations traversed by the Project are summarised in Table 15-3, along with an estimate of native vegetation remaining in each of the associations. IBRA subregions and general descriptions of the vegetation in each subregion are shown in Figure 15-2. IBRA associations are shown[5] in Figures 12-1 to 12-2 of Chapter 12 Soils, Landform and Geology.

Landscape management regions

The Project is located within the Eyre Peninsula (EP) Landscape Management Region (LMR) and the South Australia Arid Lands (SAAL) LMR, which are established under the LSA Act. These regions are referred to throughout this chapter as the Native Vegetation Council assessment methodology differs between them (as discussed in Section 15.3).

The boundary between the EP and SAAL LMRs in the vicinity of the Project is approximately 18 km north of Whyalla, as shown in Figure 15-3.

[4] Interim Biogeographical Regionalisation of Australia. The IBRA system classifies Australia's landscapes into geographically distinct regions based on climate, geology, landform and vegetation.

[5] Chapter 12 Soils, Landform and Geology uses IBRA Associations to define land systems

Table 15-3: IBRA subregions and associations traversed by the Project

IBRA region and subregion description	IBRA associations and vegetation description	Native vegetation cover[1]
Gawler region		
Myall Plains subregion Characterised by vast plains of chenopod shrubland with emergent trees with a narrow coastal strip of samphire low open shrubland and tidal mangrove forests.	**Whyalla** Low open woodland of Black Oak and Western Myall sometimes with False Sandalwood, low woodland of Mangrove and chenopod shrubland of samphire.	95%
	Red Rock Low open woodland of Western Myall and Myall / Black Oak. However, vegetation tended to tall shrublands noted during field surveys.	100%
	Tregolana Low woodland of Western Myall and Black Oak, chenopod shrubland of saltbush and bluebush, chenopod shrubland of samphire and low woodland of mangroves.	96%
Arcoona Plateau subregion Dominated by treeless low stony hills supporting chenopod shrubland and samphire low open shrubland with open woodlands and taller shrublands at creeklines.	**Simmens** Chenopod shrubland of Saltbush and Plover-daisy, low woodland of Black Oak and False Sandalwood, low open woodland of Western Myall with Black Oak or bluebush, open scrub of Beaked Red Mallee, grassland of rolling spinifex and low woodland of mangroves.	99%
	Mt Gunson Chenopod shrubland of Saltbush and Plover-daisy, low woodland of Western Myall and Bluebush and woodlands of River Red-gum.	96%
	Andamooka Chenopod shrubland of saltbush and plover daisy, tall shrubland of mulga and turpentine mulga, woodland of river red gum and chenopod shrubland of samphire.	98%
	Woomera Tall shrubland of Mulga and Turpentine Mulga, or Horse Mulga, chenopod shrubland of saltbush and either bluebush or bindyi, woodland of native pine and chenopod shrubland or samphire.	98%

IBRA region and subregion description	IBRA associations and vegetation description	Native vegetation cover[1]
	Chenopod shrubland of saltbush and Plover-daisy, tall shrubland of Mulga and Turpentine Mulga, tall shrubland of Horse Mulga and chenopod shrubland or samphire.	
Gawler Lakes subregion Characterised by sandy plains and low dunes with wattles, low open woodland and chenopod low open shrublands with ephemeral salt lakes fringed with samphire low open shrublands.	**Hesso** Low open woodland of Western Myall, bluebush and Black Oak, tall shrubland of Mulga, Turpentine Mulga and Horse Mulga, chenopod shrubland of saltbush and Plover-daisy, or samphire, tall shrubland of Horse Mulga and woodland of native pine.	97%
	Arden Plains with sand dune and numerous lakes along the overflow course of Lake Torrens, samphire or mangrove flats along the coastline.	95%
	Oakden Tall shrubland of Mulga and Turpentine Mulga, or Horse Mulga, chenopod shrubland of saltbush and either bluebush or bindyi, woodland of native pine and chenopod shrubland or samphire.	100%
Roxby subregion[2] Low sand dunes with low open woodland and mixed grasses, sandy interdune swales with Acacia low open woodland over chenopod low open shrubland and interdune swales with clay soils supporting swamp cane-grass tall grassland.	**Moondiepitchnie** Dunefield with tall shrubland of Mulga and Turpentine Mulga, or Horse Mulga, chenopod shrubland of saltbush and either bluebush or bindyi, woodland of native pine and chenopod shrubland or Samphire.	100%

[1] Source: NVC (2024a). Native Vegetation Council (NVC) Bushland Assessment Manual, Sep 2024.

[2] The Roxby subregion was split out of the Kingoonya subregion in IBRA Version 7. In accordance with email correspondence between Jacobs and the Native Vegetation Branch in March 2026, the previous Version 6 of the IBRA subregions has been used for the native vegetation datasheets and calculations, due to the mismatch between IBRA Association boundaries (only available as v6) and the IBRA subregion boundaries in v7. Consequently, this subregion is referred as 'Kingoonya' in the Terrestrial Ecology Assessment and Native Vegetation Data Clearance reports. 'Roxby' has been used in this chapter to maintain consistency with the remainder of the EIS.

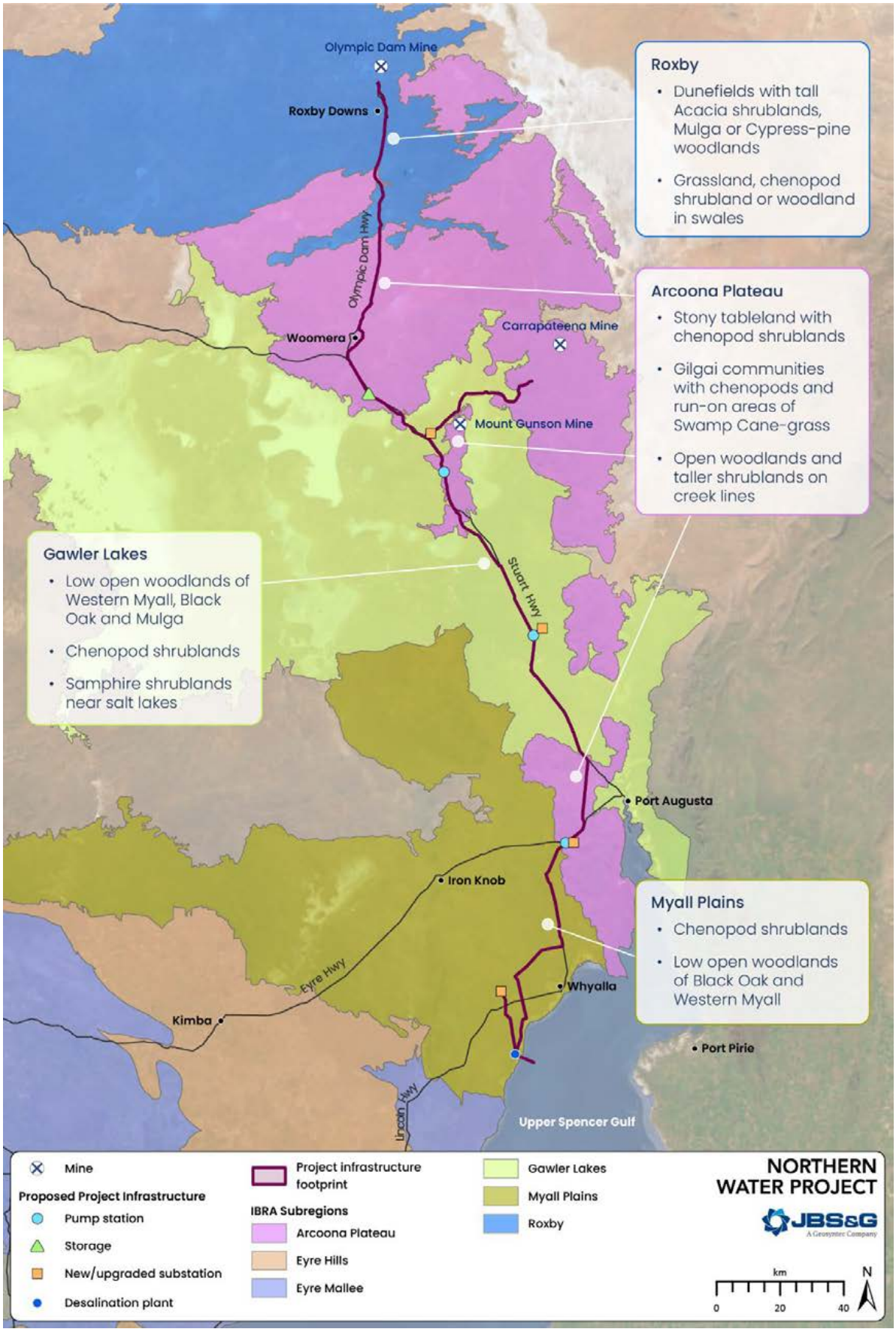


Figure 15-2: IBRA subregions and general vegetation descriptions

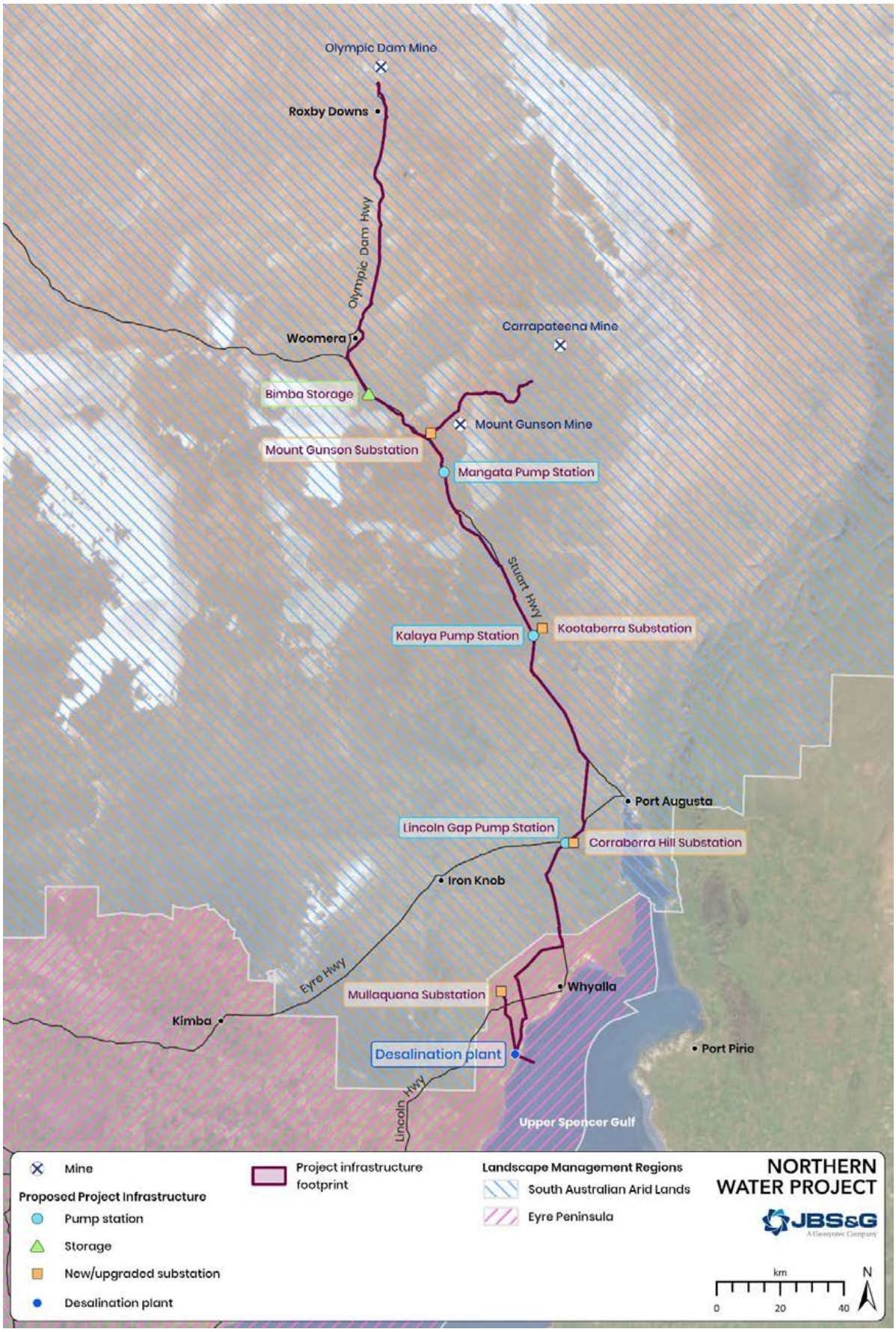


Figure 15-3: Landscape Management Regions

Conservation areas

Areas of conservation value are avoided by the Project and there are no areas protected under the *National Parks and Wildlife Act 1972* or protected by a native vegetation heritage agreement under the *Native Vegetation Act 1991* in or adjacent to the disturbance footprint.

The Whyalla Conservation Park is located on the southern margin of the Project Area approximately 10 km north of the centre of Whyalla, adjoining the Lincoln Highway. The transfer system alignment is located approximately 2 km north of Whyalla Conservation Park. Conservation areas in the vicinity of the Project Area are shown in Figure 9-13 in Chapter 9 Use of Land and Marine Waters.

15.4.2 Native vegetation

Overview of vegetation type and condition

The Project Area has relatively low rainfall, limiting the potential for cropping land use and hence limiting associated broadscale vegetation clearance. Consequently, the level of remnancy of native vegetation is high (between 95 and 100%) as indicated in Table 15-3 above.

Vegetation communities in the south of the Project Area are characterised by chenopod shrublands and open woodlands of Black Oak (*Casuarina pauper*) and Western Myall (*Acacia papyrocarpa*).

Closer to Port Augusta, areas of stony tablelands are dominated by chenopod shrubland.

North of Port Augusta the Gawler Lakes IBRA subregion contains extensive plains of Western Myall over chenopods, patches of chenopod shrubland and sand plains of mixed Western Myall and Mulga (*Acacia aneura*).

Further north, the vast Arcoona Plateau IBRA subregion contains stony tablelands with chenopod shrublands, woodlands on drainage lines, and gilgai communities with chenopods and run-on areas of Swamp Cane-grass (*Eragrostis australasica*).

In the far north of the Project Area, the Roxby IBRA subregion contains dune fields with low sand dunes with Slender Mulga (*Acacia aptaneura*) and Cypress-pine (*Callitris glaucophylla*) woodland and swales with woodlands, grassland or chenopod shrubland.

The vegetation communities recorded in the Project Area are generally common and widespread, and other than the coastal saltmarsh located adjacent to the desalination plant site, none are listed as threatened.

Vegetation assessed in field surveys was generally in moderate to good condition with extensive intact native vegetation present throughout the Project Area. Vegetation condition scores from BAM and RAM survey sites across the disturbance footprint are summarised in Table 15-4.

Minimal weeds were present throughout the majority of the Project Area although they increased in density near roads, tracks and easements. Biotic disturbance indicators were evident in grazed areas (the majority of the Project Area) and increased close to water points and fence lines.

Table 15-4: Summary of vegetation condition scores at BAM / RAM sites

Condition category	Condition score*	Area in Disturbance Footprint (ha)	% of Disturbance Footprint
Very low	<20	0	0
Low	20-36	23.997	1.205
Medium	36-56	1262.203	63.373
High	56+	705.5034	35.422

*Condition score corresponds with bar graph in electronic RAM/BAM scoresheets (NVC 2025a, b).

Native flora species

Field surveys associated with the Terrestrial Ecology Assessment identified more than 254 flora species including approximately 26 exotic species and 228 native species. Full species lists are included in Appendix D of the Terrestrial Ecology Assessment (Appendix I-1).

Vegetation communities

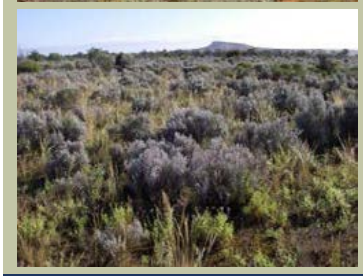
Vegetation assessments undertaken for the Project classified the vegetation present into 89 Vegetation Associations (VAs i.e. RAM / BAM sites). These have been grouped into 30 Broad Vegetation Communities and further grouped into 17 Major Vegetation Groups. These groupings were developed to provide manageable descriptions for reporting and mapping and they broadly represent landform, major floristic composition and key habitats.

The Major Vegetation Groups and Broad Vegetation Communities present in or near the disturbance footprint in each landscape management region are described in Table 15-5 and Table 15-6.

Full descriptions of Broad Vegetation Communities and details of Vegetation Associations (RAM/BAM sites) are presented in Section 4.3 of Appendix I-1 (Terrestrial Ecology Assessment). Detailed vegetation mapping is contained in Appendix B5 of Appendix I-1.

Table 15-5: Broad vegetation communities - Eyre Peninsula LMR

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (BAM sites)	Area in disturbance footprint (ha)
EP 2 Open Woodlands of Western Myall / Black Oak / Sugarwood 	NW EP 2.1 Low open woodlands of Western Myall with a chenopod shrub understorey	6	53.248
	NW EP 2.2 Low open woodlands with Western Myall and Black Oak over chenopod shrub understorey	4	30.064
	NW EP 2.3 Low open woodlands of Sugarwood with a chenopod shrub understorey	1	1.277

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (BAM sites)	Area in disturbance footprint (ha)
			
EP 3 Chenopod shrublands (including drainage lines)  	NW EP 3.1 Coastal environments with low open chenopod shrublands on stony hills or undulating plains +/- Samphire	4	249.689
	NW EP 3.3 Chenopod open shrublands +/- emergent trees	13	123.651
EP 4 Tall shrublands in drainage lines and on plains 	NW EP 4.1 Inland tall shrublands in drainage lines and on plains	1	0.285
EP 6 Coastal Shrublands 	NW EP 6.1 Coastal tall shrublands	1	0
EP 7 Coastal saltmarsh and samphire	NW EP 7.2 Temperate coastal saltmarsh on intertidal flats	1	0

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (BAM sites)	Area in disturbance footprint (ha)
			
EP 12 Mangroves 	NW EP 12.1. Mangroves in tidal areas	1	0

Table 15-6: Broad vegetation communities - SAAL LMR

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (RAM sites)	Area in Disturbance Footprint (ha)
SAAL 1 Stony plains and tableland with chenopod shrublands 	NW SAAL 1.1 Chenopod / samphire low shrublands on stony plains and tableland	11	689.170
SAAL 2 Chenopod shrublands on flat to undulating plains 	NW SAAL 2.1 Chenopod low open shrublands +/- emergent trees	6	129.017
SAAL 3 Ephemeral and permanent drainage lines and waterholes	NW SAAL 3.1 Drainage lines with tall shrubs over *Maireana pyramidata* / chenopod	7	8.179
	NW SAAL 3.2 Drainage lines with tall shrubs +/- Black Oak	5	13.026

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (RAM sites)	Area in Disturbance Footprint (ha)
 	NW SAAL 3.3 Ephemeral to permanent waterholes and drainage lines	1	1.759
	NW SAAL 3.4 Drainage lines with River Red Gum and/or Myall	3	6.049
SAAL 4 Open woodlands of Western Myall and Mulga on sand plains and low dunes 	NW SAAL 4.1 Low open Western Myall woodlands with a chenopod shrub understorey	5	372.557
	NW SAAL 4.2 Mulga woodlands and tall shrublands on plains and low dunes in the Gawler Lakes	1	25.005
SAAL 5 Woodlands and shrublands on low dunes and dune crests 	NW SAAL 5.1 Low dune crests with tall shrubland +/- Cypress-pine woodlands	4	110.456
	NW SAAL 5.2 Cypress-pine woodlands on dune crests	1	47.117
	NW SAAL 5.3 Black Oak woodlands on dunes	1	0.627
	NW SAAL 5.4 Mulga woodlands and tall shrublands on dunes.	1	32.294
SAAL 6 Dune swales with open woodlands, shrublands and tussock grassland 	NW SAAL 6.1 Chenopod low open shrubland in dune swale +/- emergent trees	1	18.066
	NW SAAL 6.2 Tussock grassland in dune swales +/- emergent trees	1	15.263
	NW SAAL 6.3 Open woodlands in dune swales	2	33.992

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (RAM sites)	Area in Disturbance Footprint (ha)
			
SAAL 7 Cane-grass run-on and depressions 	NW SAAL 7.1 Swamp Cane-grass grassland	1	2.394
SAAL 8 Inland saline depressions and drainage lines  	NW SAAL 8.1 Tall shrublands on inland saline depressions	1	0.673
	NW SAAL 8.2 Inland samphire depressions and drainage lines	2	5.163
SAAL 10 Non-saline shrublands in clay depressions 	NW SAAL 10.1 Non-saline shrublands in clay depressions	1	1.426

Major Vegetation Group (representative photos)	Broad Vegetation Community	No. of VAs (RAM sites)	Area in Disturbance Footprint (ha)
SAAL 11 Sandhill Cane-grass grassland. 	NW SAAL 11.1 Sandhill Cane-grass grassland.	1	5.516
SAAL 12 Woodlands of Black Oak on flat undulating plains 	NW SAAL 12.1 Woodlands of Black Oak on flat undulating plains	1	15.741

Groundwater dependent ecosystems

Some of the vegetation associations present may rely on the presence of groundwater for part of their lifecycle (i.e. groundwater dependent vegetation forming groundwater dependent ecosystems (GDEs)). GDEs are discussed in Chapter 14 Groundwater.

15.4.3 EPBC-listed threatened ecological communities

The EPBC Act PMST output for the Study Area highlighted three threatened ecological communities (TECs) with potential to occur within the Study Area. Two were found not to be present, with one (Subtropical and Temperate Coastal Saltmarsh) known to occur. These communities are summarised briefly below, with further detail provided in Section 4.4 of the Terrestrial Ecology Assessment (Appendix I-1).

Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of SA (Critically Endangered) has not been previously mapped in or near the Project Area, is not known to occur west of Port Augusta and was not observed during field surveys.

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered) occurs in higher rainfall areas near Adelaide and the Flinders Ranges and the Project Area occurs outside its known range.

Subtropical and Temperate Coastal Saltmarsh (Vulnerable) occurs in many areas along the coast of Spencer Gulf. The Subtropical and Temperate Coastal Saltmarsh TEC relies on regular or intermittent tidal influence or weather assisted tides such as storm surges, some saltmarsh communities are reliant on groundwater tidal flows (DSEWPC 2013). Patches of saltmarsh that have been disconnected (either naturally or artificially) from a tidal regime are excluded from the definition of this community.

This TEC was observed adjacent to the proposed desalination site during field surveys, in mixed Samphire (*Tecticornia* spp.) shrubland in an area experiencing tidal influence. The location of the TEC in relation with the Project Area is shown Figure 15-4. As it is listed as a Vulnerable threatened ecological community, it is not a MNES for the purposes of Part 3 of the EPBC Act (requirements for environmental approvals).

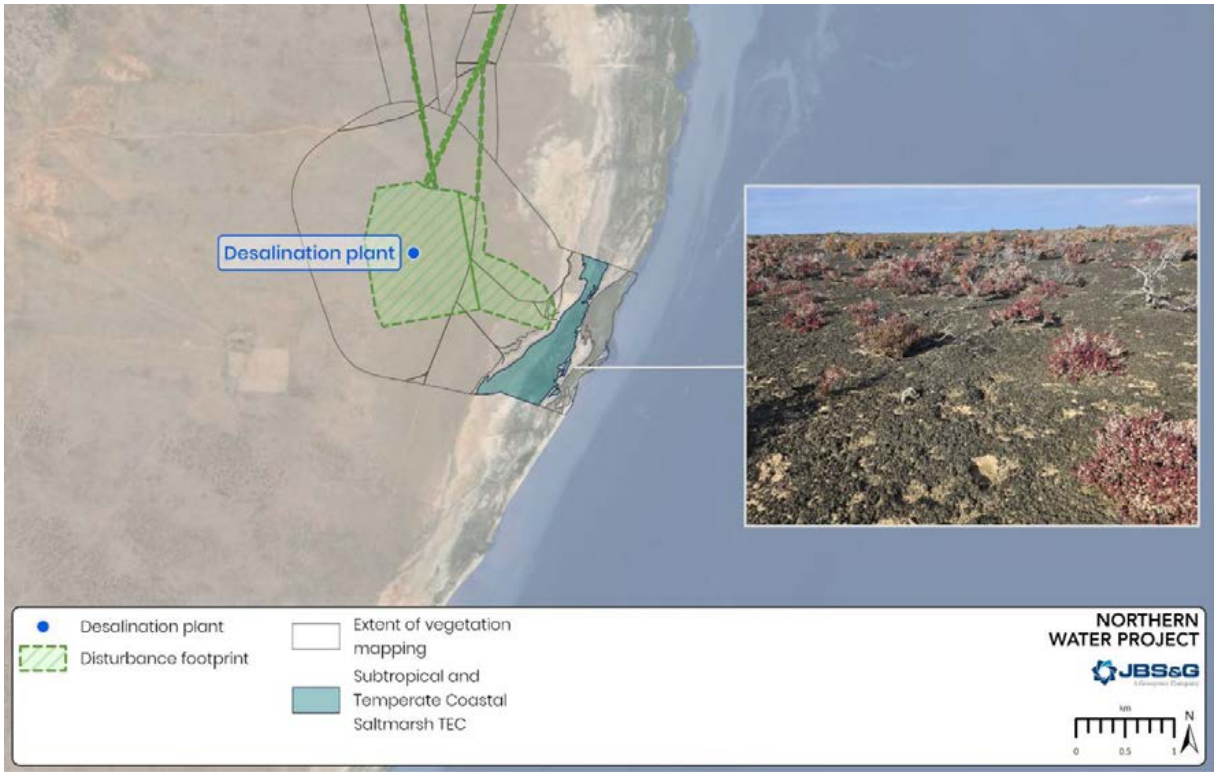


Figure 15-4: Subtropical and Temperate Coastal Saltmarsh TEC - desalination plant

15.4.4 EPBC-listed threatened flora

The desktop assessment (using the PMST and BDBSA) identified four flora species listed as threatened under the EPBC Act that could potentially occur within the EP LMR Study Area, and 21 EPBC-listed threatened species that could potentially occur in the SAAL LMR Study Area.

The likelihood of occurrence assessment determined that all of these species are unlikely to occur in or near the disturbance footprint. The full likelihood of occurrence assessment is provided in Appendix C of the Terrestrial Ecology Assessment (Appendix I-1).

No EPBC-listed flora species were detected in field surveys and there are no database records in or near the disturbance footprint.

Although the DEW biodiversity values mapping predicted that the EPBC-Vulnerable *Frankenia plicata* was of moderate concern due to its modelled distribution and potential for interaction with the Project, this species was assessed as being unlikely to occur based on field surveys and review of database records (noting that a number of herbarium records have been misidentified and updates are ongoing, as discussed in Appendix I-1).

Records[6] of EBPC-listed flora in the Study Area are shown in Figure 15-5 and Figure 15-6.

[6] As per NVC (2024a and b) only records from 1995 onwards and locational reliability <1 km are shown.

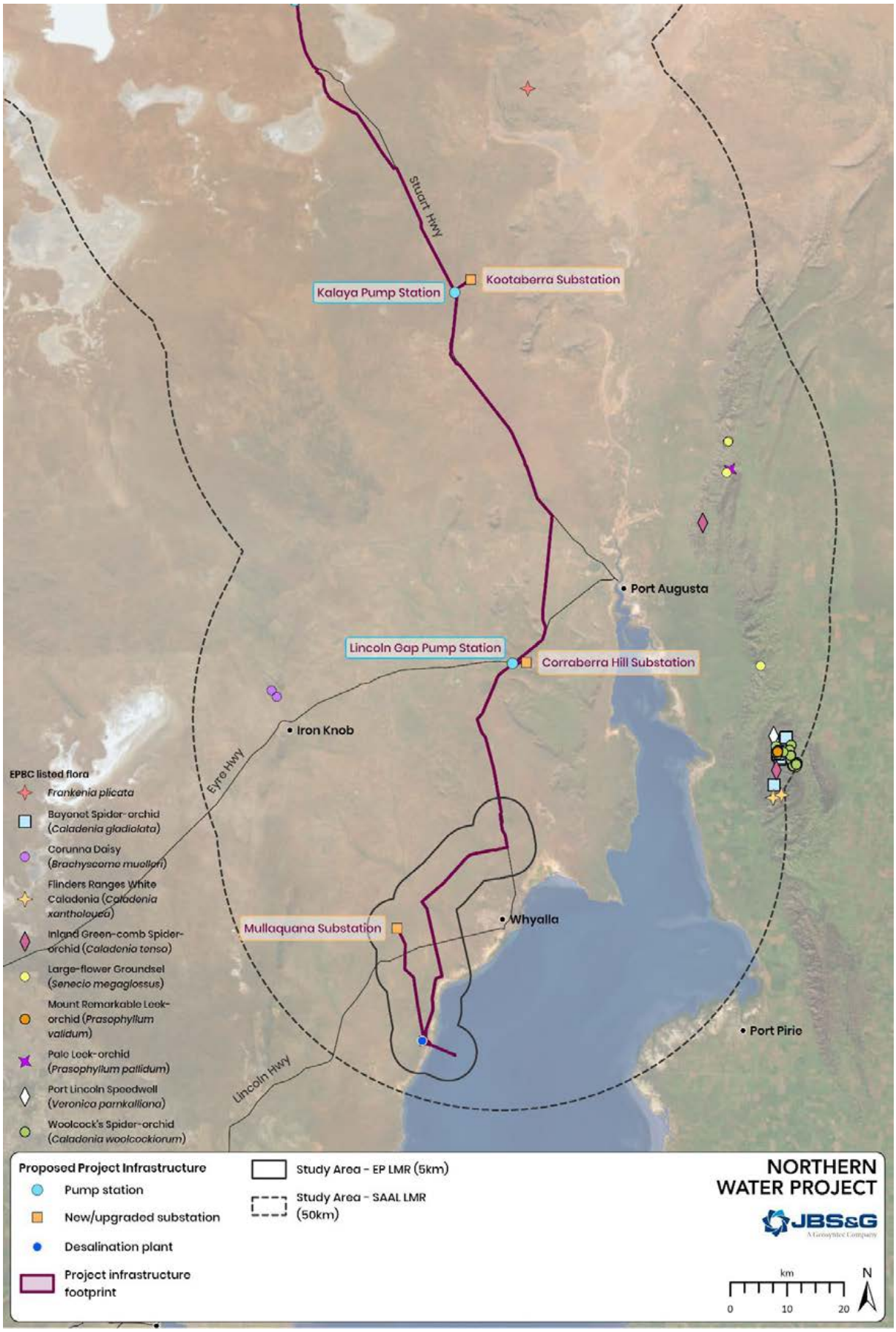


Figure 15-5: Records of EPBC-listed flora in the Study Area – southern section

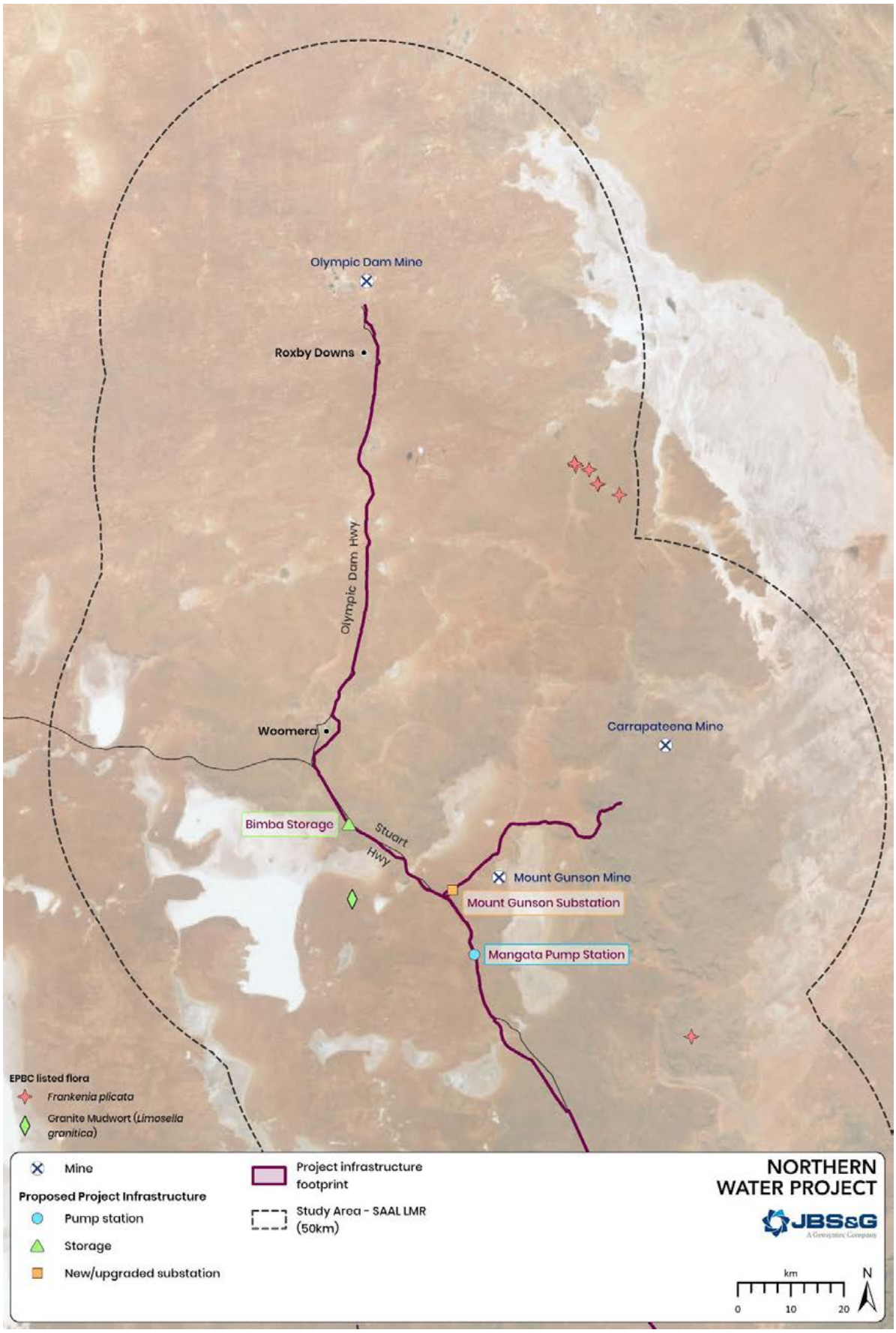


Figure 15-6: Records of EPBC-listed flora in the Study Area – northern section

15.4.5 State-listed flora and vegetation communities

State-listed vegetation communities

None of the vegetation communities identified in assessments undertaken for the Project are included on lists of rare or threatened vegetation communities in South Australia (DEH 2001, NVC 2026).

State-listed flora

The desktop assessment identified three flora species listed as rare or threatened under the NPW Act that could potentially occur within the EP LMR Study Area, and 12 Rare or threatened species that could potentially occur in the SAAL LMR Study Area. These did not include flora species also listed as threatened under the EPBC Act. The likelihood of occurrence assessment determined that one of these species, Sandalwood (*Santalum spicatum*, Vulnerable) is known to occur adjacent to the disturbance footprint. A further seven Rare species and one Vulnerable species were considered possible. The remaining species were considered to be unlikely.

Table 15-7 summarises the results of the likelihood of occurrence assessment for all species other than those considered unlikely to occur. The full likelihood of occurrence assessment (which includes species considered unlikely and provides justification for the likelihood assessment) is provided in Appendix C of the Terrestrial Ecology Assessment (Appendix I-1).

Records[7] of State-listed flora in the Study Area are shown in Figure 15-7 and Figure 15-8.

Table 15-7: State-listed rare or threatened flora - possible, known or likely to occur

Species	Common name	NPW[1]	Likelihood (EP)	Likelihood (SAAL)
Austrostipa breviglumis	Cane Spear-grass	R	N/A	Possible
Citrus glauca	Desert Lime	V	N/A	Possible
Frankenia subteres	Round Sea-heath	R	N/A	Possible
Gilesia biniflora	Western Tar-vine	R	N/A	Possible
Gratwickia monochaeta	One-bristle Everlasting	R	N/A	Possible
Malacocera gracilis	Slender Soft-horns	V	Possible	Possible
Orobanche cernua var. australiana	Australian Broomrape / Native Broomrape	R	Possible	N/A
Roepera humillima	Small-fruit Twinleaf	R	N/A	Possible
Santalum spicatum	Sandalwood	V	**Known**	**Known**
Wurmbea stellata	Star Nancy	R	N/A	Possible

[1] SA NPW status: Endangered (E); Vulnerable (V); Rare (R).

Further information on Sandalwood, which is considered known to occur, is provided below.

[7] As per NVC (2024a and b) only records from 1995 onwards and locational reliability <1 km are shown.

Sandalwood – *Santalum spicatum* - Vulnerable

Sandalwood is known to occur in open woodlands over chenopods, chenopod shrublands and tall chenopod shrublands within both the EP and SAAL LMRs. It is a shrub or tree growing up to 8 m in height with dark green leaves, fragrant flowers and edible nuts. Sandalwood grows in sandy, gravel and loam soils and has been observed near granite outcrops as well as dune crests, ridges and hill foot-slopes.

The species is listed due to low recruitment and severe population fragmentation. Commercial timber harvesting has almost exhausted the wild population. Field surveys identified two individuals; near Woomera (outside the disturbance footprint) and south-west of Whyalla and there are historic records near the Project alignment.

15.4.6 Other species of interest

Regionally listed flora species

Regionally listed species are not listed as rare or threatened in South Australia under the NPW Act, but have been assessed as either rare or threatened at a regional level (see Gillam and Urban 2009 and Gillam and Urban 2013). The Project traverses two regions defined by DEW – West and Outback.

The DEW biodiversity values mapping identified that the following regionally listed flora species were of moderate concern due to their modelled distribution and potential interactions with the Project:

- *Angianthus glabratus* – Rare (West and Outback)
- *Maireana cannonii* – Rare (West and Outback)
- *Rhodanthe troedelii* – Rare (West) and Near Threatened (Outback)
- *Sclerolaena bicuspis* – Rare (West and Outback)
- *Senna cardiosperma*– Rare (West) and Near Threatened (Outback).

Senna cardiosperma ssp. *gawlerensis* (Gawler Ranges Senna) was recorded during field surveys in the SAAL LMR. The other species listed above were not recorded.

Culturally significant species

As discussed in Chapter 16 Aboriginal Cultural Heritage, various types of mature vegetation have been identified as significant to Traditional Owners. During engagement activities, both Barngarla Determination Aboriginal Corporation (BDAC) and Kokatha Aboriginal Corporation RNTBC (KAC) expressed their preference for minimising the impact to mature vegetation (trees), and to minimising impacts on specific species including Black Oak (*Casuarina pauper*), Mallee (various *Eucalyptus* species), Mulga (*Acacia aneura*), Sandalwood (*Santalum spicatum*), Quandong (*Santalum acuminatum*), Western Myall (*Acacia papyrocarpa*), and bush medicine (*Eremophila alternifolia*).

The tree species identified are relatively common and widespread throughout most of the Project Area, with the exception of Sandalwood, which was recorded at only two locations (outside the disturbance footprint) and is known from historic records near the Project alignment (see Section 15.4.5).

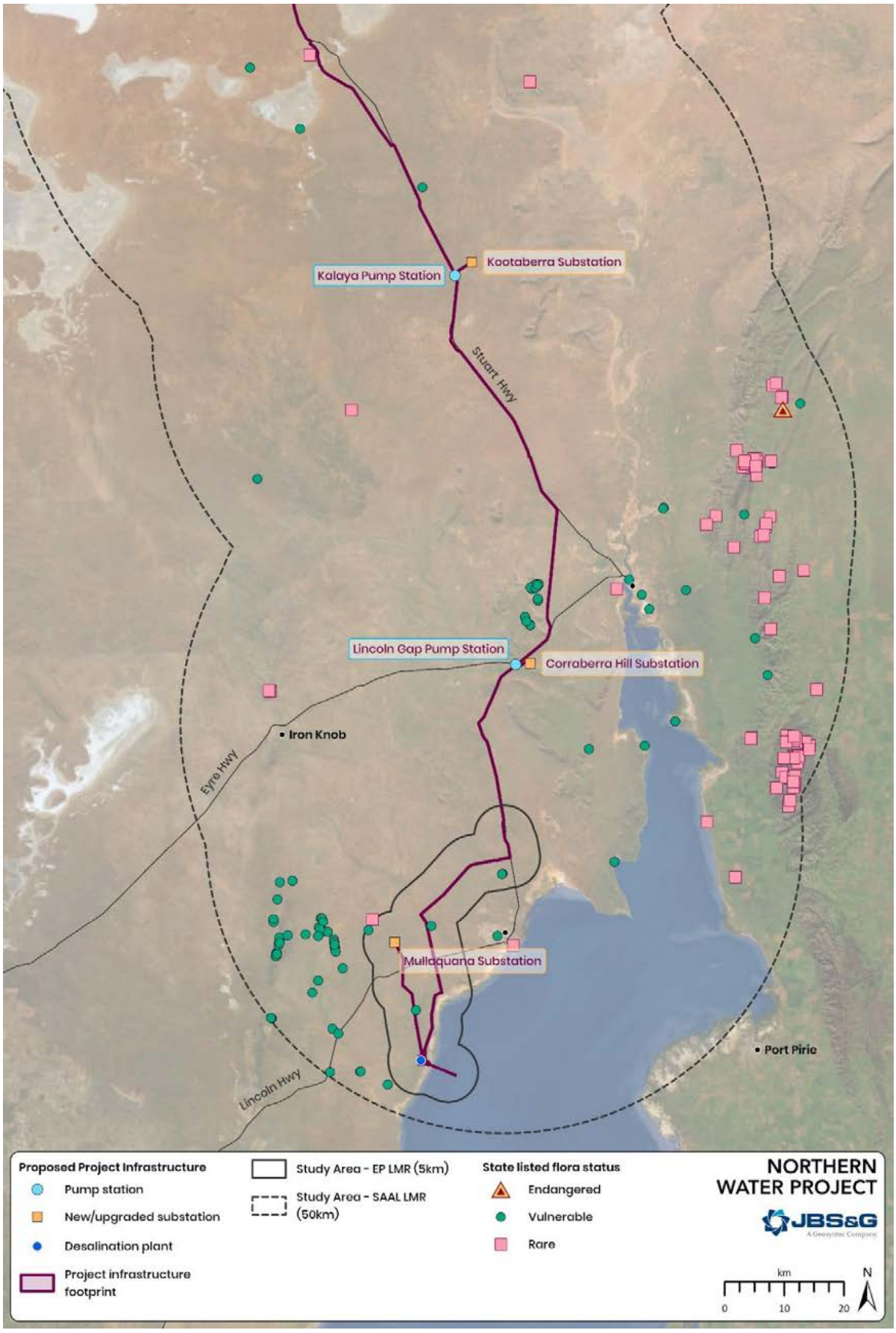


Figure 15-7: Records of State-listed flora in the Study Area – southern section

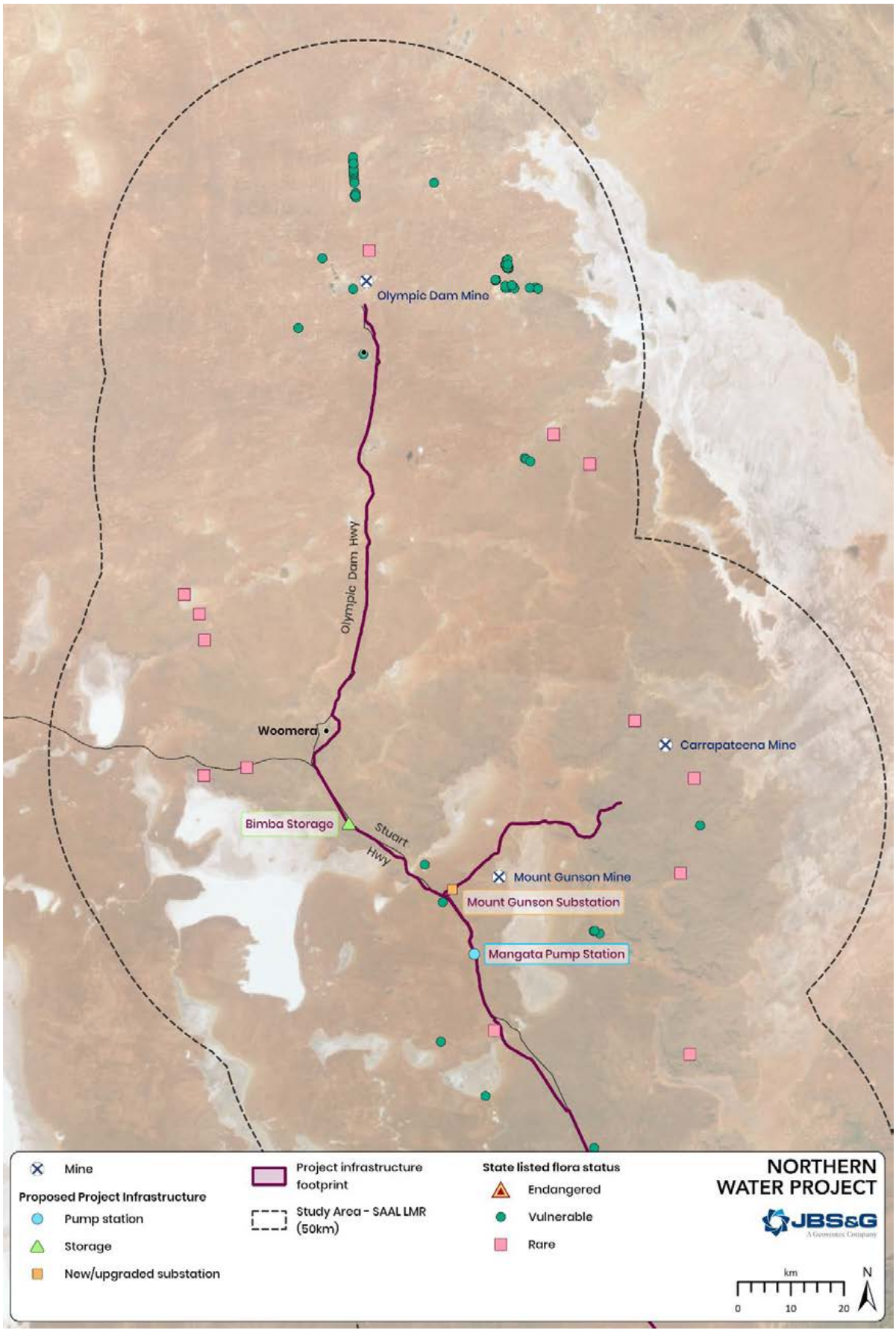


Figure 15-8: Records of State-listed flora in the Study Area – northern section

15.4.7 Native fauna and habitats

Fauna habitats

The main habitat types present along the Project alignment are described in Table 15-8. These habitats are based on the Major Vegetation Groups identified in the Project Area and are defined in the Terrestrial Ecology Assessment (Appendix I-1). They have been used in the likelihood assessments that are contained in Appendix I-1.

Table 15-8: Key fauna habitat within or near the disturbance footprint

Key habitat types	Description	Notable fauna that are known or likely[8] to use habitat (EPBC Status/ NPW Status)[9]
Eyre Peninsula Landscape Management Region		
Coastal dunes / beaches	Well-vegetated coastal dunes aid in the control of coastal erosion and wind damage to native flora. With several different zones (i.e. terrestrial, aquatic, tidal) this habitat type provides key habitat for many fauna and flora species. The PMST and BDBSA searches highlighted threatened and / or migratory bird species which rely on this habitat for breeding and foraging.	• Red-necked Stint (*Calidris ruficollis*) (MW/-) • Banded Stilt (*Cladorhynchus leucocephalus*) (-/V) • Little Egret (*Egretta garzetta nigripes*) (-/R) • Sooty Oystercatcher (*Haematopus fuliginosus fuliginosus*) (-/R) • Pied Oystercatcher (*Haematopus longirostris*) (-/R) • Little Tern (*Sternula albifrons*) (MW, VU/-) • Australian Fairy Tern (*Sternula nereis nereis*) (VU/E) • Common Greenshank (*Tringa nebularia*) (EN, MW/-)
Coastal saltmarsh / coastal samphire / mangrove	Historically, these habitats have been overlooked, causing them to become threatened in many regions. Flora associated with the habitats are often endemic to restricted areas, and others, such as Bead Samphire (*Tecticornia flabelliformis*), are nationally threatened due to the removal and degradation of key coastal habitats. Such habitats are critical for maintaining water quality and controlling coastal erosion, as well as providing suitable breeding and foraging habitat for both aquatic and terrestrial fauna.	• Red-necked Stint (*Calidris ruficollis*) (MW/-) • Banded Stilt (*Cladorhynchus leucocephalus*) (-/V) • Sooty Oystercatcher (*Haematopus fuliginosus fuliginosus*) (-/R) • Pied Oystercatcher (*Haematopus longirostris*) (-/R) • Blue-winged Parrot (*Neophema chrysostoma*) (VU/V)

[8] A likelihood of occurrence assessment of listed fauna was undertaken for each key habitat type and is detailed in Appendix I-1.

[9] EPBC status: Endangered (EN); Vulnerable (VU); Migratory Wetland (MW); Migratory Terrestrial (MT); Migratory Marine (MM). NPW status: Endangered (E); Vulnerable (V); Rare (R).

Key habitat types	Description	Notable fauna that are known or likely[8] to use habitat (EPBC Status/ NPW Status)[9]
	Several threatened and / or migratory bird species highlighted in the PMST and BDBSA searches utilise these saline environments to forage for specific invertebrates.	
Open woodlands over chenopod/ chenopod shrublands/ tall chenopod shrublands	A major habitat type along the disturbance footprint and surrounding region. Chenopods are typically slow-growing and long-lived. They provide rich nutrients for both native fauna and livestock, which can result in fragmented patches and allow for invasive species to infiltrate. Often diverse, these habitats have multiple strata which can be utilised by a wide range of flora, fauna and fungi. Birds of prey may utilise tree canopies to hunt and construct large nests, while shrubby strata can provide shelter, nesting, and foraging opportunities for birds, mammals, and reptiles. Insect / pollinator diversity also thrives in diverse chenopod shrublands, which aids in a range of ecological processes.	• Western Grasswren (*Amytornis textilis myall*) (VU/V) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-) • Australian Bustard (*Ardeotis australis*) (-/V) • Chestnut-rumped Heathwren (*Hylacola pyrrhopygia*) (-/E) • Blue-winged Parrot (*Neophema chrysostoma*) (VU/V) • Gilbert's Whistler (*Pachycephala inornata*) (-/V) • Grey-headed Flying Fox (*Pteropus poliocephalus*) (VU/R)
SA Arid Lands Landscape Management Region		
Ephemeral creeks / drainage lines	Habitats are largely dry except during and after major rainfall events. They provide valuable inland habitat for many threatened and/or rare fauna including migratory birds such as the nationally threatened Curlew Sandpiper (*Calidris ferruginea*). When not inundated, cracks in clay soils can offer refuge habitat for fauna such as frogs. Drainage lines can support a range of vegetation types including open-to-closed shrubland and woodland. Wetland associated flora such as sedges and rushes can further increase the diversity of flora / fauna seen within this habitat.	• Western Grasswren (*Amytornis textilis myall*) (VU/V) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-) • Musk Duck (*Biziura lobata menziesi*) (-/R) • Grey-headed Flying Fox (*Pteropus poliocephalus*) (VU/R)

Key habitat types	Description	Notable fauna that are known or likely[8] to use habitat (EPBC Status/ NPW Status)[9]
Grasslands / woodlands in dune swales	The environment between sand dunes where the soil is more structured. Temperatures in these areas get hotter than surrounding dunes. Swales are typically more impermeable and hold surface water at higher rates creating ponds after rains. As seeds remain in the soil during drought induced die-back, many herbaceous plants emerge following large rain events. The PMST and BDBSA searches highlighted several threatened bird and flora species which may occur within this habitat.	• Australian Bustard (Ardeotis australis) (-/V) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-)
Low dunes and dune crests of *Acacia* and *Callitris*	These habitats are formed and changed by accreting sand and succumbing to wind erosion. Many native mammals in the critical weight range (the most at-risk group) are supported by dunes with sufficient vegetation. They are able to burrow into the well-stabilised soils and forage for a wide range of invertebrates. Many reptiles and bird species also occur in this habitat type. The PMST and BDBSA results highlighted several threatened bird species and some mammals which can occur in this habitat.	• Western Grasswren (*Amytornis textilis myall*) (VU/V) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-) • Pernatty Knob-tailed Gecko (*Nephrurus deleani*) (-/R)
Open woodlands over chenopod/chenopod shrublands/tall shrublands of *Senna*, Mulga on plains	A major habitat type within the Project Area and surrounding region. Chenopods are typically slow-growing and long-lived. They provide rich nutrients for both native fauna and livestock, which can result in fragmented patches and allow invasive species to establish. Often diverse, these habitats have multiple strata which can be utilised by a wide range of flora, fauna and fungi.	• Slender-billed Thornbill (western) (*Acanthiza iredalei iredalei*) (-/R) • Western Grasswren (*Amytornis textilis myall*) (VU/V) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-) • Australian Bustard (*Ardeotis australis*) (-/V) • Major Mitchell's Cockatoo / Pink Cockatoo (*Lophochroa leadbeateri*) (-/R)

Key habitat types	Description	Notable fauna that are known or likely[8] to use habitat (EPBC Status/ NPW Status)[9]
	Birds of prey may utilise tree canopies to hunt and construct large nests, while shrubby strata can provide shelter, nesting, and foraging opportunities for birds, mammals, and reptiles. Insect/pollinator diversity also thrives in diverse chenopod shrublands, which aids in a range of ecological processes.	• Blue-winged Parrot (*Neophema chrysostoma*) (VU/V) • Elegant Parrot (*Neophema elegans elegans*) (-/R) • Scarlet-chested Parrot (*Neophema splendida*) (-/R) • Grey-headed Flying Fox (*Pteropus poliocephalus*) (VU/R)
Tableland and inland saline depressions, inland samphire	A major habitat type within the Project Area and surrounding region. Flat, stony (gibber plain) tablelands with scattered low-open chenopod shrublands. Often includes cracking clay habitat. This tableland is considered hostile due to extreme conditions, including high temperatures and limited resources. As such, many inhabitant species are moderately to highly specialised. Many avian species are likely to occur in this habitat within the disturbance footprint including several threatened species. Gibber plains and depressions with Swamp Cane-grass, such as those occurring west of Pernatty Lagoon, provide habitat for fauna such as the nationally threatened Plains Mouse. Gibber plains (from "kibba", meaning "stone") also hold major cultural significance to Aboriginal people.	• Slender-billed Thornbill (western) (*Acanthiza iredalei iredalei*) (-/R) • Southern Whiteface (*Aphelocephala leucopsis*) (VU/-) • Australian Bustard (*Ardeotis australis*) (-/V) • Blue-winged Parrot (*Neophema chrysostoma*) (VU/V) • Plains Mouse (*Pseudomys australis*) (VU/V)

Important Habitat Areas

Important habitat areas in the Project Area include habitat for listed species, which is detailed under individual species description in Sections 15.4.8, 15.4.9, 15.4.10 and the Significant Impact Assessment (Appendix I-6) and Migratory Birds Impact Assessment (Appendix I-4).

Birdlife Australia have also identified a number of Key Biodiversity Areas (KBAs) that meet the criteria of IUCN (2016) in vicinity of the Project Area. These include the Arcoona Lakes KBA located along the Olympic Dam Highway, adjacent to the disturbance footprint (KBA 2024) and approximately 1.6 km from the disturbance footprint at the closest point. The Arcoona Lakes KBA is a series of inland, ephemeral lakes which were identified as important habitat for Freckled Duck, Pink-eared Duck, Hardhead, Grey Teal, Banded Stilt, Red-capped Plover, Blue-billed Duck, Inland Dotterel and Bourke's Parrot during periods of infrequent inundation.

Habitat identified as important under the Australian National Directory of Important Migratory Shorebird Habitat (Driessen et al. 2025) includes the Whyalla salt fields and effluent ponds (which are located approximately 6 km from the Project) as well as the Arcoona Lakes KBA.

15.4.8 EPBC-listed threatened fauna

The desktop assessment (using the PMST and BDBSA) identified 41 terrestrial fauna species listed as threatened under the EPBC Act that could potentially occur within the EP LMR Study Area, and 55 listed threatened species that could potentially occur in the SAAL LMR Study Area.

The likelihood of occurrence assessments determined that three of these species (Western Grasswren, Southern Whiteface and Blue-winged Parrot) are known to occur within at least one habitat type in the disturbance footprint with a fourth species (Little Tern) recorded adjacent to the terrestrial disturbance footprint and considered likely to occur (refer Appendix I-4). A total of five species were considered likely and 13 species considered possible. The remaining species were considered to be unlikely.

Table 15-9 summarises the results of the likelihood of occurrence assessments for species other than those considered unlikely to occur. The likelihood of occurrence assessments for all species (including species considered unlikely to occur) are summarised in the Significant Impact Assessment[10] (Appendix I-6) and full details of the assessments (including justification) are provided in Migratory Birds Impact Assessment (Appendix I-4) for migratory bird species and Appendix C of the Terrestrial Ecology Assessment (Appendix I-1) for all other species and threatened ecological communities.

Records[11] of EBPC-listed fauna in the Study Area are shown in Figure 15-9 to Figure 15-12.

Table 15-9: EPBC-listed threatened fauna - possible, likely or known to occur

Species	Common name	EPBC[1]	NPW[2]	Last record[3]	Likelihood
Known or likely species					
Amytornis textilis myall	Western Grasswren	VU	V	2024	**Known** (EP), **Known** (SAAL)

[10] The Significant Impact Assessment also addresses marine species which are not considered in this chapter.

[11] As per NVC (2024a and b) only records from 1995 onwards and locational reliability <1 km are shown.

Species	Common name	EPBC[1]	NPW[2]	Last record[3]	Likelihood
Aphelocephala leucopsis	Southern Whiteface	VU	-	2025	**Known** (EP), **Known** (SAAL)
Calidris acuminata	Sharp-tailed Sandpiper	VU, MW	-	2024	Likely
Neophema chrysostoma	Blue-winged Parrot	VU	V	2023	**Known** (EP), **Known** (SAAL)
Sterna albifrons	Little Tern	VU, MM	-	2023	Likely
Sternula nereis nereis	Australian Fairy Tern	VU	E	2024	Likely (EP), Unlikely (SAAL)
Pseudomys australis	Plains Mouse	VU	V	2024	N/A (EP), Likely (SAAL)
Pteropus poliocephalus	Grey-headed Flying-fox	VU	R	2024	Likely (EP), Likely (SAAL)
Possible species					
Amytornis modestus	Thick-billed Grasswren	VU	-	2021	N/A (EP), Possible (SAAL)
Arenaria interpres interpres	Ruddy Turnstone	VU, MW	R	2017	Possible
Calidris canutus	Red Knot	VU, MW	-	2024	Possible
Calidris ferruginea	Curlew Sandpiper	CE, MW	E	2025	Possible
Calidris tenuirostris	Great Knot	VU, MW	E	2024	Possible
Charadrius leschenaultii	Greater Sand Plover	VU, MW	R	2024	Possible
Falco hypoleucos	Grey Falcon	VU	R	2014	Possible (EP), Possible (SAAL)
Limosa lapponica baueri	Nunivak Bar-tailed Godwit	EN, MW	R	2024	Possible
Numenius madagascariensis	Eastern Curlew	CE, MW	E	2024	Possible
Pluvialis squatarola	Grey Plover	VU, MM	-	2019	Possible
Thinornis cucullatus cucullatus	Eastern Hooded Plover	VU	V	-	Possible (EP), Unlikely (SAAL)
Tringa nebularia	Common Greenshank	EN, MW	-	2024	Possible
Notomys fuscus	Dusky Hopping-mouse	VU	V	-	N/A (EP), Possible (SAAL)

[1] EPBC Act status: Critically Endangered (CE); Endangered (EN); Vulnerable (VU); Migratory Wetland (MW); Migratory Terrestrial (MT); Migratory Marine (MM)

[2] SA NPW status: Endangered (E); Vulnerable (V); Rare (R).

[3] Most recent record between EP and SAAL LMR.

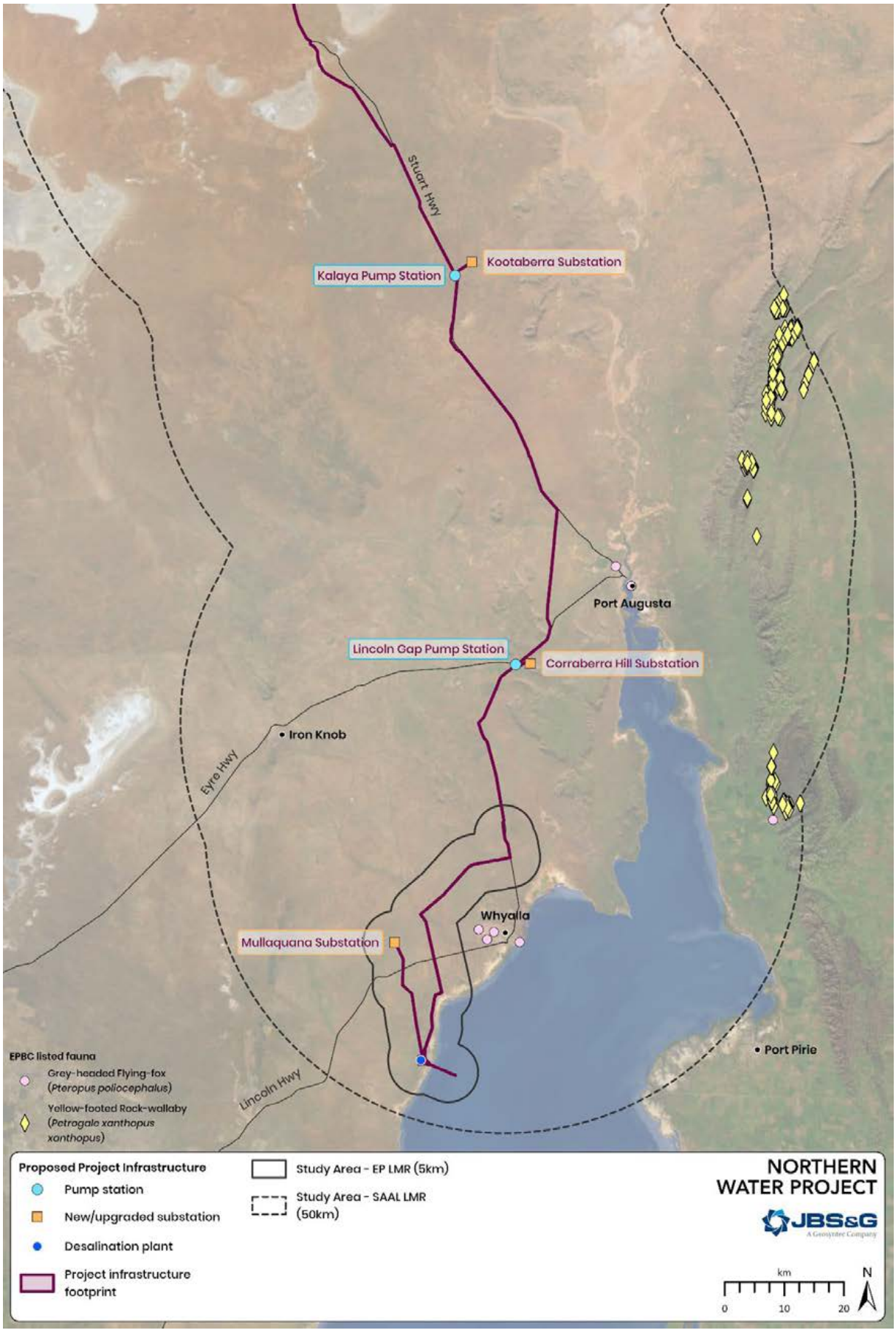


Figure 15-9: Records of EPBC-listed mammals in the Study Area – southern section

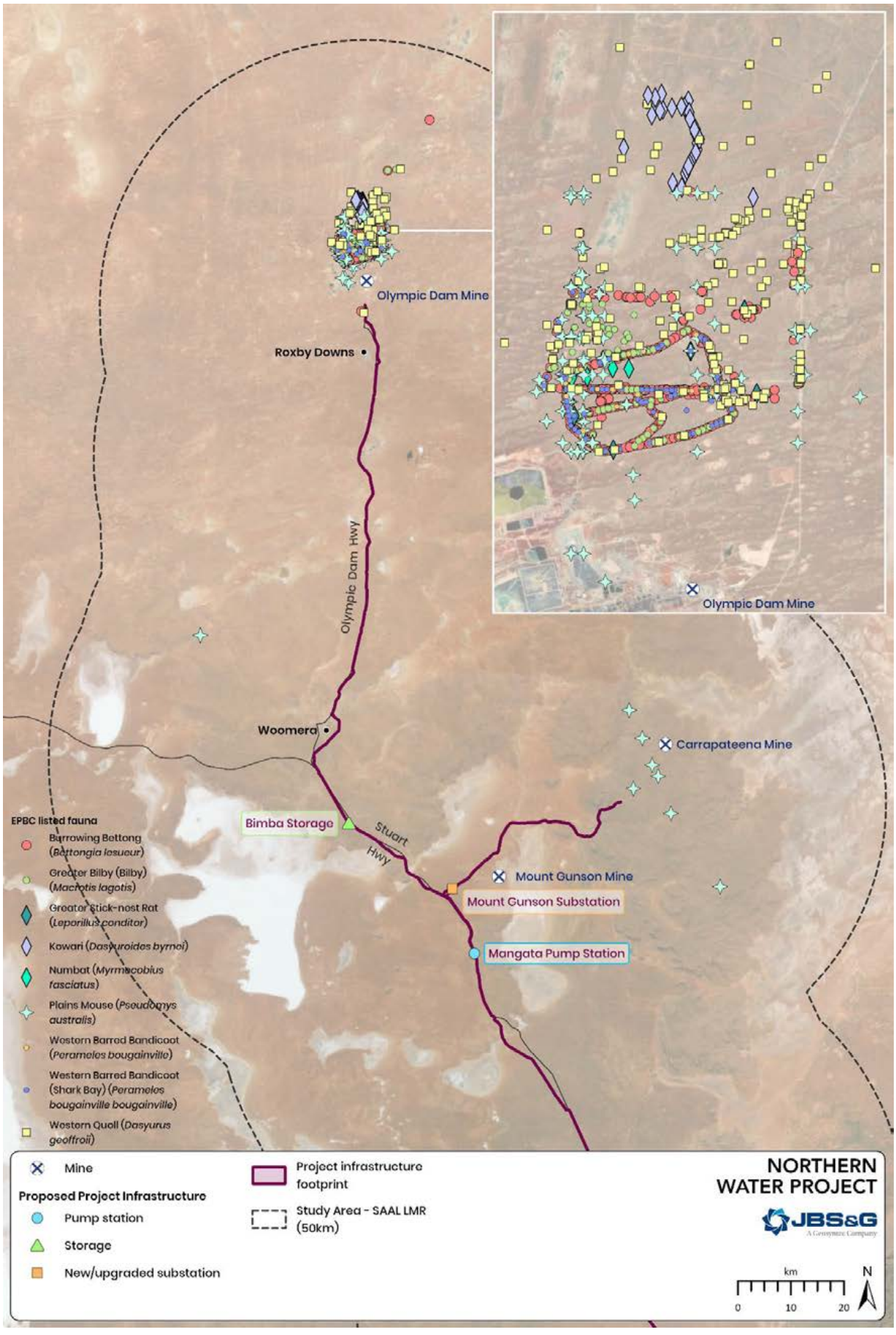


Figure 15-10: Records of EPBC-listed mammals in the Study Area – northern section

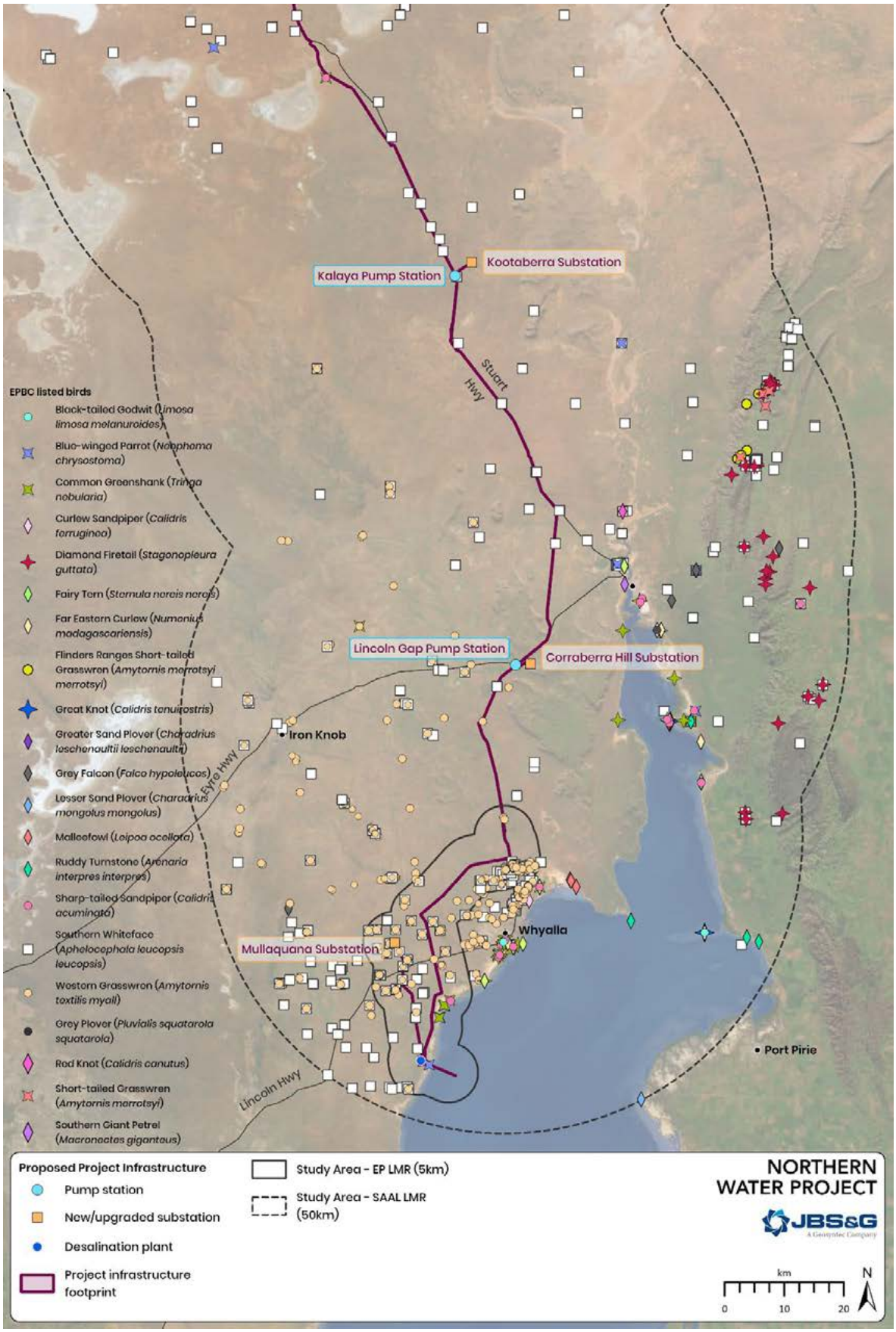


Figure 15-11: Records of EPBC-listed birds in the Study Area – southern section

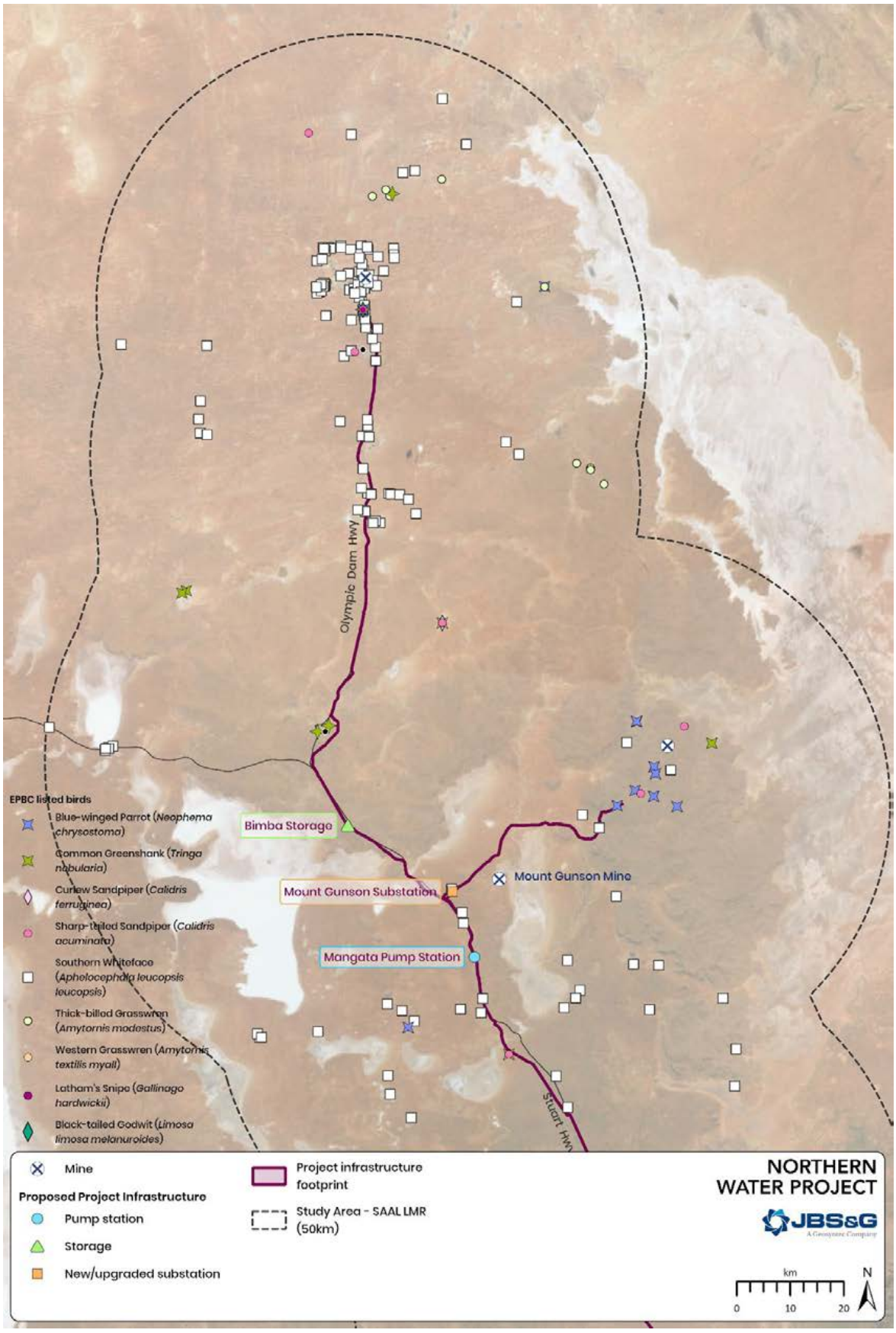


Figure 15-12: Records of EPBC-listed birds in the Study Area – northern section

Information on species listed as threatened under the EPBC Act and considered possible, likely or known to occur is provided below, with a focus on the species that are known or likely to occur. Threatened shorebirds are addressed as a group. Further detail on these species (including detailed habitat mapping) is provided in Section 4.6.2 of the Terrestrial Ecology Assessment (Appendix I-1).

Western Grasswren (Gawler Ranges) (*Amytornis textilis myall*) - Vulnerable



The Western Grasswren (Gawler Ranges) is small endemic songbird subspecies occurring in the Gawler ranges in SA (*Amytornis textilis myall*). The total subspecies population has been estimated at around 8,400 individuals across more than ten locations (DoE 2014; Garnett et al. 2011) with more recent estimates of 12,000 individuals (Garnett and Baker 2021). Distribution is limited to areas of suitable habitat on the western side of Spencer Gulf in SA (Rowley et al. 2020).

The species inhabits arid and semi-arid shrublands that contain various combinations of saltbush, bluebush and wattles. The species is scattered and widespread in the Myall Creek and Pine Creek drainages of the north-eastern Eyre Peninsula, bounded in the south by Munyaroo Conservation Park, and in the north towards Lake MacFarlane and eastern Lake Gairdner and Lake Gilles Conservation Park (Garnett and Baker, 2021). The extent of occurrence is estimated as 19,000 km^2 (Garnett and Baker, 2021).

The species is sedentary and does not exhibit migratory movements or nomadic responses to resource fluctuations. Breeding behaviour is poorly described but is thought to occur during late June through to September with monogamous pairs or groups requiring a territory of around one hectare in optimal seasons (Higgins et al. 2001, DoE 2014).

Preferred habitat is characterised by moderate to high shrub cover with dense, tall chenopod or spiny shrubs, typically around drainage-lines where shrub density and structural complexity are greatest (Black et al. 2009). Dominant shrub species in preferred habitat include Black Bluebush (*Maireana pyramidata*), Australian Boxthorn (*Lycium australe*), Spiny Saltbush (*Rhagodia spinescens*) and Bladder Saltbush (*Atriplex vesicaria*).

Atypical habitat still supports the species at lower shrub cover levels, often outside drainage lines, but remains suitable where dense patches of spiny shrubs provide a 'high cover' refuge, particularly within otherwise connected landscapes (Black et al. 2009). Low-potential areas (<15% cover or sparse / short shrubs) lack sufficient structure, while unsuitable habitat (<1% shrub cover) lacks the vegetation complexity required for shelter, nesting, and predator avoidance (Black et al. 2009). Refer to Appendix I-1 (Terrestrial Ecology Assessment, Section 3.3.2.1) for detailed discussion of habitat suitability.

Western Grasswren was classed as known to occur in the disturbance footprint for the transfer system and electricity infrastructure; field surveys observed a number of individuals around Whyalla, in particular between Mullaquana Station and Whyalla CP as discussed further below. The known range of Western Grasswren intersects with the disturbance footprint between Mullaquana Station and north of Port Augusta and there are numerous records in this region.

Potential habitat (including preferred, atypical and low suitability habitat) for the species was observed throughout the entire southern portion of the Project Area, ranging from north-west of Port Augusta to Mullaquana Station and occurs extensively throughout the broader region.

An overview of suitable habitat for Western Grasswren within and adjacent to the disturbance footprint (and in other areas subject to field survey) is shown in Figure 15-13, along with database and field survey records. Detailed habitat mapping is provided in Appendix I-1 (Terrestrial Ecology Assessment, Appendix B6). Database records of Western Grasswren within the Study Area (including date of record and habitat information where available) are summarised in Appendix I-10 Western Grasswren and Plains Mouse Database Records.

Approximately 747 ha of potential habitat, ranging from low potential to preferred, was mapped within the disturbance footprint, including 136 ha of preferred habitat and 266 ha of atypical habitat on the transfer system and electricity infrastructure alignments, predominantly between Whyalla and Port Augusta. A further 189 ha of habitat that was conservatively classified as atypical (but considered marginal and unlikely to support core populations or serve as important breeding habitat, as discussed below) was mapped in the disturbance footprint at the desalination plant site.

Western Grasswren was recorded at over 20 survey sites in or near the Project Area, mostly between Mullaquana Station and Whyalla Conservation Park. Appendix I-1 Terrestrial Ecology Assessment, Section 4.6.2.1.2 provides additional detail on field survey results, including summary details for all Western Grasswren field observations in Table 4-46.

The species has not been detected at the Mullaquana Station desalination plant site despite intensive search effort including timed area searches, call playback and song meter deployments over multiple survey periods. This area has been conservatively assessed as providing atypical habitat for the species, however vegetation at the site (in vegetation association BAM 142) lacks the structural characteristics typically associated with key breeding or foraging habitat, including the density and height of chenopod shrubs preferred by Western Grasswren. Although opportunistic use by Western Grasswren during periods of high abundance or favourable conditions cannot be excluded, habitat within the disturbance footprint at the desalination plant site is considered to be marginal and unlikely to support core populations or serve as important breeding habitat.

Survey effort for Western Grasswren is considered to broadly align with the recommendations of the survey guidelines for Australia's threatened birds (DEWHA 2010), noting that the guidelines are not ideally suited to linear projects. The guidelines recommend use of area searches or transect surveys as well as broadcast surveys, especially in the breeding season.

Targeted timed area searches and song meter deployment for Western Grasswren were undertaken in the southern section of the Project Area (around Mullaquana Station, Whyalla and northwards towards Port Augusta) to align with known species ranges and previous records. Survey effort aligned with recommendations in DEWHA (2010), which suggest a survey duration over three days (15 person hours), using timed area searches (detection of calls and sightings of birds) early in the morning to determine presence / absence. The total timed area search time for the Project was over 50 hours. This was supplemented by song meter recordings in the morning and evening, as outlined in Section 3.3.2.2 of Appendix I-1.

The combination of the timed area searches (often utilising call-playback) and deployment of song meters is considered to be appropriately aligned with the survey recommendations in the guidelines (see Appendix I-1, Terrestrial Ecology Assessment, Sections 3.3.2 and 4.6.2.1 for further discussion).

It is acknowledged that the spatial coverage of targeted searches for Western Grasswren across the disturbance footprint, while extensive, is uneven and concentrated on key areas (e.g. on Mullaquana Station and near Whyalla). This is a function of the large geographic extent and linear nature of the Project which meant that undertaking targeted survey in every location of potential habitat on the alignment was not feasible. It is unlikely that additional information gathered through further survey effort will provide value, as Western Grasswren are difficult to detect, and a non-detection in a survey on the alignment would not necessarily exclude presence in adjacent areas and utilisation of habitat on the alignment. Further survey outputs would therefore be unlikely to change the outcome of the assessment. Consequently, this EIS uses habitat suitability mapping as the basis of the assessment and has conservatively assumed the presence of Western Grasswren in suitable habitat.

Survey effort is therefore considered adequate to characterise the likely presence of the species and assess potential impacts.

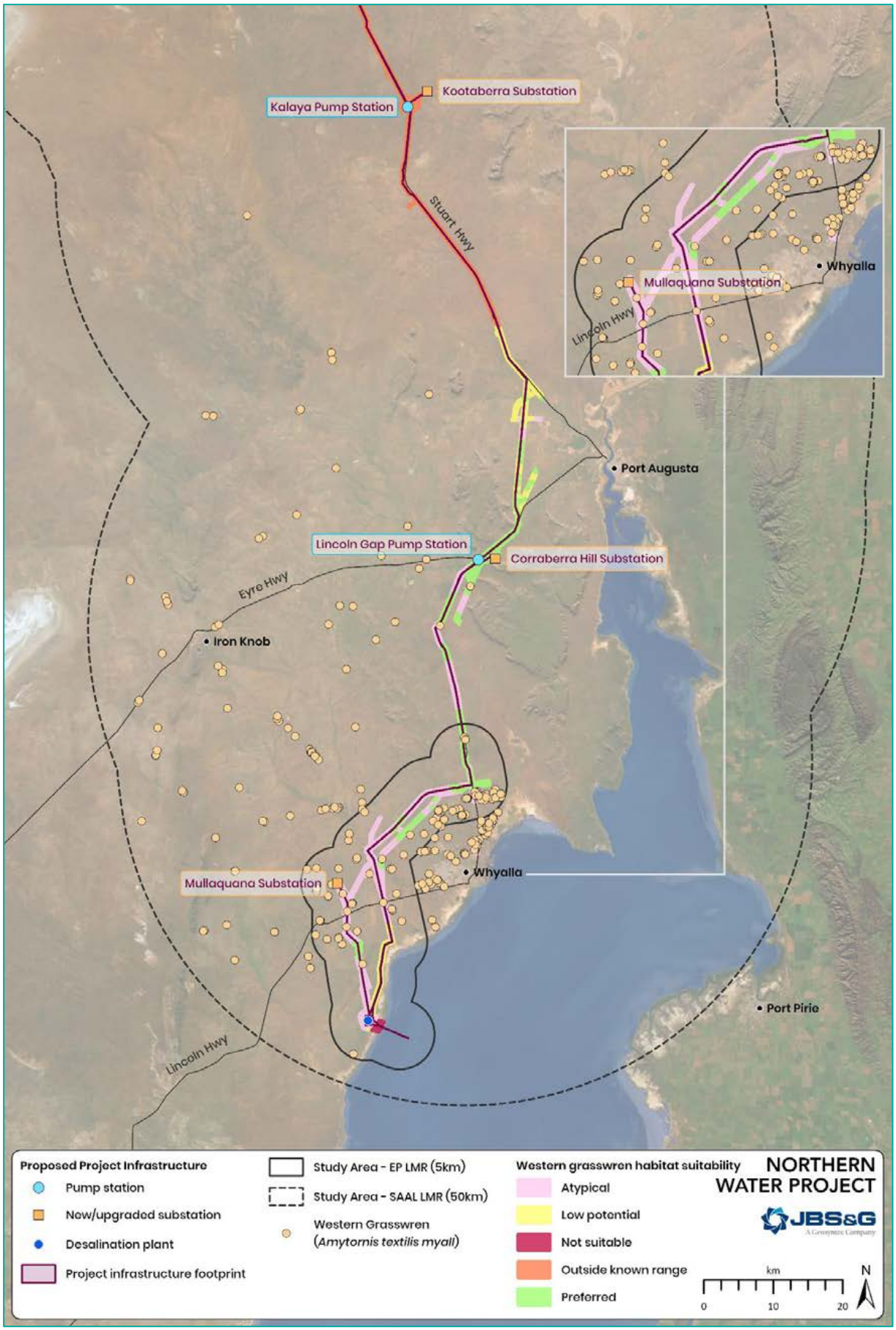


Figure 15-13: Western Grasswren habitat mapping and records in the Study Area

Southern Whiteface (*Aphelocephala leucopsis*) - Vulnerable



Southern Whiteface is a small, widespread songbird species endemic to Australia. It is very broadly distributed and can be found in a range of habitats, mostly below the tropics, from coastal and near coastal areas to the most inland areas of the continent. It predominantly occupies arid and semi-arid biomes, favouring habitats characterised by wattles, native pines and mallee scrubland, woodland, and shrubland communities with an understorey of grass and low shrubs such as saltbushes, bluebushes, and emu bushes (Ehmke et al. 2021).

Southern Whiteface was listed as Vulnerable under the EPBC Act on 31 March 2023 as the overall population has declined substantially (Ehmke et al. 2021, DCCEEW 2023c). However, this species does not have a conservation rating under South Australian legislation and is broadly present across the State, with frequent detections recorded during field surveys.

Clearing for agriculture and overgrazing have been identified as the main cause of its decline, particularly where there is complete habitat removal for intensive agriculture as evidenced by the absence of the species in intensive agriculture areas in the south-west of Australia. However, a study on the influence of agriculture-driven degradation on ground-foraging birds in Victoria (Maron & Lill 2005) found no effect of habitat fragment area, isolation, fragmentation, quality or vegetation complexity on Southern Whiteface.

The species has declined in some areas across its range but is locally quite common albeit patchily distributed. Habitat degradation and loss of nesting hollows due to human influences such as deforestation, pastoral activity, and urban encroachment are likely causes of any declines along with direct and nest predation by introduced cats and rats (Gregory 2020).

Southern Whiteface habitat in South Australia varies between the intensively used agricultural zone which is characterised by extensive vegetation clearance, and the pastoral rangelands with stock grazing of native vegetation. The availability of habitat within the agricultural zone has been significantly reduced since European settlement through broad scale land clearing activities to accommodate cropping and other intensive agricultural activities. The habitat that remains within these areas is often highly fragmented and with remaining patches degraded.

The Project traverses the Gawler IBRA region, which is dominated by pastoral rangeland over native vegetation and thus continues to support potentially suitable habitat for Southern Whiteface. With 88% of native vegetation remaining across the region as a whole, the IBRA associations within the Gawler region traversed by the Project have over 95% remnant vegetation (refer Table 15-3). Whilst the available habitat may have been modified to varying degrees depending on density of stocking, extensive suitable contiguous habitat is available for Southern Whiteface across the pastoral rangelands region of South Australia.

Although there is no published data on stability of the Southern Whiteface population in the Gawler IBRA region, ecologists working across the region and in adjacent regions have observed that the species continues to be commonly recorded in field surveys across their habitat. This indicates that the species is likely to be stable across its range in the region.

Suitable habitat for Southern Whiteface is widespread throughout the Project Area in both the SAAL and EP LMRs, noting that the species also has a widespread distribution throughout the Project Area. Around the Woomera area, suitable habitat becomes sparser as treeless plains become more dominant, however ephemeral creeks may provide habitat throughout the area. Other small but notable areas of unsuitable habitat occur north of Purple Downs, north of Pernatty Lagoon, and west of Port Augusta. Besides the small mangrove coastal saltmarsh patches at Mullaquana Station, the entire area mapped within EP LMR is classified as suitable for the Southern Whiteface.

A total of 1,335 ha of suitable habitat has been mapped in the disturbance footprint. An overview of Southern Whiteface habitat mapping and location of database records are shown in Figure 15-14. Detailed habitat mapping is provided in Appendix I-1 (Terrestrial Ecology Assessment, Appendix B8).

There are no survey guidelines for Southern Whiteface however, timed surveys and song meter deployment (as undertaken for Western Grasswren) are considered sufficient to detect this species. As this species has been identified and is classed as 'known' along the Project alignment, additional surveys would not provide additional benefit to the assessment.

Southern Whiteface is widespread throughout the Project Area and was recorded at 29 sites during field surveys, extending across the Project Area from Mullaquana Station to Olympic Dam, hence was considered as 'known' to occur within the Project Area.

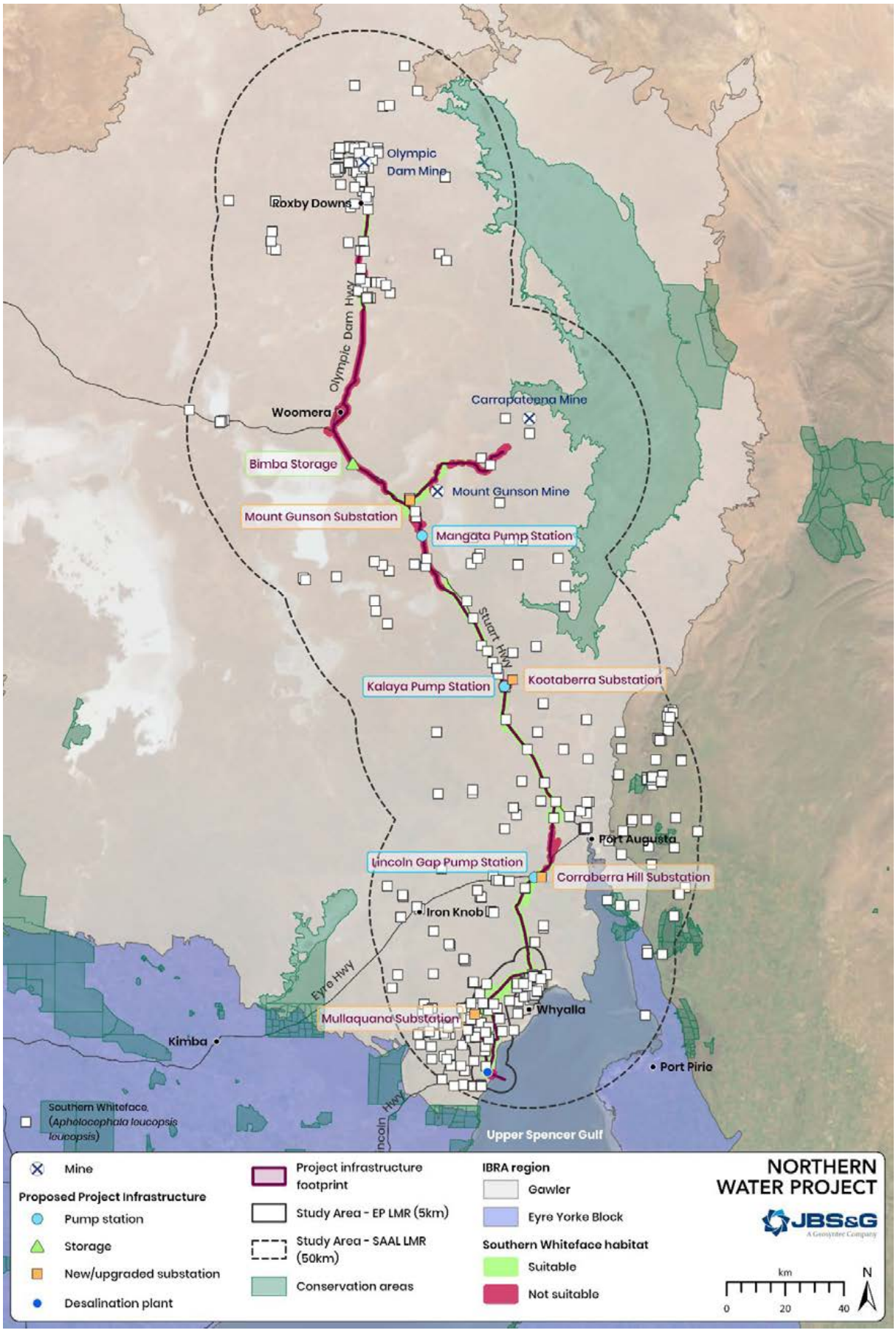


Figure 15-14: Southern Whiteface habitat mapping and records in the Study Area

Blue-winged Parrot (*Neophema chrysostoma*) – Vulnerable

The Blue-winged Parrot is a small parrot found in southeastern Australia. Its area of occupancy is estimated at 11,000 km^2 with approximately 10,000 mature individuals (Garnett and Baker 2021). This species is partially migrant, with individuals breeding in Tasmania, southern Victora and coastal south-eastern South Australia, and over-wintering in northern Victoria, eastern South Australia, south-western Queensland and western New South Wales. Strong decline in the species population has occurred in the last decade, leading to a listing as Vulnerable under the EPBC Act in March 2023. Habitat loss caused by land clearing was identified as a high threat to the survival of this species (DCCEEW 2023d).

The Blue-winged Parrot favours grasslands and grassy woodlands, and is often found near wetlands near the coast and in semi-arid zones (DCCEEW 2023d). The species may also use altered environments such as airfields, golf-courses and paddocks. Blue-winged Parrots are known to forage on seeds of a wide range of native and introduced grasses, herbs and shrubs (Higgins 1999). The species likely traditionally favoured a variety of foraging habitats including saltmarsh, heathland / sedgeland, grassy woodland, sparse grassland, and chenopod shrubland.

Blue-winged Parrot is considered as 'known' to occur, having been recorded on a song meter during field survey at the Mullaquana Station desalination plant site and having scattered records throughout the Study Area from Whyalla to Roxby Downs. The species does not breed in or near the Project Area but individuals could occur when its distribution extends into arid and semi-arid Australia in non-breeding periods. Suitable foraging habitat occurs widely in the Project Area, in particular coastal saltmarsh, open woodland over chenopods and tableland and inland saline depressions / inland samphire.

Australian Fairy Tern (*Sternula nereis nereis*) – Vulnerable

The Australian Fairy Tern is a small, fish-eating bird that occurs around the southern coast of Australia, nesting on sandy beaches or coral shingles in areas with sparse vegetation. Habitat also includes coastal wetlands and islands. The main threat to the species is disturbance of breeding sites by human activities and predation by introduced species and native birds (DAWE 2020b). The Project Area has limited suitable habitat for this species, mainly occurring in coastal areas around the desalination plant site, outside the disturbance footprint. It was not recorded in field surveys but is considered likely to occur as there are previous records along the coastline in the Study Area.

Threatened migratory birds

The Likelihood of Occurrence assessment of EPBC-listed migratory birds identified **11 EPBC-listed threatened shorebirds** listed as having the potential to occur within the Study Area (ranging from likely to possible) (Appendix I-4). These species are the Ruddy Turnstone, Sharp-tailed Sandpiper, Red Knot, Greater Sand Plover, Common Greenshank, Curlew Sandpiper, Eastern Curlew, Great Knot, Nunivak Bar-tailed Godwit, Little Tern and Grey Plover (Table 15-9).

These species are all migratory shorebirds overwintering in Australia. They are a diverse group of birds which are found worldwide, occupying marine, coastal, freshwater and terrestrial habitats. Migratory members of the Order Charadriiformes often breed in Europe, Asia or the Arctic before migrating to Australia, commonly in spring or summer. Juveniles of

some migratory species will remain in Australia for the first winter before returning to their breeding location. These migratory species are typically known to inhabit coastal wetlands, estuaries, mudflats, rocky inlets, reefs and sandy beaches, floodplains and grassland areas often with ephemeral water sources.

Two threatened migratory bird species were assessed as likely to occur by the Migratory Birds Impact Assessment (Appendix I-4): Sharp-tailed Sandpiper and Little Tern.

Sharp-tailed Sandpiper (*Calidris acuminata*) (Vulnerable) is a small to medium-sized sandpiper. Following breeding in northern Siberia, this species migrates to Australia and New Guinea. It is widespread in Australian coastal and inland areas, but prefers non-tidal fresh or brackish wetlands, damp grasslands and will also utilise farms dams, wastewater irrigation areas, tidal flats and beaches (Geering et al. 2008, Menkhorst et al. 2023). There are scattered records of the species throughout the Study Area where suitable habitat exists including several records from around Whyalla in intertidal areas, salt evaporation ponds and Whyalla Wetlands, Cowleds Landing and Lake Dutton, and isolated records in the north at Coorlay Lagoon, Lake Mary, Purple Lake and Lake Richardson.

Little Tern (*Sternula albifrons*) (Vulnerable). The south-eastern sub-population breeds in Australia and is present in low numbers in south-eastern South Australia. The species forages over sheltered coastal waters and roosts on exposed sand bars, spits or beaches as well as harbours, inlets, estuaries (Menkhorst et al. 2023, DAWE 2020b). There are limited database records in the Study Area, however the species was recorded in field surveys on the beach at Mullaquana Station near the desalination plant site. These individuals likely belong to the south-eastern sub-population and are not known to be nesting in the area. The extent of suitable habitat within the disturbance footprint is considered to be negligible (refer Appendix I-1 Terrestrial Ecology Assessment, Section 4.6.2.4).

Targeted surveys undertaken in February 2025 in coastal areas adjacent to the Mullaquana Station desalination plant site did not detect any additional threatened (or non-threatened) EPBC-listed migratory species (refer Appendix I-1 Terrestrial Ecology Assessment, Section 4.6.2.4.2).

Further discussion on migratory bird species occurrence and location of potential habitat is provided below in Section 15.4.9 and Appendix I-4 (Migratory Birds Impact Assessment).

Plains Mouse (*Pseudomys australis*) - Vulnerable



The **Plains Mouse** (Vulnerable) is a small to mid-sized rodent native to arid and semi-arid areas of SA. The species spends most of its time in extensive shallow tunnel systems beneath the surface. It emerges at night to feed on seeds, fibrous plant stems and arthropod prey. They will breed at any time of year in response to resource availability and, during consecutive years of good rainfall, their lifespan may be as long as 4.5 years. In counterpoint to this, during poor years, individuals may perish after only one year (Brandle 2013).

The species' preferred habitat is characterised by gibber, stony desert plains, small boulders and gilgais (Brandle and Moseby 1999). The Arcoona Tableland (part of which occurs with the Project Area) represents one of the five broad geographic zones considered to comprise

the bulk of the remaining high-value habitat for extant populations of the species (Moseby 2012).

Habitats typical of the Arcoona Tableland include cracking clay, minor drainage lines ephemeral grasslands and ephemeral cane-grass swamps. Areas of higher shelter value (cracking clays, gilgais and cane-grass) may represent refugia into which Plains Mice may retreat during unfavourable seasons. Following rains, the species may rapidly spread outwards again from these areas in a process called irruption, sometimes into habitat types and areas not typically associated with the species (Pavey et al. 2014, Young et al. 2017).

Although the key threats to the Plains Mouse have not been clearly identified, it has been suggested that predation by introduced cats and foxes is a major threat to this species particularly during dry periods when the populations are contracted and more vulnerable to extinction. Habitat degradation due to stock grazing may also be a major threatening process. Gilgais, a key habitat for Plains Mouse, frequently attract high densities of stock which can result in the removal of vegetation cover, trampling of burrows and siltation of cracks.

The Plains Mouse was assessed as likely to occur in the Project Area, due to the presence of suitable habitat and occurrence of historical records within the broader region. Although there are no records in close proximity to the disturbance footprint other than in the Arid Recovery Reserve north of Olympic Dam and near the Carrapateena Mine, east of the disturbance footprint, it is expected that the species could occur in areas of suitable habitat in the disturbance footprint, particularly during periods of irruption.

The Plains Mouse Habitat Assessment undertaken for the Project identified a total of 151.1 ha of suitable refuge habitat within the disturbance footprint for the Project (Appendix I-2). This included 123.1 ha of suitable refuge habitat and 10.4 ha of low suitability refuge habitat within the disturbance footprint of the main transfer pipeline alignment, and 17.1 ha of suitable refuge habitat and 0.5 ha of low suitability refuge habitat within the disturbance footprint along the Carrapateena lateral branch.

An overview of the Plains Mouse habitat mapping is presented in Figure 15-15 along with historic records in the Study Area. Detailed habitat mapping is provided in Appendix I-2 (Plains Mouse Habitat Assessment, Appendix A and Appendix B). Database records of Plains Mouse within the Study Area (including date of record and habitat information where available) are summarised in Appendix I-10 Western Grasswren and Plains Mouse Database Records.

Plains Mouse was not recorded during the targeted camera trapping survey undertaken for the Project (Appendix I-3). This indicates that Plains Mouse were either not present or were present in very low numbers at the sites surveyed. However, it is noted that the survey results cannot be used as definitive evidence that the Plains Mouse is not present in the Project Area, as small numbers of Plains Mouse may persist in refuge habitat sites during period of average or below average rainfall, from where they spread to surrounding habitats following the periods of prolonged rainfall and resultant seed production.

Plains Mouse trapping has also been undertaken to the east of the disturbance footprint previously by Oz Minerals (now BHP) as part of the approvals for the Carrapateena Mining Lease (Oz Minerals 2017) which noted individuals were found in 2007 and 2012 surveys but

were not detected during the recently published 2022 fauna monitoring (Oz Minerals 2022). This species is known to experience boom and bust periods which may explain the periodic detections in certain years.

No observations or signs (such as burrows, tracks, scats) of Plains Mouse were recorded during RAM assessments and timed area searches within representative habitats that were undertaken for the Project (refer Appendix I-1).

Survey effort for Plains Mouse was considered to broadly align with the recommendations of the Survey Guidelines for Australia's Threatened Mammals (DSEWPC 2011). Recommended techniques for assessment of Plains Mouse presence in DSEWPC (2011) include:

- daytime searches for potentially suitable habitat resources such as gilgai habitats
- daytime searches for signs, including burrows, tracks, and scats
- collection of predator scats, owl casts, or remains in predatory bird / mammal nests / dens located within suitable Plains Mouse habitat
- Elliott trapping surveys (and possibly pitfall trapping) over periods of three to five nights
- consultation with local people, particularly investigating potential Indigenous knowledge of this species' presence in an area and discussion with graziers and farm hands, particularly in dry periods when densities are likely to be low.

Key elements of these recommendations have been undertaken:

- Potentially suitable habitat resources have been surveyed and mapped (refer Appendix I-2).
- Daytime searches for signs (such as burrows, tracks, scats) were undertaken during RAM assessments and timed area searches within representative habitats (refer Appendix I-1).
- While Elliott trapping was not undertaken, it is considered that camera trapping is a suitable substitute. While not specifically outlined by DSEWPC (2011) for Plains Mouse, camera trapping has been found to be an effective method for detecting species at low or moderate densities (Vine et al. 2009). General camera trapping guidelines provided in DSEWPC (2011) recommend a survey period of at least 14 nights. The camera trap survey consisted of 8 camera sites and the cameras were deployed for 40 to 50 nights, resulting in a total of 334 trap nights. The survey effort is considered to substantially exceed the recommendations as described in Paull et al. (2011) (recommended minimum 14 nights of survey effort for the species), and Meek et al. (2012) (recommend a deployment time of 12 to 18 days for surveys of small mammals).
- Ecologists undertaking the surveys also had extensive local knowledge of Plains Mouse and suitable habitats, including surveys at the nearby Carrapateena mine over preceding years.

The targeted survey (Appendix I-3) concluded that additional surveys for Plains Mouse are not recommended, as Plains Mouse can be assumed to occasionally inhabit areas of suitable habitat within their range. It is likely that any additional survey work would also not detect Plains Mouse, however this non-detection would not change the assumption that it is present in the region and can occur in suitable habitat. Survey effort is therefore considered adequate to characterise the presence of the species and assess potential impacts,

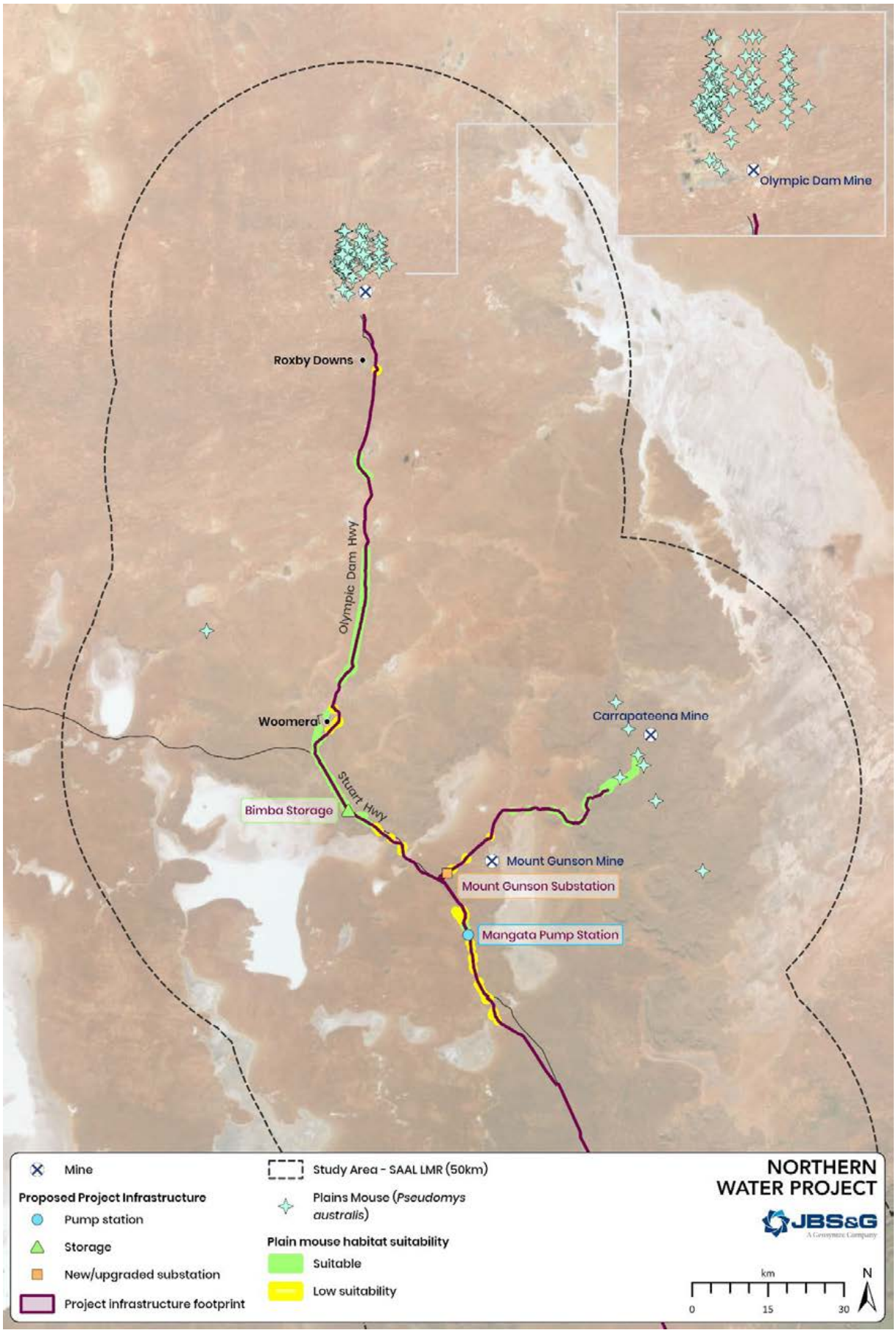


Figure 15-15: Plains Mouse habitat mapping and records within the Study Area

Grey-headed Flying Fox (*Pteropus poliocephalus*) – Vulnerable

The Grey-headed Flying Fox is a canopy-feeding frugivore and nectarivore, and one of the largest bats in the world. It occurs in the coastal belt from central Queensland, through New South Wales, Victoria and into South Australia. The species is considered to be a single, mobile population (DAWE 2021). The species feeds in a large range of habitats including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands (DAWE 2021). Grey-headed Flying-foxes roost and breed in large aggregations in camps, in the exposed branches of trees (DAWE 2021).

Occurrence of the Grey-headed Flying-fox within the Project Area was assessed as likely due to two records identified in the vicinity of the study area and a camp recently reported as occurring in Port Augusta (DEW 2024a). The nearest important population is located in the Adelaide Botanic Gardens (DAWE 2021), approximately 275 km from the disturbance footprint. The Project Area provides no core habitat and limited useable habitat thus any usage would be occasional, opportunistic and infrequent. This species was not identified during field surveys and there are limited records around Whyalla and Port Augusta.

Species considered possible occurrences

Thick-billed Grasswren (*Amytornis modestus*) (Vulnerable) was identified as a separate species to the Western Grasswren in 2009. The only subspecies with potential to occur within the Project Area is *Amytornis modestus indulkanna* which is recorded through the Northern Territory, western regions of Kati Thanda (Lake Eyre) and Lake Torrens basins. The species appears to be entirely restricted to low chenopod shrublands, usually in drainage lines through stony plains (TSSC 2016). The Project is outside the recorded range of the species, with the closest records 10-20 km north of the disturbance footprint near Olympic Dam and 29-49 km east of the disturbance footprint near Lake Torrens. There are known populations within the Arid Recovery Program (ARP) north of Olympic Dam, with recent records showing some individuals are moving outside the ARP. Bird surveys and acoustic monitoring (song meters) in potentially suitable habitat through this northern section of the Project failed to detect this species. It has been conservatively considered as possibly occurring in the Project Area.

Grey Falcon (*Falco hypoleucos*) (Vulnerable) is a medium-sized bird occupying arid and semi-arid regions of Australia. Preferred habitat includes open plains and treed watercourses in arid inland areas (TSSC 2020). When not actively hunting it roosts in shady trees or communications towers (Menkhorst et al. 2023). The species has a widespread, but sparse distribution across Australia. While historical records near the Project have been identified, they are primarily in the Flinders Ranges with different habitats to those found in the Project Area, and there are scattered records near Whyalla, Port Augusta, Island Lagoon and Woomera. It is considered as possibly occurring due to potentially suitable habitat in ephemeral creeks / drainage lines and inland saline depressions, chenopod shrublands and dune fields.

Eastern Hooded Plover (*Thinornis cucullatus cucullatus*) (Vulnerable) is endemic to southern Australia and Tasmania. It is a resident shorebird that mainly occurs on wide sandy ocean beaches backed by dunes, in creeks or inlet entrances (Menkhorst et al. 2023). The sub-species is known to occur on many South Australian beaches, including some with human activity presence. There are no records of the species in the Study Area and it was not

recorded in field surveys of coastal habitat adjacent to the desalination plant site. It has been assessed as a possible occurrence as coastal habitat in the vicinity of the desalination plant may be suitable, principally for foraging.

A number of **migratory bird** species are considered as possible occurrences. These species are discussed above, along with known or likely migratory bird species.

Dusky Hopping-mouse (*Notomys fuscus*) (Vulnerable) is a small rodent native to arid areas of SA. The Project Area is outside the known range of the species and there are no known historic records in the Study Area, nor was evidence of this species (e.g. tracks or burrows) identified during field surveys. Potentially suitable habitat does occur within the SAAL LMR including low dunes and dune crests with *Acacia* spp., which have been associated with the species in the Conservation Advice (DEWHA 2008). This species was conservatively assessed as a possible occurrence in the Project Area during favourable conditions when the population may have expanded to the south.

Other EPBC-listed species of interest

Malleefowl (*Leipoa ocellata*) (Vulnerable) and **Sandhill Dunnart** (*Sminthopsis psammophila*) (Endangered) were listed in the ARs as having the potential to be significantly impacted by the Project. These species were assessed as being unlikely to occur, due to the absence of records and suitable habitat in the Project Area. These species are therefore not discussed in this chapter. A detailed assessment of these species' likelihood of occurrence is provided Appendix I-1 (Terrestrial Ecology Assessment - Appendix C2).

15.4.9 EPBC-listed migratory fauna

The migratory birds desktop assessment (Appendix I-4) identified 39 EPBC-listed terrestrial migratory bird species as having the potential to occur in the Project Area. This included 37 migratory (marine / wetland) bird species highlighted by the PMST searches and two additional species detected as Biological Databases of South Australia records or during field survey: Grey Plover (*Pluvialis squatarola*) and Little Tern (*Sternula albifrons*). Twenty-six of these species were also listed as threatened under the EPBC Act.

Results of the likelihood of occurrence assessment indicate that 17 species are considered likely or possible occurrences in the disturbance footprint, with two considered likely to occur (Sharp-tailed Sandpiper and Little Tern; note these species are also listed as threatened) and 15 species considered possible. Twenty-two species were considered unlikely to occur. No EPBC-listed terrestrial migratory species were assessed as known to occur.

The likelihood of occurrence assessments for migratory species that are listed as threatened are summarised above in Table 15-9. The likelihood of occurrence assessments for migratory species that are not listed as threatened (other than those considered unlikely to occur) is summarised in Table 15-10 below.

The likelihood of occurrence assessments for all migratory species (including species considered unlikely to occur) is summarised in the Significant Impact Assessment (Appendix I-6) and full details of the assessments (including justification) are provided in Appendix B of the Migratory Birds Impact Assessment (Appendix I-4).

Table 15-10: EPBC-listed migratory fauna (non-threatened) - possible, known or likely to occur

Species	Common name	EPBC[1]	NPW[2]	Last record	Likelihood
Actitis hypoleucos	Common Sandpiper	MW	R	2023	Possible
Calidris melanotos	Pectoral Sandpiper	MW	R	2013	Possible
Calidris ruficollis	Red-necked Stint	MW	-	2024	Possible
Pandion haliaetus / Pandion haliaetus cristatus	Osprey	MW	E	2022	Possible
Thalasseus bergii	Greater Crested Tern	MW	-	2024	Possible
Tringa brevipes	Grey-tailed Tattler	MW	-	2000	Possible

[1] EPBC Act status: Critically Endangered (CE); Endangered (E); Vulnerable (VU); Migratory Wetland (MW); Migratory Terrestrial (MT); Migratory Marine (MM).

[2] SA NPW status: Endangered (E); Vulnerable (V); Rare (R).

In addition to the species listed in Table 15-10, **Sanderling** (*Calidris alba*) and **Fork-tailed Swift** (*Apus pacificus*) were referred to in the ARs as having the potential to be significantly impacted by the Project. These species were assessed as being unlikely to occur in the disturbance footprint due to the lack of records and the Project's avoidance of ocean beaches and mudflats (for the Sanderling) and the aerial nature of the Fork-tailed Swift. These species are therefore not discussed in this chapter. A detailed assessment of these species' likelihood of occurrence is provided in the Migratory Birds Impact Assessment (Appendix I-4).

As discussed in Section 15.4.8 above, most migratory species with the potential to occur within the disturbance footprint are waders that breed overseas and overwinter in Australia. These species are listed under international conventions and agreements to protect them along their migratory journeys. Migratory species breeding in Australia and assessed as having the potential to occur include Osprey, Greater Crested Tern and Little Tern (discussed above in Section 15.4.8). Core populations and breeding areas for these species occur well outside the Project Area.

Historical records of migratory species in the Study Area are shown in Figure 15-17 and Figure 15-18. There are limited areas of suitable habitat for migratory species within the disturbance footprint or Project Area. Habitats within the broader Study Area include the following, and important habitat areas are shown in Figure 15-16:

- The **Mullaquana Station** desalination plant is adjacent to coastal habitats (including intertidal mangroves and wide bare sand flats) that could be utilised by migratory species (refer to migratory bird habitat mapping in Appendix I-1 Terrestrial Ecology Assessment - Appendix B7). These habitats are not unique and there are vast areas of coastline adjacent the Project Area that provide similar habitats. These habitats do not

meet the criteria for an internationally important wetland or nationally important habitat for migratory shorebirds[12].

- There are a number of **ephemeral waterway crossings** in the Project Area which may provide occasional habitat for migratory species when water is present. These areas only represent small potential areas of foraging habitat for migratory species, with known coastal staging areas and larger inland lakes avoided by the Project. None of the ephemeral waterway crossings are considered to provide important habitat for migratory species.
- A number of **large inland salt lakes** occur in the Study Area that provide known habitat for migratory species when they are present in Australia. These include Lake Torrens, Pernatty Lagoon, Lake Dutton, Lake Windabout, Lake Richardson, Arcoona Lake, Lake Mary, Lake Campbell, Coorlay Lagoon. None of these lakes are in the disturbance footprint.
- **Saltmarsh** occurs adjacent to the desalination plant location, and may provide foraging habitat for migratory birds. The saltmarsh is outside the disturbance footprint and the alignment avoids areas of saltmarsh on coastal flats between Mullaquana Station and Whyalla. These areas are not identified as meeting nationally or internationally important shorebird habitat criteria.
- There are a number of **bays and artificial habitats** along the coastline of the Study Area, outside the Project Area, that are listed as nationally important wetlands or meet national shorebird habitat significance criteria for several species. These include the Upper Spencer Gulf wetland, Whyalla salt evaporation ponds / salt fields and Whyalla Wetlands. These areas are avoided by the Project.

Further detail on migratory bird habitat areas, including important habitat areas (that are all avoided by the Project), is provided in Appendix I-4.

Surveys targeting migratory shorebirds were undertaken in February 2025 in coastal areas adjacent to the Mullaquana Station desalination plant site, including deployment of one song meter, and timed area searches at four sites, undertaken each day for three days (refer Figure 3-1 in Appendix I-1 Terrestrial Ecology Assessment). Surveys targeting migratory shorebirds have been also undertaken for a separate project (the Nonowie Wind Farm) on a similar and contiguous section of the coast approximately 6 km north of the Mullaquana Station desalination plant site, in summer 2023 and 2024 (EBS Ecology 2025).

The targeted surveys undertaken for the Project adjacent to the Mullaquana Station desalination plant site did not detect any EPBC-listed migratory shorebirds[13] (refer Appendix I-1 Terrestrial Ecology Assessment, Section 4.6.2.4.2). Results of two years of surveys undertaken across 4 km of coastline north of the desalination plant site (EBS Ecology 2024) reported a total of six observations of Sharp-tailed Sandpiper, 15 observations of Common

[12] As summarised in DoEE (2017), wetland habitat is considered:

- internationally important if it regularly supports 1 per cent of the individuals in a population of one species or subspecies of waterbird or a total abundance of at least 20 000 waterbirds.
- nationally important if it regularly supports 0.1 per cent of the flyway population of a single species of migratory shorebird, or 2000 migratory shorebirds, or 15 migratory shorebird species.

[13] One other species listed as migratory, Little Tern (*Sternula albifrons*), was detected and is discussed under EPBC-listed threatened fauna in Section 15.4.8.

Greenshank and 493 observations of Red-necked Stint (which is a commonly encountered and abundant migratory shorebird). These results support the conclusion noted above, that the coastal habitats occurring adjacent to the desalination plant site and extensively to the north and south, while providing suitable habitat for migratory species, do not support large numbers of migratory shorebirds and do not meet the criteria for important habitat for migratory shorebirds.

The level of survey effort for migratory birds is considered to be adequate to allow assessment of the Project. Surveys in coastal areas adjacent to the Mullaquana Station desalination plant site were undertaken in summer (February) over multiple days, consistent with industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoEE 2017). The spread of surveys across the summer months is less than the ideal survey effort outlined in DoEE (2017), which identify that survey effort should ideally be comprised of four surveys over the period December to February. However, the survey effort, in conjunction with the habitat assessment undertaken in the field survey, database records and data reported in EBS Ecology (2025) is considered adequate to characterise migratory bird habitat and assess potential impacts., particularly given that the location and design of the Project avoids any direct impact to intertidal migratory shorebird habitats.

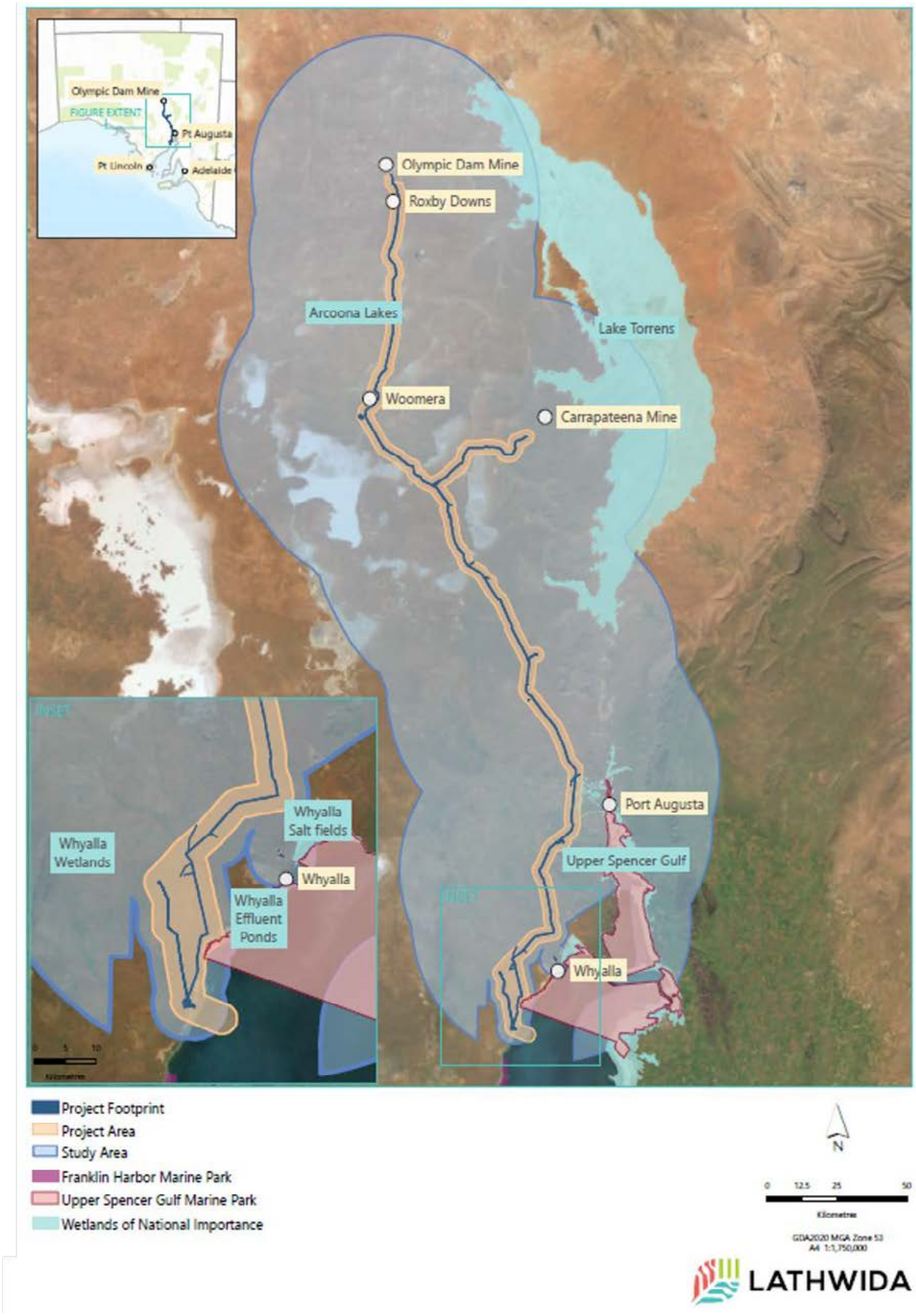


Figure 15-16: Important shorebird habitat areas
[Source: Lathwida 2026]

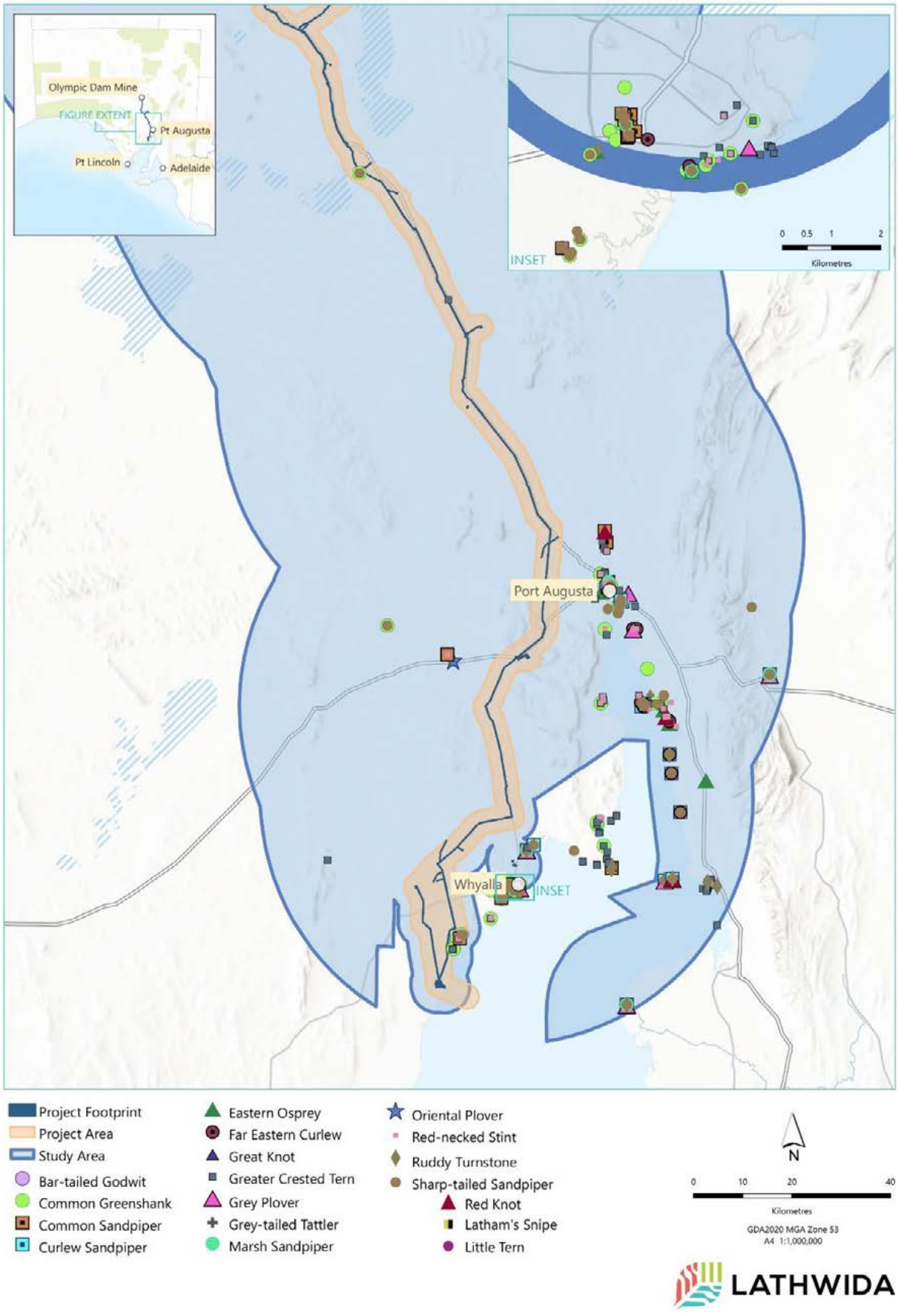


Figure 15-17 Migratory species records - southern section
[Source: Lathwida 2026]

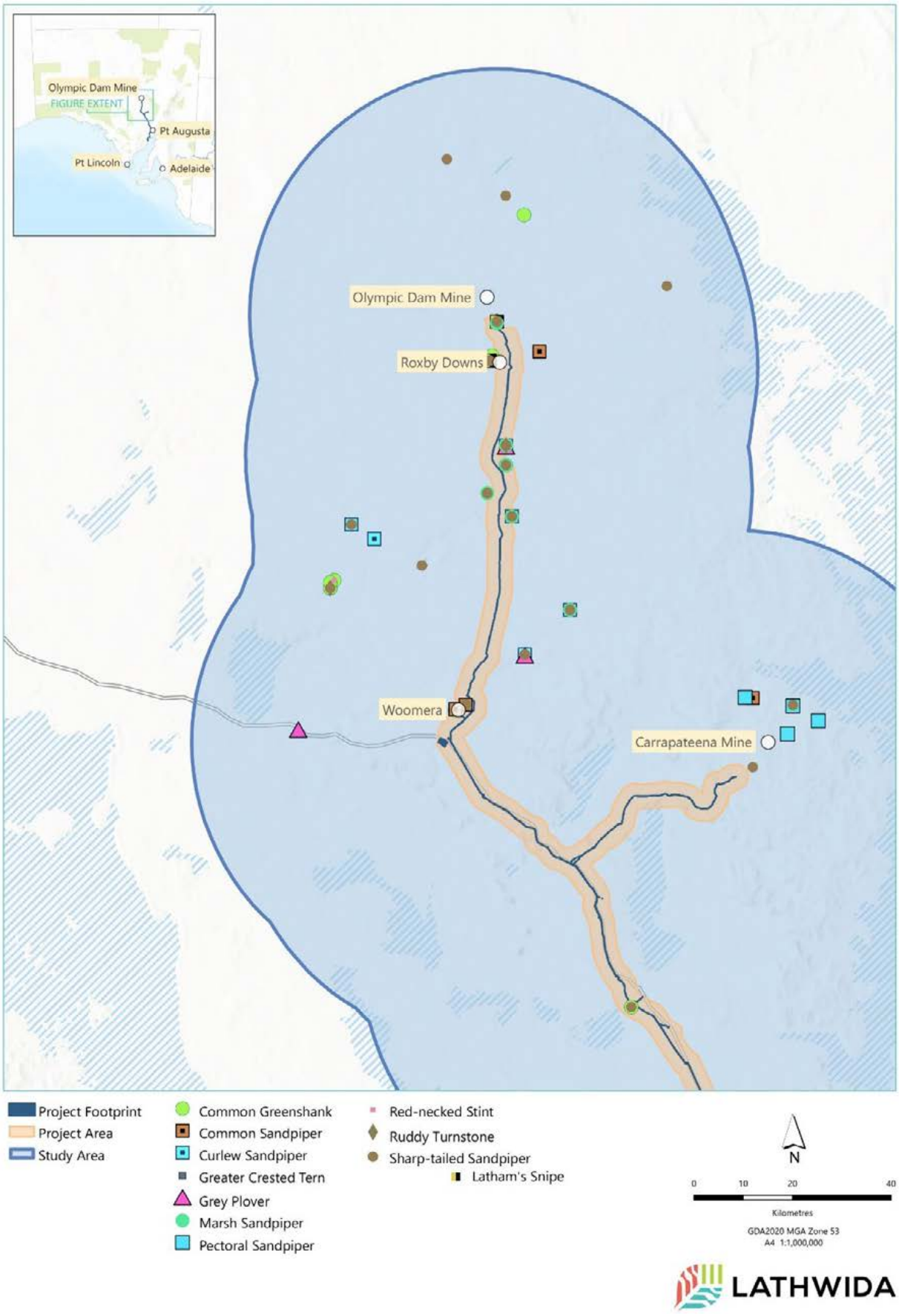


Figure 15-18 Migratory species records - northern section
[Source: Lathwida 2026]

15.4.10 State-listed fauna

The assessment undertaken in Appendix I-1 identified 57 fauna species in the EP LMR and 104 fauna species in the SAAL LMR listed as rare or threatened under the NPW Act that could potentially occur within the Project Area. Of these, 23 of the species in the EP LMR and 41 of the species in the SAAL LMR are also listed as threatened under the EPBC Act.

A likelihood of occurrence assessment was undertaken for all species listed only under the NPW Act, other than those where their listed subspecies distributions are located outside the regions associated with the Project (refer Appendix I-1 Terrestrial Ecology Assessment Section 4.4.5 for further detail).

The likelihood of occurrence assessment determined that three of these species (one Vulnerable and two Rare) are known to occur within the Project Area. A further one Endangered species, one Vulnerable species and eight Rare species were considered likely to occur.

Table 15-11 summarises the results of the likelihood of occurrence assessment for all species other than those considered unlikely to occur. The full likelihood of occurrence assessment (which includes species considered unlikely and provides justification for the likelihood assessment) is provided in Appendix C of the Terrestrial Ecology Assessment (Appendix I-1).

Records of State-listed fauna in the Study Area are shown in Figure 15-19 and Figure 15-20.

Table 15-11: State-listed rare or threatened fauna - possible, known or likely to occur

Species	Common name	NPW[1]	Likelihood (EP)	Likelihood (SAAL)
Acanthiza iredalei iredalei	Slender-billed Thornbill (western)	R	Possible	Likely
Anhinga novaehollandiae	Australasian Darter	R	Possible	N/A
Ardea intermedia plumifera	Plumed Egret	R	Possible	N/A
Ardeotis australis	Australian Bustard	V	**Known**	Likely
Biziura lobata menziesi	Musk Duck	R	Unlikely	Likely
Bubulcus ibis coromandus	Eastern Cattle Egret	R	Possible	Unlikely
Cinclosoma castanotum	Chestnut quail-thrush (Chestnut-backed quail-thrush)	R	Possible	Unlikely
Cladorhynchus leucocephalus	Banded Stilt	V	Likely	Possible
Climacteris affinis	White-browed Treecreeper	R	N/A	Possible
Corcorax melanorhamphos	White-winged Chough	R	Possible	Unlikely
Egretta garzetta nigripes	Little Egret	R	Likely	Possible

Species	Common name	NPW[1]	Likelihood (EP)	Likelihood (SAAL)
Falco peregrinus macropus	Peregrine Falcon	R	Possible (fly-over)	Possible
Falco subniger	Black Falcon	R	N/A	Possible (hunting)
Gerygone fusca	Western Gerygone	R	N/A	Possible
Geryone olivacea olivacea	White-throated Geryone	R	N/A	Possible
Haematopus fuliginosus fuliginosus	Sooty Oystercatcher	R	**Known**	Unlikely
Haematopus longirostris	Pied Oystercatcher	R	Likely	Unlikely
Haliaeetus leucogaster	White-bellied Sea Eagle	E	Possible	Possible
Hamirostra melanosternon	Black-breasted Buzzard	R	N/A	Possible
Hieraaetus morphnoides	Little Eagle	V	Unlikely	Possible
Hylacola cauta cauta	Shy Heathwren	R	Unlikely	Possible
Hylacola pyrrhopygia	Chestnut-rumped Heathwren	E	Likely	Possible
Lophochroa leadbeateri	Major Mitchell's Cockatoo / Pink Cockatoo	R	N/A	Likely
Myiagra inquieta	Restless Flycatcher	R	Possible	Unlikely
Neophema elegans elegans	Elegant Parrot	R	N/A	Likely
Neophema splendida	Scarlet-chested Parrot	R	N/A	Likely
Oxyura australis	Blue-billed Duck	R	N/A	Possible
Pachycephala inornata	Gilbert's Whistler	R	Likely	Possible
Phaps histrionica	Flock Bronzewing	R	N/A	Possible
Podiceps cristatus australis	Great Crested Grebe	R	Possible	Possible
Spatula rhychotis	Australasian Shoveler	R	Possible	Possible
Sterna hirundo longipennis	Common Tern	R	Possible	N/A
Stictonetta naevosa	Freckled Duck	V	Unlikely	Possible
Tringa glarola	Wood Sandpiper	R	N/A	Possible
Zapornia tabuensis tabuensis	Spotless Crake	R	Possible	Possible
Nephrurus deleani	Pernatty Knob-tailed Gecko	R	N/A	**Known**

[1] SA NPW status: Endangered (E); Vulnerable (V); Rare (R).

Information on State-listed threatened (i.e. Vulnerable or Endangered) species that are considered likely or known to occur is provided below.

Australian Bustard (*Ardeotis australis*) – Vulnerable

The Australian Bustard is a large bird known to occur in open plains as well as arid and semi-arid grasslands. It is likely to use habitat in open woodlands, savanna and low shrublands. Historic records show four records near Cowleds Landing (south of Whyalla) with remaining records from Port Augusta north. There are scattered records throughout the Study Area and a single individual was observed near Mullaquana Station during field surveys. The species was assessed as likely to occur in woodland and chenopod shrubland habitats in the Project Area.

Banded Stilt (*Cladorhynchus leucocephalus*) – Vulnerable

The Banded Stilt is a gregarious wader endemic to Australia. It occurs mainly in saline and hypersaline waters of the inland and coast, typically large, open and shallow (BirdLife Australia 2026). Breeding occurs inland following major rainfall events. There are multiple records of this species within the Study Area. Several thousands of individuals have previously been counted in the Whyalla Wetlands. The species was assessed as likely to occur in the EP LMR in coastal habitats.

Chestnut-rumped Heathwren (*Hylacola pyrrhopygia*) – Endangered

The Chestnut-rumped Heathwren occurs in dense heathland and undergrowth in Eucalyptus forests and woodlands, most commonly found in rocky areas. Vegetation consists of a mixture of dense shrubs (such as *Banksia, Hakea* and *Leptospermum*), grass trees and ferns, beneath a canopy of *Eucalyptus* trees (including *E. obliqua* and *E. odorata*) and (in at least some sites) scattered *Allocasuarina* trees. There are BDBSA records near Whyalla Conservation Park, south of the disturbance footprint and it was conservatively assessed as likely to occur in woodland and chenopod shrubland habitats in the EP LMR. However the habitat type and distance from other verified records suggests the records may be erroneous and the species has not been considered further in the impact assessment.

Other species of interest

The **Pernatty Knob-tailed Gecko** (*Nephrurus deleani*) (Rare) creates burrows at the base of low-lying vegetation within shrublands dominated by Sandhill Wattle (*Acacia ligulata*) and Mulga. Considered as known to occur in low dunes and dune crests of *Acacia* and *Callitris* habitat within the SAAL LMR. Historic records show this species occurring around the Carrapateena Mine site and Pernatty Lagoon.

The DEW biodiversity values mapping predicted that the State-Vulnerable Brown Quail (*Coturnix ypsilophora australis*) was of moderate concern due its modelled distribution and potential for interaction with the Project. However, this species was assessed as being unlikely to occur in the disturbance footprint due to the lack of records or suitable habitat and location outside its known distribution (Appendix I-1) and therefore is not discussed in this chapter. A detailed assessment of this species' likelihood of occurrence is provided in the Terrestrial Ecology Assessment (Appendix I-1).

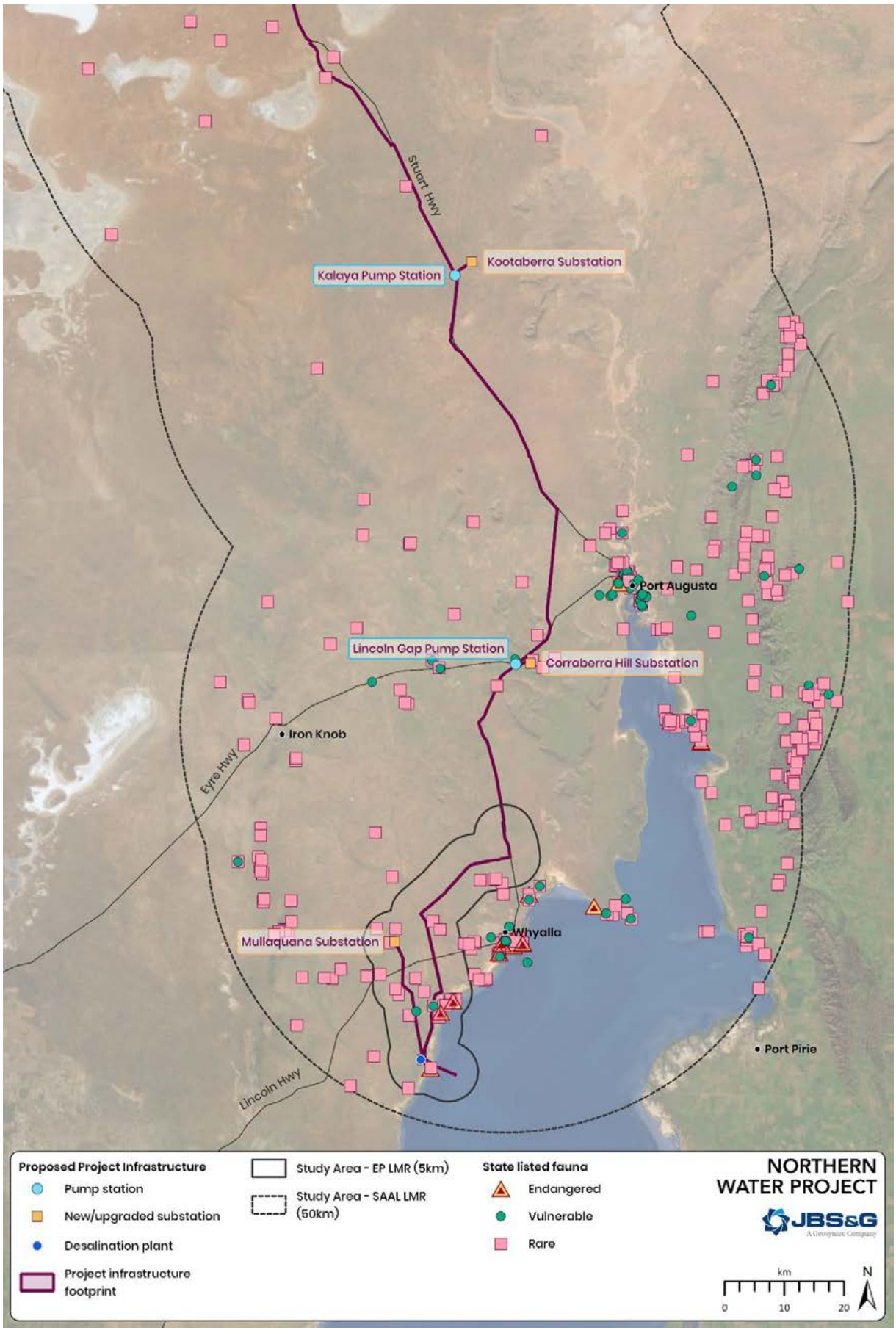


Figure 15-19: Records of State-listed fauna in the Study Area – southern section

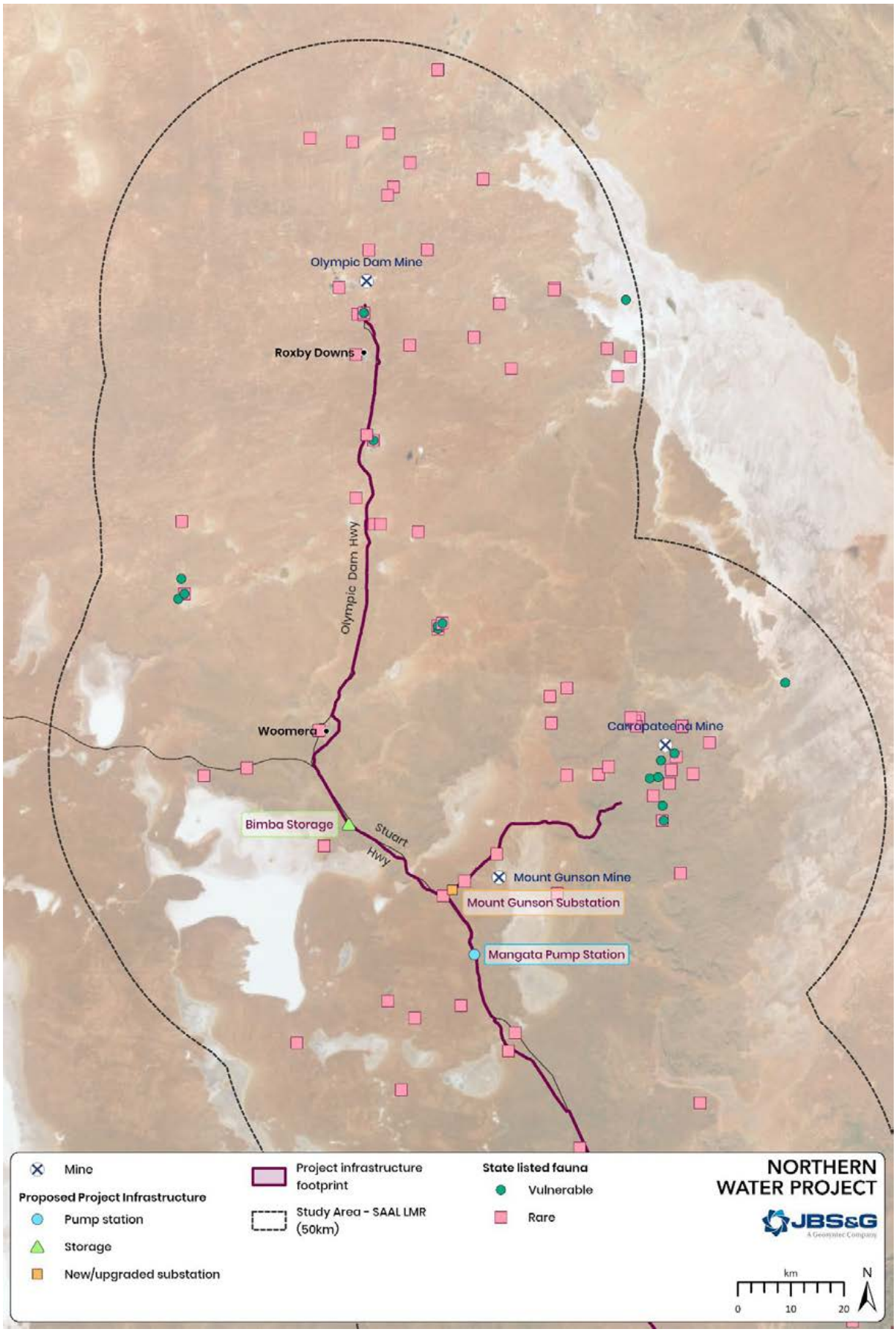


Figure 15-20: Records of State-listed fauna in the Study Area – northern section

15.4.11 Pest flora and fauna

There are recent and reliable database records for six weed species declared under the LSA Act within the Study Area, with three of these also considered Weeds of National Significance (WoNS) (refer section 4.7.3 of Appendix I-1 Terrestrial Ecology Assessment). These species were also all recorded in the field surveys.

Field surveys identified eleven declared weeds at BAM and RAM sites as described in Table 15-12.

Overall, few weeds were observed in the SAAL LMR with most species occurring adjacent to roadsides in areas with increased run-off or disturbance. Buffel Grass occurs in places along the Stuart Highway, noticed first north of Port Augusta but noting weeds were not specifically mapped along the highway. The occurrence of Horehound, Bathurst Burr and Salvation Jane is sporadic but is generally in discrete patches.

In the EP LMR, occurrence of weeds increases but is generally restricted to areas close to existing infrastructure and roadsides. The occurrence of Carrion-flower and African Boxthorn increases around Whyalla.

Table 15-12: Declared weeds identified during field surveys

Scientific name	Common Name	Declared	WoNS	EP control rating[14]	SAAL control rating
Asparagus asparagoides	Bridal Creeper	✓	✓	Control	Control
Cenchrus ciliaris	Buffel Grass	✓		Destroy	Control
Diplotaxis tenuifolia	Lincoln Weed	✓		Control	No sale
Echium plantagineum	Salvation Jane	✓		No sale	No sale
Gazania linearis	Gazania	✓		No sale	No sale
Lycium ferocissimum	African Boxthorn	✓	✓	Control	Control
Marrubium vulgare	Horehound	✓		Control	No sale
Opuntia sp.	Prickly-pear	✓	✓	Control	Control
Orbea variegata	Carrion Flower	✓		Control	No sale
Rumex hypogaeus	Three-corner Jack	✓		Control	No sale
Xanthium spinosum	Bathurst Burr	✓		Control	Control

Exotic fauna identified during the field surveys included European Fox (*Vulpes vulpes*), European Rabbit (*Oryctolagus cuniculus*), Common Starling (*Surnus vulgaris*), Common Blackbird (*Turdus merula*), Spotted Dove (*Spilophelia chinensis*), Rock Dove (*Columbia livia*), and House Sparrow (*Passer domesticus*).

[14] Indicates the highest level of control required by the LSA Act being; Movement (must not transport on public road), Sale (no sale or trading of weed), Control (reasonable measures are required to control this species) or Destroy (landowners must eliminate the plant from their property).

Buffel Grass

Buffel Grass (*Cenchrus ciliaris* and *Cenchrus pennisetiformis*) is a declared weed under the LSA Act. It grows as a tussock grass up to 1.5 m in height and is prevalent across native vegetation, pastures and rangelands frequently forming monocultures (Biosecurity SA 2019). In addition to the threat posed to native flora, it can increase the frequency and intensity of fires throughout the landscape and has been identified as a risk to Aboriginal culture and country (Biosecurity SA 2019). In the EP LMR landowners must destroy Buffel Grass on their property while in the SAAL LMR landowners are responsible for taking reasonable steps to kill plants and prevent spread (PIRSA, 2021). Buffel Grass was recorded during field surveys and there are records on the Stuart, Eyre and Lincoln Highways in the Project Area (NatureMaps 2026a).

The SA Buffel Grass Strategic Plan (Biosecurity SA 2019) identifies a number of management zones. The Project Area covers management zones 2 and 3 (refer to Table 15-13).

Once established, the feasibility of containing Buffel Grass has been assessed as low in native vegetation areas and negligible in grazing rangelands (Biosecurity SA 2019).

Table 15-13: Relevant Buffel Grass management zones and management aims

Management Zone	Status of Buffel Grass	Management aims
Zone 2 – Protect sites **SAAL LMR**	Widely distributed infestations with larger infestations challenging to contain or control, for example in town ships along major roads (e.g. Port Augusta, Pimba) and along the major highway and railway reserves.	**Protect Sites** • Aims to prevent spread of weed species to key sites / assets of high economic, environmental and/or social value • Surveillance and mapping to locate all infested areas • Identify key sites/assets in the management area • Control of infestations in close proximity to key sites / assets, aiming for significant reduction in weed density. • Limit movement and sale of species within management area • Monitor change in current distribution within and in close proximity to key sites/assets.
Zone 3 – Destroy infestations **EP LMR**	Predominantly small, widely scattered localised infestations.	**Destroy Infestations** • Aims to significantly reduce extent of weed species in the management area • Detailed surveillance and mapping to locate all infestations • Destruction of all infestations, aiming for local eradication at feasible sites • Prevent entry to management area and movement and sale within • Monitor progress towards reduction.

15.4.12 Pathogens

The key pathogen of concern for native vegetation and habitat in South Australia is *Phytophthora cinnamomi* which causes plant die-back. Phytophthora distribution is driven by climactic and soil factors with risk increasing with rainfall >400 mm per annual and acidic soils (DIT 2022). The Project alignment is located within a low-risk area and in areas of rainfall less than 400 mm. The nearest known Phytophthora records are located approximately 200 km south-west of the Project alignment, in the Hundreds of Koppio, Louth and Wanilla (DEW 2024a).

15.5 Mitigation Hierarchy

The Project has used the mitigation hierarchy (avoidance, minimisation, rehabilitation, offset) as a driving principle throughout the site and route selection process to minimise impacts on flora and fauna. General application of the hierarchy is outlined below, with additional detail provided in discussion of key species (e.g. Western Grasswren) in subsequent sections where relevant.

Avoidance

As the Project Area is almost completely vegetated with native vegetation, the ability to avoid disturbance of native vegetation and habitats is very limited. The following measures have been undertaken to avoid impacts as far as possible.

- Site selection, alignment selection and Project design have sought to avoid or minimise impacts to native vegetation and habitats as far as possible[15].
- Areas of high conservation value have been avoided and there are no areas in the disturbance footprint protected under the National Parks and Wildlife Act or under Native Vegetation Act heritage agreements.
- The disturbance footprint predominantly follows existing disturbed corridors with the aim of minimising potential impacts as a result of clearance and / or fragmentation.
- The desalination plant site has avoided locations where there is higher quality Western Grasswren habitat (e.g. initial plant locations further to the south).
- Ecological surveys identified numerous areas of high quality, preferred habitat for Western Grasswren that have been avoided by the transfer system alignment (e.g. just west of Whyalla and north of Whyalla, near the Whyalla water tanks).
- The construction of the intake and outfall pipes avoids impacts to saltmarsh (TEC) and mangrove vegetation by tunnelling under the coastal environment.
- Existing roads and tracks will be used for access as far as possible, thus avoiding clearance for new tracks.
- Areas for laydowns, camps and associated infrastructure will target previously cleared or degraded areas as far as practicable.

[15] Sand dune areas are recognised as being of heightened cultural sensitivity for Aboriginal people. Where sand dune areas are encountered, construction activities will seek to avoid disturbance where practicable through localised alignment refinement within the approved development envelope, together with adjustments to work areas and access arrangements. Where avoidance is not practicable, construction methods will be implemented, in consultation with Traditional Owners, to minimise disturbance.

Minimisation

Vegetation clearance and impacts on biodiversity will be minimised by implementing mitigation measures during the detailed design and construction phases as outlined in Section 15.6.15.

A key measure to minimise impacts to native vegetation and habitat is the specification of a maximum pipeline alignment construction corridor width of 40 m for standard installation, which is less than a more typical width of 50-60 m for a pipeline of this nature. This will be reduced in detailed design if possible. Construction footprints for all Project components will be restricted to the minimum necessary to allow safe and efficient construction.

Rehabilitation

Areas of temporary disturbance will be rehabilitated following construction, by respreading cleared and stored topsoil (which provides a seed source) and vegetation to encourage natural regeneration, with additional rehabilitation methods (e.g. direct seeding) implemented where required to supplement natural regeneration.

A Restoration and Rehabilitation Plan will be prepared outlining rehabilitation methodologies, timing of works, monitoring and contingency planning. Any additional rehabilitation undertaken to supplement natural regeneration (e.g. direct seeding) would utilise local native species.

Rehabilitation is discussed in further detail in Section 15.6.1.

Offset

Offsets for the clearance of native vegetation and for residual significant impacts to EPBC-listed threatened species have been proposed (see Appendix I-7 and I-9 for details).

15.6 Impact Assessment

The following Project aspects have been identified as sources of impacts to terrestrial flora and fauna:

- vegetation clearance and land disturbance required for construction of the Project
- construction activities including vehicle and machinery movement, presence of personnel and presence of open trenches
- the presence and operation of infrastructure including the desalination plant, pump stations and transmission lines
- operational activities associated with the Project including inspection and maintenance along the pipeline.

Impacts to aquatic flora and fauna are assessed in Chapter 13 Surface Water.

The potential impact events resulting from these aspects of the Project are discussed below. Consequence categories for the expected impacts and an evaluation of uncertainty are also provided for each impact event.

The assessment of impacts assumes that the mitigation measures outlined in Section 15.6.15 are implemented and in place.

15.6.1 Clearance of vegetation and habitat

Approximately 1,992 hectares of native vegetation will be cleared during construction along the approximately 406 km length of the Project. The majority of this is temporary and represents a very small proportion of native vegetation in the region traversed by the Project. This clearance will be offset by achieving a 'Significant Environmental Benefit' in accordance with the *Native Vegetation Act 1991.*

Construction of the Project will involve approximately 1,992 ha of native vegetation clearance, of which approximately 1,616 ha (81%) is temporary and will be rehabilitated following construction. The permanent disturbance footprint in areas containing native vegetation is estimated to be 376 ha.

Table 15-14 provides a breakdown of estimated vegetation clearance for each Project component. This breakdown is based on indicative areas of direct disturbance to the ground surface for construction and operation of all Project components, as defined in the disturbance footprint[16] shapefiles (Revision 5.2).

The disturbance footprint is preliminary and is expected to change as it is refined throughout the detailed design and construction phases. Key assumptions made in estimating the disturbance footprint are outlined below (and further detail is provided in Chapter 6 Project Description and Appendix I-5 Native Vegetation Clearance Data Report (Section 2.5)):

- The desalination plant construction footprint has been conservatively classified as permanent clearance due to uncertainty in the design and location of features such as the earth bank storage, construction laydowns, construction water treatment plant and ponds for dewatering, evaporation and stormwater management. However, parts of the construction footprint would be temporary, and the disturbance is also likely to be reduced overall.
- A maximum pipeline alignment construction corridor width of 40 m for standard installation has been specified. This is less than a more typical width of 50-60 m for a pipeline of this nature, in order to minimise impacts to native vegetation and associated habitat. This corridor width is subject to various construction constraints in some locations (typically due to cultural heritage, environmental or design constraints) where narrowing of the disturbance footprint is required..

  The ultimate construction corridor width will be dependent on the outcomes of detailed design and related construction methodology. It may be reduced in some locations, however, there may also be instances where extra workspace is required e.g. adjacent to highly constrained sections.
- Allowance for a 3 m wide access track along the pipeline alignment has been included in permanent disturbance area estimates. This is to account for an unformed track that may result from occasional vehicle access along the alignment for operational and maintenance services and for established access tracks to infrastructure such as air valves, scour valves and water meters.

[16] Refer to Chapter 1 Introduction (Section 1.12) for disturbance footprint definition.

- Allowance for a permanent access road from Lincoln Highway to the desalination plant, adjacent to the transfer pipeline, has also been included, as a 20 m corridor. This will utilise existing roads and tracks for most of its length.
- Electricity infrastructure disturbance footprints are based on nominal locations of tower / pole structures and stringing pads / tracks, with the exception of the Oakden Hills 33kV transmission line, which uses a nominal 10 m wide corridor immediately adjacent to the Stuart Highway.
- Indicative locations of potential laydown areas, camps, new access tracks and access track upgrades to allow heavy vehicle access have been identified and are included in the indicative disturbance footprint. These are nominal at this stage of the initial design, and additional or differing locations may be identified through detailed design.

Table 15-14: Summary of estimated clearance by Project component

Component	Permanent (ha)	Temporary (ha)	Total (ha)
Access Road (Lincoln Highway to Eight Mile Creek Road)	11.593	-	11.593
Access Road (Eight Mile Creek Road to Desalination Plant)	12.012	-	12.012
ARTC Level Crossing	0.300	-	0.300
Desalination Plant	185.088	-	185.088
Permanent Access Track	109.777	-	109.777
Pipeline (underbore)[17]	1.554	-	1.554
Pump Station	13.916	12.766	26.682
Substation	11.326	14.089	25.415
Transmission Line	29.789	25.181	54.97
HV Access Track Upgrade	-	6.184	6.184
Laydown Area	-	198.002	198.002
Pipeline	-	1,344.781	1,344.781
Pipeline (Conditional Requirements)[18]	-	15.344	15.344
Grand Total (ha)	**375.356**	**1,616.349**	**1,991.705**

A summary of vegetation clearance by vegetation type is provided in Table 15-15 (further details are provided in Appendix I-5 Native Vegetation Clearance Data Report). As noted in Section 15.4, the majority of vegetation is generally in moderate to good condition, the vegetation types present are generally common and widespread, and none of the vegetation communities within the disturbance footprint are listed as threatened. The

[17] Clearance not expected but has been conservatively included due to further refinement required for cultural heritage and constructability.

[18] Conditional requirements vary and are subject to confirmation based on client conversations with technical advisors and relevant stakeholders.

vegetation present represents habitat for native flora and fauna species, including several threatened fauna species (see Sections 15.6.9 to 15.6.12).

Table 15-15: Summary of estimated vegetation clearance by Major Vegetation Group

MVG	Description	Estimated construction clearance (ha)
Eyre Peninsula Landscape Management Region		
EP 2	Open Woodlands of Western Myall / Black Oak /Sugarwood	84.589
EP 3	Chenopod shrublands (including drainage lines)	373.339
EP 4	Tall shrublands in drainage lines and on plains	0.285
South Australian Arid Lands Landscape Management Region		
SAAL 1	Stony plains and tableland with chenopod shrublands	689.171
SAAL 2	Chenopod shrublands on flat to undulating plains	129.016
SAAL 3	Ephemeral and permanent drainage lines and waterholes	29.013
SAAL 4	Open woodlands of Western Myall and Mulga on sand plains and low dunes	397.562
SAAL 5	Woodlands and shrublands on low dunes and dune crests	190.494
SAAL 6	Dune swales with open woodlands, shrublands and tussock grassland	67.321
SAAL 7	Cane-grass run-on areas and depressions	2.393
SAAL 8	Inland Saline depressions and drainage lines	5.836
SAAL 10	Non-saline shrublands in clay depressions	1.426
SAAL 11	Sandhill Cane-grass grassland	5.517
SAAL 12	Woodlands of Black Oak on flat and undulating plains	15.741

The disturbance footprint represents a very small proportion of native vegetation in the region traversed by the Project, representing on average 0.04% of native vegetation present in the IBRA subregions intersected (see Table 15-16). The permanent disturbance footprint represents less than 0.007% of the native vegetation present in these IBRA subregions.

Table 15-16: Estimated clearance in each IBRA subregion

IBRA Subregion	Subregion area (ha)*	Subregion vegetation cover*	Approx. area of clearance	Clearance % of IBRA subregion remnant vegetation
Myall Plains	1,083,683	97%	543	0.05 %
Arcoona Plateau	1,084,866	99%	767	0.07 %
Gawler Lakes	2,039,398	62%**	475	0.02 %
Roxby	1,403,536	98%	207	0.01 %

* Subregion vegetation cover (%) and subregion area obtained from NatureMaps (2026b)

**Gawler Lakes has very high native vegetation remnancy but contains large salt lakes with no vegetation. Native vegetation cover for IBRA associations in the Project Area is over 95% (refer Table 15-3).

As noted in Section 15.5, site selection, alignment selection and Project design have sought to avoid or minimise impacts to native vegetation and habitats as far as possible. Areas of high conservation value have been avoided and there are no areas in the disturbance footprint protected under the National Parks and Wildlife Act or under Native Vegetation Act heritage agreements.

The disturbance footprint predominantly follows existing disturbed corridors with the aim of minimising potential impacts as a result of clearance or fragmentation. The detailed design process will involve ongoing refinement to minimise impacts as design and technical studies continue.

Construction footprints will be restricted to the minimum necessary to facilitate safe, efficient construction. Methods such as rolling vegetation in the pipeline construction corridor where possible, rather than grading, will be implemented to facilitate more rapid regeneration, preserve topsoil and reduce erosion. Existing roads, tracks and disturbed areas will be utilised as far as possible and a range of other measures to minimise vegetation clearance (such as micro-siting transmission line components) will also be implemented, as outlined in Section 15.6.15.

The impact of native vegetation clearance will be offset by implementation of a '**significant environmental benefit'** (SEB) in accordance with the requirements of the *Native Vegetation Act 1991* and *Native Vegetation Regulations 2017*. Estimates of the SEB requirements for the Project are provided in the draft Native Vegetation Clearance Data Report (Appendix I-5). The Data Report also provides further detail on the application of the mitigation hierarchy (which is summarised above in Section 15.5), identifies the level of clearance (which is assessed as level 4) and provides an assessment against the principles of clearance, in accordance with the requirements of Native Vegetation Council guidelines.

The total offset requirement under the Native Vegetation Act for terrestrial vegetation clearance is estimated as 139,448 SEB points for on-ground offset or a payment of $12,373,128 into the Native Vegetation Fund. As noted in Section 15.3.6, final SEB requirements will be confirmed following detailed design, finalisation of the native vegetation clearance footprint and assessment by the Native Vegetation Council.

A preliminary SEB offset strategy is being developed for the Project and is outlined in Appendix I-9. It outlines a hierarchy of offset delivery mechanisms that will be leveraged to achieve the required SEB. The preferred approach is to maximise delivery of on-ground offsets through the protection and active management of native vegetation, consistent with the principles of 'like-for-like or better', landscape-scale conservation outcomes and long-term biodiversity gains. Multiple offset delivery pathways are being investigated, including establishment of new SEB areas, acquisition of SEB credits, partnerships with landholders and accredited third-party providers, and opportunities to align outcomes with biodiversity conservation priorities across the regions traversed by the Project. Potential offset opportunities, including large landscape-scale conservation areas, are currently being assessed and remain subject to ecological assessment, commercial negotiations and Native Vegetation Council approval

A Construction Environmental Management Plan (CEMP) and a suite of sub-plans (e.g. Soil Erosion and Drainage Management Plan) will be developed following approval of the Project and will be implemented during construction activities. The CEMP will detail the requirements

for pre-clearance activities and post clearance audits, management of vegetation clearance and approved clearance areas. Monitoring will be undertaken as per the CEMP to ensure management measures are implemented and effective.

The expected impacts are in the **Minor** category. Uncertainty in the expected impact (based on uncertainty in the final definition of clearance areas or effectiveness of implementation of management measures (e.g. designated clearance extent)) has been evaluated in Appendix M and the level of risk is **Low.**

Progressive rehabilitation of temporary disturbance following construction in accordance with the Project's rehabilitation framework and management plans will reduce the long-term impact of vegetation clearance.

Although there is a large clearance footprint (1,992 ha) over the 406 km length of the Project, the majority of this is temporary disturbance and the final above ground infrastructure and operational footprint in areas that contain native vegetation is estimated as only 376 ha (19 % of the total clearance footprint).

Areas of temporary disturbance in native vegetation would be rehabilitated following construction, by respreading cleared topsoil (as a seed source) and cleared vegetation to encourage natural recruitment of vegetation and regeneration with limited intervention for a minimum of 12 months. Additional rehabilitation methods (e.g. direct seeding) will be implemented where required to supplement natural regeneration. Rehabilitation requirements will be detailed in the CEMP, Restoration and Rehabilitation Management Plan and associated procedures, as outlined in Section 15.5.

Rehabilitation of temporary disturbance in areas with native vegetation would involve the following:

- removal of temporary construction materials and waste
- recontouring the land to match the surrounding landform
- re-establishment of natural drainage lines and bank restoration (where necessary)
- installation of permanent erosion control structures where required
- deep ripping to break up compacted soils (perpendicular to the slope of the land) where relevant
- respreading of preserved topsoil containing retained seedstock and rootstock
- respreading of preserved gibber stone where relevant
- soil scarification perpendicular to the slope of the land where relevant (to control surface water flows and reduce potential for erosion, and to retain windborne seeds and organic materials, rainwater, and surface flows)
- respreading cleared vegetation over topsoil
- ongoing removal and destruction of weeds (where weed control will not damage regenerated vegetation).

Limited intervention is proposed for an initial period of at least 12 months, as this approach is considered most likely to achieve a sustainable long-term rehabilitation outcome in the arid and semi-arid environments of the Project Area. Natural regeneration following disturbance is highly dependent on seasonal conditions and rainfall events, which can be infrequent and

variable. Allowing time for natural recruitment from existing soil seed banks and surrounding native vegetation reduces the risk of introducing species that are not well adapted to site conditions and promotes the re-establishment of vegetation communities consistent with the surrounding landscape. Rehabilitation outcomes will be monitored during this period, with additional measures such as local provenance seed collection and direct seeding implemented where monitoring indicates that natural regeneration is not occurring or is unlikely to achieve agreed rehabilitation objectives within a reasonable timeframe.

Plant species in the disturbance footprint are expected to have a variable response to disturbance and rehabilitation. Many species of grass, forbs and shrubs present in the disturbance footprint (including key habitat species for Western Grasswren such as Black Bluebush) are known to readily regenerate in disturbed areas. Conversely, some species such as Mulga or Western Myall are likely to show very low rates of regeneration. Consequently, regenerated vegetation may take decades to fully replicate the structure of cleared vegetation. However, the generally narrow disturbance footprint is expected within a much shorter timeframe, to achieve a structure and function that is consistent with similar-sized patches of shrubland that naturally occur in the vegetation types that will be disturbed.

Although there is limited published research on regeneration or rehabilitation in vegetation types similar to those present in the Project Area, observational evidence supports the assumption that the proposed rehabilitation methods will result in successful regeneration of vegetation and habitats:

- Existing buried pipelines in the vicinity of the Project (e.g. the Moomba to Port Bonython Liquids Line) have a high level of vegetation cover which is difficult to distinguish from adjacent vegetation.
- Trials with reseeding at the Carrapateena mine have indicated that standard rehabilitation with supplementary seeding results in high levels of regeneration success.
- As noted above, colonising species including Black Bluebush are known to readily regenerate in disturbed areas.

In addition, the relatively low prevalence of weeds, and the narrow and linear nature of the disturbance (with a seed source provided by adjacent intact vegetation) are also conducive to the success of natural regeneration.

The expected impact following rehabilitation of temporary disturbance is in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty in the final definition of clearance areas and the success of rehabilitation and rate of regeneration) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.2 Habitat fragmentation

The Project will not significantly increase habitat fragmentation.

The Gawler IBRA Region largely consists of remnant vegetation, with over 95% native vegetation cover in the IBRA associations traversed by the Project. While much of this vegetation has been modified by grazing land uses, the vegetation structure largely remains and there are very few large-scale barriers to fauna movement. Road and rail corridors that

run through the Project Area could present an impediment to the movement of some small ground-dwelling fauna, however this effect is likely to be very limited.

Fragmentation is typically defined as the division of large, continuous areas of habitat into smaller isolated and unconnected areas of habitat. Due to the Project's location, below ground construction, linear nature and the existence of extensive habitat adjacent to the Project, it would not result in the creation of smaller unconnected areas of habitat. The Project Area is surrounded by large continuous areas of vegetation, which would remain accessible to any fauna present in the vicinity of the Project.

At a smaller scale, the narrow, linear cleared construction corridor is not likely to present a complete barrier to fauna movement. Although it could discourage direct movement of individuals across the cleared area, most species (including key species such as Western Grasswren) are expected to be able to cross the cleared construction corridor if necessary. It could present a short-term barrier to smaller ground-dwelling species (e.g. small reptiles) that require vegetative cover, but is unlikely to impact the majority of bird species. Following rehabilitation, cleared vegetation that has been respread would provide some cover for these species and with the re-establishment of vegetation cover over time, there are expected to be minimal ongoing effects.

The alignment of the Project's linear infrastructure is generally close to existing infrastructure corridors (e.g. highways) with similar but permanent potential for small-scale impacts to some species. Consequently, the Project is not introducing a new source of potential fragmentation impact to the Project Area.

The open pipeline trench will also present a short-term barrier to small ground-dwelling fauna for the period of time it is open. This will be very limited in duration in any particular location (typically days to weeks), as the pipeline work front is predicted to progress at an approximate average rate between 400 – 700 m per day and backfilling is generally expected to occur within days of pipeline installation. Impacts would be localised to the area where the trench is open (which is expected to be in the order of 1 km in length at any one time). Mitigation measures would be implemented to minimise potential impact on fauna from entrapment in the open trench, as discussed in Section 15.6.4.

During operation, vegetation would be re-established across the construction corridor and it is not expected to present any barrier to fauna movement.

Decommissioning activities at the end of the design life of the Project are not expected to result in additional fragmentation as the pipeline would remain in place with only above ground infrastructure and the desalination plant being decommissioned.

The expected impacts to ecological values from fragmentation are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (based on uncertainty in final definition of clearance areas and the prediction of fragmentation impacts) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.3 Indirect effects on vegetation and fauna habitats

Indirect impacts to vegetation and fauna habitats will be short-term and limited in extent.

There is potential for vegetation and fauna habitats adjacent to construction areas to be indirectly impacted by Project activities. The potential significance of this 'edge effect' is

reduced by the proposed alignment, as it predominantly follows existing disturbed corridors. Control measures will be implemented during construction and operation to ensure that these impacts are minimised and are short-term.

Dust emissions resulting from vegetation clearing, earthworks and vehicle movement, that can potentially reduce vegetation health, will be managed by implementing dust control measures during construction and progressive rehabilitation of areas of temporary disturbance, as discussed in Chapter 18 Air Quality. These impacts will be short-term, as construction is temporary and maintenance vehicle movements during operations are limited, and will be localised to the vicinity of the alignment and access tracks. Dust is therefore unlikely to result in long term reduction of vegetation health.

Erosion and sedimentation from disturbed areas or alteration of surface water flows are expected to have a very low level of impact and will be managed by a range of design measures and management controls, as discussed in Chapter 12 Soils and Landform and Chapter 13 Surface Water. Any impact to vegetation and habitats would be very localised and short-term.

Activities that could result in reduction in soil or water quality, such as wastewater management, dewatering, dust suppression using saline water and spills that have the potential to affect vegetation and habitats are discussed in Chapter 12 Soils and Landform and Chapter 14 Groundwater. With the control measures outlined in the respective chapters in place, the impact to vegetation and habitats would be localised and short-term.

Increased public access during operations via new unmanaged access tracks could also result in fauna disturbance and habitat degradation from unmanaged recreation or poor waste management (or an increase in weeds or predatory pests, as discussed in Section 15.6.5). Access to the operational easement will be restricted by locked gates where required and appropriate signage. As the water delivery infrastructure alignment predominantly follows existing tracks and infrastructure corridors where the risk of increased public access already exists, the Project is not expected to result in a significant increase in public access.

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (based on uncertainty in the implementation of management measures or unplanned events such as extreme weather events) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.4 Disturbance to fauna

Lighting

Lighting effects at camps and other sites during construction will be short-term and localised and will not have a significant impact on fauna.

During construction, temporary lighting will be required at worker camps and may also be installed at other sites including the desalination plant, pump stations and substations. As the tunnel boring machine will operate 24-hours per day, lighting in the vicinity of the launch box / shaft at the desalination plant site is expected to be utilised continuously. Continuous lighting at other sites is not expected to be required as night-time construction is not planned to be routinely undertaken.

Artificial lighting from temporary worker camp sites or other sites (where required) can result in localised impacts to behaviour of fauna, including displacement of some species and attraction of fauna such as insects, geckos and insectivorous microbats and potentially larger aerial nocturnal predators. Given the limited use of lighting for the Project at a small number of locations, impacts to fauna associated with lighting would be localised and short-term. Construction works overnight at other sites are expected to be limited and / or very short-term thus limiting the impacts on fauna.

The desalination plant site and the launch box / shaft do not support any fauna species of high conservation significance or species known to be particularly sensitive to light disturbance. The habitats and species present at the desalination plant site are common and widespread in the area and species can potentially disperse away from the site. Localised impact from lighting during construction is not expected to have a significant impact on any species that is present.

Temporary lighting during construction would be installed with consideration of National Light Pollution Guidelines for Wildlife (DCCEEW 2023b).

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty in camp locations or the extent of lighting at camps) has been evaluated in Appendix M and the level of risk is **Low**.

Lighting at the desalination plant during operation will not have a significant impact on fauna.

Once operational, the desalination plant will require lighting to allow 24-hour operations and for the safety of workers and security of the plant. Other facilities (e.g. pump stations, storages and substations) are not expected to require permanently operating lighting of any significance.

There is potential for night lighting from the desalination plant location to change behaviour of fauna including displacement for some species and attraction of others, as discussed above.

Facility lighting will be subject to detailed design, in accordance with *Australian Standard AS 4282 – Control of the obtrusive effects of outdoor lighting and principles of best practice lighting design* (DEE 2020) and National Light Pollution Guidelines for Wildlife (DCCEEW 2023b) to minimise light spillage. Best practice lighting design, as outlined in the above guidance documents, includes:

- only adding light for specific purposes
- using adaptive light controls to manage timing, intensity and colour
- lighting only the object or area intended – keep lights close to the ground, directed and shielded to avoid light spill.
- using the lowest intensity lighting appropriate for the task.
- using non-reflective, dark coloured surfaces
- using lights with reduced or filtered blue, violet and ultraviolet wavelengths.

The National Light Pollution Guidelines for Wildlife (DCCEEW 2023b) requires consideration of important habitat for listed species located within 20 km. Several migratory shorebirds have

the potential to be present near the desalination plant as detailed in Sections 15.4.8 and 15.4.9. While there is potential for small numbers of migratory shorebirds to occur on the coastline in proximity to the desalination plant, there is no important migratory shorebird habitat[19] within 20 km of the Mullaquana Station. Similarly, there is no important habitat in close proximity to the site for key other fauna groups (i.e. marine turtles, seabirds, bats, terrestrial mammals and ecological communities) identified in DCCEEW (2023b). Western Grasswren (listed as Vulnerable) is known to occur widely in the broader area but not at the desalination plant site, however it is not expected to be adversely impacted by localised lighting impacts at the site (refer to Section 15.6.9 for further discussion of this species).

In addition to implementation of best practice lighting design, the distance of the desalination plant from the shoreline and the presence of natural barriers, including low dunes, will also reduce any potential for lighting to impact small numbers of migratory shorebird species that could potentially be present on the coast.

The expected impact of lighting at the desalination plant during operation is in the **Negligible** category. Uncertainty in the expected impact (based on the limits of the spatial extent of ecological survey coverage) has been evaluated in Appendix M and the level of risk is **Low**.

Noise

Noise disturbance during construction will be temporary and localised and will not have a significant impact on fauna.

Fauna in the immediate vicinity of the Project may be directly influenced by noise and vibration associated with construction, increases in traffic and presence of construction vehicles / plant equipment. Changes to existing noise levels can potentially affect breeding behaviour, foraging behaviour and social interactions.

The impact of noise on fauna can be classified as one of four categories as noise levels increase (refer Appendix J-2):

- physiological and / or behavioural response at lower noise levels
- masking (interference with detection of biologically significant sound)
- temporary threshold shift (temporary loss of hearing)
- permanent threshold shift (permanent loss of hearing).

The noise impact assessment undertaken by Resonate for the Project (refer Appendix J-2) identified birds as the most noise sensitive fauna in the Study Area. The following criteria were used for evaluating noise impact on fauna, and were based on the work of Dooling (2007) on the effects of different noise sources on birds:

- behavioural or physiological effects can result from any audible component of traffic and construction noise

[19] As defined in the *Australian National Directory of Important Shorebird Habitat* (Driessen et al. 2025)

- masking depends on ambient noise levels, however some studies[20] have shown masking affects may occur when noise levels reach 50-60 dB(A)
- temporary threshold shift criteria (for non-strike continuous noise sources) is 93 dB(A)
- permanent threshold shift criteria for multiple impulse sources (e.g. pile driving) is 125 dB(A) and for single impulse sources (e.g. blasting) is 140 dB(A). Continuous noise sources (e.g. construction noise) do not reach levels capable of causing this.

Based on the assessment in Appendix J-2, auditory injury in fauna from Project construction activities is considered unlikely. Fauna would need to be within 16 m of vibratory hammer piling activities or within 3 m of activities such as compaction to exceed the criteria for temporary threshold shift, and within 1 m of impact piling to exceed the criteria for permanent threshold shift (see Table 15-17). Fauna would be unlikely to approach or remain within this distance and would avoid the noise source before any auditory injury occurred.

Table 15-17: Fauna criteria exceedance distances for expected typical worst-case sources

Noise source	Fauna criteria	Lw, dB(A)	Exceedance distance[21] (m)
Vibratory hammer piling	93 dB(A)	125	16
Compaction		109	3
Concrete pump		106	2
Impact piling	125 dB(A)	128	1

[Source: Resonate 2026b, provided in Appendix J-2].

Masking or behavioural impacts of construction noise from the Project will be temporary and localised to the vicinity of active work areas. The Project may result in temporary displacement of individuals from the immediate vicinity of the construction area during the construction period. For the majority of the disturbance footprint, construction noise will be sporadic and very short-term, as construction crews work past any given location. The disturbance from construction noise is not expected to result in significant impacts to populations, including species listed under the EPBC Act (as discussed in 15.6.9).

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (based on uncertainty and variability in the occurrence or extent of fauna and the estimation of the area over which responses may occur) has been evaluated in Appendix M and the level of risk is **Low**.

Noise generated during operation at the desalination plant and pump station sites will be localised and will not have a significant impact on fauna.

Operational noise is unlikely to cause auditory injury to local fauna. Predicted noise levels at the desalination plant and pump stations are below 70 dB(A) immediately adjacent to the

[20] Using critical ratio data from 14 bird species, known short-term behavioural adaptations of birds to noise, and background noise levels typical of a quiet suburban environment, masking effects may begin to occur when noise levels reach approximately 50–60 dB(A) (refer Appendix J-2).

[21] Exceedance distance has been determined by Resonate (2026b) as an absolute distance between the source and receptor, as the receptor height is unknown and is likely to change unexpectedly

plant or pump station (refer Chapter 19 and Appendix J-2). This is below the identified noise level at which a temporary hearing loss may occur (93 dB(A)).

Noise from the operation of the desalination plant and the four pump stations has the potential to cause some localised masking or short-term behavioural responses in individuals within close proximity to the sites. Predicted operation noise levels are less than 60 dB(A) within approximately 600 m of the desalination plant and they decrease to below 45 dB(A) within 3 km of the desalination plant, and within 0.5 km to 2 km of the pump stations. Predicted operation noise within these zones is higher than the measured background levels (refer to Chapter 19) and may cause masking effects in local fauna. This may lead to localised impacts such as a minor displacement of individuals without impacting any species at the population level given the widespread nature of the fauna species and habitats present in the Project Area.

Mitigation measures that will be implemented to reduce the emission of noise during operation are detailed in Section 19.5.7 in Chapter 19.

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (based on uncertainty and variability in the occurrence or extent of fauna and the estimation of the area over which responses may occur) has been evaluated in Appendix M and the level of risk is **Low**.

Fauna mortality or injury

Measures will be implemented to minimise the incidence of fauna injury or mortality during construction. Any impacts would be short-term and localised to the work front and are not likely to have a significant impact on any species.

Fauna injury or mortality can occur through impact or collision with vehicles or machinery or entrapment in excavations, predominantly during the construction phase.

Once construction commences at any location, larger or more mobile local fauna would move away from the disturbance footprint, however smaller species (e.g. small reptiles) may remain. Individuals may be impacted by construction activities, however given that habitats present in the disturbance footprint are common and widespread, impacts to overall species and populations are likely to be small and localised. If there are impacts to individuals or localised fauna populations, the impacts on populations are likely to be short-term. Impacts would predominantly be related to the construction work front of the transfer system, which is predicted to progress at an approximate average rate between 400 – 700 m per day, resulting in short-term impacts at any given location. The trench will also be open for a short time at any given location as discussed in Section 15.6.2.

Measures will be implemented to minimise fauna injury or mortality during construction, including:

- regular monitoring of trenches and excavations to release trapped fauna
- progressive backfilling of trenches to minimise the length of open trench
- presence of experienced environmental management field staff during access and clearing activities.
- use of wildlife handler where appropriate (e.g. to assist with removal and relocation of any trapped or injured fauna)

- speed restrictions to reduce the likelihood of fauna strike.

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (based on uncertainty or variability in the frequency of collision or entrapment that may result from favourable environmental conditions) has been evaluated in Appendix M and the level of risk is **Low**.

Bird strike

Potential for collision with transmission line infrastructure is not expected to have a significant impact on any species.

Bird strike can occur as a result of collision with vehicles (as discussed above) or transmission lines. Historically, the highest mortality rates occur where transmission lines pass directly through or in close proximity to wetlands, flyways or other important areas used by birds (NatureScot 2016).

None of the proposed transmission lines are in close proximity to wetlands, known flyways or other important areas used by birds. Proposed transmission lines and nearby surface water features for the Project are described below:

- Mullaquana Station transmission line crosses small ephemeral creek lines
- Pandurra transmission line crosses small ephemeral creek lines
- Bookaloo transmission line is not close to any notable surface water features
- Oakden Hills transmission line is approximately 5 km from Pernatty Lagoon, which would only provide habitat following significant rainfall, and is not considered close enough proximity to present an increased risk.

Other factors considered to influence the likelihood of risk of collision / bird strike included body size (wingspan and weight), dispersal timing, and flight type (ALT 2002). Likelihood of collision has been documented to be reduced when mitigation measures are applied to transmission lines, including line markers (reflective and non-reflective), line design / configuration features and spacing of towers are implemented.

There are no known high-risk areas for bird strike along the proposed transmission line routes. Should bird strike become an issue line marking can be installed retroactively to manage this impact.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty and variability in flight paths or behaviours of birds that occur in the region) has been evaluated in Appendix M and the level of risk is **Low.**

Displacement

Construction activities may temporarily displace fauna, with no expected long-term population impacts.

Behavioural changes of fauna due to presence of construction personnel, noise or light spill will occur during construction and operation of the Project. Construction noise will occur temporarily along the disturbance footprint with light spill predominantly at construction worker camps and the desalination plant during operations as discussed above.

Construction activities may result in temporary displacement of individuals from the immediate vicinity of the construction area. This would have a localised impact, however given the widespread nature of the habitats impacted, is not expected to result in significant impacts to species populations. Clearance will be staged along the Project Area and activities at any given location on the transfer system will generally be temporary and short-term. Habitat features including fallen timber and cleared vegetation will be retained and replaced during rehabilitation in areas of temporary disturbance to minimise loss of habitat and structure and facilitate regeneration. Light spill impacts from the desalination plant on displacement of species has been assessed above.

Weed and pest management will be undertaken to prevent weed species from displacing native flora and fauna. Further detail on weed and pest management is included in Section 15.6.5.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty or variability in the occurrence and extent of fauna species present and in the degree to which they may be displaced) has been evaluated in Appendix M and the level of risk is **Low.**

15.6.5 Pests and weeds

Incursion of predators or pests

Project activities and the presence of access tracks and other operational infrastructure are not expected to result in an increase in the existing level of pest species.

The Project activities with potential to increase the abundance of pest species include inappropriate management of waste creating a food source for pest species, temporary increase in availability of water sources during construction or creation of access tracks and linear infrastructure creating preferential corridors for pest species to traverse.

Waste will be managed and transported appropriately, including measures such as using covered waste bins to avoid increasing or facilitating the presence of predators or pests in the area. Water for use in construction or at camps will be managed to prevent access by fauna (e.g. storage in containers or tanks, or in fenced areas). Temporary exposure of groundwater during pipeline construction could occur in a small number of locations with shallow groundwater, however, as the groundwater is generally expected to be saline (refer to Chapter 14 Groundwater) and would only be exposed for a short period of time, it will not provide a significant fresh water source for pest species. Longer-term water storages (e.g. dewatering ponds at the desalination plant site, or operational water storages) will be managed to limit accessibility by fauna and stock.

The construction of the Project is not expected to significantly increase the access of predatory pests (e.g. cats or foxes) to habitats on the Project Area as there are numerous existing tracks and, where possible, the alignment follows existing clearance corridors (roads and railways) to avoid creating new corridors. Existing access tracks will predominantly be utilised to access the Project during construction.

As noted in Chapter 9 Use of Land and Marine Waters, standard pest management practices in the CEMP and OEMP will be implemented to manage potential impacts during construction and operation.

Pest management would be carried out in consultation with landholders, the Eyre Peninsula and South Australian Arid Lands Landscape Boards, local councils and PIRSA as required. A specific focus will be on ensuring that pest risks are managed across the length of the pipeline and across Landscape Regions.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty or variability in pest species abundance) and in effectiveness of implementation of management measures has been evaluated in Appendix M and the level of risk is **Low**.

Introduction or spread of weeds

Project activities are not expected to result in an introduction, increase or spread of weeds above existing levels.

During construction, earthworks and vehicle movements present a possible source of weeds on tyres and vehicles which could introduce weeds into new areas. In addition, ground disturbance and removal of established vegetation increases the opportunity for weed species to colonise an area.

As noted in Chapter 9 Use of Land and Marine Waters, weed management practices in the CEMP and OEMP will be implemented to manage potential impacts during construction and operation.

The Project will implement weed hygiene measures for construction to prevent weeds from being introduced, establishing or increasing existing populations, which will include:

- Pre-construction weed surveys will be undertaken to determine existing weed levels and appropriate control measures required during construction and operation.
- Weed hygiene practices will be implemented including vehicle checks and washdowns as required on vehicles or plant entering the construction site.
- Materials brought to site (particularly any soil or fill material) will be from weed free sources.
- During construction, monthly weed surveillance monitoring will be undertaken targeting WoNS and Declared Weed species, with follow up controls as required for any identified weed outbreaks.
- During operation, weed surveillance and control programs will be implemented targeting WoNS and Declared Weed species (if weeds identified) on an annual basis.

Buffel Grass has been noted as a specific concern by a number of stakeholders and there are known records in the Project Area, particularly along the Stuart, Eyre and Lincoln highways. The management strategies implemented will align with the key strategies recommended by the Buffel Grass Strategic Plan (Biosecurity SA 2019) especially in Zone 3 (Eyre Peninsula) to prevent establishment (see Section 15.4.11 of this chapter). Additional measures specific to Buffel Grass would be implemented during construction, for example:

- inclusion of details on Buffel Grass identification, known locations and site-specific management requirements in the CEMP and at site construction locations
- provision of records of Buffel Grass identified by the Project to the relevant LMR.

Where identified in the Eyre Peninsula, any measures to destroy Buffel Grass would be undertaken in consultation with landowners, the Landscape Board and Biosecurity SA / PIRSA guidelines.

During operations there will be no regular ground disturbance that would facilitate weed establishment. Ensuring vehicles use existing, hardstand access tracks will reduce the ability of any weeds from vehicles to spread or establish. Regular inspections will be made of above ground infrastructure (i.e. desalination plant, pump stations, substations and transmission lines) and the water transfer system alignment, which will include identifying any weeds present. Adaptative weed management, monitoring and control would be undertaken.

Weed management would be carried out in consultation with landholders, the Eyre Peninsula and South Australian Arid Lands Landscape Boards, local councils and PIRSA as required. A specific focus will be on ensuring that weeds are managed across the length of the pipeline and across and between Landscape Regions.

The expected impacts are in the **Minor** category. Uncertainty in the expected impact (based on uncertainty or variability in pest species abundance and in effectiveness of implementation of management measures) has been evaluated in Appendix M and the level of risk is **Medium.**

This rating reflects the higher consequence of the introduction or spread of weeds such as Buffel Grass and the need for effective monitoring and management to be implemented.

Pathogens

Project activities are not expected to result in introduction or spread of pathogens.

The Project Area is low to negligible risk for the establishment of Phytophthora due to the low annual rainfall along the alignment, as discussed in Section 15.4.11. The nearest outbreak of Phytophthora recorded on NatureMaps (DEW 2024a) is south-west of Tumby Bay, approximately 200 km south of the Project Area.

Standard weed hygiene measures proposed to mitigate introduction of weeds to the site will also reduce the risk of introducing Phytophthora to the site.

The expected impacts are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer Appendix M).

15.6.6 Fire

The level of risk associated with fires during construction and operation can be appropriately managed with the implementation of risk treatment and mitigation measures.

Bushfires are a natural occurrence in the region. They may result from lightning but can also occur as a result of other causes including reignition or escape of prescribed burns (which are typically undertaken to the south of the Project Area), improperly extinguished or out of season campfires or arson.

As discussed in Chapter 25 (Hazards and Risks), construction and operation of the Project involves a number of potential ignition sources. Construction activities have a higher risk of ignition throughout the Project Area. During construction, key potential ignition sources include sparks or exhaust systems from heavy machinery or 'hot works' such as welding and

grinding. During operation, ignition sources would be limited to the transmission line and substation infrastructure interacting with vegetation, extreme weather events (including lighting and wind) and electrically induced fires.

Bushfires can have direct and immediate impacts to flora and fauna, as well as ongoing impacts, depending on factors such as the type of vegetation, fire intensity and fire frequency. Some plants are able to resprout from underground or ground-level woody tissue that has been insulated from heat (such as the lignotubers of mallee Eucalypt species), and a number of plant species' seeds are well insulated in soils or within dense woody capsules which can be released following fire. However, if fires are extremely hot due to excessive fuel loads or catastrophic conditions, some species will not readily regenerate. Other plant species are more susceptible to fire and may not readily regenerate. In addition to potentially reducing flora diversity, severe fires can impact hollows and deep litter cover which take many years to develop.

Mitigation measures to reduce risk of fires are outlined in Chapter 25 Hazards and Risks and Appendix N Bushfire Risk Management Plan and include controls on activities on high fire-risk days, vegetation management around infrastructure and construction zones and maintenance of appropriate clearance around electrical infrastructure.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty related to extreme weather events or effectiveness of implementation of controls) has been evaluated in Appendix M and the level of risk is **Low**.

Consequently, with the mitigation strategies such as those outlined in the Bushfire Risk Management Plan in place, the fire risk can be reduced to an acceptable and manageable level.

15.6.7 Impacts to Threatened Ecological Communities

EPBC-listed TECs

There are no Critically Endangered or Endangered TECs (i.e. MNES under the EPBC Act) present and there is no expected impact to TECs listed as Vulnerable under the EPBC Act.

There are no Critically Endangered or Endangered listed TECs occurring in or adjacent to the disturbance footprint. There are consequently no impacts expected to any TECs that are MNES for the purposes of Part 3 of the EPBC Act (requirements for environmental approvals).

The EPBC-listed (Vulnerable) Subtropical and Temperate Coastal Saltmarsh TEC that occurs within the Project Area is not expected to be impacted by the Project. Construction activities where this TEC occurs (adjacent to the desalination plant site) will consist of constructing a tunnel at depth below the TEC using a tunnel boring machine to install the intake and outfall pipes. Tunnelling will be a sufficient depth to meet engineering design requirements and this distance is not expected to impact the surface environment (including being deep enough to not affect the root zone of saltmarsh species). As such, there will be no direct impact to the TEC.

Impact to the Subtropical and Temperate Coastal Saltmarsh TEC due to sedimentation and contamination from construction and operation activities is unlikely, given this site is buffered from Project activities by other vegetation and a dune system, and the erosion and

stormwater management measures that will be implemented (refer to Chapter 13 Surface Water).

Groundwater modelling has shown potential for minor groundwater drawdown during construction (in the order of 0.5 m) adjacent to the box cut, decline and TBM launch facilities where the TEC is present (see Chapter 14 Groundwater). This is not expected to result in a material impact to the vegetation present due to the localised, small-scale nature and limited duration of the drawdown, and the possible mitigating impacts of surface water inputs (e.g. tidal flows). However, there is some uncertainty in both the groundwater modelling and the impact of small-scale drawdown on the vegetation. Further groundwater data collection, modelling and development of dewatering management plan will be undertaken prior to construction, to identify any additional mitigation and management measures that are required to minimise the potential for impact (see Chapter 14 Groundwater).

The expected impacts are in the **Negligible** category. The level of certainty in the assessment of expected impact to Critically Endangered or Endangered TECs is **High.** Uncertainty in the expected impact to the Vulnerable TEC (based on uncertainty in groundwater drawdown modelling) has been evaluated in Appendix M and the level of risk is **Medium**.

State-listed TECs

The Project will not impact any State-listed TECs.

No vegetation communities on or near the disturbance footprint are listed as rare or threatened in South Australia.

The expected impacts are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer Appendix M).

15.6.8 Impacts to EPBC-listed threatened flora

There are no impacts expected to any EPBC-listed flora.

All EPBC-listed flora species were assessed as unlikely to occur and therefore no impacts from the Project are expected (Appendix I-1).

The expected impacts are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer Appendix M).

15.6.9 Impacts to EPBC-listed threatened fauna

The Project is not expected to have a significant impact on any species of EPBC-listed threatened fauna except Western Grasswren. It may have a residual significant impact on Western Grasswren, which can be compensated for through implementation of offsets. No long-term impacts to EPBC-listed fauna are expected.

A detailed assessment of potential impacts against EPBC Act significant impact guidelines has indicated that, with the exception of Western Grasswren, impacts to listed threatened fauna species are not likely to be significant (refer Appendix I-6 Significant Impact Assessment).

The Project may have a residual significant impact on Western Grasswren (*Amytornis textilis myall*), as discussed further below. Mitigation and management measures as well as offsets

have been proposed for this species, as discussed below and in the Preliminary Commonwealth Offset Strategy provided in Appendix I-7. Long-term impact to this species as a result of the Project is not expected to occur.

The following tables and discussion provide further information on the assessments for key species of interest:

- A summary of the impact assessments for species that are known or likely to occur in the Project Area is included in Table 15-18.
- A summary of the impact assessments for other species that are listed in the EIS ARs is provided in Table 15-19.
- A discussion of potential impacts on known and likely species (and other species listed in the ARs) is provided following Table 15-18 and Table 15-19.

The full assessment for all species is contained in Appendix I-6 Significant Impact Assessment.

Table 15-18: Summary of impact assessment for known or likely EPBC-listed fauna

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
Terrestrial Birds				
Amytornis textilis myall **(Western Grasswren) (VU, V)**	**Known** (EP and SAAL) Field surveys observed a number of individuals around Whyalla, in particular between Mullaquana Station and Whyalla CP. The known range of Western Grasswren intersects with the disturbance footprint between Mullaquana Station and north of Port Augusta and there are numerous records in this region.	Standard mitigation measures as detailed in Section 15.6.15. Minimising construction corridor width in areas of preferred habitat where possible.	Clearance of approximately 136 ha of potential preferred habitat and 266 ha of atypical habitat for construction of the water transfer system and electricity infrastructure, the majority of which will be rehabilitated. This clearance is spread over approximately 100 km of the alignment and represents a very small proportion of available habitat in the region. Clearance of approximately 189 ha of atypical habitat (which is considered of only marginal suitability) for construction of the desalination plant. Disturbance of individuals in the vicinity of the Project during construction. Low potential for individuals to be impacted by collisions with vehicles or earth moving equipment. Low potential for increase in feral animal predation as existing tracks occur in the Project Area. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices.	**Minor** Residual significant impacts are considered possible under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
			Residual significant impacts are considered possible. Although disturbance will largely be temporary and represents a very small proportion of available habitat for Western Grasswren in the region, impacts from the Project could be considered to trigger the criteria adversely affect habitat critical to the survival of a species (in the short-term).	
Aphelocephala leucopsis **(Southern Whiteface)** **(VU, -)**	**Known** (EP and SAAL) Extremely widespread species distributed across most of mainland Australia, occurring in wide range of open woodlands and shrublands where there is an understory of grasses or shrubs, or both. Broadly present (with frequent detections during field surveys) across South Australia. In the EP LMR, the species was recorded in Whyalla CP, Mullaquana Station, and between Mullaquana Station and Whyalla. In the SAAL LMR, records of the species were scattered evenly throughout the alignment, with a small gap north of Woomera.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of habitat for construction of water transfer system and electricity infrastructure, the majority of which will be rehabilitated. Disturbance of individuals in the vicinity of the Project during construction. Low potential for individuals to be impacted by collisions with vehicles. Low potential for increase in feral animal predation as existing tracks occur in the Project Area. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices. *Although suitable habitat for this widely distributed habitat generalist occurs in patches throughout the full length of the Project Area, any impact from the Project is considered proportionately very small compared with the overall size of the*	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
			population and extent of habitat in the bioregion and across southern Australia, and is not considered important, notable, or of consequence with regards to its context or intensity.	
Neophema chrysostoma **(Blue-winged Parrot)** **(VU, V)**	**Known** (EP), **Known** (SAAL) Breeds in Tasmania and on mainland Australia south of the Great Dividing Range but can be found in large parts of south-eastern Australia outside the breeding season. Recorded at Mullaquana Station during field surveys. Scattered records throughout the Study Area from Whyalla to Roxby Downs. Does not breed in or near the Project Area but individuals could occur when its distribution extends into arid and semi-arid Australia in non-breeding periods	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of potential foraging habitat for construction of water transfer system and electricity infrastructure, the majority of which will be rehabilitated. No nesting habitat occurs within the alignment. Low potential for individuals to be impacted by collisions with vehicles. Low potential for increase in feral animal predation as existing tracks occur in the Project area. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices. *The Project Area is unlikely to support a specific important population of this species, and the species does not breed in the region. Disturbance as a result of the Project is likely to represent a loss of occasional foraging habitat only, representing a very small fraction of total available foraging habitat for this species across much of Australia.*	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
Sternula nereis nereis (Australian Fairy Tern) (VU, E)	**Likely** (EP) The sub-species' distribution extends along the coasts of SA, Tasmania, and central Western Australia. Limited suitable habitat for this species in the Project Area, mainly in coastal areas around the desalination plant site, outside the disturbance footprint. Not recorded in field surveys but is considered likely to occur as there are previous records along the coastline in the Study Area.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. *The Project will not directly impact any coastal habitat and no impacts to any population are likely to occur.*	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Threatened migratory birds				
Calidris acuminata (Sharp-tailed Sandpiper) (VU / MW, -)	**Likely** Migratory shorebird that breeds in Siberia and migrates to New Guinea and Australia in summer. Species has a widespread distribution in Australian coastal and inland areas, but prefers non-tidal fresh or brackish wetlands, damp grasslands, will also utilise farms dams, wastewater irrigation areas, tidal flats, beaches.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Possible loss of small areas of ephemeral habitat. Injury or mortality from collisions with powerline conductors. Noting powerlines are not near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track. Introduction of invasive species and disease.	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	Scattered throughout the Study Area where suitable habitat exists including around Whyalla in intertidal areas and salt evaporation ponds., Cowleds Landing, Lake Dutton and isolated records at Coorlay Lagoon, Lake Mary, Purple Lake and Lake Richardson.		*There are nil to limited suitable aquatic habitats in the Project Footprint and no spatially reliable / recent records in the Project Footprint. The Sharp-tailed Sandpiper has a low possibility of occurrence in the Project Footprint (i.e. only when water is present, but other suitable habitat would be extensive under such conditions). The Project will not impact core habitats.*	
Sterna albifrons **(Little Tern)** **(VU / MM, E)**	**Likely** Widespread in Australia, with breeding sites widely distributed on the Australian coast. No breeding sites are known close to the Project Area. Recorded once within the Project Area on the beach near the desalination plant site. The extent of suitable habitat within the disturbance footprint is considered to be negligible.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. *The Project avoids key inland and coastal aquatic habitats which are important to migratory bird species, there is limited presence of migratory species or habitat within the Project Footprint and important habitats (as identified in the National Shorebird Directory Driessen, et al., 2025) are avoided.*	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Mammals				
Pseudomys australis **(Plains Rat, Palyoora, Plains Mouse)** **(VU, V)**	**Likely** (SAAL) Irruptive species (responds to rainfall / good conditions) with a limited distribution to the gibber plains of the Lake Eyre Basin, SA.	Standard mitigation measures as detailed in Section 15.6.15. Minimise construction width in areas of refuge	Disturbance of approximately 151 ha of potential Plains Mouse refuge habitat, the majority of which will be rehabilitated. Potential for individuals to be impacted by trenching if present.	**Negligible** Residual significant impacts are considered unlikely under EPBC significant

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	Not recorded during targeted surveys. No records in close proximity to the disturbance footprint other than in the Arid Recovery Reserve north of Olympic Dam and near the Carrapateena Mine, east of the disturbance footprint. Expected that the species could occur in areas of suitable habitat in the disturbance footprint, particularly during periods of irruption.	habitat where possible. Restrict travel on access tracks during construction and operation to daylight hours, as far as practicable, to avoid potential impacts to this nocturnally active species.	Low potential for increase in feral animal predation as existing tracks occur in the Project area. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices. *The species has not been detected during surveys for the Project. With only very low numbers of Plains Mouse potentially present within the Project Footprint (an assumed presence only), potential impacts to the species as a result of temporary disturbance for installation of the water transfer system followed by site rehabilitation are not considered to be significant, given the very broad range across which the species persists, and the species' ability to recover during boom periods, and to spread into adjacent habitats.*	impact guidelines (see Appendix I-6).
Pteropus poliocephalus **(Grey-headed Flying-fox)** **(VU, R)**	**Likely** (EP and SAAL) Canopy-feeding frugivore and nectarivore occurring in the coastal belt from central Queensland, through New South Wales, Victoria and into South Australia. Not identified during field survey. Previously recorded around	Standard mitigation measures as detailed in Section 15.6.15.	Disturbance of potential foraging habitat outside the foraging range of nearest important population. Injury or mortality from collisions with powerline conductors if present. *The nearest recognised important population is located in the Adelaide Botanic Gardens, approximately 275 km from the Project Footprint. While there are two records*	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	Whyalla and Port Augusta. The Project Area provides no core habitat and limited useable habitat thus any usage would be occasional, opportunistic and infrequent.		*in the vicinity of the study area and camp has been reported as occurring in Port Augusta, the Project does not impact suitable roosting and foraging habitat and is not likely to have any impact on the species if it is present.*	

[1] EPBC Act status: Critically Endangered (CE); Endangered (E); Vulnerable (VU); Migratory Wetland (MW); Migratory Terrestrial (MT); Migratory Marine (MM)
[2] SA NPW status: Endangered (E); Vulnerable (V); Rare (R).

Table 15-19: Summary of impact assessment for other species listed in ARs

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
Birds				
Amytornis modestus (Thick-billed Grasswren) (VU,-)	**N/A** (EP), **Possible** (SAAL) Not recorded during surveys. The Project is outside the recorded range of the species, with the closest records 10-20 km north of the disturbance footprint near Olympic Dam and 29-49 km east of the disturbance footprint near Lake Torrens.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of potentially suitable habitat. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices. Low potential for increased feral animal predation and / or competition if present.	**Negligible** Residual significant impacts considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Arenaria interpres (Ruddy Turnstone) (VU/MW, R)	**Possible** Ruddy Turnstone breeds in Siberia and Alaska. In Australia, range includes Australian	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal /	**Negligible** Residual significant impacts are considered unlikely under EPBC significant

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	coastline except Great Australian Bight. There are existing records in the vicinity of the Project infrastructure near Whyalla and Point Lowly. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.		foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access tracks. Introduction of invasive species or disease.	impact guidelines (see Appendix I-6).
Calidris canutus (Red Knot) (VU/MW, -)	**Possible** Migratory wader overwintering in Australia, where it is found across all coastal areas of the country. There are existing records in the Study Area, and records nearby from locations such as, Whyalla salt fields, and eastern USG. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Introduction of invasive weed species or disease.	**Negligible** Residual significant impacts considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Calidris ferruginea (Curlew Sandpiper) (CE/MW, E)	**Possible** Not recorded during surveys. Recorded along the east coast of the Eyre Peninsula in proximity to the Project, predominantly	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal /	**Negligible** Residual significant impacts considered unlikely under EPBC significant impact

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	from coastal flats in and around Whyalla. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.		foraging habitat and therefore risk of collisions is expected to be low. Introduction of invasive weed species or disease.	guidelines (see Appendix I-6).
Charadrius leschenaultii (Greater Sand Plover) (VU / MW, R)	**Possible** Migratory wader that breeds near Turkey through Mongolia and is a spring migrant to Australia where it is primarily found in coastal and near coastal habitats. There are limited records restricted to east of the southern extent of the Project Area. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Introduction of invasive weed species or disease.	**Negligible** Residual significant impacts considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Leipoa ocellata (Malleefowl) (VU, V)	**Unlikely** (EP), **Unlikely** (SAAL) Large ground-dwelling bird found mostly in mallee-dominated shrublands and low woodlands in the southern half of Australia.	Unlikely to occur - N/A	Unlikely to occur - N/A	**Negligible** No significant impacts expected as species is considered unlikely to occur in this area.

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	Assessed as being unlikely to occur due to the absence of records and absence of suitable habitat in the Project Area (Appendix I-1).			
Numenius madagascariensis (Eastern Curlew, Far Eastern Curlew) (CE / MW, E)	**Possible** Migratory wader that breeds in NE Asia, Siberia and is a spring migrant to Australia where it is primarily found on the coast in all states. Records of this species exist near the Study Area from Whyalla salt fields and across to eastern shores of Spencer Gulf. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact Injury or mortality from collisions with powerline conductors in proximity to the coast. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track in proximity to the coast. Introduction of invasive weed species and disease.	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Tringa nebularia (Common Greenshank) (EN / MW, -)	**Possible** Migratory shorebird with a widespread distribution throughout Australia, in summer during the non-breeding season. The species was previously recorded on the coastal fringe	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track.	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).

Species (Status EPBC, NPW)	Background	Mitigation measures	Expected impact	Impact level and significance
	of Whyalla and at Whyalla Salt fields. Limited areas of suitable habitat within the disturbance footprint or Project Area. Important habitat areas are avoided.		Introduction of invasive weed species or disease.	
Thinornis cucullatus cucullatus **Eastern Hooded Plover** **(VU, V)**	**Possible** (EP), **Unlikely** (SAAL) Not recorded in field surveys. No records of the species in the Study Area. Assessed as a possible occurrence as coastal habitat in the vicinity of the desalination plant may be suitable, principally for foraging.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact.	**Negligible** Residual significant impacts are considered unlikely under EPBC significant impact guidelines (see Appendix I-6).
Mammals				
Sandhill Dunnart (*Sminthopsis psammophila*) **(EN, V)**	**Unlikely** (EP), **Unlikely** (SAAL) Not recorded during surveys. Previous records exist to the south and west of the Study Area in Ironstone Hill CP, west and north Middleback Ranges (DEW 2024a), which fall on the eastern extent of the species' range (ALA 2026). No suitable habitat in the Project Area.	Unlikely to occur - N/A	Unlikely to occur - N/A	**Negligible** No significant impacts expected as species is considered unlikely to occur in this area.

Western Grasswren

Significant impacts to Western Grasswren (Gawler Ranges) are considered possible. Although disturbance will largely be temporary and represents a very small proportion of available habitat for Western Grasswren in the region, impacts from the Project could be considered to trigger the criteria *adversely affect habitat critical to the survival of a species* (in the short-term). An offset will be implemented to offset any residual significant impact.

The following discussion summarises the impact assessment for Western Grasswren. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2).

Suitable habitat for Western Grasswren occurs extensively throughout the broader region and habitat was observed in field surveys throughout the entire southern portion of the Project Area, ranging from north-west of Port Augusta to Mullaquana Station. There are also numerous records of the species in this region.

Disturbance to Western Grasswren habitat from **vegetation clearance** will largely be temporary. The Project involves clearance of approximately 136 ha of preferred habitat and 266 ha of atypical habitat for the water transfer system and electricity infrastructure (see Table 15-20). Over 85% of this disturbance is temporary - approximately 120 ha in preferred habitat and 229 ha in atypical habitat will be rehabilitated.

This disturbance will be spread over approximately 100 km of the alignment and represents a very small proportion of available habitat in the region. This disturbance is not considered likely to lead to a long-term decrease in the size of an important population of the species or result in a reduced area of occupancy over the longer term. Given the pipeline will be buried and in the longer term this habitat is expected to successfully regenerate (as discussed in Section 15.6.1), habitat critical to the survival of the species could be considered to be adversely affected, but only in the short-term.

Table 15-20: Western Grasswren habitat disturbance areas

Habitat suitability category	Area within disturbance footprint (ha)
Preferred	135.7
Atypical	266.16
Atypical - marginal (desalination plant site)[1]	188.86
Low potential	156.71
Not suitable	1.28
Outside known range	1243.02
Total	**1991.7**

[1] The area for marginal habitat at the desalination plant site includes all disturbance within vegetation association BAM 142 so is slightly larger than the desalination plant footprint shown in Table 15-14.

Figure 15-21 provides an overview of the total area of habitat for Western Grasswren within the disturbance footprint for each category of habitat suitability. Detailed mapping of habitat in relation to the disturbance footprint is provided in Appendix B.6 of the Terrestrial Ecology Assessment (Appendix I-1 of this EIS).

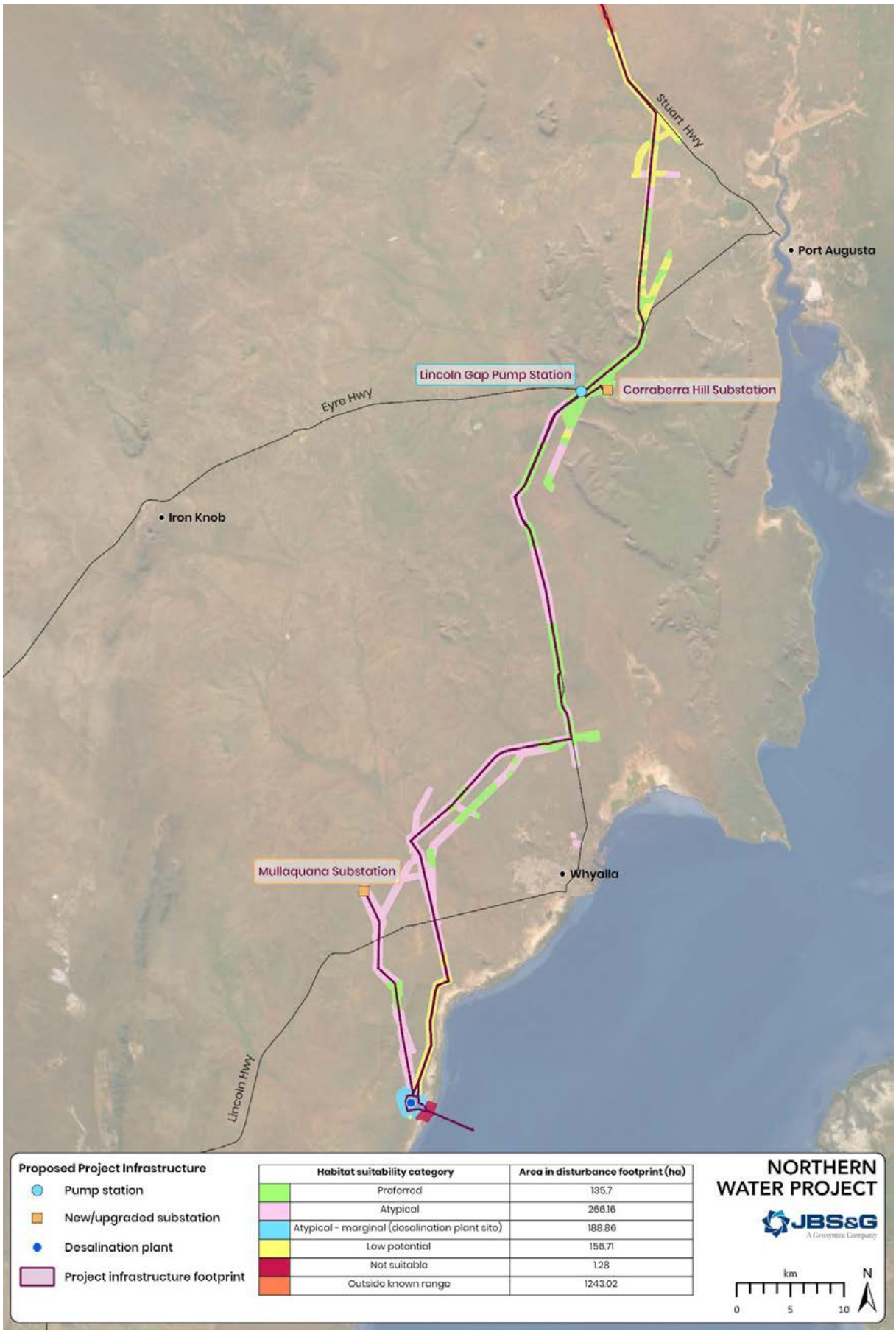


Figure 15-21: Area of Western Grasswren habitat in the disturbance footprint

Clearance of approximately 189 ha of vegetation at the desalination plant site is not expected to impact Western Grasswren to any material extent. The low chenopod shrubland at the desalination plant site has been conservatively categorised as 'atypical habitat', however, extensive survey efforts have not recorded any Western Grasswren within the proposed site, despite targeted and intensive searches over multiple surveys. The habitat present is considered marginal and unlikely to support core populations or serve as important breeding habitat for the species. While it is possible that Western Grasswren may opportunistically use the area during periods of high abundance or favourable conditions, the site does not appear to provide the structural characteristics typically associated with key breeding or foraging habitat.

As discussed in Section 15.6.2, **fragmentation** effects from temporary habitat clearance are not expected to be significant. The narrow, linear cleared construction corridor could discourage direct movement of individuals across the cleared area during construction, however it is not expected to present a complete barrier to Western Grasswren movement. Although Western Grasswren are predominantly terrestrial and do not fly high above the ground, grasswrens are known to cross open areas by flying at a low height (Black & Gower 2017). It is therefore expected that individuals could cross the cleared construction corridor if necessary.

In addition, the alignment of the Project's linear infrastructure is generally close to existing cleared corridors for most of its length (e.g. highways, train line). These do not appear to present a barrier to Western Grasswren movement, based on the apparent dispersion of the species to the east of Lincoln Highway near Whyalla in recent years. This also suggests that the cleared construction corridor would also not present a complete barrier to movements of the species. Following the completion of construction, the buried infrastructure and rehabilitated construction corridor is also unlikely to provide a complete barrier to movements of this species. Once vegetation is re-established, vegetation and habitat would be continuous across the pipeline and the Project would not present any barrier to Western Grasswren movement.

The Project is not expected to significantly impact the species **breeding cycle**. A contiguous well documented population with numerous records occurs in the Study Area and extends significantly to the north and west throughout extensive and interconnected habitat. Vegetation clearance in areas of preferred habitat during the breeding season will be avoided.

Vegetation clearance in areas of atypical habitat during the breeding season could potentially impact breeding success of a small number of individuals. Any impacts would be restricted to the immediate vicinity of the pipeline and transmission lines and would not impact the breeding cycle at the population level, as the population is widely distributed throughout its range. Once constructed, the transmission lines, transfer system and access tracks and low traffic volume maintenance access are not expected to disrupt movement across the landscape for this species, so impacts to breeding are not anticipated.

Noise impacts on the Western Grasswren are expected to be very limited. Auditory injury from the Project construction and operation activities is considered unlikely as discussed in Section 15.6.4. Noise levels that could cause behavioural or masking effects have the potential to impact a small number of individuals in the vicinity of the disturbance footprint

without affecting the species at the population level. Western Grasswrens appear to be reasonably noise tolerant based on numerous records adjacent to highways and operational mines (as well as Whyalla township and steelworks), suggesting potential for birds to tolerate a noisier environment. Construction noise for most of the disturbance footprint will be sporadic and very short-term, as construction crews work past any given location. It is expected that potentially impacted individuals would be able to temporarily relocate in adjacent habitat further from the noise source if required.

Ground **vibration** during construction is unlikely to have any material impact on Western Grasswren due to its ecology and behaviour (e.g. it does not use burrows) and effects of noise on any individuals in close proximity to construction would dominate any effect of vibration.

Potential impacts of **lighting** are also likely to be very limited, as discussed in Section 15.6.4. The Project is also unlikely to result in degradation of habitat quality from introduction of **invasive species**, as discussed in Section 15.6.5.

The Project will not substantially interfere with the **recovery** of the species.

As discussed in Section 15.6.14, there is some potential for **cumulative impact** to Western Grassswren from the Project in combination with other developments, however the potential significance of these impacts is reduced by the temporary nature of most of the Project's impacts, rehabilitation that will be undertaken, and the offsets that are proposed.

The Project is considered to have a **residual significant impact** of clearance of approximately 136 ha of preferred habitat and 266 ha of atypical habitat for the water transfer system and electricity infrastructure. This estimate conservatively excludes the rehabilitation of over 85% of this disturbance, which could be considered to reduce the residual significant impact. Clearance of marginal habitat at the desalination plant site, where no Western Grasswren have been observed, is not considered to be significant, as discussed above.

An **offset** is proposed to offset the residual significant impact to Western Grasswren for the for the construction of the water transfer system and electricity infrastructure. Offset calculations and the offset strategy are described in the Preliminary Commonwealth Offset Strategy (Appendix I-7).

Mitigation measures are summarised in Section 15.6.15 and further details (including environmental objectives, performance criteria, monitoring, reporting, corrective action, responsibility and timing) are provided in the Threatened Species Management Strategy (Appendix I-8).

Southern Whiteface

Southern Whiteface is not considered likely to be significantly impacted. Although suitable habitat for this widely distributed habitat generalist occurs in patches throughout the full length of the Project Area, any impact from the Project is considered proportionately very small compared with the overall size of the population and extent of habitat in the Gawler bioregion and across southern Australia, and is not considered important, notable, or of consequence with regards to its context or intensity.

The following discussion summarises the impact assessment for Southern Whiteface. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2).

Suitable habitat for this widely distributed species generally occurs in patches throughout the full length of the Project Area. There are abundant, regular, and recent records of the species from Mullaquana Station, around Whyalla and Port Augusta through to the Woomera and Olympic Dam regions. Individuals present within the Project Area would be part of the continuous population across the majority of Australia, rather than part of a specifically identified important population. No important populations of Southern Whiteface are identified in the Conservation Advice for the species (DCCEEW 2023c).

As noted in Section 15.4.8, Southern Whiteface continues to be commonly recorded in field surveys across their habitat in the Gawler IBRA region and adjacent regions in South Australia, indicating that the species is likely to be stable across its range in the region.

Declines in Southern Whiteface numbers in other regions have been linked to broadscale agricultural removal of habitat (Ehkme et al. 2021) and studies on the impact of agriculture on Southern Whiteface has found no effect of habitat fragment area, isolation, fragmentation, quality or vegetation complexity (Maron & Lill 2005). The Project falls within the Gawler IBRA Region, which retains 88% of remnant native vegetation. Whilst the habitat available may have been modified to varying degrees depending on density of stocking, extensive suitable contiguous habitat is available for Southern Whiteface across the pastoral rangelands region of South Australia. The Project clearance within this region is predominantly temporary, which is not expected to alter habitat suitability for Southern Whiteface.

Any impact from vegetation clearance for the Project is considered proportionately very small compared with the overall extent of available habitat and size of the species population in the Gawler bioregion and across southern Australia, and the impact is not considered important, notable, or of consequence with regard to its context or intensity.

The Project is not likely to result in significant impacts from fragmentation, disrupt the breeding cycle of an important population or result in habitat degradation or introduction of invasive species or diseases or interfere with the recovery of the species.

While no offset is required as the residual impacts are not considered significant, due to habitat overlap with Western Grasswren, it is likely the offset proposed by the Project will benefit this species.

Blue-winged Parrot

Blue-winged Parrot is not considered likely to be significantly impacted. The Project Area is unlikely to support a specific important population of this species, and the species does not breed in the region. Disturbance as a result of the Project is likely to represent a loss of occasional foraging habitat only, representing a very small fraction of total available foraging habitat for this species across much of Australia.

The following discussion summarises the impact assessment for Blue-winged Parrot. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2).

The Blue-winged Parrot is predominantly found in the south-eastern portions of Australia, occasionally. There are scattered records throughout the Study Area from Whyalla to Roxby

Downs. It does not breed in or near the Project Area but individuals could occur when its distribution extends into arid and semi-arid Australia in non-breeding periods. Suitable foraging habitat occurs widely in the Project Area. The Project Area is unlikely to support a specific important population of this species.

Vegetation clearance for construction of the Project is likely to represent a loss of occasional foraging habitat only, representing a very small fraction of total available habitat for this species in the region. The disturbance footprint does not intersect larger areas of open grassy woodland, which are preferred by the species. Clearance of predominantly low open chenopod shrublands, which could be considered general foraging habitat for the species, is considered regionally insignificant.

The Project is not expected to limit movement of the Blue-winged Parrot across the landscape. The Project will not result in fragmentation of the extensive habitat in the region, particularly given the dispersal capabilities of the species.

The Project will not disrupt the species breeding cycle. The species breeds in localised areas restricted to the south-east of mainland Australia and Tasmania, well outside the Project Area. The Project is unlikely to contribute to the introduction and spread of weed and / or disease that would impact the Blue-winged Parrot and will not interfere with the recovery of the species.

Impacts from the Project on the Blue-winged Parrot are not considered significant and no offset is proposed.

Australian Fairy Tern

Australian Fairy Tern is not likely to be significantly impacted. The Project will not directly impact any coastal habitat and no impacts to any population are likely to occur.

The following discussion summarises the impact assessment for Australian Fairy Tern. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2).

This species is found along the coast of the southern two thirds of Australia where it forages offshore, in estuaries and wetlands. There is limited suitable habitat for this species in the Project Area, mainly in coastal areas around the desalination plant site, outside the disturbance footprint. It was not recorded in field surveys but is considered likely to occur as there are previous records along the coastline in the Study Area.

The Project will not impact coastal habitats as infrastructure will be tunnelled under the coastal interface. The desalination plant site is also a significant distance from the shoreline (e.g. the closest component, the intake pump station, is 700 m west of the seaward edge of the mangroves) and is separated from intertidal areas by low dunes. Consequently, there is very limited potential for indirect impact to any individuals that may be present in the coastal area during construction or operation.

No impacts to any population of Australian Fairy Tern are likely to occur.

Impacts from the Project on Australian Fairy Tern are not considered significant and no offset is proposed.

Threatened migratory birds

A significant impact is considered unlikely for all listed migratory bird species. The Project avoids important inland and coastal aquatic habitats and there is limited presence of migratory species or habitat within the disturbance footprint. There will be no direct impact to intertidal habitats at the desalination plant site and there is very limited potential for indirect impact to any shorebirds that may be present in the vicinity.

The following discussion summarises the impact assessment for threatened migratory birds. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2) and the Migratory Birds Impact Assessment (Appendix I-4).

Two threatened migratory bird species were assessed as likely to occur by the Migratory Birds Impact Assessment (Appendix I-4): Sharp-tailed Sandpiper and Little Tern. A number of other species that have been assessed as possible or unlikely occurrences were also listed in the ARs (see Table 15-19 above).

Sharp-tailed Sandpiper records are scattered throughout the Study Area where suitable habitat exists including around Whyalla (in intertidal areas and salt evaporation ponds), Cowleds Landing, Lake Dutton and isolated records at Coorlay Lagoon, Lake Mary, Purple Lake and Lake Richardson. Little Tern is widespread in Australia, with breeding sites widely distributed on the Australian coast. There are no breeding sites known close to the Project Area and the extent of suitable habitat within the disturbance footprint is considered to be negligible.

The Project avoids key inland and coastal aquatic habitats which are important to migratory bird species, as discussed in Section 15.4.9. There is limited presence of migratory species or habitat within or in close proximity to the disturbance footprint and important areas (as identified in the National Shorebird Directory, Driessen et al. 2025) are avoided.

None of the ephemeral water crossings within the Project Area are considered to provide important habitat for migratory species. They may occasionally provide suitable habitat at times when water is present, but would only represent small potential areas of foraging habitat, and similar habitat would be widespread in other ephemeral watercourses or lakes at these times. There are also large areas of high-quality foraging and breeding habitat available to migratory birds in the region, none of which will be impacted by the Project.

The intake and outfall tunnel infrastructure will be installed by tunnel boring underneath the nearshore coastal environments at the Mullaquana Station site, and as such there will be no direct impact to intertidal migratory shorebird habitats.

The desalination plant site is also a significant distance from the shoreline (e.g. the closest component, the intake pump station, is approximately 700 m west of the intertidal habitats at the seaward edge of the mangroves) and is separated from intertidal areas by low dunes. Consequently, there is very limited potential for indirect impact to any migratory shorebirds that may be present in the area during construction or operation.

Impacts from the Project on migratory birds are not considered significant and no offset is proposed.

Plains Mouse

Plains Mouse is not considered likely to be significantly impacted. It has not been detected during surveys for the Project. With only very low numbers of Plains Mouse potentially present, potential impacts as a result of temporary disturbance for construction of the water transfer system are not considered to be significant, given the very broad range across which the species persists and its ability to recover during boom periods and spread into adjacent habitats.

The following discussion summarises the impact assessment for Plains Mouse. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2), the Plains Mouse Habitat Assessment (Appendix I-2) and the Plains Mouse Targeted Survey (Appendix I-3).

Plains Mouse was assessed as likely to occur in the Project Area, due to the presence of suitable habitat and occurrence of historical records within the broader region. Although there are no records in close proximity to the disturbance footprint, it is expected that the species could occur in areas of suitable habitat, particularly during periods of irruption.

The Project will involve disturbance to approximately 151 ha of potential Plains Mouse refuge habitat, which is considered unlikely to significantly impact this species. The Plains Mouse Habitat Assessment undertaken for the Project identified 123.1 ha of suitable refuge habitat and 10.4 ha of low suitability refuge habitat within the disturbance footprint of the main transfer pipeline alignment (Appendix I-2). Similarly, within the disturbance footprint along the Carrapateena lateral branch, 17.1 ha of suitable refuge habitat and 0.5 ha of low suitability refuge habitat have been identified.

Figure 15-22 provides an overview of the total area of suitable habitat for Plains Mouse within the disturbance footprint for each category of habitat suitability. Detailed mapping of habitat in relation to the disturbance footprint is provided in Appendix A and Appendix B of the Plains Mouse Habitat Assessment (Appendix I-2 of this EIS).



Figure 15-22: Area of Plains Mouse habitat in the disturbance footprint

The disturbance to approximately 151 ha of potential Plains Mouse refuge habitat represents a very small proportion of habitat available in the region. The Area of Occupancy of the Plains Mouse is estimated to be 2,000,000 ha (Moseby 2012). Disturbance of 151 ha of refuge habitat for the Project represents a very small proportion of this (0.008%) and is considered regionally insignificant. Construction width in areas of refuge habitat will be minimised where possible. The majority of disturbed areas will be rehabilitated post-construction.

The species has not been detected during surveys for the Project (refer Appendix I-1 and Appendix I-3), however it is possible that small groups of Plains Mouse could be present in the landscape in a few secluded refuge habitat sites, from where they can spread to the surrounding habitat following the next period of prolonged rainfall and resultant seed production (Appendix I-3).

The Plains Mouse Targeted Survey (Appendix I-3) concluded that with only very low numbers of Plains Mouse potentially present within the Project's disturbance footprint (an assumed presence only), potential impacts to the species as a result of temporary disturbance for installation of the water transfer system followed by site rehabilitation are not considered to be significant. The species has a very broad range, and its ability to recover during boom periods and to spread into adjacent habitats is likely to make any short-term impacts to the species arising from the Project undetectable following the next population irruption period.

The Project is not considered likely to result in fragmentation, disruption of a breeding cycle, result in invasive species or diseases or trigger any other significant impact criteria.

Noise and vibration could impact Plains Mouse individuals if the species is present at the time of construction. Construction noise and vibration will be sporadic and short-term, as construction crews work past any given location. As Plains Mouse is burrow-dwelling and nocturnal (i.e. generally active outside construction hours), any impacts from noise and vibration, if the species is present, are likely to be restricted to burrows in very close proximity to active work areas. While some individuals may be impacted, this is not likely to have an impact on a population.

If the species is present at the time of construction, injury or mortality of Plains Mouse individuals due to entrapment in open trenches, direct impact from excavation or collision with Project vehicles or construction machinery is expected to have a short-term and localised impact on the species. Measures will be put in place to mitigate the impacts as outlined in Section 15.6.15, including trench monitoring and fauna retrieval protocols, speed restrictions and restriction of travel on access tracks in areas of Plains Mouse refuge habitat to daylight hours as far as practicable. While some individuals may be impacted, this is not likely to have an impact to a population.

Recovery actions for this species include better understanding of locations and distributions of important populations and critical habitat, and to better understand threats to current populations (Moseby 2012). The Project will not interfere with the recovery of the species.

The assessment indicates that the residual impacts are not significant and therefore an offset for Plains Mouse is not required. However, it is acknowledged that the Commonwealth Minister's decision may differ. Consequently, an offset strategy has been developed for Plains Mouse, in the event that an offset should be required (refer Appendix I-7).

Grey-headed Flying-fox

Grey-headed Flying-fox is not considered likely to be significantly impacted. The nearest recognised important population is located approximately 275 km from the Project Area. The Project does not impact suitable roosting and foraging habitat and is not likely to have any impact on the species if it is present.

The following discussion summarises the impact assessment for Grey-headed Flying-fox. Further detail is provided in the Significant Impact Assessment (Appendix I-6, Table 3-2).

The Project will require minimal clearance of potential low-quality foraging habitat, outside the foraging range of the nearest important population. The nearest recognised important population is located in the Adelaide Botanic Gardens, approximately 275 km from the nearest section of the Project Area (DAWE 2021). While two records were identified in the vicinity of the study area and a camp has been reported as occurring in Port Augusta (DEW 2025), it is well outside the standard foraging range of 30 – 40 km from the important population (DAWE 2021).

The Project will not impact roosting or breeding habitat for the Grey-headed Flying-fox. The species roost and breed in large aggregations in camps, in the exposed branches of trees (DAWE 2021). No camps have been identified within or in proximity to the Project Area. The closest reported camp is in Port Augusta, approximately 10 km from the disturbance footprint.

Injury or mortality as a result of the Project (e.g. collision with transmission line conductors) represents a very low risk to the species given the distance of the Project from the reported camp at Port Augusta, lack of core habitat and limited useable habitat in the Project Area and the resulting very low numbers of individuals that may have the potential to occasionally occur near the Project.

Potential impacts from the Project on Grey-headed Flying-fox are not considered significant and no offset is proposed.

Other EPBC-listed threatened species

No other EPBC-listed species are considered likely to be significantly impacted.

As noted in Table 15-19, Thick-billed Grasswren, Malleefowl, Eastern Hooded Plover and Sandhill Dunnart were listed in the ARs as having the potential to be significantly impacted by the Project (along with a number of threatened migratory birds discussed above).

None of these species, or any other EPBC-listed species addressed in the Significant Impact Assessment (Appendix I-6), are likely to be significantly impacted.

Malleefowl and **Sandhill Dunnart** were assessed as being unlikely to occur due to the absence of records and absence of suitable habitat in the Project Area. They are therefore not expected to be impacted by the Project.

Thick-billed Grasswren is not likely to be significantly impacted as the Project is outside the recorded range of the species and any impact to potentially suitable habitat is insignificant when compared with habitat regionally and the species distribution.

Eastern Hooded Plover was not recorded in field surveys and there are no records of the species in the Study Area. Significant impacts are not considered likely, due to the avoidance

of impact to coastal habitats and the limited potential for indirect impact to any individuals that may be present in the coastal area during construction or operation.

Summary of expected impacts

The expected impacts to EPBC-listed threatened fauna are in the **Negligible** category, with the exception of Western Grasswren, where impact has been assessed as **Minor**. Uncertainty in the expected impact (based on spatial and temporal variability in the occurrence and extent of fauna species, and some uncertainty in the prediction of extent and severity of impact) has been evaluated in Appendix M and the level of risk is generally **Low** but has been assessed as **Medium** for Western Grasswren.

The expected impacts are not at variance with the provisions of any relevant Commonwealth of Australia conventions, agreements or obligations under international agreements or treaties as they relate to MNES aspects or any relevant Commonwealth plans (such as threat abatement plant and recovery plans), conservation or management principles.

15.6.10 Impacts to EPBC-listed migratory species

No significant impacts to EPBC-listed migratory fauna are expected.

The following discussion briefly summarises the impact assessment for migratory species. Further detail is provided in the Migratory Birds Impact Assessment (Appendix I-4) and outcomes are summarised in the Significant Impact Assessment (Appendix I-6).

Migratory species that are listed as threatened are discussed above in Section 15.6.9, which concludes that significant impacts are not likely.

No non-threatened migratory species were assessed as known or likely to occur. As discussed in Section 15.4.9, six non-threatened migratory bird species were assessed as possible occurrences, and two additional bird species were listed in the ARs as having the potential to be significantly impacted by the Project, but were assessed as being unlikely to occur.

As discussed in Section 15.6.9 for threatened migratory birds, a significant impact to any migratory bird species is not likely because:

- the Project avoids key inland and coastal aquatic habitats which are important to migratory bird species
- there is limited presence of migratory species or habitat within or in close proximity to the disturbance footprint and important areas (as identified in the National Shorebird Directory, Driessen et al. 2025) are avoided.
- none of the ephemeral water crossings within the Project Area provide important habitat
- there will be no direct impact to intertidal habitats at the desalination plant site, and there is very limited potential for indirect impact to any migratory shorebirds that may be present in the area during construction or operation.

The expected impacts are not at variance with the provisions of any relevant Commonwealth of Australia conventions, agreements or obligations under international

agreements or treaties as they relate to MNES aspects or any relevant Commonwealth plans (such as threat abatement plant and recovery plans), conservation or management principles.

The expected impacts to EPBC-listed migratory birds are in the **Negligible** category. The level of certainty in the assessment of expected impact is **High.**

15.6.11 Impacts to State-listed threatened flora and fauna

No significant or long-term impacts to State-listed threatened flora and fauna are expected.

Table 15-21 presents the assessment of potential impacts on state-listed threatened (i.e. Vulnerable or Endangered) flora and fauna species that are possible[22], likely or known to occur. Any species listed under the NPW Act that are also listed under the EPBC Act has been addressed in Sections 15.6.7, 15.6.9 and Appendix I-6.

Detailed discussion of potential impacts on known and likely State-listed threatened species is provided after Table 15-21.

[22] In contrast to tables for EPBC-listed species in previous sections, State-listed 'possible' species are included in Table 15-21 as there is no separate appendix that captures the impact assessment for 'possible' species

Table 15-21: Summary of impacts to State-listed threatened flora and fauna

Species (Status NPW) [23]	Background	Mitigation measures	Potential impact	Impact level
State listed flora				
Desert Lime (*Citrus glauca*) (V)	**N/A** (EP) **Possible** (SAAL) Small upright tree native to Queensland, New South Wales and South Australia. Existing records have been reported by SAAL LMB (2010) from Port Augusta up to Pernatty Lagoon. Not recorded in field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of individual plants if present and undetected. Clearance of potential habitat.	**Negligible**
Slender Soft-horns (*Malacocera gracilis*) (V)	**Possible** (EP) **Possible** (SAAL) Erect annual or perennial herb growing on saline clay soils or gypseous mounds. There are existing records near the Project Area on the margin of Lake Dutton and scattered throughout saline areas of Port Augusta. Not recorded during field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of individual plants if present and undetected Clearance of potential habitat	**Negligible**
Sandalwood (*Santalum spicatum*) (V)	**Known** (EP), **Known** (SAAL) Tree species with commercial uses. Currently being considered under EPBC Act listing assessment at the time of preparation. There are several records in the Study Area.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of individual plants if present and undetected. Clearance of potential habitat.	**Negligible**

[23] E = Endangered, V = Vulnerable, R = Rare

Species (Status NPW) [23]	Background	Mitigation measures	Potential impact	Impact level
	Recorded during field surveys adjacent to the Carrapateena lateral, on Nonowie Station and south-west of Whyalla.			
Stated listed fauna				
Australian Bustard *(Ardeotis australis)* (V)	**Known** (EP), **Likely** (SAAL) Large ground-dwelling bird common in grassland, woodland and open agricultural country. The species was previously recorded within the Project Area approximately 60m from the alignment west of Cowleds Landing. Other records in the region exist near Port Augusta and near the Carrapateena mine. Recorded near Mullaquana Station during field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Clearance of potential habitat for construction of water transfer system and electricity infrastructure, the majority of which will be rehabilitated. Disturbance of individuals in the vicinity of the Project during construction Low potential for individuals to be impacted by collisions with vehicles. Low potential for increase in feral animal predation as existing tracks occur in the Project Area. Low potential for habitat degradation due to invasive species and disease introduction with proposed weed controls and hygiene practices.	**Negligible**
Banded Stilt (*Cladorhynchus leucocephalus*) (V)	**Likely** (EP), **Possible** (SAAL) Wading bird found in shallow saline to hypersaline lakes both near the coast and inland. Breeding occurs inland following major rainfall events (Birdlife Australia 2026a). There are multiple records of this species within the Study Area. Several thousands	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Possible loss of small areas of ephemeral habitat. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging	**Negligible**

Species (Status NPW) [23]	Background	Mitigation measures	Potential impact	Impact level
	of individuals were previously counted in Whyalla Wetlands. Not recorded during field surveys.		habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track. Introduction of invasive species and disease.	
White-bellied Sea Eagle (*Haliaeetus leucogaster*) (E)	**Possible** (EP), **Possible** (SAAL) Bird of prey found near fresh and salt water lakes as well as coastal areas. The species was previously recorded along the coast of the EP. Not recorded during field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track. Introduction of invasive weed species or disease.	**Negligible**
Little Eagle (*Hieraaetus morphnoides*) (V)	**Unlikely** (EP), **Possible** (SAAL) Small bird of prey found in open forest, woodlands and croplands. There are several existing records of the species within the Study Area. Not recorded during field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track. Introduction of invasive weed species or disease.	**Negligible**

Species (Status NPW) [23]	Background	Mitigation measures	Potential impact	Impact level
Freckled Duck (*Stictonetta naevosa*) (V)	**Unlikely** (EP), **Possible** (SAAL) Occurs primarily in south-eastern and south-western Australia There are several existing records of the species within the Study Area. Not recorded during field surveys.	Standard mitigation measures as detailed in Section 15.6.15.	Low potential for disturbance / indirect impact. Possible loss of small areas of ephemeral habitat. Injury or mortality from collisions with powerline conductors. Noting powerlines are not expected to be near important coastal / foraging habitat and therefore risk of collisions is expected to be low. Injury or mortality from collisions with vehicles traversing access track. Introduction of invasive species and disease.	**Negligible**

Sandalwood

Sandalwood is listed as Vulnerable and is known to occur within the Project Area. This species was recorded during field surveys adjacent to the Carrapateena lateral branch, on Nonowie Station and south-west of Whyalla. Ecological field inspections of the final alignment would aim to identify any individuals located within the footprint and determine whether there is potential for micro-siting or reducing the width of construction footprint to prevent disturbing individuals.

Australian Bustard

Construction of the water transfer system and electricity infrastructure will require clearance of potential habitat representing a very small fraction of total available habitat for this species in the region. The Australian Bustard is nomadic and widespread across the country. The majority of the disturbed areas will be rehabilitated following construction.

Project construction has the potential to disturb a very small number of individuals in the vicinity of the disturbance footprint. Disturbance from construction noise, light and increase traffic will be temporary and short-term, and is unlikely to significantly impact the species. The Australian Bustard is a nomadic species and will be able to relocate away from the construction site if required.

There is a very low potential for individuals to be impacted by collisions with vehicles and construction machinery. Australian Bustards are ground-dwelling birds that will walk away slowly when disturbed (Birdlife Australia 2026b). Impacts to overall fauna species and populations from mortality or injury due to Project traffic has been assessed in Section 15.6.4 as likely to be small and at the local level.

Banded Stilt

The Project will have minimal impacts on habitats such as dunes and saltmarsh that provide suitable habitat to this species. The desalination plant site is also a significant distance from the shoreline and there is very limited potential for impact to individuals if they were present.

Proposed powerlines are not expected to be near important coastal or foraging habitat and therefore risk of injury or mortality from collisions with powerline conductors is expected to be low.

The risk of the Banded Stilt being impacted by vehicles traversing access tracks, or by the introduction of invasive species, is low. These impacts are addressed in Section 15.6.4.

Summary of expected impacts

The mitigation measures outlined in Section 15.6.15 will reduce impacts to State-listed threatened species with the potential impacts (e.g. potential clearance of some individual plants or minor loss of potential habitat) considered unlikely to have a significant impact on any species as a whole.

The expected impacts to State-listed threatened flora and fauna are in the **Negligible** category. Uncertainty in the expected impact (based on spatial and temporal variability in the occurrence and extent of species, and uncertainty in the prediction of extent and severity of impact) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.12 Impacts to other flora and fauna

Impact to Rare or regionally listed species

The Project will not have a significant impact on other flora and fauna species, including Rare or regionally listed species.

Desktop assessment and field survey did not identify any other species of high conservation significance that were assessed as known or likely to occur (refer Sections 15.4.5, 15.4.6 and 15.4.10).

A number of State-listed Rare fauna species and one regionally-listed flora species were identified as known or likely. These species were generally associated with habitats that are avoided by the disturbance footprint (e.g. Musk Duck, Little Egret, Sooty Oystercatcher, Pied Oystercatcher) or associated with relatively common and extensive habitats (e.g. Gawler Ranges Senna, Slender-billed Thornbill (western), Elegant Parrot, Scarlet-chested Parrot, Gilbert's Whistler, Pernatty Knob-tailed Gecko). Project activities are unlikely to have any material impact on these species.

The expected impacts to other flora and fauna are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty due to spatial and temporal variability in the occurrence and extent of species) has been evaluated in Appendix M and the level of risk is **Low**.

Impact to culturally significant species

The Project will not have a significant impact on any culturally significant species.

The majority of species communities identified in Section 15.4.6 as being of cultural significance to Traditional Owners are common and widespread. Impacts to these species are expected to be negligible.

One species identified, Sandalwood, is less common and is listed as Vulnerable in SA. Specific measures will be implemented to avoid impacts to this species where possible, as outlined in Section 15.6.11, and no residual impacts are expected.

As discussed in Chapter 16 Aboriginal Cultural Heritage, cultural heritage surveys have been carried out with Traditional Owners (Barngarla Determination Aboriginal Corporation and Kokatha Aboriginal Corporation RNTBC) and the results of the surveys are that the Project can proceed without impact to cultural heritage as long as agreed design and construction management measures (e.g. the presence of monitors during high impact activities) are implemented.

The expected impacts to culturally significant species are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty due to spatial and temporal variability in the occurrence and extent of species) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.13 Affected flora / fauna vulnerability under climate change scenarios

As the expected impacts are largely short-term and related to the construction phase, there is limited vulnerability of affected terrestrial flora and fauna under climate change scenarios.

Impacts to terrestrial flora and fauna from the Project are predominantly related to the construction phase and are relatively short-term. Consequently, the vulnerability of affected flora and fauna to impacts from the Project to climate change scenarios (which operate on a scale of decades) is limited. As the Project would impact a very small proportion of available habitat for all species potentially impacted, and the majority of disturbance will be rehabilitated, it is not expected to interact significantly with other longer-term impacts that may be occurring as a result of climate change (e.g. changes or reduction in range or area of occupancy). Although the success of rehabilitation and regeneration of vegetation could potentially be affected under climate change scenarios, the existing high inter-annual variability in rainfall is more likely to be important over the time scales involved.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty in level of interaction between regeneration success and climate change scenarios) has been evaluated in Appendix M and the level of risk is **Low**.

15.6.14 Cumulative impact considerations

There are a number of proposed developments in the vicinity of the Project. These include proposed mining developments to the west and east of the Project Area, expansion of refining capacity at Olympic Dam and proposed hydrogen and renewable energy projects in the vicinity of Whyalla and Port Augusta. Proposed projects in the vicinity of the Project Area (focussing on those that have been referred under the EPBC Act) are summarised in Table 15-22.

In addition to these projects, Alligator Energy has recently completed a Field Recovery Trial (FRT) approximately 1.4 km north-west of the desalination plant site at Mullaquana Station for their Samphire Uranium Project (S Uranium Pty Ltd, RL 137).

Table 15-22: Relevant proposed projects in the vicinity of the Project Area

Project details[1]	EPBC status	Proximity / location
Nonowie Wind Farm (Tilt Renewables DevCo Pty Ltd, EPBC 2025/10164 & REILA 25)	Assessment commenced	7 km north of Mullaquana Station desalination plant and intersected by the Project's transmission line
Aurora Energy Project (SiliconAurora Pty Ltd, EPBC 2025/10119)	Approval not required	1 km east of water transfer system, approximately 25 km north of Port Augusta
Olympic Dam Smelter Refinery Expansion (SRE) Project (BHP Olympic Dam Corporation Pty Ltd, EPBC 2024/10096)	Approval not required	At northern end of water transfer system
Middleback Ranges MEP 2 Project (OneSteel / SIMEC, EPBC 2024/09878)	Assessment commenced	30 km west of Mullaquana Station desalination plant

Project details[1]	EPBC status	Proximity / location
Whyalla Hydrogen Pipeline (Epic Energy, EPBC 2024/09873)	Approved (not being progressed)	6 km south of water transfer system, approximately 6 km north of Whyalla
Hydrogen Jobs Plan (including all approved ancillary infrastructure) (DEM, EPBC 2023/09759)	Approved (not being progressed[2])	6 km south of water transfer system, approximately 6 km north of Whyalla
Oak Dam Underground Access Project, SA (BHP Olympic Dam Corporation Pty Ltd, EPBC 2023/09696)	Approval not required	25 km east of water transfer system, 40 km north-east of Woomera
Cultana Solar Farm (Cultana Solar Project Company Pty Ltd, EPBC 2023/09658)	Assessment commenced	4 km south of water transfer system, approximately 5 km north of Whyalla
Yoorndoo Ilga Solar Project (Yoorndoo Ilga Solar, Cultana | SA: Yoorndoo Ilga Solar)	Not referred	2 km south-east of water transfer system, approximately 10 km north of Whyalla
Eyre Peninsula Transmission Line upgrade (ElectraNet, Eyre Peninsula Upgrade | ElectraNet)	Not referred	Whyalla – Port Augusta region Proposed project. No referral / approval submissions to date

[1] Note that projects referred before 2016 or that have been withdrawn are not included in this table.

[2] Hydrogen Jobs Plan is not being progressed beyond electricity transmission infrastructure which is now installed.

Project activities (i.e. the Mullaquana Station transmission line) will directly interact with the Nonowie Wind Farm, however there is expected to be very limited direct interaction between Project activities and other proposed projects listed above. There is potential for direct interaction with the adjacent Samphire Uranium Project, however the timing, nature and extent of any potential future development of this project remains uncertain.

There is some potential for cumulative impacts on Westen Grasswren if other projects in the Whyalla region proceed, as discussed further below. Given the narrow width of the disturbance footprint, common and widespread nature of the habitats impacted and the geographically dispersed and largely temporary nature of Project impacts, cumulative impacts are not expected to be significant for any other species or location.

Proposed projects surrounding Whyalla (principally Nonowie Wind Farm, Cultana Solar Farm and Yoorndoo Ilga Solar Farm) all involve clearance of suitable habitat for Western Grasswren. The likely total cumulative clearance is uncertain and is subject to regulatory assessment and approval, and to proponents continuing to progress toward development approval and implementation. The cumulative clearance could potentially reduce the area of occupancy for the Western Grasswren at the eastern extent of its range. However, several factors mitigate that impact:

- The Project will work closely with Tilt Renewables to minimise cumulative impact within the Nonowie Wind Farm site, including refinement of the transmission line alignment and micro-siting of towers to minimise clearance of higher quality habitat for Western Grasswren.

- Individual projects require their own site selection, impact mitigation and offsetting strategies. It is expected that projects undergoing EPBC Act assessment will, if approved, be required to provide an offset for any residual impacts to MNES, in addition to SEB offsets provided under the Native Vegetation Act. Over time, these offsets will provide a net environmental benefit of direct relevance to Western Grasswren.
- Some cleared areas will be rehabilitated following construction, reducing permanent habitat loss.
- Significant areas of intact remnant vegetation of high-quality adjoining or in vicinity of these proposed projects will remain protected, notably the Whyalla Conservation Park and the heritage agreement area to its south-west. These conservation areas will allow Western Grasswren to persist in the local region.
- The conservation areas also have direct connectivity to the Cultana Training Area and broader pastoral estate. The Cultana Training Area is estimated to support approximately 20 per cent of the Western Grasswren population (DoE 2014).
- This higher value vegetation / habitat, along with the substantial areas of conservation protection and defence estate described above, provide regional high quality 'refuge' habitat in areas around Whyalla. As a result, the species is expected to persist within the Whyalla region irrespective of potential cumulative impact resulting from proposed development.

Consequently, while the combined actions present some potential to cause a decline in Western Grasswren population numbers around Whyalla, the development context indicates they are unlikely to result in a significant decline in the population of the species at either a local or regional level. In addition, assuming effective implementation of offsets, any change is likely to be short-term.

15.6.15 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval Project management plans (including the CEMP, OEMP, and other plans).

Table 15-23: Key mitigation measures – terrestrial ecology

Mitigation measure	Design and construction	Operation and maintenance
Desktop and field surveys carried out to identify key ecological constraints, feeding into iterative design process to avoid and minimise interaction with important habitat as far as reasonably practicable.	✓	
Minimise construction footprint and utilise previously cleared or disturbed areas where practicable.	✓	
Restrict construction width to the minimum necessary to allow safe and efficient pipeline installation.	✓	
Minimise construction width in areas of Western Grasswren preferred habitat where possible	✓	
Avoid vegetation clearance in areas of Western Grasswren preferred habitat during the breeding season.	✓	

Mitigation measure	Design and construction	Operation and maintenance
Minimise construction width in areas of Plains Mouse refuge habitat where possible.	✓	
Where the construction footprint intersects with, or comes within proximity of, key coastal and inland ephemeral swamps and salt lake habitats supporting EPBC-listed or NPW-listed threatened or migratory shorebird species, the construction footprint boundary will be defined to avoid unintentional disturbance outside of defined construction areas. Identification of key habitats to be identified by suitably qualified ecologist prior to disturbance.	✓	
A field inspection will be undertaken with an experienced ecologist and construction design specialist in order to further reduce the construction corridor width where possible and to assist with demarcation of no-go zones for particularly sensitive areas.	✓	
Pre-construction weed surveys will be undertaken to determine existing weed levels and appropriate control measures required during construction and operation.	✓	
During construction, implement weed hygiene practices including vehicle checks and washdowns as required on vehicles or plant entering the construction site.	✓	
Materials brought to site (particularly any soil or fill material) will be from weed free sources.	✓	
During construction, undertake monthly weed surveillance monitoring targeting WoNS and Declared Weed species, with follow up controls as required for any identified weed outbreaks.	✓	
During operation, implement weed surveillance and control programs targeting WoNS and Declared Weed species (if weeds identified) on an annual basis.		✓
Micro-site transmission line tower locations where possible to avoid important habitat features.	✓	
Develop and implement protocols for management of waste during construction to avoid an increase in, or attraction of, feral pest animals to the Project Area.	✓	
Avoid construction works associated with crossings of ephemeral lakes and watercourses when water is present where practicable.	✓	
Presence of experienced environmental management field staff during access and clearing activities.	✓	
Presence of, or access to, trained fauna handlers during construction to assist with removal of, and relocation of, any trapped (and / or injured) fauna caught within trenches, or displaced during habitat clearance.	✓	

Mitigation measure	Design and construction	Operation and maintenance
Routine monitoring of open trenches during construction activities to inspect for trapped fauna.	✓	
Progressive backfilling of trenches to minimise the length of open trenches at any time during construction.	✓	
Inclusion of fauna ladders in open trenches to enable egress of any trapped fauna.	✓	
Speed restrictions in place within construction corridor and along access tracks.	✓	
Restrict travel on access tracks in areas of Plains Mouse refuge habitat to daylight hours, as far as practicable, to avoid potential impacts to this nocturnally active species.	✓	✓
Maximise on-ground environmental offset (Significant Environmental Benefit) for native vegetation removal where opportunities are available.	✓	
Progressive rehabilitation of all temporary construction areas where native vegetation clearance has occurred.	✓	
Preparation of a project-specific CEMP including controls on activities near salt pans and clay pans, weed hygiene, weed monitoring and progressive rehabilitation.	✓	
Preparation of a Threatened Species Management Plan.	✓	✓
AS 4282 – Control of the obtrusive effects of outdoor lighting and principles of best practice lighting design (DEE, 2020) and National Light Pollution Guidelines for Wildlife (DCCEEW 2023b).		✓
Operations and Maintenance Environmental Management Plan prepared and implemented prior to commissioning.		✓

15.7 Conclusion

The key finding is that with the implementation of proposed management measures and offsets, Project construction or operational activities will not lead to significant or long-term impacts to flora and fauna. The Project could be considered to have a residual significant impact on Western Grasswren, which can be compensated for through implementation of offsets.

Potential impacts are largely short-term and related to the construction phase, and can be readily managed with appropriate design and location of infrastructure and application of mitigation measures during construction.



Chapter 16

Aboriginal Cultural Heritage

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

16 ABORIGINAL CULTURAL HERITAGE 16-1

16.1 Key Findings 16-1

16.2 Setting the Context 16-1

16.2.1 Requirements in legislation and other standards 16-2

16.3 Engagement with Traditional Owners 16-3

16.3.1 Engagement with the Barngarla People 16-3

16.3.2 Engagement with the Kokatha People 16-4

16.3.3 Associated Traditional Owner engagement 16-5

16.4 Assessment Method 16-5

16.4.1 Desktop review 16-5

16.4.2 Aboriginal cultural heritage significance 16-6

16.5 Detailed Assessment – Site Surveys 16-7

16.5.1 Barngarla traditional lands 16-7

16.5.2 Kokatha traditional lands 16-9

16.6 Impact Assessment 16-13

16.6.1 Project design and planning 16-13

16.6.2 Discovery of sites, objects or ancestral remains 16-14

16.6.3 Land disturbance outside approved areas 16-15

16.6.4 Summary of key mitigation measures 16-15

16.7 Conclusion 16-16

LIST OF TABLES

Table 16-1: Key mitigation measures – Aboriginal Cultural Heritage 16-15

LIST OF FIGURES

Figure 16-1: Project infrastructure footprint within the Barngarla determined Native Title claim areas 16-11

Figure 16-2: Project infrastructure footprint within the Kokatha determined Native Title claim area 16-12

16 ABORIGINAL CULTURAL HERITAGE

Aboriginal cultural heritage comprises both the physical evidence of Aboriginal occupation which may be visible in the landscape (such as stone arrangements or culturally modified trees), as well as the spiritual and cultural connection to Country which is known only to the Traditional Owners. There are many areas of South Australia which have never been the subject of comprehensive Aboriginal heritage survey, meaning that there is potential for Aboriginal heritage to be revealed or discovered where there is no other indication of its presence.

This chapter describes how the construction and operation of the Project may impact on known, unknown, tangible or intangible Aboriginal cultural heritage values within the Project Area and how those values will be protected.

16.1 Key Findings

- Due to appropriate infrastructure site and alignment selection, engagement with Traditional Owners and the undertaking of cultural heritage surveys, no known cultural heritage will be impacted by the Project.
- Inadvertent discovery of Aboriginal sites, objects or ancestral remains during construction, operations or maintenance activities will be addressed by the heritage management processes agreed through Indigenous Land Use Agreement (ILUA) negotiations. These include Aboriginal Cultural Heritage Agreement and Management Plans, Cultural Heritage Management Plans (CHMPs), ILUA Implementation Plans, the Project Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP), and compliance with the *Aboriginal Heritage Act 1988*.
- Operational and maintenance activities associated with the Project are not expected to result in impacts to Aboriginal cultural heritage as no activities will be conducted outside previously disturbed or surveyed areas, and as long as agreed operational cultural heritage management measures are implemented as required.
- CHMPs will be prepared in consultation with, and for endorsement by, the relevant Recognised Aboriginal Representative Bodies / Traditional Owner representatives. They will address Design and Build, and Operate and Maintain phases of the Project.
- To create greater certainty for the Project in the event that unexpected cultural heritage discoveries occur during works, an authorisation under the Aboriginal Heritage Act will be sought subsequent to the ILUA negotiation process.

16.2 Setting the Context

The EIS Assessment Requirements (ARs) require an assessment of the effect of the Project on Aboriginal cultural heritage (whether known, unknown, tangible or intangible). Relevant ARs have been covered in this chapter as set out in Appendix A-2. This chapter also describes relevant requirements in legislation and other standards.

Engagement undertaken with Traditional Owners in relation to the Project is set out in Section 16.3.

The assessment methodology used to identify baseline heritage values and to undertake the impact assessment is set out in Section 16.4.

16.2.1 Requirements in legislation and other standards

State legislation

The *Aboriginal Heritage Act 1988* provides for the legal protection and preservation of known and unknown Aboriginal sites and objects of significance, and remains of an Aboriginal person[1]. Section 3 of the Act defines Aboriginal sites and objects as being of significance according to Aboriginal tradition or to Aboriginal archaeology, anthropology or history. The Act outlines the obligations of parties to disclose newly discovered sites, objects and ancestral remains.

It is an offence to excavate land for the purpose of uncovering any Aboriginal site, object, or ancestral remains without prior authorisation from the Minister for Aboriginal Affairs (the Minister) under Section 21 of the Act. It is also an offence to damage, disturb or interfere with Aboriginal sites, objects or ancestral remains unless prior written authorisation has been obtained from the Minister.

The Act includes provisions to encourage early engagement by project proponents with relevant Traditional Owners or a Recognised Aboriginal Representative Body (RARB) to make decisions and agreements about managing Aboriginal cultural heritage.

State Guidelines

A guide to managing Aboriginal heritage in South Australia (AGD 2025) assists proponents in setting out their responsibilities under the Aboriginal Heritage Act, particularly in relation to identifying and protecting Aboriginal heritage. It provides information on how to find recorded information, who to liaise with and what actions can be taken to ensure Aboriginal heritage sites, objects or ancestral remains are not damaged, disturbed or interfered with.

The *Discovery of Aboriginal Sites and Objects* fact sheet (AGD n.d.) provides guidance on what to do should an Aboriginal site, object or ancestral remains be found. Information on landscape features that have the potential to be of Aboriginal heritage value (e.g. areas within close proximity to creeks, rivers, watercourses etc (refer Section 16.4.2)) are provided, together with guidance on managing, avoiding and protecting any areas of Aboriginal heritage.

Commonwealth legislation

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for applications by Aboriginal and Torres Strait Islander people to protect places or objects that are of particular significance (in accordance with Aboriginal tradition) from injury or desecration. The Commonwealth Minister for Environment and Water may make a declaration protecting a place or object for a specified period of time after first consulting

[1] This does not include remains that have been buried in accordance with the law of the State.

with the relevant State or Territory (DCCEEW 2023d). The Commonwealth Act takes precedence over the State Aboriginal Heritage Act where there is a conflict between the two.

16.3 Engagement with Traditional Owners

The key stakeholders for Aboriginal cultural heritage are the Traditional Owners and Native Title parties across the Project Area. Both the Kokatha People and Barngarla People have had areas of Native Title determined by the Federal Court (refer Chapter 9 Use of Land and Marine Waters) and are the primary Traditional Owners for consultation on the Project and the undertaking of cultural heritage surveys.

Engagement and consultation activities with the Barngarla and Kokatha respectively are discussed in the following sections - initial engagement and consultation (Section 16.3.1 and Section 16.3.2); protocols and agreement-making (Section 16.3.1 and Section 16.3.2) and cultural heritage surveys (Section 16.5.1 and Section 16.5.2). Engagement with other Aboriginal groups with an expressed interest in the Project is addressed in Section 16.3.3.

16.3.1 Engagement with the Barngarla People

The Barngarla People are represented by the Barngarla Determination Aboriginal Corporation (BDAC) Registered Native Title Body Corporate (RNTBC). Formal communication with BDAC regarding the Project commenced with a Board briefing in April 2023, following an initial briefing to BDAC's legal representatives in September 2022. Continued communications and consultations have been undertaken since to progress cultural heritage surveys and negotiations for an Indigenous Land Use Agreement (ILUA). Engagement with BDAC also progressed the development of a Memorandum of Understanding (MOU) to record each party's commitment to enter into a Preliminary Heritage Survey and Monitoring Agreement, work towards Project milestones and negotiate an ILUA.

Agreed protocols relating to Aboriginal heritage surveys and monitoring requirements will be outlined in the ILUA. The parties worked together to confirm these requirements via the MOU as a priority to ensure EIS assessments and other early works, such as geotechnical investigations, could be completed.

The MOU was novated from Infrastructure SA to the Minister for Infrastructure and Transport.

Indigenous Land Use Agreement

ILUAs are legal binding agreements established under the *Native Title Act 1993* (Cth) that establish a range of rights and obligations for both parties, and would reflect the outcomes agreed by each of the parties regarding the Project. ILUAs provide relevant tenure consents required under South Australian legislation and cultural heritage inputs to support compliance with the Aboriginal Heritage Act.

The BDAC ILUA will apply to an area of land and waters as defined within the agreement and include, but not be limited to, matters such as:

- compensation (financial benefit) regimes
- ongoing reporting, communication and engagement
- governance matters including participation in committees to oversee implementation of the ILUA

- provision of employment, training and contracting opportunities
- Aboriginal cultural heritage protocols and management requirements
- cultural competency training
- actions and activities to acknowledge the Traditional Owners
- general terms and clauses including confidentiality, assignment of agreement, dispute management, intellectual property, default events, reviews, amendment and termination.

The ILUA process is comprehensive, and once terms are negotiated and agreed, will be subject to an assessment process by the National Native Title Tribunal before it can be registered under the *Native Title Act 1993*.

16.3.2 Engagement with the Kokatha People

The Kokatha People are represented by the Kokatha Aboriginal Corporation RNTBC (KAC), a RARB under the Aboriginal Heritage Act. Consultation commenced in July 2022 with a briefing to the Kokatha Heritage committee. Similar to BDAC, engagement and negotiations with respect to the Project have been guided by a Negotiation Plan with agreed protocols relating to Aboriginal heritage surveys and monitoring requirements, allowing early works to commence (e.g. geotechnical investigations). The Negotiation Plan was established to record each party's commitment to the following:

- negotiating a Project specific ILUA, which reflects the parties' agreement on terms regarding the Project
- entering into a Preliminary Heritage Survey and Monitoring Agreement
- working towards the Project's milestone targets.

Similar to the BDAC MOU, the Negotiation Plan was novated from Infrastructure SA to the Minister for Infrastructure and Transport.

Indigenous Land Use Agreement

An ILUA is being negotiated with KAC and will apply to an area of land within the Kokatha determined Native Title area as defined in the ILUA and include, but not be limited to, matters such as:

- compensation (financial benefit) regimes
- ongoing reporting, communication and engagement
- governance matters including participation in committees to oversee implementation of the ILUA
- provision of employment, training and contracting opportunities
- Aboriginal cultural heritage protocols and management requirements
- cultural respect training
- actions and activities to acknowledge Kokatha through infrastructure naming, signage, co-branding and other reconciliation activities

- general terms and clauses including confidentiality, assignment of agreement, dispute management, intellectual property, default events, reviews, amendment and termination.

Once negotiated and agreed, the ILUA will be assessed and registered by the National Native Title Tribunal in accordance with the *Native Title Act 1993*.

16.3.3 Associated Traditional Owner engagement

It is recognised that the Project may also be of interest to Aboriginal people and communities beyond the two recognised Native Title holders. Aboriginal groups with traditional lands surrounding the Project Area include the Adnyamathanha, Arabana, Dieri, Gawler Ranges, Kuyani, Narungga, Nauo and Nukunu Peoples.

These groups have been identified as key stakeholders due to their expressed interest in the Project, their proximity to the Project Area, and the potential for the Project to have environmental, cultural, and economic impact beyond the Project's construction footprint. Areas of interest expressed by these groups include the protection of the Great Artesian Basin and mound springs, general cultural heritage protection, employment and procurement opportunities, and social and economic benefits.

Consultation with these groups has commenced and will continue as the Project progresses.

16.4 Assessment Method

Various assessment methods were utilised to determine the Aboriginal cultural heritage values for the Project Area, including desktop reviews, engagement with the recognised Traditional Owners, and the undertaking of on-ground cultural heritage surveys. Each of these are discussed in the following sections.

When considering the impacts that are expected to occur as part of the construction and operation of the Project, the method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

16.4.1 Desktop review

Desktop reviews of available information have been undertaken by appropriately qualified specialists to understand known Aboriginal cultural heritage across the Project Area. This included searches of the Central Archive[2], to understand the type and significance of known registered and recorded sites, objects and ancestral remains.

Literature searches, including of published regional archaeological and anthropological studies together with other available resources, were also undertaken to support the development of a risk profile of the Project construction footprint. An overview of the

[2] The Central Archive is part of the Register of Aboriginal Sites and Objects maintained by Attorney General's Department, Aboriginal Affairs and Reconciliation (AGD-AAR).

environmental context was developed to complement background heritage research and considered land use, occupation patterns, soil and hydrology characteristics, and the potential for sites and other cultural heritage to be present (Australian Heritage Services (AHS), 2024 (confidential)).

Results from searches of the AGD-AAR Central Archive dated 5 June 2026 noted Aboriginal cultural heritage is located within parts of the Project construction footprint and broader landscape area.

While the search results from the Central Archive are helpful in understanding the extent of cultural interest, undertaking on-ground cultural heritage surveys with the relevant Traditional Owners is critical to ensuring that all Aboriginal heritage sites, objects or ancestral remains – including those that have not been registered or recorded on the Central Archive - are protected from all elements of the Project.

Cultural heritage surveys with BDAC and KAC have been undertaken (refer Section 16.5.1 and Section 16.5.2 respectively) to determine any constraints for the purpose of constructing the Project infrastructure.

16.4.2 Aboriginal cultural heritage significance

When assessing the significance of an Aboriginal object or site, it is important to understand the cultural value it holds for members of the appropriate Aboriginal community. The Aboriginal Heritage Act considers significance to Aboriginal tradition and recognises the fluidity of 'tradition', in that it is defined as:

'…traditions, observances, customs or beliefs of the people who inhabited Australia before European colonisation and includes traditions, observances, customs and beliefs that have evolved or developed from that tradition since European colonisation….' (AHS, 2024 (confidential)).

For Aboriginal people, significance can extend to natural environmental features or places that may not show any physical evidence of human modification but are culturally significant. As noted in *A guide to managing Aboriginal heritage in South Australia* (AGD 2025), landscape features to be aware of include:

- **areas in close proximity to creeks, rivers, watercourses, lakes, waterholes, claypans, rock holes, wells, and springs:** surface water features (especially in arid zones) can be associated with Aboriginal campsites, stone artefact sites, shell middens, painted or engraved motifs, stone arrangements, ancestral burials, and other signs of Aboriginal occupation
- **dunes and sand hills:** these landscape features may be associated with stone artefact sites, Aboriginal campsites and burials
- **areas near the coast:** may include campsites, stone artefact scatters, shell middens, and burials
- **rocky outcrops:** may be associated with stone quarries, painted and engraved motifs, rock holes, stone arrangements, ceremonial sites, and stone artefact sites.

The significance of these features can relate to traditional practices, stories, kinship systems, ceremonies, or other ethnographic details. In many cases, it is very difficult or impossible to

identify culturally significant features or places without consultation with the relevant Traditional Owners.

Various types of mature vegetation can also be significant to Traditional Owners. During engagement activities, both BDAC and KAC expressed their preference that impact to mature vegetation (trees) is minimised, and both groups have spoken to minimising impacts on several species of trees and other vegetation (refer Sections 16.5.1 and 16.5.2). KAC has an interest in the environment that supports important food and bush medicine plants, and BDAC wants to ensure that there will be no impacts to the Giant Australian Cuttlefish.

The Kokatha People have also shared the following to demonstrate their cultural heritage values: *"The land, waterways and sky provide both physical and spiritual connection through our stories, songlines, lore and cultural practices"* and *"For us water and landscapes are closely connected to cultural responsibility and custodianship of Country, so ensuring strong environmental protections and proper consultation is critical."*

16.5 Detailed Assessment – Site Surveys

Cultural heritage surveys with BDAC and KAC have been undertaken in relation to each group's respective areas of interest and were preceded by agreed heritage and monitoring protocols. The surveys enabled each of the Traditional Owner groups to further determine cultural heritage constraints including identifying any areas that cannot be accessed for the purpose of constructing the Project infrastructure, and those that can be accessed under certain conditions.

The types and locations of Aboriginal heritage significance identified by Traditional Owners during on-site cultural heritage surveys are provided in the confidential survey reports completed by cultural heritage experts (including anthropologists and archaeologists) for BDAC and KAC respectively. However, these reports are not included in this EIS due to their confidentiality.

The findings of the surveys will support the development of CHMPs with both the BDAC RNTBC and KAC RNTBC. The CHMPs will be prepared in consultation with, and for endorsement by, BDAC and KAC respectively.

16.5.1 Barngarla traditional lands

The proposed desalination plant site at Mullaquana Station, approximately 122 km of main transfer pipeline, and other associated Project infrastructure (including a pump station, transmission lines, a new substation and upgrade to an existing substation) are located within the boundaries of the Barngarla Native Title Claim determined by the Federal Court on 23 June 2016 (SCD2016/001) and 24 September 2021 (SCD2021/002). Figure 16-1 shows the Project Area and location of infrastructure components within the boundaries of SCD2016/001 and SCD2021/002.

Surveys

Aboriginal cultural heritage surveys commenced in October 2024 for elements of the Project infrastructure located within the Barngarla Native Title Claim determination area (SCD2016/001). A total of four surveys have so far been undertaken across the Project,

including at Mullaquana Station for the desalination plant site and surrounds, as well as looking at different sections of the pipeline alignment and other Project infrastructure.

Each survey was attended by BDAC representatives, together with BDAC's chosen cultural heritage specialists (including anthropologists / archaeologists) and a Project representative.

The aim of the cultural heritage surveys was to identify Barngarla cultural heritage objects, places or values located within the Project Area and to provide strategies to manage identified areas of cultural significance appropriately. The surveys enabled BDAC to assess the proposed desalination plant site and surrounding area, as well as the section of the Project corridor within the BDAC Native Title determination area and determine whether the Project could proceed without impacting cultural heritage.

During the surveys, BDAC representatives expressed their preference for minimising the impact to mature vegetation (trees) and to minimising impacts on specific species including Black Oak (*Casuarina pauper*), Mallee (various *Eucalyptus* species), Mulga (*Acacia aneura*), Sandalwood (*Santalum spicatum*), Quandong (*Santalum acuminatum*), Western Myall (*Acacia papyrocarpa*), and bush medicine (*Eremophila alternifolia*).

Survey results and reports

The survey reports documented the findings of the cultural heritage surveys including appropriate mapping and any management requirements provided by BDAC representatives for the Project Area.

General outcomes of the surveys include the establishment of exclusion / no go zones and conditional areas, and appropriate construction management measures (which include above-ground / trenchless pipeline construction and a reduced Project construction footprint).

The survey reports have been prepared by BDAC's cultural heritage specialists, and while the contents are confidential, the reports address the following:

- survey results clearly outlining the location of Aboriginal heritage within the Project Area and any areas where unrecorded sub-surface Aboriginal heritage is likely to occur
- consideration of the Project's potential impact to known and unknown Aboriginal heritage
- consideration of the Central Archive search results and the outcomes of other searches of local archives, relevant databases and any review of relevant historical survey reports
- incorporation of the views of the Traditional Owner representatives, including any recommendations to relocate Project elements to avoid Aboriginal heritage.
- consideration of archaeological and anthropological / ethnographic values of the area, based on relevant literature, previous heritage assessments and the views of the Traditional Owner representatives.
- inclusion of any recommendations for the management of Aboriginal heritage before construction, during Project works, and post-construction (i.e. operation and maintenance activities) in light of the above.

The result of the surveys is that the Project (as it relates to activities on the Barngarla Native Title Claim determination area) can proceed without impact to cultural heritage, provided agreed design and construction management measures (e.g. the presence of monitors during high impact activities) are implemented.

Cultural Heritage Management Plan

The cultural heritage surveys have informed the (ongoing) development of an Aboriginal Cultural Heritage Agreement and Management Plan, and subsequent detailed CHMP to capture all requirements and protocols relating to the protection of cultural heritage during construction and operation of the Project. The CHMP will set out heritage identification, protection and management processes and protocols over the life of the infrastructure as agreed between the parties.

16.5.2 Kokatha traditional lands

A preliminary on-ground consultation was undertaken in December 2022 comprising representatives from KAC together with KAC's qualified heritage expert and a Project representative. The purpose of the preliminary visit was for all parties to view parts of the proposed construction corridor and discuss areas of cultural significance which may be impacted by the proposed Project. The on-ground consultation was considered to be a discussion between the parties and did not constitute a heritage survey or clearance.

Surveys

Formal site surveys commenced within the boundaries of the Kokatha People (Part A) Native Title determination area (SCD2014/004) (refer Figure 16-2) in September 2023. A total of 13 site visits and surveys have been undertaken so far, noting that most of the transfer system is located within the Kokatha Native Title area.

Each of the surveys was attended by KAC representatives together with KAC's qualified heritage specialist and a Project representative. The purpose of the surveys was for KAC to assess the proposed Project corridor and determine whether Project activities could be conducted in a manner that would not impact cultural heritage, including archaeological and ethnographic sites.

During the surveys and through other meetings, KAC representatives expressed the importance of reducing native vegetation clearance (with a particular focus on reducing impact to old growth trees), preventing impacts to watercourses and groundwater, controlling sediment and runoff, and avoiding the spread of invasive species including Buffel Grass and other declared weeds. Environmental features such as gibber plains, cane-grass swamps, rocky outcrops, claypans, sand dunes, waterways and lakes are culturally significant to the Kokatha People.

KAC representatives expressed their preference to minimise impacts on particular native plant species, including Western Myall (*Acacia papyrocarpa*), White Cypress-pine (*Callitris glaucophylla*), Native lime (*Citrus glauca*), Quandong (*Santalum acuminatum*), Sandalwood (*Santalum spicatum*), Woollybutt Grass (*Eragrostis eriopoda*), Jungul-jungul (*Wurmbea* species), Maroon Bush (*Scaevola spinescens*), *Nicotiana* species and Cane-grass swamps.

Survey results and reports

The survey reports documented the findings of the cultural heritage surveys including appropriate mapping and any management requirements provided by KAC representatives for the Project Area.

General outcomes of the surveys include the establishment of exclusion / no go zones and conditional areas, construction management measures (which may include above-ground / trenchless pipeline construction and a reduced Project footprint).

The survey reports have been prepared by KAC's cultural heritage specialists and while they are confidential, the reports address the following:

- survey results clearly outlining the location of Aboriginal heritage within the Project Area and any areas where unrecorded sub-surface Aboriginal heritage is likely to occur
- consideration of the Project's potential impact to known and unknown Aboriginal heritage
- consideration of the Central Archive search results and the outcomes of other searches of local archives, relevant databases and any review of relevant historical survey reports
- incorporation of the views of the RARB representing all Traditional Owners of the relevant Aboriginal heritage, including any recommendations to relocate Project elements to avoid Aboriginal heritage
- consideration of archaeological and anthropological / ethnographic values of the area, based on relevant literature, previous heritage assessments and the views of the RARB / Traditional Owner representatives
- inclusion of any recommendations for the management of Aboriginal heritage before construction, during Project works, and post-construction (i.e. operation and maintenance activities) in light of the above.

The result of the surveys is that the Project (as it relates to activities on the Kokatha People (Part A) Native Title Claim determination area) can proceed without impact to cultural heritage as long as agreed design and construction management measures (e.g. the presence of monitors during high impact activities) are implemented.

Cultural Heritage Management Plan

The cultural heritage surveys have informed the (ongoing) development of an Aboriginal Cultural Heritage Agreement and Management Plan, and subsequent detailed CHMP to capture all requirements and protocols relating to the protection of cultural heritage during construction and operation of the Project. The CHMP will set out heritage identification, protection and management processes and protocols over the life of the infrastructure as agreed between the parties.

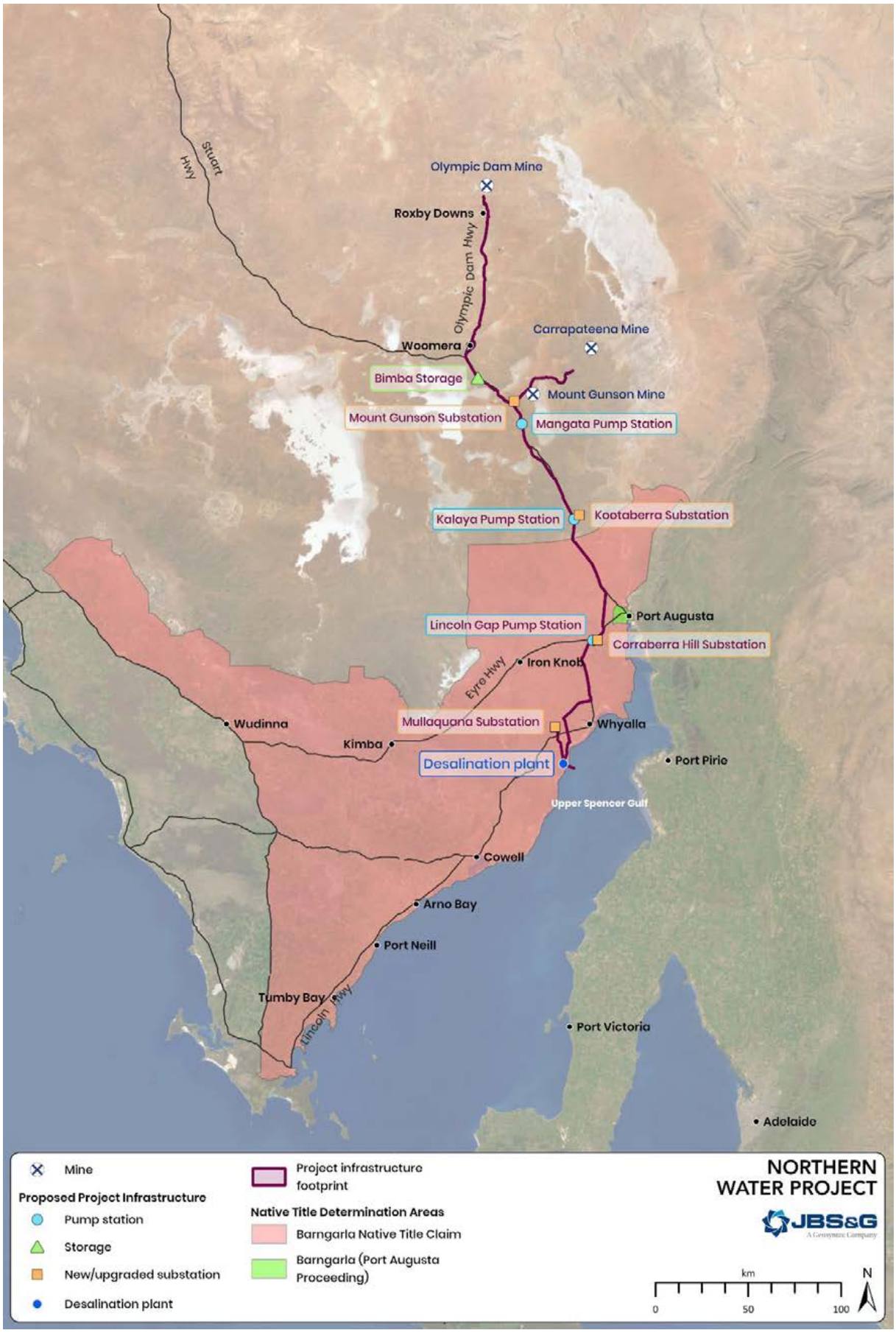


Figure 16-1: Project infrastructure footprint within the Barngarla determined Native Title claim areas

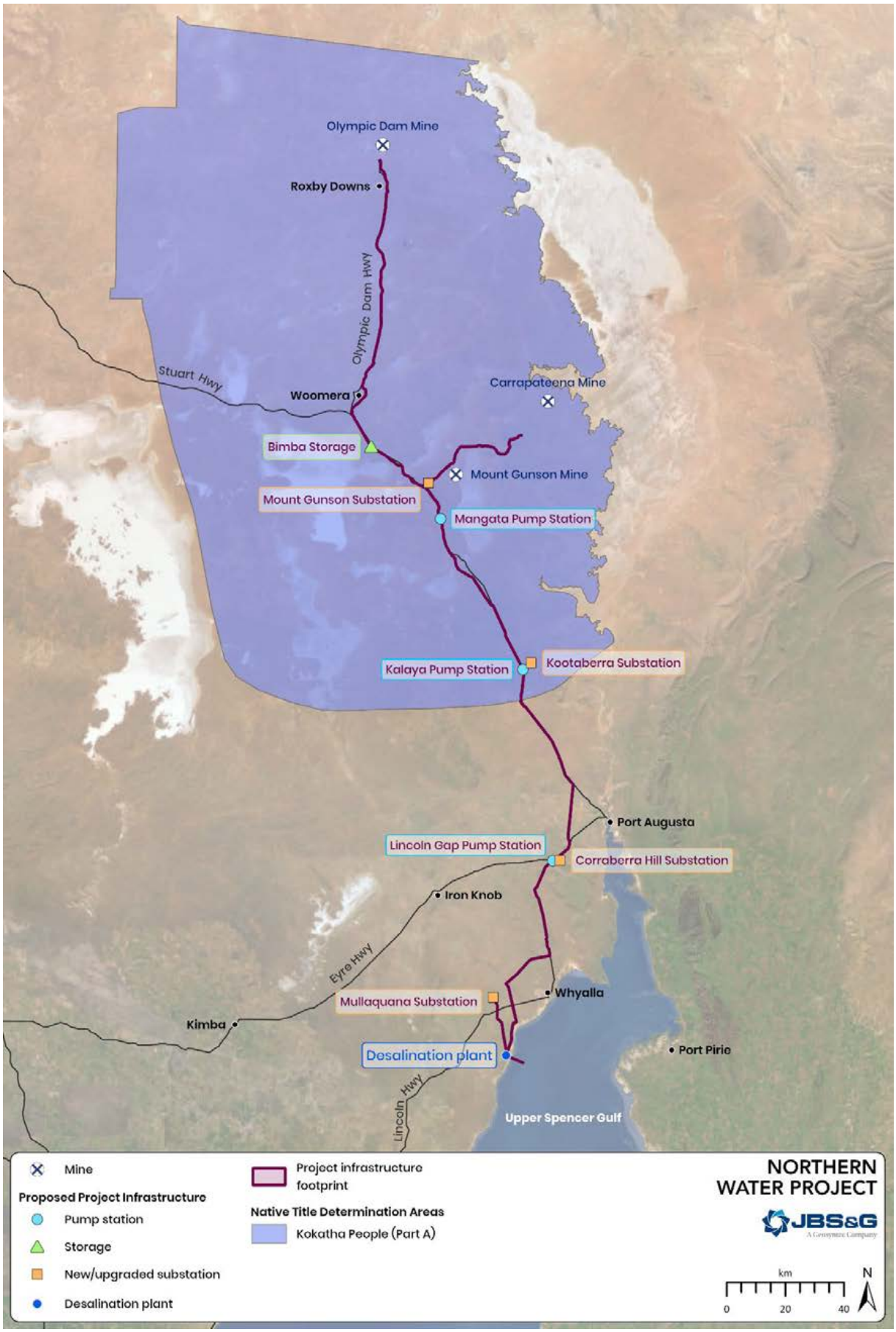


Figure 16-2: Project infrastructure footprint within the Kokatha determined Native Title claim area

16.6 Impact Assessment

The following Project aspects have been identified as potential sources of impact to Aboriginal cultural heritage:

- location of Project infrastructure
- land disturbance from Project activities during construction, operations and maintenance
- land disturbance outside of approved access areas.

The potential impact events resulting from these aspects of the Project are discussed in the following sections. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

16.6.1 Project design and planning

No known cultural heritage will be impacted by the Project due to infrastructure site and alignment selection, engagement with Traditional Owners and the undertaking of cultural heritage surveys.

The Project has been subject to a thorough site and alignment selection process to ensure Project infrastructure will not impact known cultural heritage. Areas of Aboriginal cultural heritage significance have been identified through desktop assessment, Traditional Owner engagement and cultural heritage surveys.

Specialists have undertaken desktop assessments of publicly available cultural heritage data, including searches of the Central Archive maintained by AGD-AAR, and engagement with the Traditional Owner groups commenced early in the planning process. Cultural heritage surveys have been undertaken with Traditional Owner group representatives and their chosen cultural heritage specialists, encompassing the proposed desalination plant site and transfer system alignment. Project construction footprint and realignments of the pipeline route have been made to avoid culturally significant sites and objects identified by Traditional Owners during those surveys. If required, further adjustments to the alignment will be made during detailed design.

CHMPs will be prepared in consultation with, and for endorsement by each of BDAC and KAC to ensure protection of identified sites and objects during all phases of the Project. The CHMPs will also include strategies to protect any unknown areas of cultural heritage value that may be discovered during construction and operation works, including a stop-work procedure and notification process.

Kokatha and Barngarla representatives will be employed as cultural heritage monitors during all high impact activities on their respective Native Title lands to further reduce the risk of damage, disturbance or interference with sites, objects or ancestral remains with Aboriginal cultural heritage significance.

Cultural **Respect** Training (KAC) and Cultural **Competency** Training (BDAC) requirements will be outlined in Aboriginal Cultural Heritage Agreement and Management Plans, and subsequent CHMPs. The framework and approach of those training requirements will be as agreed and approved by KAC and BDAC respectively.

The expected impacts to known Aboriginal cultural heritage from construction of the Project are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

16.6.2 Discovery of sites, objects or ancestral remains

Inadvertent discovery of Aboriginal sites, objects or ancestral remains during construction, operations or maintenance activities will be addressed by the heritage management processes agreed through ILUA negotiations. These include Aboriginal Cultural Heritage Agreement and Management Plans, CHMPs, ILUA Implementation Plans, the Project CEMP and OEMP, and compliance with the *Aboriginal Heritage Act 1988*.

Construction

The Project construction footprint has been subject to cultural heritage surveys with the relevant Traditional Owners, and changes to the transfer system alignment have been made to avoid areas of known cultural significance. However, as the Project will require extensive ground disturbance during construction, there is the potential for discovery of unrecorded and / or unregistered sites, objects or ancestral remains. Project infrastructure has been located within existing infrastructure corridors and disturbed areas wherever possible to further reduce this risk.

The CHMPs developed with Traditional Owner groups will set out Aboriginal heritage discovery procedures. If any sites, objects or ancestral remains are discovered during construction activities, work will cease immediately in the vicinity and care taken not to cause disturbance. The CHMPs will set out procedures for reporting and notifications, including a requirement that any Aboriginal heritage discoveries by the Contactor will be immediately reported to the relevant group for a decision, following the unexpected finds decision making flow chart tailored to each group's requirements. It is the intention that the decision making flow charts will become an agreed management methodology approved by the Minister under Section 20A of the Aboriginal Heritage Act.

An authorisation under the Aboriginal Heritage Act will also be sought subsequent to the ILUA negotiation process, to create greater certainty for the Project in the event that unexpected cultural heritage discoveries occur during works.

The expected impacts to unknown Aboriginal heritage are in the **Minor** category. Uncertainty in the predicted impact (due to potential for occurrence of Aboriginal sites, objects or ancestral remains not detected in pre-construction surveys) has been evaluated in Appendix M and the level of risk is **Low**.

Operation

Operational and maintenance activities associated with the Project are unlikely to result in impacts to Aboriginal cultural heritage as no activities will be conducted outside previously disturbed or surveyed areas. Access tracks alongside the pipeline will be utilised for maintenance purposes and the CHMPs and OEMP will address all matters relating to the protection of Aboriginal heritage that must be complied with by the design, build, operate and maintain contractors. This will include roles and responsibilities, management and reporting of finds, and specific requirements for exclusion zones and conditional areas.

The expected impacts due to discovery of unknown Aboriginal heritage during operations are in the **Negligible** category and the level of **certainty** in the assessment of expected impacts is **High** (refer Appendix M).

16.6.3 Land disturbance outside approved areas

Operational and maintenance activities associated with the Project are not expected to result in impacts to Aboriginal cultural heritage as no activities will be conducted outside previously disturbed or surveyed areas, and as long as agreed operational cultural heritage management measures are implemented as required.

The use of vehicles and heavy machinery such as excavators (for operations and maintenance) outside areas approved by the Traditional Owners during the Aboriginal heritage clearance surveys have the potential to cause significant damage or disturbance to areas of known or unknown Aboriginal heritage value.

The importance of staying within the approved areas will be emphasised in the Project OEMP (for operations and maintenance) including site inductions for staff and contractors and other key management strategies and mitigations. Contractors must undertake operations in accordance with the requirements set out in the ILUAs and supporting schedules, including the Barngarla and Kokatha Aboriginal Cultural Heritage Agreement and Management Plans and CHMPs, including ensuring works do not intrude into the cultural heritage exclusion zones and meet the requirements for access to conditional areas.

Site inductions will also include the requirement for all contractors to undertake Cultural Competency Training (within Barngarla Native Title area) and Cultural Respect Training (within Kokatha Native Title area).

The expected level of impacts are in the **Negligible** category and the level of **certainty** in the assessment of expected impacts is **High** (refer Appendix M).

16.6.4 Summary of key mitigation measures

The key mitigation measures presented in Table 16-1 apply to the entire Project and the infrastructure elements within each of the Barngarla and Kokatha areas of interest. Specific management and mitigation measures relating to sensitive sites, including locations of those sites, are discussed in the confidential survey reports and not reproduced here.

Table 16-1: Key mitigation measures – Aboriginal Cultural Heritage

Mitigation measure	Construction	Operation
Undertaking of on-ground cultural heritage surveys by qualified heritage experts and in consultation with the relevant Traditional Owner representatives, being BDAC RNTBC and KAC RNTBC, also a RARB.	✓	✓
Cultural heritage surveys required for any realignments of the pipeline corridor and / or any associated Project infrastructure, including any changes to Project design and delivery (e.g. new access tracks or laydown areas during delivery).	✓	✓

Mitigation measure	Construction	Operation
Project components, including access routes, to be designed to avoid or minimise impacts to the extent practicable on areas that may be of cultural heritage value.	✓	✓
Staff, consultants and contractors will be required to undertake Cultural Competency Training (BDAC) and Cultural Respect Training (KAC) as part of the overarching Project induction.	✓	✓
Development of an Aboriginal Cultural Heritage Agreement and Management Plan, and CHMPs for each of the Barngarla and Kokatha areas of interest, in consultation with and as endorsed by each of BDAC RNTBC and KAC RNTBC.	✓	✓
All site access and associated works for the Project will be subject to compliance with the CHMPs and Project CEMP / OEMP.	✓	✓
Cultural heritage monitoring to be conducted by Traditional Owner representatives as agreed with each of BDAC RNTBC and KAC RNTBC through the negotiated ILUAs and as outlined in the individual Aboriginal Cultural Heritage Agreement and Managements Plans.	✓	✓
Cultural heritage sites and objects to be protected in accordance with any requirements set out in the CHMPs.	✓	✓
Ongoing consultation and engagement with the relevant Traditional Owners.	✓	✓
An authorisation under the Aboriginal Heritage Act will be sought subsequent to the ILUA negotiation process.	✓	✓

16.7 Conclusion

The key finding is that the Project construction and operational activities have been designed to avoid impacts to Aboriginal cultural heritage, as long as agreed management measures are implemented appropriately.

The Project has been the subject of ongoing engagement, extensive review of historical and current information, the development of CHMPs and cultural heritage surveys carried out with the relevant Traditional Owner representatives.

The risk of potential impacts can be managed through the application of mitigation measures set out in the Project CEMP, OEMP, Aboriginal Cultural Heritage Agreement and Management Plans, the ILUAs and the CHMPs endorsed by both BDAC RNTBC and KAC RNTBC.



Chapter 17

Non-Aboriginal Cultural Heritage

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

17 NON-ABORIGINAL CULTURAL HERITAGE 17-1

17.1 Key Findings 17-1

17.2 Setting the Context 17-1

17.2.1 Requirements in legislation and other standards 17-2

17.2.2 Views of stakeholders 17-3

17.3 Assessment Method 17-4

17.3.1 Desktop review 17-4

17.4 Description of the Existing Environment 17-5

17.4.1 Heritage places and sites – southern section 17-5

17.4.2 Heritage sites and places – northern section 17-9

17.5 Impact Assessment 17-10

17.5.1 Location of Project infrastructure 17-11

17.5.2 Land disturbance during construction and operation 17-12

17.5.3 Seabed disturbance during marine construction and operation 17-13

17.5.4 Summary of key mitigation measures 17-14

17.6 Conclusion 17-14

LIST OF TABLES

Table 17-1: Key mitigation measures – non-Aboriginal cultural heritage 17-14

LIST OF FIGURES

Figure 17-1: Listed heritage sites – Whyalla 17-6

Figure 17-2: Listed heritage sites – southern section 17-8

Figure 17-3: Local historical site – northern section 17-9

LIST OF PLATES

Plate 17-1: Mount Laura (Monument 1468 Whyalla District) 17-7

Plate 17-2: Fence on Eight Mile Creek Road 17-7

Plate 17-3: Phillips Ponds outstation cemetery 17-10

Plate 17-4: Phillips Ponds ruins 17-10

17 NON-ABORIGINAL CULTURAL HERITAGE

This chapter describes how the construction and operation of the Project may affect non-Aboriginal cultural heritage values within the Project Area.

A site or place may be of National, State or local cultural heritage value because of its history, evolution, rare qualities, or its contribution to historical understanding. These places are identified to protect and enable their special cultural values to be passed on to future generations.

Post European contact, the Eyre Peninsula and Far North regions reflect a long history of exploration and pioneering agricultural, pastoral, maritime and mining settlement and enterprise. Listed cultural heritage sites and places in these regions reflect this history and include buildings, maritime infrastructure and shipwrecks, and sites of special geological interest. More recently Defence facilities established around Whyalla and Woomera have introduced new heritage and historical values to the region.

Protection of Aboriginal cultural heritage and the role of Traditional Owners in the design and implementation of the Project are addressed in Chapter 16 Aboriginal Cultural Heritage.

17.1 Key Findings

- Project infrastructure siting and alignment selection has avoided known sites and places of non-Aboriginal cultural heritage significance.
- As there are no Commonwealth, National, State or Local Heritage places mapped within 5 km of the Project Area, impacts to known non-Aboriginal heritage due to Project construction are not expected.
- There will be no impacts to any known sites or places of non-Aboriginal heritage significance during construction, operations and maintenance.
- Sites or objects that may be discovered during construction activities will be managed by implementing unexpected discovery procedures in the CEMP (or relevant sub-plan) and in accordance with relevant legislation and guidelines.
- Unexpected finds of historic shipwreck material will be managed by implementing procedures in the Marine and Coastal Construction Environmental Management Plan and in accordance with relevant legislation and guidelines.
- There will be no impacts to unknown non-Aboriginal heritage or historic shipwrecks from the operation and maintenance of Project infrastructure as there will be no ground disturbing activities outside previously cleared or disturbed areas.

17.2 Setting the Context

The EIS ARs require an assessment of the effect on all non-Aboriginal cultural heritage potentially affected by the development including State and Commonwealth-listed places and areas, and shipwrecks. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 17.3.

17.2.1 Requirements in legislation and other standards

A comprehensive list of legislation relevant to the Project is provided in Chapter 3 Legislative Approvals Framework. The following refers to specific legislation relating to non-Aboriginal cultural heritage and relevant guidance materials issued by the Department for Environment and Water (DEW).

State legislation

The *Heritage Places Act 1993* provides for the identification, recording and conservation of places and objects of non-Aboriginal heritage significance, including historical archaeology, through listing in the South Australian Heritage Register. Under Section 27 of the Act, archaeological artefacts may not be excavated or disturbed unless a permit from the South Australian Heritage Council has been obtained.

The *Archaeological Provisions Guideline* (HSA 2022) provides best-practice advice on the process for managing potential, newly discovered, or known, historical archaeological sites or artefacts in South Australia. Archaeological Fact Sheet No. 1, *Historical archaeology and sites* (DEW n.d.) provides comprehensive information on historical archaeology including the sub-disciplines of historical archaeology (such as urban, buildings, industrial and maritime) and the types of historical archaeology (e.g. pastoral and farming sites; resource extraction sites; industrial and commercial facilities; municipal and civic sites; and infrastructure sites).

The *Historic Shipwrecks Act 1981* protects historic shipwrecks[1] and relics associated with historic shipwrecks in South Australian waters, including the Spencer Gulf. Historic shipwrecks are protected under the Act, irrespective of whether they have been found, located or retrieved.

The *Planning, Development and Infrastructure Act 2016* (PDI Act) establishes the Planning and Design Code (the Code) which addresses heritage and historic sites through a number of planning Overlays.

- State Heritage is identified in the Code via the State Heritage Places Overlay and / or the State Heritage Area Overlay. These Overlays provide:
  - demolition control which considers the building's existing heritage values, structural condition of the building and risk to safety.
  - reference to Statements of Significance and Heritage Standards, which form the basis of Heritage South Australia's assessment of referred development proposals.

[1] Any wreck in South Australian waters which is 75 years old is automatically protected under the *Historic Shipwrecks Act 1981*.

  - the Minister responsible for the *Heritage Places Act 1993* with authority to direct decisions on development applications that affect a State Heritage Place / Area.
- Local Heritage Places are contained in the Local Heritage Place Overlay and listed in Part 11 of the Code. Local Heritage Places are structures, buildings or places that demonstrate important local historical attributes or contribute to the historical themes of a local area.
- The Historic Area Overlay in the Code protects places that contribute to the historic value of neighbourhoods and includes Historic Area Statements which set out the historic attributes of importance in an area and which should be protected or complemented.
- The Historic Shipwrecks Overlay in the Code provides an indicative location of historic shipwrecks and relics and seeks to protect and conserve these important artefacts and sites from encroaching development.

The State's geoheritage sites[2] are administered by the South Australian Geological Heritage Subcommittee of the Geological Society of Australia in close cooperation with the Geological Society of South Australia and DEW. The locations and defined boundaries of all geoheritage sites are available via the South Australian Resources Information Gateway (SARIG).

Commonwealth legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes the Commonwealth Heritage List which comprises natural, Indigenous and historic heritage places on Commonwealth lands and waters under the control of the Australian Government. The EPBC Act also provides for the National Heritage List which lists places of outstanding heritage significance / national heritage value to Australia including natural, historic and Indigenous places. The Commonwealth and National Heritage Lists are maintained by the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The *Underwater Cultural Heritage Act 2018* protects all shipwrecks, sunken aircraft and associated artefacts located in Commonwealth or Australian waters that have been underwater for more than 75 years.

17.2.2 Views of stakeholders

There have been no specific non-Aboriginal cultural heritage issues raised in stakeholder feedback, however assessment in this chapter has considered the sense of place experienced by local communities which is grounded in the protection and conservation of valued historical and heritage sites and places, whether they are listed or not.

Previous studies have identified sites in the vicinity of the proposed main transfer pipeline alignment, mainly comprising building ruins and / or structures associated with the pastoral history of the Far North (BHP 2009b). The studies did not assess these sites as having particular heritage significance (BHP 2009b), although some are likely to be considered as

[2] South Australian Geoheritage Sites were formerly described as 'geological monuments'. They represent rare, unique or representative occurrences of geological interest that are considered by the earth science community to be worthy of conservation for reference, research and training.

having local historical significance or interest to property owners, visitors and travellers or the broader community.

A post and wire boundary fence along Eight Mile Creek Road has been identified by the community as being of local historical interest due to its unique construction (i.e. use of salvaged driftwood for posts).

The Project traverses Department of Defence land at the Cultana Training Area outside of Whyalla, and is located east of the township of Woomera. The Department of Defence has been consulted in relation to heritage registers it may hold relating to buildings or other items of historical heritage importance on land it controls, that has the potential to be impacted by the Project.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

17.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 Impact Assessment Methodology and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

17.3.1 Desktop review

A desktop assessment of non-Aboriginal cultural heritage was conducted, utilising the standard Project Area (comprising a 2.5 km buffer surrounding all Project infrastructure including the alignment of linear infrastructure) as the heritage study area.

A search of the following South Australian and national databases was undertaken:

- South Australian Heritage Places Database maps.sa.gov.au/heritagesearch/HeritageSearchLocation.aspx
- State Heritage Places, State Heritage Areas Overlays and Local Heritage Places listed in the Code
- Location SA (historic shipwrecks) - location.sa.gov.au/viewer/
- Australasian Underwater Cultural Heritage Database - www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage/auchd
- SARIG map.sarig.sa.gov.au/
- Commonwealth Heritage Places – searched via the Australian Heritage Database www.environment.gov.au/heritage/places/commonwealth-heritage-list
- National Heritage Places –searched via the EPBC Act Protected Matters Search Tool www.environment.gov.au/heritage/places/national-heritage-list
- National Trust SA – searched at www.nationaltrust.org.au/sa/.

Non-Aboriginal cultural heritage survey results conducted for other major infrastructure projects in areas overlapping or adjacent to the heritage study area were also reviewed including BHP's Olympic Dam Expansion EIS (BHP 2009b).

Feedback and observations from field work and consultation with landholders and councils also contributed to the assessment.

17.4 Description of the Existing Environment

Evidence of past non-Aboriginal settlements, such as ruins of homesteads, huts and other buildings, cemeteries, fences, stockyards and windmills, is scattered throughout the pastoral regions of Eyre Peninsula and Far North of South Australia. Sites related to the maritime history of the Eyre Peninsula are also evident in coastal towns and marine waters. The topography and geology of the Eyre Peninsula have resulted in the identification of a number of sites of geological significance.

The locations of National, State or Local heritage places, geoheritage sites and shipwrecks identified in the desktop assessment are discussed below in Sections 17.4.1 and 17.4.2. Locations of heritage and historical sites are described for the southern and northern sections of the Project and are shown in Figure 17-1, Figure 17-2 and Figure 17-3.

17.4.1 Heritage places and sites – southern section

There are no places entered on the National, Commonwealth or State, heritage lists, or sites identified under the Local Heritage Overlay within the heritage study area in the southern section (refer Figure 17-2). An overview of heritage places and sites in the broader region of the southern section is provided below.

National Heritage Place

The National Heritage-listed Cuttlefish Coast Sanctuary Zone (CCSZ) protects the Spencer Gulf breeding grounds for the Giant Australian Cuttlefish. The heritage place is located in marine waters offshore of Point Lowly and is approximately 34 km north-east of the outfall diffuser at the desalination plant (refer Figure 17-2).

There will be no impact on this National Heritage Place from construction and operation of the Project due to the significant distance from the Project marine infrastructure site (refer Chapter 11 Marine Environment and the Giant Australian Cuttlefish Assessment at Appendix G-16).

State-listed sites in the vicinity of the Project Area

The majority of listed sites of State heritage significance are located in the City of Whyalla and will not be impacted by construction or operation of the Project. Sites include the Spencer and Bayview Hotels, the former Whyalla Technical School and the Whyalla Court House, the former wooden lockup from the Whyalla Policeman's dwelling and the Gay Street Cottage which are all located more than 8 km from the heritage study area (refer Figure 17-1).

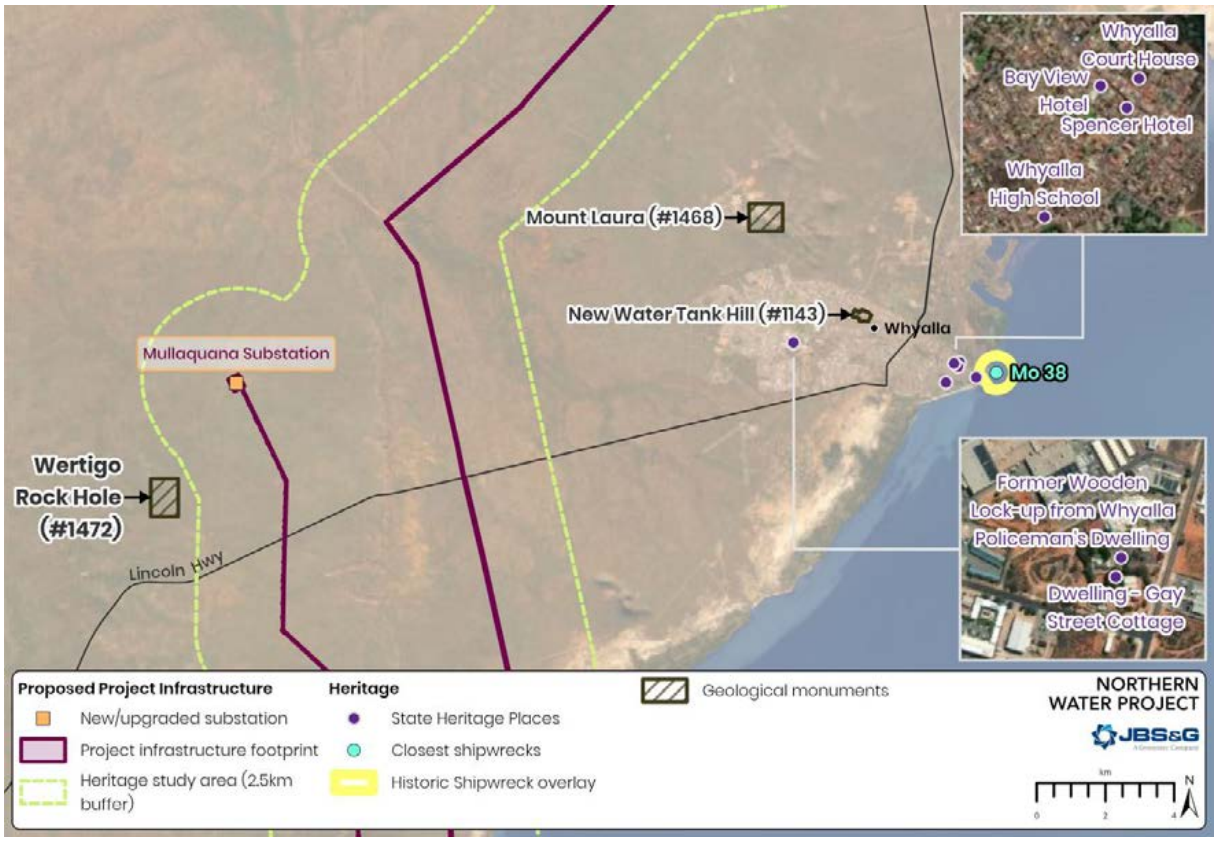


Figure 17-1: Listed heritage sites – Whyalla

Historic shipwrecks

The desalination plant is the only Project infrastructure site where marine works will be undertaken. There are two shipwreck locations[3] recorded on the Australasian Underwater Cultural Heritage Database, mapped within 13 km of the marine Project Area. Both locations are within an Historic Shipwrecks Overlay (refer Figure 17-2).

The closest shipwreck location is the 'Mary Ann', a wooden cutter abandoned in 1885 after springing a leak. This wreck location is mapped south-east of Murninnie Beach, more than 9 km south-west of the marine Project Area. The second location is the 'Rooganah' which was a wooden schooner wrecked in 1927 and is mapped offshore from Eight Mile Creek Beach approximately 12 km north-east of the marine Project Area. A third record is for Mo38 which was wrecked in September 1988 and is mapped near the No.2 Ore Jetty at the Whyalla Port (refer Figure 17-2).

It is acknowledged that as the shipwreck sites have not been physically located, there is potential for the actual locations to be closer to the Project Area than currently mapped.

Geoheritage sites

Geoheritage sites Mount Laura (Monument 1468 Whyalla District) and New Water Tank Hill (Monument 1143 Whyalla District) are located more than 4 km from the Project Area will not be impacted by construction or operation of the Project.

[3] Both shipwrecks are 'unlocated' meaning that they have not been physically found.

Similarly, there will be no impacts to the Wertigo Rock Hole (Monument 1472) which is a historically and geologically significant natural rock waterhole located on Nonowie Station. The site is approximately 3 km west of the alignment of the proposed Mullaquana transmission line and outside the Project Area. The closest geoheritage site in proximity to the desalination plant location is more than 6 km west of the Project Area (Deep Creek - Monument 1145).

The locations of the geoheritage sites are shown in Figure 17-1 and Figure 17-2.



Plate 17-1: Mount Laura (Monument 1468 Whyalla District)
[Source: Google Earth]

Local historical places and features

A post and wire fence of local historical interest is located largely on the western side of Eight Mile Creek Road, commencing south of Mount Young and continuing to the boundary of Mullaquana Station. The proposed pipeline is also expected to be located west of Eight Mile Creek Road.



Plate 17-2: Fence on Eight Mile Creek Road
[Source: JBS&G]

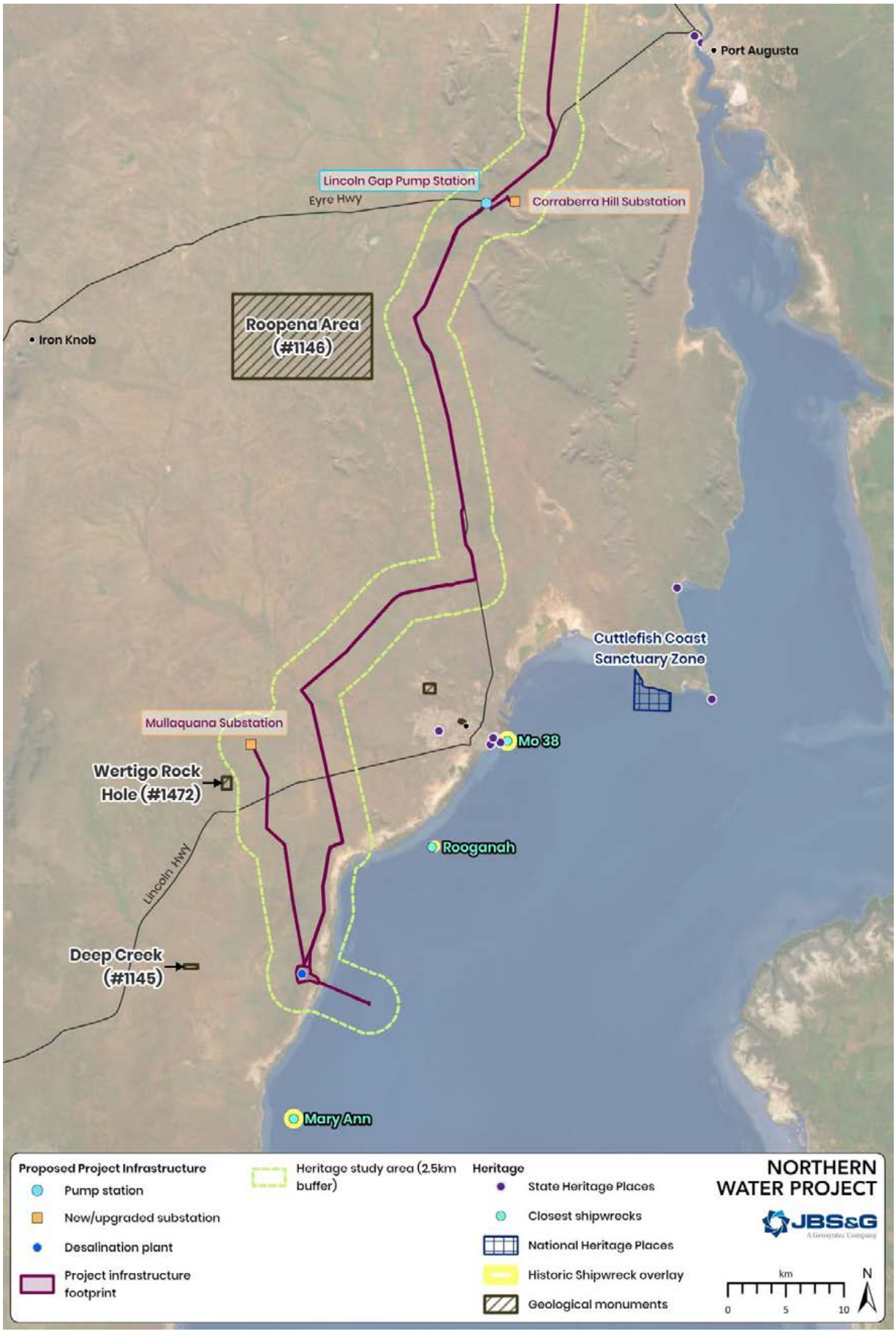


Figure 17-2: Listed heritage sites – southern section

17.4.2 Heritage sites and places – northern section

There are no listed National, Commonwealth or State Heritage places, sites identified under the Local Heritage Overlay or geoheritage sites within the heritage study area between Whyalla and Olympic Dam.

The Ediacara Fossil Site–Nilpena is the closest National Heritage Place, located approximately 55 km east of the pipeline alignment and will not be affected by the Project.

A site of local historical interest known as Phillips Ponds is located approximately 2 km north-east of Woomera within the Project Area and in proximity to the proposed pipeline alignment. The two elements of the site are a cemetery and building ruins.

The Phillips Ponds outstation cemetery (refer Plate 17-3) is within the Project Area but is located approximately 200 m from the construction footprint on the western side of the Olympic Dam Highway and will not be impacted by Project activities.

The Phillips Ponds ruins (refer Figure 17-3) are located approximately 39 m from the construction footprint (refer Figure 17-3) and are thought to be the remains of an accommodation house which later became an outstation of the Arcoona Station (BHP 2009b). Phillips Ponds ruins and the cemetery were considered as part of the non-Aboriginal heritage assessment undertaken by BHP for its EIS in 2009 (refer Section 17.5.1).



Figure 17-3: Local historical site – northern section



Plate 17-3: Phillips Ponds outstation cemetery
[Source: JBS&G]



Plate 17-4: Phillips Ponds ruins
[Source: JBS&G]

17.5 Impact Assessment

The following Project aspects have been identified as potential sources of impact to non-Aboriginal cultural heritage:

- selection of Project infrastructure locations and alignments
- land disturbance during construction
- seabed disturbance during marine construction works

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

17.5.1 Location of Project infrastructure

Project infrastructure locations and alignments have been selected to avoid known sites of heritage significance.

The locations of the desalination plant, transfer system and electricity infrastructure have been selected to follow existing infrastructure corridors and previously disturbed areas where possible. Listed sites and locations of heritage importance have been avoided for both land-based and marine infrastructure.

No State or nationally-listed non-Aboriginal cultural heritage places or sites were identified within 5 km of the Project Area during desktop assessment. The geoheritage sites identified in the vicinity of the Project are sufficiently separated from the Project to avoid impacts.

Engagement with landholders, councils and other stakeholders, has not resulted in the identification of sites of local historical interest. Should any additional sites be identified during ongoing engagement with stakeholders and landholders as being of local heritage or historical significance, consideration will be given to their management as part of detailed design, including avoidance or protection measures set out in the Project Construction Environmental Management Plan (CEMP).

Phillips Ponds ruins

Although not formally protected under heritage legislation or noted on any heritage register, the Phillips Ponds ruins are a local landmark and are well-known to remote area travellers. The Non-Aboriginal Cultural Heritage Assessment prepared for the draft BHP EIS (BHP 2009b, Appendix P), found that the Phillips Ponds ruins and graves are not of National or State significance although they are prominent local landmarks with an interesting history, forming a link with the earliest decades of pastoral settlement. The assessment noted that if the ruins and graves were within a Council area they would likely be entered as local heritage places; however, given the isolated location the idea of local heritage significance has no practical implications (BHP 2009b).

The potential for vibration from construction works to impact the ruins was assessed in the Terrestrial Noise and Vibration Assessment prepared for the Project (refer Appendix J-2). The ruins were identified as a location with potential to be sensitive to construction-related vibration. However, the assessment found that the predicted vibrational levels from vibration generating plant and equipment used in pipeline construction pose a low risk to the Phillips Ponds ruins. Further detail of the vibration impact assessment is provided in Chapter 19 Noise and Vibration and Appendix J-2.

Given their proximity to the Project footprint, the Phillips Ponds ruins and cemetery will be identified in the Project CEMP and measures developed and implemented to ensure a buffer is in place and to minimise disturbance to the immediate area. The CEMP will include a requirement to reference the Heritage South Australia Archaeological Provisions Guidelines (HSA 2022) in assessing the archaeological potential on the construction footprint and

development of appropriate management measures in the event that archaeological material is discovered during construction or operation activities (refer Section 17.5.2).

The expected impacts to the Phillips Ponds ruins and cemetery are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Eight Mile Creek Road fence

Although the fence has been identified as being of local historical importance during community engagement, it is not noted on any heritage register. However, it is understood that the fence is valued as a demonstration and legacy of the resourcefulness of historical pastoral practices in this region and as a notable feature in this landscape.

The fence is generally located on the western side of Eight Mile Creek Road and is likely to be within the proposed 40m construction footprint for the pipeline for most of its length until the boundary with Mullaquana Station. Beyond this point the fence line turns west and while it would be crossed by the Mullaquana Station transmission line, impacts to this section of the fence due to the Project are not expected.

The Project will be seeking approval for works within the pipeline construction footprint, and road upgrades to Eight Mile Creek Road to a standard suitable for heavy vehicles are also proposed. The final pipeline corridor alignment and the nature and extent of upgrades to Eight Mile Creek Road are subject to the outcomes of ongoing design and engineering, and Project approvals. Accordingly, the potential for impacts to the fence have not been considered further in this assessment.

17.5.2 Land disturbance during construction and operation

Discovery of potential sites or objects of cultural heritage significance will be managed in accordance with CEMP and OEMP procedures.

The location of the proposed desalination plant is on land that has not been extensively cleared of native vegetation and has historically been utilised for stock grazing. As there are no listed heritage places or areas within the construction footprint, heritage with the most potential to be impacted is undiscovered archaeological artefacts.

An initial assessment was undertaken using the Archaeological Provisions Guidelines (HSA 2022). At the desalination plant site, archaeological potential was assessed to be low. Although the site is relatively undisturbed and the potential for artefacts to survive is high, archaeological significance is assessed as low as any artefacts found would be unlikely to yield information that will contribute significantly to an understanding of the State's history.

The transfer system and electricity infrastructure were also assessed as low archaeological potential, particularly due to the previously disturbed nature of much of the alignment, but also the low likelihood of artefacts of historical value to the State.

In the event that potential sites or objects are discovered during construction, a process for the identification, assessment, management and protection (if required) of those sites or objects will be implemented in accordance with the Project CEMP, which may include a preliminary assessment in accordance with the Archaeological Guidelines. Historical archaeological induction for all construction staff and contractors and an unexpected finds protocol for archaeological materials will be provided in the CEMP and OEMP.

If sites or objects are found and cannot be avoided, the requirements under the *Heritage Places Act 1993* to provide safeguards to protect heritage values would be followed, including obtaining a permit from the South Australian Heritage Council prior to any excavation, disturbance or removal of a potential place / object of archaeological significance. Obtaining a permit is subject to a qualified archaeologist undertaking an archaeological assessment and developing a research plan. Construction works in that area would be suspended until a permit is obtained.

There are no expected impacts to unknown non-Aboriginal cultural heritage from the operation and maintenance of Project infrastructure as there will be no ground-disturbing activities undertaken outside of previously cleared or disturbed areas.

The expected impacts to unknown non-Aboriginal heritage places or sites during construction and operation are in the **Negligible** category and the level of **certainty** in assessment of expected impact is **High.**

17.5.3 Seabed disturbance during marine construction and operation

Discovery of historic shipwreck material or relics will be managed in accordance with procedures in the Marine and Coastal Construction Environmental Management Plan.

Construction of Project marine infrastructure will require disturbance of the seabed (refer Chapter 6 Project Description). Activities that involve contact with or disturbance of the seabed, or operations in close proximity to the seabed, have the potential to damage, destroy or interfere with historic shipwrecks. While two locations have been mapped within 13 km of the site of the marine Project Area, it is understood that shipwrecks break down and get buried over time, often leaving no visible signs of the wreck on the surface of the seabed. As noted above, unless shipwrecks sites have been physically located, it is possible that the actual locations maybe different to the mapped location.

The *Historic Shipwrecks Act 1981* protects shipwrecks from unauthorised interference, removal or damage and requires discoveries to be notified. The Marine and Coastal Construction Environmental Management Plan (MCCEMP) will include procedures to address the discovery of shipwreck material during construction. These would include immediate stop work, marking the area to prevent removal or further disturbance of any material, reporting the location and details of the materials to the Department for Environment and Water (DEW) and seeking a permit (if required).

The potential for disturbance to historic shipwreck material due to the movement of Project construction vessels (e.g. barges and other support vessels) is considered to be negligible, due to their small footprint and draught compared to the water depth and in the context of the existing level and nature of maritime traffic in the region and Whyalla Port. Further information on marine vessel movements is provided in Chapter 21 Traffic and Transport.

Potential impacts to historic shipwrecks or relics are not expected during operation as there will be no seabed disturbance outside previously disturbed areas.

The expected impacts from disturbance of unknown historic shipwrecks or shipwreck materials during construction and operation are in the **Negligible** category and the level of **certainty** in assessment of expected impact is **High.**

17.5.4 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP and other relevant plans).

Table 17-1: Key mitigation measures – non-Aboriginal cultural heritage

Mitigation measure	Construction	Operation
Buffer zone to be included in the CEMP and implemented for the Phillips Ponds ruins and cemetery.	✓	
Safety bunting or similar measures to define buffer zones included in the CEMP.	✓	
CEMP includes process for identifying, assessing, managing and protecting unexpected finds of non-Aboriginal cultural heritage sites or objects, including a preliminary assessment in accordance with the Archaeological Guidelines.	✓	
MCCEMP includes process for managing and protecting unexpected finds of historic shipwreck material.	✓	
Project inductions for staff and contractors address unexpected finds of non-Aboriginal cultural heritage places or sites, including shipwreck material.	✓	✓
The operation and maintenance of Project infrastructure will be limited to previously cleared or disturbed areas.		✓

17.6 Conclusion

The Project infrastructure has been located to avoid sites of non-Aboriginal cultural significance both on land and on the seabed. Due to the distance of known non-Aboriginal cultural heritage sites from the Project Area, no impacts are expected from Project construction and operational activities.

The Project CEMPs (both marine and terrestrial) and OEMPs will be implemented prior to the commencement of construction and operations, and will detail requirements and responsibilities for all staff and contractors, including site inductions and the importance of remaining within designated and approved areas, training and protocols for site discovery and reporting.



Chapter 18

Air Quality

NORTHERN
WATER PROJECT

JBS&G
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TABLE OF CONTENTS

18 AIR QUALITY 18-1

18.1 Key Findings 18-1

18.2 Setting the Context 18-2

18.2.1 Requirements in legislation and other standards 18-2

18.2.2 Views of stakeholders 18-3

18.3 Assessment Method 18-3

18.3.1 Relevant ground level concentrations (GLCs) 18-3

18.3.2 Identifying sensitive receptors 18-3

18.3.3 Evaluation distances 18-4

18.3.4 Assessment 18-4

18.4 Description of the Existing Environment 18-5

18.4.1 Project Area climate 18-5

18.4.2 Estimates of baseline air quality 18-6

18.4.3 Desalination plant site 18-7

18.4.4 Transfer system infrastructure 18-8

18.5 Impact Assessment 18-13

18.5.2 Construction impacts – Mullaquana Station 18-14

18.5.3 Construction impacts – transfer system infrastructure 18-15

18.5.4 Operational impacts 18-18

18.5.5 Cumulative impacts 18-19

18.5.6 Summary of key mitigation measures 18-20

18.6 Conclusion 18-20

LIST OF TABLES

Table 18-1: Existing air quality at locations along the transfer system alignment 18-6

Table 18-2: Sensitive receptor locations near transfer system infrastructure 18-9

Table 18-3: Emissions inventory 18-13

Table 18-4: Key mitigation measures – air quality 18-20

LIST OF FIGURES

Figure 18-1: Sensitive receptors - desalination plant and associated infrastructure 18-8
Figure 18-2: Sensitive receptors - southern section 18-11
Figure 18-3: Sensitive receptors - northern section 18-12

18 AIR QUALITY

Project construction and operation activities are potential sources of particulate matter and other emissions (including odour) which if not appropriately managed can have adverse health or amenity effects on nearby sensitive receptors including people, flora and fauna.

This chapter describes the existing air quality conditions in the Project Area, the predicted emission sources due to Project activities, the location of potential sensitive receptors and how potential impacts will be avoided or minimised.

An Air Quality Impact Assessment was undertaken for the Project and is provided at Appendix J-1.

18.1 Key Findings

Construction Phase

- Potential air quality impacts will primarily be related to dust associated with soil disturbance due to vegetation clearance, earthworks (including temporary stockpiling), vehicle movements on unsealed roads and general construction activities for the desalination plant and transfer system infrastructure.
- Although dust will be generated by construction activities, the region traversed by the Project is generally sparsely populated, with only three locations where sensitive receptors are within 250 m of construction activities (including potential laydown locations).
- Along with standard dust mitigation measures to be set out in construction Dust Management Plans (DMPs), additional measures will be implemented to minimise potential impacts at sensitive receptors within 250 m of the Project activity boundary (i.e. at Olympic Dam Village).
- With implementation of these measures, air quality impacts due to nuisance dust, PM_{10} and $PM_{2.5}$ emissions at these sensitive receptor locations are expected to be minor, localised and short-term.
- Due to the distance of the nearest sensitive receptor from the desalination plant storage areas for saturated marine sediments (5 km), no odour impacts are expected during construction.

Operation Phase

- Plant design and appropriate waste management procedures will minimise the potential for odour impacts from storage of fine solids received via the seawater intake. The nearest sensitive receptor to the desalination plant is 5 km to the west which is well beyond the worst-case separation distance for odour impacts.
- Impacts of operational air emissions are expected to be negligible and limited to minor short-term dust from regular but infrequent Project inspection, maintenance and monitoring activities. These impacts will be typical of existing light vehicle movements on unsealed roads.

Decommissioning Phase

- During decommissioning of the desalination plant, the potential for dust emissions from the removal of desalination plant buildings and other above ground infrastructure is expected to be comparable to those during the construction phase. These impacts would be managed in accordance with appropriate mitigation measures set out in an environmental management plan which would be put in place for the Project decommissioning phase.
- The pipeline will remain in situ during decommissioning, reducing the potential sources of dust emissions.

18.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effects of the Project on air quality and sensitive receptors. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 18.3.

18.2.1 Requirements in legislation and other standards

Air quality in South Australia is regulated under the *Environment Protection Act 1993* (EP Act), with air quality standards adopted by the EPA set out in the *Environment Protection (Air Quality) Policy 2016* (Air Quality EPP). The Act also sets out the general environmental duty of care (GED) which requires that all reasonable and practicable measures are taken to prevent or minimise environmental harm if potentially polluting activities are undertaken.

The air quality impact assessment undertaken for the Project was conducted in accordance with the following EPA guidance:

- *Ambient air quality assessment guideline* (EPA 2016b) which describes the EPA's risk-based approach to air quality assessment. The approach begins with considering the indicators of risk, specifically the evaluation distances, and the health and environmental indicators such as ground level concentrations (GLCs) and nuisance dust.
- *Evaluation distances for effective air quality and noise management* (EPA 2023a) which recommends evaluation distances between specified activities and sensitive receptors within which the air quality effects of the activity on the receptor should be assessed.

To qualitatively assess the Project's emissions (particularly with regard to dust during the construction phase), estimates were based on the Commonwealth Government's National Pollutant Inventory (NPI) Emission Estimate Techniques Manual for Mining (CoA 2012). The air

quality section of the EPA Construction Environmental Management Plan Guideline (EPA 2024) addresses air quality management when preparing a CEMP.

Dust generated on premises that has travelled to neighbouring premises may also (in certain circumstances) be considered a local nuisance under the *Local Nuisance and Litter Control Act 2016*.

18.2.2 Views of stakeholders

Dust associated with earthworks, tunnelling activities, vehicle movements and construction plant was identified as a concern, particularly for nearby residents, shack owners and other sensitive land uses.

Concerns about biosecurity issues for primary producers caused by dust generated by development of major infrastructure was raised in a submission by Livestock SA to the draft Hydrogen and Renewable Energy Bill (Livestock SA, 2023).

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

18.3 Assessment Method

The method of impact assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The Air Quality Impact Assessment Report is provided at Appendix J-1.

18.3.1 Relevant ground level concentrations (GLCs)

The GLCs determined to be relevant for the Project are those for deposited (nuisance) dust, particulate matter 10 micrometres or less (PM_{10}), particulate matter 2.5 micrometres or less ($PM_{2.5}$) (during construction) with the combustion gases, nitrogen dioxide (NO_2) and carbon monoxide (CO) also relevant for operations.

18.3.2 Identifying sensitive receptors

A sensitive receptor is defined in the EPA evaluation distance publication (EPA 2023a) as a house, building or other premises or open area where health, property or amenity is affected by emissions that increase the concentration of the emitted air pollutant (including dust and odour) above background levels. Sensitive natural environments, plants and animals may also be considered as sensitive receptors because vegetation and animals can be affected by emissions.

The length of exposure is an important consideration when identifying potential sensitive receptors. In the case of particles (PM_{10} and $PM_{2.5}$), sensitive receptors are those places where people are located for 24 hours or more, due to these GLCs having a 24-hour averaging time (EPA 2016b).

For the purposes of the Project, sensitive receptors during construction were defined as locations where a person would be reasonably expected to be present for 24-hours or more, which would typically include private or commercial residential / accommodation properties, hospitals and other similar facilities. Potential residential, commercial and community sensitive receptors have been assessed for the Project[1].

18.3.3 Evaluation distances

The evaluation distance provides an 'envelope' around an activity (or multiple activities) within which environmental risks need to be assessed against current knowledge, technologies and practices. The activity boundary encloses all sources of potential emissions such as plant and equipment, buildings, stacks, stockpiles and access roads and doesn't necessarily coincide with property boundaries.

The EPA publication, *Evaluation Distances for Effective Air Quality and Noise Management* (EPA 2023a) recommends an 'individual assessment' for the activity of desalination plants. However, the publication does not provide a specific evaluation distance for construction or excavation type activities. Assessment was therefore undertaken against the evaluation distance recommended in EPA 2023a for concrete batching works (200 m) as these works involve dust generating activities similar to those expected during Project construction e.g. vehicle movements on unsealed working areas, disturbance by vehicles of cement and aggregate dust on the ground and vehicle loading and unloading.

For the purposes of the assessment in this chapter[2], the edge of the Project construction footprint[3] was nominated as the 'activity boundary' for construction of all Project infrastructure, and for operational activities as these will also generally take place within the same footprint. A conservative evaluation distance of 250 m from the edge of the activity boundary was adopted (comprising the 200 m concrete batching works evaluation distance and an additional 50 m). For consistency, the activity boundary therefore includes the construction footprints for the desalination plant, transfer system infrastructure and camp/ laydown areas.

Individual assessment for operation of the desalination plant was based on a worst-case assumption for odour impacts, and used the evaluation distance recommended in EPA 2023a for stockpiling of biosolids (400 m). Construction and operational activities (to a lesser extent) will involve the stockpiling of spoil derived from tunnel, intake and outfall riser construction, and management of material screened from the seawater intake during operation.

18.3.4 Assessment

A desktop assessment of local meteorological data and existing air quality conditions was conducted to identify baseline conditions and potential Project-related air quality impacts.

[1] Receptor locations were identified by desktop assessment and have been verified where possible from field observations. Where this was not possible a conservative presumption of occupation has been adopted.

[2] Note that this evaluation distance differs slightly to the evaluation distance referred to in Appendix J-1.

[3] The construction footprint is defined as the area within which construction works will take place. For the desalination plant this is an area of approximately 123 ha (refer Figure 18-1). For the transfer system this is generally a corridor of nominal 50 m width or less. The construction footprint for pump stations could be up to 9 ha but is generally smaller.

The methodology prioritised the identification of potential air quality issues, focusing on particulate matter emissions (PM_{10} and $PM_{2.5}$) and evaluating the Project's proximity to sensitive receptors. Activities were screened against the 250 m evaluation distance, described above. Sensitive receptors where additional mitigation might be required to avoid or reduce impacts were identified as those within 250 m of the Project activity boundary.

A comparative assessment was undertaken considering accepted practices and technology in similar activities. The assessment considered health and environmental indicators such as GLCs and nuisance dust levels.

The methodology estimated volumes of excavation and fill associated with the Project construction and detailed the predicted emissions, focusing on dust generated from construction activities occurring across multiple sites within the Project activity boundary. Emissions were estimated in accordance with published emission factors in the NPI Emission Estimate Techniques Manual for Mining (CoA 2012).

Modelling

As agreed with the EPA, a modelling approach was not considered necessary for either construction or operations due to the relatively low number of potential receptors and the short-term nature of the activities. In addition, insufficient detail is available at this stage about the proposed construction activities on which predictive assessments could be based. Emission rates could vary significantly depending on local conditions and the construction management practices employed and would result in a high level of uncertainty in any modelling, limiting its usefulness.

18.4 Description of the Existing Environment

18.4.1 Project Area climate

A detailed description of land use and climate conditions for the southern and northern sections of the Project Area is provided in Chapter 9 Use of Land and Marine Waters.

In summary, the Project is generally located in semi-arid coastal environments in the south, transitioning to increasingly hotter and drier conditions in the north of the Project Area. The desalination plant site and the southern section of the Project on Eyre Peninsula experiences a semi-arid climate with warm summers and cool winters, with rainfall predominantly in winter. The northern section is semi-arid to arid and typically experiences hot dry summers and cold winters with low rainfall. Relative humidity for inland locations (e.g. Woomera and Roxby Downs) is overall significantly lower than for Whyalla.

Maximum wind speeds occur during the summer months, with minimum speeds occurring around the winter months. Seasonally, south or south-easterly winds dominate in summer, becoming less dominant in autumn with wind speeds dropping overall. In winter the dominant wind direction can be northerly overall and not very pronounced, with the exception of Whyalla, where winds dominate from the north and north-west. Wind speeds increase and return to the summer southerly pattern during spring.

18.4.2 Estimates of baseline air quality

Deposited dust, PM_{10} and $PM_{2.5}$

The primary pollutants of concern during Project construction are deposited dust and particulate matter. There are a number of existing and potential sources of industrial air emissions within 50 km of the Project which are primarily mining and quarrying operations, and metal refineries. These include[4]:

- Sand quarry near the desalination plant site (Extractive Mineral Lease EML 4101)
- SIMEC's Middleback Ranges Iron Ore Operations
- Whyalla Steelworks
- Boral Resources Stirling North Quarry
- Holcim's Roxby Downs Quarry
- BHP's Olympic Dam and Carrapateena Mines.

Deposited dust is an indicator of nuisance where dust deposited on and in houses, vehicles and clothes has the potential to impact amenity, or through surface run-off (e.g. rainwater collection from roofs). Deposited dust can also have effects on ecology (e.g. vegetation smothering). Average dust deposition rates at Olympic Dam and Carrapateena mine sites have been used as examples for arid and semi-arid locations in South Australia.

There is also a connection between visible nuisance dust and smaller particles which can include fractions of PM_{10} and $PM_{2.5}$. Air quality monitoring stations in Whyalla are closest to the Project alignment and provide the most representative estimates for background PM_{10} for the Project. Recent $PM_{2.5}$ monitoring has been conducted at Port Augusta which was considered representative for Project sites (Jacobs 2026e).

The representative sites identified for estimates of background deposited dust, PM_{10} and $PM_{2.5}$ are summarised in Table 18-1.

Table 18-1: Existing air quality at locations along the transfer system alignment

Parameter	Representative location	Background levels	Legislative standards
Deposited dust	Olympic Dam and Carrapateena	• Carrapateena mine average of 1.6 g/m²/month • Olympic Dam average of 1.9 g/m²/month	4 g/m²/month [NSW assessment criteria (NSW EPA 2022)].
PM_{10}	Schulz Reserve, Whyalla	• Average concentration 17.3 µg/m³ (24-hr average) • 99th Percentile concentration 44.8 µg/m³ (24-hr average)	50 µg/m³ (24-hr average) [Air Quality EPP]
$PM_{2.5}$	Port Augusta	• Average concentration 7.4 µg/m³ (24-hr average)	25 µg/m³ (24-hr average)

[4] The proposed Tilt windfarm near Nonowie has not been included in this list as (at the time of writing) it has not obtained State development approval and the potential impacts should the project be developed are not clear or certain.

Parameter	Representative location	Background levels	Legislative standards
		• 99th Percentile concentration 25.6 µg/m³ (24-hr average)	[Air Quality EPP]

Gaseous pollutants and background odour

Estimates for background levels of gaseous pollutants such as CO and NO_2 were not determined for the Project. Impacts of these pollutants from construction and operations are expected to be negligible due to the sparse distribution of sensitive receptors along the Project alignment and / or the distance of construction activities from nearby townships.

As no background levels were available for odour, a background odour level of zero has been assumed for the assessment.

18.4.3 Desalination plant site

The existing ambient air quality at the desalination plant site at Mullaquana Station is characterised by clean air typical of a sparsely populated rural environment where the principal land uses are sheep grazing on native vegetation.

Monitoring of air quality at Mullaquana Station Homestead was undertaken in 2010 by On Site Technology to support the Samphire Uranium Project. The results of monitoring have identified:

- Total Suspended Particulates (TSP) levels were low (average of 0.016 mg/m^3); and
- PM_{10} particulate matter was up to 0.004 mg/m^3 averaged over a 24-hour period with peaks of 0.2 mg/m^3 associated with local vehicular traffic (On Site Technology 2011).

Existing emission sources within the broader area of the desalination plant site would typically comprise airborne particulate matter including dust from movement of livestock, traffic on unsealed roads, the nearby sand quarry, pesticides and emissions from agricultural machinery. Episodic events such as dust storms or bushfire would also impact local background pollutant levels.

Sensitive receptors at Mullaquana Station

At Mullaquana Station the closest sensitive receptor is the station homestead (SR01), located 5 km west of the Project as shown in Figure 18-1 and Figure 18-2.

Mullaquana Station homestead is an occupied rural residential dwelling accessed from Mullaquana Station Road.



Figure 18-1: Sensitive receptors - desalination plant and associated infrastructure

18.4.4 Transfer system infrastructure

Due to the Project's geographic coverage, the existing air quality conditions at transfer system infrastructure locations will vary according to the land uses, terrain and climatic regions traversed over the approximately 400 km extent.

In the southern section, existing air quality conditions are similar to those described in Section 18.4.3 for the desalination plant. Transfer system, electrical supply infrastructure and camp / laydown locations are generally located in remote rural areas dominated by pastoral land uses, namely dryland grazing. Traffic along the Lincoln Highway and a number of small population centres would make a minor contribution to local background air quality conditions due to the higher frequency of vehicle movements, commercial activities and presence of residential properties.

Mining in the region, industrial activities associated with the Whyalla Steelworks and movement of bulk materials at the Whyalla Port also contribute to the existing air quality in the Whyalla area to varying degrees. Hourly PM_{10} monitoring data in Whyalla from 2021 to 2023 indicates that, overall, PM_{10} concentrations are higher in spring and summer during conditions of higher wind speeds (Jacobs 2026e). There were a few exceedances of the relevant EPA standard (50 µg/m^3) in 2021 but, generally PM_{10} levels are less than the standard (refer Table 18-1).

In the northern section, Project infrastructure is in a sparsely populated arid environment where the main land uses are grazing, conservation, Department of Defence activities and mining. The Olympic Dam and Carrapateena mines are the primary emission sources with potential to significantly affect air quality in this region. Other local emission sources such as

vehicles on highways and unsealed roads, rail transport and emissions from appliances such as air conditioners and gas heaters are insignificant. Dust storms would be an occasional and temporary, although significant, contributor to air quality.

Sensitive receptors on transfer system and transmission line alignments

Most of the Project transfer system infrastructure passes through pastoral and / or remote areas, with large separation distances to sensitive receptors. As discussed in Section 18.3.3, the evaluation distance of 250 m was used to identify sensitive receptors along the transfer system alignment where additional air quality management may be required.

Potential receptors have been identified within 2 km of Project infrastructure (with up to 5 km around the desalination plant site) where air quality impacts may occur during operations (refer Table 18-2). Receptors with potential for dust impacts are identified in bold. Locations of residential, commercial or community sensitive receptors are shown in Figure 18-2.

Table 18-2: Sensitive receptor locations near transfer system infrastructure

ID	Name [5]	KP	Type of Receptor	Distance from SR to construction footprint (m)
Southern section				
SR01	Mullaquana Station homestead	0	Residential	4,075 m
SR02	Nonowie Station homestead (near Mullaquana transmission line)	n/a	Residential	2,804 m
SR03	Cowleds Landing (settlement)	6	Residential	1,090 m
SR04	Middleback Homestead[6]	13	Residential	4,104 m
SR05	**Whyalla laydown areas**	**30**	**Commercial**	**10,000 m** [7]
SR06	Whyalla Airstrip	48	Commercial	858 m
SR07	The Tanks rest area	80	Public Area	57 m
SR08	Lincoln Gap homestead 1	81	Residential	426 m
SR09	Lincoln Gap homestead 2	81	Residential	1,188 m
SR10	Mount Arden	111	Residential	1,800 m
SR11	Carriewerloo area	115	Residential	1,275 m
SR12	North Tent Hill rest area	126	Public Area	86 m
SR13	Kootaberra / Yudnapinna	143	Residential	1,945 m

[5] Receptors within 250 m of the construction footprint (including laydowns) and long term residences (identified in air quality impact assessment as having a potential for dust impacts) are identified in bold.

[6] Note: in the Noise and Vibration Technical Study (Appendix J-2), this receptor is referred to as Whyalla outer West.

[7] Note this location is near potential laydown areas within the Whyalla industrial estate. However, the distance provided is to the nearest construction footprint point on the transfer system alignment (as laydown areas are not considered as part of the construction footprint in this context, and the potential air impacts from the laydown area are expected to be minimal). The potential laydown areas within the Whyalla industrial estate are more than 2 km from this SR.

ID	Name [5]	KP	Type of Receptor	Distance from SR to construction footprint (m)
SR14	Hesson Pump Station, Kootaberra	149	Residential	2,348 m
SR15	Ranges View rest area	153	Public Area	97 m
SR16	Kootaberra road	158	Residential	3,000 m
SR17	Kootaberra homestead	161	Residential	1,503 m
SR18	Oakden Hills area	188	Residential	432 m
Northern Section				
SR19	Pernatty area	CA 7	Residential	893 m
SR20	Camel Dam area	CA 40	Residential	1,366 m
SR21	**Pimba township**	**265**	**Residential**	**525 m**
SR22	**Woomera township**	**271**	**Residential**	**1,580 m**
SR23	Purple Downs Station	322	Residential	1,874 m
SR24	Roxby Downs township	348	Residential	1,070 m
SR25	**Olympic Dam Village**	**358**	**Residential**	**410 m**

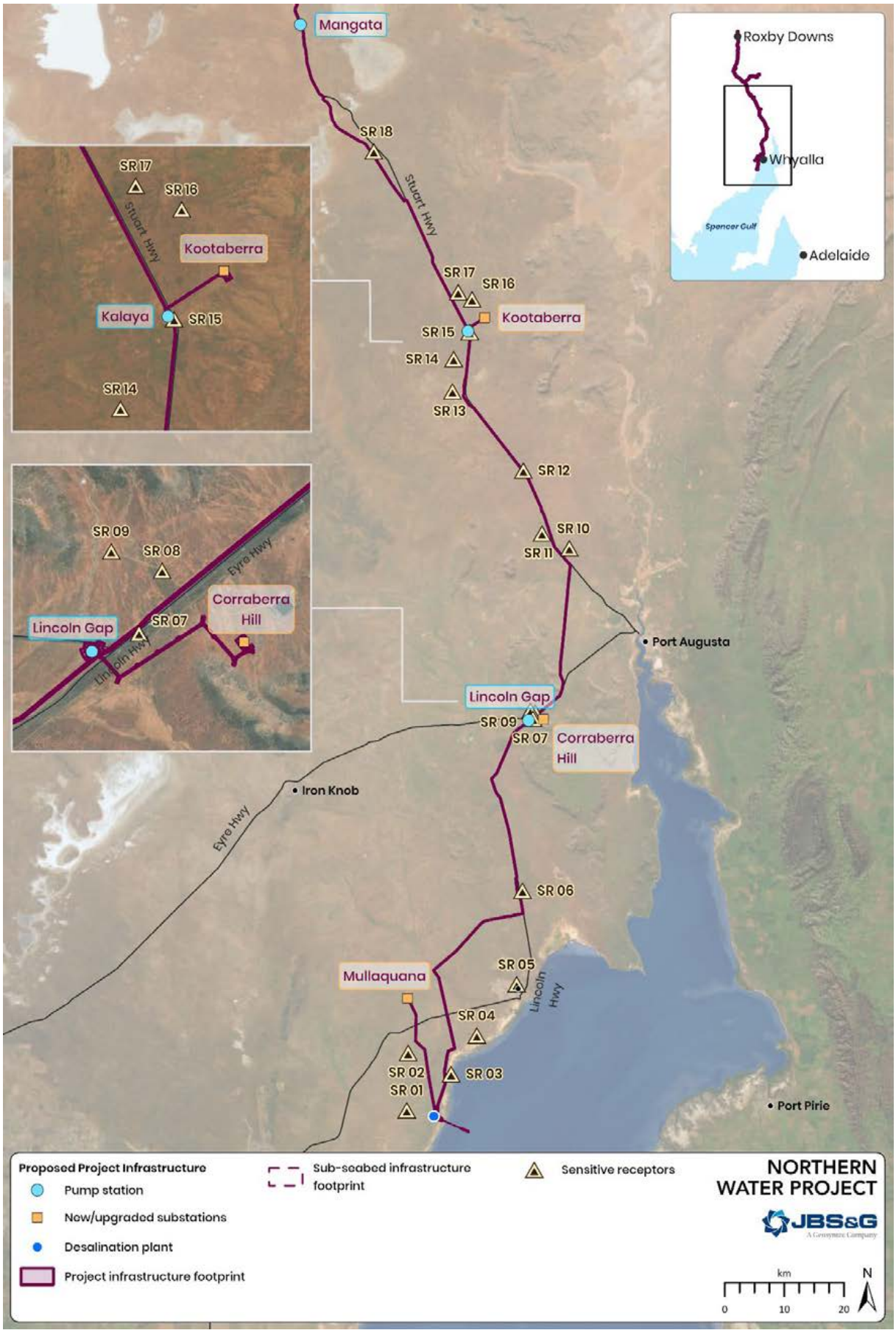


Figure 18-2: Sensitive receptors - southern section

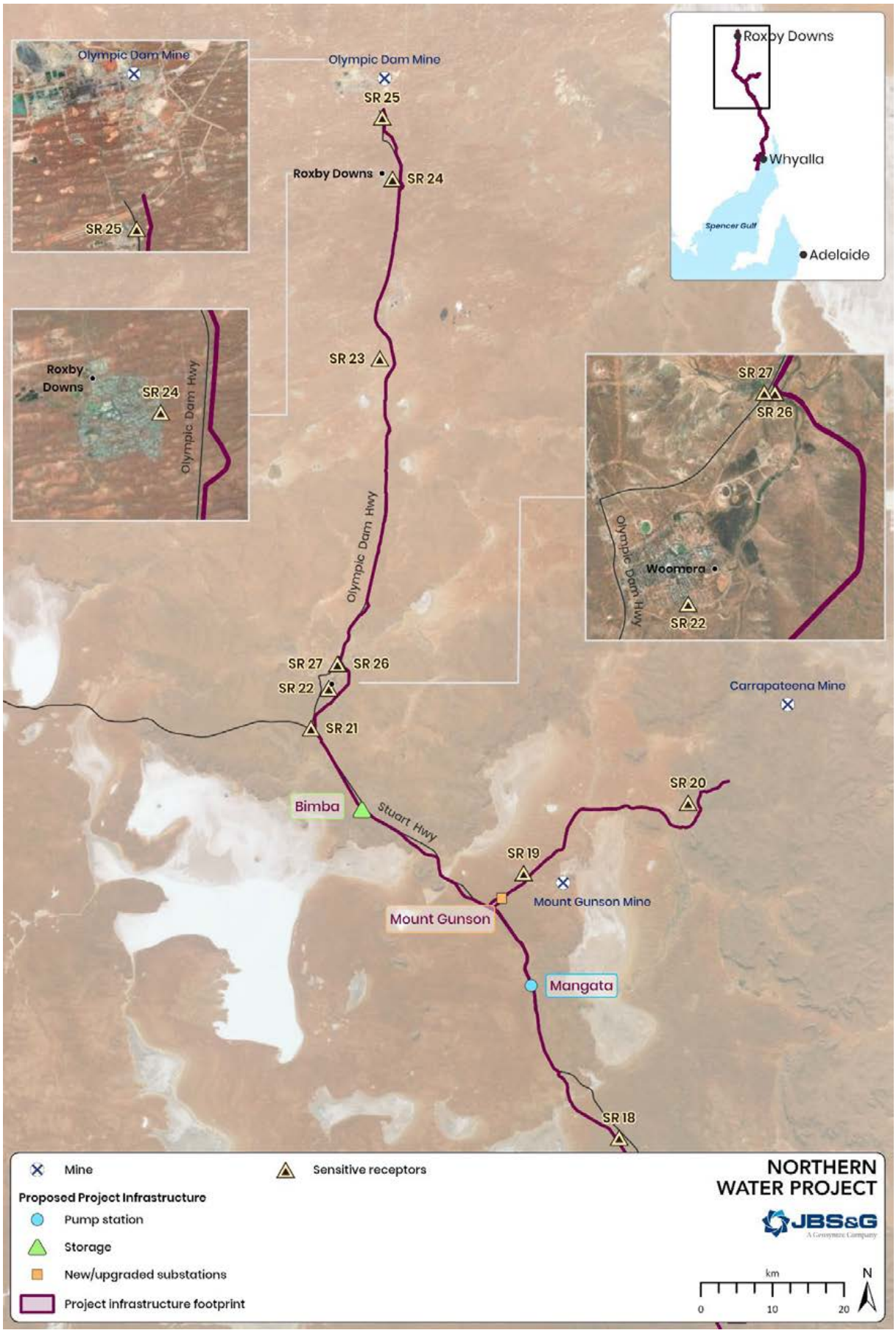


Figure 18-3: Sensitive receptors - northern section

18.5 Impact Assessment

The following Project aspects have been identified as sources of impacts to air quality:

- vegetation and topsoil clearance, earthworks, excavation and backfill, stockpiles, material handling
- construction plant and machinery emissions
- vehicle movements on unsealed roads
- storage of saturated marine sediment from the offshore jack-up barge (JUB) and organic matter from pre-treatment filtration.

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Emissions inventory

Project emissions with potential to affect air quality were calculated for each phase of the project in accordance with published emission factors in the NPI Emission Estimate Techniques Manual for Mining (DSEWPC 2012).

Emission sources included excavation of spoil and dozer movements, removal of spoil to haul trucks, placement of spoil in stockpiles and backfill in trench areas, vehicles on unsealed roads, wind erosion of stockpiles and exposed surfaces (i.e. cleared land).

Details are provided in the Air Quality Impact Assessment provided at Appendix J-1 and are summarised in Table 18-3.

Table 18-3: Emissions inventory

Project phase	Pollutant	Calculated emissions / sources of contaminants
Construction		
Whole of project	PM_{10}	377,196 kg/yr (over entire transfer system)
	$PM_{2.5}$	56,510 kg/yr (over entire transfer system)
	Odour (desalination plant)	Fine sediments from tunnel boring machine (TBM) and marine riser construction.
Operations		
Transfer system	Dust	Equivalent to background – light vehicle travel on dust roads only.
Desalination plant	Odour	Fine solid removal from pre-treatment filters.
Decommissioning		
Transfer system	None	Pipeline will remain in-situ (no decommissioning)
Whole of Project	Dust	As per construction
	Odour	No source at decommissioning

Upset conditions

These occurrences are normally documented from a project's Hazard and Operability Analysis (HAZOP) that looks at potential actions that could impact the environment, what risks there are and the controls that are required.

At this stage of the Project, it is not feasible to define potential upset conditions and as such, it is proposed that a HAZOP will be undertaken by the Design Build Operate, Maintain (DBOM) Contractor during detailed design. This process will assist with identifying and mitigating potential impacts from uncontrolled process events that may impact the environment, as well as nominate specific controls to be implemented where risks are unacceptably high.

Of relevance to air quality is the impact of a Harmful Algal Bloom (HAB) or a high marine suspended solids event triggering the need for additional desalination plant pre-treatment, resulting in increased solids to be managed on land.

18.5.2 Construction impacts – Mullaquana Station

Dust generation from construction activities at Mullaquana Station infrastructure sites will not have a significant impact on the small number of sensitive receptors.

Dust generating activities during construction of the desalination plant, access, transfer system and the Mullaquana Station transmission line and substation include vegetation clearance, soil stockpiling, earthworks, construction of the TBM launch shaft and pipeline trenching and backfilling. Increased traffic movements within the construction site and associated with equipment mobilisation and worker transport along unsealed sections of the Eight Mile Creek Road[8] are also expected to generate wheel dust. These activities are expected to take place over a period of up to 35 months (noting that this will be subject to final design and construction methodologies nominated by the DBOM contractor).

The predominant wind direction at Mullaquana Station is easterly (i.e. from the coast to inland) indicating airborne dust is more likely to be directed towards the west. As shown in Figure 18-1, Mullaquana Station homestead is located to the west of the Project activity boundary. As described in Chapter 12 Soils, Landform and Geology, there is the potential for wind erosion along the coastline.

The desalination plant construction site presents the primary source of dust emissions at Mullaquana Station due to the scope of the required earthworks and the extended construction period. The most significant dust generating activities (e.g. construction of the TBM launch shafts and earthworks) will occur well within the existing clearance footprint. There are no sensitive receptors within the 250 m evaluation distance for the desalination plant activity boundary with the Mullaquana Station homestead being located 5 km west of the site. No residential receptors are located within 250 m of either the pipeline or transmission line / substation activity boundary (refer Figure 18-1).

Accepted industry standard measures for the management of dust and air emissions at the Mullaquana Station construction sites will be implemented through the Dust Management Plan (DMP) that will be developed by the Design Build Operate, Maintain (DBOM) Contractor

[8] An alternative access route is being considered via a new Mullaquana Station access road (which would be sealed) connecting between Lincoln Highway (south-west of Whyalla) and Eight Mile Creek Road parallel to the alignment of the main transfer pipeline. Further details are provided in Chapter 21 Traffic and Transport.

and incorporated in the overarching Construction Environmental Management Plan (CEMP). The DMP will focus on adaptive management with measures that would include but not be limited to:

- planning and scheduling work to minimise the period between land clearing and rehabilitation
- locating and stabilising stockpiles and unvegetated areas to minimise wind erosion
- using water sprays to reduce wind-blown and wheel generated dust
- minimising transport on unsealed roads wherever practicable (e.g. by selecting unsealed roads that minimise distances and prevent unnecessary travel)
- implementing speed limits on unsealed roads (e.g. Eight Mile Creek Road)
- visual monitoring of dust generation.

Engagement with sensitive receptors in relation to the construction work schedule will also be undertaken.

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

18.5.3 Construction impacts – transfer system infrastructure

Impacts to sensitive receptors during construction of transfer system infrastructure will be short-term, localised and minor.

Dust generation during construction of the transfer system infrastructure will be mainly due to vegetation clearance, and soil stockpiling, trenching and backfilling earthworks required for construction of the pipeline (refer Chapter 6 Project Description). There will be smaller localised areas of soil disturbance for transmission line foundations and at pump station, storage and substation construction sites. Temporary camp and laydown sites will be located in previously disturbed areas where possible to reduce requirements for clearance.

The major sources of dust are expected to be wind generated dust from exposed areas, vehicle movements on unsealed roads and materials handling (Jacobs 2026e). The semi-arid to arid conditions of the Project area are likely to increase the potential for dust generation, particularly during the summer months.

Sensitive receptors in the vicinity of transfer system infrastructure are described in Section 18.4.4. Small numbers of receptors are located at Olympic Dam Village, and residences at Lincoln Gap and Lake Dutton, however there are no sensitive residential receptors within 250 m of the activity boundary. Commercial receptors present include the Whyalla industrial estate and Olympic Dam Village commercial area. Due to the nature of these receptors it is highly unlikely they will be disturbed by short-term dust and other air emissions resulting from transfer system construction.

As noted above, management of dust and air emissions to reduce potential impacts at these sensitive receptors will be implemented through the DMP and pipeline CEMP. In addition to the dust management measures identified above for the Mullaquana Station site, these could include:

- limiting the construction footprint (area) and the area that is stripped for construction

- limiting the period for which an area is stripped prior to pipe construction / installation with rehabilitation progressively occurring as construction continues
- if possible, minimising the area of cleared land during the drier months of the year, when potential for dust generation is at its greatest
- stockpiling and preserving vegetative matter cleared from the construction footprint for the execution of the works for post-construction rehabilitation
- locating stockpiles as far from residences and any other sensitive receptors as practicable
- developing strategies for minimising dust from temporary stockpiles of soil or other material, e.g. covering or spraying with water particularly during dry or windy conditions
- constructing wind fences wherever appropriate, e.g. installation of shade cloth as a wind break on longer term stockpiles
- minimising dust by water application at higher traffic areas, e.g. site access points, at construction / laydown sites.
- developing strategies for minimising dust generated from material transfer operations (e.g. water sprays).
- covering all materials transported to and from the construction sites.

As the work fronts for construction of the transfer system are expected to proceed at an approximate average rate of between 400 – 700 m per day, each location is expected to experience construction activities for no more than 14 days. With implementation of measures in the DMP, impacts would be temporary, localised and limited to the period that construction is taking place in the vicinity of any receptors. The potential for health impacts is considered low as the particulate size of construction dust is typically greater than that which can pose a health risk (typically smaller than 10 microns).

Dust generation from construction activities also has the potential to cause visual impairment to passing road traffic. This may in turn affect public safety, especially in northern reaches of the project where dust storms are common. The dust management measures designed to reduce impacts on sensitive receptors will also protect other receptors such as road users.

Longer term construction activities (e.g. use of construction laydown areas which are spaced approximately every 70 km along the transfer system) will be located away from sensitive receptors to reduce the potential for ongoing impacts. Rolling vegetation at laydown areas and construction compounds (rather than clearing) would be considered where possible and where safety is not compromised.

Given the Project context and environment, minor air emissions of nitrous oxides, sulphur oxides and carbon monoxide from the exhausts of machinery and support vehicles would have a negligible, localised and short-term impact on air quality.

The expected impacts from construction of transfer system infrastructure are in the **Negligible** category. Uncertainty in the expected impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

Construction sites will be promptly and effectively rehabilitated to minimise the potential for ongoing dust impacts.

As noted above, clearance of land is predicted to be a significant potential source of dust during construction, particularly on the transfer system alignment. To avoid ongoing impacts, rehabilitation of disturbed areas to reduce exposure to wind erosion and dust generation will be undertaken as soon as practicable.

Implementing the rehabilitation measures set out in the CEMP will reduce the potential for ongoing dust impacts, once construction activities have concluded. The period for which an area is stripped prior to pipe construction / installation will be minimised and rehabilitation would progressively occur as construction continues along the transfer system alignment.

In most locations, the transfer system disturbance corridor will be reinstated as soon as possible after pipe laying, testing and backfill. The site will be re-contoured, soils deep-ripped to break up any compaction and preserved topsoil containing retained seedstock and rootstock and any cleared vegetation will be re-spread to allow for natural regeneration. With these measures, dust generated during the rehabilitation phase would be significantly lower than the dust generated during the active construction period.

The rehabilitation of disturbed areas will be monitored to ensure success. If necessary, the DBOM Contractor will undertake further stabilisation and / or rehabilitation works until all construction areas have achieved rehabilitation objectives.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

Effective dust management will minimise impacts of deposited dust on vegetation.

Dust generated during construction activities has the potential to be deposited on vegetation in and around the activity boundary, leading to impacts for vegetation health. In the context of the Project this would predominantly consist of native vegetation.

Dust impacts on vegetation health are influenced by a range of factors including the size, shape and composition of the dust, the dust deposition load and the morphology of the vegetation being impacted (Doley (2006); Doley and Rossato (2010)). There are no Australian standards for assessing dust impacts on vegetation, however the establishment of dust controls for the protection of human health and amenity will also afford a level of protection for vegetation health. Dust is unlikely to build up to levels that could affect vegetation health due to the short-term and transitory nature of the transfer system construction (less than one week in one location).

Roadside vegetation is already frequently subjected to long term dust from vehicular traffic. Dust generated by construction traffic is not expected to have a significant additional impact on roadside vegetation as the Project will implement dust management measures to reduce wind-blown and wheel generated dust.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

Odour impacts from construction at the desalination plant site will be managed through appropriate separation distances between receptors and saturated sediments storage locations.

Saturated marine sediments from intake and outfall riser construction transported back to shore for settling and dewatering may generate odour as the sediment dries.

The marine risers will be constructed in offshore areas largely comprised of areas of bare sand with sparse organic cover and low presence of invertebrates (refer Chapter 10 Coastal Processes). These sediments have a low level of organic matter decreasing the potential for odour generation when disturbed.

Volumes of saturated sediments brought to shore are expected to be small (112,000 m^3 including both JUB and TBM spoil) and will be stored in areas located north of the box cut TBM launch site. Although odour impacts from this activity are expected to be low, a worst-case assumption of odour equivalent to stockpiling of biosolids indicated separation distances of 400 m would reduce the potential for odour impacts (EPA 2023a). As the nearest receptor to the desalination plant site is the Mullaquana Station homestead (5 km west of the construction footprint), there would be no odour impacts at this distance.

The expected impacts are in the **Negligible** category and the level of **certainty** in this prediction is **High.**

18.5.4 Operational impacts

During operations, Project air quality impacts are limited to potential odour risks associated with organic matter separated out during the desalination process, and vehicle access to the transfer system for regular inspections and maintenance work. As noted in Chapter 6 Project Description there are no gaseous emissions from the desalination process.

Odour emission

There is a low risk of odour impact from desalinated water and pipeline air valves.

Management of the organic matter derived during pre-treatment intake filtering of seawater is the only anticipated odour impact from operation of the desalination plant.

The desalination plant intake structure is likely to be located at a minimum water depth of approximately 13 m LAT. Screens on the intake structure will minimise entrainment of marine organisms and debris. Biofouling treatment will further reduce filtration requirements. The Adelaide Desalination Plant (which is slightly larger than the proposed desalination plant at Mullaquana Station) produces approximately 1 x 660 L bin of organic matter per week from pre-filtering. The Project would be expected to generate a similar or slightly smaller volume of organic matter.

Organic matter will be contained in a covered waste bin with regular disposal to prevent build-up of odour emissions from decaying material. As noted above, the nearest sensitive receptor to the desalination plant is 5 km to the west. This is well beyond the worst-case separation of distance for odour impacts of 400 m nominated as the evaluation distance for odour impacts during Project operations (refer Section 18.3.3).

There is potential for increased volume of organic matter should another HAB event occur within Upper Spencer Gulf (or a high marine sediment event), which could cause increased

biofouling of desalination plant filters and thus increased organic matter requiring management on land. In an upset condition scenario such as this, the material produced would be managed in the same manner, with strategies adopted to minimise odour emissions. The separation distance to the nearest sensitive receptor (5 km) remains the same and is the key mitigating factor ensuring there are no odour impacts during Project operations.

The expected impacts are in the **Negligible** category and the level of **certainty** in this prediction is **High.**

Vehicle movements during operation

Traffic and wheel generated dust during inspection and regular maintenance activities along the transfer system would be within expected background levels.

Regular (likely to be weekly) inspections of the transfer system will be required along with periodic maintenance, inspection and monitoring. Light vehicle access for inspections may generate wheel dust along unsealed roads. The frequency and nature of operational vehicle traffic on local unsealed roads and access tracks would have no impact on existing traffic volumes or levels of dust generation.

Operational inspections and maintenance are not expected to require any significant soil disturbance or other activities that have the potential to generate significant dust.

The expected impacts are in the **Negligible** category and the level of **certainty** in this prediction is **High.**

Decommissioning

Decommissioning of the desalination plant and other Project infrastructure will not result in significant air quality impacts at sensitive receptors.

Removal of the desalination plant and other facilities such as pump stations and storages are expected to create dust emissions comparable to those from construction and would be managed under the same control strategies.

It is assumed that, during decommissioning, the pipeline would remain in situ. The number of sites where dust emissions have the potential to cause air quality impacts would therefore be limited to the small number of receptors currently in proximity to the desalination plant, as discussed above.

The expected impacts are in the **Negligible** to **Minor** category. Uncertainty in the expected impact (due to uncertainty in the effectiveness of control measures) has been evaluated in Appendix M and the level of risk is **Low**.

18.5.5 Cumulative impacts

Other sources of emissions along the transfer system alignment are detailed in Section 18.4.2. These activities are located along sections of the transfer system where any impacts from dust during construction will be extremely short-term (less than 7 days) and no impacts are expected during operations. Due to the low level of air quality emissions, limited timeframe for impacts, low number of receptors and distance from similar emitters, no cumulative impacts are expected.

The Alligator Energy Samphire Uranium Project (located approximately 1.3 km to the north-west of the desalination plant) currently has a Retention Lease (RL 137) under the *Mining Act 1971*. A small-scale Field Leach Trial has been constructed and undertaken on the Retention Lease. Approval for a full scale mine has not yet been applied for or authorised, hence, potential impacts should the project be developed are not clear or certain. Hence, a cumulative assessment addressing the Samphire Uranium Project has not been undertaken (and is not required to be undertaken as part of the EIS Assessment Requirements).

The proposed Tilt Nonowie Wind Farm (also located north-west of the desalination plant) has not obtained State development approval (at the time of writing) and potential impacts should the project be developed are not clear or certain. Hence, a cumulative assessment in regard to the Tilt Nonowie Wind Farm has not been undertaken (and is not required to be undertaken as part of the EIS Assessment Requirements).

18.5.6 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP and other relevant plans).

Table 18-4: Key mitigation measures – air quality

Mitigation measure	Construction	Operation
Development of an adaptive DMP including monitoring of climatic conditions and during high-risk conditions, reduced dust generating activities and increased dust suppression.	✓	
Minimising disturbance areas (staging of construction, reinstatement as soon as practicable)	✓	
Stabilising stockpiles and unvegetated areas	✓	
Dust suppression (e.g. water spray truck)	✓	
Greater than 100 m separation distance between sensitive receptors and significant dust generating activities, unless appropriate mitigation measures are implemented and monitored	✓	
Trucks carrying fill, aggregate, sand, cement to and from site will be contained (e.g. tarped) to prevent dust emissions	✓	
Retention of cleared vegetation or ground cover to place over reinstatement areas to assist with stabilisation of soils and natural re-establishment of vegetative cover	✓	
Containment of organic matter from pre-treatment filtration and regular disposal offsite in accordance with relevant guidance.		✓

18.6 Conclusion

The primary pollutants of concern during desalination plant and transfer system infrastructure construction are deposited dust and particulate matter. The potential for dust impacts to sensitive receptors at the desalination plant site and locations of transfer system infrastructure is expected to be higher during construction than operations. These impacts will be minimised to acceptable levels through implementation of standard industry dust management practices and will generally be short term and localised.

Sources of potential odour have been identified during construction and operations but are not expected to impact sensitive receptors due to the distance from the odour source and implementation of management strategies.

An adaptive DMP will be developed as part of the CEMPs prepared for the Project by the DBOM Contractor in accordance with relevant guidelines.



Chapter 19

Noise and Vibration

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

19 NOISE AND VIBRATION 19-1

19.1 Key Findings 19-1

19.2 Setting the Context 19-1

19.2.1 Requirements in legislation and other standards 19-2

19.2.2 Views of stakeholders 19-5

19.3 Assessment Method 19-5

19.3.1 Noise assessment methodology 19-5

19.3.2 Evaluation distances for sensitive receptors 19-6

19.3.3 Baseline noise monitoring 19-7

19.3.4 Meteorological data 19-9

19.3.5 Noise emission modelling 19-9

19.4 Description of the Existing Environment 19-11

19.4.1 Introduction to noise measurement 19-11

19.4.2 Baseline noise levels 19-12

19.4.3 Noise and vibration sensitive receptors 19-12

19.5 Impact Assessment 19-18

19.5.1 Summary of adopted noise guidelines 19-18

19.5.2 Construction 19-19

19.5.3 Operations 19-22

19.5.4 Cumulative impacts 19-26

19.5.5 Summary of key mitigation measures 19-27

19.6 Conclusion 19-28

LIST OF TABLES

Table 19-1: Applicable noise legislation for day and night activities 19-3

Table 19-2: Ground vibration and airblast criteria for construction blasting 19-5

Table 19-3: Noise levels for construction components 19-10

Table 19-4: Baseline noise level monitoring results 19-12

Table 19-5: Sensitive receptor locations near transfer system infrastructure 19-13

Table 19-6: Summary of adopted operational noise guidelines 19-18

Table 19-7: Key mitigation measures – noise and vibration 19-27

LIST OF FIGURES

Figure 19-1: Baseline noise monitoring location – desalination plant 19-7

Figure 19-2: Baseline noise monitoring location - Lincoln Gap pump station 19-8

Figure 19-3 Baseline noise monitoring location - Kalaya pump station 19-8

Figure 19-4: Examples of sounds on the dB(A) scale 19-11

Figure 19-5: Noise and vibration sensitive receptors - southern section 19-16

Figure 19-6: Noise and vibration sensitive receptors - northern section 19-17

Figure 19-7: Modelled operational noise contours from the desalination plant and intake pump station with mitigation (night) 19-23

Figure 19-8: Lincoln Gap pump station modelled operational noise contours with mitigation (night) 19-24

Figure 19-9: Kalaya pump station modelled operational noise contours, no mitigation (night) 19-24

Figure 19-10 Mangata pump station modelled operational noise contours, no mitigation (night) 19-25

Figure 19-11: Noise modelling for the Lincoln Gap Wind Farm 19-26

LIST OF PLATES

Plate 19-1: Example of truck carrying marine tunnel segments 19-21

19 NOISE AND VIBRATION

Project construction and operation activities are potential sources of noise and vibration which if not appropriately managed can have adverse health or amenity effects on nearby sensitive receptors including people, fauna and structures.

This chapter describes the existing acoustic environment of the terrestrial component of the Project Area, the predicted noise emission and vibration sources due to construction and operation of the Project, the location of sensitive terrestrial receptors, and how potential impacts to sensitive receptors will be avoided or minimised.

A Terrestrial Noise and Vibration Impact Assessment was undertaken for the Project and is provided at Appendix J-2.

The potential for noise and vibration disturbance to fauna is discussed in Chapter 15 Terrestrial Flora and Fauna.

An assessment of the potential impacts of underwater noise to the marine environment due to Project activities is discussed in Chapter 11 Marine Environment.

19.1 Key Findings

- Potential impacts to the amenity of sensitive terrestrial receptors due to construction noise will be minimised through implementation of noise mitigation measures in Project design and construction activity planning.
- Laydown areas and construction camps along the transfer system alignment have been located away from sensitive receptors and adverse amenity impacts are not expected.
- Construction (including piling) at the desalination plant is unlikely to impact sensitive receptors due to the separation distance and adherence to Australian Standards.
- Impacts from the operation of the desalination plant will be below recognised thresholds for amenity noise with proposed mitigations in place.
- Noise and vibration from operation of the pump stations along the transfer system are not expected to adversely impact sensitive receptors due to the short-term nature of exposure (Kalaya pump station) or absence of sensitive receptors (Mangata pump station).
- Noise mitigation measures proposed for the pump station at Lincoln Gap will minimise adverse noise impacts at the nearest sensitive receptor.
- Vibration levels are expected to remain below human comfort thresholds. Short duration perceptible effects may occur during close-proximity activities but these are not expected to result in exceedance of acceptable limits.

19.2 Setting the Context

The EIS Assessment Requirements require an assessment of the noise and vibration effects of the Project on sensitive receptors and other environmental values. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 19.3.

19.2.1 Requirements in legislation and other standards

Noise can be defined as either a pollutant or a local nuisance. Vibration can also be defined as a local nuisance. Due to the wide range of noise sources (e.g. barking dogs, traffic, industrial premises) different State and local government authorities are involved in assessing noise impacts based on the noise source.

The *Environment Protection Act 1993* (EP Act) and the *Environment Protection (Commercial and Industrial Noise) Policy 2023* (the Noise EPP) are administered by the South Australian EPA which is responsible for noise originating from EPA-licensed commercial and industrial premises.

The Local Nuisance and Litter Control Act 2016 (LNLC Act) regulates animal and machine noise, noise from non-EPA licensed commercial and industrial premises, and general construction noise. Local councils are the responsible authority for these matters.

Environment Protection Act 1993 and *Environment Protection (Commercial and Industry Noise) Policy 2023*

The EP Act sets out the general environmental duty (GED) which requires that all reasonable and practicable measures are taken to prevent or minimise environmental harm if potentially polluting activities are undertaken. Noise emissions (as a pollutant) are regulated under the EP Act and the Noise EPP.

The Noise EPP establishes noise goals that, when complied with, would satisfy the GED under section 25 of the EP Act. The Noise EPP applies to activities licensed under the EP Act and will apply during the operational phase of the project. In general, construction noise is exempt from the Noise EPP with the exception of EP Act licensed activities including concrete batching and abrasive blasting.

The Noise EPP defines day (7am – 10 pm) and night (10pm – 7am) and identifies indicative noise levels for each based on zoning of proposed development areas in the relevant planning instrument and the closest noise impacted premises. As the Project site and pipeline infrastructure will be in several different land use zones, the operational noise criteria will vary.

Local Nuisance and Litter Control Act 2016

The LNLC Act applies to noise emissions or vibration that may result in local nuisance impacts depending on the timing and activities being undertaken. The LNLC Act states that construction noise and vibration may be considered a local nuisance, if:

- it occurs on any Sunday or Public Holiday; or after 7pm or before 7am on any other day (night hours), and
- the noise or vibration is likely to interfere unreasonably with the enjoyment of the area by persons occupying a premises.

Construction works for the proposed Project are likely to extend into the above times. Consequently, assessment will be required to determine if there is potential for nuisance. If so, the Project's construction contractor may need to seek an exemption under section 19(2) of the LNLC Act. Under Part 3 of Schedule 1 of the LNLC Act, works undertaken to avoid or reduce inconvenience or disruption to traffic or pedestrians during normal business hours do not constitute a local nuisance.

Relevant noise guidelines

The Department for Infrastructure and Transport (DIT) *Guideline for the Management of Noise and Vibration: Construction and Maintenance Activities, 2021* (DIT 2021) will be adopted for management of Project construction noise, especially over the night-time period. Different levels of mitigation are proposed under the guideline depending on the noise level of works and the length of time a sensitive receptor would be expected to be impacted by them.

Indicative Noise Factor Guidelines for the new Noise Policy and Guidelines for the use of the Environment Protection (Commercial and Industrial Noise) Policy 2023 (EPA 2023c) provides guidance for interpreting indicative noise levels under clause 5 of the Noise EPP.

Evaluation distances for effective air quality and noise management (EPA 2023a) recommends evaluation distances between specified activities and sensitive receptors within which the air quality effects of the activity on the receptor should be assessed.

Day and night noise emissions

Table 19-1 summarises the legislative requirements relating to day and night noise emissions.

Table 19-1: Applicable noise legislation for day and night activities

Construction	Operations
Day	
Defined as 7 am to 7 pm for construction. The GED under the EP Act requires reasonable measures to be undertaken to reduce noise but does not apply specific limits. Construction noise for public infrastructure is exempt from the Noise EPP. It is also exempt from the LNLCA during the day. **Exception:** Activities licensed under the EP Act during construction (potentially including concrete batching and abrasive blasting) will be regulated under the Noise EPP.	**Defined as 7 am to 10 pm for operations.** Operational noise is subject to the Noise EPP which prescribes maximum noise limits at the location of a receptor. The noise limits differ between day and night (to allow quieter time for sleeping) and depend upon the planning zone the receptor is located within e.g. a residential dwelling would have a lower noise limit (i.e. quieter) than an industrial estate.

Construction	Operations
Night	
Defined as 7 pm to 7 am for construction. Construction noise is subject to the LNLC Act and may require an exemption from the local council. No specific noise limits apply. For the purpose of the Project the DIT guidelines for managing construction noise. **Exception:** Activities licensed under the EP Act during construction (potentially including concrete batching and abrasive blasting) will be regulated under the Noise Policy.	**Defined as 10 pm to 7 am for operations.** Operational noise is subject to the Noise Policy under the EP Act.

Construction vibration standards

The DIT *Guideline for the management of Noise and Vibration: Construction and Maintenance Activities, 2021* will be adopted for managing vibration from the Project. The guideline adopts the following standard for protecting human comfort:

- 0.35 – 0.5 mm/s, to be evaluated with reference to Australian Standard 2670.2 Evaluation of human exposure to whole-body vibration.

In the absence of Australian standards for structural damage, the guideline adopts the German standard *DIN 4150-3 "Structural Vibration Part 3 – Effects of vibration on structures",* specifically:

- Table 1 of German Standard DIN 4150-3 Structural Vibration Part 3 – Effects of vibration on structures for structures
- Table 3 of German Standard DIN 4150-3 Structural Vibration Part 3 – Effects of vibration on structures for buried pipework.

The full tables are provided in Appendix J-2.

Construction blasting standards

The Australian Standards AS 2187.2-2006: *Explosives – Storage and use part 2: Use of explosives* and AS 2670.1-2001: *Evaluating of human exposure to whole-body vibration – General Requirements* and guideline *Assessing Vibration: a technical guideline, 2006* detail considerations for blasting activities.

The construction of the box cut at the desalination plant site will result in noise and vibration. It is not expected that blasting would be required for construction purposes at the desalination plant. Small, isolated blasting events may be required along the transfer system if rock is encountered that is unable to be excavated via mechanical means. Blasting effects include both airblast (i.e. pressure waves produced by blasting and transmitted through the air) and ground vibration (i.e. movement of mechanical energy within the rock mass).

Appropriately designed and controlled blasting techniques can reduce the effects of airblast and ground vibrations on sensitive receptors. AS 2187.2-2006 specifies requirements for safe use of explosives including mixing, testing, initiation and firing of charges and provides

background information, guidelines for measurement and criteria for peak levels of ground vibration and airblast.

Should Project construction blasting works be required, the relevant ground vibration and airblast criterial from AS 2187.2-2006 are the human comfort criteria for sensitive receptors (i.e. residential houses), for operations lasting less than 12 months or less than 20 blasts, as specified in Table 19-2. These criteria reflect a threshold for preventing damage to buildings.

Table 19-2: Ground vibration and airblast criteria for construction blasting

Category	Criteria
Ground vibration	AS 2187.2-2006 specifies a human comfort limit of 5 mm/s for 95% of blasts per year and a total limit of 10 mm/s for the remaining 5% of blasts at sensitive receiver locations, unless agreement is reached with the occupier that a higher limit may apply.
Airblast	Peak sound pressure level of 115 dBL for 95% blasts per year at sensitive receiver locations. 120 dBL maximum unless agreement is reached with the occupier that a higher limit may apply.

19.2.2 Views of stakeholders

Noise and vibration associated with earthworks, tunnelling activities, vehicle movements and construction plant have been identified as stakeholder concerns, particularly for nearby residents, shack owners and for other sensitive land uses. The potential for impacts from noise generated by the operational desalination plant on adjacent landowners has also been raised during stakeholder engagement.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement.

19.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

The Terrestrial Noise and Vibration Impact Assessment Report is provided at Appendix J-2.

19.3.1 Noise assessment methodology

Noise loggers were deployed in November 2023 at Lincoln Gap and May 2025 near the Kalaya pump station and Mullaquana Station to measure baseline noise levels and establish the existing acoustic environment in the vicinity of the Project and transfer system infrastructure. Loggers were left in place for a period of 5 - 14 days.

Construction noise targets and vibration limits for the Project were established in line with the DIT Guideline for the *Management of Noise and Vibration: Construction and Maintenance*

Activities EHTM Attachment 7D, 2021. Operational noise criteria were established in line with the EPA Noise EPP.

Noise and vibration sources during construction and operation were identified along with their typical outputs for different Project components and phases. Noise propagation from construction and operational activities were calculated using SoundPLAN three-dimensional noise modelling.

Potential sensitive noise and vibration receptors located within the Project Area were identified, with the addition of Mullaquana Station homestead which is outside the Project Area but is the closest receptor to the desalination plant (likely to be the largest source of potential impacts). Where there were multiple receptors in close proximity (i.e. Whyalla, Woomera and Roxby Downs) a single worst-case scenario receptor location has been identified. Receptors have been classified as residential, commercial or public areas, noting that receptors are not considered to be present in the locations classified as public areas during night hours.

The potential impact of Project construction noise and vibration on identified noise sensitive receptors was assessed against the established criteria.

Project operational noise levels and vibration were also assessed against established criteria. To assess the expected worst-case potential impacts during operation, the desalination plant site has been assumed to operate continuously.

Potential control measures were identified to further reduce the noise emissions to prevent or minimise any resulting environmental harm in accordance with section 25 of the EP Act and the GED.

19.3.2 Evaluation distances for sensitive receptors

An evaluation distance provides an 'envelope' around an activity (or multiple activities) within which environmental risks need to be assessed against current knowledge, technologies and practices. Evaluation distances form part of a suite of tools that assist with protection of environmental air and noise values near an activity, whether the activity is licensed by the EPA or not.

In the noise context, the EPA guidance document *Evaluation distances for effective air quality and noise management* (EPA 2023a) defines an adverse impact on amenity as 'an average noise of 45dB(A) or any singular noise event with a maximum noise level of 60dB(A) at a noise receiver (such as a domestic premise)'. However, EPA (2023a) does not stipulate a recommended evaluation distance for construction or excavation type activities and requires an 'individual assessment' for such activities.

A range of factors will influence the potential for construction noise impacts including:

- background noise levels
- selection, timing and use of machinery
- distance of the noise source to the receiver
- topography
- atmospheric conditions such as wind direction and strength and temperature gradient.

Operational modelling undertaken for the Project shows background noise levels are predicted to be reached within 1 km. A conservative evaluation distance of two kilometres has been applied across the entire Project Area for the purposes of the noise impact assessment.

Sensitive receptors that may experience construction noise are shown in Table 4 (Section 4) of Appendix J-2. These were identified through noise contours derived from initial construction noise modelling based on an indicative fleet of plant and machinery.

19.3.3 Baseline noise monitoring

Unattended noise measurements were undertaken at three locations to acquire day and night-time noise results. Environmental noise logger equipment was deployed over a period of 5 - 14 days with noise levels averaged over the day and night-time periods. Noise monitoring included continuous unattended noise measurement at locations representative of sensitive receptor locations at the desalination plant site at Mullaquana Station (refer Figure 19-1) between 15 and 28 May 2025, the Lincoln Gap pump station between 15 and 23 November 2023 (refer Figure 19-2) and the Kalaya pump station (refer Figure 19-3) between 15 and 19 May 2025. Equipment type and serial numbers of the environmental noise loggers are provided in Appendix J-2.

Following completion of baseline monitoring, an assessment was undertaken of likely sources of noise and potential impacts to sensitive noise receptors during construction and operation.

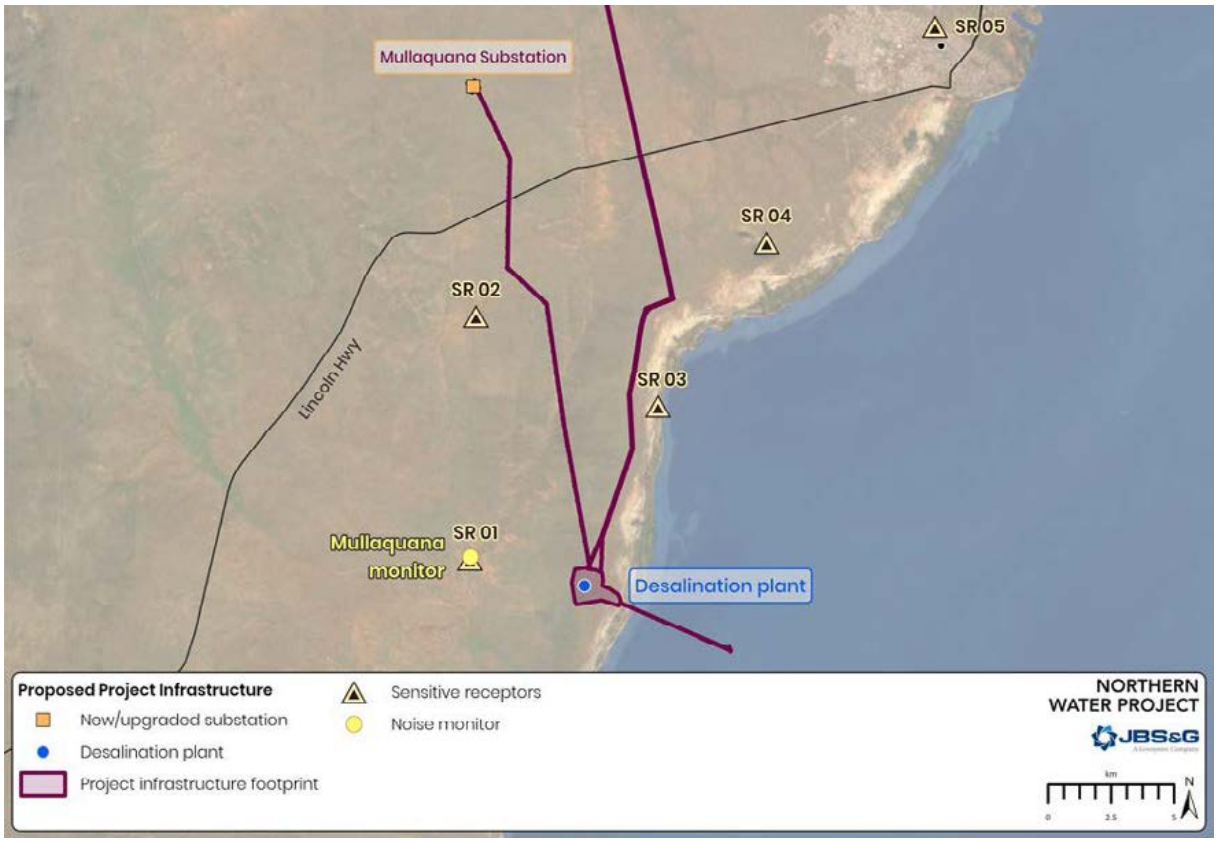


Figure 19-1: Baseline noise monitoring location – desalination plant



Figure 19-2: Baseline noise monitoring location - Lincoln Gap pump station

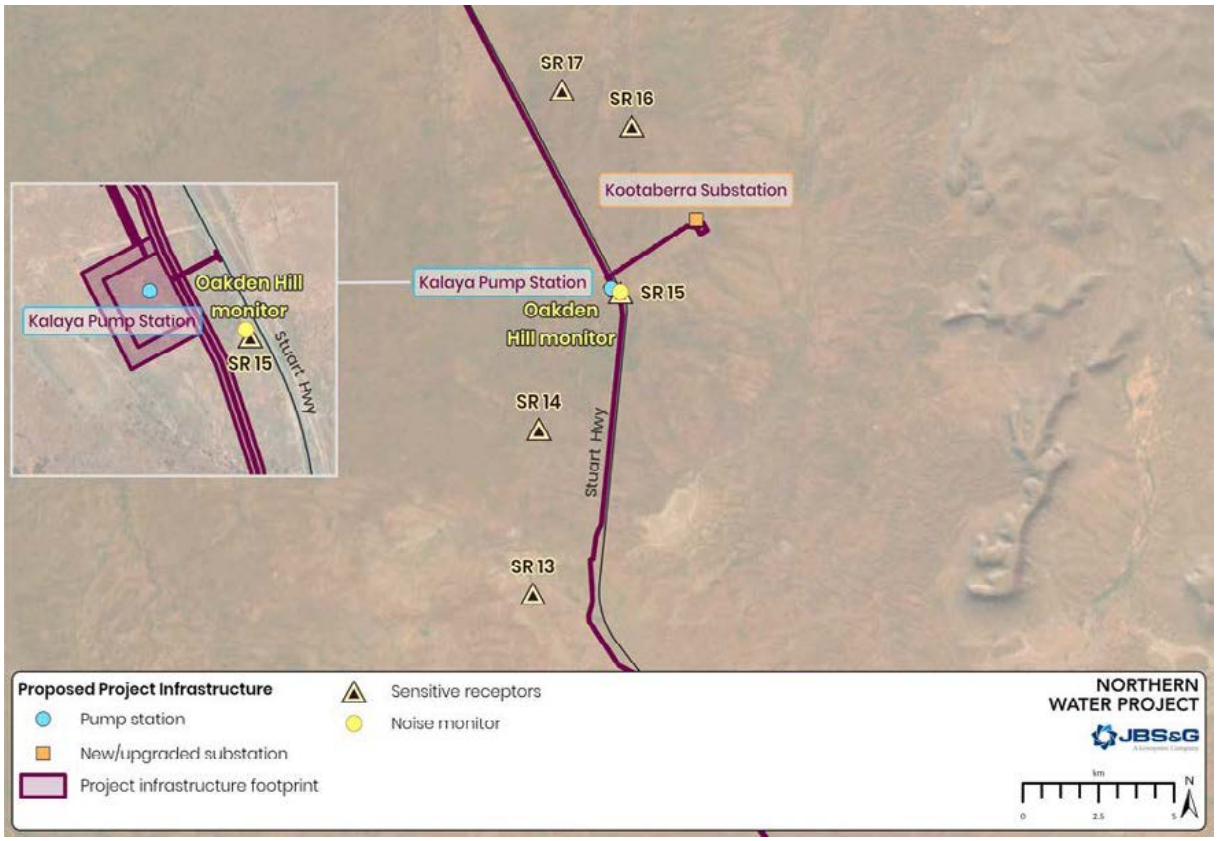


Figure 19-3 Baseline noise monitoring location - Kalaya pump station

19.3.4 Meteorological data

Meteorological data used in modelling was obtained from the Bureau of Meteorology Whyalla and Olympic Dam Aerodrome weather stations (BoM 2026a).

Wind roses, for 3pm wind direction, rainfall data and temperature data were incorporated into the noise model to describe worst-case weather conditions conducive for the highest noise propagation levels (night-time conditions). Historical data shows that:

- The southern section of the transfer system experiences predominantly southerly winds, strengthening in the afternoon with speeds between 13 and 25 km/h (Whyalla and Port Augusta Aero BoM stations; 018120 and 018201 respectively). Rainfall between 270 (Whyalla) and 222 (Port Augusta) mm/annum is spread evenly across the year and average temperatures vary between 4°C in winter to 35°C in summer.
- The northern section of the transfer system experiences predominantly south to south-easterly winds with average speeds of between 10 and 20 km/h. (Woomera and Olympic Dam Aerodrome, BoM stations 016001 and 016096 respectively). Rainfall is lower than the southern section with an average of 150 mm/annum in Olympic Dam and average temperatures ranging between 4°C in winter and 37°C in summer.

19.3.5 Noise emission modelling

Noise emissions were modelled using the CONCAWE noise modelling prediction algorithm, as implemented within the SoundPLAN 9.0 proprietary computer noise modelling software package. The CONCAWE calculation was selected due to its reliability in assessing industrial noise impacts, with validity of its use in Australia confirmed in technical publications. CONCAWE is also the preferred industrial noise propagation algorithm recommended for modelling purposes in the document, *Guidelines for the use of the Environment Protection (Commercial and Industrial Noise) Policy 2023*.

The CONCAWE prediction algorithm considers noise propagation and attenuation by:

- geometrical spreading
- atmospheric absorption
- ground effects
- the influence of meteorological conditions on the propagation of environmental noise
- barriers
- topography and distance between the source and receptor.

Noise levels were predicted using both 'standard' or 'neutral' as well as 'noise-enhancing' meteorological conditions:

- Standard or Neutral: CONCAWE Meteorological Category 5
- Noise-Enhancing: CONCAWE Meteorological Category 6.

Identifying sources of Project noise emissions

Information on relevant construction equipment and noise levels was obtained from the Reference Design (GHD 2025a) and Reference Design Constructability Report (Systra 2025). Typical plant and equipment and indicative construction scenarios were considered to

establish reasonable and typical noise emissions expected from Project construction activities.

The noise levels modelled for various indicative construction activity components within equipment fleets are presented in Table 19-3. The construction job components, equipment fleets for each job component of the Project and the qualitative assessment have been tabulated in in the Noise Assessment (refer Appendix J-2).

Table 19-3: Noise levels for construction components

Construction activity component	Total acoustic power - SWLeq dB(A)
Pipeline infrastructure	121
Pump stations	121
Storage facilities	121
Substations and transmission lines	121
Mullaquana Station desalination plant	124

Construction blasting

Construction blasting will not be required during the construction of the desalination plant launch shafts as all works are proposed in clay and can be excavated through mechanical means. Small, isolated blasting events may be required along the transfer system if rock is encountered that is unable to be excavated via mechanical means. Blasting will be undertaken in accordance with *Guideline for the management of Noise and Vibration: Construction and Maintenance Activities, 2021* (DIT 2021).

Operational electricity infrastructure noise emissions

Noise modelling was not performed for the operation of transmission lines as the only noise generated by transmission lines would be due to possible aeolian noise (wind noise) and noise due to the corona effect. Low frequency humming or crackling noise is generally considered corona noise which comprises electrical discharge from high voltage power lines, such as high voltage alternating current (HVAC) and high voltage direct current (HVDC).

The production of noise from transmission lines depends on meteorological conditions. Noise impacts from HVAC lines depends on wet weather and noise generated from HVDC lines is associated with dry conditions. The degree to which people can hear, and be affected by low level noise will be determined by:

- hearing sensitivity
- presence of tones
- fluctuating noise level
- frequency modulation
- rattle or vibration associated with noise
- proximity to other noise sources.

Corona and aeolian noise are assessed based on comparison with similar systems.

19.4 Description of the Existing Environment

19.4.1 Introduction to noise measurement

Noise is commonly defined as unwanted sound. The EPA *Guideline for the use of the Environmental Protection (Commercial and Industrial Noise) Policy 2023* notes that sound is produced by fluctuations in air pressure detected by the ear. The loudness of a sound is predominantly related to the amplitude of the fluctuations; while the frequency of its fluctuations determines the pitch or the tone that is perceived.

The loudness of sounds ranges from those that the human ear can just detect (the threshold of hearing) to those that exceed a threshold of pain. As sound is produced by changes in air pressure, the international standard unit of sound pressure is a pressure measurement, the micropascal (µPa). The range of audibility that the human ear can perceive to the threshold of pain is very large (approximately 20 µPa to 63 million µPa) and, therefore, sound pressure range is expressed on a logarithmic scale as the commonly known decibel (dB).

The frequency of a sound is the rate at which the fluctuations are produced per second. Practically all sounds contain a mixture of frequencies that are detected by the ear. The human ear is most sensitive to sound in the mid-range and high-range frequencies and is less sensitive to noise at low frequencies.

With noise, weighting scales are used to define parameters to mimic loudness perception. The A-weighted sound pressure level in decibels, denoted dB(A), is the unit generally used to measure environmental, transportation or industrial noise. The A-weighting scale approximates the sensitivity of the human ear when it is exposed to normal levels and correlates well with subjective perception over different types of sounds. Figure 19-4 shows typical sound levels in dB(A) for a range of settings.

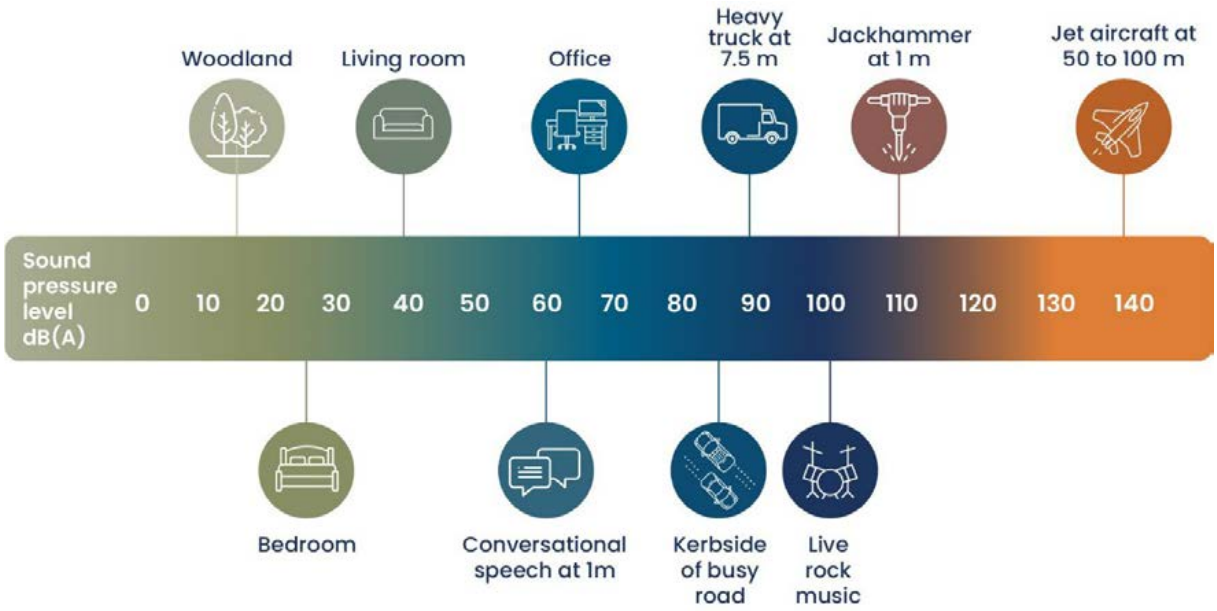


Figure 19-4: Examples of sounds on the dB(A) scale

19.4.2 Baseline noise levels

Due to the Project's length, the existing acoustic environment conditions in the Project Area will vary according to the land uses, terrain and climatic regions traversed over the approximately 400 km distance.

As discussed in Section 19.3.3 background noise monitoring to establish a baseline was undertaken at locations in the vicinity of sensitive receptors (including locations outside the Project Area), to establish the existing ambient noise environment in areas potentially affected by construction and operation of Project infrastructure. These locations were selected to be representative of the existing noise levels and land uses in the wider region.

The results of baseline noise level monitoring undertaken in November 2023 and May 2025 (refer Section 19.3.3) are set out in Table 19-4. Monitoring indicates that the background noise levels range from 14 dB(A) at night and 25 dB(A) during the day at Kalaya, to 27 dB(A) at night and 29 dB(A) during the day at Lincoln Gap.

At all other monitoring locations, the background noise levels during the day and night were measured from 14 dB(A) to 29 dB(A).

Table 19-4: Baseline noise level monitoring results

Location	Noise descriptor	Noise level dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Mullaquana Station	$L_{Aeq(time\ period)}$	39 - 59	32 - 45
	$L_{Background}$	15 – 16	15 - 19
Lincoln Gap	$L_{Aeq(time\ period)}$	50	46
	$L_{Background}$	29	27
Kalaya (Kootaberra)	$L_{Aeq(time\ period)}$	51 – 53	50 – 52
	$L_{Background}$	15 - 25	14 – 18

1. $L_{Aeq(time\ period)}$: The energy average of the daily equivalent continuous noise levels over the time period Day or Night

2. $L_{Background}$: The lowest background noise level regularly expected at the noise affected premises over a 15-minute period. Calculated as the minimum of the hourly average $L_{A90,15minute}$ noise levels measured throughout the noise monitoring period.

19.4.3 Noise and vibration sensitive receptors

The locations of existing and potential noise and vibration-sensitive receivers include residential properties, public use areas (i.e. rest areas), heritage / historical sites and terrestrial fauna.

The full list of sensitive receptor (SR) locations is provided in Table 19-5.

Table 19-5: Sensitive receptor locations near transfer system infrastructure

SR ID	Name [1]	KP	Type of receptor	Distance from SR to construction footprint (m)
Southern section				
SR01	Mullaquana Station homestead	0	Residential	4,075 m
SR02	Nonowie Station homestead (near Mullaquana transmission line)	n/a	Residential	2,804 m
SR03	Cowleds Landing (settlement)	6	Residential	1,090 m
SR04	Middleback Homestead[2]	13	Residential	4,104 m
SR05	**Whyalla laydown areas**	**30**	**Commercial**	**10,000 m [3]**
SR06	Whyalla Airstrip	48	Commercial	858 m
SR07	The Tanks rest area	80	Public Area	57 m
SR08	Lincoln Gap homestead 1	81	Residential	426 m
SR09	Lincoln Gap homestead 2	81	Residential	1,188 m
SR10	Mount Arden	111	Residential	1,800 m
SR11	Carriewerloo area	115	Residential	1,275 m
SR12	North Tent Hill rest area	126	Public Area	86 m
SR13	Kootaberra / Yudnapinna	143	Residential	1,945 m
SR14	Hesson Pump Station, Kootaberra	149	Residential	2,348 m
SR15	Ranges View rest area	153	Public Area	97 m
SR16	Kootaberra road	158	Residential	3,000 m
SR17	Kootaberra homestead	161	Residential	1,503 m
SR18	Oakden Hills area	188	Residential	432 m
Northern Section				
SR19	Pernatty area	CA 7	Residential	893 m
SR20	Camel Dam area	CA 40	Residential	1,366 m
SR21	**Pimba township**	**265**	**Residential**	**525 m**
SR22	**Woomera township**	**271**	**Residential**	**1,580 m**
SR23	Purple Downs Station	322	Residential	1,874 m

[1] Receptors within 250 m of the construction footprint (including laydowns) and long term residences are in **bold**.

[2] The Noise and Vibration Technical Study (Appendix J-2) names this receptor as Whyalla Outer West.

[3] Note this location is near potential laydown areas within Whyalla industrial estate. However, the distance provided is to the nearest construction footprint point on the pipeline alignment (as laydown areas are not considered a construction footprint in this context, and potential noise impacts from the laydown area are expected to be minimal). The potential laydown areas within the Whyalla industrial estate are more than 2 km from this SR.

SR ID	Name [1]	KP	Type of receptor	Distance from SR to construction footprint (m)
SR24	Roxby Downs township	348	Residential	1,070 m
SR25	**Olympic Dam Village**	**358**	**Residential**	**410 m**
SR26	**Phillips Pond Homestead Ruins**	**276**	**Historic**	**39 m**
SR27	**Phillips Pond Cemetery**	**276**	**Historic**	**200 m**

Desalination plant

The acoustic environment at the desalination plant site is dominated by natural noise sources such as wind, insects and birds, typical of a remote rural landscape. Some vehicle noise from traffic along local roads and access tracks, and agricultural activity on the site and surrounding properties may have an influence on background noise from time to time.

The nearest residence to the desalination plant at Mullaquana Station is the Mullaquana Station homestead (SR01), located approximately 5 km inland of the desalination plant site and outside the Project Area (refer Figure 19-5) (note, as per Table 19-5, SR01 is approximately 4 km from the construction footprint).

The only other terrestrial noise receptors are fauna (including native fauna and stock); the most noise sensitive of these known to be in the area of the desalination plant site is the EPBC-listed Western Grasswren (*Amytornis textilis myall*) (Commonwealth Vulnerable). Noise impacts to native fauna are assessed in Chapter 15 Terrestrial Flora and Fauna.

Transfer system and electricity infrastructure

The transfer system (i.e. pipeline and pump stations) and electricity infrastructure are largely located in rural and remote areas, although there are sections of the pipeline alignment in the vicinity of Woomera, Pimba and Roxby Downs. The existing acoustic environment for most of the transfer system alignment is similar to that for South Australia's rural and remote arid areas. Identified noise sources along the alignment include traffic along the Lincoln Highway, Iron Knob Road, Eyre Highway, Stuart Highway and Olympic Dam Highway, rail transport, mining exploration and production activities, generators at some station homesteads and outstations, and aerial mustering of livestock.

At the northern end of the pipeline alignment, previous assessments undertaken at Roxby Downs found that, although Olympic Dam mining operations and other industrial activities north of Roxby Downs were potential noise sources, none were found to be audible in Roxby Downs. Noise levels in Roxby Downs were dominated by air conditioners and local traffic noise (BHP 2009a). Similarly, noise levels measured at Woomera and Pimba found that there are no significant continuous industrial noise sources and that weapons testing and aircraft movements at the Woomera Prohibited Area nearby are rare and only result in short-term noise and vibration. Minor traffic noise was found to be audible at night, but background noise levels were very low (BHP 2009a).

Southern section

Noise and vibration sensitive receptor locations in the vicinity of transfer system and electricity infrastructure in the southern section of the Project Area are shown in Figure 19-5.

These receptors represent isolated homesteads (e.g. Mullaquana Station – SR01, Nonowie Homestead – SR02 and at Lincoln Gap – SR08 and SR09), rural shack settlements (e.g. Cowleds Landing – SR02) and highway rest areas (e.g. Lincoln Gap Tanks rest area - SR07 and Ranges View rest area - SR15).

Northern section

Noise and vibration sensitive receptors in the vicinity of transfer system and electricity infrastructure in the northern section of the Project Area are shown in Figure 19-5. These receptors represent isolated homesteads (e.g. Purple Downs Station – SR23) and remote towns and residential areas (e.g. Pimba – SR21, Woomera – SR22, Roxby Downs – SR24 and Olympic Dam Village SR25). The Phillips Ponds homestead ruins and cemetery are locations of historical interest with potential to be sensitive to construction-related vibration (SR27 and 26).

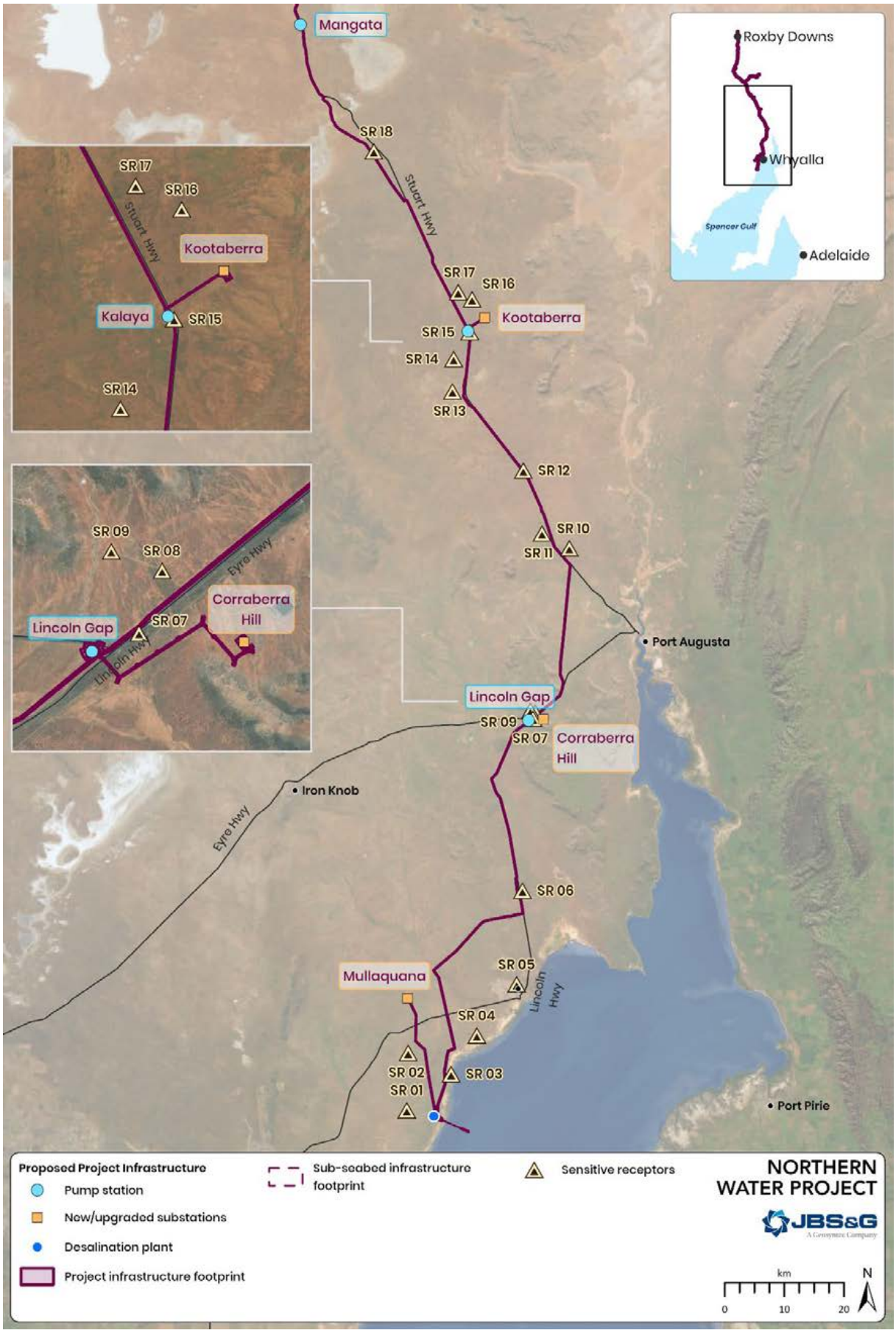


Figure 19-5: Noise and vibration sensitive receptors - southern section

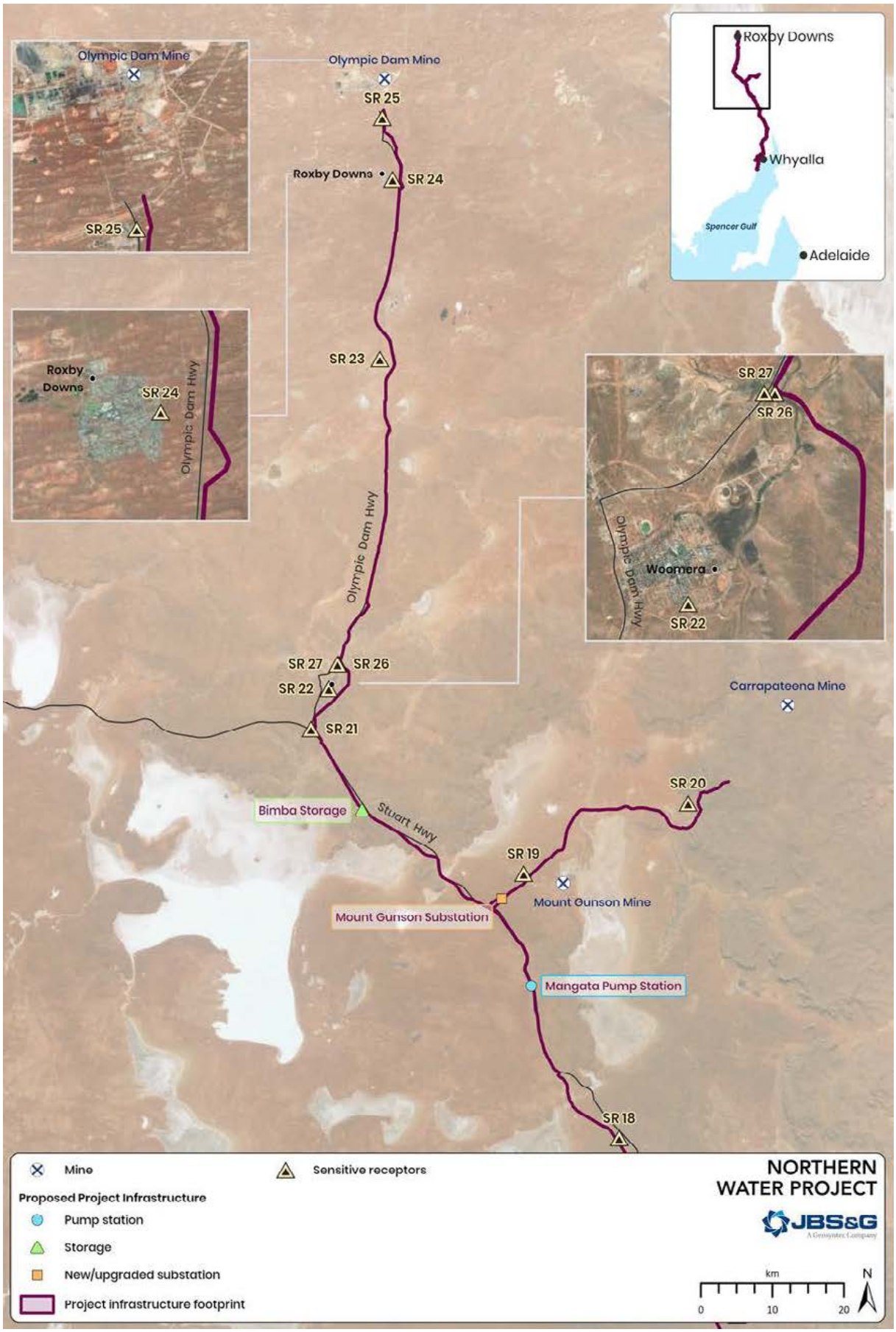


Figure 19-6: Noise and vibration sensitive receptors - northern section

19.5 Impact Assessment

The following Project aspects have been identified as sources of impacts from noise and vibration.

- use of construction machinery - includes earthmoving, construction equipment and other heavy vehicles and diesel generators.
- piling used in construction of TBM launch box excavation and marine risers[4].
- operation of desalination plant, pump stations and sub-stations.
- wind and corona noise along the transmission lines.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

19.5.1 Summary of adopted noise guidelines

The predicted operational noise levels under worst-case noise enhancing meteorological conditions have been assessed against the Project noise criteria and tabulated in the Terrestrial Noise and Vibration Impact Assessment (Appendix J-2).

The assessment found that predicted operational noise levels from noise sources (with basic mitigation applied) at Mullaquana Station and Lincoln Gap at identified sensitive receptors does not exceed predicted criteria of 52 dB(A) during the day and 44 dB(A) during the night. Precited noise impacts from Kalaya and Mangata pump stations show noise will be below recognised limits with no mitigation measures applied.

The applicable levels are summarised in Table 19-6.

Table 19-6: Summary of adopted operational noise guidelines

Location	Land Use	Indicative noise factor dB(A)	
		Day (7am to 10pm)	Night (10pm to 7am)
Mullaquana Station (Desalination plant)	Rural living	52	42
Lincoln Gap pump station	Remote areas	52	44
Kalaya pump station	Remote areas	52	44
Mangata pump station	Remote areas	52	44

Due to its short-term nature, construction noise is not considered to have an adverse impact on the amenity of residential receptors unless it exceeds a continuous level of 45 dB(A) overnight (DIT, 2021).

[4] Impacts on the marine environment from noise and vibration associated with the TBM are addressed in Chapter 11 Marine Environment.

19.5.2 Construction

Impacts to sensitive receptors due to noise and vibration during site establishment and construction of the desalination plant will be short-term and minor to negligible.

Noise levels at the location of Mullaquana Station Homestead (SR01) during the desalination plant construction period were modelled as 44 dB(A) which is below the relevant night-time noise criteria under the DIT guidelines (2021) for construction noise overnight. While some noise may be heard at the receptor location, it will be low level and below required limits. The construction period for the desalination plant site is expected to be two years. Construction work on the desalination plant is expected to be a 5.5 day calendar on day shift (6 am to 6pm), however tunnel boring activities are expected to be 24 hours /day and 7 days / week. Accordingly, while noise levels are likely to fluctuate during this time, some level of noise will likely be present.

The most significant vibration impacts at the desalination plant site are from piling to form the walls of the box cut, from which the TBM will be launched. Modelling of vibration using the Attwell et al. 1992 (quadratic regression model) shows vibration levels would be below the 5 mm/s Peak Particle Velocity (PPV) within 20 m of the equipment and barely discernible by 200 m. As the nearest receptor, Mullaquana Station homestead (SR01) is over 5 km from the location of the box cut, no impacts from vibration are expected. No impacts at other sensitive receptor sites in the vicinity of the desalination plant site (Nonowie homestead - SR02 and Cowleds Landing – SR03) are expected due to distance from construction works.

Engagement regarding the Project is ongoing with the residents of Mullaquana Station homestead.

Minor increase in noise is expected at the nearest receptor (SR01) during construction, which is predicted to remain below night-time noise criteria under relevant guidelines. The expected noise impacts at the nearest terrestrial receptor are **Minor** and the level of **certainty** in this prediction is **High**.

The expected impacts from vibration at the nearest terrestrial receptor are **Negligible** due to the distance from the source and the level of **certainty** in this prediction is **High**.

Impacts to sensitive receptors due to noise and vibration during transfer system and electricity infrastructure construction will be short-term and minor.

Project activities will generate short-term and transient noise and vibration effects during construction of the transfer system (pipeline and pump stations) and electricity infrastructure (transmission lines and substations). Construction will be undertaken in accordance with *Guideline for the Management of Noise and Vibration: Construction and Maintenance Activities* (DIT 2021) with construction mainly occurring during daylight hours unless there is specific need for night works.

This guideline identifies target noise levels for construction that are considered not to impact on the amenity of residential receptors. As the work fronts for construction of the transfer system are expected to proceed at an approximate average rate of between 400 – 700 m per day, each location is expected to experience construction activities for no more than 14 days.

Daytime construction noise will be managed to a level as low as reasonably practicable in accordance with regulatory requirements. Construction noise is not considered to have an adverse impact on the amenity of residential receptors unless it exceeds a continuous level of 45 dB(A) overnight (DIT 2021). Modelling of the noise levels associated with land clearing and construction activities for the Project concludes mitigation measures for noise impacts may be required in the proximity of sensitive receptors if night works are employed. The predicted noise levels from construction are considered acceptable for daytime works in accordance with DIT and EPA construction noise guidelines (refer Appendix J-2).

While some noise may be audible at residential receptors during construction of the transfer system, it will be within recognised guidelines and short-term as the work front moves (between 7 – 14 days). The expected noise impacts to sensitive receptors are in the **Minor** category and the level of **certainty** in this prediction is **High** based on modelling with site specific data and well-known controls.

The vibration produced by transfer system and electricity infrastructure construction works will be highly dependent on the construction methodology and equipment that is employed. The closest residential receptors to the Project are SR25 (Olympic Dam Village) and SR08 (Lincoln Gap), while the Phillips Ponds ruins north of Woomera (SR26 and SR27) have been identified as historic sites which may be sensitive to vibration. The potential for vibration impacts on sensitive receptors will be minimised through refinement of the construction methodology, such as the selection of alternative equipment if works need to occur within close proximity of receptors[5].

As the separation of distance between construction works and sensitive receptors is greater than 300 m and it is understood that attenuation of vibration from construction equipment occurs over short distances, the construction vibration levels will be below the applicable vibration criteria. The expected vibration impacts to sensitive receptors from construction activities are in the **Negligible** category and the level of **certainty** in this prediction is **High**.

Noise from temporary construction camps, laydown and staging area is not expected to adversely affect the amenity of residential receptors.

Temporary worker construction camps, laydown and staging areas will be required along the pipeline infrastructure with final locations determined during the detailed design phase.

The temporary worker camps, laydown and staging areas will have multiple noise sources associated with their operation, including temporary camp, workshops, generators, vehicle movements, however these locations will be sited in areas away from residences and other sensitive receptors. Potential noise impacts would be discussed and managed as agreed with local council and landowners.

The expected impacts of noise from temporary camps, laydown and staging areas are in the **Negligible** category due to chosen separation distances from sensitive receptors, and the level of **certainty** in this prediction is **High**.

[5] The potential for vibration impacts to the Phillips Ponds historic site is assessed in Chapter 17 Non-Aboriginal Cultural Heritage, with further information provided in Appendix J-2.

The noise impact associated with haulage and large vehicle movements is expected to be minor and short-term.

The Project will require haulage of material to and from the desalination plant and transfer system. Haulage routes will, where practicable, be located as far as possible from residential areas. However, it is possible that some access roads will pass through residential areas on route to major highways or other large roads better suited to haulage.

Noise impacts associated with haulage along the transfer system will be short-term given the short material movement period and the transient nature of the pipeline infrastructure construction.

Components and materials for the desalination plant (including marine tunnel segments) will be transported by OSOM and other heavy vehicles from and through Whyalla to the Mullaquana Station site via gazetted roads. Trucks will comply with size and weight limits for gazetted roads and hence noise impacts are expected to be in accordance with legislative requirements.



Plate 19-1: Example of truck carrying marine tunnel segments

Truck movements along unsealed surfaces will be restricted to minimum speeds near sensitive receptors (including the Cowleds Landing community when travelling along Eight Mile Creek Road). During construction, the condition of roads used to access the site will be frequently monitored with appropriate maintenance undertaken to reduce traffic noise from heavy vehicle movement along the access. The use of engine brakes near sensitive areas will also be restricted to reduce noise. These measures and other traffic noise mitigation measures will be included in the CEMP and implemented to limit the noise impacts associated with travelling at speed on uneven surfaces.

The Project is proposing to construct a new access road from the Lincoln Highway to the desalination plant to reduce traffic on Horseshoe Road, Mullaquana Road and Eight Mile Creek Road, all located to the south of Whyalla. Further details are provided in Chapter 21 Traffic and Transport.

The expected impacts associated with haulage and large vehicle movements are **Minor** and the level of **certainty** in this prediction is **High**.

There will be minor short-term impact on amenity of receptors from airblast and ground vibration during transfer system construction.

Blasting is not expected as part of normal construction, however, it may be required during construction of the transfer system and electricity infrastructure depending upon the underlying geology. Single, isolated blasts may be required where the trench is unable to be excavated using standard mechanical equipment, including rock breakers.

Any blasting requirements would be undertaken in accordance with AS 2187.2-2006 including design of blasts to ensure relevant vibration amenity levels are met. As the closest residential receptor to the transfer system construction footprint is over 400 m away, at this distance vibration impacts are not expected. Engagement with nearby stakeholders will be undertaken prior to any blasting occurring.

The expected impacts from air blast and ground vibration impacts due to construction are **Negligible** and the level of **certainty** in this prediction is **High.**

19.5.3 Operations

Noise and vibration impacts to sensitive receptors from the operation of the desalination plant will be negligible.

Modelling of the operational noise from the desalination plant concluded noise will generally be below the ambient noise but not below the lowest noise level and thus will occasionally be audible at the closest sensitive receptor during quiet periods. Without mitigation there is a minor exceedance of the EPA noise criteria during night operations.

Industry standard mitigations will be applied including absorptive treatment to internal plant room walls and ceiling and acoustic louvres for pre-treatment, reserve osmosis and transfer pump station buildings with an acoustic enclosure around the cartridge filters and reverse osmosis feed pumps. These modifications are modelled to ensure compliance with EPA noise criteria is always met (refer Figure 19-7).

Consideration of emergency equipment required during upset conditions at the desalination plant and pump station was included in the noise model. However, since it was found to comply with the standard noise level for the Noise EPP, this was not separated into a new model.

With the application of the proposed mitigation measures to reduce noise from the desalination plant and intake pump station, the expected impacts are in the **Negligible** category. The level of **certainty** in the prediction is **High** as modelling results are based on site specific data, well known and respected modelling software and using industry standard control measures.

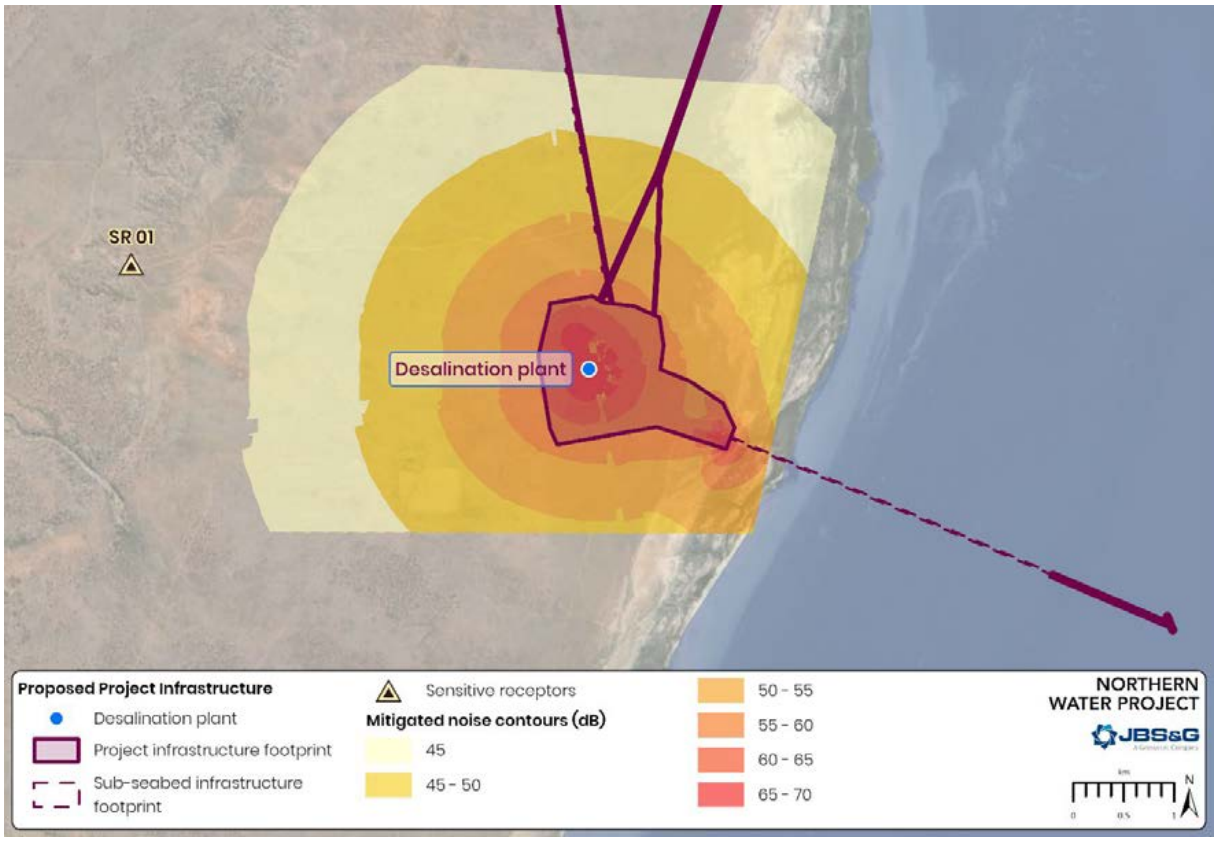


Figure 19-7: Modelled operational noise contours from the desalination plant and intake pump station with mitigation (night)

Noise and vibration impacts to sensitive receptors from the operation of the transfer system pump stations will be negligible.

Assessment of the potential noise emissions from the pump station at Lincoln Gap (refer Figure 19-8) indicates compliance with the applicable noise criteria (as defined in the Noise EPP), can be met with industry standard noise mitigation measures. Mitigation measures proposed at Lincoln Gap (included in the noise modelling) include installation of cladding and absorptive treatment for internal plant room walls and ceiling and acoustic louvres.

With the incorporation of noise mitigation measures at Lincoln Gap pump station, the nearest noise sensitive receptor will experience up to 36 dB(A) overnight. This is well below the applicable night-time Noise EPP criteria for 44 dB(A). The expected noise impacts from Lincoln Gap pump station with mitigation measures in place at the nearest sensitive receptor are **Negligible** and the level of **certainty** in this prediction is **High**.

At Kalaya pump station there are no noise sensitive receptors that could be impacted by the proposed development (refer Figure 19-9). The Ranges View rest area is located within the modelled noise contours but as a truck stop on Stuart Highway there are no relevant criteria and the area is already highly impacted by traffic noise.

There are no noise sensitive receptors within 5 km of Mangata pump station that would be impacted by noise from operations. Modelled noise contours for this pump station have been included in Figure 19-10. There are no residential noise sensitive receptors that would experience an increase in noise levels as a result of the Kalaya and Mangata pump stations. The expected noise impacts are **Negligible** and the level of **certainty** in this prediction is **High**.

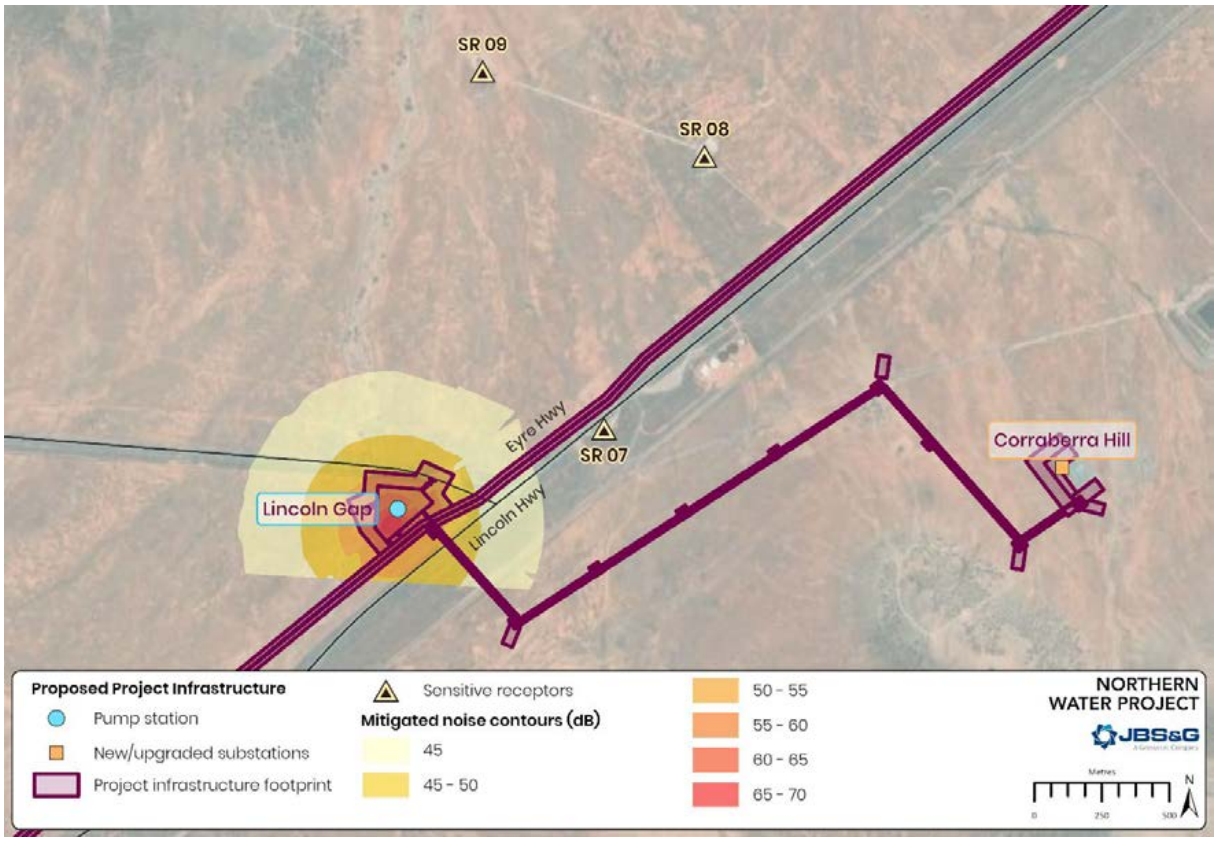


Figure 19-8: Lincoln Gap pump station modelled operational noise contours with mitigation (night)

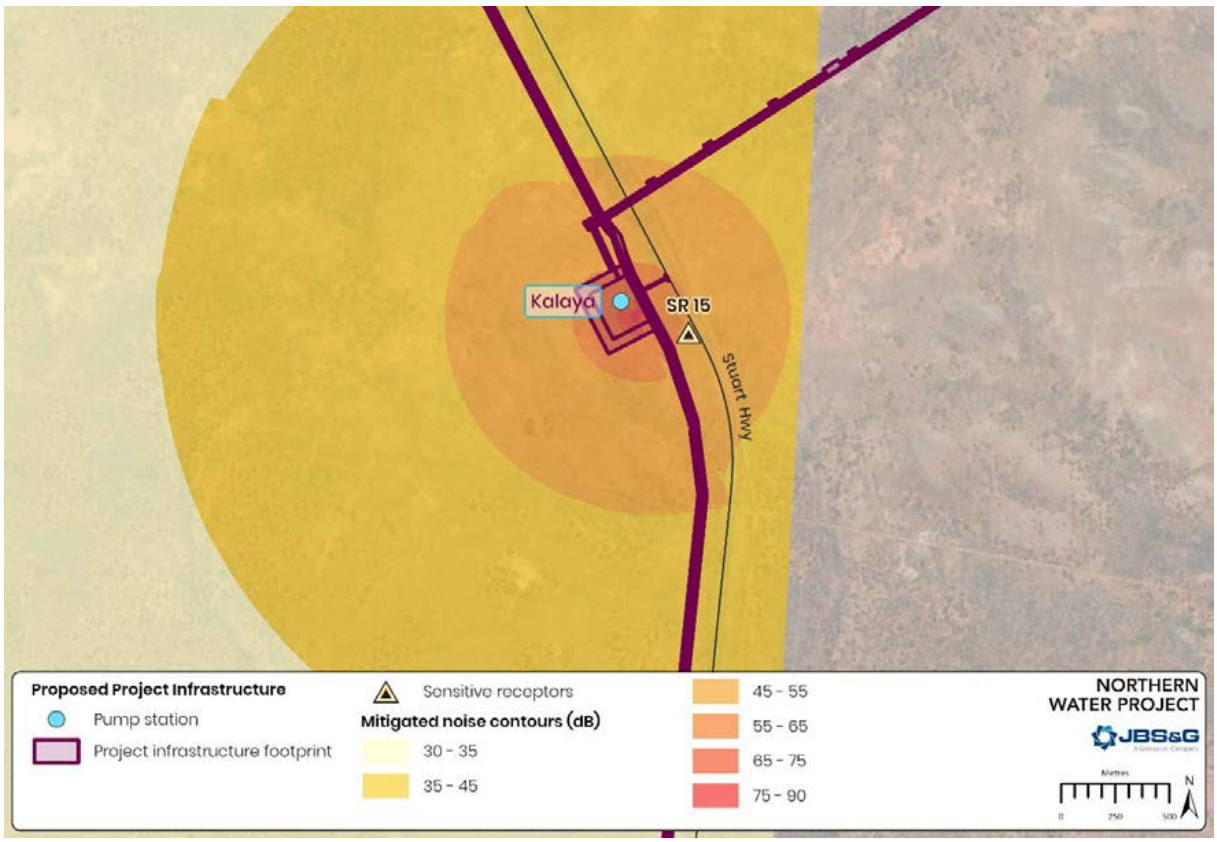


Figure 19-9: Kalaya pump station modelled operational noise contours, no mitigation (night)

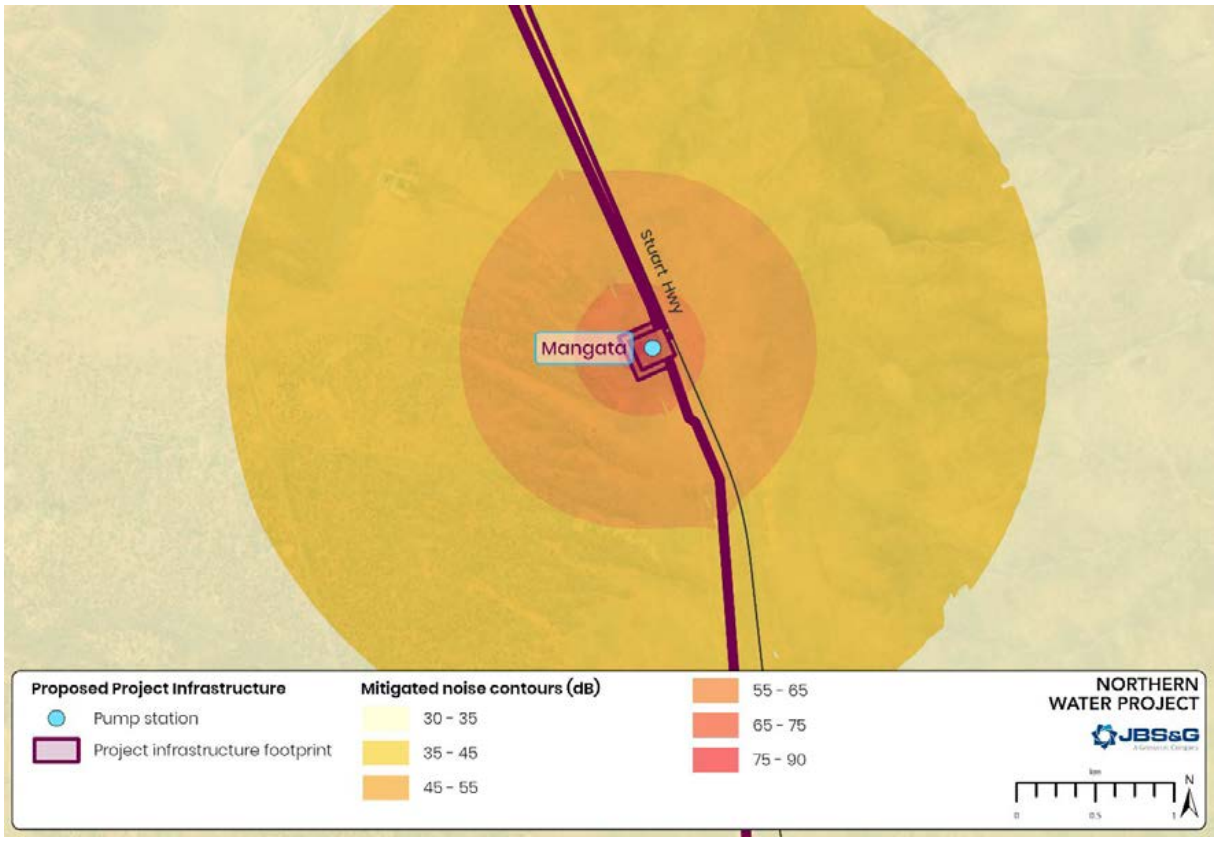


Figure 19-10 Mangata pump station modelled operational noise contours, no mitigation (night)

Impacts to sensitive receptors due to corona and aeolian noise are not expected.

Transmission lines are a potential source of environmental noise that occurs when the electric field around a conductor ionises the surrounding air. This process can produce a faint crackling or hissing sound, particularly under humid or wet conditions. Although typically low in level, corona noise may become perceptible near high-voltage infrastructure.

Generally, the measured overall noise associated with the corona effect is 45 dB(A) to 50 dB(A) at a distance of 3 m from the transmission line. Wszolek (2006) found that the maximum noise that a transmission line will produce due to corona discharge is 53 dB(A) at a distance of 15 m. The noise assessment for the Project found that at 30 m distance this can be expected to have attenuated to 43 dB(A). A residential dwelling approximately 1 km from a HV transmission line would therefore not be expected to notice corona noise from that distance (refer Appendix J-2). No residential dwellings have been identified within 1 km of proposed Project transmission lines.

Aeolian noise refers to the tonal sound generated by airflow-induced vibration of cylindrical or tensioned structures, such as overhead power lines, conductors, or insulator structures. Aeolian noise is most prominent during moderate to high wind conditions, especially when wind speeds are sufficient to trigger sustained structural vibration. Similar to corona noise the predicted night-time noise levels at a noise-sensitive receiver, located approximately 1 km from the transmission line is predicted to be below any relevant night-time Noise EPP limits (refer Appendix J-2).

Overall transmission line corona and aeolian noise are predicted to remain below relevant night-time noise criteria at the nearest residential dwelling and will be compatible with

surrounding land uses. The expected impacts from corona and aeolian noise are **Negligible** and the level of **certainty** in this prediction is **High**.

19.5.4 Cumulative impacts

Cumulative impacts from Lincoln Gap Wind Farm and the proposed Lincoln Gap pump station result in minor impacts during construction and negligible impacts during closure.

The potential for cumulative noise impacts due to the Project and any approved development in the vicinity was also assessed. The only identified approved development with significant noise source was the Lincoln Gap Wind Farm (refer Figure 19-11). Information regarding the noise output of the wind farm was taken from publicly available planning approval documentation prepared by WSP for stage 3 development (WSP 2019).

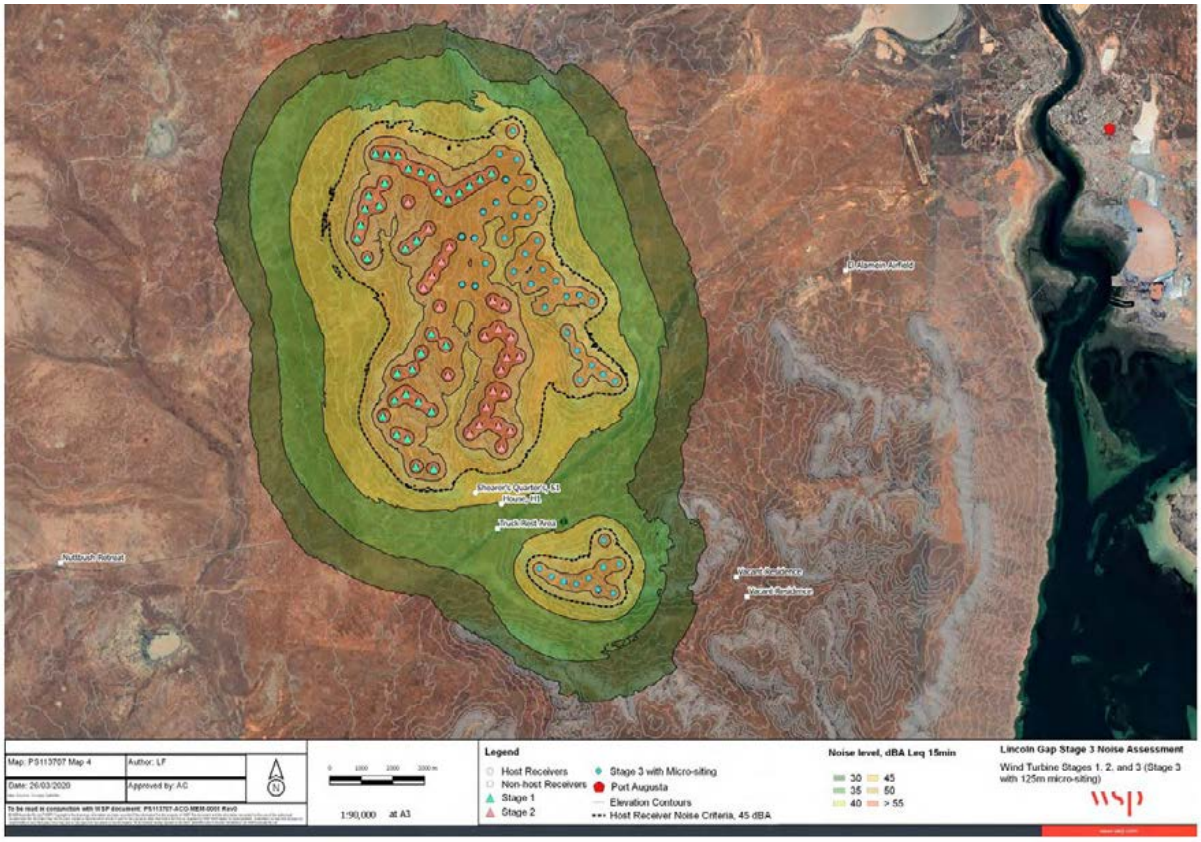


Figure 19-11: Noise modelling for the Lincoln Gap Wind Farm
[Source: WSP 2019]

The noise from the Lincoln Gap Wind Farm at the noise sensitive receptors (SR 08 and 09) is 41-43 dB(A) for cumulative stage 1, 2 and 3 operating conditions. With the proposed mitigations (refer Section 19.5.3) the noise from the Lincoln Gap pump station is predicted to be 36 dB(A). The combined (cumulative) impact of these two developments on SR 08 and 09 is approximately 43 dB(A), below the EPA night-time criterion of 44 dB(A).

There may be some minor increases in noise during the initial construction period which is expected to be during daytime operations over a shorter period of a few months. The cumulative impact of noise from Lincoln Gap Wind Farm and the Lincoln Gap pump station is expected to be in the **Minor** category during construction and **Negligible** during operations. The level of **certainty** in this prediction is **High** as the full acoustic report supporting the

Lincoln Gap Wind Farm assessment could be obtained including baseline data and methods.

Other projects

The Alligator Energy Samphire Uranium Project (located approximately 1.3 km to the north-west of the desalination plant) currently has a Retention Lease (RL 137) under the *Mining Act 1971*. A small-scale field leach trial has been constructed and undertaken on the Retention Lease. As approval for a full scale mine has not yet been applied for or authorised, potential impacts should the project be developed are not clear or certain. Accordingly, a cumulative assessment addressing the Samphire Uranium Project has not been undertaken (and is not required to be undertaken as part of the EIS Assessment Requirements).

The proposed Tilt Nonowie Wind Farm (also located north-west of the desalination plant) has not obtained State development approval (at the time of writing) and potential impacts should the project be developed are not clear or certain. Similar to the uranium project, a cumulative assessment in regard to the Tilt Nonowie Wind Farm has not been undertaken (and is not required to be undertaken as part of the EIS Assessment Requirements).

19.5.5 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CEMP, OEMP and other relevant plans).

Table 19-7: Key mitigation measures – noise and vibration

Mitigation measure	Construction	Operation
Complaints register and corrective action program in place	✓	✓
Ongoing consultation with local council and affected landholders	✓	✓
Planning of noisy construction activities to take account of distance to receptor	✓	
Consultation with landowners and local council if noise generating activities in the vicinity of residences are planned outside normal construction hours	✓	
Location of temporary accommodation camps away from existing receptors, unless otherwise agreed.	✓	
Heavy vehicle movements limited to designated routes and use of engine brakes near sensitive areas restricted	✓	
Truck movements along uneven surfaces restricted to minimum speeds near sensitive receptors and built into the construction traffic management plan	✓	
Affected receptors along haulage routes to be consulted in advance of works	✓	
Adoption of offsite or other alternative processes that may eliminate or reduce noise	✓	
Location of noisy plant, access roads and site compounds as far as practicable from receptors	✓	✓

Mitigation measure	Construction	Operation
Selecting processes and equipment that generate lower noise levels	✓	✓
Equipment shut down when not in use (e.g. backhoes, cranes, loaders, excavators, loaders and generators)	✓	
Regular maintenance of equipment	✓	✓
Shutting or throttling down equipment that is used intermittently	✓	
Avoidance of structural damage to buildings by implementing appropriate vibration mitigations methods, including selection and control of construction equipment and providing safe buffering distances.	✓	✓
Restriction of maintenance activities to standard working hours where feasible		✓
Cladding and / or absorptive treatment to be applied at the desalination plant and Mullaquana Station and Lincoln Gap pump stations	✓	✓
Acoustic louvres to be applied at the desalination plant and Mullaquana Station and Lincoln Gap pump stations	✓	✓
Acoustic enclosures to be applied to cartridge filters and desalination plant feed pumps	✓	✓

19.6 Conclusion

Noise modelling indicates that the potential noise impacts on sensitive receptors from the desalination plant during the construction phase can be managed with appropriate mitigation measures and are expected to be minor.

Noise impacts from construction of the transfer system and electricity infrastructure will be minor and short term.

During operations proposed mitigation measures will ensure all noise impacts from Project infrastructure are below relevant noise level criteria as set out the in the Noise EPP.

Impacts from vibration are not expected as the construction vibration levels will be below the applicable vibration criteria and short term as the work front moves (7-14 days for most of the alignment).



Chapter 20

Landscape Character and Visual Amenity

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

20 LANDSCAPE CHARACTER AND VISUAL AMENITY 20-1

20.1 Key Findings 20-1

20.2 Setting the Context 20-2

20.2.1 Requirements in legislation and other standards 20-2

20.2.2 Views of stakeholders 20-3

20.2.3 Acknowledgement of landscape character values 20-3

20.3 Assessment Method 20-4

20.3.2 LCVIA methodology 20-4

20.4 Description of the Existing Environment 20-7

20.4.1 Desalination plant and transmission line 20-7

20.4.2 Transfer system and electricity infrastructure 20-17

20.5 Impact Assessment 20-24

20.5.1 Desalination plant construction 20-24

20.5.2 Mullaquana transmission line construction 20-26

20.5.3 Desalination plant operation 20-26

20.5.4 Mullaquana transmission line operation 20-31

20.5.5 Transfer system and electricity infrastructure - construction 20-32

20.5.6 Transfer system and electricity infrastructure - operation 20-33

20.5.7 Photomontages of likely appearance of the Project at sensitive receptor locations 20-36

20.5.8 Summary of key mitigation measures 20-40

20.6 Conclusion 20-40

LIST OF TABLES

Table 20-1: Impact definitions used in this chapter 20-4

Table 20-2: Elements of LCVIA desktop analysis for the desalination plant site 20-5

Table 20-3: Definitions for landscape scenic quality and sensitivity to change 20-6

Table 20-4: Viewpoints and SR / SRLs - desalination plant and transmission line 20-8

Table 20-5: Desalination plant landscape character description - contextual landscape 20-11

Table 20-6: Desalination plant landscape character description – SRL 1 Eight Mile Creek beach 20-12

Table 20-7: Desalination plant landscape character description – SR 2 Cowleds Landing 20-13

Table 20-8: Desalination plant landscape character description – SR 3 Nonowie Station homestead and SRL 4 Lincoln Highway 20-14

Table 20-9: Desalination plant landscape character description – SRL 5 Hummock Hill Lookout 20-15

Table 20-10: Desalination plant landscape character description – SR 6 Mullaquana Station homestead 20-16

Table 20-11: Contextual landscape subregions and assessed transfer system infrastructure 20-17

Table 20-12: Arcoona Plateau landscape character region and contextual landscape for transfer system infrastructure 20-20

Table 20-13: Gawler Lakes landscape character region and contextual landscape for Project infrastructure 20-22

Table 20-14: Key mitigation measures – landscape character and visual amenity 20-40

LIST OF FIGURES

Figure 20-1: Desalination plant viewpoints and sensitive visual receptors 20-10

Figure 20-2: Landscape character regions assessed for the Project 20-19

LIST OF PLATES

Plate 20-1: Likely Project appearance at SRL 1 Eight Mile Creek beach looking north 20-36

Plate 20-2: Likely Project appearance at SRL 2 Cowleds Landing looking south 20-36

Plate 20-3: Likely Project appearance from SRL 3 (Nonowie Station homestead) and SRL 5 Lincoln Highway looking north-east 20-37

Plate 20-4: Likely Project appearance from SRL 5 Hummock Hill looking south-west 20-37

Plate 20-5: Likely Project appearance from SRL 6 Mullaquana Station homestead looking east 20-38

Plate 20-6: Lincoln Gap pump station - predicted view from east at approximately 250 m from site 20-38

Plate 20-7: Bimba storage - predicted view from south at approximately 500 m from site 20-39

Plate 20-8: Kalaya pump station - predicted view from south at approximately 500 m from site 20-39

20 LANDSCAPE CHARACTER AND VISUAL AMENITY

Landscape and visual impact refers to how a proposed development may affect landscape character or a view, and the way that people perceive that change. This chapter describes the potential effects of the construction and operation of the Project on the physical character and quality of the varying landscapes in the Project Area and provides an objective assessment of how these changes are likely to alter what people see from different viewpoints.

This chapter provides a summary of the outcomes of the specialist Landscape Character and Visual Impact Assessment (LCVIA) undertaken for the Project. The LCVIA applies an established landscape and visual assessment methodology that seeks to provide a consistent and objective assessment of potential changes to landscape character and visual amenity, having regard to factors such as landscape character, scenic quality, sensitivity to change, visibility, viewing distance and the physical characteristics of the proposed infrastructure.

20.1 Key Findings

- Changes to visual amenity will be experienced at sensitive visual receptors in the vicinity of construction activities. This will largely be due to the introduction, presence and movement of heavy equipment and vehicles at, and to and from the site, lighting of construction sites and an overall increase in the number of people present.
- Transfer system construction phase impacts will be limited to the period that construction activities will be underway in a particular location.
- Once constructed, the desalination plant, new transmission line and substation have been assessed as having a minor impact overall on landscape character and visual amenity for some onshore and offshore sensitive receptor locations. Depending on the location, these include Cowleds Landing, Nonowie Station homestead, travellers on the Lincoln Highway, and users of marine waters offshore of Mullaquana Station. Impacts of the desalination plant are generally mitigated by the distance from sensitive receptors.
    - Mullaquana Station is the closest sensitive receptor and will therefore experience the most significant change to visual amenity both as a working pastoral property and place of occupation.
- Outside both the 5 km and 10 km Zones of Theoretical Visual Impact, the desalination plant and the north-south alignment of the Mullaquana transmission line will have no discernible impact on the wider landscape and be a largely inconsequential feature within panoramic views from publicly accessible vantage spots.
- Pump stations, storages and transmission lines will be visible and in some cases prominent when viewed from major highways, however visual impacts will largely be fleeting and temporary for the majority of visual receptors.
- Minor visual impacts will be mitigated as far as practicable through materials selection and lighting design at Project infrastructure sites.

20.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effect of the Project on landscape character and visual amenity. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet
- the approach to addressing the findings of the assessment report and acknowledgement of individual and community perceptions and opinions about the intrinsic landscape values of particular locations.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 20.3.

20.2.1 Requirements in legislation and other standards

There are no specific South Australian legislation or guidelines which regulate the assessment of impacts to visual amenity. General guidance for assessment and management of visual impacts is provided through the State's statutory planning framework as detailed below.

The Planning and Design Code

The South Australian *Planning and Design Code* (the Code) is established under section 65 of the *Planning, Development and Infrastructure Act 2016* (PDI Act). The Code provides for the appropriate design and siting of structures to protect to scenic and rural vistas, minimise impacts on the natural environment and rural amenity values, and minimise visual impacts from key public vantage points and scenic travel routes. The requirements for visual amenity considerations are set out in desired outcomes and performance outcomes for each individual planning zone.

State Planning Policies

The State Planning Policy for Energy (SPP 12) notes the role that the planning system plays in reducing the impacts of energy infrastructure (such as transmission lines) including visual amenity, health, noise, public safety and maintenance.

Regional Plans

The Eyre and Western Regional Plan (DHUD 2026a) and Far North Regional Plan (DHUD 2026b) are detailed plans to guide development and fulfill the obligations of the State Planning Policies and are also relevant to assessment of the visual impact of the Project.

The regional plans note that there are scenic rural and natural landscapes surrounding many townships in these regions, which are valued by local communities and visitors, making a significant contribution to local identity and supporting the visitor economy. Maintaining or enhancing the scenic amenity of important natural coastal landscapes, views and vistas are long term strategic objectives in these regions.

An assessment of the Project against the Code (including visual and aesthetic impacts) is provided in the Planning Assessment Report which is provided at Appendix E-1 and summarised in Chapter 7 Planning and Design Quality.

20.2.2 Views of stakeholders

An extensive stakeholder engagement program has been undertaken for the Project which has included ongoing consultation with local councils and communities, Traditional Owners, affected landholders and other known receptors in close proximity to the various Project infrastructure components.

Stakeholders have expressed concerns about the visual impacts of the Project, specifically in relation to impacts associated with construction infrastructure and night works, and the potential disruption of local landscape character, coastal amenity and the seascape and amenity of the Upper Spencer Gulf (USG) marine environment.

Further details of stakeholder engagement and community consultation are provided in Chapter 4 Community and Stakeholder Engagement and Appendix D.

20.2.3 Acknowledgement of landscape character values

The LCVIA provides a consistent and objective assessment of potential changes to landscape character and visual amenity using a standardised methodology that focuses on physical and observable attributes of the landscape. It is acknowledged that in doing so the LVCIA undertaken for the Project does not capture or quantify values that individuals and communities may associate with the landscape, including longstanding connections to place, land stewardship, attachment to particular views, or the contribution that a landscape may make to a person's sense of identity and wellbeing. The assessment in this chapter therefore recognises that landscape and visual amenity are inherently influenced by personal experience, connection to place and individual perceptions.

The assessment has also been undertaken in the knowledge that there will be a range of perceptions and opinions in the community regarding the scenic quality of the landscape, the sensitivity of particular locations to change, and the acceptability of the visual changes associated with the Project. It is acknowledged that the impact levels presented in this chapter may not align with the views of all community members, landholders or residents. In some cases, individuals may perceive the visual effects of the Project as more significant than indicated by the LCVIA due to the connection to or value they place on particular landscapes, views or places.

Landscape character and visual amenity are related but distinct concepts. A development may have a limited effect on the broader character of a landscape while still resulting in a noticeable change to the visual amenity experienced by particular residents, landholders or users of that landscape. Accordingly, this chapter considers both the broader landscape context assessed through the LCVIA and the potential for visual changes to be experienced differently by individual receptors.

Mullaquana Station

The LCVIA includes an assessment of views from the homestead dwelling at Mullaquana Station and applies a standardised methodology to determine visual impact. However, the

assessment in this chapter also recognises that Mullaquana Station is not simply a viewing location but a working pastoral property and place of residence.

The residents' experience of visual amenity extends beyond the immediate homestead curtilage to the broader Station landscape traversed and viewed as part of day-to-day pastoral activities and through their ongoing occupation and enjoyment of the property. Consequently, it is acknowledged that the visual experience of the Station is therefore not limited to a series of defined viewpoints but encompasses the wider landscape setting within which the homestead and pastoral operations are located.

20.3 Assessment Method

The method of assessment in this chapter has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur due to the construction and operation of the Project.

For this chapter, the methodology in the Landscape Character and Visual Impact Assessment (LCVIA) (Appendix J-3) for impact definitions has been merged with the method set out in Chapter 8 (refer Table 20-1).

Table 20-1: Impact definitions used in this chapter

LCVIA impact definition	EIS definition used in this chapter
No change	Negligible
Slight adverse impact	Minor
Moderate adverse impact	Moderate
Substantial adverse impact	Major

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

Exclusions from the assessment

Decommissioning activities for the desalination plant, pump stations / storages and transmission lines have the potential to result in visual impacts, however this will not take place until many years into the future. As possible land uses and visual receptors cannot be predicted, it was not possible to accurately assess the potential visual impacts and accordingly decommissioning has not been considered further in this assessment.

Decommissioning of the pipeline is expected to result in minimal aboveground visual impacts as the pipeline is likely to be left in situ.

20.3.2 LCVIA methodology

The LCVIA methodology aims to provide an objective, reliable analysis of the potential visual impact of a development when considered against the existing landscape character. A LCVIA for the Project was undertaken by Hemisphere Design, in accordance with the *Guidelines for Landscape and Visual Impact Assessment* (Landscape Institute 2013).

The LCVIA Report (Hemisphere 2026) is provided at Appendix J-3.

Desktop analysis

For the desalination plant, a desktop study was undertaken to determine the likely Zone of Theoretical Visual Influence (ZTVI) of the Project and areas from within the ZTVI where proposed infrastructure will likely fall within the visibility shadow (refer Table 20-2). A 5 km radius from the centre of desalination plant site was identified as the likely extent of the ZTVI for both the desalination plant and associated infrastructure, and the north-south alignment of the Mullaquana transmission line.

Viewpoints[1] within the ZTVI and further afield were identified for further on-site assessment of the landscape character of the contextual landscape and locality, and the likely presence of sensitive visual receptors within the ZTVI.

Table 20-2: Elements of LCVIA desktop analysis for the desalination plant site

Desktop analysis element	Description
Zone of Theoretical Visual Influence (ZTVI)	This is the defined geographical area within which components of a development are theoretically visible to a human receptor standing on the ground (noting that as the viewer gets further away, the Project infrastructure will become indistinguishable from the background). Key factors are the visual capability of humans, dimensions of the development, distance of the viewpoint, and characteristics of the surrounding topography.
Viewpoints	Viewpoints are identified within the ZTVI where notable views of the development are considered possible or likely. Viewpoint selection considers the level of public accessibility and the frequency and duration of possible visits.
Visibility shadow	The predicted visibility shadow identifies areas within the ZTVI where topography (e.g. ridgelines or depressions), blocks of vegetation or built structures located between the viewer and the proposed site potentially block views of the Project infrastructure.

Landscape desktop assessment

The landscape assessment addresses the elements that make up landscape such as landform, land use and cultural influences and describes the wider contextual landscape within which a development is located. This characterisation process establishes a 'baseline' upon which assessments about the potential effects of the proposed development can be made.

Contextual landscape and locality

The contextual landscape and locality where Project infrastructure will be located are defined and the landscape character described to provide the baseline for the visual impact assessment. For the transfer system infrastructure, landscape character regions were

[1] A Viewpoint is a position providing a view of the proposed development from where an assessment is made to consider landscape character and the likely potential for visual impacts which may result as a consequence of the development.

defined based on homogeneous physical characteristics including topography, geology, drainage patterns, vegetation and land use patterns.

Local Council information, aerial photographs, drone footage and relevant information contained in the Project reference design maps and drawings was also utilised.

Landscape scenic quality

Changes to landscape character from a development may affect its perceived value, giving rise to changes in its quality (refer Table 20-3). The scenic quality of landscapes generally increases with an increase in:

- topographic variation
- presence of geological features
- presence of permanent water bodies
- patterning of vegetation texture and density.

Landscapes lacking most of these characteristics would be rated of low scenic quality, while those that exhibit most of them would be rated as having high scenic quality.

Landscape sensitivity to change

The ability of the landscape to accommodate visual change associated with proposed infrastructure was also assessed. Landscape sensitivity considers a range of factors, including existing land use, openness of views, the pattern and scale of the landscape, scope for mitigation of impacts, and the value of the visual landscape and sense of place (refer Table 20-3).

In general, landscape sensitivity decreases when the viewing time is infrequent and becomes shorter, and as the distance from the viewer to the development increases. Sensitivity increases where a view is enjoyed and highly valued by the immediate community, where it is seen by many viewers or from residences, and if the visual landscape plays a part in tourist or recreational activities. Repetitive viewing even of short duration will also increase sensitivity.

Table 20-3: Definitions for landscape scenic quality and sensitivity to change

Rating	Definition
Scenic quality	
High	Exhibits an exceptionally strong positive character with valued features which combine to give an experience of unity, richness and harmony.
Moderate	Exhibits a strong positive character with valued features with evidence of a visually acceptable level of alteration/degradation/erosion resulting in a location of more mixed character.
Low	Exhibits a generally positive character with fewer valued features with evidence of a visually acceptable level of alteration/degradation/erosion resulting in a location of more mixed character.
None	Exhibits little or no positive character with few or no valued features with evidence of a visually unacceptable level of alteration/degradation/ erosion resulting in a highly modified location of little character.
Sensitivity to change	

Rating	Definition
High	Key landscape characteristics and qualities are highly sensitive to change from the development. Severe adverse impacts are likely to arise.
Medium	Some key landscape characteristics or qualities are sensitive to change from the development type. There is some ability to accommodate development in some situations without widespread or severe changes to the landscape.
Low	Fewer key landscape characteristics and qualities are sensitive to change from the development type. There are opportunities to accommodate the development type in most locations without widespread or severe effects.
Negligible	Key landscape characteristics and qualities are unlikely to be adversely affected by introduction of the development type. The development type relates well and change may be accommodated without widespread significant adverse impacts on the landscape.

Site analysis

An on-site visit was subsequently made to the identified viewpoints within the likely 5 km desalination plant ZTVI (as determined by desktop assessment, and other general locations to validate the predicted ZTVI, viewpoints, visibility shadow and affirm the contextual landscape character. On-site assessment also enabled identification of sensitive visual receptors and receptor localities.

Photographs were taken at selected viewpoints and renders of the Project overlain to provide projections of the unmitigated visual impact of the project at sensitive visual receptor localities.

Photomontages

The photomontages developed for the LCVIA depicting the projected appearance of Project infrastructure from sensitive receptors have utilised drawings and specifications from the Project Reference Design (GHD, 2025) and publicly available satellite and terrain data (refer Appendices A and B of the LCVIA provided at Appendix J-3).

20.4 Description of the Existing Environment

20.4.1 Desalination plant and transmission line

The desktop analysis for the desalination plant determined that the majority of the likely 5 km ZTVI fell across mostly private land which is not accessed by the public. Due to this inaccessibility, the ZTVI was extended further to a 10 km radius to include publicly accessible areas (e.g. Cowleds Landing) as viewpoints for the likely visual impact of the desalination plant. Given the relatively low height, size and massing of the desalination plant built form, the likelihood it being visible from distances at and beyond 10km was considered extremely unlikely.

Viewpoints for the transmission line were also considered in relation to the alignment looking south-east, east and north-east of Lincoln Highway.

Sensitive visual receptors

The desktop assessment identified 8 viewpoints for further on-site assessment (refer Table 20-4 and Figure 20-1). Following on-site visits, six Sensitive Receptor (SR) or Sensitive Receptor Localities (SRL)[2] were identified. Two are located within the 5 km and 10 km ZTVIs for the desalination plant and one SR and one SRL were identified in relation to the Mullaquana transmission line (refer Table 20-4 and shown in Figure 20-1).

The potential for visual impacts from construction and operation of the Project at each SR or SRL is discussed in Sections 20.5.1, 20.5.2, 20.5.3 and 20.5.4. Although offshore viewpoints were not considered in the LCVIA, the potential visual impacts of Project onshore infrastructure for users of marine waters off Mullaquana Station is also considered in these sections.

The contextual landscape for the desalination plant site is described in Appendix J-3 and summarised in Table 20-5. A summary of the landscape character description at each SR and SRL is provided in Table 20-6 to Table 20-10, with further detail provided in Appendix J-3.

A photomontage of the likely appearance of the Project at each SR and SRL is provided in Section 20.5.7. High resolution images are provided in the LVCIA at Appendix J-3.

Table 20-4: Viewpoints and SR / SRLs - desalination plant and transmission line

Viewpoint	Sensitive receptor	Desktop description	Site Assessment
VP 1	**SRL 1**	Eight Mile Creek beach	Views south-west and south.
VP 2	**SR 2**	Cowleds Landing	Views south-west and south. **This SR is within the 10 km ZTVI.**
VP 3	**SR 3**	Nonowie Station homestead	Nonowie Station homestead was identified as a likely SR for the Mullaquana transmission line however this is private property which was not accessed for the LCVIA. A nominal SRL on the Lincoln Highway 4.3 km north-east of the homestead was assessed (see SRL 4).
VP 4 and 5	**SRL 4**	Lincoln Highway	Viewpoints offer 180-degree views north-east, east and south-east towards the proposed transmission line.
VP 6	**SRL 5**	Hummock Hill Lookout in Whyalla (southern aspect)	SRL provides extensive views south-west and south from a scenic lookout.
VP 7		The nearest publicly accessible location for representative views from Murninnie Beach [*Due to poor road conditions caused by inclement weather*	Figure 20 1 shows that views of the Project from Murninnie Beach are precluded by a foreground and visibility shadow comprised of subtly undulating terrain overlain with small to medium coastal shrubs.

[2] A Sensitive Receptor is a viewpoint or viewpoint locality where the observer is more susceptible to the visual impact of the development. A Sensitive Receptor Locality is an area where there are a number of collocated Sensitive Receptors.

Viewpoint	Sensitive receptor	Desktop description	Site Assessment
		Murninnie Beach was inaccessible at the time of the site assessment.]	• Given the distance from the Project (15 km south-west), the low-lying nature of the locality and the relatively low height of the Project built form, the Project is predicted to be indiscernible from this viewpoint and this location is not considered to be a Sensitive Receptor.
VP 8	No	Residential dwelling at Mount Young off Eight Mike Creek Road, south of the Whyalla suburb of Mullaquana	The Project will be concealed from the single residential dwelling located on the lower north-eastern aspect of Mount Young. As the Project will be indiscernible this viewpoint is not considered to be a Sensitive Receptor.
	SR 6	Mullaquana Station homestead	This location is private land and therefore was not considered as a viewpoint in the LCVIA. However, it has been assessed as a Sensitive Receptor. **This SR is within the 5 km ZTVI.**

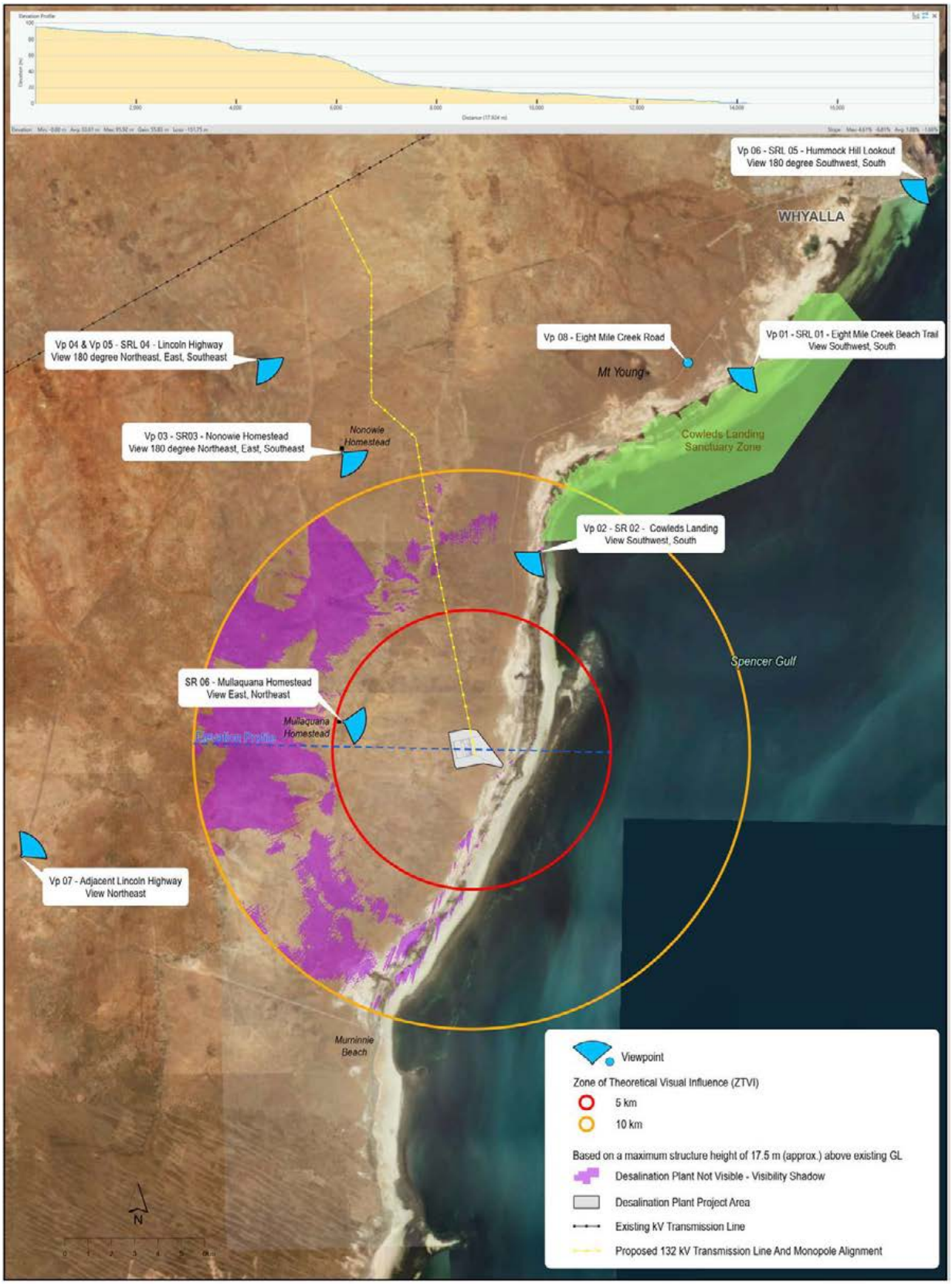


Figure 20-1: Desalination plant viewpoints and sensitive visual receptors

[Source: Hemisphere 2026]

Table 20-5: Desalination plant landscape character description - contextual landscape

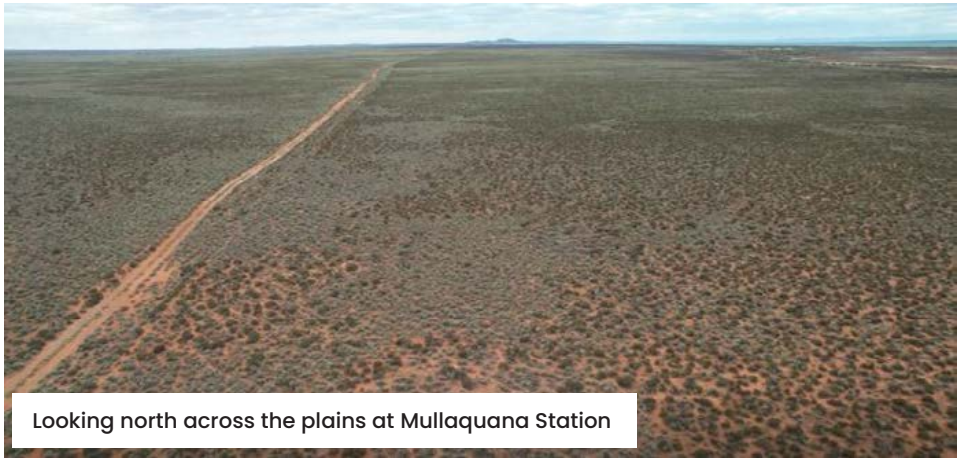
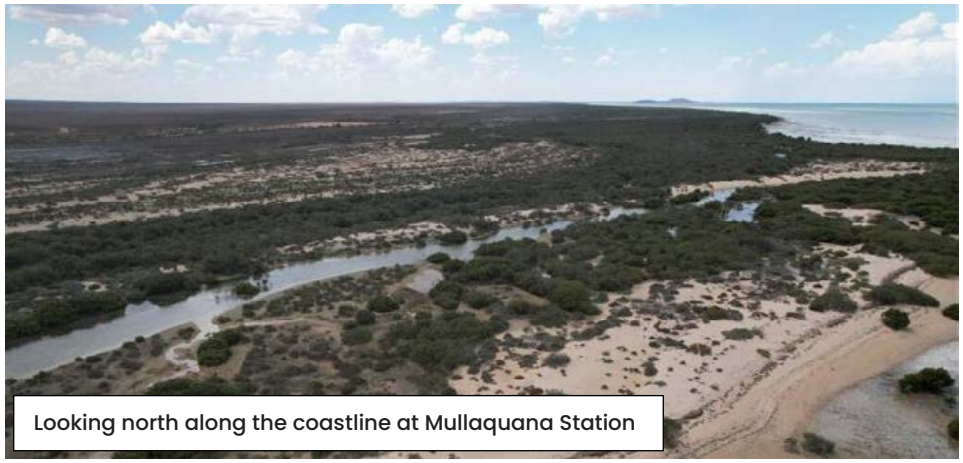
Landscape character description
The contextual landscape of the desalination plant is located in the Myall Plains IBRA subregion (refer Figure 20-2). It is characterised by extensive sparsely populated plains of native vegetation, with limited public access and an absence of discernible vantage points, which merge with the remote coastal wetland and tidal seascapes of the western USG. Mullaquana Station is located on the relatively flat and low-lying coastal plains south-west of Whyalla, which gently rise from the shoreline of the USG in the east to the escarpment in the west. Mount Young in the mid-ground and the more distant Middleback Ranges provide a backdrop to expansive panoramic vistas of relatively undisturbed plains of Western Myall, saltbush and bluebush scrubland. The coastal area is characterised by an often inaccessible shoreline of small sandy beaches interspersed with fringing mangroves, tidal creeks, saltmarsh, sand and mud flats. Coastal waters in this part of Spencer Gulf are calmer, shallower and more visually tranquil than the more dynamic 'wavescapes' of the rocky bays and headlands which characterise the Eyre Peninsula coastline further south. The absence of taller vegetation and the generally low profile of the small number of structures that are present provides unobstructed views across the USG from viewpoints such as rural residences, coastal shack communities, roads and other publicly accessible vantage points. Man-made elements present in the landscape include houses, parking areas and boat ramps at Eight Mile Beach, Cowleds Landing and Murninnie Beach, homesteads, farm buildings, fences and private tracks, and sealed and unsealed public access roads from Whyalla and the Lincoln Highway. Vertical features include telecommunication and high voltage transmission towers which are visually prominent in this landscape.  Looking north across the plains at Mullaquana Station  Looking north along the coastline at Mullaquana Station The contextual landscape and locality of the desalination plant and associated infrastructure have been assessed as having **low to moderate scenic quality** and **low to medium sensitivity to change** (refer Table 20-3).

Table 20-6: Desalination plant landscape character description – SRL 1 Eight Mile Creek beach

Landscape character description
Sensitive Receptor Locality 1 – Eight Mile Creek beach

SRL 1 is 17 km from the desalination plant site and 12 km from the nearest point of the Mullaquana transmission line.

Eight Mile Creek beach is located within the Cowleds Landing Marine Sanctuary Zone and is accessed via Eight Mile Creek Road from Whyalla. The location offers a tranquil small beach and foreshore area with coastal wetland and mangrove habitat walking trails. Eight Mile Creek Road is sealed to the turn-off to the unsealed beach access which is predominantly used by locals, although tourists may also visit the site.

The locality provides a 180-degree visual plane uninterrupted by vertical structures. Within a limited zone of visual influence, Mount Young further to the west is a prominent and abrupt landscape element within a fore- and mid-ground panorama consisting of mangroves, native coastal shrubs and ground covers

Visual exposure[3] at this SRL was assessed as moderate to high across an open coastal foreshore and coastal expanse.



Eight Mile Creek beach - looking south-west



Landscape around Eight Mile Creek beach looking towards Mount Young

[3] Visual exposure is a measure of the degree to which an observer at a location can see or potentially see the area to be affected by the proposed development. The visual exposure is subjectively classified as either none, low, moderate or high.

Table 20-7: Desalination plant landscape character description – SR 2 Cowleds Landing

Landscape charcater description
Sensitive Receptor 2 – Cowleds Landing

SR 2 is 8 km from the desalination plant and 3.6 km from the nearest point of the Mullaquana transmission line.

Cowleds Landing is a small coastal holiday settlement, accessed via Eight Mile Creek Road. The small beach area is sheltered on both sides by mangroves and other coastal vegetation and the foreshore beyond the southern extent of the locality is generally inaccessible. A memorial to Humphrey Cowled, one of the region's early pioneers and pastoralists has been erected at the locality.

Publicly accessible views to the south-west are restricted to adjacent the most southerly two-storey dwelling and from a viewpoint overlooking a low-lying partially inundated area of tidal flats, to a mid-ground of livestock grazed saltbush plains and out to the Middleback Range and the distant Minbrie Range.

Visual exposure at this SRL was assessed as low to medium where built form excludes views south from the foreshore.



Cowleds Landing looking north



Looking east to Cowleds Landing from Eight Mile Creek Road

Table 20-8: Desalination plant landscape character description – SR 3 Nonowie Station homestead and SRL 4 Lincoln Highway

Landscape charcater description
Sensitive Receptor 3 - Nonowie Station homestead and Sensitive Receptor Locality 4 - Lincoln Highway

Nonowie Station homestead (SR 3) was assessed as a likely sensitive receptor due to its location 2 km from the nearest point of the Mullaquana transmission line, however the site was not accessed for the LCVIA. The homestead is 11 km from the desalination plant and SRL 4 represents the likely visual impact from the homestead.

SRL 4 is a linear sensitive receptor locality on a low crest on the Lincoln Highway approximately 18 km west of Mullaquana Station. This location is 4 km to the nearest point of the Mullaquana transmission line and 15.5 km from the desalination plant. The SRL is a subtly elevated crest which extends along the carriageway in an easterly direction notionally for up to 3 km.



Nonowie Station entrance from Lincoln Highway looking north-east

The Lincoln Highway is the principal road connecting Whyalla to the southern Eyre Peninsula, with a single-lane carriageway in either direction and a posted maximum speed of 110 kmph. The SRL affords elevated views north-east with Mount Young an obvious focal point within an expansive west-east panorama of open native scrub and grassland utilised for livestock grazing.

West of the Lincoln Highway, there are glimpsed views through scattered native roadside vegetation of the latticed towers of an existing 275 kV transmission line that are relatively inconspicuous within the open tracts of native scrub despite being the only nearby columnar features of note.



Lincoln Highway looking north-east towards the transmission line crossing point

At speeds of up to 110 kmph, travellers would observe the landscape in broad sweeping vistas and as such singular detailed features of 'incident' are less conspicuous. Elongated vistas draw the eye along the road corridor to the visually prominent Mount Young and distant Whyalla township.

Visual exposure at this SRL was assessed as high across the fore and mid-ground in a sweeping 180-degree panorama.

Table 20-9: Desalination plant landscape character description – SRL 5 Hummock Hill Lookout

Landscape character description
Sensitive Receptor Locality 5 Hummock Hill Lookout (southern aspect)

SRL 5 is located 26 km from both the desalination plant and nearest point of the 132 kV transmission line and provides views to the south and south-west.

Hummock Hill is located at the eastern edge of Whyalla adjacent the expansive coastal foreshore. The site is a scenic vantage point offering 360-degree panorama from a lookout and interpretive station and is visited by locals and visitors from intra and interstate and overseas.

The Whyalla foreshore of manicured and irrigated lawns, exotic vegetation, palm trees and vividly coloured sunshades covering a children's playground make-up the foreground. This contrasts with the view south-west across a mid-ground 'natural' landscape of native coastal vegetation and mudflats, devoid of large and obtrusive man-made features. In the distance coastal waters are juxtaposed against the visually abrupt silhouette of Mount Young and the distant Middleback and Minbrie Ranges.

Visual exposure at this SRL was assessed as high where a panoramic vista affords extensive views across a visually contrived foreground and more 'natural', midground and horizon.



View from Hummock Hill lookout looking south



Looking north towards Hummock Hill lookout from Whyalla foreshore

Table 20-10: Desalination plant landscape character description – SR 6 Mullaquana Station homestead

Landscape charcter description
Sensitive Receptor 6 Mullaquana Station Homestead

Mullaquana Station homestead (SR 6) was identified as a sensitive receptor due to its location within the ZTVI and is the closest residence to the desalination plant site. The homestead is occupied and located on a subtly rising site within the saltbush plains of Mullaquana Station approximately 5 km west of the desalination plant site.

An assessment of visual impacts was undertaken following a site visit in June 2026.

The homestead is 10 km east of the Lincoln Highway and is concealed from view when travelling along the highway in either direction.

Views from the residence across the open expansive coastal plain are somewhat restricted to glimpsed and partially obscured views, due to the presence of taller sheds and buildings, post and wire fencing and an earth mound to the north-east which dominate the foreground view and partially disrupt longer views.

Visual exposure at this SR was assessed as low, given the distance from the desalination plant site and the foreground-built form, vegetation and earth mound.



Aerial view indicating direction of view (east) from Mullaquana Station homestead towards the desalination plant.

20.4.2 Transfer system and electricity infrastructure

Transfer system infrastructure (i.e. the main transfer pipeline, pump stations, storages and communications towers) and related electricity infrastructure are located along alignments which traverse coastal and northern regions of the USG and the south-west of the Far North region.

The landscape character assessment for transfer system and electricity infrastructure has been undertaken as a desktop study, supplemented with site photographs, drone footage and relevant maps and design drawings contained in the Reference Design report (GHD 2025a).

Landscape character regions

The regional landscape character for the transfer system transitions from the desalination plant location on the saltbush plains and mangrove-fringed coastline of the western USG to the final delivery point in the remote arid and semi-arid dunefields and Mulga woodlands around Olympic Dam in the Far North.

The LCVIA (Appendix J-3) used Landscape Board subregions and districts to define the landscape character for the assessment. However, for the purposes of this chapter (and for consistency with the other EIS chapters), landscape character has been described using relevant subregions in the Interim Biogeographical Regionalisation for Australia (IBRA) classifications, supplemented by descriptions in the Eyre Peninsula Regional Landscape Plan (EPLB 2021b and 2026) and South Australian Arid Lands Regional Landscape Plan (SAALLB 2022 and 2026). The landscape descriptions in this chapter therefore remain aligned with and maintain the integrity of the descriptions in the LCVIA. The IBRA regions and subregions relevant to the Project are described in Chapter 9 Use of Land and Marine Waters.

Landscape character at representative locations

The LCVIA assessed the Lincoln Gap and Kalaya pump stations (and associated electricity infrastructure), and the Bimba storage as representative infrastructure locations for the transfer system landscape character assessment. The relevant IBRA land system subregion classifications for these locations and the corresponding subregion classifications used in the LCVIA are set out in Table 20-11. The IBRA-based landscape character regions are shown in Figure 20-2.

Table 20-11: Contextual landscape subregions and assessed transfer system infrastructure

Representative transfer system infrastructure	IBRA-based landscape character regions	LCVIA landscape character region
Lincoln Gap pump station and electricity infrastructure	Arcoona Plateau (south)	Eyre Peninsula – Spencer subregion
Kalaya pump station and electricity infrastructure	Gawler Lakes	Far North – Gawler Ranges subregion
Bimba storage	Arcoona Plateau (north)	Far North – Kingoonya subregion

The contextual landscape character for the three representative locations is described in Table 20-12 and Table 20-13. The potential for visual impacts from construction and operation of the Project at these locations is discussed in Section 20.5.5 and Section 20.5.6. A

photomontage of the likely appearance of the Project at the assessed locations is provided in Section 20.5.7. High resolution images are provided in the LVCIA at Appendix J-3.

Further detail of the vegetation and landform characteristics of the Project Area is provided in Chapter 12 Soils and Landform and Chapter 15 Terrestrial Flora and Fauna. Land uses in the Project Area are described further in Chapter 9 Use of Land and Marine Waters.

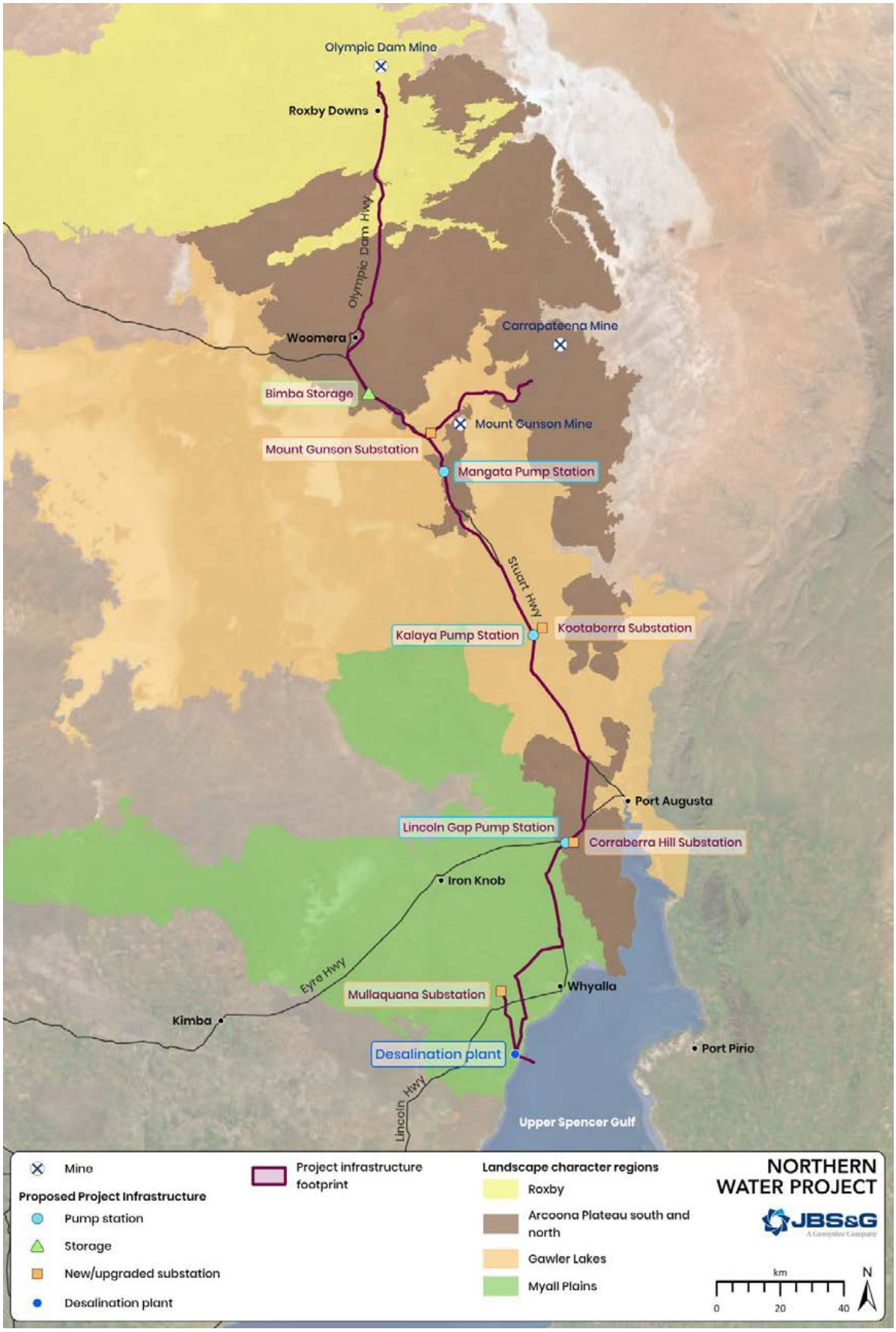


Figure 20-2: Landscape character regions assessed for the Project

Table 20-12: Arcoona Plateau landscape character region and contextual landscape for transfer system infrastructure

Arcoona Plateau landscape character region
This landscape region features dissected stony tablelands, treeless low stony hills and low and gently sloping gibber plains. The landscape is back-dropped by the slopes of the Lincoln Gap plateau in the south and by isolated rounded hills further north. Land use transitions from intermittent livestock grazing to open arid scrubland. Low vegetation of similar height and varying density allows for unobstructed, panoramic views. Development and built form in this landscape character region includes the Lincoln Gap wind farm, the Carrapateena gold and copper mine, the townships of Pimba and Woomera and Department of Defence facilities. Infrastructure includes major roads (the Eyre, Stuart and Olympic Dam Highways), the trans-continental railway, the Port Augusta to Woomera pipeline and electricity infrastructure supporting mining and remote communities in the region. Regional landscape character is assessed to be of **low to moderate scenic quality** where more specific, localised areas of both low and high scenic value can be identified, with a **low to medium sensitivity to change** (refer Table 20-3).
 
Contextual landscape character: Lincoln Gap pump station and Pandurra transmission line (Arcoona Plateau south)
The Lincoln Gap pump station, storage and associated transmission line are located at the intersection of the Eyre and Lincoln Highways south-west of Port Augusta. The open plains landscape at this locality accommodates arid scrubland with livestock grazing and is largely devoid of stands of taller trees and shrubs. Travelling further north along the Eyre Highway the eye is drawn to the troughs, peaks and faceted slopes of the undulating plateau of Lincoln Gap to the north-west. Within this vista the vertical forms of the Lincoln Gap wind farm turbines, poles and powerlines, substation latticed infrastructure and telecommunication towers 'trace' over the landform and horizon in a linear east to west progression. A large vehicle rest area and the five large tanks located to the north are prominent local landmarks for travellers on the Eyre Highway. Contextual landscape character at the location is assessed to be of **moderate scenic quality** where specific localised areas of low scenic value can be experienced with a **low to medium sensitivity to change**.

Arcoona Plateau landscape character region



Looking west to Lincoln Gap windfarm



Looking south-west across the Lincoln Gap pump station site

Contextual landscape character: Bimba storage (Arcoona Plateau north)

The Bimba storage location is 500 m west of the Stuart Highway approximately 13km south-east of Pimba.

The landscape is one of open arid low-growing bluebush scrubland, intermittently grazed by livestock and largely devoid of taller trees and shrubs. There is an absence of topographical features, notable trees and built form in the expansive stony landscape other than a large telecommunications tower to the west of the storage location which draws the eye of the observer. Contextual landscape character is assessed to be of **low scenic quality** with a **low sensitivity to change**.



Landscape character at Bimba storage looking south-east

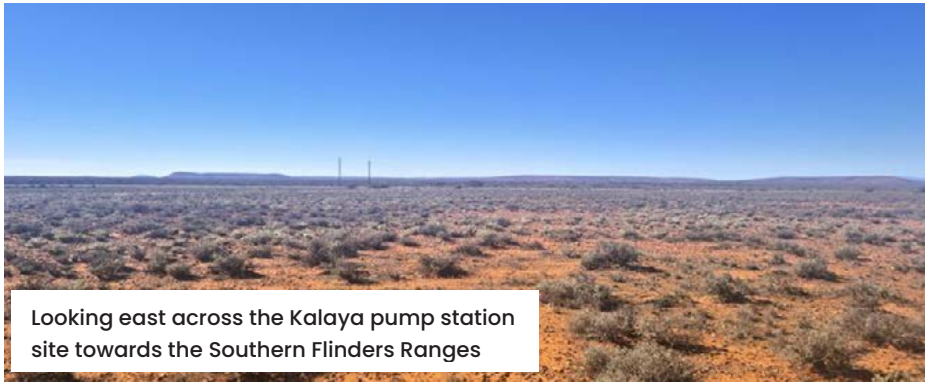


Landscape character at Bimba storage looking south-west

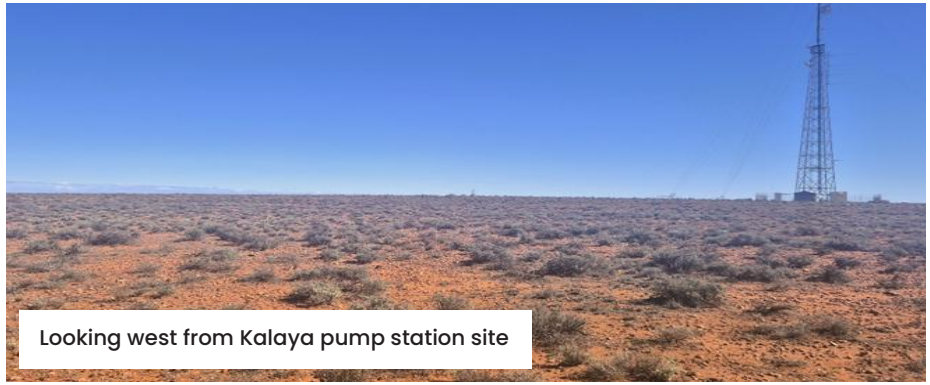
Table 20-13: Gawler Lakes landscape character region and contextual landscape for Project infrastructure

Gawler Lakes landscape character region
This landscape region features extensive undulating low open sand plains, ephemeral creeks, large salt lakes and claypans. Arid scrubland ranges from taller woody Myall and Mulga which limits expansive views, to open bluebush plains which allow for unobstructed, panoramic vistas. Sheep grazing on native vegetation for wool and meat production is the primary land use with cattle also run on pastoral leases. Development and built form in the landscape character region includes station homesteads, large communications towers, the Stuart Highway, the trans-continental railway and electricity infrastructure which supports mining and remote communities in the region. The regional landscape character is assessed to be of **low to moderate scenic quality** where more specific, localised areas of both low and high scenic value can be identified, with a **low to medium sensitivity to change** (refer Table 20-3)**.**
 
Contextual landscape character: Kalaya pump station and storage, Bookaloo transmission line and Kootaberra substation
Kalaya pump station and associated electricity infrastructure are located on the Stuart Highway approximately 55 km north of Port Augusta. In this landscape the eye of the observer travelling along the Stuart Highway is cast in all directions whilst being immersed in the dramatic panoramic vistas east to the distant Southern Flinders Ranges. The landscape is devoid of canopy vegetation and dominated by native, largely prostrate shrubs and groundcovers. Man-made focal references are limited to taller telecommunication towers, the occasional string of stobie poles and power lines and the regular road-side rest stops adjacent the highway. Contextual landscape character is assessed to be of **low to moderate scenic quality** with a **low to medium sensitivity to change**.

Gawler Lakes landscape character region



Looking east across the Kalaya pump station site towards the Southern Flinders Ranges



Looking west from Kalaya pump station site

20.5 Impact Assessment

The following Project aspects have been identified as sources of impacts to landscape character and visual amenity:

- presence and movement of construction equipment and vehicles at construction sites, establishment of laydown areas and construction camps
- light spill from construction sites, laydowns, construction camps and night works during construction
- presence of the constructed desalination plant, pump stations, storages, transmission lines and substations in the landscape
- afterhours and security lighting at the desalination plant (operations).

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

20.5.1 Desalination plant construction

Changes to visual amenity will be experienced at sensitive visual receptors in the vicinity of construction activities.

Construction activities at the desalination plant site are projected to take place over a period of approximately two years, and will result in changes to the existing visual amenity during this time. Potential impacts will be due to the introduction, presence and movement of heavy equipment and vehicles at, and to and from the site (including visual impacts from dust), establishment and appearance of materials storage and laydowns, construction of temporary facilities (e.g. the launch box and spoil drying areas), and lighting of construction sites. An overall increase in the number of people present and vehicle movements on Eight Mile Creek Road and new access roads can also be expected.

In a contextual landscape characterised by its isolation, sparse population, expansive views and absence of large structures, the change in visual amenity experienced at the identified sensitive receptors due to construction activities at the desalination plant will be notable.

As described in Table 20-4, the LCVIA predicted three sensitive visual receptors for the desalination plant.

Mullaquana Station homestead (SR 6)

Mullaquana Station homestead (SR 6) is located approximately 5 km from the desalination plant site and is the closest identified sensitive receptor. Construction of the Project will alter the existing visual amenity at the homestead, particularly for distant views to the coastline and the eastern skyline which are currently uninterrupted by large structures. However, the LCVIA found that the presence of buildings and trees close to the homestead will reduce the impact as views to the construction site to the east will be partially obscured. The site is expected to become more discernible on the horizon as construction proceeds.

Desalination plant construction is expected to be undertaken during the daytime, however there will be some night-lighting during the construction phase given tunnelling is likely to proceed on a 24-hr basis. Construction lighting may be observable as a glow in the distance

from the homestead and although this will add a new element to the existing view, it is not expected to significantly impact on the overall visual amenity of the residence.

Construction of the Project will also alter the existing visual amenity of the landholders as they traverse, enjoy and work the Mullaquana Station property, as views of the desalination plant will be generally unobscured by vegetation and built structures.

Eight Mile Beach (SR 1) and Cowleds Landing (SR 2)

Temporary visual impacts from construction are also expected to be experienced by residents and visitors at Eight Mile Beach and Cowleds Landing, largely related to the increased presence of heavy vehicles and potentially dust from vehicle movements on Eight Mile Creek Road. While these impacts may be experienced in the early stages of the construction phase, there will be a significant reduction during later phases due to the diversion of Project traffic to the new desalination plant access proposed from the Lincoln Highway.

Visual receptors are also likely to include local users of Eight Mile Creek Road which usually experiences low levels of traffic. Potential visual impacts from the view of the desalination plant construction site in the distance would be experienced fleetingly on road crests by a small number of individual receptors using the publicly accessible roads and would be limited to the period of transit along the road.

During construction of the offshore marine infrastructure, a jack-up barge (JUB[4]) will be positioned above the proposed location of the intake and outfall structures. The JUB is expected to be located between 3 and 5 km offshore from Mullaquana Station and will be present for the duration of the marine construction works. (refer Chapter 6 Project Description).

The JUB may be discernible to varying degrees on the horizon from locations such as Cowleds Landing, Murninnie Beach and Eight Mile Creek beach. The extent of visibility would depend on viewpoint and weather conditions. As the JUB will be lit at night, the glow from the lighting is also likely to be visible from some locations onshore for the duration of the marine construction works. However, it is expected that impacts to these SRs will be mitigated by the distance from the coastline viewpoints to the JUB.

As noted previously, there will also be some night-lighting (designed in accordance with Australian Standards) at the desalination plant construction site for the duration of tunnelling activities. Impacts to these SRs during construction will be temporary and largely mitigated by the distance from the coastline viewpoints to the site.

Offshore receptors

For marine waters users offshore from the desalination plant, construction activities at the site will likely be initially discernible as dust from earthworks and vehicle movements. Mangroves and the dunes behind the tidal zone are likely to provide some concealment of the construction site which is located between approximately 700 m - 2 km from the shoreline. However the site is expected to become more visible in the landscape as the built

[4] A JUB is a non-powered floating platform with legs extending into the sea floor, providing a relatively stable working platform above the sea surface away from swell and currents.

form takes shape. As noted above there will be some night-lighting of the construction site which is likely to be visible to some extent from offshore.

Overall the expected visual impact of construction of the desalination plant at sensitive visual receptors is in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High**.

20.5.2 Mullaquana transmission line construction

Impacts to visual amenity at sensitive visual receptors due to construction of the Mullaquana transmission line are expected to be temporary and minor.

The Mullaquana transmission line extends north-west across the saltbush plains of several station properties for approximately 20 km from the desalination plant to the new Mullaquana substation which will be constructed adjacent the existing 275 kV Eyre Peninsula Link transmission line.

Sensitive receptors include travellers on the Lincoln Highway who will experience some temporary visual impact from transmission line construction activities which will cross the highway approximately 16 km west of Whyalla. The presence of light and heavy vehicles, work crews, dust and clearance of vegetation will contribute to the change in visual amenity during the construction period.

Impacts to road users would be fleeting as vehicles will be approaching and passing the location at high speeds, transitory as the construction workfront progresses along the transmission line alignment, and limited to the duration of the construction period.

Nonowie Station homestead (SR 3) is located within the ZTVI and approximately 2 km (at the closest point) from the Mullaquana transmission line. As the homestead was not accessed for the LCVIA, the assessment has assumed that the location would experience similar views of the transmission line as travellers on the Lincoln Highway at SRL 4. Mullaquana Station homestead is located approximately 5 km from the transmission line alignment. The visual impacts at these locations due to construction are likely to be similar those expected once the transmission line is operational (refer Section 20.5.4).

The potential for visual impacts from construction of the Mullaquana substation has not been assessed due to its isolated location, the presence of the existing 275 kV transmission line and the absence of sensitive receptors.

The expected visual impact of construction of the Mullaquana transmission line at sensitive visual receptors is in the **Minor** category and the level of certainty in the assessment of expected impact is **High**.

20.5.3 Desalination plant operation

The desalination plant has been assessed as having a minor impact overall on landscape character and visual amenity at a small number of sensitive receptor locations.

The LCVIA assessed the visual landscape of Mullaquana Station as having low to moderate scenic quality and low to medium sensitivity to change. This assessment was used to determine the likely visual impact of the Project on SRs and SRLs within the landscape.

A 5km ZTVI was calculated from the centre of the proposed desalination plant site footprint to identify SRs and SRLs at which Project infrastructure may be visible. Due to the lack of public accessibility within the 5km ZTVI, an extended 10km ZTVI was also assessed (refer Figure 20-1). Mullaquana Station homestead is the only SR within the 5km ZTVI, while Cowleds Landing is the only publicly accessible SRL within the 10km ZTVI (refer Figure 20-1).

The LCVIA concluded that the Project will be inconspicuous at most ground level locations which fall outside the 5km ZTVI. The desalination plant will not be a feature of the journey north-south along the Lincoln Highway.

The settlement at Murninnie Beach and the viewpoint adopted for the LCVIA are both outside the 10 km ZTVI and views of the Project are predicted to be precluded by a foreground and visibility shadow comprising of subtly undulating land overlain with low to medium height coastal vegetation. Given the low-lying nature of the locality and the relatively low height of the Project built form the Project will be indiscernible at this location.

Potential impacts at the six identified SRs and SRLs from operation of the desalination plant are assessed below.

Mullaquana Station homestead (SR 6)

The following assessment is based on the technical LCVIA, and is based on views from the Mullaquana homestead only. It is acknowledged, however, that the change in views from the homestead to the east would be perceived as a significant and negative impact on the existing visual amenity of the residents of the homestead. It is also acknowledged that the residents of the homestead currently traverse and work Mullaquana Station and that visual amenity from other locations across the Station will be significantly impacted for them.

The LCVIA for the Mullaquana Station homestead found that within an enclosed vista which is defined by an earth mound to the north-east and farm buildings to the east, there will be glimpses of the desalination plant over the coastal vegetation to the east.

The assessment predicts that the proposed built form and surrounding security fencing of the desalination plant will appear as a prostrate linear form silhouetted against the seascape horizon (refer Plate 20-5). Looking toward the site from adjacent the homestead, the relative height of taller built form at the desalination plant site would appear much lower in height, and smaller in size and form, than the single storey agricultural and storage sheds in the immediate foreground.

As such, when viewed within a vista where the built form of sheds and other structures is prominent in the foreground, the proposed desalination plant will be mainly discernible as an indistinct 'collective massing' of built form. However, it is likely to be more obvious on days with exceptionally high visibility. Within the slightly elevated vista and at a viewing distance of approximately 5 km, the low-lying and prostrate built form of the proposed desalination plant is predicted to be discernible but not obtrusive.

Colours and finishes that are neutral in colour and which complement the colours and hues of the contextual landscape are proposed for the desalination plant-built form and transmission towers, and highly reflective finishes will be avoided (refer Chapter 7 Planning and Design Quality).

In a contextual landscape of low to moderate scenic quality and with a low to medium sensitivity to change, the LCVIA found that the likely visual impact on views east from SR 6 will be one of slight adverse impact (refer Plate 20-5).

The expected visual impacts at this location have been assessed as being in the **Minor** category. Uncertainty in the expected impact (as the accuracy of assumptions used in modelling for the LVCIA is subject to final design) has been evaluated in Appendix M and the level of risk is **Medium.**

Cowleds Landing (SR 2)

SR 2 is located within the 10 km ZTVI. This location is a holiday settlement consisting of a small number of holiday homes and shacks and is the most southerly and last publicly accessible location from Eight Mile Creek Road. The beach area is confined by mangroves on both sides and is just south of the boundary of the Cowleds Landing Sanctuary Zone. The saltbush / bluebush plains behind the locality are grazed by stock, with pastoral infrastructure (fences and gates) present in the landscape.

The built form of the desalination plant will likely be faintly discernible at SRL 2 on days with exceptionally high visibility, appearing as a grey 'pencil line' form sitting below and without interrupting the expansive horizon. The distant columnar form of the telecommunications tower and the north-south aligned transmission line and slender monopoles will for the most part be imperceptible (refer Plate 20-2).

In a contextual landscape of low to moderate scenic quality and a low to medium sensitivity to change, the likely visual impact will be one of slight adverse impact. Visual mitigation measures are not considered necessary.

The expected visual impacts at this location are in the **Minor** category and the level of **certainty** in the assessment of the expected impact is **High**.

Eight Mile Creek Beach (SRL 1)

This location is popular with the local Whyalla community, but is also visited by tourists to the region. The Salt Marsh Trail on the beach foreshore provides self-guided walks through coastal wetland habitat. The site is also intermittently used for short-term camping, despite there being no facilities. The beach is within the Cowleds Landing Sanctuary Zone which protects coastal and tidal habitats and species and where fishing activities are prohibited.

The location was identified as a SRL due to its public accessibility, despite being well outside the ZTVI. The assessment found that views of the desalination plant and electricity transmission infrastructure[5] approximately 12 to 17 km to the south-west would be concealed from visitors to the beach and the walking trail by the undulating vegetated fore- and mid-ground of mangroves, native coastal shrubs and ground covers. The Project will therefore be inconspicuous at this location (refer Plate 20-1).

The visual impact of the desalination plant, associated infrastructure and electricity transmission infrastructure will be one of no change and visual mitigation strategies are not considered necessary.

[5] At all locations the visual impact of 35 m monopoles for electricity infrastructure was assessed, except for Mullaquana Homestead (SR 6) where 60 m towers were assessed as a 'worst-case' scenario.

The expected visual impacts at this location are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

Nonowie Station homestead (SR 3) and Lincoln Highway (SRL 4)

The SR 3 viewpoint (representing Nonowie Station homestead) looks south-east from the Lincoln Highway towards the desalination plant and is approximately 80 m above the proposed ground level height of the desalination plant. However, the undulating vegetated foreground conceals both the proposed desalination infrastructure and Nonowie Station homestead, located a further 3 km to the south-east.

The Nonowie Station homestead[6] is located more than 10 km north-west of the desalination plant site. Within the curtilage of the homestead, the proposed desalination plant infrastructure would likely be concealed by the visibility shadow (refer Figure 20-1) which is created by taller vegetation overlain across a minor north-south ridge between the property and desalination plant.

The expected visual impacts from the desalination plant at this location are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

Hummock Hill Lookout (SRL 5)

At Hummock Hill Lookout the eye of the observer is cast across an expansive visual landscape. The abrupt interjection of Mount Young and midground of native vegetation, sandy beach and mudflats draw and direct the eye of the observer to the backdrop of the distant ranges. The desalination plant location is over 26 km south of Hummock Hill and at this distance will be indiscernible from this SRL.

In a landscape of low to moderate scenic quality and with a low sensitivity to medium sensitivity to change the likely visual impact of the Project will be one of no change (refer Plate 20-4). Visual mitigation measures are not required.

The expected visual impacts at this location are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

Views from offshore

It is acknowledged that the coastline and waters in this part of the USG are valued by members of the local community seeking peaceful, quiet and undisturbed natural environments. Potential visual receptors offshore from the desalination plant site who are likely to experience the change in visual amenity of the coastline and surrounding landscape due the Project will primarily be local recreational and commercial fishers, tourist operators and other regular users of the marine waters offshore from Mullaquana Station.

The desalination plant will be visible from offshore and its built form within a landscape with few built structures (other than the houses on the shoreline at Cowleds Landing and Murninnie Beach) will change the visual amenity from offshore viewpoints. The overall visual impact will be slightly mitigated by the presence of the fringing mangroves and the dune

[6] It is also noted that Nonowie Station homestead is located within a land parcel which is part of a proposal by Tilt Renewables for a wind farm located west of Eight Mile Creek Road and Cowleds Landing. If approved the proposed Nonowie wind farm project would incorporate up to 148 wind turbine generators and associated infrastructure including substations, access tracks, transmission lines, underground cabling and operations and maintenance facilities.

area to the rear, the relatively low-lying nature of the desalination plant site and it's location approximately 2 km from the shoreline. The LCVIA predicted that the low roof lines of the plant will blend with the horizon line, reducing the visual impact and preserving panoramic views into the distance. Taller columnar structures would be discernible but not prominent while structures closer to the foreshore such as the intake pump station may be more noticeable due to their height, dependent on the viewpoint. Further west the 132 kV transmission line will be a distant and indistinct feature.

Selection of muted colour and matte and non-reflective finishes on building materials at the desalination plant site will help reduce but will not eliminate visual impacts on the surrounding landscape.

The required security night-lighting at the desalination plant would also be visible from offshore marine waters at night, however as discussed in Chapter 11 Marine Environment there are significant distances (700 m – 2 km) between the marine environment and terrestrial sources of night-lighting at the desalination plant and intake pump station. As lighting will be designed to avoid unnecessary night spill by angling and shielding, the visual impacts from offshore are expected to be primarily experienced as an additional observable but unobtrusive glow by the very small number of receptors which would be expected to be offshore at night. Further information on lighting at the desalination plant is provided below.

The expected visual impacts from offshore are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High**.

Lighting at the desalination plant

Best practice guidelines will be implemented to minimise impacts from lighting and light spill.

Once operational, the desalination plant will require lighting to allow 24-hour operations and provide for the safety of workers and security of the plant.

Facility lighting will be designed in accordance with *Australian Standard AS 4282 – Control of the obtrusive effects of outdoor lighting and principles of best practice lighting design* (DEE 2020) best practice lighting design as per the National Light Pollution Guidelines for Wildlife (DCCEEW 2023b) to minimise light spillage. By directing lighting inwards to the site in accordance with these standards, the effect will be an ambient glow rather than a direct beam, avoiding excessive overspill beyond the site and reducing its visual impact.

The LCVIA noted that a night-time assessment of visual impacts from lighting and light spill is usually undertaken where lighting will have a potential significant influence on landscape character and / or visual amenity, as a result of the combination of the sensitivity of the receiving night-time environment and the nature of the proposed lighting. The LCVIA concluded that lighting of the desalination plant is unlikely to have a significant influence on either the locality or contextual landscape and night-time assessment as part of the LCVIA was therefore not warranted.

Notwithstanding the conclusions of the LCVIA regarding the broader locality and contextual landscape, it is acknowledged that lighting associated with the desalination plant may be visible from the Mullaquana Station homestead and may result in a change to the existing night-time visual environment experienced by residents. While lighting will be designed and managed to minimise off-site light spill, the introduction of a permanent source of

illumination associated with a 24-hour industrial facility may be perceived by residents as a reduction in the existing dark-sky character and visual amenity of the area.

The visual effect of lighting has the potential to be noticeable during periods of darkness and under atmospheric conditions where an ambient glow from the facility may be visible above the horizon. The potential for this effect to be noticeable will depend on the final lighting design (in accordance with Australian Standards) and operational requirements of the facility.

The expected visual impacts at this location are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

For residents of the Mullaquana Station homestead, lighting associated with the desalination plant may represent a more noticeable change to visual amenity than indicated by the broader landscape-scale assessment, particularly in relation to the existing night-time character of the locality. The expected visual impacts at this location are in the **Minor** category. Uncertainty in the expected impact (due to the accuracy of assumptions considered in the LCVIA being subject to the effectiveness of final design) has been evaluated in Appendix M and the level of risk is **Medium**.

20.5.4 Mullaquana transmission line operation

The Mullaquana transmission line will have a minor impact on landscape character and visual amenity at a small number of sensitive receptor locations.

The LCVIA concluded that the Project will be inconspicuous at most ground level locations which fall outside the 5km ZTVI. The transmission towers may be faintly discernible from greater distances, but such views will be largely inconsequential within the panoramic vista and at such distances the likely visual impact of the Project beyond the immediate contextual landscape is considered to be one of no change.

Mullaquana Station homestead (SR 6)

The proposed transmission line from the proposed desalination plant runs along the horizon and expansive skyscapes in a north-south axis. The LCVIA assumed a 'worst-case scenario' that the transmission lines will be strung along 60 m latticed transmission towers at 40m / 50m centres.

The homestead is located approximately 5 km from the transmission line alignment and at this distance, the transmission line and towers will likely appear as faint lines and vertical skeletal forms where they interface with the proposed desalination plant, notable but not overly obtrusive to the eye of the observer. As the proposed transmission line and towers proceed northward away from the desalination plant, their faint appearance is predicted to be concealed from the homestead by an earth mound and rising midground to the north-east of the residence.

In a contextual landscape of low to moderate scenic quality and with a low to medium sensitivity to change, the likely visual impact on views north-east from SR 6 will be one of slight adverse impact (refer Plate 20-5).

The expected visual impacts of the transmission line at SR 6 are in the **Minor** category and the level of **certainty** in the assessment of the expected impact is **High**.

Nonowie Station homestead (SR 3) and Lincoln Highway (SRL 4)

The proposed 132 kV transmission line located approximately 2 km to the east of the Nonowie Station homestead will likely be conspicuous and somewhat incongruous visual feature from the homestead and dwelling curtilage. The physical characteristics and quality of views north and north-east across the contextual landscape are likely to be similar to the views from Lincoln Highway (SRL 4).

For SRL 4, views to the east and at the crossing point on the Lincoln Highway, the north-south alignment of the Mullaquana transmission line will be an obvious new addition to the visual landscape. However, within the 180-degree panorama where the transmission line sits below the horizon it's presence will be notable but largely incidental. The expanse of the plains, the abruptness of Mount Young and the distant mountainous horizon function to direct and capture the eye of the traveller. Approaching and departing the Lincoln Highway crossing point, the transmission line will be a conspicuous linear feature, however as it will be fleetingly glimpsed by travellers likely to be travelling at high speeds through the immediate locality, as a visual impact it is considered largely inconsequential.

In a contextual landscape of low to moderate scenic quality and with a low to medium sensitivity to change, the likely visual impact on views north-east from SR 3 an SRL 4 will be one of slight adverse impact (refer Plate 20-3). Visual mitigation is considered not considered necessary.

The expected visual impacts of the transmission line at SR3 and SRL 4 are in the **Minor** category and the level of **certainty** in the assessment of the expected impact is **High**.

20.5.5 Transfer system and electricity infrastructure - construction

Construction phase impacts will be limited to the short period that construction activities will be underway in a particular location and will be temporary and localised.

Impacts to landscape character and visual amenity from construction of transfer system infrastructure will generally be due to clearance of native vegetation, the presence of excavations and stockpiles of soil and fill, light and heavy vehicle movements and appearance of material laydown areas and construction camps.

The alignment of the transfer system has minimised the number of potential visual receptors in vicinity of the main transfer pipeline. In the south of the Project Area this would largely be limited to travellers on the Lincoln and Eyre Highways and local roads which are crossed by the pipeline or located near transfer system infrastructure construction sites. Visual receptors in the northern section include users of the Stuart Highway and residents at Pimba and Woomera. Pipeline construction across the majority of the transfer system is expected to occur at an approximate average rate of 400-700 m per day with construction activities (from clearing and excavation through to backfilling and demobilisation) expected to pass visual receptor locations within a matter of weeks. Longer occupation (months) is expected where trenchless methods (e.g. underboring is proposed).

The need to clear native vegetation has been minimised through the site and route selection process by utilising existing infrastructure corridors and other previously disturbed areas. Once the pipeline has been laid the sites will be rehabilitated with previously cleared native vegetation placed over the reinstated areas to assist in soil retention, reduce dust, provide

seed stock and encourage regrowth. Intervention (whether it be replanting or other activities) is only proposed where encouragement of natural regrowth is not successful.

As much of the transfer system construction will take place along major highways and other roads, stockpiles of soil, machinery and other evidence of construction will be visible to travellers along those roads. Road and water crossing works are a regular occurrence over the length of major regional roads and their appearance would not be unfamiliar or incongruent features to travellers. Interactions will be transitory only and on the major roads, fleeting, as vehicles quickly move through the areas at higher speeds.

Receptors in proximity to transmission line and substation construction will experience some temporary visual impact as a result of vehicle movements and presence of the construction workforce and materials. These impacts will be transitory as construction progresses along the transmission line alignment and limited to the duration of the construction period. Clearance of native vegetation will be avoided (where possible) through appropriate placement of tower footings.

Laydown areas and construction camps will be temporary but will be present in the landscape for periods that extend beyond the transitory construction activities. As discussed in Chapter 18 Air Quality, laydown areas will be located away from sensitive receptors to minimise impacts. Good 'housekeeping' will be maintained at laydowns and construction camps including appropriate waste management which will assist in reducing visual impacts. Dust impacts from construction activities will be managed through implementation of mitigation measures in the Project CEMP and the Pipeline CEMP (refer Chapter 18 Air Quality). As discussed above, night-lighting at these sites will be designed in accordance with Australian Standard AS 4282 (DEE 2020) to minimise light spillage.

Overall, due to the temporary and transitory nature of the construction activities and the largely fleeting nature of views of infrastructure, the expected visual impacts from construction of the transfer system and electricity infrastructure are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

20.5.6 Transfer system and electricity infrastructure - operation

Project infrastructure will be visible from major highways, but visual impacts will largely be fleeting and temporary for the majority of visual receptors.

As set out in Section 20.4.2, two landscape character regions are described to assist the assessment of impacts to landscape character and visual amenity due to the presence of transfer system infrastructure (pump stations and storages) and electricity infrastructure (transmission lines and substations). The potential impacts at three representative sites within these regions have been assessed to provide a benchmark for potential visual impacts within the contextual landscape.

As the pipeline will be largely buried for the majority of its length and therefore not visible, visual impacts post-construction have not been assessed further. Some aboveground pipeline infrastructure (e.g. valves) will be visible but will be unobtrusive in the landscape and similarly has not been assessed further.

Lincoln Gap pump station

Lincoln Gap pump station and Pandurra transmission line are located at the southern extent of the Arcoona Plateau landscape character region. This infrastructure location was selected to demonstrate the worst-case scenario in this landscape region due to the highly visible location.

The site is at the intersection of the Eyre and Lincoln Highways in a highly modified contextual landscape where the wind turbines of the Lincoln Gap wind farm along the ridgeline silhouette the skyline. An array of existing power lines and transmission towers traverse the locality connecting the wind farm to an existing substation. A vehicle rest area and series of large tanks is also located nearby. The proposed 275 kV transmission line that will cross and run adjacent to and east of the Eyre Highway at this location will be no more conspicuous than existing lines and towers in the vicinity. The pump station and transmission line will therefore be largely incidental features in this highly modified landscape.

In a landscape of moderate scenic quality and of low to medium sensitivity to change there will be a slight adverse impact where open views will be prominent from further / longer distances when approaching from the south-west, north-east and west along the Eyre Highway (refer Table 20-12). In a landscape where the wind farm and other transmission lines are highly conspicuous, the cumulative visual impact will be one of no change.

Use of muted matte building materials that avoid creation of glare and complement the natural landscape and lighting designed to avoid excessive overspill beyond the site will be implemented (subject to detailed design).

In the context of the existing landscape, the expected visual impacts of the Lincoln pump station and associated transmission line are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High**.

Kalaya pump station

Kalaya pump station, and the new Bookaloo transmission line and Kootaberra substation are located in the Gawler Lakes landscape character region. The pump station and transmission line infrastructure were selected to demonstrate the worst-case scenario in this landscape due to their location on a major highway and in close proximity to a vehicle rest area and scenic viewing point.

Other transfer system infrastructure in this region includes Mangata pump station and storage, a section of the Oakden Hills transmission line, Mount Gunson substation and the majority of the Carrapateena lateral branch.

The single story-built form of the pump station and the columnar communications tower will be conspicuous features of the locality and wider contextual landscape where the existing communication towers and rest area shelters are notable man-made introductions.

The pump station will be connected to the new 3.6 km 'Bookaloo' 275 kV transmission line which will cross the Stuart Highway and connect to the new Kootaberra network substation. In a plains landscape where tall columnar features are discernible over large distances the transmission towers will be additional and highly conspicuous features of the journey along the Stuart Highway. The ambient glow from the occasional use of after-hours security or maintenance lighting at the pump station or substation will be apparent.

In a landscape of low to moderate scenic quality and low to medium sensitivity to change the visual impact will be a slight to moderate adverse impact where views of the pump station and in particular the transmission towers will be prominent from further / longer distances when approaching from the north and south.

Subject to detailed design, construction materials for built form will use muted matte finishes that would complement the natural landscape colours and hues, and the use of exposed galvanized steel which can emit a distracting glare would be minimised where possible. Afterhours lighting would be designed to avoid excessive overspill beyond the site.

In the context of the existing landscape, the expected visual impacts of the Kalaya pump station and associated transmission line and substation are in the **Moderate** category and the level of **certainty** in the assessment of the expected impact is **High**.

Bimba storage

The Bimba storage is located in the northern extent of the Arcoona Plateau landscape character region and was similarly selected to demonstrate the worst-case scenario in this landscape region due to the highly visible location on a major highway. Other transfer system infrastructure in this region includes the Mangata pump station and storage and a section of the Oakden Hills transmission line from the Mangata pump station to the existing Mount Gunson substation.

The storage site is located approximately 500 m to the west of the Stuart Highway on a flat but gently sloping plain with scattered low shrubs and ground covers. Whilst the storage structure will be notable and conspicuous[7] in views to the west from the highway, the visual impact will be somewhat 'incidental' within the broader panorama where the eye of the observer is drawn to the distant horizon.

The security fencing surrounding the pump station will be largely transparent and inconsequential. A traveller north-south along the Stuart Highway will observe the Project site as a fleeting moment of curiosity on a journey through the contextual landscape (refer Plate 20-7). In a landscape of low scenic quality and low sensitivity to change the likely visual impact will be one of slight adverse impact. Visual mitigation is not considered necessary.

In the context of the existing landscape, the expected visual impacts of the Bimba storage are in the **Minor** category and the level of **certainty** in the assessment of the expected impact is **High**.

[7] For the purposes of the LCVIA the storage structure has been assumed to be a tank storage.

20.5.7 Photomontages of likely appearance of the Project at sensitive receptor locations



Plate 20-1: Likely Project appearance at SRL 1 Eight Mile Creek beach looking north

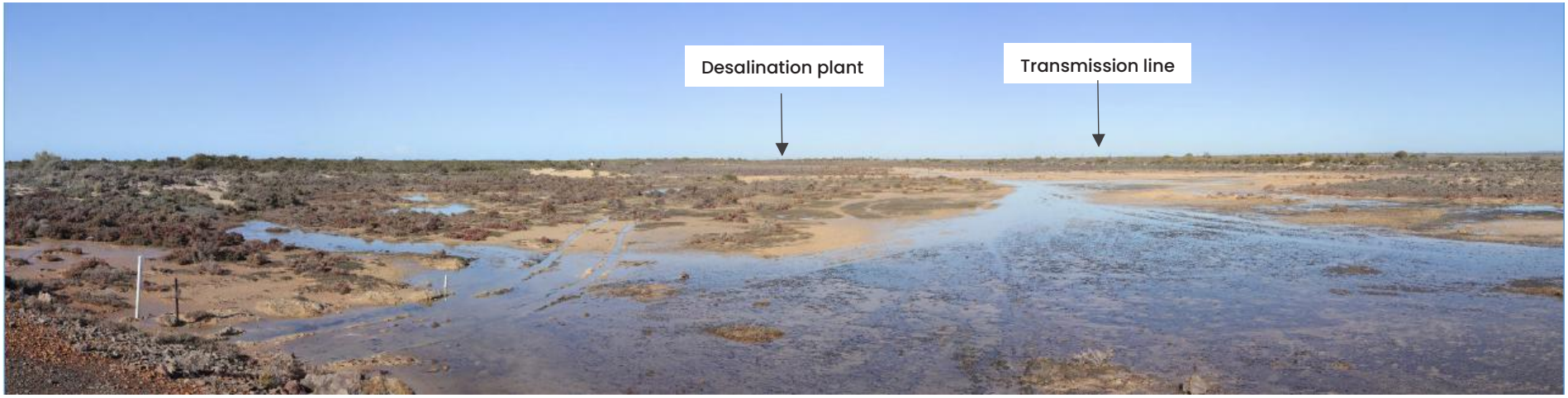


Plate 20-2: Likely Project appearance at SRL 2 Cowleds Landing looking south



Plate 20-3: Likely Project appearance from SRL 3 (Nonowie Station homestead) and SRL 5 Lincoln Highway looking north-east



Plate 20-4: Likely Project appearance from SRL 5 Hummock Hill looking south-west



Plate 20-5: Likely Project appearance from SRL 6 Mullaquana Station homestead looking east



Plate 20-6: Lincoln Gap pump station - predicted view from east at approximately 250 m from site



Plate 20-7: Bimba storage - predicted view from south at approximately 500 m from site[8]



Plate 20-8: Kalaya pump station - predicted view from south at approximately 500 m from site

[8] For the purposes of the LCVIA the Bimba storage structure has been assumed to be a tank storage.

20.5.8 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post-approval management plans (including the CEMP, OEMP and other relevant plans).

Table 20-14: Key mitigation measures – landscape character and visual amenity

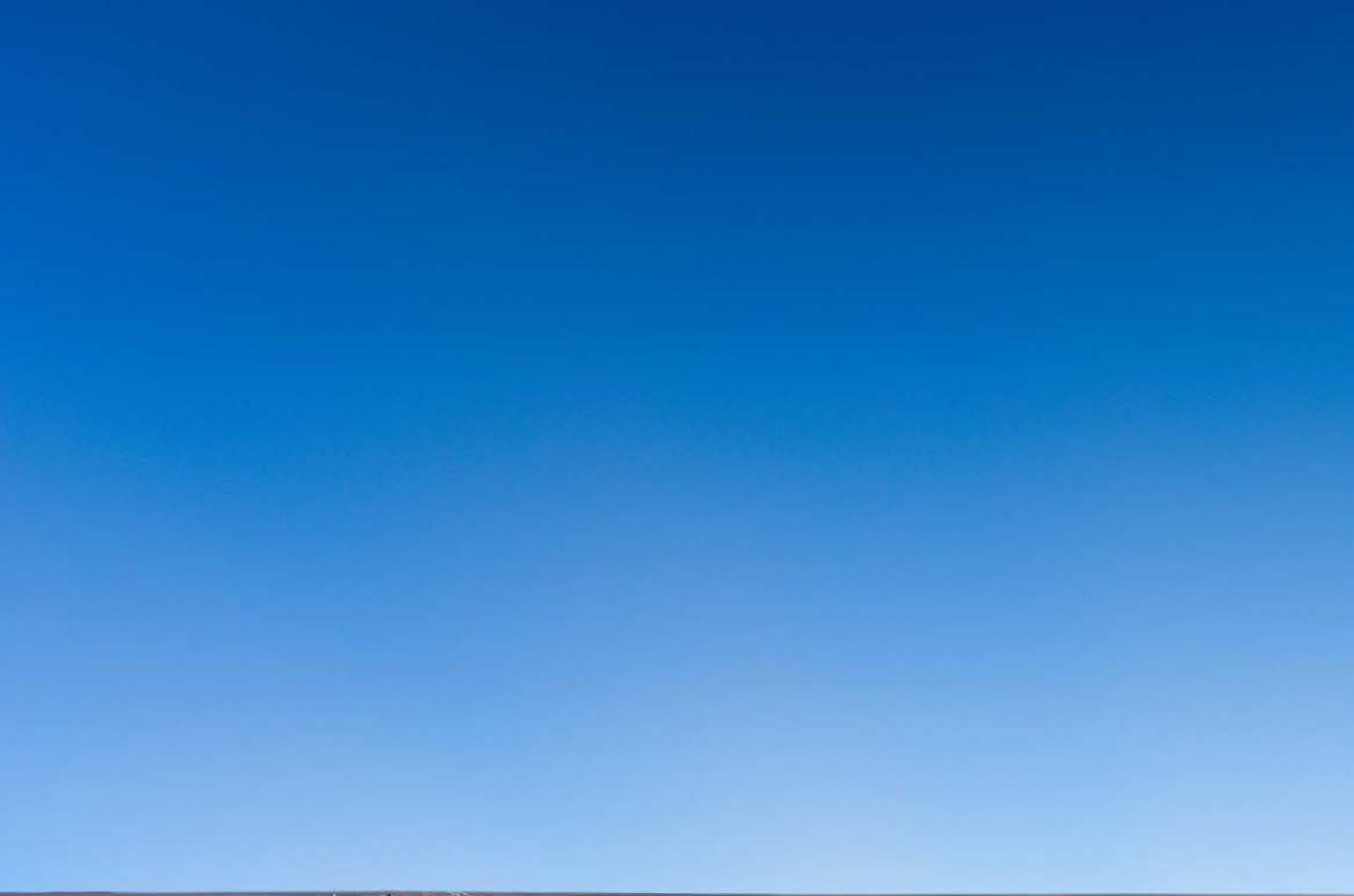
Mitigation measure	Construction	Operation
Low profile of roof lines in desalination plant (where possible) to reduce visual impact on horizon line	✓	✓
Consideration of use of non-reflective (matte) surfaces and neutral colours in building materials.	✓	✓
Minimise use of exposed galvanized steel where possible to reduce glare	✓	✓
Compliance with AS 4282 - Control of the obtrusive effects of outdoor lighting	✓	✓
Lighting design in accordance with principles of best practice design (DEE 2020)	✓	✓
Good 'housekeeping' including waste management at construction sites, laydowns and construction camps.	✓	
Siting of laydown areas away from sensitive receptors where reasonably practicable.	✓	
Rehabilitation of surrounding landscape through encouragement of natural recruitment of vegetation with limited intervention for a minimum of 12 months		✓

20.6 Conclusion

The desalination plant is located in a landscape characterised by extensive open plains and limited number of vertical structures. There are few sensitive receptor locations, largely due to the lack of public access and, other than from the Mullaquana Station homestead, the desalination plant will be visible but inconspicuous when viewed from a few, isolated locations.

Transfer system and electricity infrastructure is similar to existing infrastructure located on major roads in the region and will be fleetingly visible for periods along these roads as travellers pass by at high speeds.

Visual mitigation measures are generally not considered necessary, however where practicable, Project design will incorporate the use of muted, matte finishes to blend infrastructure into the background and avoid reflective materials which can create glare over distances.



Chapter 21

Traffic and Transport

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

21 TRAFFIC AND TRANSPORT 21-1

21.1 Key Findings 21-1

21.2 Setting the Context 21-2

21.2.1 Requirements in legislation and other standards 21-2

21.2.2 Views of stakeholders 21-3

21.3 Assessment Method 21-4

21.3.1 Key assumptions 21-4

21.3.2 Road operations assessment method 21-5

21.3.3 Maritime operations assessment method 21-6

21.3.4 Rail operations assessment method 21-6

21.3.5 Air operations assessment method 21-6

21.4 Description of the Existing Environment 21-7

21.4.1 Road operations 21-7

21.4.2 Maritime operations 21-17

21.4.3 Rail operations 21-21

21.4.4 Air operations 21-24

21.5 Project Transport Task 21-26

21.5.1 Construction program 21-26

21.5.2 Summary of road operations transport task 21-26

21.5.3 Summary of Project marine operations transport task 21-28

21.5.4 Summary of Project rail operations transport task 21-29

21.5.5 Summary of air operations transport task 21-30

21.6 Impact Assessment 21-30

21.6.1 Road operations 21-30

21.6.2 Maritime operations 21-39

21.6.3 Rail operations 21-42

21.6.4 Air operations 21-43

21.7 Summary of Key Mitigation Measures 21-46

21.7.1 Road operations 21-46

21.7.2 Maritime operations 21-47

21.7.3 Rail operations 21-47

21.7.4 Air operations 21-47

21.8 Conclusion 21-48

LIST OF TABLES

Table 21-1: Access to infrastructure sites 21-7

Table 21-2: Arterial road network - desalination plant and marine tunnel sites 21-9

Table 21-3: Arterial road network - transfer system, electricity infrastructure and temporary sites 21-10

Table 21-4: Local road network - desalination plant 21-11

Table 21-5: Vessel calls at Whyalla Port by type (2024-2025) 21-19

Table 21-6: Vessels recorded in Upper Spencer Gulf in February 2026 21-20

Table 21-7: Construction program 21-26

Table 21-8: Light and heavy vehicle types 21-26

Table 21-9: OMOS vehicle deliveries 21-27

Table 21-10: Annual trips generated to permanent sites during operation 21-28

Table 21-11: Construction vessel types 21-28

Table 21-12: Marine traffic volumes during construction (30 months) 21-29

Table 21-13: Estimated rail freight deliveries generated 21-29

Table 21-14: Air transport trips generated during construction 21-30

Table 21-15: Estimated increase in traffic volume and anticipated demand for key roads 21-31

Table 21-16: Relevant turn treatment types 21-35

Table 21-17: FIFO transport level of impact 21-43

Table 21-18: Key mitigation measures – road operations 21-46

Table 21-19: Key mitigation measures – maritime operations 21-47

Table 21-20: Key mitigation measures – rail operations 21-47

Table 21-21: Key mitigation measures – air operations 21-47

LIST OF FIGURES

Figure 21-1: Proposed Mullaquana Station desalination plant access options 21-13

Figure 21-2: Crashes by road section 2020 – 2024 21-15

Figure 21-3: Numbers of crashes by type (all road sections) 2020-2024 21-15

Figure 21-4: Crash severity (all road sections) 2020-2024 21-16

Figure 21-5: Whyalla bus network 21-17
Figure 21-6: Aggregated vessel tracks in Spencer Gulf (2020) 21-19
Figure 21-7: Rail infrastructure crossed by the pipeline 21-23
Figure 21-8: Location of airfields and relevant Code Overlays in the Project Area 21-25

LIST OF PLATES

Plate 21-1: End of sealed Mullaquana Road looking south to Eight Mile Creek Road (unsealed) 21-12
Plate 21-2: Eight Mile Creek Road north-west of Cowleds Landing near entrance to Mullaquana Station 21-12
Plate 21-3: Location of Lincoln Highway intersection with Option 2 access point - looking east 21-12
Plate 21-4: Whyalla Marina and jetty 21-18
Plate 21-5: Whyalla boat ramp 21-21
Plate 21-6: The transcontinental railway (the Ghan) 21-22

21 TRAFFIC AND TRANSPORT

This chapter describes the potential impacts of construction and operation of the Project on existing road, maritime, rail and air transport operations in the Upper Spencer Gulf and Far North, and how those impacts can be managed to minimise impacts to local residents, communities and visitors.

A Project-specific Transport Impact Assessment was undertaken to assess the likely impacts on the existing traffic network including traffic generation, impacts to road capacity, road safety, Project access requirements and the potential for intersection or road upgrades (refer Appendix J-4).

21.1 Key Findings

Road operations

- A Construction Traffic Management Plan (CTMP) will be developed by the Design Build, Operate Maintain (DBOM) Contractor in consultation with DIT and relevant councils to minimise the impacts of Project vehicle movements within towns, and on highways and local roads.
- Impacts to community amenity due to construction traffic will be managed through the Construction Environmental Management Plan (CEMP) and the CTMP and are expected to be short-term and minor.
- Peak traffic volumes during construction and operation of the Project are likely to be well within the capacity of roads on proposed transport routes and impacts on the existing traffic network are expected to be minor.
- Movement of Oversize Overmass (OSOM) vehicles will be in accordance with National Heavy Vehicle Regulator (NHVR) requirements and the Project CTMP.
- Road condition audits and inspections will minimise the potential for impacts to road pavements from heavy and OSOM vehicle movements.
- The Project will consider implementation of enhanced turn treatments at specific Project site access intersections on the Lincoln, Eyre, Stuart and Olympic Dam highways to improve road safety.

Maritime operations

- A minor and temporary increase to overall maritime vessel traffic in the area of Whyalla Port is expected during marine construction however, due to the small number of Project vessels and low frequency of vessel movements, impacts to existing maritime users are not expected.
- Implementation of the Marine and Coastal Construction Environmental Management Plan (MCCEMP) will minimise impacts to marine operations due to Project construction vessel movements.
- A marine exclusion zone will be implemented for construction and operation of the desalination plant intake and outfall structures to protect Project infrastructure and

public safety. Due to the low level of marine vessel traffic in the vicinity of the exclusion zone and its small area in the context of the Spencer Gulf, impacts to vessel movements are not expected.

Rail operations

- Impacts to railway freight and passenger services are not expected due to use of trenchless pipeline construction methodology at rail line crossings. Methodology and timing will be developed by the DBOM Contractor in consultation with railway operators to ensure design, construction and safety standards and requirements are met.

Air operations

- Use of air services by Fly-in Fly-out (FIFO) construction workforce is not expected to negatively impact the capacity and cost of flights to and from Whyalla, Port Augusta and Olympic Dam.
- Air transport planning will be undertaken by the DBOM Contractor in collaboration with airport operators, owners and carriers to ensure that potential cost and capacity impacts on the community are minimised.
- The potential for wire strike or other collision with new transmission lines by low-flying aircraft will be mitigated through industry standard controls (e.g. marking of transmission line conductors), consultation with the Civil Aviation Safety Authority (CASA) and operation of air safety regulations.

21.2 Setting the Context

The EIS Assessment Requirements require an assessment of the Project's effect on traffic and rail, air and maritime operations in the region. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline environmental values and to undertake the impact assessment is set out in Section 21.3.

21.2.1 Requirements in legislation and other standards

Road operations

The *Heavy Vehicle National Law (South Australia) Act 2013* enables the application of a national scheme for facilitating and regulating heavy vehicles on roads and applies to all heavy vehicles over 4.5 tonnes. The Heavy Vehicle National Law and its associated regulations operate in most states and covers vehicle standards, mass, dimensions and loadings, fatigue management, the Intelligent Access Program, heavy vehicle accreditation and on-road enforcement. The national regulations prescribe mandatory standards for heavy vehicles using public roads.

The *Road Traffic Act 196*1 provides for vehicle standards, mass, loading and other safety measures for light vehicles, the installation, use and maintenance of traffic control devices and closing of roads for traffic management and other purposes.

The Traffic Impact Assessment (TIA) (GHD 2026a, Appendix J-4) for the Project was prepared with reference to relevant parts of the Austroads Guide to Traffic Management, Guide to Road Design, and Guide to Road Safety. A full list of the reference materials used in the assessment is provided in the TIA report (GHD 2026a).

Maritime operations

Harbors and Navigation Act 1993 provides for safe navigation in South Australian waters. Under the Act, a licence is required for aquatic activities requiring exclusive use of a designated area or waterway. Notices to Mariners issued by Marine Safety SA and the Australian Hydrographic Office provide information on hazards and changes to navigation in South Australian waters.

The *Australian Maritime Safety Authority Act 1990* (Cth) establishes the Australian Maritime Safety Authority (AMSA) which is Australia's national maritime regulatory agency responsible for maritime safety, protection of the marine environment, and maritime aviation search and rescue. AMSA administers a range of legislation and intergovernmental agreements which implement international and national standards relating to marine navigation, protection of the sea and shipping registration.

The *Navigation Act 2012* (Cth) is administered by AMSA and gives effect to a number of international conventions for maritime issues where Australia is a signatory. This includes the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) and the International Convention for the Prevention of Pollution from Ships (MARPOL).

Rail operations

In South Australia, rail safety is regulated under the *Rail Safety National Law (South Australia) Act 2012*.

Construction of pipelines within a railway boundary must comply with the *Australian Standard AS 4799 - Installation of underground utility services and pipelines within railway boundaries*, and the *Master Specification RD-EW-C3 Boring* (DIT, 2019).

Air operations

Activities with the potential to interfere with air operations are regulated under the *Civil Aviation Act 1988*, *Civil Aviation Regulations 1988* and *Civil Aviation Safety Regulations 1998.* Aircraft undertaking mustering, firefighting or other aerial activities may be present in the vicinity of Project transmission lines during construction and operation.

The *Planning, Design and Infrastructure Act 2016* (PDI Act) regulates development in the vicinity of aerodromes, with specific constraints applying to development that falls within the Building Near Airfields and the Airport Building Heights (Aircraft Landing Areas) Overlays.

21.2.2 Views of stakeholders

A range of issues relating to traffic and transport have been raised during community engagement, particularly in relation to impacts to roads and road traffic. These include the

potential for increased construction traffic and heavy vehicle movements on local and regional roads, and associated implications for road safety, access and congestion. Particular concern was raised regarding interactions with agricultural traffic, tourist movements and daily commuting routes, especially near townships and key access corridors. Effects of the Project on the main haulage routes were also raised by local councils.

Commercial fishery stakeholders have raised concerns in relation to the implications of Project asset-protection exclusion zones offshore from the desalination plant for commercial fishing operations. Potential impacts of increased shipping traffic in local waters have also been raised.

Local councils and DIT have been consulted to gather information and local understanding about potential issues and opportunities regarding roads and access points that may be used by the Project.

Further details of stakeholder engagement and community consultation are set out in Chapter 4 Community and Stakeholder Engagement.

21.3 Assessment Method

The method of assessment has followed the approach set out in Chapter 8 Impact Assessment Methodology. The impact assessment considers the impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and is discussed under each impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

21.3.1 Key assumptions

A Project-specific traffic impact assessment (TIA) was undertaken by technical specialists and is provided at Appendix J-4. Preparation of the TIA was based on the following key assumptions:

- The assessment was based on Reference Design Report and Drawings and assumed construction methodology (GHD 2025a)
- Specific site options were assumed for temporary use during construction as laydown and stacking areas, accommodation camps, for maritime operations, air transport, etc. Sites assessed are subject to further assessment of viability and to detailed design.
- Worst-case scenarios for traffic volumes for access to the desalination plant on Mullaquana Station have been assumed (for both access route options):
- Existing traffic data has been sourced from publicly available sources. Where existing traffic data is unavailable, a reasonable assumption has been derived based on the nearest road where traffic volume data is available or based on land use factors understood from desktop assessment.
- Vehicle movement numbers associated with the construction of new transmission lines and substations are included in the total construction vehicle movement numbers for each of the respective pump station, product water storage and desalination plant sites.

- The TIA assumed that all pipes and fittings will come from South Australian or Victorian manufacturing plants and be delivered to Port Augusta via a variety of routes and transportation methods. Accordingly, only the potential traffic movements and impacts between Port Augusta and Project sites were assessed.
- The assessment has not considered heavy vehicle movements for spoil removal from each site as it has been assumed that there will be no external spoil removal (other than spoil movements from Whyalla Port to Mullaquana Station).
- The overall Project lifespan assumed for the purposes of the EIS is 100 years. Accordingly decommissioning impacts were not specifically assessed, given the changes to the road network and traffic demands that are likely to occur in the intervening period. However, at a high level, the TIA assumed traffic volumes would be comparable with construction volumes.

A full list of assumptions used in the assessment is provided in the TIA report (Appendix J-4).

21.3.2 Road operations assessment method

The assessment area for the TIA is defined as the area surrounding the transfer system route and associated infrastructure, which extends broadly from Mullaquana Station to Olympic Dam.

Existing conditions assessment

An existing conditions assessment was undertaken to establish an understanding of the various potential traffic impacts within and around the assessment area. The assessment methodology involved a combination of desktop research, review of planning and transport data and site-specific observations. Key components of the methodology included:

- identification of the assessment area and connectivity to the surrounding road network
- review of local planning maps to understand land use patterns
- identification of State and local government owned roads, existing road hierarchy and road conditions
- collection and analysis of publicly available traffic count data
- analysis of crash history data for the past five years to identify crash trends and any other potential safety concerns.

Assessment methodology

An analysis was undertaken of the existing traffic and road conditions and the likely traffic volumes generated through Project construction and operation were calculated. Potential impacts of the Project on existing traffic and road capacity were assessed and roads and access suitable to be used by the Project were identified. The assessment was based on the most appropriate information and publicly available data available at the time of writing, including documents prepared for the Project (refer Appendix J-4).

The impact assessment methodology included:

- identification of relevant construction and operation activities that have the potential to affect traffic operations, road safety, road conditions, and access to the surrounding road network

- assessment of activities, considering significance of impact
- identification of mitigation measures (where required).

Decommissioning of the Project would involve the same, or similar, issues as those associated with the construction of the project, however, the overall level of impact is expected to be lower due to the nature of decommissioning activities.

21.3.3 Maritime operations assessment method

A desktop assessment of maritime users and vessel traffic in the Whyalla Port and the broader Upper Spencer Gulf (encompassing Whyalla Port, Port Bonython and surrounding waters) was undertaken using publicly available information including the following sources:

- Whyalla Port Handbook (2023)
- AMSA's Craft Tracking System (CTS) which includes terrestrial and satellite shipborne Automatic Identification System (AIS) data accessed at www.operations.amsa.gov.au/spatial/DataServices/DigitalData
- SA Government Boat Registrations accessed at: https://data.sa.gov.au/data/dataset/boat-registrations
- Port / vessel tracking portals including:
  - myShip Tracking https://www.myshiptracking.com/
  - Vessel Finder https://www.vesselfinder.com/
  - Flinders Ports https://portmis.flindersports.com.au/#
  - MagicPort https://magicport.ai/ports/australia

21.3.4 Rail operations assessment method

The desktop assessment study area for rail operations addressed railway infrastructure located within the EIS Project Area definition (i.e. a 2.5 km buffer surrounding all Project infrastructure including the alignment of linear infrastructure (i.e. a 5 km wide corridor)).

The TIA assumed that all Project materials will be transported along the Project corridor by road. However, consideration was given to an option to use the spur line off the transcontinental line at Pimba for interstate pipe deliveries for nearby sections of the transfer system.

If the use of rail for delivery of construction materials is considered by the DBOM Contractor, traffic volumes would require further assessment for road segments between rail yards to the relevant highway.

21.3.5 Air operations assessment method

The desktop assessment study area for air operation addressed the airports and airfields likely to be utilised for transport of Project personnel. The key airports are at Whyalla and Port Augusta. Flights servicing mines in the north also fly in and out of smaller airports such as Carrapateena and Olympic Dam, which may be considered for Project use.

21.4 Description of the Existing Environment

21.4.1 Road operations

This section sets out a summary of proposed access to Project infrastructure construction sites, a description of the State highways and existing traffic volumes, potential local roads which may be used for access, and existing road safety conditions.

Detailed information is provided in the TIA at Appendix J-4.

Project site accessibility

The existing access route to the desalination plant site from Lincoln Highway is via the Council-owned roads of Horseshoe Road, Mullaquana Road and Eight Mile Creek Road. An alternative route is being considered via a new Mullaquana Station access road connecting between Lincoln Highway (south-west of Whyalla) and Eight Mile Creek Road parallel to the alignment of the main transfer pipeline. This new Mullaquana Station access road has been considered as the preferred route on the basis that it will be completed and available to use during both the construction and operation phases.

Vehicle access to the main transfer pipeline is expected to be predominantly from arterial roads via existing sealed and unsealed public roads, with lateral access tracks provided at generally 10 km intervals. The location of lateral tracks has focused on utilising existing unformed tracks where possible. Some tracks will be proposed for heavy vehicles and may require widening and upgrades. All pump stations and substations will have direct access to a highway via new all-weather access tracks from the adjacent highway.

Laydowns and temporary construction camps will similarly be accessed from the major highways. Construction workers' accommodation is proposed to be split between purpose-built workers' camps and existing tourist accommodation. Proposed laydown areas for construction materials have been nominated based on sites previously used for the same purpose by other projects in the region.

The DBOM Contractor will determine the final locations of the laydown areas, accommodation and routes based on final design and construction approach.

Proposed accessibility to Project infrastructure sites is summarised in Table 21-1.

Table 21-1: Access to infrastructure sites

Infrastructure component	Proposed access
Desalination plant and associated infrastructure	
Desalination plant and marine infrastructure	**Option 1:** Existing route via Horseshoe Road, commencing at the intersection with the Lincoln Highway (Broadbent Terrace) in Whyalla to the intersection with Mullaquana Road. Route follows the sealed Mullaquana Road to the unsealed Eight Mile Creek Road, which connects to the existing Mullaquana Station access track to the desalination plant site.
	Option 2: Access route follows the Lincoln Highway for approximately 12 km south-west from Horseshoe Road before turning south at a new access point. New access parallels the proposed main transfer pipeline alignment south to the

Infrastructure component	Proposed access
	intersection with the unsealed Eight Mile Creek Road, which connects to the existing Mullaquana Station access track to the desalination plant site.
Transfer system pipelines	
Main transfer pipeline	Generally accessed from the main State highways and sealed and unsealed local access roads
Carrapateena lateral branch	Access via the Carrapateena Mine access road east from the Stuart Highway
Pump stations	
Mullaquana Station pump station	Access as per access to the desalination plant and marine infrastructure above.
Lincon Gap pump station	Access from the southern side of the Eyre Highway (west), approximately 250 m west of the intersection of the Eyre Highway and Lincoln Highway.
Kalaya pump station	New access from the western side of the Stuart Highway.
Mangata pump station	New access from the western side of the Stuart Highway.
Storage	
Bimba storage	Access from the Stuart Highway via an existing unsealed access track approximately 900 m in length.
New transmission lines and substations	
Mullaquana substation	Access north from the Lincoln Highway (as the closest public road) with approximately 4.5 km new access road required. New 4m wide access is expected to follow the new Mullaquana transmission line alignment.
Kootaberra substation	New access road approximately 3 km in length on the eastern side of Stuart Highway. The access is approximately 350 m north of the entrance to the Kalaya pump station.
Construction accommodation camps, laydown areas and stack sites	
Proposed temporary construction accommodation camps, laydown and stack areas are all accessible from the existing road network in Whyalla and Port Augusta, or located near the Stuart Highway or Olympic Dam Highway (refer Appendix J-4).	

Existing traffic volumes – key arterial and local roads

Existing traffic volume data indicates that the highest light and heavy vehicle volumes along the key highway routes within the Project extents occur between Whyalla and Port Augusta. This section carries over 2,000 total vehicle movements per day, with approximately 400 heavy vehicles per day on Lincoln Highway and 750 heavy vehicles per day on Eyre Highway (northern arm).

Broadbent Terrace and Playford Avenue in Whyalla also experience high traffic volumes, with almost 4,000 vehicles per day travelling through Whyalla, including over 550 heavy vehicles. Just north of Whyalla, Arthur Glennie Drive and Lincoln Highway carry relatively high volumes

of over 2,000 vehicles per day, with approximately 20% constituting heavy vehicles. These roads are anticipated to be used during the Project construction for movements between the desalination plant and marine tunnel sites, proposed laydown area, segment yard and Whyalla Port.

The proportion of heavy vehicles along the highway network increases towards the northern end of the Project extents. This trend is expected given the remoteness of the northern areas and proximity to the Olympic Dam Mine.

Arterial roads - desalination plant and marine tunnel sites

Of the Project sites, the desalination plant is expected to generate the most traffic during all Project phases. The Lincoln Highway / Broadbent Terrace is the primary arterial that would be utilised to access the desalination plant and marine tunnel sites.

Key features of relevant parts of the arterial road network including Average Annual Daily Traffic (AADT) and National Heavy Vehicle Regulator (NHVR) Performance Base Standard (PBS) route level data are provided in Table 21-2. Further detail is provided in Appendix J-4.

Table 21-2: Arterial road network - desalination plant and marine tunnel sites

Road name	Description
Lincoln Highway (south of Whyalla)	• Sealed arterial road owned by DIT which meets the NHVR standards for PBS Level 3B / up to 42 m road trains. Two sections of this part of the Lincoln Highway are relevant to the Project. • From the intersection with Horseshoe Road to approximately 2 km west: o two-way, dual carriageway with 3 m lane widths and a posted speed limit of 80 km/h for extents of dual carriageway o AADT volumes in 2021 - 7,900 vehicles with 4% heavy vehicles. • From 2 km west of the intersection with Horseshoe Road to 16.5 km further west: o two-way, single carriageway with single 3.3 m wide lanes in each direction and 1 m sealed shoulders and a posted speed limit of 110 km/h o AADT Volumes in 2019 - 1,200 vehicles with 20% heavy vehicles o no existing turning treatment at the proposed new access road intersection (approximately 12 km west of Horseshoe Road).

Arterial roads - transfer system, electricity infrastructure and temporary sites

The primary arterials for the transfer system and electricity infrastructure are the Lincoln Highway, Eyre Highway, Stuart Highway, Olympic Dam Highway and Iron Knob Road (refer Table 21-3).

The Lincoln Gap pump station site and the new Pandurra transmission line are located at the intersection of Eyre Highway and Lincoln Highway. The intersection includes the southern arm of Lincoln Highway, the western arm of Eyre Highway (west) and the northern arm of Eyre Highway (north).

The proposed sites for the Kalaya and Mangata pump stations and the Bimba storage are located on the western side of the Stuart Highway between Port Augusta and Pimba. The new

electricity infrastructure for the pump stations (Bookaloo transmission line, Kootaberra substation and the Oakden Hills transmission line) are located on the eastern side of the Stuart Highway. The Carrapateena lateral branch pipeline access (using the existing Carrapateena Mine access road) is also located on the eastern side of the Stuart Highway.

Olympic Dam Highway will primarily be accessed for construction of the main transfer pipeline and for temporary laydown sites.

Iron Knob Road will be utilised for pipeline construction and the Project access road, including for quarry materials.

Table 21-3: Arterial road network - transfer system, electricity infrastructure and temporary sites

Road name	Description
Lincoln Highway (north of Whyalla at Lincoln Gap)	• Sealed arterial road owned by DIT with two-way, single carriageway with 3 m lane widths and posted speed limit of 110 km/h • Meets NHVR standards for PBS Level 4A / up to 53.5 m road trains • AADT volume in 2024 - 2,200 vehicles with 21% heavy vehicles • Key freight connection and highway corridor between Whyalla and Port Augusta
Eyre Highway (west)	• Sealed highway road owned by DIT with two-way, single carriageway with 3 m lane widths and posted speed limit of 110 km/h • Meets NHVR standards for PBS Level 3B / up to 42 m road trains • AADT volumes in 2024 - 950 vehicles with 44% heavy vehicles • Key freight connection and highway corridor between Iron Knob and intersection with Lincoln Highway.
Eyre Highway (north)	• Sealed highway owned by DIT with two-way, single carriageway with 3 m lane widths and posted speed limit of 110 km/h • Meets NHVR standards for PBS Level 4A / up to 53.5 m road trains • AADT Volumes in 2019 - 2,800 vehicles with 27% heavy vehicles • Key freight connection and highway corridor between Port Augusta and intersection with Lincoln Highway.
Stuart Highway	• Sealed arterial road owned by DIT with two-way, single carriageway with 3 m lane widths and posted speed limit of110 km/h • Meets NHVR standards for PBS Level: 4A / up to 53.5 m road trains • AADT Volumes in 2024 - 950 vehicles with 33.5% heavy vehicles • Key freight connection and highway corridor between Port Augusta and Pimba
Olympic Dam Highway	• Sealed arterial road owned by DIT with two-way, single carriageway with 3 m lane widths and posted speed limit of 110 km/h • Meets NHVR standards for PBS Level: 4A / up to 53.5 m road trains) • AADT Volumes in 2019 - 500 vehicles with 26% heavy vehicles • Extends from Pimba (at the intersection with Stuart Highway) through Woomera and west of Roxby Downs to Olympic Dam
Iron Knob Road	• Sealed undivided sub-arterial road owned by DIT with posted speed limit of 110 km/h

Road name	Description
	• Meets NHVR standard for PBS Level 3A / up to 36.5 m road trains • AADT Volumes in 2021 - 650 vehicles with 20% heavy vehicles • Extends approximately 50 km from Whyalla at the intersection with Arthur Glennie Drive (eastern end) to Iron Knob at the western end

Local road network - desalination plant and marine tunnel sites

Origins and destinations for construction traffic for the desalination plant and marine tunnel sites include accommodation, laydowns and local quarries. Primary local routes that will be utilised to access to the desalination plant site from Whyalla include Industry Drive, Arthur Glennie Drive, Iron Knob Road, Norrie Avenue and Broadbent Terrace / Lincoln Highway.

There are two route options from the Lincoln Highway to the site on Mullaquana Station, both of which include Eight Mile Creek Road:

- via existing Horseshoe Road and Mullaquana Road (Option 1)
- via the proposed new Mullaquana Station access road (Option 2 – preferred long term access road).

Key features of the route options are provided in Table 21-4 (also refer Figure 21-1 and Plate 21-1, Plate 21-2and Plate 21-3).

Table 21-4: Local road network - desalination plant

Road name	Description
Horseshoe Road (Option 1) [Broadbent Terrace / Lincoln Highway intersection to Mullaquana Road intersection]	• Sealed collector road owned by Whyalla City Council with two-way, single carriageway with 3.5 m lane widths and posted speed limit: 80 km/h • Not cleared for any routes under NHVR PBS • As vehicle traffic data is not available an average of 2,400 vehicles / day Horseshoe Road has been assumed based on Mullaquana Road traffic data • Provides access for a small number of residential and industrial properties, including a wastewater treatment plant
Mullaquana Road (Option 1) [Horseshoe Road intersection to Eight Mile Creek Road (end of sealed road)]	• Sealed collector road owned by Whyalla City Council with two-way, single carriageway with 3.5 m lane widths and posted speed limit: 80 km/h • Not cleared for any routes under NHVR PBS • 2017 vehicle traffic data for Mullaquana Road provided by Whyalla Council indicates an average of over 2,400 vehicles per day south-west of the caravan park entrance. • Provides access for a small number of residential streets within the suburb of Mullaquana with large semi-rural allotments set back from the road. Also provides access to Whyalla Caravan and Tourist Park, Eight Mile Creek Beach, Steel City Raceway, Whyalla Car Club & Dirt Circuit Racing Track and a secondary service route at the rear of Whyalla Airport

Road name	Description
Eight Mile Creek Road (Option 1 and 2) [End of Mullaquana Road sealed section to Mullaquana Station]	• Unsealed collector road owned by Whyalla City Council with two-way, single carriageway, approximately 9 m wide and assumed speed limit of 80 km/h. • Not cleared for any routes under NHVR PBS • As vehicle traffic data is currently not available for this road, a conservative average of 10 vehicles per day has been assumed • Provides access to Cowleds Landing, Moonabie Station, Mullaquana Station and informal beach tracks



Plate 21-1: End of sealed Mullaquana Road looking south to Eight Mile Creek Road (unsealed)
[Source: Google Earth]



Plate 21-2: Eight Mile Creek Road north-west of Cowleds Landing near entrance to Mullaquana Station



Plate 21-3: Location of Lincoln Highway intersection with Option 2 access point - looking east
[Source: Google Earth]

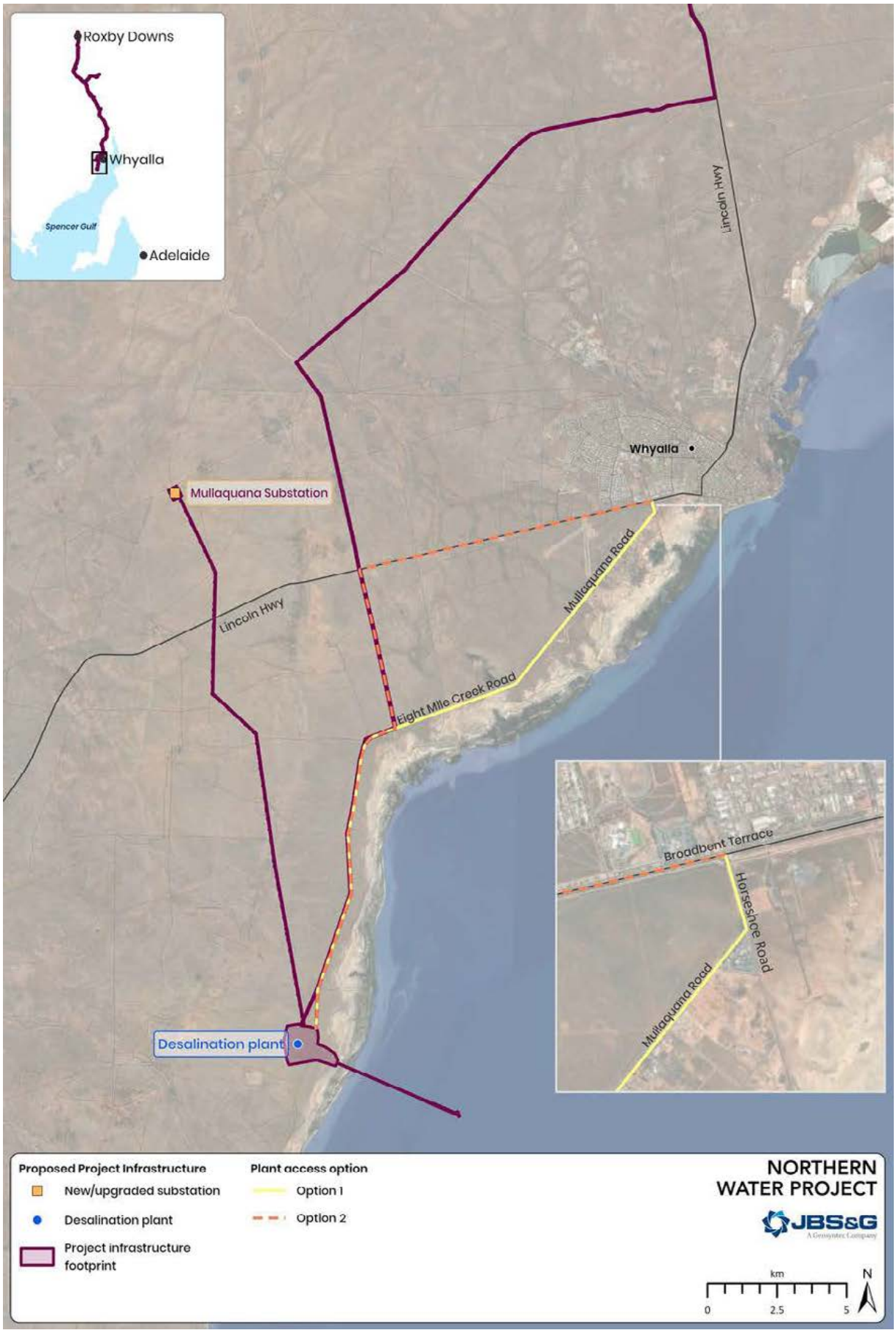


Figure 21-1: Proposed Mullaquana Station desalination plant access options

Local road network - temporary sites

The local road network will also be utilised to access a number of new and existing sites which may be used temporarily for the Project, for purposes including laydown areas, stack sites, temporary accommodation and as access to the JUB work front at Whyalla Port. In Whyalla and Port Augusta, these roads generally consist of two-way sealed council-maintained roads (other than Shipyard Road which is privately owned by the Whyalla Steelworks). In the north, roads are expected to be a combination of sealed and unsealed roads which are owned by either the Roxby Downs Municipal Council or DIT.

In Whyalla, relevant roads include Broadbent Terrace, Norrie Avenue, Playford Avenue, Arthur Glennie Drive, Kloeden Street, Shipyard Road and Industry Drive. In Port Augusta, Press Road, Caroona Road, Addison Road and Madland Street are also expected to be utilised. In the north, Olympic Way, Opal Road, Blinman Road and the Borefield Road are also proposed as access for temporary Project sites.

Further details of the local roads identified as potential access for Project temporary sites are provided in Appendix J-4.

Road safety

The TIA analysed crash data for the years 2020-2024 for intersections and roads in Whyalla and surrounds, Whyalla to Port Augusta, Port Augusta to Pimba and Pimba to Olympic Dam.

Crash occurrences are most dense within the towns (i.e. Whyalla, Port Augusta and Roxby Downs) likely due to the higher traffic volumes and greater number of intersections. Of the highway routes, the stretch of road between Whyalla and Port Augusta has the densest crash history (refer Figure 21-2).

The three most common crash types include 'Hit Fixed Object' (24% overall), 'Roll Over' (23% overall) and 'Hit Animal' (16% overall). These types of crashes are common for high-speed rural roads (refer Figure 21-3).

Highway crashes predominantly resulted in property damage only (73% overall). However, a reasonable proportion of crashes for all highway segments resulted in injuries (24% overall) and a small percentage (3% overall) resulted in fatality for the segment between Whyalla and Port Augusta and the segment between Port Augusta and Pimba. Based on the data, no crashes were recorded during 2020 to 2024 along these highways that resulted in a serious injury (refer Figure 21-4).

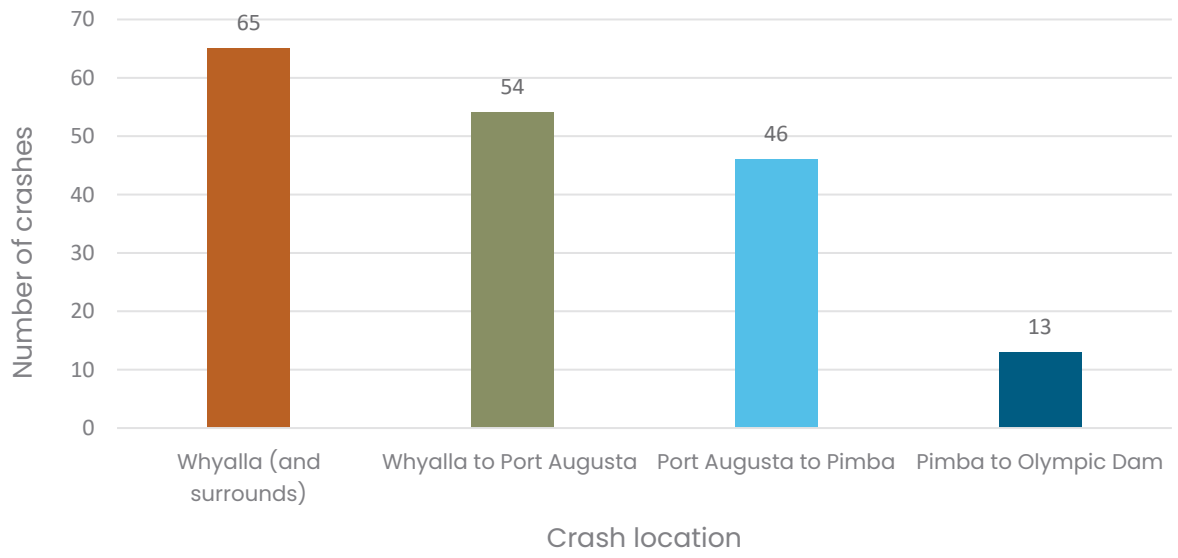


Figure 21-2: Crashes by road section 2020 – 2024

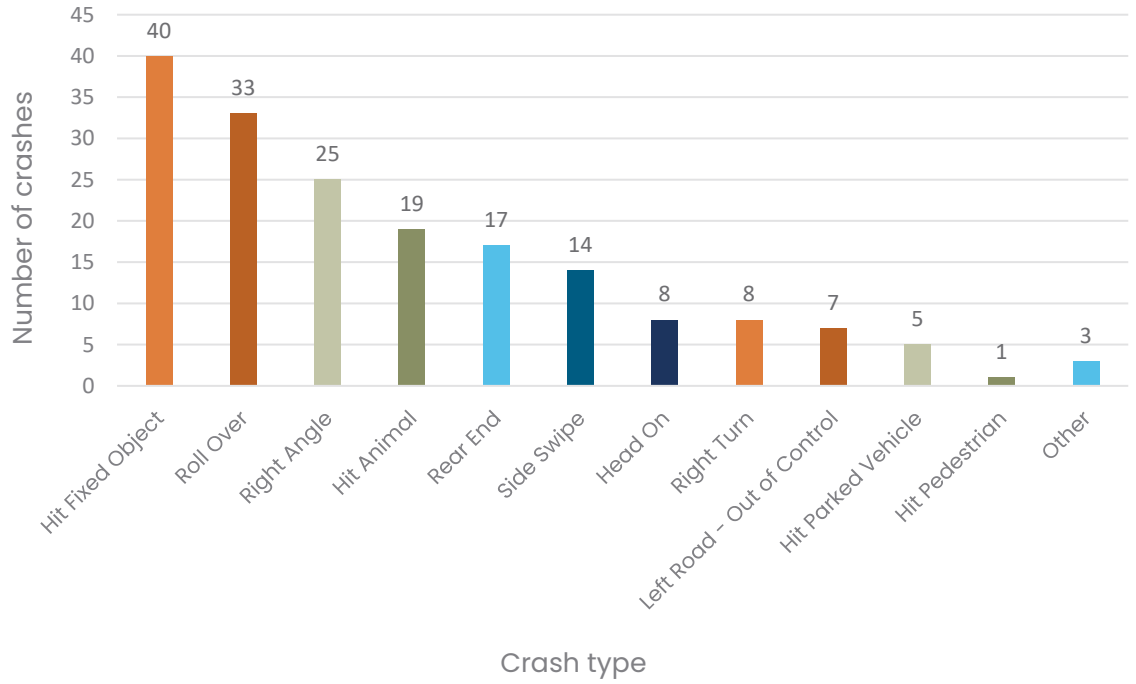


Figure 21-3: Numbers of crashes by type (all road sections) 2020-2024

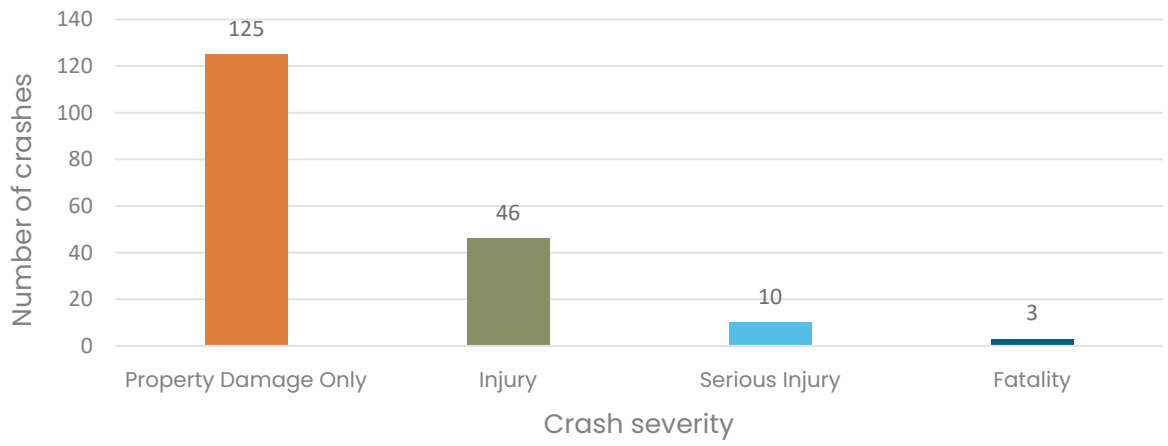


Figure 21-4: Crash severity (all road sections) 2020-2024

Public and active transport

The TIA found that public and active transport facilities in the study area are limited.

Public transport

There are no existing public transport infrastructure or routes identified in the vicinity of the Project and limited school bus services operate in some local government areas during school terms. A local bus service operated by Des's Transport offers six key routes within the Project Area and several Whyalla school bus services which operate on similar routes (refer Figure 21-5). At the 2021 Census, 3.1% of Whyalla's working population travelled to work by bus, a high proportion for a regional centre, well above Port Augusta (1.6%) and approaching the South Australian figure (3.7%) (refer Appendix K-1).

Two public routes and three dedicated school bus services are offered in Port Augusta by Des's Transport, but these predominantly operate outside the Project Area.

Regional bus services are operated by Stateliner Premier Coach Services which offers passenger and small freight transport between Adelaide and a number of rural destinations in the region, including Port Augusta and Whyalla.

There are no existing passenger rail services and there are currently no planned upgrade works within the Project Area for public and active transport infrastructure.

Taxi services in Whyalla are provided by a local operator (Des's Cabs).

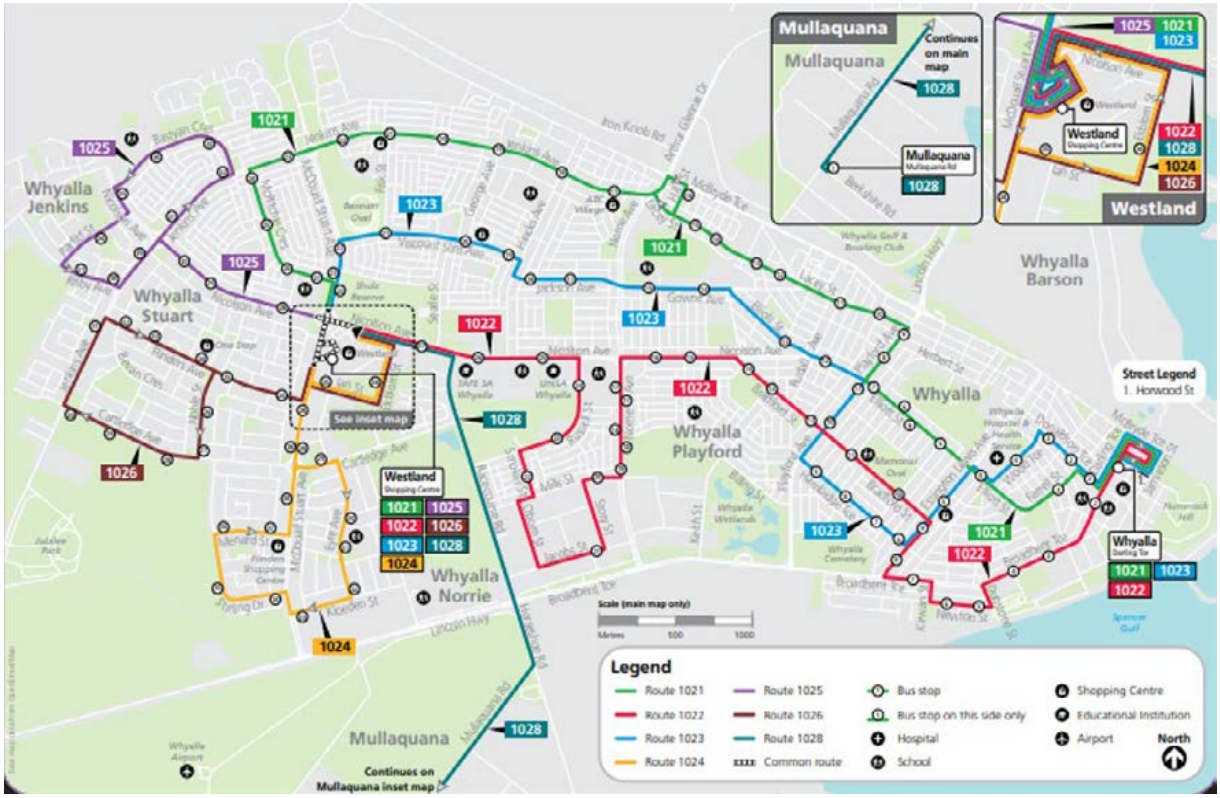


Figure 21-5: Whyalla bus network
[Source: https://des.com.au/wp-content/uploads/2026/01/2026-Bus-Timetable-Whyalla-webview-1.pdf]

Active transport

There are no known pedestrian footpaths or formalised crossings on the public roads that provide direct access to the permanent Project sites. There is also no dedicated cycling infrastructure currently providing direct access to any of the Project sites. Pedestrian and cycling infrastructure are limited to within the nearby townships and vehicle interaction with pedestrians or cyclists is most likely to be experienced places like Whyalla and Port Augusta.

Pedestrians may use Horseshoe Road or Mullaquana Road and the Whyalla Airport reserve located off Mullaquana Road also appears to be used as a recreational exercise area for pedestrians, dogs and horse riders who may travel along Mullaquana Road.

21.4.2 Maritime operations

Maritime traffic in Upper Spencer Gulf includes international and domestic shipping, commercial fishing boats, tourism operators, and smaller recreational and leisure vessels.

Whyalla Port

Whyalla Port is owned and operated by SIMEC and primarily used for steelwork operations and associated mining activities. Cargo handled through the port typically includes steel and mining materials. Access to the port requires permission from SIMEC.

Whyalla Port is composed of three main areas, each with their own unique shipping operations:

- Inner harbour - used primarily for the loading and unloading of steelmaking bulk materials, finished steel products, iron ore products, coke by-products and third-party cargo. This area is proposed to be utilised during Project construction
- Outer harbour - used primarily for the loading of bulk iron ore products
- Offshore transhipment points - consists of four fixed anchorages designated for offshore transhipment operations.

Whyalla marina and jetty

The Whyalla Marina is accessed by vehicle and provides a carpark and multi-lane boat ramp (refer Plate 21-4). The marina is home to the Whyalla Yacht Club and provides more than 30 mooring points on the mooring jetty and at number of mooring points located adjacent to the Yacht Club. In addition to the Whyalla Yacht Club, users of the marina include members of the public, Whyalla Sea Rescue, Whyalla Sportfishing Club, Spencer Gulf Adventures tour groups, and other boating groups and companies.

The Whyalla Foreshore Jetty is used primarily for recreational fishing and public access. It does not support commercial vessel operations.



Plate 21-4: Whyalla Marina and jetty

Marine vessel traffic in the Spencer Gulf

The Upper Spencer Gulf experiences significant shipping traffic largely associated with industrial activities at Port Pirie, Whyalla and Port Bonython. Due to increasing vessel sizes and the shallow nature of the waters at the northern end of the Upper Spencer Gulf, port activity at Port Augusta has migrated south to Port Pirie and Whyalla, which are now the favoured locations for shipping operations to and from the region.

Shipping traffic is generally associated with SIMEC's bulk cargo import and export port at Whyalla and Santos's Port Bonython deep-water petroleum export port. The shipping navigation channel (recommended track) is located approximately 6 km east of the likely location of any of the Project's desalination plant seabed infrastructure. The recommended track has an average depth of approximately 20 m marked with navigational hazard marker buoys (red markers) and will not be impacted by vessels associated with the Project marine construction works. Aggregated vessel tracks for 2020 are shown in Figure 21-6.

Vessel calls at Whyalla Port in 2024-25 are shown in Table 21-5.

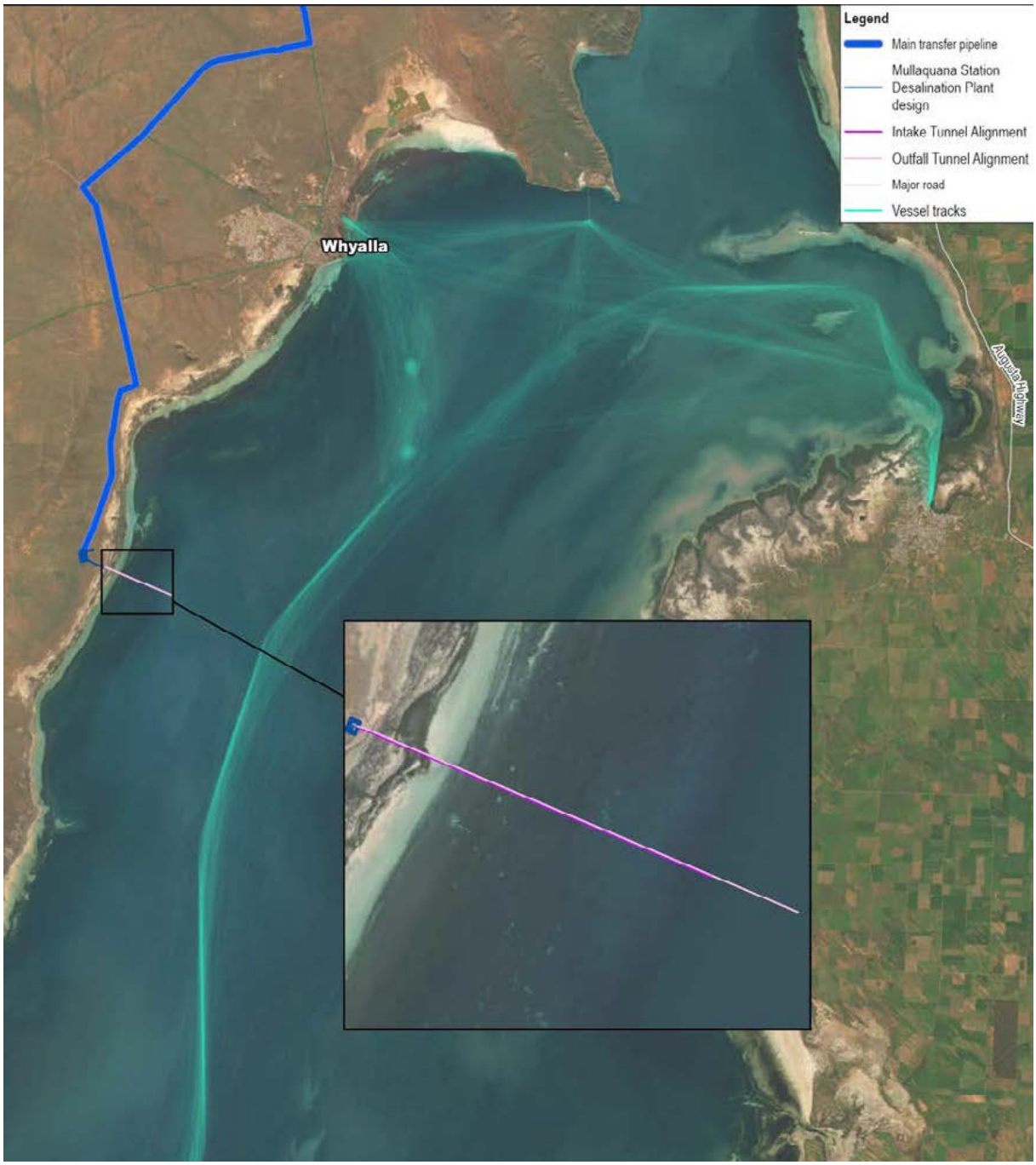


Figure 21-6: Aggregated vessel tracks in Spencer Gulf (2020)
[Source: GHD 2026a]

Table 21-5: Vessel calls at Whyalla Port by type (2024-2025)

Vessel type	Vessel calls (2024-2025)
Tugs and harbour craft (home ported vessels)	4
Bulk carrier	55
General cargo ship	1
Pilot vessel	89

Vessel traffic data in February 2026 (AMSA 2026) in the broader Upper Spencer Gulf (including Whyalla Port, Port Bonython and surrounding waters) was reviewed. Vessels recorded in Upper Spencer Gulf in February 2026 are shown in Table 21-6.

Table 21-6: Vessels recorded in Upper Spencer Gulf in February 2026

Type of vessels	No of vessels	Percent
Cargo ship	26	28.3%
Fishing	3	3.3%
Recreational	13	14.1%
Port tender, pilot vessels and tugs	13	14.1%
Sailing	27	29.3%
Search and rescue	3	3.3%
Tankers	4	4.3%
Other	3	3.3%
Total	**92**	**100%**

Based on this data, maritime activity in the Upper Spencer Gulf consists of a mix of:

- commercial shipping associated with port operations form about a third of vessel movements
- harbour support vessels (e.g. tugs and pilot vessels) form approximately 15% of vessel movements
- commercial fishing vessels about 3% of the recorded data
- recreational vessels including sailing and pleasure craft (form about 43% of recorded data).

Commercial fishing is an established industry in Spencer Gulf. The region supports several managed fisheries including the Spencer Gulf Prawn Fishery and the South Australian Marine Scalefish Fishery, which operate throughout the gulf, targeting species such as Western King Prawns, Snapper and other scalefish species. These fisheries operate across defined management areas within Spencer Gulf in accordance with fishery-specific management plans. The Spencer Gulf Western King Prawn fishery is the third most valuable prawn fishery in Australia and operates in approximately 15% of the Spencer Gulf, only fishing in waters deeper than 10m[1]. Further details of commercial fisheries are provided in Chapter 9 Use of Land and Waters and Chapter 11 Marine Environment.

The level of marine vessel traffic offshore from Mullaquana Station is low. Vessel movements would mainly be related to commercial fishing and research vessels, and recreational activities (e.g. fishing and sailing). The presence of the Upper Spencer Gulf Marine Park and the associated sanctuary and habitat protection zones (8 – 10 km north of the desalination

[1] www.spencergulfkingprawns.com.au/about/the-fishery

plant marine infrastructure) also influences the presence and location of both commercial and recreational marine activities.

In South Australia, there are approximately 51,000 registered recreational craft, with approximately 3%[2] of these registered in Upper Spencer Gulf postcodes between Cowell and Port Augusta. Recreational boating numbers in Upper Spencer Gulf fluctuate depending upon the season, holiday periods, weather and fishing conditions, and fishery closures.

The closest recognised jetty, boat ramp or launch access to the Project is at Whyalla[3] (refer Plate 21-5) although there a many informal boat launching locations along the coast and at places such as Cowleds Landing and Murninnie Beach.



Plate 21-5: Whyalla boat ramp
[Source: Whyalla City Council]

21.4.3 Rail operations

Transcontinental rail line

The transcontinental rail line connecting Sydney to Perth and Adelaide to Darwin passes through Port Augusta and Pimba generally to the west of the main transfer pipeline before heading west and on to Darwin and Perth. The transcontinental line is managed by the Australian Rail Track Corporation (ARTC) and provides regional and interstate passenger and freight services.

Passenger services on the transcontinental rail line are tourism-oriented and include the Indian Pacific (Sydney – Perth) and the Ghan (Adelaide – Darwin) services. The Indian Pacific Train can carry up to 300 passengers and operates weekly (Journey Beyond 2026a) while the Ghan operates twice weekly between March and November transporting about 300 passengers and crew (Journey Beyond 2026b).

Freight rail services on the Port Augusta-Tarcoola section of the transcontinental line primarily comprise iron ore transport (DITRDC 2022), transporting about 15 million gross tonnes per year and on average 63 trains per week.

[2] https://data.sa.gov.au/data/dataset/boat-registrations

[3] https://cdn.environment.sa.gov.au/marineparks/docs/mp-gen-upperspencergulf-atlasmap-13.pdf

The transfer system alignment pipeline is proposed to parallel the Stuart Highway and will cross under the transcontinental rail line at five locations (refer Figure 21-7).



Plate 21-6: The transcontinental railway (the Ghan)
[Source: Journey Beyond]

Whyalla to Port Augusta rail line

The Whyalla to Port Augusta rail line is owned by the ARTC. It parallels the Eyre and the Lincoln Highways, and crosses the Stuart Highway just outside of Port Augusta and the Eyre Highway approximately 12 km from Port Augusta (refer Figure 21-7). The rail line was initially established to provide services to the Whyalla Steelworks owned by BHP at the time. Although it historically provided daily passenger services, it is now only utilised for freight services.

The main transfer pipeline parallels the western side of the rail line, however the Pandurra transmission line at Lincoln Gap is the only Project infrastructure that crosses the Whyalla to Port Augusta rail (refer Figure 21-7).

Iron ore rail line

The iron ore rail line is operated by SIMEC for the transport of hematite ore from mines in the Middleback Range to Whyalla Port. The rail line serves the mining operations of the Iron Knob, Iron Baron and Iron Duke mines in the South Middleback Range (refer Figure 21-7). Trains are made up of two locomotives hauling 50 trucks each carrying 60 tonnes of ore - a total of 3,000 tonnes each. Up to four trains per day can be loaded depending on plant requirements (Unearth Whyalla 2024). Rail traffic on the ore rail line is seven days a week.

The Project infrastructure is proposed to cross under the iron ore rail line once north-west of Whyalla (near KP 31) (refer Figure 21-7).

Pimba spur line

A spur line from the ARTC line is located at Pimba, which originally ran between Pimba and the Woomera RAAF Base, but was closed in 1978[4]. The southern section of the spur line just north of Pimba has recently been re-opened as part of a new logistics hub being constructed by Aurizon to connect BHP's Olympic Dam and other mines with Port Adelaide via rail.

Consideration may be given to utilising the Pimba spur line for pipe deliveries for the nearby sections of the transfer system work front. This would be subject to suitability of the rail line, coordination with existing rail operations and approval from the rail authority.

[4] https://media.lrrsa.org.au/noah271/Light_Railways_271.pdf

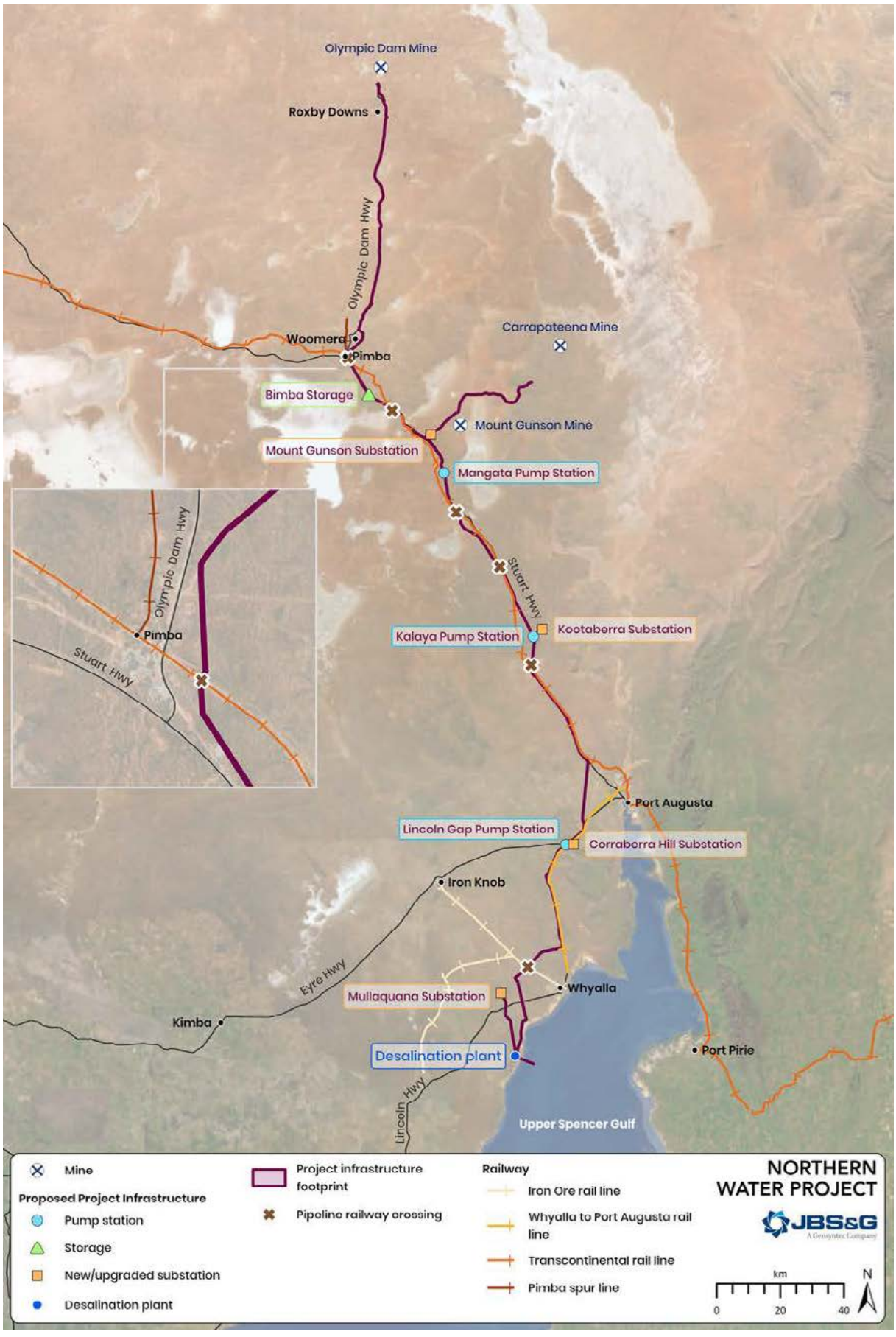


Figure 21-7: Rail infrastructure crossed by the pipeline

21.4.4 Air operations

A regional network of airports offers flights to Adelaide and other locations, providing access to health services, education, tourism and business, and including fly-in -fly-out (FIFO) workers. Further information on air operations is provided in the TIA at Appendix J-4.

Whyalla Airport

The Whyalla Airport is owned and operated by the City of Whyalla and is located in the suburb of Mullaquana on the southern outskirts of the city. The airport has two runways, a lawn helicopter parking area and provides travel connections to and from Adelaide.

Flights movements from the airport comprise 15 (Dash-8 400) flights per week between Whyalla and Adelaide, each with a capacity of approximately 74 passengers. This equates to an average of around 21,800 outbound passengers per year from 760 aircraft movements and 21,600 inbound passengers from 762 aircraft movements. In 2025, a $30 million upgrade of the airport runway was delivered which allows the operation of larger, 74-seat Q400 aircraft.

Port Augusta Airport

Port Augusta Airport is owned and operated by the City of Port Augusta and is a hub for FIFO operations to mines in the north of the state. There are currently no regular passenger transport flights into Port Augusta other than charter services, predominantly for FIFO workers (4 (Dash-8 400) flights per week between Port Augusta and Adelaide). Annual passenger numbers are approximately 16,000 per year. Port Augusta Airport is the base for the RFDS Central Operations Communications Centre.

Other airports and airstrips

Olympic Dam Airport is a privately owned regional airport operated by BHP and primarily serves the Olympic Dam mine and its surrounding community. Flight movements comprise 27 (Embraer 190) flights per week between Olympic Dam and Adelaide with a capacity of approximately 84 passengers, equating to approximately 2,200 passengers per week. There is also 1 flight per week between Olympic Dam and Port Augusta (12 passengers). The airport supports a total 54,083 outbound passengers per year on average from 677 aircraft movements and 47,701 inbound passengers from 626 aircraft movements.

There are numerous smaller airstrips throughout the region associated with mining operations, tourism activities and pastoral stations which can also accommodate RFDS aircraft. Private unregistered airstrips may also occur in the region. There are also military airstrips associated with Department of Defence facilities at Cultana and Woomera.

Airports and airstrips in the vicinity of the Project or with the potential to be affected by the Project (e.g. due to the presence of transmission lies), and the relevant Planning Code Overlays for building near airports are shown in Figure 21-8.

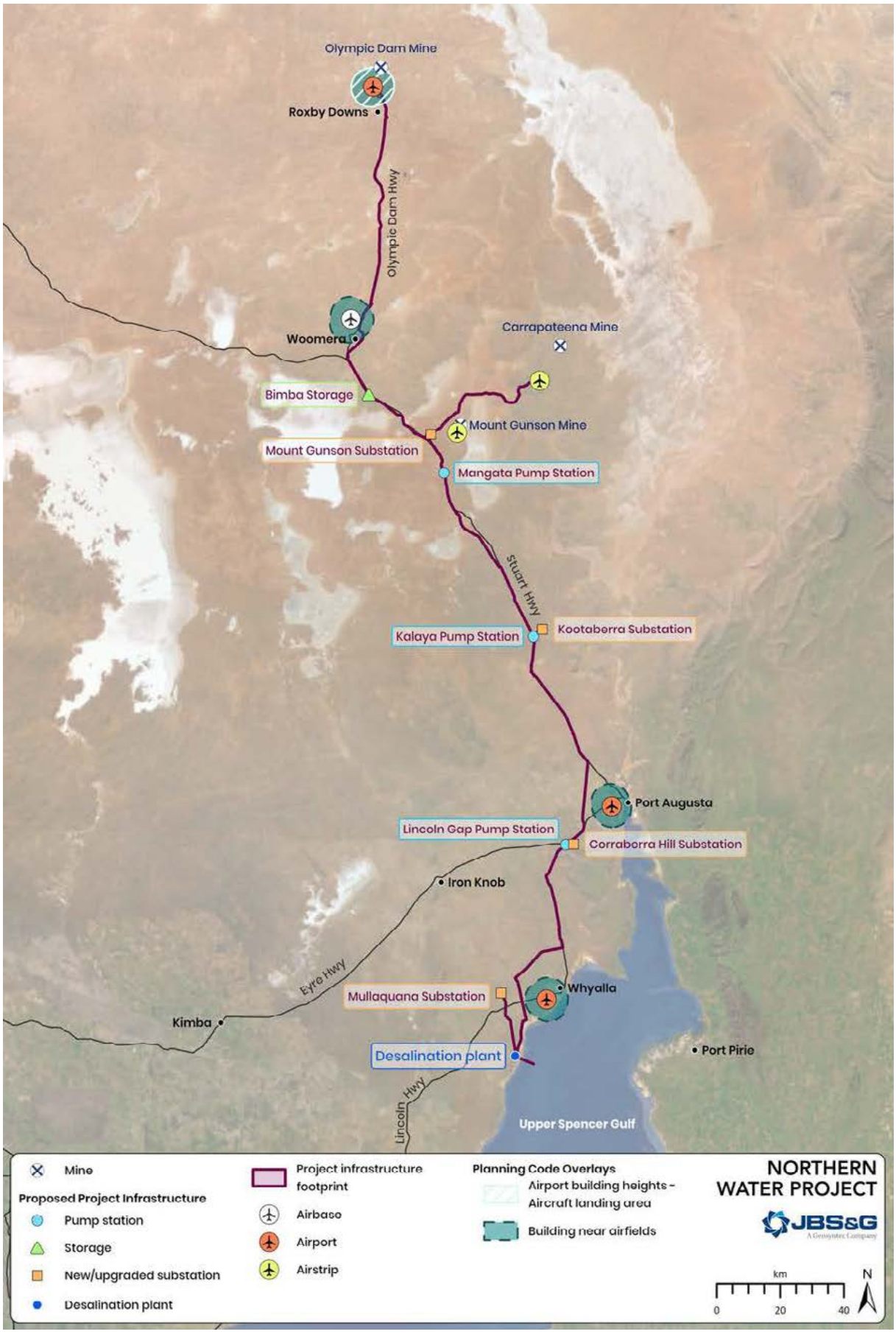


Figure 21-8: Location of airfields and relevant Code Overlays in the Project Area

21.5 Project Transport Task

To provide context for the impact assessment, this section provides a summary of vehicle and vessel types, and estimated numbers and trips for construction and operation of the Project. Further detail is provided in Appendix J-4.

21.5.1 Construction program

The total construction program is estimated to be approximately 51 months, however this will be subject to final design and construction methodologies nominated by the DBOM Contractor. Indicative workforce schedules and timeframes used in the TIA are provided in Table 21-7.

Table 21-7: Construction program

Construction element	Indicative timeframe	Indicative schedule
Transfer system	Main transfer pipeline - 20 months (months 10 to 30) and Carrapateena lateral branch – 2 months Includes 2 moving work fronts to progressively construct the main transfer pipeline, pump stations and storages	12h, 7 days/week
Marine and tunnelling	30 months (months 9 to 39) Includes offshore jack-up barge and onshore support	24h, 7 days/week
Desalination plant	35 months (months 6 to 41)	12h, 5.5 days/week
Wet commissioning	10 months (months 42 to 51)	12h, 7 days/week
Overall construction	51 months	-

21.5.2 Summary of road operations transport task

Construction

Vehicle classes have been simplified to light vehicles, heavy vehicles and OSOM vehicles, for the purposes of assessing trip generation and distribution.

Table 21-8: Light and heavy vehicle types

Vehicle type	Purpose	Site
Light vehicles		
10-seater mini-buses	Transport of workers to work front from accommodation site	Transfer system work front
Dual cab utility vehicles	Transport of workers to work front	Transfer system work front Marine and tunnelling work front Desalination plant
Heavy vehicles		
20 / 30 kL water trucks	Construction water deliveries and hydrotesting	Transfer system work front Marine and tunnelling work front

Vehicle type	Purpose	Site
B-double road train	All other heavy vehicle deliveries, including: • quarry (backfill and bedding) materials • pipes • spoil (marine and tunnelling) • tunnelling segments and supply • desalination plant materials and components	Transfer system work front Marine and tunnelling work front Desalination plant

The Project is expected to generate significant additional traffic during the construction phase[5], in the order of 829,876 two-way vehicle trips, comprised of approximately 488,026 light vehicle and 341,850 heavy vehicle movements.

During the peak construction period (Month 17 of the four-year construction program) an additional 935 one-way (1,870 two-way) vehicle trips per day are expected to be introduced into the network by the Project.

During the AM and PM peak hour periods, the anticipated construction traffic volume is 218 vehicles per hour two-way comprising 139 two-way light vehicle and 79 two-way heavy vehicle movements.

Oversize and Overmass vehicles

The majority of OSOM deliveries would be made to the desalination plant site and onshore tunnelling work front (i.e. tunnel boring machine (TBM) launch box). HV transformers, generators and some pipework would be delivered to each pump station and substation site.

Key routes expected to be subject to OSOM vehicles are the Stuart Highway, Lincoln Highway (north and south of Whyalla), Eyre Highway and one (or both) of the desalination plant access route options.

Table 21-9: OMOS vehicle deliveries

Project site	Items delivered	Total one-way trips
Desalination plant and intake and outfall tunnels	• HV transformers • generators • pre-assembled reverse osmosis racks (oversized only) • some pipework (oversized only) • lime dosing material (oversized only) • TBM cutterhead and shield • intake pump station pumps • crawler cranes (250 t and 60 t)	14

[5] Note that the vehicle movements represent traffic volumes in the 'worst case' scenario where the Pimba spur line is unable to be used, requiring more heavy vehicle traffic on the road network for pipe deliveries.

Project site	Items delivered	Total one-way trips
Lincoln Gap pump station	• HV transformers • generators • some pipework (oversized only)	2
Kalaya pump station		2
Mangata pump station		2
Bimba storage		2

Operation

During operation, it is assumed that light vehicles and heavy vehicles would access the desalination plant site and pump station sites for operational staff duties, deliveries and maintenance. The estimated annual trips generated for these sites is provided in Table 21-10.

Table 21-10: Annual trips generated to permanent sites during operation

Site	Heavy vehicle trips (1-way)	Light vehicle trips (1-way)
Desalination plant	117	3717
Lincoln Gap pump station	8	13
Mangata pump station	8	13
Kalaya pump station	8	13
Bimba storage	8	13

21.5.3 Summary of Project marine operations transport task

Construction

Marine construction activities will be undertaken primarily from a jack-up barge (JUB), supported by tugs, barges and ancillary support vessels, which will mobilise from Whyalla Port to the offshore work front.

Table 21-11: Construction vessel types

Vehicle type	Purpose	Site
Maritime vessels		
Jack-up barge (JUB) x 1	Construction of intake and outfall tunnel support piles	Marine and tunnelling work front
Tugs x 3	Support vessel for JUB	
Supply barge x 1		
Spoil barge x 2		
Support vessel, line boat, safety boat (x 2 total)		
Dive boat x 1		
Crane barge x 1		
Air support		
Helicopter x 1	Support for JUB	Marine and tunnelling work front

The expected marine traffic volumes during construction to and from Whyalla Port and Whyalla Marina are presented in Table 21-12. Only the dive boat is assumed to use Whyalla Marina while the other vessels are assumed to use Whyalla Port.

The JUB is expected to remain stationed at the work front for extended periods, with supporting vessels undertaking routine transits to deliver materials, equipment and personnel. It has also been assumed that a given vessel would undertake one movement per week from the designated port to the work front, except for the spoil barges, which have a total of three movements each during the construction period.

Table 21-12: Marine traffic volumes during construction (30 months)

Vessel type (total movements)	JUB work front	Whyalla Port	Whyalla Marina
Jack-Up Barge (JUB) x 1	1	0	0
Tugs x 3	387	387	0
Supply barge x 1	129	129	0
Spoil barge x 2	6	6	0
Support vessel, line boat, safety boat	258	258	0
Dive boat x 1	129	0	129
Crane barge x 1	129	129	0

Operation

The TIA assumed that marine vessels would also be used to access the intake and outfall structures once operational, estimating 15 marine vessel trips (one-way) would be made every year. These trips would be associated with routine inspection, monitoring and maintenance activities. It is assumed that these trips would be undertaken via a small vessel that can be launched from Whyalla Marina, with vessel movements limited to short-duration transits between the marina and the offshore intake and outfall locations.

21.5.4 Summary of Project rail operations transport task

Construction

Pimba spur line is the only rail line being considered in the TIA, assuming it is open and able to be utilised. It is anticipated that this rail line would be used for the transportation of pipes to the main transfer pipeline work front once works commence for the sections between Kootaberra and Olympic Dam. Estimated rail deliveries are based on the same heavy vehicle requirements for pipe delivery (refer Table 21-13).

Table 21-13: Estimated rail freight deliveries generated

Rail delivery requirement	Value
Weekly pipe delivery requirements	2.5 km (for the respective work front)
No. pipe lengths per rail car	4 x 12 m pipes (same as single truck trailer)
No. rail cars per week	53 rail cars
Approximate no. train deliveries per week	1 train
Total	**5512 rail cars over the 24 months**

21.5.5 Summary of air operations transport task

Construction

The TIA assumed that existing passenger flights to and from Whyalla Airport would be utilised and possibly also to and from Port Augusta Airport and Olympic Dam Airport.

The anticipated air transport related trips generated during construction are shown in Table 21-14. The Fly in Fly Out (FIFO) worker numbers are based on a 2-week on and 2-week off roster. It is assumed that these would all be originating from Adelaide, with interstate resources connecting via Adelaide Airport to Whyalla, Port Augusta or Olympic Dam. Helicopter movements have been adopted based on the assumption of 1 trip per 2 weeks from Whyalla Airport to the JUB work front.

Table 21-14: Air transport trips generated during construction

Movement	Bi-weekly peak movements (1-way)
FIFO workforce	
Transfer System (Adelaide to Whyalla, Port Augusta or Olympic Dam)	100 workers
Desalination Plant (Adelaide to Whyalla)	400 workers
Marine and Tunnelling (Adelaide to Whyalla)	120 workers
Total	**620**
JUB support	
Helicopter (Whyalla Airport to JUB Work front)	1 trip

21.6 Impact Assessment

21.6.1 Road operations

The volume of traffic generated during key Project construction phases was estimated for OSOM vehicles, heavy vehicles delivering materials and directly involved in construction activities, and light vehicles and buses transporting construction personnel. The estimated volume of traffic generated during the busiest Project phase (construction) is detailed in the TIA (Appendix J-4).

Sources of impact

The following Project aspects have been identified as sources of impacts to the traffic network and road operations.

- movements and volume of construction traffic
- heavy and OSOM vehicle movements during construction
- site access from major highways during construction.

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Increased traffic volumes and impact on road capacity

Impacts on the capacity of the existing traffic network from increased traffic volumes during Project construction and operation are expected to be minor.

Construction

Movement of Project construction materials and work crews across the Project will generate additional traffic volumes which have the potential to impact on local traffic networks, causing disruption to local communities and other road users.

Based on existing traffic volumes (refer Section 21.4.1) and assumed trip generation and distribution (refer Section 21.5.2), highways and local road networks expected to be utilised for the Project will be subject to an increase in traffic volumes during the construction period and to a lesser extent during operations. This will include light, heavy and OSOM vehicles. The TIA has adopted the busiest construction period (Month 17) as a worst-case scenario to assess the impacts to capacity.

During Month 17, it is expected that there would be an additional 1,870 two-way vehicle trips per day across the Project. During the AM and PM peak hour periods, the anticipated construction traffic volume is 218 vehicles per hour two-way. This includes 139 two-way light vehicle movements and 79 two-way heavy vehicle movements.

The TIA adopted a typical capacity of 1,700 passenger cars per hour in direction of travel on two-lane and two-way rural roads and highways to assess potential Project impacts. Capacity is largely independent of the directional distribution of traffic, meaning that the capacity of two-lane two-way rural roads and highways per direction is almost unaffected by the proportion of vehicles travelling in each direction. Conservative Project construction traffic volume estimates for one-lane peak volumes were developed using the combined total of existing traffic volumes and forecasted peak traffic volumes. Roads that are predicted to experience a significant increase from existing traffic volumes and the assessment of peak volume on these roads are summarised in Table 21-15.

As shown in Table 21-15, the assumed maximum one-lane peak hourly volumes during construction are expected to be well within the theoretical capacity of the roads experiencing the largest increase in traffic volumes (i.e. below 1,700 passenger cars per hour per lane). The TIA found that for all the impacted roads, it is expected that there would be no significant impact on traffic efficiency as a result of the additional traffic volumes associated with the Project. Further detail is provided in Appendix J-4.

Table 21-15: Estimated increase in traffic volume and anticipated demand for key roads

Road	Increase from existing traffic volume	Anticipated two-way peak hourly volume during busiest construction period	Estimated maximum one-lane hourly peak volume
Lincoln Highway (south of Whyalla)	10%	1292	388
Kloeden Street	49%	67	67

Road	Increase from existing traffic volume	Anticipated two-way peak hourly volume during busiest construction period	Estimated maximum one-lane hourly peak volume
Shipyard Road (private access)	28%	9	6
Stuart Highway	90%	418	251
Olympic Dam Highway	26%	88	53
Eight Mile Creek Road	4500%[6]	59	35
Horseshoe Road / Mullaquana Road (Desalination plant access Option 1)	19%	418	251
New Mullaquana Station Access Road (Desalination plant access Option 2)	N / A	418	251

The expected impacts of an increase in traffic volumes on the road network due to the Project are in the **Minor** category. Uncertainty in the expected impact (due to reliance on estimates made prior to final design, methodology and access decisions) has been evaluated in Appendix M and the level of risk is **Low**.

Operation

Operational traffic volumes will be low, with only the desalination plant generating daily operational traffic. As shown in Table 21-10, 117 one-way heavy vehicle trips and 3,717 light vehicle trips to the desalination plant are expected annually.

Infrastructure such as pump stations, storage tanks and substations will generate infrequent maintenance traffic only during operation, with traffic originating from maintenance depots. Final locations of depot(s) would be subject to discussions with the operational Contractor, but are expected to be located at Whyalla and potentially at Port Augusta and in the Woomera / Roxby Downs area. An estimated 8 one-way heavy vehicle trips and 13 light vehicle trips to the pump stations and storage are expected annually. The expected low frequency of maintenance traffic would be readily accommodated by the existing local road network, which is considered adequate for the anticipated traffic volumes.

The preferred option for the Mullaquana Station access road would further reduce impacts to existing local roads posed by operational traffic, as it provides an alternative route to access the desalination plant with higher capacity and reduces interactions with local road traffic.

The expected impacts to road network capacity during operations are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

[6] Note that this an increase from an estimated 10 cars to 460 cars

Movement of Oversize Overmass vehicles

Movement of OSOM vehicles will be in accordance with NVHR requirements and the Construction Traffic Management Plan to minimise potential impacts.

During construction, OSOM vehicles will be required to transport large Project components to the desalination plant, marine tunnel and pump station and substation sites (refer Table 21-9). OSOM vehicles exceed either general access dimensions (typically 2.5 m wide, 19 m long and 4.6 m high) or exceed standard legal weight limits. Because of their extreme size and weight, these vehicles can pose higher risks to road infrastructure and traffic. They are strictly regulated and typically require specific travel permits from the NHVR.

The final mass and dimensions of each OSOM load would determine specific permit conditions, which may include the following:

- pre-transport route assessment
- warning signs and devices
- pilot vehicles and escort vehicles
- mass and dimension limits, including rear overhang
- times of operation.

OSOM vehicle movements for all Project sites will be incorporated in a Construction Traffic Management Plan (CTMP) prepared for the Project. Once specific vehicle types and routes are confirmed, traffic route assessments and traffic management plans will be developed to ensure that the interaction between the oversize vehicles and general traffic does not cause unreasonable risk. If required, permits will be sought for routes which are currently not designated as oversize-approved, and in discussion with DIT and relevant councils.

OSOM vehicles are likely to be slow-moving and consideration will be given to scheduling oversize deliveries to avoid peak road usage hours and periods. Impacts to road capacity are not expected although temporary changes to the traffic environment (including delays and possibly detours will be experienced by some local road users.

The expected impacts to traffic movements from the movement of OSOM vehicles are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Impacts to road pavements

Road condition audits and inspections will minimise the potential for impacts to road pavements from heavy and OSOM vehicle movements.

Heavy vehicles proposed for use during the construction phase may result in incidental damage to the road pavement and / or road furniture, in particular on unsealed roads. Frequent movement of heavy vehicles along the road network can also accelerate the deterioration of existing road surfaces.

A road condition audit may be undertaken prior to the commencement of construction works to understand the current condition of all roads expected to carry construction traffic. The audit (if undertaken) may also include associated infrastructure such as culverts, bridges, and other critical assets. Findings of the audit would be used to determine whether

any sections of the road network are not fit for the anticipated construction traffic and whether road upgrades may be required prior to construction to ensure the road network can safely accommodate the increased vehicle movements.

Road conditions would be monitored during the construction phase to identify defects. Regular inspections would enable timely and appropriate maintenance interventions by the appropriate entity (e.g. the Contractor, local council), reducing safety hazards and minimising disruption to construction and public traffic. Subject to the audit, it is expected that roads would be reinstated to an appropriate condition once construction is complete.

Roadworks for pavement upgrade or repair may result in traffic delays at these locations. Works would be managed in accordance with standard DIT and council traffic management measures to optimise traffic flows. Any impacts would be temporary and localised and no different to those experienced during regular roadworks.

The expected impacts on road pavements due to Project traffic are in the **Minor** category. Uncertainty in the expected impact (based on incomplete understanding of current road condition) has been evaluated in Appendix M and the level of risk is **Low**.

Road treatments and upgrades

Implementation of appropriate road upgrades, turn treatments and sight distances will minimise potential impacts from the Project to road capacity and safety.

The increase in vehicle movements during a project's construction, particularly heavy vehicles, can affect road safety through greater interaction between construction vehicles and the public. The TIA assessed the road network across the Project and identified locations where treatments and upgrades may be required to maintain safety standards for both existing users and construction traffic.

Road network upgrades including turn treatments, intersection upgrades, localised road widening and pavement upgrades undertaken for the Project can also provide an ongoing benefit to local communities and travellers through improved road surfaces and safer intersections.

The TIA found that most intersections require upgrading in some capacity to accommodate construction phase traffic. All road and intersection upgrades for safe access will be undertaken in consultation with DIT (or the relevant council if occurring on a council-owned road) and in accordance with DIT standards.

Appendix J-4 provides a high-level assessment of localised road upgrades based on current condition and expected traffic (including consideration of heavy vehicle requirements) as well as proposed intersection and turn treatments for access to Project sites.

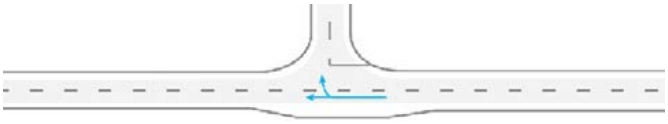
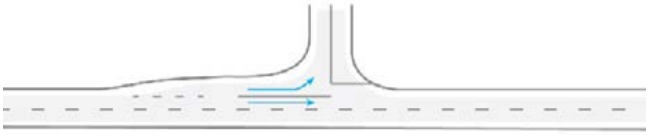
Turn treatments

The ability for existing main highway turning treatments at key Project site access points to accommodate heavy vehicles (i.e. the desalination plant, pump stations, laydown areas and key pipeline access points) was assessed in the TIA.

Key site access points considered to attract the most turn movements during construction and / or operation were assessed in accordance with the *Austroads Guide to Traffic*

Management Part 6: Intersections, Interchanges and Crossings Management (Austroads 2020). The turn treatment types relevant to the Project are shown in Table 21-16.

Table 21-16: Relevant turn treatment types

Description	Configuration
Basic turn treatment Suitable for rural locations with low cross and turning volumes.	 Basic right-turn (BAR) on the major road (two-lane, two-way road)  Basic left-turn (BAL) on the major road
Auxiliary turn treatment Suitable for rural locations where high-speed, low-volume traffic occurs and the volume and slow manoeuvring of turning traffic is sufficient to create a conflict with following traffic.	 Auxiliary left turn (AUL) on the major road CHL treatment is preferred at unsignalised intersections to ensure a clear line of sight for vehicles turning from the minor road
Channelised turn treatment Suitable when turning traffic movements are heavy with frequent queuing, and where conflicting vehicle paths need to be separated.	 Rural channelised right turn (CHR) treatment

Access to the desalination plant

- *Option 1 - Horseshoe Road / Mullaquana Road / Eight Mile Creek Road*: A turning path assessment for Option 1 was undertaken at the existing intersections of Lincoln Highway and Horseshoe Road, and Horseshoe Road and Mullaquana Road using a B-double (26 m) for the design vehicle. The assessment found that adjustments would be required to the existing treatments at both the Lincoln Highway / Horseshoe Road and the Horseshoe Road / Mullaquana Road intersection.
- *Option 2 – Lincoln Highway / new access section / Eight Mile Creek Road*: Option 2 requires a new intersection on Lincoln Highway and also a new intersection with Eight Mile Creek Road. Assessment was based on the worst case forecasted trip generation rates (i.e. during the peak construction period).

  Turn treatments proposed for the new Lincoln Highway intersection are a basic right turn treatment (BAR) and a short auxiliary left turn lane treatment (AUL(s)) (refer Table 21-16). The turn treatments for the intersection between the new section of access road and Eight Mile Creek Road will be basic left (BAL) and basic right (BAR) turn treatments, due to the very low traffic volumes anticipated to be turning onto the northern portion of Eight Mile Creek Road.

It is anticipated that additional investigation will be undertaken during detailed design including swept paths for oversize vehicles for both options (refer Appendix J-4).

Access to pump stations, pipeline, substations and transmission lines

Permanent access to pump station sites was considered in the TIA which found that upgrades would be required at the intersections of pump station access and the relevant highways. The proposed arrangement at these locations is a priority-controlled T-junction. It is anticipated that additional investigation including swept paths for oversize vehicles will also be undertaken for these sites during detailed design (refer Appendix J-4).

The access tracks to the main transfer pipeline were assessed at a high-level to determine adequate turn treatments required. As a worst-case scenario during the construction peak period (Month 17), traffic volumes would be highest for the sections of pipeline primarily accessed via the Stuart Highway. Access tracks are anticipated to be used on a temporary basis during construction and infrequently during operation and consequently turn treatments at access track intersections are expected to require BAL and BAR treatments only (refer Table 21-6).

Roads to be utilised by the Project during construction would be upgraded to a standard appropriate for the volume of traffic and the size of vehicles. Upgrades could include addition of aggregate, road grading, widening of road pavement and road sealing. The TIA identified Eight Mile Creek Road, all site access roads and access roads to main transfer pipeline (as required) for consideration for road upgrades.

Approach and safe intersection sight distance requirements

Approach site distance

Approach Sight Distance (ASD) for cars is the minimum sight distance on minor road approaches to all intersections. Trucks require a longer distance to stop than light vehicles, therefore the minimum requirements are assessed for trucks.

A preliminary ASD assessment in the TIA was undertaken using aerial imagery and indicates that the proposed access locations achieve the required ASD. However, sight distances will need to be verified by the DBOM Contractor following the selection of construction traffic routes and the identification of final access points. In particular, the ASD available for the Eight Mile Creek Road (north) approach to the proposed intersection with the new Mullaquana Station access road needs to be confirmed during detailed design.

Safe intersection sight distance

Safe Intersection Sight Distance (SISD) is the minimum sight distance that should be provided on major road approaches to all intersections.

The preliminary assessment in the TIA found that the actual SISD is expected to exceed calculated SISD requirements at Project access intersections. It was noted that this would need to be confirmed on site, particularly for the new Mullaquana Station access road approach to the proposed intersection with Eight Mile Creek Road (north), and the Lincoln Gap, Kalaya and Mangata pump stations where site distances may be obscured by bends or crests.

Following further investigation and implementation of appropriate treatments and upgrades the expected impacts to road capacity and safety due to Project traffic are in the **Negligible** category. Uncertainty in the expected impact (based on the uncertainty of location of access points) has been evaluated in Appendix M and the level of risk is **Low**.

Road safety

Potential impacts on road safety from increased traffic volumes and heavy vehicle movements will be minimised through a Road Safety Audit and implementation of the CTMP.

When major projects are proposed it is a common community perception that increased traffic, particularly from heavy vehicles within urban areas and on local roads will result in reduced road safety.

A Road Safety Audit consistent with the *Austroads Guide to Road Safety Part 7: Road Safety Strategy and Management* will be undertaken by the DBOM Contractor at proposed site access points and other locations with potential for road safety issues. The CTMP will address identified road safety risks based on known or nominated traffic movements during the construction phase.

Measures would include those described above (e.g. realignment at some locations to create perpendicular intersections and BAR turning treatments), speed management to reduce posted speed limits approaching the construction access points along the respective highways and within the construction areas, tree trimming to maintain clear sightlines and reduce hazards and signage improvements to provide clear guidance and warnings for all road users.

Safety measures will be in place within the Project traffic network so that vehicle movements are conducted in a safe manner, minimising risk to workers and the community. Measures to manage driver fatigue will be developed and incorporated into the CTMP and are expected to include:

- driver fatigue management plan and policies
- objectives to increase work, health and safety understanding in relation to fatigue, vehicle operation in public areas and obligation to the general public
- operating standards for work and rest.

Following investigation and implementation of appropriate management controls set out above the expected impacts to road safety are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Community amenity

Impacts to community amenity due to construction traffic will be managed through the Project Construction Environmental Management Plan (CEMP) and CTMP.

In addition to increased traffic volumes and the movement of heavy vehicles, Project construction traffic has the potential to temporarily affect the daily operations of residents and businesses. Disruption to normal traffic flows and access may be caused by temporary lane closures, detours, construction zones which may restrict access or require alternative

routes for residents and service vehicles, and altered traffic patterns leading to longer travel times for local road users.

Traffic disruptions will be managed in the Project CTMP. The CTMP will outline key strategies to minimise impacts, such as scheduling activities during designated hours to avoid sensitive periods and liaising with residents and businesses regarding construction timelines and expected disruptions. Impacts are expected to be short-term and minor.

Construction activities can also temporarily affect community amenity through dust emissions and noise and vibration due to an increase in traffic movements and change in the mix of vehicles, however it is expected that these impacts will be localised and limited in duration.

A CEMP will be implemented to mitigate the impacts of noise and dust emissions. Key measures include regular watering of aggregate sections to suppress dust, particularly during dry conditions, and restricting the use of engine brakes near sensitive areas to reduce noise. Proactive engagement with local communities and sensitive receptor locations will be maintained and information on construction timelines and anticipated disruptions provided. Further detail of management of air and noise emissions is provided in Chapter 18 Air Quality and Chapter 19 Noise and Vibration.

The expected impacts on community amenity from the movement of Project construction vehicles are in the **Minor** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Pipeline crossings of highways and local roads

Crossings of highways and local roads will be managed to ensure any impacts to traffic movements are short term and localised.

The main transfer pipeline is proposed to be primarily buried underground and constructed using trench and cover fill for the majority of the alignment, including road crossings. Pipeline crossing points are located on several arterial roads including the Lincoln Highway, Iron Knob Road and the Stuart Highway.

Highway crossings will most likely be constructed using trenching methodology with the pipe installed within an encasing pipe. Assessment of traffic management and safety hazards will be required in future design stages to confirm the highway crossing approach. Other sealed and unsealed road crossings would be designed as open trenched installation with pavement reinstatement which will be undertaken in accordance with DIT's specification *Pavement Reinstatement Configurations 2019*.

As traffic management measures will be put in place on roads that would be subject to open trenching, impacts due to construction activities are expected to be short-term and localised. There will be no ongoing impacts once the pipeline trench has been closed and the road surface has been reinstated.

Following implementation of appropriate management controls the expected impacts to road safety are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

Public transport, car parking, school bus routes and pedestrian / cycling access

No impacts to public transport, car parking, school bus routes and pedestrian / cycling access are expected from construction and operation of the Project.

As discussed above, significant impacts on traffic efficiency as a result of additional traffic volumes associated with the Project are not expected.

Due to the relatively low frequency of public transport in the Project vicinity and minimal overlap with Project site access routes, interactions between Project traffic and public or school bus routes are expected to be limited. Any interactions with a school bus route would be temporary and limited to the period during school terms and on school days when the presence of the bus coincides with the presence of Project-related vehicles.

As Project construction sites, laydowns and temporary accommodation camps are generally located outside urban areas and typically on pastoral land, impacts to car parking and pedestrian and cycling access from construction and operation of the Project are not expected.

The CTMP will set out measures to manage Project interactions with public transport, car parking, school bus routes and pedestrian / cycling access should they be required and will also address potential road safety risks based on known or nominated traffic movements.

The expected impacts of the Project are in the **Negligible** category and the level of **certainty** in the assessment of expected impacts is **High** (refer Appendix M).

21.6.2 Maritime operations

Sources of impact

The following Project aspects have been identified as sources of impacts to maritime operations.

- Project-related vessel movements during construction of marine infrastructure
- presence of Project marine infrastructure.

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Use of port facilities and Project vessel movements

Implementation of the Marine and Coastal Construction Environmental Management Plan (MCCEMP)will minimise impacts to marine operations due to Project construction vessel movements.

Construction of Project marine infrastructure will require the use of a number of different vessels which will be present at the marine construction site offshore from the desalination plant on Mullaquana Station for the duration of the marine infrastructure construction period.

The intake and diffuser structures will be constructed from a jack up barge[7] (JUB) moored offshore above their proposed location. The JUB and other vessels would be supported by land infrastructure likely located at the Whyalla Port. This infrastructure area would provide a point for vessels to transport personnel and construction materials to the JUB and marine construction zone, as well as accepting dredge from marine construction which would be trucked to the desalination plant site for drying and reuse. Expected vessel types and numbers are provided in Table 21-11.

Whyalla Port

The maximum number of movements at Whyalla Port by any one vessel is expected to be approximately 1 to 2 trips per day, based on total trips being evenly distributed across the construction period. The vessels are anticipated to have staggered arrivals / departures at the port, coordinated by the DBOM Contractor to pose minimal impact on port operations. Construction vessels are expected to spend the majority of time stationed at the JUB offshore work front, with port calls primarily required for mobilisation, demobilisation, crew changes and the delivery or removal of materials and equipment.

Given the limited number of vessel movements and the ability to coordinate port access with existing port users, impacts on port operations are expected to be negligible.

Whyalla Marina

Currently, Whyalla Marina is primarily used by recreational users. Minimal use of the marina is proposed during Project construction with only a single dive boat expected to require a mooring point and access. No impacts to users of the marina are expected during Project construction and operation.

Project vessel movements

Marine construction activities will occur within an existing maritime environment that includes commercial shipping associated with Whyalla Port, harbour support vessels (e.g. tugs and pilot vessels), commercial fishing vessels operating within Spencer Gulf fisheries, and recreational vessels operating from local marinas and boat ramps.

Access to and use of port facilities at Whyalla Port will be negotiated by the DBOM Contractor with the relevant management authorities to ensure impacts from the presence of Project vessels and vehicles on existing users and operations are minimised. The DBOM Contractor will engage with port operators to confirm there is adequate capacity at the port and to obtain access permits as required for the use of access roads (i.e. Shipyard Road) and the general port precinct.

Movement and navigation of Project vessels in relation to other marine users during vessel transits between Whyalla Port and the offshore work front will be managed through standard maritime navigation practices and coordination with port authorities. Project construction vessels are expected to undertake one movement per week from Whyalla Port to the marine construction work front, except for the spoil barges, which may have up to three movements per week each during the construction period. Due to the small number of Project vessels

[7] A JUB is a non-powered floating platform with legs extending into the sea floor, providing a relatively stable working platform above the sea surface away from swell and currents. The JUB legs can also be retracted from the sea floor allowing it to be moved within the work area.

expected to be present (refer Table 21-11 and Table 21-12) and the existing low level of marine vessel traffic in the vicinity of Mullaquana Station, impacts to current marine operations in the area during construction are expected to be minimal.

As discussed in Chapter 9 Use of Land and Waters, a marine exclusion zone will also be in place at the marine infrastructure construction site to avoid interactions of non-Project vessels and marine construction vessels and activities, and protect the safety of Project construction personnel and other maritime users.

No new land-based docking or launching infrastructure or facilities are proposed for the Project. As there are no known marine navigation aids present in the marine construction exclusion zone, no impacts to these structures from Project activities are expected.

The number, nature and timing of daily vessel movements at the construction site, and to and from ports and vessel launching sites will be managed through the MCCEMP developed by the DBOM Contractor. The MCCEMP will address vessel traffic management, navigation, safety and any licence or other permit requirements for marine construction works.

Operations

Operational marine vessel movements are expected to be limited to vessel trips for inspection, monitoring and maintenance of the intake and outfall structures. Following completion of construction, normal commercial and recreational maritime traffic within Upper Spencer Gulf would continue to operate under existing navigation arrangements.

During operation, approximately 15 one-way trips per year are estimated from the Whyalla Marina to the intake and outfall location. This level of activity represents a very small addition to the existing maritime traffic within the Upper Spencer Gulf (refer Section 21.4.2) and will have minimal impact on the marina and other maritime activities. Given the limited frequency and small vessel size there will be no impact to existing marine traffic conditions from operational maritime activities.

Following implementation of the MCCEMP, the expected impacts from construction and operation of the Project on marine operations are in the **Negligible** category and the level of **certainty** in the assessment of expected impacts is **High** (refer Appendix M).

Permanent presence of Project marine infrastructure

Impacts of an exclusion zone for the desalination plant marine structures on other marine activities are not expected due to the low level of marine vessel traffic.

The proposed marine desalination plant infrastructure will include intake and outfall tunnels connected to intake and outfall risers on the seabed. The tunnels will be below the seabed and will not be a source of impacts to maritime operations. However, the presence of intake and outfall structures will require an exclusion zone to protect these assets (due to their vulnerability to damage from anchors and fishing nets which can block intake screens). The exclusion zone will also ensure the safety of other marine users, however it has the potential to impact movement of non-Project marine operations and vessels.

The exclusion zone will be approximately 112 ha (or less than 0.006% of the Spencer Gulf marine waters) and will be established during construction of marine infrastructure and retained during operation (refer Chapter 9 Use of Land and Marine Waters for further detail). The exclusion zone will be clearly identified in accordance with Australian Notice to Mariners

requirements and the *Harbors and Navigation Act 1993*. Consultation will also be undertaken with relevant commercial and recreational fishing and boating stakeholders to advise of the nature and requirements for the exclusion zone to ensure that the community is fully informed. Updates to navigational marking or charts may also be required depending on the final design and location of the seabed infrastructure.

Due to the low level of marine vessel traffic in the vicinity of the exclusion zone and its small area in the context of the Spencer Gulf, impacts to vessel movements are not expected.

Following implementation of the proposed exclusion zone, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

21.6.3 Rail operations

The following Project aspect has been identified as a source of impacts to rail operations.

- pipeline crossings of railway lines.

The potential impact event resulting from this aspect of the Project is discussed below. The expected impact consequence category and an evaluation of uncertainty is also provided for this impact event.

Railway crossing methodology and consultation with railway operators will avoid impacts to freight and passenger services and railway infrastructure.

The main transfer pipeline is proposed to be primarily below ground and there are currently six locations where the pipeline will cross beneath railway lines (refer Figure 21-7). Rail crossings are proposed to be constructed via trenchless methodology, with the pipe installed within an encasing pipe. Underground pipe-laying methods allow the pipeline to be installed under the railway lines without impacting on the rails or rail operations.

All rail crossings will be pipe-jacked in accordance with Australian Standard *AS 4799 - Installation of underground utility services and pipelines within railway boundaries*, and the *Master Specification RD-EW-C3 Boring* (DIT 2019) and any other requirements detailed by ARTC and SIMEC as rail line operators. Matters requiring consideration include orientation (i.e. intersection of the track at 90 degrees), requirements for geotechnical investigations, track protection measures and track monitoring during tunnelling activities.

Pipe-jacking activities are not expected to impact on ARTC and SIMEC operations as trains can continue to operate on rail lines during construction. Additional safety and other requirements would be required if construction activities are taking place when trains are running.

The Pandurra transmission line will span across ARTC land at Lincoln Gap, although towers will not be located within railway land.

ARTC, as operator of the transcontinental rail line, and SIMEC as operator of the iron ore rail line will continue to be consulted during detailed design to ensure that design, construction and safety standards and requirements are met and that disruption to rail traffic or damage to railway infrastructure from Project construction is avoided.

Arrangements for access and maintenance of the pipeline on railway land will be agreed with the railway operators. No impacts to rail operations are expected due to operation of the pipeline.

Following implementation of required railway operator standards and requirements, the expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

21.6.4 Air operations

The following Project aspects have been identified as sources of impacts to air operations.

- use of existing airline services by the construction workforce
- presence of transmission lines near airports, registered aerodromes and private airfields

The potential impact events resulting from these aspects of the Project are discussed below. Expected impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

Movement of the construction workforce

Use of air services by FIFO construction workforce is not expected to negatively impact the capacity and cost of flights to and from Whyalla, Port Augusta and Olympic Dam.

Stakeholder engagement for the Project indicates that there is a level of community sensitivity to the potential for an increase in flight prices or freight transport costs and / or impact on the availability of flights due to use of commercial services by a Project FIFO workforce.

Although full workforce planning is yet to be undertaken, it is expected that a significant volume of the construction workforce would be comprised of FIFO workers. The proportion would vary by work package, from around 50% FIFO / DIDO at the desalination plant and 60% across the transfer system, to approximately 80% for the specialised marine and tunnelling works, while indirect labour would be sourced locally. FIFO workers are assumed to originate from Adelaide, with interstate workers connecting through Adelaide Airport before potentially travelling to Whyalla, Port Augusta or Olympic Dam (refer Social Environment Technical Report at Appendix K-1).

The TIA assessed the required movements for FIFO workers against existing passenger flight movements between Adelaide Airport and the respective airports as summarised Table 21-17.

Table 21-17: FIFO transport level of impact

Project FIFO movements (bi-weekly)	Average weekly movements (existing)	Weekly flight capacities (approx.)	Typical flight days / week	Increase in passengers	Within capacity
Whyalla Airport					
620 workers	420 passengers	1100 passengers to	7	148%	Yes

Project FIFO movements (bi-weekly)	Average weekly movements (existing)	Weekly flight capacities (approx.)	Typical flight days / week	Increase in passengers	Within capacity
		/ from Adelaide			
Port Augusta Airport					
100 workers	310 passengers	222 passengers to Adelaide, 74 passengers from Adelaide	5	32%	No
Olympic Dam Airport					
100 workers	1040 passengers	TBC	7	10%	Yes

Impacts to air travel capacity

The TIA found that the number of air passengers (from Adelaide) during construction would be significantly increased into Whyalla Airport (148%) and Port Augusta Airport (32%). Olympic Dam Airport would experience a 10% increase. It is expected that existing flight capacities for Whyalla Airport and Olympic Dam Airport (especially with the potential Olympic Dam airport expansion being planned) can absorb this increase. However, Port Augusta Airport does not currently have sufficient capacity to accommodate estimated Project FIFO workforce movements, particularly for inbound flights, and would require additional charter flights to be added to the schedule.

To manage Project workforce movements, preferred work rosters and options for transporting FIFO workers will be considered by the DBOM Contractor and the potential for additional FIFO charter services on the Adelaide-Port Augusta route investigated. As Whyalla is approximately a four-hour drive from Adelaide, it may also be feasible for Adelaide-based workers to travel by vehicles instead of by plane. Fatigue management would be a significant consideration for the DBOM Contractor in this case.

Impacts to air travel costs

Communities in the region of the Project are dependent on flights to access health and other services in Adelaide as well as to visit friends and family, for recreation and for education and work purposes. Community engagement indicates there is concern that Project demand for flights in and out of Whyalla could generate higher flight prices and / or impact on the availability of flights, particularly if there are other large projects within the region at the same time. As noted in Appendix K-1, there is some evidence to support this concern from other projects where block bookings / seat chartering have been negotiated and result in increased airfares and lower seat availability for the general public. Pricing of regular passenger flights in and out of Whyalla is managed by the carrier (i.e. Qantas Link).

Air transport planning will be undertaken by the DBOM Contractor in collaboration with airport operators, owners and carriers to ensure that potential cost and capacity impacts on the community are minimised. As there are currently no regular passenger transport flights

operating to or from Port Augusta or Olympic Dam airports, there will be no impacts on community access to affordable air travel from these two locations.

For marine works, only one helicopter approximately every 2 weeks is required on the Project during construction for crew transfers and medivac support at the JUB. Due to the low number of expected helicopter movements, no impact on existing air operations is expected.

As operational personnel are likely to reside in the region, there will be no ongoing impacts to airport operations due to a FIFO workforce.

Potential benefits to regional air services

Engagement with airport operators indicates that increased demand for services due to the Project has the potential to enhance the viability of existing services, through increasing service regularity, and reducing the incidence of cancelled flights due to poor patronage. Increased demand also has the potential to attract additional services and carriers, opening up new options that would be of benefit to the community (refer Appendix K-1).

Whyalla Airport is included in the Eyre Peninsula's Regional Airports Strategy prepared by Regional Development Australia (RDA Eyre Peninsula, 2025) which focuses on improvement in operational performance, expansion of routes, and investment in infrastructure. Similarly, the Port Augusta Infrastructure for Growth Strategy (RDA Far North, 2025) highlights the opportunity for increased economic development in the Far North to provide a catalyst for the reinstatement of passenger services that ceased in 2017 and 2020. The Project has the potential to be a catalyst for the achievement of these strategies and provide opportunities to work in partnership with the regional airports to deliver improved air services to the region.

The expected impacts are in the **Negligible** category. Uncertainty in the expected impact (due to uncertainty in the eventual level of demand for air services by the FIFO workforce and the response by airline and airport operators) has been evaluated in Appendix M and the level of risk is **Low.**

The presence of transmission lines near airfields

The potential for wire strike or other collision with transmission lines by low flying aircraft will be mitigated through industry standard controls (e.g. marking of transmission line conductors), consultation with CASA and operation of air safety regulations.

The construction and presence of the transmission towers and conductors have the potential to impact aerial activities such as mustering, baiting and firefighting. Tall structures such as transmission towers near airports, airfields and landing strips can impact the flight paths of arriving and departing aircraft. The new and existing transmission lines proposed in the vicinity of the Project are described in Chapter 9 Use of Land and Marine Waters.

Transmission conductors [8] have low visibility from the air (i.e. with a land background) when compared to conductors viewed from the ground with a sky background. Night flying and low cloud also create the potential for collision with either towers or conductors.

The proposed Mullaquana transmission line and substation will be located in open country where existing electricity infrastructure includes the 132 kV Cultana-Yadnarie section of EP

[8] Transmission conductors, commonly referred to as 'power lines' or 'wires', are the metal cables that carry high voltage electricity over long distances.

Link and SA Power Networks powerlines. There are no known airstrips or airfields in the vicinity of the new Mullaquana transmission line. Proposed Project transmission lines at Lincoln Gap (Pandurra), Kalaya (Bookaloo) and Mangata (Oakden Hills) pump stations are in close proximity to the existing 132 and 275 kV transmission lines which supply power to mines and communities in the Upper Spencer Gulf and Far North.

The new transmission lines are of similar height to the existing transmission lines (45 - 60m) and the 33kV Oakden Hills line is of smaller scale (30 – 40m) (note, heights to be confirmed as part of detailed design). No new impacts are expected to the use of local airstrips and the conduct of aerial operations due to the presence of the new transmission lines. There are no transmission lines proposed within the Airport Building Heights Aircraft Landing Area and the Building Near Airfields Overlays in the Planning and Design Code (refer Figure 21-8).

Pilots using local and private airfields in and around transmission line corridors are required to adhere to aviation rules and regulations which would mitigate against potential collision with new and existing infrastructure. Pilots also undertake risk assessments prior to flight which would include ascertaining the location of powerline structures. Pilots undertaking aerial operations are generally specialists trained in low-level flying and must be appropriately licenced by the CASA.

The Royal Australian Air Force (RAAF) and Airservices Australia will be notified of all Project structures above 30 m. The potential for wire strike or other collision with transmission lines by low flying aircraft will be mitigated through marking of transmission line conductors, consultation with CASA and operation of air safety regulations.

The expected impacts of the presence of transmission lines on aerial activities and local airfields are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer Appendix M).

21.7 Summary of Key Mitigation Measures

21.7.1 Road operations

The following mitigation measures are subject to detailed design and will be confirmed in post approval management plans (including the CTMP, CEMP and OEMP).

The DBOM Contractor will develop a detailed CTMP to safely manage traffic during all construction phases. Requirements that may be addressed in the CTMP are detailed in Table 21-18 subject to detailed design, while some mitigation measures will be dependent on final Contractor decisions in relation to workforce management and supply chain selection. Further detail of mitigation measures is provided in the TIA (Appendix J-4).

Table 21-18: Key mitigation measures – road operations

Mitigation measure	Construction	Operation
CTMP prepared by an accredited professional in consultation with DIT and relevant councils will address: • detailed traffic management strategies for the proposed Project site access points based on vehicle types and sizes, and traffic frequency and routes, including turning treatments and temporary traffic management	✓	

Mitigation measure	Construction	Operation
• swept path assessments for all bends in the haulage routes and all turns at intersections along the haulage routes • requirements for pre- and post-construction road dilapidation surveys and pre-construction road upgrades • a plan for routine inspections and repairs of road infrastructure identification of specific routes to minimise impacts to road surfaces and community disruption • measures to manage the presence of OSOM vehicles in urban areas • movement frequencies and volumes of construction vehicles • delivery schedules and construction vehicle access routes • designated haulage routes, timing restrictions and signage • driver fatigue management		
Road safety audit undertaken on the proposed Project site access points in accordance with the *Guide to Road Safety Part 7: Road Safety Strategy and Management* (Austroads 2021)	✓	

21.7.2 Maritime operations

Table 21-19: Key mitigation measures – maritime operations

Mitigation measure	Construction	Operation
Negotiation of access to and use of port facilities at Whyalla by the DBOM Contractor to ensure impacts from the presence of Project vessels and vehicles on existing users and operations are minimised	✓	✓
MCCEMP addressing vessel traffic management, navigation, safety and any permit requirements for marine construction works	✓	

21.7.3 Rail operations

Table 21-20: Key mitigation measures – rail operations

Mitigation measure	Construction	Operation
Use of trenchless construction method for pipeline crossing of rail lines	✓	
Pipe-jacking to comply with *Australian Standard AS 4799 - Installation of underground utility services and pipelines within railway boundaries*, and the Master Specification RD-EW-C3 Boring (DIT, 2019)	✓	
Consultation with railway owners and contractors to ensure to ensure design, construction and safety standards and requirements are met and railway operations are not disrupted	✓	✓

21.7.4 Air operations

Table 21-21: Key mitigation measures – air operations

Mitigation measure	Construction	Operation
Air transport planning to be undertaken in collaboration with airport operators and owners, together with carriers to ensure the capacity of air services for the Project whilst minimising impacts on the community	✓	
Consultation with CASA	✓	✓
Reporting of infrastructure above 30 m to RAAF and Airservices Australia	✓	✓
Marking of transmission line conductors	✓	✓

21.8 Conclusion

Impacts to traffic movements and road capacity from Project construction and operational activities are expected to be minimal with no impact to road capacity on key access routes.

Traffic impact on roads in parts of the Whyalla and Port Augusta urban areas is also expected to be minimal although there may be an observable increase in traffic volumes during the construction phase, creating public perceptions of road safety. A Construction Transport Management Plan will be developed by the DBOM Contractor in consultation with DIT, relevant councils and local police to minimise the impacts of increased light and heavy vehicle movements on highways, within urban areas and on local roads.

A new access to the Mullaquana Station desalination plant site is proposed which will minimise the Project's impacts in the suburb of Mullaquana by diverting traffic to the Lincoln Highway. Development of turn treatments is likely to be required for safe access at Project site access intersections on the Lincoln, Eyre, Stuart and Olympic Dam highways. A road safety audit may also be undertaken of Project site access to assess whether further treatments and traffic controls may be required.

Although the potential for interaction with other maritime users is low, a MCCEMP will be developed and implemented to minimise impacts from the presence of Project construction vessels. A marine exclusion zone will ensure the safety of Project personnel, other marine users and protect Project infrastructure.

Impacts to railway freight and passenger services are not expected. Railway crossing methodology and timing will be developed in consultation with railway operators to ensure design, construction and safety standards and requirements are met.

A significant volume of the construction workforce would be comprised of FIFO workers who would fly in via Whyalla Airport and potentially Port Augusta and Olympic Dam. Current average passenger loading data indicates capacity to absorb potential extra passenger numbers from a FIFO construction workforce.

Overall, impacts to road, maritime, rail and air operations on Upper Spencer Gulf and the Far North from construction and operation of the Project are expected to be Negligible to Minor. Expected impacts can be readily managed through implementation of the construction management plans developed in consultation with relevant transport operators.



Chapter 22

Economic Environment

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

22 ECONOMIC ENVIRONMENT 22-1

22.1 Key Findings 22-1

22.2 Setting the Context 22-1

22.2.1 Requirements in legislation and other standards 22-2

22.2.2 Views of stakeholders 22-2

22.3 Assessment Method 22-3

22.3.1 Economic impact assessment study area 22-3

22.3.2 Regional economy baseline 22-4

22.3.3 Economic appraisal approach 22-4

22.4 Existing Regional and Local Economic Environment 22-6

22.4.1 Population and growth 22-6

22.4.2 Employment 22-7

22.4.3 Gross State Product 22-9

22.4.4 Gross Regional Product 22-9

22.4.5 Commercial fisheries and aquaculture 22-14

22.4.6 Tourism 22-18

22.4.7 Local businesses 22-20

22.5 Assessment of Economic Impacts and Benefits 22-22

22.5.1 Project Cost Benefit Analysis 22-22

22.5.2 Computable General Equilibrium modelling of economic impact 22-25

22.5.3 Assessment of key economic impacts 22-29

22.5.4 Key economic benefits 22-34

22.6 Conclusion 22-37

LIST OF TABLES

Table 22-1: Resident population 2021 and 2025 for study area SA2s 22-6

Table 22-2: Resident population projections up to 2041 for EIA study area SA2s 22-7

Table 22-3: Industries of employment in the study area (2021 Census) 22-8

Table 22-4: South Australian Gross State Product 2020-2025 22-9

Table 22-5: Summary of Gross Regional Product 2024-2025 22-9

Table 22-6: Key seafood industry figures 22-14

Table 22-7: Fisheries in the EIA study area 22-16
Table 22-8: Aquaculture value of production in the Eyre Peninsula Region, 2022-23 22-18
Table 22-9: Summary of quantifiable benefits 22-23
Table 22-10: Summary of qualitative benefits 22-24
Table 22-11: Modelled Northern South Australia and State results 2026-2062 22-26
Table 22-12: Summary of average sectoral impacts, Northern South Australia, 2026-2062 22-27
Table 22-13: Modelled national impacts 2026-2062 22-29

LIST OF FIGURES

Figure 22-1: Economic impact assessment study area - SA2 areas relevant to the Project 22-5
Figure 22-2: Study area population 2021 and 2041 by SA2 22-7
Figure 22-4: RDA Eyre Peninsula region - agriculture contribution to South Australia 2024-25 22-10
Figure 22-5: RDA Far North region mining contribution to South Australia 2024-25 22-11
Figure 22-6: RDA Far North region agriculture contribution to South Australia 2024-25 22-12
Figure 22-7: RDA regions relevant to the Project 22-13
Figure 22-8: Real value of production for wild catch – South Australia 1998-99 to 2023-24 22-14
Figure 22-9: Real value of production for aquaculture – South Australia 1998-99 to 2023-24 22-15
Figure 22-10: Eyre Peninsula Region – total registered businesses by industry 2025 22-21
Figure 22-11: Far North Region – total registered businesses by industry 2025 22-21
Figure 22-12: City of Whyalla - registered businesses by industry 2025 22-22
Figure 22-13: Estimated average deviation in value added by sector 2026-2062 22-28

22 ECONOMIC ENVIRONMENT

The Project is designed to support economic growth through the provision of a new, sustainable, climate resilient water source for industry in the Upper Spencer Gulf and the Far North regions of South Australia. In maximising the economic benefits of the Project across these regions and the State more broadly, there is also a commitment to reducing or avoiding potential negative economic impacts.

This chapter describes the existing local and regional economic environment and provides an assessment of the key predicted economic impacts of construction and operation of the Project. Relevant aspects of the South Australian and national economies are also described.

The social and economic environments potentially impacted (both positively and negatively) by a major infrastructure project are generally inter-related. Accordingly this chapter should be read in conjunction with Chapter 23 Social Environment and the Project-specific Social Impact Technical Report attached at Appendix K-1.

22.1 Key Findings

- The Project[1] will have a significant economic benefit to the local communities in the Upper Spencer Gulf and Northern South Australia[2] with a State benefit to cost ratio (BCR) of 1.25, and to the Australian economy with a national BCR of 1.75 (meaning the benefits outweigh the costs at both the State and national level).
- Between 2026 and 2062, Gross Regional Product (GRP) in Northern South Australia has the potential to be approximately $3 billion larger on average and Gross State Product (GSP) $3.3 billion larger on average as a result of the Project.
- In average annual terms, between 2026 and 2062, an additional 2,000 Full Time Equivalents (FTEs) are expected to be employed across South Australia, with 1,600 in Northern South Australia.
- Economic impacts to commercial fisheries and aquaculture from construction and operation of the desalination plant are expected to be negligible.
- Ongoing engagement with local business, workforce and industry stakeholders will maximise local employment, procurement and business participation in the Project.

22.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effects of the Project on local, regional and State economies. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

[1] Key findings in relation to BCR, GDP and other economic measures are subject to the selection of the preferred option (see Section 22.5.1). This option has formed the basis of the Reference Design and is 'the Project' for the purposes of the EIS assessment.

[2] For this assessment 'Northern South Australia equates to the Regional Development Regions of Eyre Peninsula and Far North.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline economic values and to undertake the assessment of impacts and benefits is set out in Section 22.3.

22.2.1 Requirements in legislation and other standards

There are no legislative requirements or standards specifically relating to assessing economic impact in South Australia. The following guidance was considered in the assessment:

- Infrastructure SA's *Impact Analysis Guide Cost-Benefit Analysis 2022* for a cost-benefit analysis (Infrastructure SA 2022)
- Infrastructure Australia's *Guide to Economic Appraisal* (Infrastructure Australia 2021b)
- SA Department of Treasury and Finance *Guidelines for the evaluation of public sector initiatives, Part A Overview* (DTF 2014).

22.2.2 Views of stakeholders

Stakeholder views regarding socio-economic matters are also discussed in Chapter 23 Social Environment and in the Project-specific Social Impact Technical Report provided at Appendix K-1.

The Project has received significant interest from industry, business and local communities. Across the life of the Project, many stakeholders have expressed general support due to the potential for growth in the regional economy, future industrial development and employment during construction and operation. However, concerns have also been raised in relation to delivery of tangible local employment and business participation outcomes, while also protecting industries such as commercial fishing, aquaculture, tourism, agriculture and associated local supply chains.

Issues relating to the economic impact assessment which have been raised during community engagement include:

- realising benefits of the Project for the Upper Spencer Gulf and Far North which contribute to long term regional resilience and economic capacity beyond the construction phase
- maximising local workforce participation and ensuring meaningful access for local and regional businesses throughout procurement and delivery
- how the Project could contribute to broader workforce development initiatives, including apprenticeships, skills transfer opportunities, and Aboriginal employment and procurement pathways
- protection of commercial fishing licence areas, aquaculture operations, access to key fishing grounds and impacts to key commercial species within the Upper Spencer Gulf

- protection of the Upper Spencer Gulf marine environment and tourism values, particularly in relation to the Giant Australian Cuttlefish.

Further details of stakeholder engagement and community consultation outcomes is provided in Chapter 4 Community and Stakeholder Engagement and Appendix D-2.

22.3 Assessment Method

The method for undertaking the economic impact assessment was consistent with the approach used throughout this EIS. The assessment considers the benefits and impacts that are expected to occur as part of the construction and operation of the Project.

The assessment in the chapter was prepared using information provided by the Proponent and included the following steps:

1. Identification of the economic impact assessment (EIA) study area
2. Description of the regional economy baseline
3. Review of relevant specialist reports (including the Social Impact Technical Report (Planning Futures 2026), Traffic Impact Assessment (GHD 2026a), Air Quality Impact Assessment (Jacobs 2026e), and a revised project business case.
4. Undertaking a cost-benefit (risk return) analysis (CBA)
5. Undertaking economic Computable General Equilibrium (CGE) modelling to assess the economy-wide impact of the development of the construction and operation of the preferred capacity option including changes to Gross Regional Product (GRP), Gross State Product (GSP) and employment growth
6. Assessment of potential economic impacts and benefits at local, regional and State level.

22.3.1 Economic impact assessment study area

A study area was defined for the purposes of the EIA based on the Australian Bureau of Statistics (ABS) classifications for Statistical Area 2 (SA2) as these have most of the baseline economic data available at this level. The following SA2 areas were selected where they apply to the proposed location of Project infrastructure or are important regional economic centres:

- Whyalla - Whyalla North
- Port Augusta
- Port Pirie
- Kimba – Cleve – Franklin Harbour
- Quorn - Lake Gilles
- Outback
- Roxby Downs / Olympic Dam

Where required (depending on the data available), other data sources have also been referenced including Regional Development Australia (RDA) regions and Local Government Areas (LGAs).

Figure 22-1 below shows the key SA2 Areas for the Project. Whyalla, Port Augusta and Port Pirie are the major population centres of the study area while Roxby Downs is an important service centre in the far north area of the Project. Whyalla is the closest population centre to the desalination plant at Mullaquana Station and will be the primary staging point for movement of construction personnel, materials and equipment, both by road and sea. A significant number of workers are likely to be accommodated in the Whyalla area during the construction phase.

Fisheries and aquaculture

An EIS Marine Study Area (MSA) has been defined for the purposes of assessment of a range of potential marine impacts including economic impacts to commercial fisheries and aquaculture. This area is broadly defined as a 2.5 km buffer around the Project infrastructure footprint, extending approximately 5 km along the shoreline and out to approximately 7 km offshore. A map of the MSA is provided in Chapter 11 Marine Environment.

Tourism

The assessment references the Eyre Peninsula[3] and Flinders Ranges and Outback[4] tourism regions.

22.3.2 Regional economy baseline

A baseline for the assessment of economic impacts and opportunities was established using desktop research and in response to stakeholder engagement. This baseline research is summarised in Section 22.4.

ABS and other data have been utilised to provide a baseline addressing population and growth, industry of employment, GSP and GRP, commercial fisheries /aquaculture, tourism and local businesses. The data referred to in the economic impact assessment in this chapter should also be read in conjunction with more detailed demographic data provided in the Social Environment Technical Report provided at Appendix K-1.

22.3.3 Economic appraisal approach

Two forms of economic appraisal have been undertaken - a cost benefit analysis (CBA) and computable general equilibrium (CGE) modelling.

A CBA is used to systematically analyse the estimated economic, social and environmental costs and benefits of a project. The analysis provides a quantitative evaluation in monetary terms (where practicable), of the outcomes of options considered for the Project.

CGE modelling assesses the economy-wide economic impact of the Project on key economic metrics including GSP / GRP, employment at the sub-regional level, and sectoral analysis of value added and employment. CGE modelling captures both the direct impacts of the Project (e.g. construction and operation of the desalination plant; increased production from additional water supply) and the indirect flow-on impacts to other sectors. This includes positive impacts to supporting sectors, and adverse 'crowding out' effects on other sectors. The CBA and CGE are summarised in Section 22.5.1 and Section 22.5.2.

[3] https://www.eyrepeninsula.com/

[4] https://flindersandoutback.com.au/

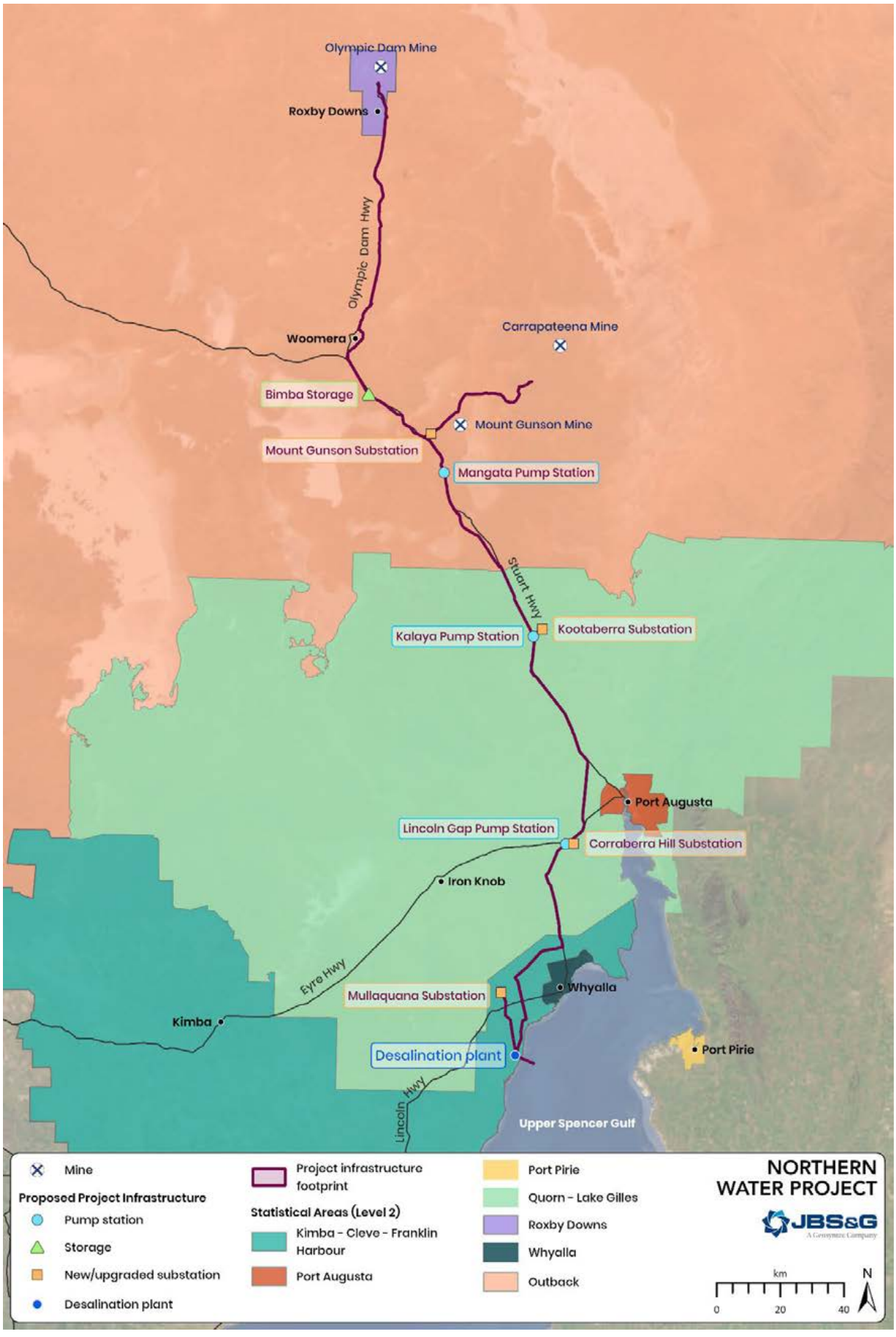


Figure 22-1: Economic impact assessment study area - SA2 areas relevant to the Project

22.4 Existing Regional and Local Economic Environment

22.4.1 Population and growth

At the time of the Census of Population and Housing 2021 (2021 Census), the population counted at home for the EIA study area (SA2 areas) comprised 3.8% of South Australia's total population, with most people (81%) residing in Whyalla, Port Augusta and Port Pirie. Further detailed demographic data is provided in Chapter 23 Social Environment and the Social Environment Technical Report at Appendix K-1.

The population statistics for the EIA study area are shown in Table 22-1 for the data period December 2021 to September 2025. Between 2021 and 2025, populations within the SA2 areas mostly decreased or remained approximately the same - the most notable reduction being in the Outback SA2 (7.6%). During this time, the population of South Australia grew by 5.6%, indicating that the population within the EIA study area is not growing in the same manner as South Australia as a whole.

Table 22-1: Resident population 2021 and 2025 for study area SA2s

Location (SA2)	2021	2025	2021-25 % change
Whyalla / Whyalla North	21,868	21,641	-1.0%
Port Augusta	14,125	14,134	+0.1%
Port Pirie	14,297	14,195	-0.7%
Kimba-Cleve-Franklin Harbour	4,286	4,362	+1.8%
Quorn - Lake Gilles	2,197	2,170	-1.2%
Outback	2,099	1,939	-7.6%
Roxby Downs/Olympic Dam	4,115	4,089	-0.6%
Total	62,987	62,530	-0.6%
South Australia	*1,806,599*	*1,908,182*	*+5.6%*

Source: www.abs.gov.au/statistics/people/population/regional-population/latest-release#south-australia

Population projections

The State government provides population projections at different geographic levels which are updated every five years, following the release of final figures from the most recent Census of Population and Housing published by the ABS (GoSA 2024e).

Projections for the population in South Australian SA2 areas applicable to the Project from 2021 to 2041 are shown in Table 22-2. The three main population centres are forecast to increase in population over this period, with Whyalla projected to be in the top 5 highest growth SA2s in Country SA. Population in Whyalla is influenced by the operations of the Whyalla Steelworks, which is the main employer in the region and growth in the Whyalla region is expected to be driven by jobs in the steel and mining sector and renewables (GoSA 2024e).

The population decline in the Outback and Quorn-Lake Gillies SA2s is forecast to continue out to 2041, with external migration expected to larger centres such as Port Augusta and Whyalla. Population growth of Roxby Downs is predicted to remain stable at current levels.

Table 22-2: Resident population projections up to 2041 for EIA study area SA2s

Location (SA2)	2021 population	2041 projection	2021-2041 % change
Whyalla-Whyalla North	21,868	23,595	+7.9%
Port Augusta	14,125	14,770	+4.6%
Port Pirie	14,297	14,752	+3.2%
Kimba-Cleve-Franklin Harbour	4,286	4,617	+7.7%
Quorn-Lake Gilles	2,197	1,903	-13.4%
Outback	2,099	1,961	-6.6%
Roxby Downs-Olympic Dam	4,115	4,129	+0.3%
Total	62,987	65,727	+4.3%

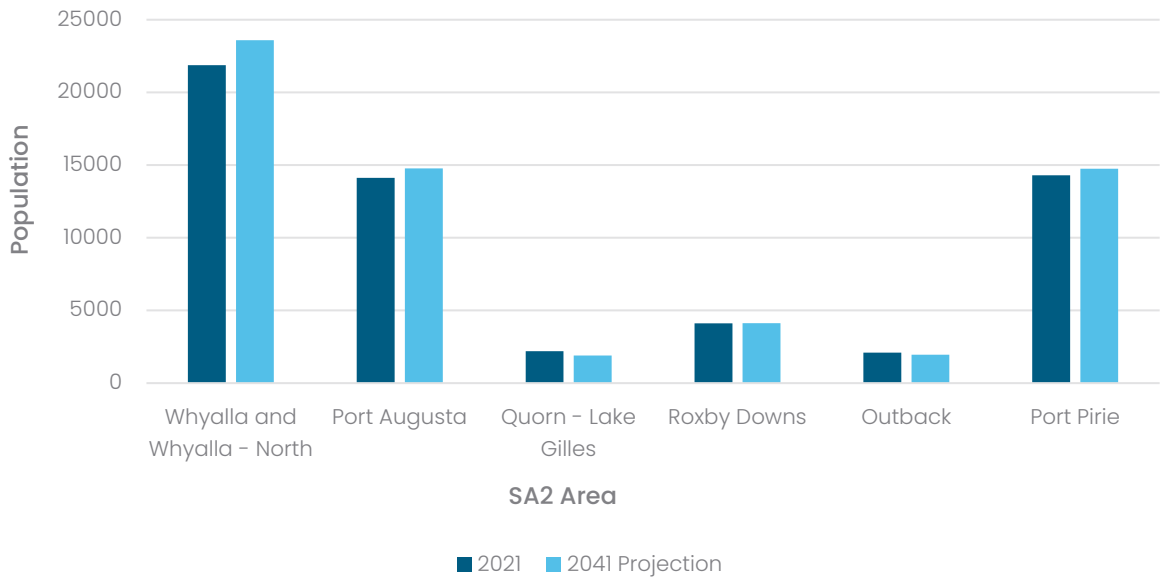


Figure 22-2: Study area population 2021 and 2041 by SA2
[Source: GoSA 2024e]

22.4.2 Employment

The ABS Census Community Profiles provide information on where employed people over the age of 15 worked in the week prior to Census night. As of the 2021 Census, 27,703 people aged over 15 years were employed within the EIA study area. The number of employed people and the top industries of employment across the EIA study area at the time of the 2021 Census are summarised in Table 22-3.

Across the EIA study area, Mining, Iron Ore Smelting, Heavy and Civil Engineering Construction and supporting industries were the largest industries of employment, (particularly in the Whyalla, Port Pirie and Roxby Downs SA2 areas), employing close to 12% of the workforce[5].. Healthcare, Social Assistance, Education and Retail are the next largest industries of employment across the study area, employing approximately 11% of the workforce. Healthcare and social assistance workers are concentrated in the population centres of Whyalla, Port Augusta and Port Pirie.

With the exception of mining in the Roxby Downs / Olympic Dam SA2 area, livestock production is the predominant land use in the SA2 areas of the Far North region of the study area.

More than 27% of the people who work in the EIA study area are employed in four sectors - mining, healthcare and social assistance, retail and agriculture.

Table 22-3: Industries of employment in the study area (2021 Census)

Location SA2 and labour force numbers	Top of industries of employment (%)
Whyalla-Whyalla North • 9,577 (55.2%) in the labour force	Iron Smelting and Steel Manufacturing (13%) Hospitals (6%) Supermarkets and Grocery Stores (4%) Iron Ore Mining (4%) Aged Care Residential Services (3%)
Port Augusta • 5,830 (53%) in the labour force	Hospitals (6%) Correction and Detention Services (4%) Other Social Assistance Services (4%) Supermarket and Grocery Stores (4%) Primary Education (4%)
Port Pirie • 5,949 (51.6%) in the labour force	Copper, Silver, Lead and Zinc Smelting and Refining (11%) Hospitals (6%) Aged Care Residential Services (4%) Other Social Assistance Services (4%) Supermarket and Grocery Stores (4%)
Kimba-Cleve-Franklin Harbour • 1,978 (57.9%) in the labour force	Grain-Sheep or Grain-Beef Cattel Farming (12%) Other Grain Growing (10%) Hospitals (6%) Combined Primary and Secondary Education (6%) Sheep Farming (specialised) (3%)
Quorn-Lake Gilles • 957 (51.0%) in the labour force	Sheep Farming (specialised) (8%) Hospitals (7%) Combined Primary and Secondary Education (4%)

[5] The data discussed in this chapter pre-dates the recently announced closure of the blast furnace at the Whyalla Steelworks. It is acknowledged that the closure potentially constitutes a significant change to the economic baseline which the assessment in this chapter has assumed, particularly regarding employment, population growth and value of the regional economy.

Location SA2 and labour force numbers	Top of industries of employment (%)
	Accommodation (4%) Local Government Administration (4%)
Outback • 1,110 (62.2%) in the labour force	Sheep Farming (specialised) (13%) Beef Cattle Farming (specialised) (12%) Accommodation (5%) Copper Ore Mining (5%) Other Mining Support Services (4%)
Roxby Downs-Olympic Dam • 2,302 (78%) in the labour force	Copper Ore Mining (39%) Other Heavy and Civil Engineering Construction (4%) Supermarket and Grocery Stores (3%) Combined Primary and Secondary Education (3%) Labour Supply Services (3%)

22.4.3 Gross State Product

Over the past five years, South Australia has experienced average GSP growth of 3%. South Australia's GSP showed a strong rebound in 2020–21, then settled into modest, positive growth through to 2024–25. Growth peaked at +5.1% in 2021–22 (attributable to the post-pandemic recovery) and has slowed but remained positive (although below the national average) at 1% in 2024–25 (refer Table 22-4).

Table 22-4: South Australian Gross State Product 2020-2025

Unit	2020-21	2021-22	2022-23	2023-24	2024-25
GSP ($m)	$114,921 m	$124,252 m	$134,209 m	$142,175 m	$151,803 m
Annual growth (SA)	3.9%	5.1%	3.8%	1.2%	1.0%
Annual growth (Aust)	1.5%	3.6%	3.0%	1.4%	1.4%

Source: www.treasury.sa.gov.au/Growing-South-Australia/economic-briefs

22.4.4 Gross Regional Product

Gross Regional Product (GRP) is a measure of size or net wealth generated by the local economy. Changes in this figure over time can represent changes in employment, productivity or the types of industries in the area. To assess the State's GRP, data from RDA regions have been used. The relevant regions for the purposes of the EIA assessment are the Eyre Peninsula and Far North RDA regions (refer Figure 22-7). The 2024-25 GRP data for these regions is summarised in Table 22-5.

Table 22-5: Summary of Gross Regional Product 2024-2025

RDA Region	GRP 2024-25	% State GRP	Main Industry sectors
Eyre Peninsula (SA2 areas Whyalla - Whyalla North, and Kimba-Cleve-Franklin Harbour)	$4.0 billion	2.7%	Agriculture, Forestry and Fishing (21%) Manufacturing (19%) Construction (14%)

RDA Region	GRP 2024-25	% State GRP	Main Industry sectors
Far North (SA2 areas Outback, Roxby Downs, Port Augusta and Quorn-Lake Gilles)	$4.5 billion	3.0%	Mining (64%) Construction (14.5%) Agriculture, Forestry and Fishing (2.9%)

[Source: economy.id 2026]

RDA Eyre Peninsula Region

The RDA Eyre Peninsula region is one of South Australia's most productive regions generating over $4 billion in GRP annually. The region has well-established agriculture, commercial fishing and aquaculture industries, exporting (on average) over 90% of grain and over 80% of seafood production. The region also has an abundance of wind, solar, copper, graphite, and other rare-earth resources (RDA SA 2024).

Agricultural activities in the RDA Eyre Peninsula region ranges from broad-hectare agricultural production with largely mixed cereal and livestock grazing on annual pastures to intensive cropping in the more reliable rainfall areas with pulse and oilseed crops in the rotations. Cropping and grazing account for 80% of land uses for the region.

The largest contributor to GRP in the RDA Eyre Peninsula region (by industry sector) is Agriculture, Forestry and Fishing which accounted for almost a quarter of the region's output ($1.6 billion in 2024-25). Agriculture made up 21% of this output, with Fishing, Hunting and Trapping and Aquaculture contributing 5%. Manufacturing ($1.5 billion) and Construction ($1 billion) were also major outputs (economy.id 2026). The contribution of Agriculture in the RDA Eyre Peninsula region to the South Australian economy is shown in Figure 22-4.

Whyalla is the largest population centre in the RDA region and the EIA study area. In the Whyalla LGA construction was the largest output by industry, generating $489 million in 2024-25 (economy.id 2026).

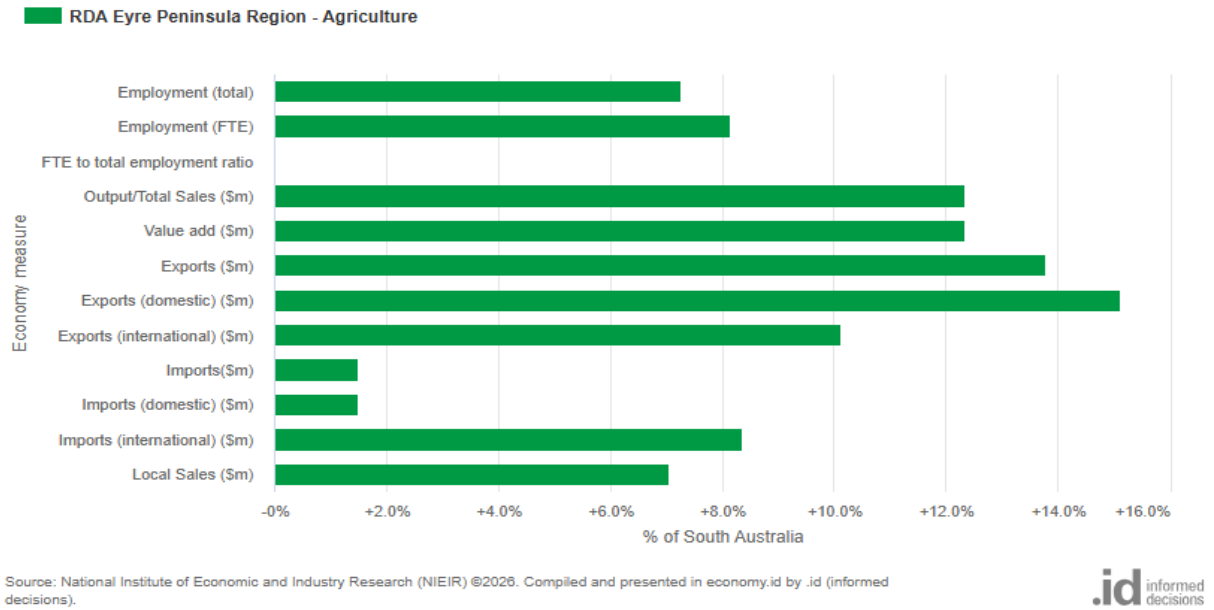


Figure 22-3: RDA Eyre Peninsula region - agriculture contribution to South Australia 2024-25

RDA Far North Region

The RDA Far North region's GRP was $4.5 billion in the year ending June 2025, representing 3.0% of South Australia's GSP (refer Table 22-5). Roxby Downs contributes approximately $1.8 billion or 26.4% of the Far North's GRP. Port Augusta is the largest population centre in this region and is estimated to contribute approximately $1 billion to the RDA GRP (REMPLAN 2026).

GRP in the region is dominated by Mining (including exploration and other mining support services). Construction, largely involving heavy and civil engineering construction is another significant contributor (economy.id 2026). The RDA Far North region has experienced the highest growth of any region in headline GRP, driven by record copper production and increased activity by magnetite explorers. (RDA SA 2024). The contribution of Mining in the RDA Far North region to the South Australian economy is shown in Figure 22-5.

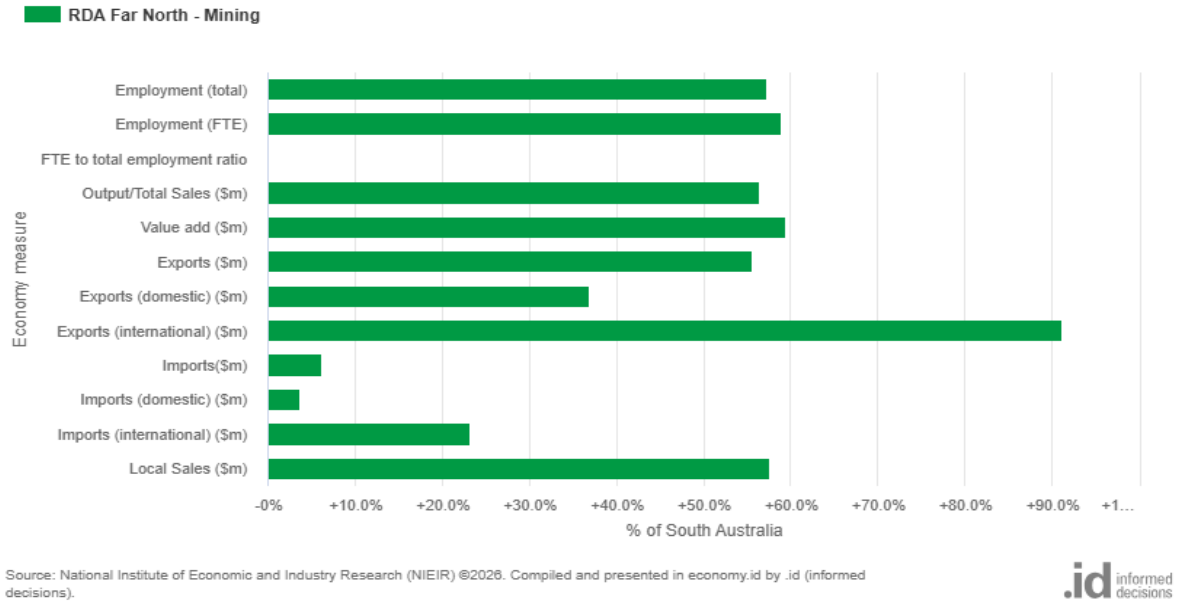


Figure 22-4: RDA Far North region mining contribution to South Australia 2024-25

Agriculture activities in the RDA Far North region are primarily focussed on extensive livestock grazing, with more than 400,000 km^2 taken up by pastoral stations held under pastoral leases. Sheep and cattle graze at low stocking rates over a range of native pasture systems, producing wool, meat and live export commodities. In the most southern parts of the region some mixed cropping and livestock grazing is also undertaken. The output of Agriculture in the Far North in 2024-25 was $286 million. The contribution of Agriculture in the RDA Far North region to the South Australian economy is shown in Figure 22-6.

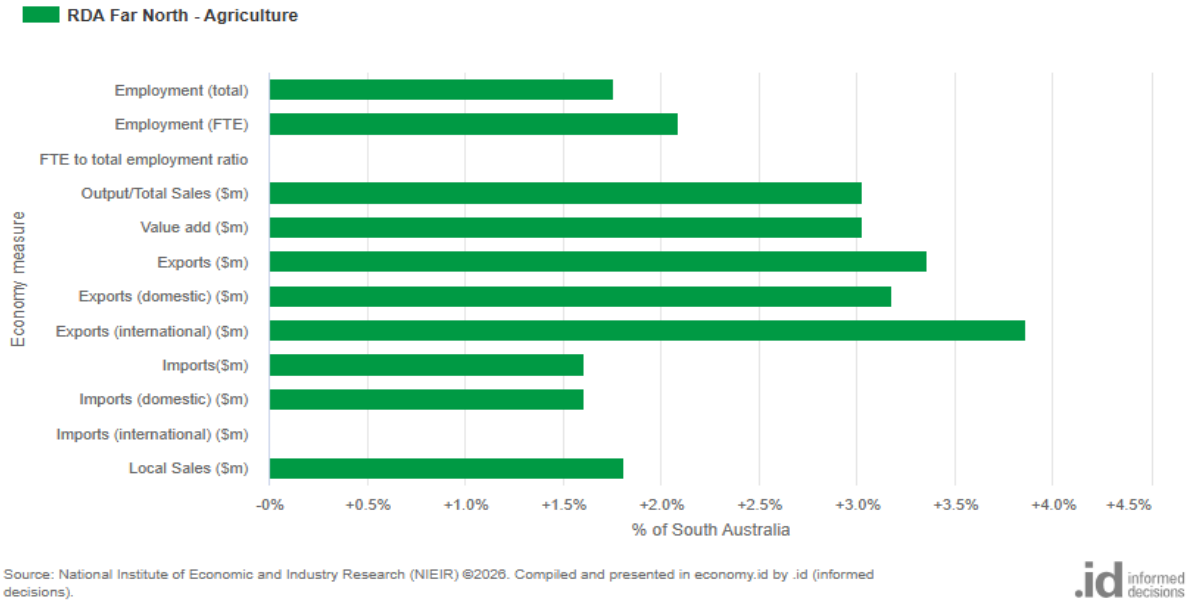


Figure 22-5: RDA Far North region agriculture contribution to South Australia 2024-25

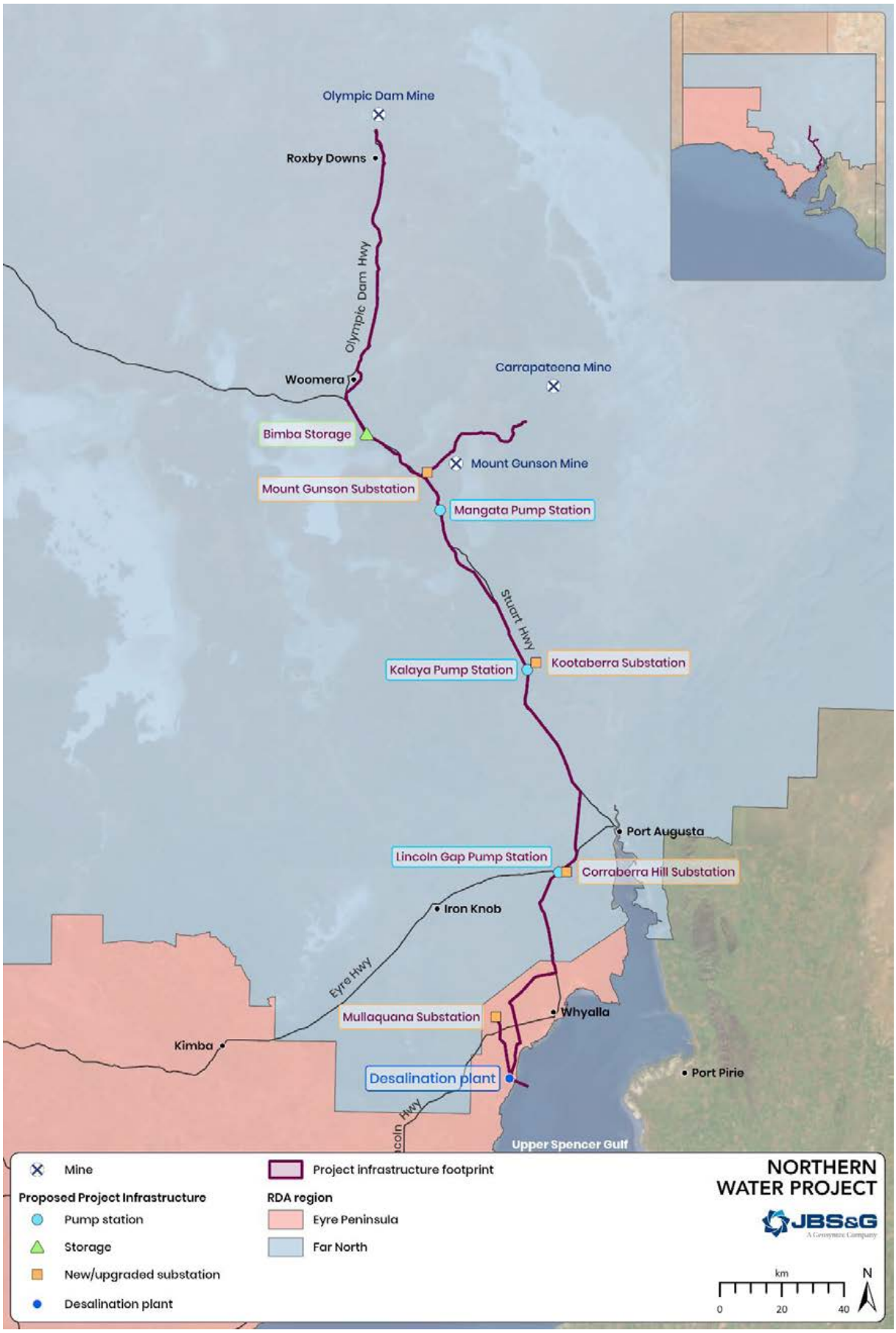


Figure 22-6: RDA regions relevant to the Project

22.4.5 Commercial fisheries and aquaculture

There is a wide range of commercial fisheries and seafood processors in South Australia, producing high value products, including Southern Rock Lobster, Southern Bluefin Tuna, oysters, mussels, prawns, abalone and Yellowtail Kingfish (PIRSA 2025b). The value of the South Australian seafood industry (including both wild catch and farmed product) is set out in Table 22-6.

Table 22-6: Key seafood industry figures

Value	2023-24	Average 2019-20 to 2023-24
Revenue	$522 million	$490 million
Primary production value	$470 million	$440 million
Processed value	$522 million	$490 million
Oversea export value	$218 million	$215 million
Interstate export value	$234 million	$190 million

(Source: PIRSA 2025b)

In 2023-24, the South Australian Rock Lobster fishery was the highest value wild catch, contributing $104 million in real value in 2023-24. Other finfish contributed $46 million while the Prawn fishery contributed $27 million. The real value of wild catch production in South Australia is shown in Figure 22-8.

Tunas and oysters are the major aquaculture contributors in terms of real value of production with Tunas contributing $79 million and oysters $59 million in 2023-24. The real value of aquaculture production in South Australia is shown in Figure 22-9.

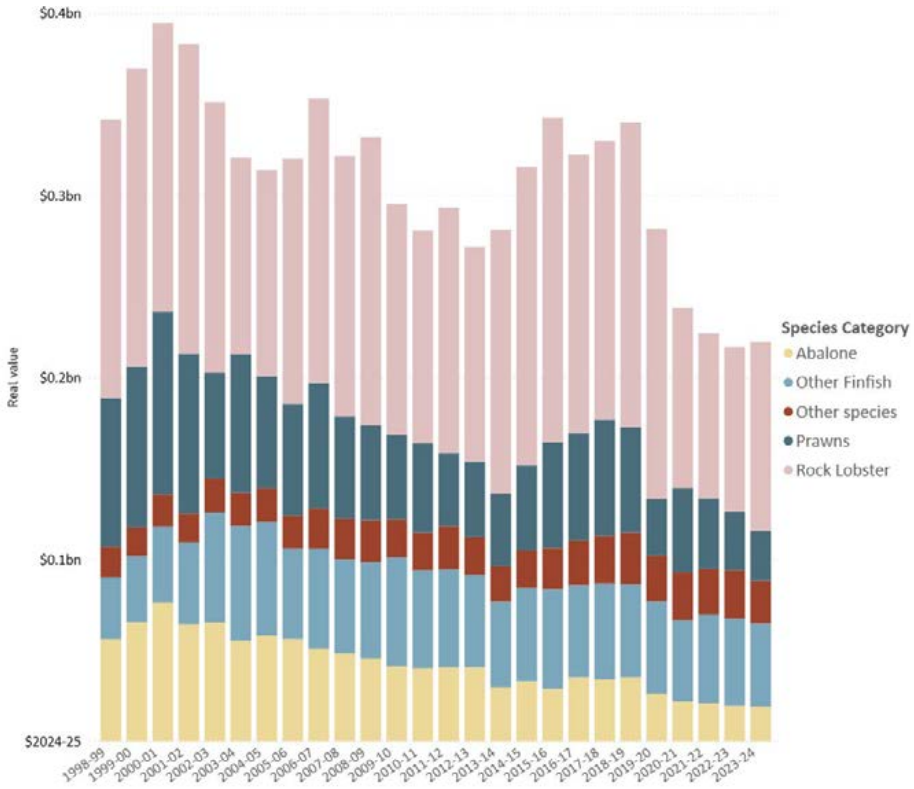


Figure 22-7: Real value of production for wild catch – South Australia 1998-99 to 2023-24

[Source: ABARES 2026]

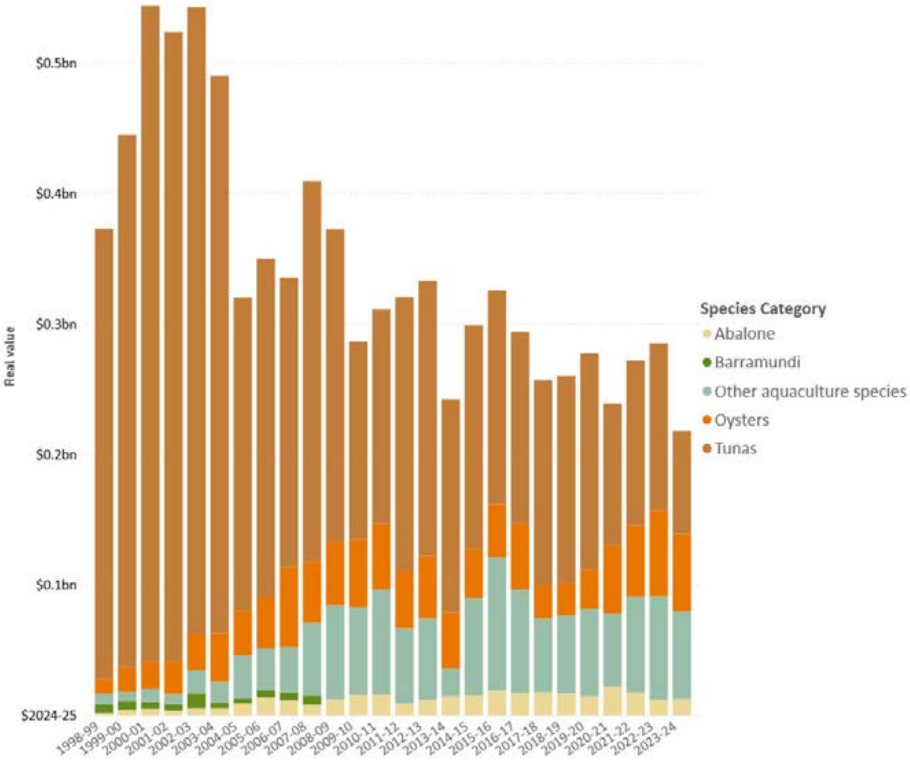


Figure 22-8: Real value of production for aquaculture – South Australia 1998-99 to 2023-24
[Source: ABARES 2026]

Commercial fisheries in the Spencer Gulf

The Spencer Gulf and coastal areas of the eastern Eyre Peninsula support a wide variety of marine industries including economically significant commercial wild fisheries. Commercial fisheries operating in Spencer Gulf are summarised in Table 22-7.

The significance of commercial fishing as an industry of employment in the wider region (refer Section 22.4.2) is generally understated in ABS SA2 data which reflects a resident workforce. As the industry is largely seasonal and operator-based it is not strongly represented in Census employment counts for any single area.

Effect of the harmful algal bloom (HAB)

Recent harmful algal bloom (HAB) events have affected many parts of the South Australian coastline including the Upper Spencer Gulf marine environment. The Senate Enquiry into Algal Blooms in South Australia[6] which reported in November 2025, heard evidence about the widespread economic impacts of the algal bloom across South Australia's fishing, and aquaculture sectors. These impacts ranged from direct financial losses due to closures of fisheries and harvesting areas and stock mortality, to longer term reputational harm and business uncertainty. The report found that while the total economic cost is difficult to

6 https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/AlgalBloom48P

determine, evidence provided to the enquiry indicated losses could be substantial and that ongoing impacts were likely.

In light of the above, it is acknowledged that the baseline datasets relied upon in this assessment are unlikely to have captured the influence of HAB events on the performance of some Spencer Gulf fisheries, aquaculture operations and associated supply chains. While the data presented in this section represent the most recent consolidated industry information available, it may not fully reflect short-term changes experienced by parts of the seafood sector as a consequence of those events.

Further detail on commercial fisheries is provided in Chapter 9 Use of Land and Marine Waters, Chapter 11 Marine Environment and the Marine Ecology Assessment in Appendix G-3. Further information on the relationship between desalination plants and algal blooms is provided in Chapter 25 Hazards and Risks.

Table 22-7: Fisheries in the EIA study area

Fishery	Description
Blue Crab Fishery (Spencer Gulf Sector)	This is a quota-managed fishery targeting the Blue Swimmer Crab using pots. There are five licence holders in the Spencer Gulf Sector (PIRSA 2026b). Fishing occurs all year except for some areas with seasonal closures. There was no catch for the Blue Crab Fishery within the MSA during the 2014 / 15–2023 / 24 fishing seasons, however there had been significant catches prior to this period. Impacts on this fishery due to the Project are not expected.
Charter Boat Fishery	The Charter Boat Fishery is a statewide fishery with 37 active licences in 2023-24. Whyalla was used as a port of landing by 1–5 licence holders in 2020-21. This fishery has seen a decrease in output, household income, contribution to GSP and employment since 2009-2010. This decline in contribution to GSP can be partly attributed to the total closure of the Snapper fishery, which began in November 2019 and remains in place, and by COVID-19 lockdowns and travel restrictions which began in January 2020 (PIRSA 2022). The fishery has a strong association with tourism in regional communities, as it is a drawcard for visitors who may wish to experience fishing in offshore areas. Many of the species caught in the Marine Scalefish Fishery are also taken by the Charter Boat Fishery in Spencer Gulf.
Marine Scalefish Fishery	The commercial Marine Scalefish Fishery is a multi-species and multi-gear fishery targeting Snapper, Garfish, King George Whiting and Southern Calamari. Commercial fishing can be undertaken for more than 60 species of scalefish using a range of gear types in South Australian coastal waters. The Marine Scalefish Fishery is a limited entry fishery. There are no new licences available. In 2023-24 the state-wide gross value of production of the fishery was $38.4 million with a total employment contribution of 279 FTE jobs The Spencer Gulf fishing region contributed $7 million to gross regional product and 58 direct FTE positions (BDO, 2025).
Northern Zone Rock Lobster Fishery	The Northern Zone Rock Lobster Fishery is a quota managed fishery targeting Southern Rock Lobster using pots. There are 63 licence holders. The fishery has an annual closed season from 1 June to 31 October.

Fishery	Description
	Catches from the Marine Fishing Area (MFA 21) relevant to the Project have not been reported in recent annual stock assessments but due to the lack of suitable habitat it is expected that they have remained at zero (refer Appendix G-3). Impacts to this fishery from the Project are not expected.
Spencer Gulf Prawn Fishery	The Spencer Gulf Prawn Fishery is the most significant commercial fishery in the Spencer Gulf and its adjacent waters, recording a gross value of production of $24 million in 2023-24 and contributing an estimated $28.8 million to gross regional product and 298 full-time equivalent jobs on the Eyre Peninsula. (BDO 2025) The Spencer Gulf Prawn Fishery has 39 licence holders. The target species is the Western King Prawn harvested in waters deeper than 10 m, but other retained species include eastern Balmain bug and Southern Calamari which are important by-product species. Fishing generally occurs during November–December and March–June, at nighttime up to a week either side of the new moon. There have been relatively small catches from the Spencer Gulf Prawn Fishery during the 2016 / 17–2023 / 24 seasons, within reporting areas surrounding the MSA and with an area collectively four times greater, and there has historically been negligible trawl effort within the MSA. The results of surveys of prawn larvae and juvenile prawns suggest that the Project MSA is within a region of significant spawning and / or nursery habitat (refer Appendix G-3).
Sardine Fishery	The South Australian Sardine Fishery targets Australian Sardine using purse seine nets in South Australian and Commonwealth marine waters. There are 14 licence holders. South-western Spencer Gulf is the most important area for the Fishery, but there have been no catches north of Arno Bay / Point Riley. The MSA is situated outside the reporting areas for these fisheries. There will be no impacts on this fishery from the Project.
Western Zone Abalone Fishery	The Western Zone Abalone Fishery is a quota managed fishery targeting Blacklip Abalone, Greenlip Abalone and Roe's Abalone using hand collection by scuba divers. There are 22 licence holders. No abalone catch has ever been recorded from within the MSA. There will be no impacts on this fishery from the Project.

Aquaculture on the Eyre Peninsula

There are over four hundred marine aquaculture licenses in South Australia. In 2022-23, aquaculture in South Australia contributed $386 million to GSP, representing 0.27% of the total GSP for South Australia ($142 billion in 2022-23). Around 77% of the contribution to GSP was generated in regional South Australia and concentrated in the Eyre Peninsula region (BDO 2024).

The Eyre Peninsula aquaculture region which covers the Lower Eyre Peninsula to Port Augusta, contributed $334 million to GSP equating to 92% of the economic contribution from

aquaculture (BDO 2024). Aquaculture production and value of production in the region in 2022-23 is shown in Table 22-8.

Table 22-8: Aquaculture value of production in the Eyre Peninsula Region, 2022-23

Species	Production (kg)	Value of production ($'000)
Southern Bluefin Tuna	8,000,000	120,000
Kingfish	3,353,819	59,899
Oysters	4,144,620	42,609
Mussels	2,317,541	5,099
Abalone	200,000	4,183
Freshwater Finfish	315	3
Marron and Yabbies	153	9
Other	576,561	4,324
Total	**18,593,009**	**236,126**

(Source: BDO 2024)

The Project MSA is situated more than 40 km from the closest aquaculture zones and / or leases located at Port Broughton (south-east) and Fitzgerald Bay (north-east), and 30 km from a land-based aquaculture lease at False Bay (refer Appendix G-3).

A land-based aquaculture lease is located adjacent to an aquaculture exclusion zone in the Port Broughton estuary, which permits pond farming of brine shrimp. Three active leases for finfish production span two areas within the Fitzgerald Bay aquaculture zone. It is understood that no fish have been stocked in those leases since 2022. The aquaculture lease at the north of False Bay spans approximately 400 ha of hypersaline water and produces microalgae, from which human and animal food products are extracted (refer Appendix G-3).

22.4.6 Tourism

The Project will interact with the Eyre Peninsula and Flinders Ranges and Outback tourism regions. Both regions are looking to increase the economic benefits from tourism by increasing the number of overnight stays, improving tourism experiences, and increasing the diversity and quality of accommodation options.

The following data is summarised from the Regional Profiles for the Eyre Peninsula and Flinders Ranges tourism regions to December 2024 produced by Tourism SA (Tourism SA 2025a and Tourism SA 2025b). Detailed data in relation to tourism is also provided in the Social Environment Technical Report (Appendix K-1).

Eyre Peninsula

To December 2024, the Eyre Peninsula tourism region contributed $455 million to the $9.8 billion tourism expenditure in South Australia. This was marginally lower than the year ending December 2023 ($591 million) but above the 2025 target of $397 million. The majority was derived from overnight expenditure ($392 million).

The Eyre Peninsula had 455,000 overnight visitors in 2024, with 72% from intrastate, 25% from interstate and 3% international visitors. The average length of stay was 3.7 nights. Of the total

overnight visitors, 39% were on holiday, 25% were visiting friends or relatives, and 25% were visiting on business. Whilst international visitor numbers were comparatively low (13,000), they tended to stay longer (12.5 nights average), spending $16 million.

In 2023-24, 2,400 people were directly employed and a further 1,100 people were indirectly employed in tourism in the region. The majority of the direct employees worked in cafes, restaurants and takeaway food services, accommodation and retail trade.

A total of 2,944 rooms across 166 establishments were provided in the region in 2024, with January and October being the strongest months for visitation, coinciding with school holidays and long weekends. According to Tourism SA, 30% of domestic overnight visitors stayed with friends or relatives compared to the international visitor average of 50%, while 23% stayed in a hotel, resort, motel or motor inn, and 19% stayed in a caravan park or commercial camping ground.

The Gross Value Added (GVA) was $320 million in total direct and indirect tourism and $384 million in total tourism GRP.

Whyalla

Whyalla is experiencing a transition from a predominantly industrial hub to a visitor destination based on unique local experiences. The most significant of these is the growing popularity of eco-tourism due to Whyalla being the only place in the world where the Giant Australian Cuttlefish aggregates in large numbers, leading to a significant increase in visitation to Whyalla during the winter months.

Tourism in Whyalla currently supports an estimated 725 jobs, which is 10.2% of total employment, with 515 jobs in Accommodation and Food Services supported by tourist expenditure. The value added to Whyalla's GRP from tourism is estimated at $70 million, representing 4.2% of total value added by all industries. Domestic day visitors to Whyalla are estimated to spend an average of $158 per trip. For those domestic visitors who stay overnight, the average spend per night is estimated at $206 (REMPLAN 2026).

Recent harmful algal bloom (HAB) events in Upper Spencer Gulf have generated uncertainty for some marine-based tourism operators and tourism assets, including tourism experiences associated with the Giant Australian Cuttlefish aggregation and recreational fishing charters. The Senate Enquiry into Algal Blooms received extensive evidence about the significant impacts of the algal bloom on South Australia's tourism industry more broadly, particularly in regional areas which rely heavily on marine-based tourism. These impacts were felt through losses in revenue, cancellations and operational disruptions, as well as concerns about reputational damage. It is acknowledged that while the tourism data presented in this section represent the most recent regional datasets available, it may not fully reflect any short or medium term economic effects on regional tourism arising from those events.

Flinders Ranges and Outback Region[7]

To December 2024, the Flinders Ranges and Outback tourism region contributed $603 million to the State's tourism expenditure. This was marginally lower than the year ending December

[7] The Flinders Ranges and Outback tourism region includes the Far North and North-East, the Flinders Ranges and the Southern Flinders Ranges regions.

2023 ($606 million) and below the 2025 target of $638 million. The majority was derived from overnight expenditure ($461 million).

The Flinders Ranges and Outback region had 699,000 overnight visits in 2024, with 66% intrastate, 29% from interstate and 5% international visitors. The average length of stay was 4.7 nights. Of the total overnight visits, 38% were visiting on business, 33% were on holiday, and 20% were visiting friends or relatives. Whilst international visitors were comparatively low (37,000) they tended to stay longer (14.7 nights average), spending $24 million.

In 2023-24, 2,500 people were directly employed and a further 1,200 people were indirectly employed in tourism in the region. SA 2024b). The majority of the direct employees worked in cafes, restaurants and takeaway food services, accommodation and retail trade.

A total of 3,091 rooms across 125 establishments were provided in the region in 2024, with June, July, September and October being the strongest months for visitation, coinciding with the cooler months and school holidays. According to Tourism SA, 33% of domestic overnight visitors stayed in 'Other accommodation' – the majority of this relating to FIFO accommodation, 32% stayed in caravan parks or camping areas and 11% stayed in a hotel, resort, motel or motor inn.

The Gross Value Added (GVA) was $342 million in total direct and indirect tourism and $411 million in total tourism GRP.

22.4.7 Local businesses

Based on ABS data for business entries and exits, at June 2025 there were 3,274 businesses operating within the study area SA2s. More than 60% of these businesses are located in Whyalla (21%), Port Augusta (20%) and Port Pirie (20%) (ABS 2025).

The dominant industry sectors across the SA2 areas serviced by these businesses are the Construction and Agriculture, Fisheries and Forestry sectors. These businesses would also be of the most relevance to the Project as they have the potential to contribute to the workforce and supply chain during Project construction and operations. The Construction industry had the largest number of total registered businesses in City of Whyalla, comprising 16% of all total registered businesses (compared to 16.4% in South Australia).

Figure 22-10, Figure 22-11 and Figure 22-12 show the registered business by industry in the RDA Eyre Peninsula and Far North regions and the City of Whyalla LGA, using data from the ABS Business Register.



Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, 2016 to 2021

Figure 22-9: Eyre Peninsula Region – total registered businesses by industry 2025



Source: Australian Bureau of Statistics, Counts of Australian Businesses, including Entries and Exits, 2016 to 2021

Figure 22-10: Far North Region – total registered businesses by industry 2025

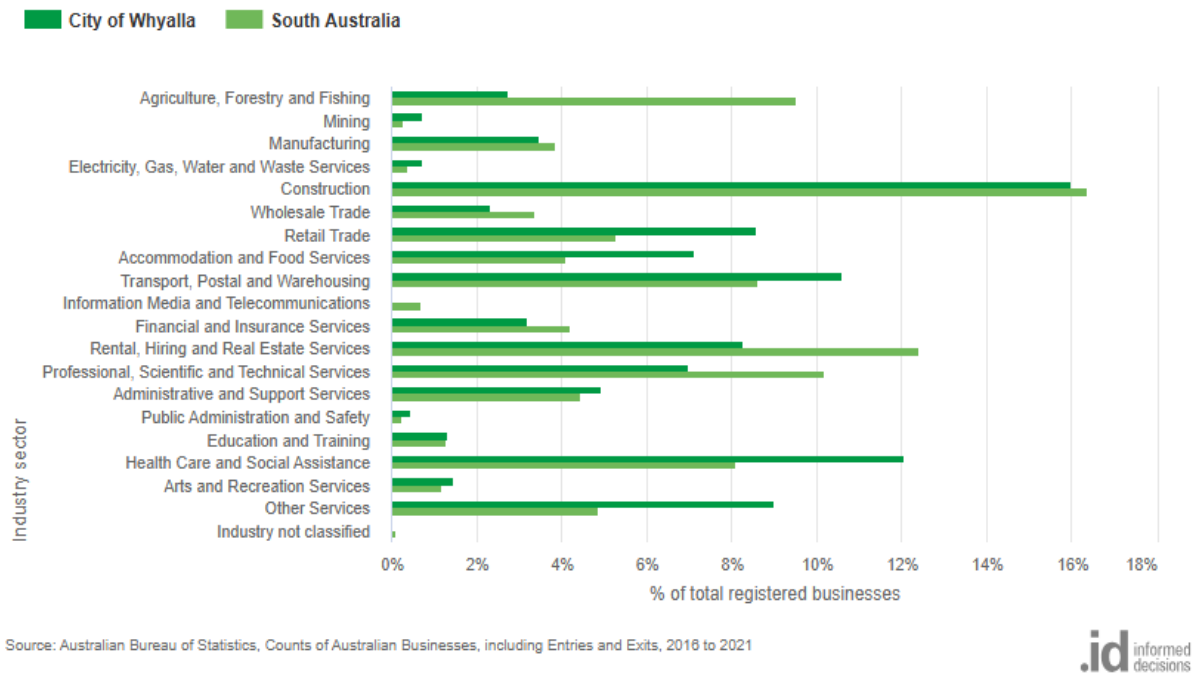


Figure 22-11: City of Whyalla - registered businesses by industry 2025

22.5 Assessment of Economic Impacts and Benefits

This section provides the results of the Cost Benefit Analysis and Computable General Equilibrium modelling undertaken as part of the economic assessment.

Negative impacts and positive benefits can both result from a single aspect or event, or the Project as a whole. Impacts may also be direct or indirect and social impacts and benefits often overlap with economic impacts and benefits. As such, many of the impacts and benefits discussed are an extension of the social impact assessment (Chapter 23 Social Environment and Appendix K-1), expressed in economic terms where applicable.

22.5.1 Project Cost Benefit Analysis

The CBA evaluated the economic merit of the three supply capacity options that were assessed for the Project relative to the Base Case (i.e. the situation without the Project) (refer Chapter 2 Justification and Alternatives). The CBA was undertaken in accordance with Department of Treasury and Finance guidelines[8] , Infrastructure South Australia Impact Analysis Guide[9] and Infrastructure Australia Guide to Economic Appraisal [10].

Relevant costs assessed in the CBA were:

- initial Project capital costs (e.g. desalination plant and transfer system infrastructure)
- Project operating and maintenance costs (e.g. power, chemicals, labour)
- capital replacement costs (e.g. replacement of mechanical plant)
- opportunity costs of resources used (e.g. land acquisition costs)

[8] Accessed at www.treasury.sa.gov.au/__data/assets/pdf_file/0006/515292/ti17-guidelines-part-a.pdf

[9] Accessed at www.infrastructure.sa.gov.au/publications/business-case-templates/Impact-Analysis-Guide.pdf

[10] www.infrastructureaustralia.gov.au/sites/default/files/2024-02/Assessment%20Framework%202021%20Guide%20to%20economic%20appraisal.pdf

- emissions costs (i.e. cost associated with carbon emissions generated through the construction and operation of assets).

Benefits were determined across three categories:

- **Provision of new water**: relates to increased output due to the provision of 'new water'. Benefit occurs when the options provide additional water which would not have been able to be provided in the Base Case leading to greater economic output.
- **Substitution of existing water**: relates to substitution of the source of existing water consumption with water from the desalination plant. This leads to environmental benefits through reduced water consumption from environmental sources relative to the Base Case.
- **Total volume of water**: the combination of new and substituted water and includes all water supplied by the desalination plant.

The quantifiable benefits identified are summarised in Table 22-9. Qualitative benefits are summarised in Table 22-10.

Table 22-9: Summary of quantifiable benefits

Stakeholder	Quantifiable benefits	Rationale
Provision of new water		
SA Government	Increased mining royalties	Provision of water to the mining industry in the Far North and USG regions of South Australia is expected to lead to increased mining productivity (relative to the Base Case) and therefore an increase in the royalty payments received by the SA Government. Typically, tax benefits are not included in economic appraisals however, in this case, there is a clear increase in a key direct funding stream for the SA Government which would not have occurred in the Base Case.
SA mining company owners	Producer surplus for mining companies	Provision of water to the mining industry is expected to lead to increased mining productivity (relative to the Base Case) and therefore a producer surplus (post tax and post royalties) for South Australian owners of the mining companies.
SA Water customers	Consumer surplus from additional water available to SA Water customers	Provision of water to Whyalla industrial customers reduces demand on SA Water's system, with the resulting unallocated capacity available to support new demand.
	Improved drought resilience	Unallocated capacity for SA Water (relative to the Base Case) due to removing Whyalla industrial demand would lead to additional capacity during drought.
Substitution of existing water		

Stakeholder	Quantifiable benefits	Rationale
Community	Reduced water extraction from the GAB	Provision of water to BHP Olympic Dam from the Project provides an alternative water supply, creating an opportunity for a reduction in the volume of water extracted from the GAB and local groundwater sources by BHP. This will lead to a quantifiable environmental, cultural and social benefit for the South Australian community.
	Reduced water extraction from local groundwater sources	
	Reduced water extraction from the River Murray	Unallocated capacity for SA Water is assumed to lead to additional capacity, and a reduction in the volume of water extracted from the River Murray.
Total water volume		
SA Government	Producer surplus from the sale of water to entities outside of South Australia	Provision of water from the Project by the SA Government to entities outside of South Australia is expected to lead to a producer surplus for the SA Government through the revenue received from offtaker water charges. This was determined to be the largest benefit and is linked with the water charges recovered from offtakers during the Project's delivery. Charges would be calculated to recover capital and operating costs of the Project and therefore expected to result in a substantial benefit.
	Residual Value	Residual value captures the economic benefit generated from the remaining life of the asset outside of the assessment period.

Table 22-10: Summary of qualitative benefits

Benefit recipient	Benefit	Rationale
SA mining sector	Increased mining sector confidence	Increased confidence in the mining sector due to a secure water source is expected to lead to additional increased mining exploration activity beyond that captured in the CBA.
	Reduced operational costs for mining companies	Water quality provided by the Project is expected to be better than the water currently used in mining operations. Improved water quality is expected to lead to reduced operational costs associated with equipment wear and tear and potentially improved profit margins for the mining companies.
SA community	Improved drought resilience	A drought resilience benefit has been captured in the SA Water demand allocation. However, depending on timing, additional drought resilience may be able to be achieved through spare plant capacity or through negotiations with offtakers in the event of a drought.

Benefit recipient	Benefit	Rationale
SA renewable energy / construction industry	Increased activity in the renewable energy sector	The Project is likely to be powered by 100% renewable electricity the development for which will result in increased economic activity in the renewables sector.

Summary of the CBA and comparison between the three capacity options

Three demand scenarios and three capacity options were considered to determine the preferred supply capacity option (refer Chapter 2 justification of Alternatives). The results of the CBA and comparison between the three supply capacity options is summarised as follows:

- Capacity Option 1 provides the greatest BCR[11] in the central demand scenario (1.30) but has no spare capacity to support additional future demand and cannot fully support the central demand scenario.
- Capacity Option 2 was the next best performing capacity option, providing a BCR of 1.25 in Demand Scenario 2 (central demand scenario). Whilst having a lower BCR than Capacity Option 1, this option provides more capacity to support future growth and can fully support Demand Scenario 2 (through a future expansion to 73 GL/year). This capacity to support future growth through expansion can have an overall positive economic impact assuming there is sufficient demand, with the expanded Capacity Option 2 demonstrating a BCR of 1.35 under Demand Scenario 3.
- Capacity Option 3 was the poorest performing option in the CBA, providing a BCR of 1.02. This is because the plant is significantly oversized for the proposed demand under the central demand scenario (Demand Scenario 2).

Capacity Option 2 is the preferred option and is the basis of the Reference Design which has been used for the assessments presented in this EIS.

22.5.2 Computable General Equilibrium modelling of economic impact

The 'baseline scenario' for the CGE modelling represents a trajectory of the South Australian economy between 2026 and 2062 (in terms of economic growth and employment) where the Project does not proceed. This scenario used specific assumptions about growth in GSP, as well as growth trajectories for key sectors, based on forecasts produced by Deloitte Access Economics.

For the CGE modelling, Northern South Australia is defined as the combination of Eyre Peninsula and South-west (SA3) and Outback - North and East (SA3). These SA3 areas equate to the RDA Regions of Eyre Peninsula and Far North.

The 'Project case scenario' was based on the Project proceeding under Capacity Option 2 (refer Chapter 2 Justification and Alternatives). The scenario measures the impact of the capital expenditure required for the construction of the Project's assets (i.e. desalination plant and transfer pipeline), as well as additional mining and smelting industry output in the Upper

[11] Benefit-Cost Ratio (BCR) is a standard financial metric used in business and infrastructure to evaluate whether a project is viable. A BCR higher than 1 means benefits outweigh the costs.

Spencer Gulf and far North regions associated with the uptake of the additional water supplied.

Gross State and Regional Product

The results of the CGE modelling indicate that the additional investment and activity associated with the Project would have a significant positive impact on the economies of Northern South Australia and South Australia, increasing GSP and employment (in fulltime equivalent (FTE) terms) substantially over the period between 2026 and 2062. The results of the analysis are summarised in Table 22-11.

Table 22-11: Modelled Northern South Australia and State results 2026-2062

Option 2	Northern South Australia		South Australia	
	Average (2026-2062)	2062	Average (2026-2062)	2062
GRP / GSP ($B deviation)	$3 billion	$4 billion	$3.3 billion	$4.3 billion
GRP / GSP (% deviation)	12%	13%	1.5%	1.5%
Employment (FTEs)	1,600	2,000	2,000	2,100

2026 to 2062: GRP in Northern South Australia could be expected to be approximately 12% (or $3 billion) larger on average. In dollar terms, impacts at the State level are higher than for Northern South Australia, demonstrating positive flow-on impacts for the rest of South Australia. Between 2026 and 2062, South Australian GSP could be expected to be 1.5% (or $3.3 billion) larger on average.

2026 to 2032: Impacts would initially be driven by Project-related capital and infrastructure investments. These investments could be expected to generate a significant uplift in construction and ancillary sectors such as heavy manufacturing and services, leading to a substantial increase in GRP within Northern South Australia. As the Project construction phase winds down post 2032, transitory impacts on construction, and related sectors begin to decline and the primary driver of the expected GRP increase shifts to the increased output from the mining and water sectors due to access to additional water.

2033 to 2062: Post construction, South Australian GSP could be expected to be 1.8 %, (or $4 billion) larger on average. This arises largely through growth in sectors such as Trade, Construction Services, Transport and a range of other services (both private and government), which expand to support the sub-regional growth in Mining, demonstrating the sub-regional linkages between Northern South Australia and services in metropolitan areas of South Australia.

Approximately 65% of the additional GRP generated in Northern South Australia is predicted to come from the growth in value added from the Mining and Water sectors, with the remaining 35% coming from Trade (retail and wholesale), Manufacturing, Construction and a range of government services including Health, Education, Public administration and Defence.

Impacts to other sectors in the region

Sectors in Northern South Australia other than Mining and Water will experience some moderate reduction in value added (relative to the Base Case) due to the Project. This is known as 'crowding out' and will occur as the expansion in Mining and Water sectors creates competition for labour and capital, diverting workers and investment away from other sectors that are not explicitly expected to grow under the scenario, such as the Agriculture sector. The average sectoral impacts in Northern South Australia are summarised in Table 22-12 and shown in Figure 22-13.

Table 22-12: Summary of average sectoral impacts, Northern South Australia, 2026-2062

Sector	Impact (+, - or ~)	Explanation
Agriculture	-	• Large regional sector • Faces some competition for capital and labour as the mining sector expands
Mining	+	• Direct beneficiary of additional water supply
Coal, Oil and Gas	~	• Small regional sector
Light Manufacturing	~	• Small regional sector
Heavy Manufacturing	+	• Positive spillovers as the mining sector expands and additional smelting activity occurs in SA
Utilities	~	• Small regional sector
Water	+	• Direct increase to regional output via Project
Construction	+	• Direct increase to regional output via construction activity related to Project • Positive spillovers as mining expands and requires additional capital investments
Trade	+	• Positive spillovers from the expansion of Mining • Additional demand from higher regional household incomes
Transport	~	• Small regional sector
Services	+	• Large regional sector • Faces some competition for capital and labour as mining expands
Public Administration and Defence	+	• Positive spillovers from the expansion of Mining • Additional demand from higher regional household incomes
Health and Education	+	• Positive spillovers from the expansion of Mining • Additional demand from higher regional household incomes

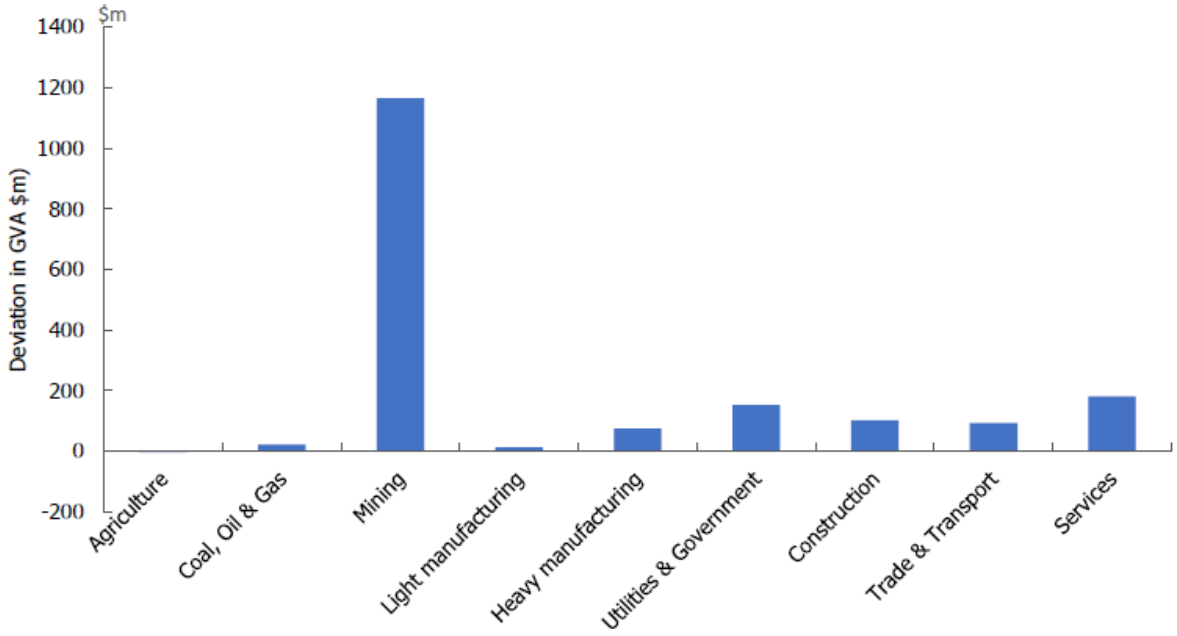


Figure 22-12: Estimated average deviation in value added by sector 2026-2062

Regional employment

The Project is also expected to have a significant positive impact on employment within Northern South Australia.

In average annual terms, between 2026 and 2062, an additional 2,000 FTEs are expected to be employed across South Australia, with 1,600 in Northern South Australia. As with value added, employment impacts are initially driven by an influx of capital expenditure and associated construction activity between 2026 and 2032. The influx of capital expenditure and related construction activity is predicted to lead to strong initial employment growth between 2026 and 2032 with an additional 500 FTEs employed in Northern South Australia on average, with over 90% of being jobs in the Construction sector.

After the construction phase, employment impacts are expected to slow briefly, before growing steadily out to 2062, as the Mining sector expands due to access to additional water. On average, in the post-construction phase between 2033 and 2062, an additional 2,000 FTEs are expected to be employed in Northern South Australia, with approximately 75% of these in the Mining sector.

As with GRP, results at the South Australian level are higher than for Northern South Australia, demonstrating the sub-regional linkages between Northern South Australia and services in metropolitan areas of South Australia. Similarly, this appears in sectors such as Trade, Construction Services, Transport and a range of other services (both private and government), which expand to support the sub-regional growth in Mining.

The Mining, Construction and Water sectors also draw on a range of services throughout the economy. As they expand, this leads to positive employment generated in other sectors such as Trade (retail and wholesale), and government services including Public Administration and Education, which also experience a degree of growth in demand due to the increase in incomes more broadly across the region.

A degree of crowding out is also expected to be seen in employment across sectors in Northern South Australia because of the Project. This primarily occurs in the Agriculture sector, which accounts for approximately 8% of local employment, and experiences the largest degree of competitive pull from Mining, and other sectors directly benefitting from the Project. However, as this potential impact is anticipated to be spread over 30 years, the Project is unlikely to cause a significant decline in available workers that would have a material impact upon the Agriculture sector in the study area.

National economic impacts

Modelling of national impacts shows that as whole Australian Gross Domestic Product (GDP) is expected to be 0.1%, or $4.2 billion higher on average between 2026 and 2062 (inclusive of the impact in South Australia). Results at the national level are higher than for South Australia, demonstrating some positive spillover impacts from the Project in other Australian states. These mainly occur within the services and manufacturing sectors which benefit through downstream flow-on demands for services in support of the Project. Additional employment impacts for both South Australia and Australia peak in 2040, at 2,700 and 5,800 additional FTEs respectively (refer Table 22-13).

Table 22-13: Modelled national impacts 2026-2062

Option 2	South Australia	Australia
Additional total FTE (avg)	2,000	3,800
Peak additional FTE	2,700 in 2040	5,800 in 2040
GSP / GDP ($B avg deviation)	$3.3 billion	$4.2 billion
GSP / GDP ($B avg deviation)	1.5%	0.1%

22.5.3 Assessment of key economic impacts

This section sets out the assessment of the key economic impacts of the Project at a local and regional level.

Regional non-mining sector

Moderate 'crowding out' effects on output in non-Mining sectors in the region are predicted.

As noted in Section 22.5.2, the CGE modelling assessed the impacts of the Project on sectors of the regional economy that would not directly benefit from the Project in the same way as the Mining sector. Table 22-12 lists the sectors predicted to be directly or indirectly affected in terms of output.

Mining is clearly the sector which will experience the most value added as the direct beneficiary of additional water supply as shown in Figure 22-13. Other sectors are predicted to experience some positive spillover effects, however Agriculture (as a sector) is predicted to face competition for capital and labour as the Mining sector expands. It is noted that pastoral activities in the Project Area (as a component of the overall Agriculture sector) is not a significant employer).

Overall the crowding out effects on value added in Northern South Australia are predicted to be moderate due to several factors:

- Increased output generated from users of additional water, particularly mining, is expected to be achieved via additional capital investments within the mining sector.
- Investment required for construction of the desalination plant and transfer system, as well as other growing sectors is likely to be partially sourced from outside the Northern South Australian region, and thus have a limited effect on diverting local investment flows.
- Reliance on migrant and fly-in-fly-out workers which typically supply the mining sector in the region means that labour required for the expansion of mining can be imported from neighbouring regions with relative ease, moderating the competitive effects on other sectors.

Pastoral businesses

Economic impacts to pastoral businesses due to Project construction activities are expected to be negligible due their temporary nature and effective engagement with landholders.

Agriculture (including pastoral activities) is one of the four major sectors of employment in the EIA study area. The Project is largely located within the pastoral regions of the Upper Spencer Gulf and the Far North, with the transfer system alignment traversing a number of pastoral leases.

Project construction activities that can affect existing land uses include land clearance, site works, the presence of Project machinery and personnel, temporary restrictions to access to land and (possible) road closures. For affected businesses and landowners these have the potential to result in a short-term economic impact. Within the Project Area, this is most likely to be pastoral businesses where Project transfer system and electricity infrastructure construction works are occurring.

It is estimated that approximately 1,700 ha of land mapped as the Livestock land use (PlanSA 2026) will be temporarily impacted during construction of the transfer system and electricity infrastructure. Post-construction, this area is reduced to approximately 181 ha over the 406 km length of the transfer system. As discussed in Chapter 9 Use of Land and Marine Waters, the potential for negative economic impact due to the effects of pipeline construction activities on land use is expected to be negligible due to:

- the relatively short timeframe for the construction workfront to pass through a location (i.e. duration of approximately a few weeks)
- the extremely small area of land relative to the size of the pastoral properties that will be temporarily subject to construction activities
- rehabilitation of the pipeline trench as soon as reasonably practicable to allow landholder operations to resume
- consultation with landholders regarding the location, timing and management of proposed activities and advance notification of planned construction activities with the aim of minimising disruption to property operations.

Commercial fisheries and aquaculture

Economic impacts to commercial fisheries and aquaculture from Project construction and the ongoing presence of Project infrastructure are expected to be negligible.

Commercial fisheries that operate in the Spencer Gulf include Spencer Gulf Prawn, Marine Scalefish, Blue Crab, Northern Zone Rock Lobster, Sardine, Western Zone Abalone and Charter Boat fisheries. Of these, the Marine Scalefish, Spencer Gulf Prawn, Blue Crab and Charter Boat fisheries overlap spatially with the Project MSA (refer Section 22.4.5). The MSA also incorporates areas of seagrass, mangroves and tidal flats which provide nursery and recruitment areas for several commercial species.

The effects on the marine environment of return water from the desalination plant, seabed disturbance during construction and the establishment of a marine exclusion zone during construction and operation have been identified as potential sources of impact to nursery / recruitment areas and the catch of commercial species which could in turn economically impact relevant fisheries.

Potential impacts of seabed disturbance and return water on the marine environment including important commercial species have been extensively assessed in the EIS (refer Chapter 11 Marine Environment and the Marine Ecology Assessment in Appendix G-3).

Nursery and recruitment areas for commercial species will not be negatively affected by the Project. Studies undertaken for the Project have concluded that beyond the immediate vicinity of the desalination plant outfall diffuser, salinity is predicted to remain within the range of natural seasonal variability near Mullaquana Station for most of the year. The effects of dilution on return water will be sufficient to protect more than 99% of species in seagrass and an even higher level of protection within mangrove habitats.

The marine area expected to be affected by potential sedimentation due to Project construction will be highly localised and any impacts due to turbidity would be short-term. A marine silt and sediment management plan would be prepared to minimise turbidity and silt deposition arising from installation of the intake and outfall risers.

Marine exclusion zone

A marine exclusion zone of approximately 112 ha will be established around the location of the intake and outfall infrastructure to ensure the safety of Project construction vessels and operators, and other marine users. This exclusion zone will continue once the desalination plant is operating to protect the marine infrastructure and public safety.

Impacts to the Marine Scalefish Fishery which surrounds the MSA (and the Charter Boat Fishery which utilises the same area) are not expected as these fishery areas are 50 times larger than the MSA within which the exclusion zone will be located. Overall the proposed exclusion zone will result in loss of access to approximately 112 ha (or less than 0.006% of the Spencer Gulf marine waters) for commercial fishers which is immaterial in the context of the available fishing areas.

Aquaculture

As discussed in Section 22.4.5 the Project is situated more than 30 km from the closest marine and land-based aquaculture zones and / or leases. Due to the distance of the Project from

aquaculture zones, and active and non-active leases there will be no impacts to aquaculture production in the Spencer Gulf due to the Project.

Overall the potential for economic impact to commercial fisheries and aquaculture from the construction and operation of the Project is considered to be negligible.

Impacts to the marine environment are discussed in further detail in Chapter 11 Marine Environment. The marine exclusion zone is also addressed in Chapter 9 Use of Land and Marine Waters and Chapter 21 Traffic and Transport.

Tourism

Impacts to marine-based tourism from the Project are not expected.

Impacts on the affordability and availability of tourist accommodation will be addressed through a workforce Accommodation Strategy developed in consultation with local authorities, accommodation providers, regional stakeholders and other major projects.

Marine-based tourism

The marine environment assessments undertaken in this EIS have found that the Project is expected to have negligible impact on the marine environment including water quality and marine flora and fauna. Accordingly economic impacts to the marine-based tourism industry (e.g. marine experience and fishing tours) due to the construction and operation of the Project are not expected.

The impact assessment for the marine environment is provided in Chapter 11 Marine Environment.

Visitor accommodation

The Project's proposed accommodation approach is to accommodate the majority of non-local construction workers in a combination of temporary workforce accommodation, existing short-stay accommodation and, where appropriate, marine-based accommodation facilities. Based on current workforce planning assumptions, existing short-stay and tourism accommodation in Whyalla and Port Augusta will accommodate portions of the transfer system, tunnelling and marine workforces.

As discussed in Section 22.4.6, tourism in the Eyre Peninsula and Far North and Outback tourism regions is highly dependent on intrastate and interstate visitors. More than 40% of overnight visitors stay in tourist accommodation including caravan parks and hotels, motels and motor inns. The Social Environment Technical Report (Appendix K-1) found that tourist accommodation in the region is already commonly used by a range of workers for short and long-stay options.

Some tourist accommodation operators would benefit from this additional support in the context of a highly seasonal operation. However a reduction in the availability of visitor accommodation through reduced supply or increased costs may indirectly have a negative impact on overall visitor numbers, affecting other suppliers and businesses that rely on tourism and resulting in reduced spend in the local area.

An Accommodation Strategy, developed with input from relevant stakeholders, will be implemented to monitor and manage workforce accommodation demand and minimise impacts on tourism accommodation availability and affordability, particularly during peak

visitor periods. The approach to management of construction workforce accommodation is addressed in further detail in Chapter 23 Social Environment and Appendix K-1.

Giant Australian Cuttlefish tourism

Assessment of the effects of the Project on the marine environment found that there will be no impact due to Project activities on Giant Australian Cuttlefish tourism experiences.

The Cuttlefish Coast Sanctuary Zone National Heritage Place lies ~34 km north-east of the desalination plant and is highly valued as it attracts the only known mass aggregation of spawning Giant Australian Cuttlefish in the world.

A Giant Australian Cuttlefish Assessment report was prepared for the Project (refer Appendix G-16) and the potential for impacts to the species or the sanctuary zone have been assessed in Chapter 11 Marine Environment.

The assessment found that construction and operation of the Project desalination plant is expected to have no direct or indirect impacts on the Giant Australian Cuttlefish population or the EPBC Act National Heritage listed CCSZ.

Accordingly there will be no economic impact due to Project activities on Giant Australian Cuttlefish tourism experiences.

Accommodation supply and demand

With an Accommodation Strategy in place, developed in collaboration with local and regional stakeholders, the Project's effect on the supply or demand for accommodation in the region is expected to be minor.

As detailed above, the construction workforce will be largely accommodated outside the residential housing market in a combination of temporary workforce accommodation and existing short-term visitor accommodation, rather than relying on local residential housing stock. A workforce Accommodation Strategy will be developed by the DBOM Contractor in consultation with relevant authorities and stakeholders and will seek to minimise impacts on local housing availability and affordability.

The Project will also collaborate through established regional coordination mechanisms to manage cumulative housing and workforce accommodation pressures associated with major projects.

Once operational, it is estimated that a small number (estimated 45) long-term FTE staff will be employed by the Project, associated with management of the desalination plant and maintenance of the transfer pipeline and associated infrastructure. The majority will be based at locations including the desalination plant, and at depots expected to be near Port Augusta and in the Woomera / Roxby Downs area, however final locations would be subject to discussions with the operational contractor. Where practicable, opportunities for locally based operational employment will be maximised to reduce accommodation demand and support long-term community and economic benefits.

Accommodation of the construction workforce is addressed in further detail in Chapter 23 Social Environment and Appendix K-1.

Existing utilities

Impacts to existing users of distribution networks for gas, electricity, waste, potable water, sewerage, and communication systems are not expected.

There will be no impacts to existing users of the electricity or gas distribution network due to the Project. The majority of Project construction power would be provided by diesel generators, with the potential for temporary solar and battery systems to be added. During operations, the Project has committed to using 100% renewable electricity during operations.

No impacts to existing users of the potable water / sewerage distribution network due to the Project are expected. Potable water required during construction workforce is proposed to be sourced primarily via existing infrastructure and in particular from the SA Water network and the Port Augusta to Woomera Pipeline. Other supplementary sources of water being considered include groundwater wells and an offtake from BHP's Roxby Downs water supply. During operations potable water may be carted in for critical potable water uses (drinking, lunchrooms, etc).

There will be no impacts to existing users of waste disposal facilities due to the Project. Waste management for the Project has considered the principles of a circular economy with maximisation of reuse and recycling where possible. Wastes generated by construction and operation of the Project will be managed in accordance with the waste management hierarchy.

22.5.4 Key economic benefits

This section sets out the key economic benefits identified for the Project at a local, regional and State level. Further detail on economic benefits is provided in Chapter 2 Justification and Alternatives.

Additional investment

Additional investment and activity associated with the Project is predicted to increase GSP and GRP substantially between 2026 and 2062.

As detailed in Section 22.5.2 and Table 22-11, additional investment and activity associated with the Project is predicted to have a significant positive impact on the economies of Northern South Australia and South Australia, increasing GRP and GSP substantially over the period between 2026 and 2062.

Between 2026 and 2062, GRP could be expected to be approximately 12% (or $3 billion) larger on average while GSP could be expected to be 1.5% (or $3.3 billion) larger on average.

Approximately 65% of the additional GRP generated in Northern South Australia is predicted to come from the growth in value added from the Mining and Water sectors.

Positive Benefit-Cost Ratio (BCR)

Capacity Option 2 provides a Benefit-Cost Ratio of 1.25 meaning the Project would have a positive net value.

The direct economic benefits from the Project (Capacity Option 2) were determined by the CBA, resulting in a positive Benefit-Cost Ratio (BCR) of 1.25.

The quantifiable and qualitative benefits of the Project identified in the CBA are summarised in Table 22-9 and Table 22-10.

Regional employment

The Project is predicted to have a significant positive impact on employment within Northern South Australia.

The CGE modelling undertaken for the Project assessed the employment impacts of the Project against a Base Case where the Project was not constructed.

As detailed in Section 22.5.2, an additional 2,000 FTEs are expected to be employed across South Australia, with 1,600 in Northern South Australia between 2026 and 2062. In the post-construction phase (2033 to 2062) approximately 75% of these would be in the mining sector as it expands due to access to additional water.

Local employment opportunities

The construction workforce will require a wide range of skills and opportunities. Preference will be given to utilising local labour, where appropriate.

The scale of the construction workforce presents opportunities to address longstanding regional challenges. A large, sustained construction program offers the potential to support local skills development, attract and retain workers, and strengthen the regional labour market, provided participation barriers are actively managed. Realising these benefits will depend on coordinated workforce planning, including training pathways aligned to Project needs and measures that enable broader local participation.

The regional data provided in Section 22.4 indicates that the region is potentially well-placed to provide significant support to the Project, given the well-established businesses and workforce with experience in industry sectors such as Construction, Mining, Heavy and Civil Engineering.

Workforce numbers will vary throughout the course of the construction period and will depend on activities being undertaken. Labour requirements will increase during the early establishment stage and will peak during the stages of construction when the full range of activities across the desalination plant, marine infrastructure / tunnel boring and transfer system construction are proceeding concurrently.

The anticipated number of construction workers is predicted to peak during year two of construction at approximately 1,500 Full Time Equivalent (FTE) workers. These workers would be split between two work fronts along the transfer system, in addition to the tunnelling work site, desalination plant, pump station and storage sites and the marine JUB.

The construction workforce is expected to include plant operators, excavators, riggers, trades including mechanics and carpenters, labourers, delivery and ancillary staff. Temporary construction camps will also require staff including camp assistants, kitchen and laundry staff, cleaners, maintenance staff and bus drivers. The marine-based workforce will include crews for the Jack-up Barge, supply, spoil and crane barges, support vessels and dive boat.

Preference will be given to utilising local labour, where appropriate, however it is noted that many of the jobs will be highly skilled or specialist roles which may need to be sourced from outside the region, or even the State.

The Project operation and maintenance phase is estimated to require an estimated 45 FTEs across two to three depots at locations to be determined by the operational contractor.

Further information of the Project workforce is provided in Appendix K-1.

Indigenous employment and training opportunities

Economic participation opportunities for Indigenous businesses and workers will be a key focus of Project procurement.

The Project's substantial workforce and procurement demand presents an opportunity for the region's Aboriginal population. With culturally appropriate support, these benefits could be significant and enduring, contributing to economic participation, skills and intergenerational outcomes that extend well beyond construction.

To maximise economic opportunities during construction and operation, many targeted industry engagement activities have been undertaken including:

- establishment of the Industry Capability Network register for the Project, with specific recognition of Aboriginal businesses in the region
- engagement with Aboriginal employment organisations and training providers
- attendance at multiple industry 'Meet the Buyer' events where Aboriginal businesses participated
- delivering a Tactical Advantage Program in partnership with TACTIC to support local suppliers to increase capability for participation in major projects
- delivering a cultural competency program in partnership with Regional Development Australia Eyre Peninsula held in Port Pirie, Port Augusta, Whyalla and Port Lincoln.

Engagement activities provided valuable insights into the opportunities and barriers affecting Aboriginal business and workforce participation in major projects which has guided approaches to Aboriginal participation targets for the project.

Engagement with Traditional Owners is ongoing and will deliver on commitments arising from cultural heritage processes, Native Title discussions and the Indigenous Land Use Agreements (ILUAs). An Aboriginal Employment Strategy will be developed, outlining how the Project will achieve opportunities for businesses, training, employment and retention of Traditional Owners and other Aboriginal People during construction and operation of the Project.

Further information of Indigenous employment is provided in Appendix K-1.

Supply of goods and services

Ongoing engagement with local business, workforce and industry stakeholders will maximise local employment, procurement and business participation in the Project.

Ongoing and targeted engagement has been undertaken with business, workforce and industry stakeholders to better understand regional capacity, supply chain readiness and opportunities to maximise local employment, procurement and business participation. Industry associations, local businesses, workforce development bodies and organisations specialising in Aboriginal employment and procurement have been consulted, with the aim

of embedding these considerations into procurement frameworks, contractor obligations and local participation strategies.

Engagement included participation in local business engagement activities and Meet the Buyer events facilitated through TACTIC, the Industry Capability Network (ICN) and the Office for the Industry Advocate in multiple locations including Whyalla, Port Augusta, Port Pirie and Roxby Downs and Adelaide. This provided opportunities for engagement directly with local and regional businesses regarding Project updates, procurement processes and potential future supply chain opportunities. Businesses have been encouraged to register with ICN to support visibility of local capability and future involvement in project delivery.

This engagement has informed decisions regarding procurement design, timing and contract packaging, as well as expectations placed on delivery partners relating to local workforce utilisation, training outcomes and reporting on local participation performance. Engagement has also brought a clearer understanding of regional constraints, including labour availability, accommodation capacity and service pressures, so that potential impacts can be anticipated and managed.

Future engagement with local business and industry will continue to clearly distinguish between potential economic opportunities and confirmed commitments, while progressively demonstrating how local employment, procurement and business participation objectives will be translated into measurable outcomes.

A Local Industry Engagement Plan and Tailored Industry Participation Plan for the Project will be prepared to address the approach to local industry and business participation during construction and operation.

Further information of business engagement is provided in Appendix D-2.

22.6 Conclusion

The Project is predicted to have a significant positive impact on the economies of Northern South Australia and South Australia, increasing GRP by $3 billon and GSP by $3.3 billion on average over the period between 2026 and 2062. Australian GDP is also expected to be $4.2 billion higher on average between 2026 and 2062 (inclusive of the impact in South Australia).

Approximately 65% of the additional GRP generated in Northern South Australia is predicted to come from the growth in value added from the Mining and Water sectors. Economic benefits to the region and the State will flow through increased royalties from growth in mining productivity, positive employment generated in sectors directly linked to Project construction and ancillary sectors such as heavy manufacturing and services. Growth in the construction, mining, construction and water sectors also leads to positive employment generated in a range of other sectors such as trade (retail and wholesale) and government services as these sectors draw on a range of services throughout the economy. An additional 2,000 FTEs are expected to be employed across South Australia, with 1,600 in Northern South Australia between 2026 and 2062.

Negative economic impacts from the Project on non-mining sectors including pastoral businesses, commercial fisheries and aquaculture are expected to be negligible. The potential for economic impact from the accommodation requirements for the construction

workforce will be managed in collaboration with local authorities and the tourist accommodation industry, to ensure negative outcomes are avoided.

Early and ongoing engagement with local providers of goods and services has provided a good understanding of regional capacity, supply chain readiness and opportunities to maximise local employment, procurement, business participation and economic benefit to the community.

Overall the Project will create greater investment security and opportunities in the Far North and USG regions by providing an alternative, secure and sustainable water supply to support current mining operations and other industries, as well as incentivising exploration and mine expansion.



Chapter 23

Social Environment

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

23 SOCIAL ENVIRONMENT 23-1

23.1 Key Findings 23-1

23.2 Setting the Context 23-2

23.2.1 Requirements in legislation and other standards 23-2

23.2.2 Views of stakeholders 23-3

23.3 Assessment Method 23-4

23.3.1 Desktop assessment 23-4

23.3.2 Identifying the social impact study area 23-4

23.3.3 Desktop sources 23-5

23.3.4 Establishing a social environment baseline 23-5

23.3.5 Stakeholder and community engagement 23-6

23.3.6 Identifying potential impacts, mitigation measures and opportunities 23-6

23.4 Description of the Existing Environment 23-10

23.4.1 Overview of the social impact study area 23-10

23.4.2 Baseline social environment 23-13

23.4.3 Advantage and disadvantage indicators 23-17

23.5 Impact Assessment 23-18

23.5.1 Workforce management 23-19

23.5.2 Housing and accommodation 23-20

23.5.3 Local business and industry procurement 23-23

23.5.4 Health and community wellbeing 23-24

23.5.5 Summary of key mitigation measures 23-29

23.6 Conclusion 23-31

LIST OF TABLES

Table 23-1: Summary of study area baseline environment 23-13

Table 23-2: SEIFA – Percentiles within Australia for the LGAs within the study areas 23-18

Table 23-3: Key mitigation measures – social environment 23-29

LIST OF FIGURES

Figure 23.1: Social assessment study area – southern section 23-7
Figure 23.2: Social assessment study area – northern section 23-8
Figure 23.3: Planning regions and important population centres in the Project Area 23-9

LIST OF PLATES

Plate 23-1: Whyalla Port 23-10
Plate 23-2: Royal Flying Doctor Service, Port Augusta 23-11
Plate 23-3: Woomera Missile Park 23-12
Plate 23-4: Roxby Downs town centre 23-12

23 SOCIAL ENVIRONMENT

Maximising the benefits and understanding and reducing potential negative social impacts of the Northern Water Project to local and regional communities is a key focus in the design and management of the Project and is the driver of ongoing engagement with affected landholders and other key stakeholders.

A Social Environment Technical Report has been prepared for the Project (Planning Futures, 2026) which provides baseline demographic and social data, identifies potential social impacts, mitigation and management initiatives that may eliminate or minimise social impacts, and identifies opportunities and value-adds that may enhance potential benefits to local communities. This report is attached at Appendix K-1.

While the social impact assessment addresses the potential impacts of the Project on the existing lifestyles and amenity of local communities, landholders and individuals, there is also a clear interrelationship between economic impacts and benefits, and community and social wellbeing. This chapter addresses these matters at a high-level while further assessment is provided in the following chapters:

- economic impacts and benefits of the Project are set out in Chapter 22 Economic Environment
- potential impacts on lifestyle amenity of affected landholders, and from restrictions on land use and marine activities are addressed in Chapter 9 Use of Land and Marine Waters
- amenity impacts to air quality and from Project noise are addressed in Chapter 18 Air Quality and Chapter 19 Noise and Vibration
- impacts to visual amenity in the Project Area and on Mullaquana Station are addressed in Chapter 20 Landscape Character and Visual Amenity
- impacts to roads and traffic, and air, rail and marine operations are addressed in Chapter 21 Traffic and Transport
- impacts to the marine environment are addressed in Chapter 11 Marine Environment.

23.1 Key Findings

- The Project has the potential to contribute to broader economic revitalisation and to reinforce community confidence, sense of place and resilience across the Project Area.
- The Project represents a significant economic opportunity for the Upper Spencer Gulf and Far North, generating substantial demand for labour, goods and services across an extended construction period. Project requirements for local procurement will benefit local communities by providing opportunities for local industries, businesses service providers and workforce.
- The importance and value to the community of the Upper Spencer Gulf's marine environment is the most frequently raised issue by stakeholders and Traditional Owners. The need to ensure that marine values are protected has driven Project location, design, construction methodology and operational parameters.

- Early and ongoing engagement with local communities will minimise the potential for impacts to social cohesion due to the presence of the construction workforce.
- The Project will seek to minimise impacts on local housing availability and affordability by accommodating the majority of non-local construction workers in a combination temporary workforce accommodation, existing short-stay accommodation, and where appropriate, marine based accommodation facilities.
- Impacts to local housing availability and affordability from the operational workforce will be negligible due to the relatively small number of long-term staff required.
- Presence of construction workforce is not expected to negatively impact access to local services.
- Impacts to community amenity (e.g. air quality, noise, traffic, visual and the marine environment) have been assessed in the EIS and with proposed mitigation measures in place the overall impacts to community amenity are expected to be minor. The chapters where these matters are considered are listed above.

23.2 Setting the Context

The EIS Assessment Requirements require an assessment of the effects on the social environment of communities impacted by the Project. Key matters include workforce management, housing and accommodation, local business and industry procurement, and health and community wellbeing. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment has been undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used to identify baseline social and demographic values and to undertake the impact assessment is set out in Section 23.3.

23.2.1 Requirements in legislation and other standards

Apart from the EIS ARs, there are no specific South Australian legislative requirements or guidelines for the assessment of social impacts related to proposed development under the *Planning, Development and Infrastructure Act 2016* (PDI Act). The methodology for assessing social impacts in Appendix K-1 was guided by the principles and guidelines outlined by the International Association for Impact Assessment (IAIA) and the *SIA Guidance for assessing and managing the social impact of projects* (Vanclay et. al., 2015).

The IAIA principles were adopted in defining social impacts for the purposes of the Project, which were defined as changes to one or more of the following:

- people's way of life, how they live, work, play and interact with one another on a day-to-day basis
- shared culture, beliefs, customs, values and language
- community cohesion, stability, character, services and facilities

- environmental impacts, including air, water, hazard, risks, physical safety, access to resources, dust and noise
- their health and wellbeing – health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity
- personal and property impacts
- community perceptions, fears and aspirations.

23.2.2 Views of stakeholders

Comprehensive community and stakeholder engagement has been undertaken for the Project as part of baseline data gathering, route selection and refinement and included local councils, industry representatives, the public, affected landholders and known social receptors within and adjacent to locations of Project construction activities and permanent infrastructure.

At a local level there is generally strong support for the Project as a catalyst for economic opportunities and development, including employment and contractor opportunities, with many stakeholders expressing an interest in being involved in and benefiting from the Project. The Project has received a high level of interest from industry, business and local communities, and government stakeholders regarding potential local employment, procurement and regional economic participation opportunities. This support sits alongside concerns relating to potential impacts of construction activities, workforce accommodation pressures on local housing, amenity impacts and cumulative regional development pressures.

Protection of the Upper Spencer Gulf marine environment is the most prominent theme across stakeholder groups, which includes commercial and recreational fishers, environmental organisations and local communities. Stakeholders framed the marine environment not only as an ecological value in its own right, but as the foundation for regional livelihoods including fisheries, tourism and local identity.

Recent harmful algal bloom (HAB) events in Upper Spencer Gulf have heightened community awareness of, and sensitivity to, the condition of the marine environment and the industries and community values that depend upon it, including commercial fishing, tourism and experiences associated with the Giant Australian Cuttlefish. These events have reinforced the importance placed by community on protection of marine values.

Amenity impacts were primarily raised by nearby residents, shack owners and the Whyalla City Council, particularly in relation to potential construction impacts (e.g. from dust, noise and increased traffic) and the effect on local communities, travellers and regional infrastructure. While these impacts were generally understood to be temporary in nature, stakeholders emphasised that poorly managed construction impacts could affect quality of life, community wellbeing and perceptions of the Project.

The Whyalla City Council and other regional stakeholders also identified potential workforce accommodation pressures and associated flow-on effects for housing availability, short-term accommodation, local services, infrastructure and community facilities during peak construction periods. Some stakeholders noted that cumulative amenity impacts could become more pronounced when considered alongside other regional projects and

seasonal population increases, particularly if activities were not appropriately coordinated and communicated.

Further details of stakeholder engagement and community consultation outcomes are set out in Chapter 4 Community and Stakeholder Engagement and Appendix D-2.

23.3 Assessment Method

The method for undertaking the social impact assessment was consistent with the approach used through this EIS. The impact assessment considers the benefits and impacts that are expected to occur as part of the construction and operation of the Project.

Where there was uncertainty in the assessment of the expected impacts, this was evaluated using risk assessment tools set out in Chapter 8 and discussed under the impact event where relevant. A summary of the evaluation of uncertainty for all impact events is contained in Appendix M.

23.3.1 Desktop assessment

Desktop research and the outcomes of stakeholder and community engagement informed the desktop assessment. Potential social impacts from the Project were identified, both negative and positive, and suggested mitigation and enhancement opportunities noted to highlight where the Project could potentially eliminate or reduce negative impacts and optimise positive benefits.

A study area was identified and a social environment baseline for the assessment of social impacts and opportunities was established using desktop research and the outcomes of stakeholder and community engagement. Potential mitigation and monitoring directions were identified, including opportunities to avoid or minimise impacts and enhance opportunities.

23.3.2 Identifying the social impact study area

The potential area of impact of the Project in terms of social values potentially occurs at different scales (i.e. local, regional, State and national). The potential area of social impact is defined as:

- the area directly impacted by the Project footprint, and
- nearby population centres outside the Project construction footprint that may be impacted by the Project due to proximity i.e. visual, noise, traffic and transport, workforce opportunities, demand for community services, supply of goods or services, industry participation or other impact.

The following study area levels were utilised in the social technical report (refer Appendix K- 1), based on Australian Bureau of Statistics (ABS) statistical areas:

- **State Study Area (ABS State / Territory)** - encompasses the entirety of South Australia. Used mainly for comparison purposes or where impacts are far-reaching across the whole of the State.
- **Regional Study Areas (ABS Statistical Areas Level 3) (RSA)** - used for comparison purposes and to discuss regional impacts such as community services and facilities. The relevant RSAs are Outback North and East; and Eyre Peninsula and South West.

- **Local Government Study Areas (ABS Local Government Areas) (LGA)** - includes those areas directly impacted in the Project Area and / or adjoining areas likely to experience impacts associated with transport movements directly related to the Project. Relevant LGAs are the City of Whyalla, Port Augusta City Council and Roxby Downs Council. For Roxby Downs Council, the Locality Study Area of Roxby Downs is referred to as it covers an identical geographic area.
- **Locality Study Areas (ABS Urban Centres / Localities) (UCL)** - a selection of UCLs as defined by the ABS that sustain populations in proximity to or having connection to an area within the Project Area. Relevant UCLs are Woomera, Roxby Downs and Andamooka.
- The LGAs, main population centres and study area levels are shown in Figure 23-1 (southern section) and, Figure 23-2 (northern section). State planning regions are shown in Figure 23-3.

23.3.3 Desktop sources

A desktop review was undertaken to characterise the existing social environment of the study areas to establish a baseline for the identification and assessment of impacts (refer Appendix K-1 for further detail). The data and information used for this review was primarily sourced from:

- Australian Bureau of Statistics (ABS) 2021 Census and additional data releases (https://www.abs.gov.au/census)
- ABS Socio-Economic Indexes for Areas, Australia, 2023 (Accessed at https://www.abs.gov.au/websitedbs/censushome.nsf/home/seifa
- Plan SA Population Projections 2021 to 2041 (https://plan.sa.gov.au/state_snapshot/population/population-projections)
- Australian Institute of Health and Welfare 2022 (https://www.aihw.gov.au/)
- Mental Health Australia (https://mhaustralia.org/)
- National Institute of Economic and Industry Research (https://nieir.com.au/)
- Tourism SA (https://tourism.sa.gov.au/)
- Other publicly available information such as community reports, agency plans and regional and local planning and strategic documents.

23.3.4 Establishing a social environment baseline

A baseline for the assessment of social impacts and opportunities was established using desktop research and the community and stakeholder engagement process. The detailed outcomes of this baseline research are presented in Appendix K-1 and include:

- the analysis of data from several sources including the ABS and other government departments
- research of case studies and academic research papers
- identification of on-ground community services and facilities.

23.3.5 Stakeholder and community engagement

The social impact assessment was informed by the extensive stakeholder and community engagement undertaken, including meetings, briefings and workshops with key stakeholders such as landholders, local Councils, government agencies, environmental and special interest groups and the general public; attendance at community events including shows and field days; and staffing of a local office at Whyalla.

The full range of engagement activities undertaken in support of the Project are outlined in Chapter 4 Community and Stakeholder Engagement and the Engagement Outcomes Report at provided at Appendix D-2.

23.3.6 Identifying potential impacts, mitigation measures and opportunities

Potential impacts and opportunities are discussed in detail in the Appendix K-1 and have been identified based on:

- the established baseline and knowledge of the Project Area
- the outcomes of other technical reports prepared in support of the Project and discussions with the respective specialists that undertook the work
- experiences and lessons learned from similar projects
- general community engagement sentiment and feedback
- internal workshops held with the Project team.

Potential impacts are detailed in Section 23.5 and mitigation measures are presented in Section 23.5.5.

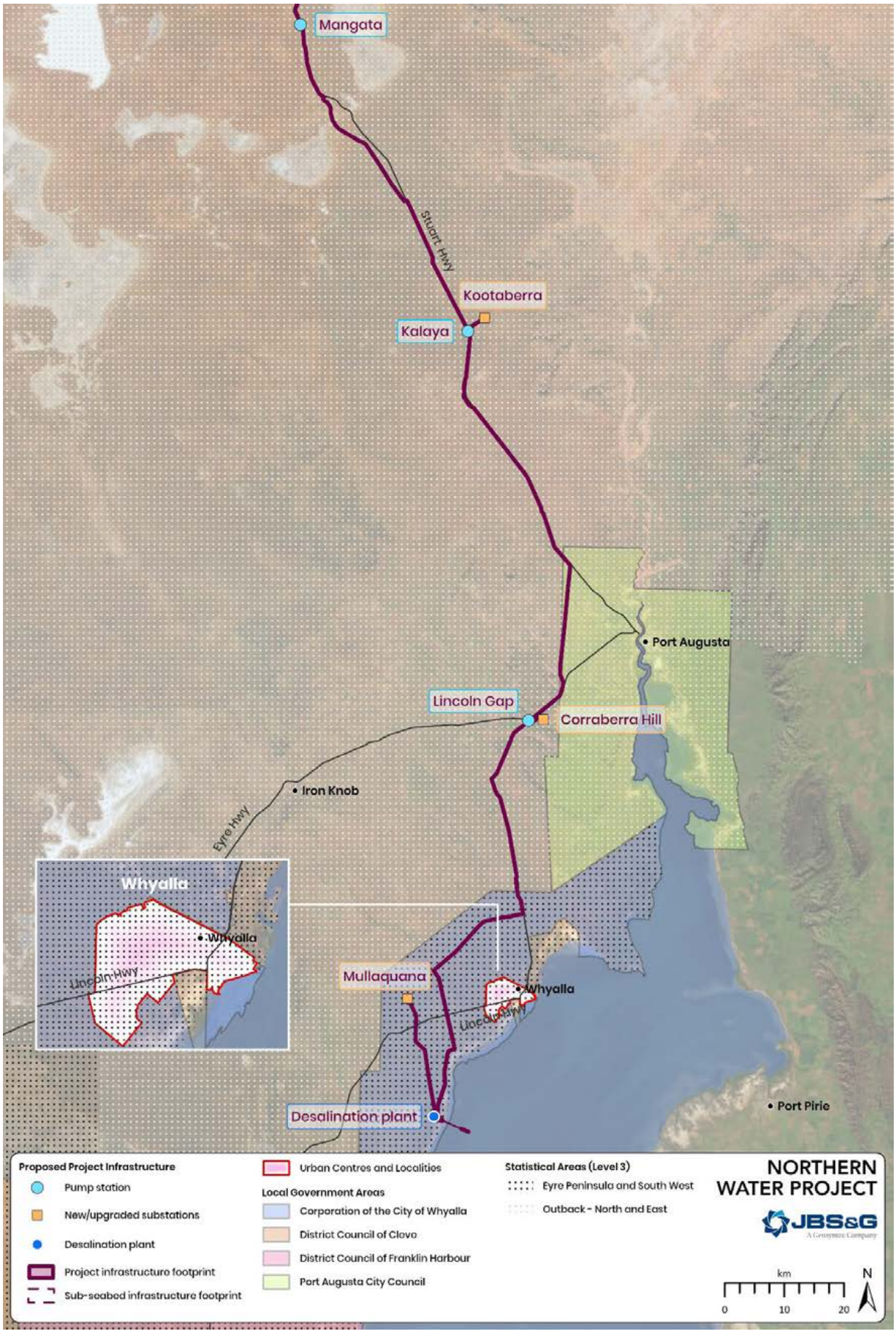


Figure 23.1: Social assessment study area – southern section

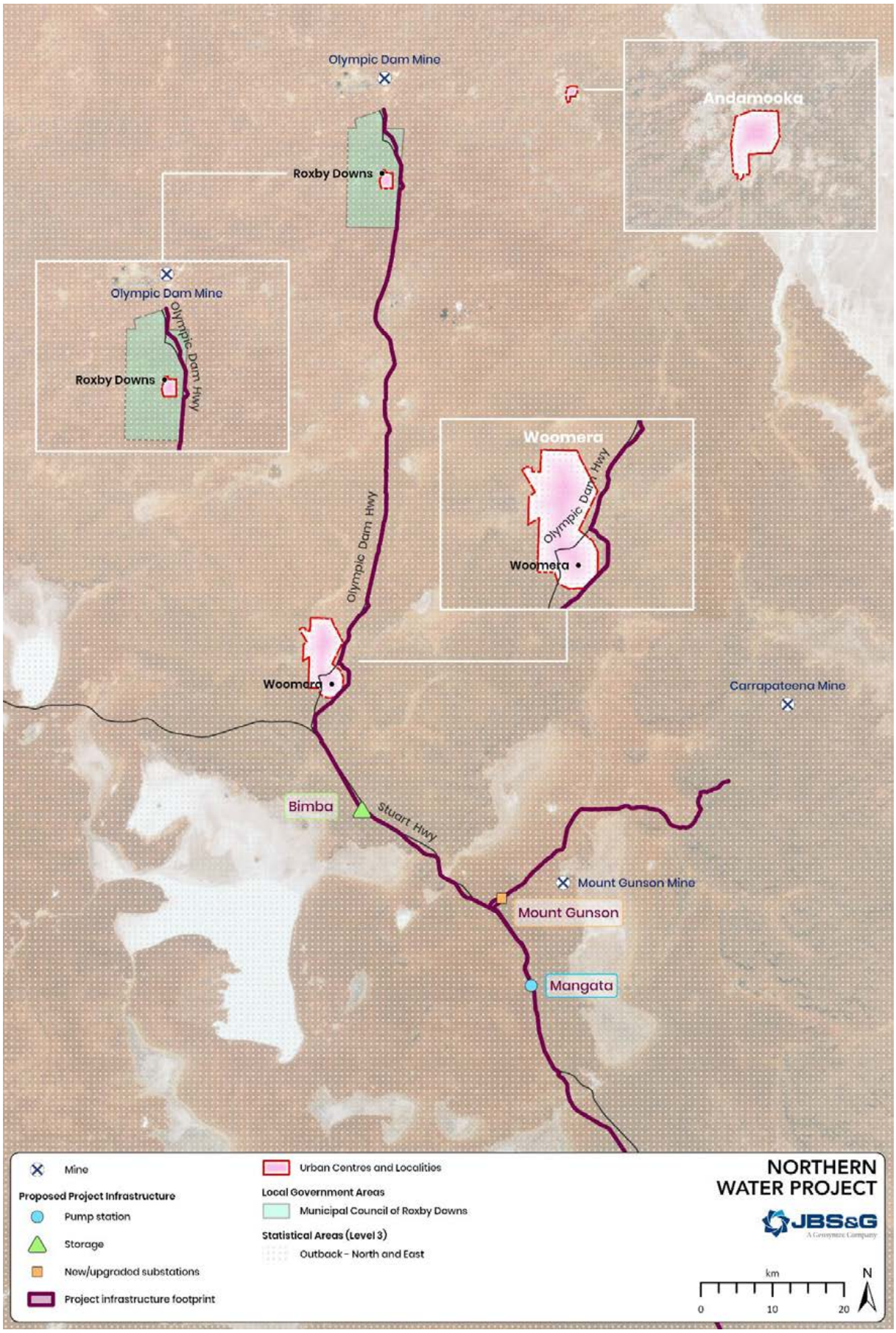


Figure 23.2: Social assessment study area – northern section



Figure 23.3: Planning regions and important population centres in the Project Area

23.4 Description of the Existing Environment

23.4.1 Overview of the social impact study area

A high-level description of the existing environment of each of the LGAs referred to in Appendix K-1 and the towns of Woomera, Pimba and Roxby Downs is provided below. The LGAs and important population centres are shown in Figure 23-3.

City of Whyalla

The City of Whyalla is located on the upper east of the Eyre Peninsula. Whyalla is a key population centre providing services, employment opportunities and education to the wider north-eastern Eyre Peninsula and Upper Spencer Gulf. The Lincoln Highway heads south from Port Augusta to Port Lincoln, via Whyalla, providing the main highway connection on the east coast of the Eyre Peninsula. Whyalla Airport is located on the southern side and provides regular services to Adelaide and other regional locations. Whyalla Port supports shipping operations for the resources industry while the Whyalla marina provides recreational boating facilities for the local and visiting users.

Whyalla has an important history associated with its steelworks and shipbuilding industries that generated significant population growth during the middle of the 20th century. The steelworks are located adjacent to the port on the northern side of the city and are supplied by iron ore mines to the west of the City of Whyalla boundary. The mining operations, steelworks and associated industries are major employers in the region.

The steelworks continue to play an important role in the economic and social identity of Whyalla and the broader Upper Spencer Gulf region. Recent developments associated with the future operation, transition and long-term sustainability of the steelworks have reinforced its significance to the community and the importance of investment and infrastructure that support regional economic resilience and future industrial growth.

To the north of Whyalla is Olsson's Pacific salt works at False Bay. Port Bonython is to the north-east of Whyalla supporting export of natural gas and crude oil piped from Moomba in the Cooper Basin and import of diesel products from overseas refineries.

The annual breeding of the Giant Australian Cuttlefish in Spencer Gulf waters near Port Bonython is a popular tourism attraction for Whyalla (refer Plate 23-1).



Plate 23-1: Whyalla Port
[Source: https://www.vesseltracker.com/en/Ports/Whyalla/gallery/1365118]

City of Port Augusta

The City of Port Augusta is located at the top of Spencer Gulf, with the city extending similar distances along the eastern and western sides of the gulf.

Port Augusta is a significant junction for road, rail and sea transport. The Eyre Highway, Stuart Highway, Augusta Highway and Flinders Ranges Way all connect to Port Augusta, while the Lincoln Highway meets the Eyre Highway just south-east of the city at Lincoln Gap. The Indian Pacific and The Ghan interstate train services both transit through Port Augusta, which also connects to Quorn via the Pichi Richi Heritage Railway. Port Augusta Airport is located on the western side of the city and provides charter services to Adelaide and other regional locations.

Also known as a gateway to the Far North of South Australia and the Flinders Ranges, a significant number of tourists, fly-in fly-out (FIFO) workers and road freight pass through Port Augusta every year and the city is the base for a number of services to the Far North including the Royal Flying Doctor Service (RFDS) and School of the Air (Plate 23-2).



Plate 23-2: Royal Flying Doctor Service, Port Augusta
[Source: RFDS]

Woomera

The town of Woomera is owned and operated by the Department of Defence as part of the Royal Australian Air Force Woomera Range Complex. Woomera has experienced a declining population since establishment after the Second World War, although small increases occurred during the late 1990s and early 2000s when the Woomera Immigration Detention Centre was active. Woomera remains home to a small number of workers mostly associated with the Department of Defence but is also attracts tourists to its museums and missile park (Plate 23-3). The Olympic Dam Highway connects Woomera to Pimba and the Stuart Highway to the south.

Pimba

Pimba is a small settlement located 6 km south of Woomera at the junction of the Stuart Highway to Alice Springs and the Olympic Dam Highway. It was established originally as a workers' camp during the construction of the transcontinental railway to Western Australia at the end of World War One on the national rail network. It now serves as an outback stop for travellers heading towards Alice Springs and comprises a railway station, Spud's Roadhouse and a small number of dwellings.



Plate 23-3: Woomera Missile Park

Roxby Downs

The town of Roxby Downs was built to support the Olympic Dam mining operations and is located approximately 13 km south of the mine. The town's economy is based on providing services to the mine and the local community, including health and education facilities, a range of retail, hospitality and leisure facilities, parks and playgrounds (Plate 23-4).

The Olympic Dam Highway connects Woomera and the Stuart Highway to Roxby Downs. Olympic Dam Airport is located approximately 7 km to the north of Roxby Downs and provides services to Adelaide and other regional locations.



Plate 23-4: Roxby Downs town centre
[Source: Google Earth]

23.4.2 Baseline social environment

The baseline environment is described for the following key social and economic indicators:

- population and demography
- households and families
- housing and accommodation
- employment, income and industry
- social services and facilities
- health and wellbeing.

The different aspects of the baseline environment in the study areas (ABS, 2022) are discussed in detail in Appendix K-1 and summarised in Table 23-1.

Table 23-1: Summary of study area baseline environment

Key social aspect	Summary description of the study area
Population and demography	
Population	At the time of the 2021 Census, the population for the Eyre Peninsula and South West region comprised 3.2% of the State population, with the Outback North and East region comprising 1.4%. Most of this population resided in the larger urban areas including within Whyalla (20,880) and Port Augusta (12,788). The population of the three smaller urban centres / localities within the study area was 132 in Woomera, 260 in Andamooka, and 3,671 in Roxby Downs. Across the region, population level over the five years 2016-2021 was generally steady, with the Eyre and South West experiencing a small increase of 1% and the Outback North and East a small decline of -2%. All three local government areas have experienced population decreases over the 10-year period including the City of Whyalla (-842 people), Roxby Downs Council (-726) and Port Augusta City Council (-158). As a mining town Roxby Downs is more sensitive to population fluctuations which are associated with the operations of the mine. Whilst Whyalla's population has declined over the last 10 years, with industrial growth, it is projected to grow its permanent population over the next 20 years by 1,733 people, an average of 87 people per year.
Age	At the time of the 2021 Census, the median age of usual residents in the study area varied from 30 years in Roxby Downs to 43 years in Woomera and Andamooka, and for the Eyre and South West region. The median ages of settlements located inland in closer proximity to working pastoral areas is lower when compared to coastal settlements, which are more likely to be popular retirement locations. Roxby Downs' very low median age reflects its status as a mining town, with a proportionally large working population. The median age in the Cities of Whyalla and Port Augusta is the same as, or slightly lower than the State median age.
Aboriginal population	At the time of the 2021 Census, Aboriginal populations were more likely to reside in the Port Augusta LGA (2,825 people) or Whyalla LGA (1,160). Both cities had higher proportions of Aboriginal residents (20.4% and 5.5% respectively) when compared to South Australia (2.4%). Outside of Port Augusta and Whyalla, higher numbers of Aboriginal populations were more likely to reside in Roxby Downs LGA (198, or 5.0%), or Unincorporated SA (733, or 22.9%).

Key social aspect	Summary description of the study area
	The median age of Aboriginal and Torres Strait Islander people in Whyalla was significantly lower than the median age of the total population of Whyalla in 2021, at just 23 years of age compared with 41 years of age.
Language and education	Language spoken at home in most study areas was almost universally English. Households speaking another language were more common in the very remote areas of Outback North and East and Unincorporated SA, with Australian Indigenous Languages being the most dominant language spoken at home other than English. In the larger population centres of Roxby Downs, Port Augusta and Whyalla, South-east Asian Austronesian languages, Indo-Aryan languages were recorded as amongst the most common languages spoken. Most study areas had lower rates of year 12 completion when compared with South Australia except for Roxby Downs, which had rates of year 11 and 12 completion similar to the State.
Households and families	
Households and families	All study areas (other than Roxby Downs) had a higher proportion of single person households when compared with South Australia (28%), with Woomera and Andamooka UCLs having the highest proportion at 57% and 51% respectively. Roxby Downs LGA and UCL had a relatively low proportion of lone person families at around 24%. Roxby Downs had a high proportion of family households, with more than 47% of all households being families with children, compared to the State (39%). Single parent households were more prevalent in Port Augusta and Whyalla, where the proportion of one-parent households was 14% and 13% respectively, compared with 11% for South Australia. Whyalla had higher proportion of single person households (36%) when compared with the Eyre Peninsula and South West (33%) and South Australia (28%). It is noted that Aboriginal and Torres Strait Islander people in Whyalla were less likely to live alone and more likely to live in either one-parent family or couple with children families.
Housing and accommodation	
Housing and accommodation	At the time of the 2021 Census, a total of 40,260 dwellings were located within the two statistical areas, Eyre and South West (70%), and Outback North and East (30%), the majority of which are located in the main population centres of Whyalla and Port Augusta.
Housing occupancy	Unincorporated SA recorded a very high proportion of unoccupied private dwellings (51.1%), likely due to the gradual depopulation of remote and very remote South Australia over a long period of time. Similarly, Andamooka and Woomera also had a high proportion of unoccupied private dwellings again most likely due to depopulation over time (74% and 62% respectively). There was a total of 10,471 private dwellings in Whyalla, of which 1,489 (14%) were unoccupied at the time. Higher rates of unoccupancy in coastal locations during the winter months is not unusual and this compares with an unoccupancy rate of 19% for the Eyre Peninsula and South West region, and 11% for South Australia.

Key social aspect	Summary description of the study area
Housing availability	Housing availability for the home ownership and rental markets is low in the study areas despite there being adequate land zoned for residential use. A 2022 survey report found that much of the Upper Spencer Gulf's housing stock was subject to pressures caused by 'the cumulative impact of a large number of short-term construction projects that had introduced a significant transient working population' (Spencer Gulf Cities 2022). Workers' accommodation in the region is provided via four overlapping markets: • the private rental market, where demand from workers competes with that of resident households • social and key worker housing, captured within government housing tenure • tourist accommodation such as caravan parks, cabins and motels, which is recorded as visitor accommodation but is frequently used by workers on a short or long-term basis, and • purpose-built workforce camps and villages, which are often not recorded within residential dwelling data at all due to their temporary nature.
Housing affordability	In 2021, median monthly mortgage repayments in the study areas were lower than for the whole of South Australia ($1,500 per month), with the exception of Roxby Downs ($1,517 per month). Weekly median rent in all the study areas was also lower than for the whole of South Australia. Rents were highest in Roxby Downs and in Port Augusta. The median rent in Woomera was very low (<$100), due to subsidy by the Department of Defence.
Visitor accommodation	Eyre Peninsula had 1.66 million visitor nights in 2024, with 72% of visitors from South Australia, 25% interstate, and 3% international. The holiday sector generates 39% of visitor nights, 25% were visiting friends or relatives, and 25% were travelling for business. There was a total of 2,944 rooms across 166 establishments. The Flinders Ranges and Outback region had 699,000 overnight visits in 2024, with 66% from South Australia, 29% interstate and 5% international. Of the total overnight visits, 38% were visiting on business, 33% were on holiday, and 20% were visiting friends or relatives. Whilst international visitors were comparatively low at 37,000 people, they tended to stay longer (14.7 nights average).
Employment, income and industry	
Labour force participation	At the time of the 2021 Census, 60% of South Australia's population over 15 years was participating in the labour force. Across the study areas, Roxby Downs and Woomera recorded much higher rates (79% and 80%), which is reflective of their status as major employment centres for the mining and defence industries. All other townships and settlement areas recorded lower participation rates that ranged between 50% in the township of Andamooka, and 58% across Unincorporated SA. Labour force participation rates in Whyalla and Port Augusta LGAs were 55.0% and 53% respectively. Participation rates for women in the workforce when compared with rates for the total population vary across the study area, with females living in Port Augusta having higher labour force participation rates. For all other areas,

Key social aspect	Summary description of the study area
	participation rates for women are generally lower, particularly in Woomera, Andamooka, Whyalla and Roxby Downs.
Unemployment	Unemployment rates across the study areas varied considerably compared with South Australia (5.4%). The highest unemployment rate was in Andamooka (10.3%) and the lowest was Roxby Downs (2.1%). The Whyalla and Port Augusta LGAs had unemployment rates of 7.6% and 6.4% respectively, and Woomera had an unemployment rate of 5.4%.
Income	Median total household weekly incomes across the study areas at the time of the 2021 Census were mostly lower than for the whole of South Australia ($1,455). Notable exceptions were Roxby Downs ($3,142) and Woomera ($1,829), again reflecting their association with the mining and defence industries respectively.
Industry of employment	At the 2021 Census, the two top industries of employment within the City of Whyalla were manufacturing, and health care and social assistance. Within the City of Port Augusta, the top industry of employment was health care and social assistance, followed by public administration and safety. Mining and construction were the top industries of employment for Roxby Downs local government area (including Olympic Dam) followed by accommodation and food services. In Woomera, people were employed in either public administration and safety, or construction. Across the SA Outback more generally, health care and social assistance, followed by agriculture, forestry and fishing were the two main industries of employment.
Social services and facilities	
Health facilities	The majority of health services are provided in the cities of Port Augusta and Whyalla, with both cities having a hospital and supporting health services. A health service operates in Roxby Downs. Whyalla is also home to the Country and Outback Mental Health Service, University of South Australia's Rural Health Clinic and Whyalla Medical Centre, and a number of General Practitioners are located in each city. Outreach and emergency services, including Royal Flying Doctor Service clinics and retrieval, supplement resident services across the region. The hospitals in the study area are typical of regional South Australia in offering acute, emergency, general medical and aged-care services, with more specialised and complex care requiring referral and travel to Adelaide. The medical and broader health workforce across the study area is generally lower, relative to population, than in metropolitan South Australia, consistent with the established pattern of health workforce shortages in regional and remote areas. There are a number of Aboriginal health services in key locations that focus on providing health, mental health and care services in locations close to Aboriginal populations. In this respect, the City of Port Augusta is a key location for the provision of health services and facilities supporting remote and very remote Aboriginal populations in the Far North.
Education and childcare	Education services within the study area are predominately located in Whyalla and Port Augusta as the larger population centres. Each has a TAFE campus, several schools, and early learning centres and childcares. There are also a TAFE campus, area school and childcare and early learning facilities at Roxby Downs. There is an area school at Woomera and a primary school at Andamooka.

Key social aspect	Summary description of the study area
Emergency services	Most emergency services are provided in the main population centres of Whyalla and Port Augusta. These consist of the State Emergency Service (SES), Metropolitan Fire Service, Country Fire Service (CFS), SA Ambulance Service and the SA Police. The Region 4 CFS headquarters and the Royal Flying Doctor Service are located in Port Augusta and the Middleback CFS in Whyalla. Other CFS stations are based in Roxby Downs, Woomera and Andamooka. The SA Ambulance Services and SA Police operate out of Woomera and Roxby Downs in addition to the cities (noting SA Police also have a station at Andamooka). SES have operations at Whyalla, Port Augustan Roxby Downs and Andamooka. Emergency services across the study areas are highly dependent on volunteers.
Health and wellbeing	
Health	When compared with South Australia as a whole, rates of people who identified with a long-term health condition were particularly high in Andamooka (43%) and Woomera (38%). In Whyalla, 35% of the population indicated that they had one or more long-term health conditions, which was higher than for South Australia (31%). In relation to mental health, rates of people who identified with a long-term mental health condition were slightly higher in Whyalla, Woomera and Andamooka at around 11% when compared with South Australia (10%). Mental Health Australia (MHA 2023) estimates that there are nearly twice the number of psychologists and more than twice the number of psychiatrists per head of population in major cities compared to regional areas. Whyalla is home to the Country and Outback Mental Health Service and performs an important Mental Health service provision role across the Eyre Peninsula and Outback.
Community support	Across the study areas, rates of volunteering in 2021 were significantly higher in rural areas and rural townships. Whyalla and Port Augusta had much lower rates of volunteering when compared with rural and coastal townships. Only 17% of all people in South Australia over 15 years of age reported that they undertook voluntary work for an organisation or a group.

23.4.3 Advantage and disadvantage indicators

The Socio-Economic Indexes for Australia (SEIFA) which was developed by the ABS was last updated in 2023 and uses four indexes to calculate relative socio-economic disadvantage:

- **Index of Relative Socio-Economic Disadvantage** is calculated based on the number of people with low incomes, low levels of qualification, unemployment, low rent, high disability and low skilled occupations.

  Whyalla and Port Augusta have relatively high levels of socio-economic disadvantage and are similar to the unincorporated (remote) parts of South Australia. Roxby Downs has, by contrast, a very low index, indicating higher incomes, qualifications and employment (refer to Table 23-2).
- **Index of Relative Socio-Economic Advantage and Disadvantage** also takes into account indicators of advantage and shows a similar outcome across the study areas as the Index of Relative Socio-Economic Disadvantage (refer to Table 23-2).

- **Index of Economic Resources** focuses on financial indicators including income, wealth and home ownership. This Index shows a similar outcome as the more general indices of disadvantage and advantage (refer to Table 23-2).

  For Roxby Downs, it indicates that the town's relative lack of disadvantage is not due to income and wealth alone. In particular, the low level of home ownership in Roxby Downs may have resulted in the Index of Economic Resources being higher than for general disadvantage.

- **Index of Education and Occupation** focuses on indicators that include qualifications and occupation, with a low score indicating larger numbers of people with no qualifications, higher unemployment and higher numbers of people with low skilled occupations. Again, the City of Whyalla and the City of Port Augusta have relatively low scores, whilst Roxby Downs and the unincorporated parts of South Australia have higher scores (refer to Table 23-2).

  For Roxby Downs, the percentile is higher than for general disadvantage and economic resources indicating that there may be a high proportion of lower skilled occupations or levels of education, notwithstanding higher incomes.

  For Unincorporated SA, the relatively high score compared to the other indices may indicate that there are higher levels of employment, education and occupation skill level, notwithstanding other factors of disadvantage such as lower incomes, higher levels of disability, lower rents, low internet connectivity, or single parent status.

Table 23-2: SEIFA – Percentiles within Australia for the LGAs within the study areas

Area	Index of Relative Socio-Economic Disadvantage	Index of Relative Socio-Advantage and Disadvantage	Index of Economic Resources	Index of Education and Occupation
City of Whyalla	10th	10th	10th	7th
City of Port Augusta	11th	10th	11th	8th
Municipal Council of Roxby Downs	90th	79th	75th	32nd
Unincorporated SA	13th	18th	10th	16th

23.5 Impact Assessment

The following Project aspects have been identified as potential sources of impacts and benefits to the social environment:

- presence of a large temporary construction workforce in the community
- accommodation of construction workers
- Project requirements for local workforce and service procurement
- effects of an increase in the workforce on local services and businesses
- construction noise, traffic, dust, presence of plant and machinery, and permanent infrastructure.

The potential impact events resulting from these aspects of the Project are discussed below. Predicted impact consequence categories and an evaluation of uncertainty are also provided for each impact event.

As noted in section 23.2, the Project ARs include the following key matters to be addressed in the social impact assessment:

- workforce management
- housing and accommodation
- local business and industry procurement
- health and community wellbeing.

Further discussion of matters that may have an impact on the amenity of landholders and communities is provided in Chapter 9 Use of Land and Waters, Chapter 18 Air Quality, Chapter 19 Noise and Vibration, Chapter 20 Landscape Character and Visual Amenity and Chapter 21 Traffic and Transport and the Social Environment Technical Report at Appendix K-1.

23.5.1 Workforce management

Early and ongoing engagement with local communities will minimise the potential for impacts to social cohesion due to the presence of the construction workforce.

Stakeholder engagement for the Project has shown that the prospect of an incoming construction and operational workforce is generally perceived positively, as a source of local economic benefit rather than primarily as a source of disruption. However, construction of major projects can generate concern within local communities about the possible effects of the influx and ongoing presence of a large temporary workforce, a proportion of which is likely to have been sourced from outside the region.

While preference will be given to utilising local labour where appropriate, there is unlikely to be a sufficient number of workers in the immediate region with the necessary skills. The Project will therefore need to source workers from across the broader region, State or interstate, particularly given that there are other proposed and existing projects in the area requiring a similarly skilled workforce, which will increase demand.

An introduced workforce has the potential to generate community wellbeing concerns due to behaviours and poor integration with local communities. The Project construction workforce would typically be predominantly male (although there is an increase in female participation in projects of this nature). This is consistent with the gender composition of the existing population in the study area (i.e. the male to female population ratio is generally more than 50% male), but with a younger age profile. Management of offsite behaviours and introduction of initiatives and strategies that seek to integrate a working community into the resident community would be an important part of workforce planning.

It is also true that an introduced workforce can result in benefits to local communities through increased membership and volunteering at local sporting, service clubs, emergency services and recreational groups. Support from the Project via sponsorship, volunteer promotion amongst the workforce, collaborations with local sporting teams or groups, and programs that encourage workers to participate in local clubs and services can contribute

significantly to the wider sustainability and cohesion of the local community, and the health and wellbeing of the workforce itself.

Interactions between community members and the construction workforce are expected to be intermittent given the nature of rosters and shift durations for projects of this scale and nature. Typically, there is limited free time, although this would be dependent on the construction methodology and approach adopted by the Design Build, Operate Maintain (DBOM) Contractor. During rostered time-off it is likely that many workers would return to their usual place of residence, although some workers may take the opportunity to visit or travel through the region outside of shift work or between rosters.

As there is general community support for the Project (provided environmental values are protected), this is anticipated to assist in mitigating potential impacts to social cohesion due to the presence of the workforce. A Community and Stakeholder Engagement Plan that supports transparent communication, ongoing consultation and enquiry, issue and grievance management processes will be implemented to maintain the trust and support of local communities.

The expected impacts are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty about the workforce size, location, and timing and duration of workforce mobilisation and demobilisation) has been evaluated in Appendix M and the level of risk is **Low**.

23.5.2 Housing and accommodation

Detail of the housing profile in the Project Area including, dwelling supply, diversity and utilisation, housing tenure, workers accommodation, and mortgage repayments and rents is provided in Appendix K-1.

The economic impact of the Project on the availability and affordability of visitor / tourist accommodation has also been addressed in Chapter 22 Economic Environment and Appendix K-1.

Accommodation of the construction workforce

Impacts on local housing availability and affordability will be minimised by accommodating the majority of non-local construction workers in temporary workforce accommodation and existing short-stay / tourism accommodation facilities.

The Project is one of a number of major developments proposed or underway across the Upper Spencer Gulf and Far North. The socio-economic effects of the Project, particularly on workforce and accommodation in these regions, should be understood in the context of this broader pipeline of regional activity.

It is projected that the total FTE workers required for the Project would peak at around 1,500 during year two (Systra, 2025), comprising workers on the desalination plant, marine and tunnelling infrastructure, the construction of the transfer system, and project-wide labour. During construction, the Project workforce will be simultaneously concentrated at the desalination plant site, and distributed along the main transfer pipeline alignment at concurrent work fronts.

As noted above, over the life of Project construction, a significant proportion of this workforce is likely to be sourced from outside the region and will require Project accommodation. The existing housing market in Whyalla and Port Augusta is known to be experiencing capacity and affordability pressures, including low rental vacancy rates, increasing rental costs and growth in property values. In this context, reliance on existing dwelling stock to accommodate Project construction or operational workers could place additional pressure on housing availability and affordability, particularly for lower-income households and other vulnerable community members (refer Appendix K-1).

Accommodation for the Project workforce over the proposed construction timeframe has been raised as a concern by stakeholders (e.g. Whyalla City Council and local residents) in an environment of tight rental markets and short-term accommodation scarcity.

The Project's proposed accommodation approach will seek to minimise impacts on local housing availability and affordability by accommodating the majority of non-local construction workers outside the residential housing market, rather than relying on local residential housing stock. This would include a combination of temporary workforce accommodation, existing short-stay accommodation and, where appropriate, marine-based accommodation facilities.

A workforce Accommodation Strategy will be developed by the DBOM Contractor in consultation with relevant authorities and stakeholders and will seek to minimise impacts on local housing availability and housing affordability.

The Project will also collaborate through established regional coordination mechanisms, including the Whyalla Delivery Co-ordination Group, Spencer Gulf Cities and other relevant forums, to manage cumulative housing and workforce accommodation pressures associated with major projects. Opportunities for workforce accommodation solutions to deliver accommodation capacity or other longer-term community benefits beyond the construction phase (where practical and economically viable) will be investigated.

Use of visitor / tourist accommodation

Based on current workforce planning assumptions, existing short-stay and tourism accommodation in Whyalla and Port Augusta are proposed to be utilised to accommodate portions of the transfer system, tunnelling and marine workforces.

The assessment in Appendix K-1 found that tourist accommodation in the region is already commonly used by a range of workers for short and long-stay options and it is likely that the Project will generate additional demand. Local tourist accommodation providers have reported high occupation rates during the week that decreases over the weekend, indicating a significant level of use by visiting workers.

The use of tourist accommodation for Project personnel therefore has the potential to impact affordability and availability for visitors especially during peak tourism periods (e.g. summer and school holidays and the winter cuttlefish aggregation season in Whyalla), leading to displacement of visitors and potential flow-on effects to other tourism businesses and operators. However, some tourist accommodation operators have also indicated that this additional support from a construction workforce significantly assists them to be financially sustainable in the context of a highly seasonal operation.

The Project will seek to accommodate the majority of non-local construction workers through workforce accommodation arrangements, existing short-stay accommodation and other suitable accommodation options in a manner that minimises impacts on tourism accommodation availability during peak visitor periods.

The workforce Accommodation Strategy to be developed in consultation with local authorities, accommodation providers, regional stakeholders and other major projects will be implemented to manage workforce accommodation demand and minimise impacts on tourism accommodation availability and affordability.

There will be ongoing engagement with tourist accommodation operators, local authorities and communities to understand seasonal demand patterns and identify measures that minimise impacts on visitors and tourism businesses. Workforce use of tourism accommodation would be monitored, and, where required, accommodation arrangements adapted to minimise impacts on accommodation availability and affordability during periods of peak visitor demand.

Short-term worker housing initiatives that also deliver long-term housing legacy outcomes for the wider community will also be investigated in Whyalla and Port Augusta.

Overall the expected impacts of construction workforce accommodation are in the **Minor** category. Uncertainty in the predicted impact (due to uncertainty about the accommodation location and mix, size of the workforce, and timing and duration of workforce mobilisation and demobilisation) has been evaluated in Appendix M and the level of risk is **Medium**.

Temporary workforce accommodation

The use of purpose-built temporary workforce accommodation and strategically located accommodation facilities is expected to substantially reduce reliance on local residential housing markets and assist in managing potential impacts on housing availability and affordability. The scale, location and configuration of temporary workforce accommodation will be determined by the DBOM Contractor having regard to workforce requirements, construction method, program and planning approval.

It is anticipated that Whyalla and Port Augusta would be capable of providing some accommodation requirements for the Project, however as the construction workforce will be concentrated at the desalination plant site and distributed along the main transfer pipeline at the same time, a combination of existing short-stay accommodation and temporary transportable construction camps is also proposed. Camp locations have been selected to minimise travel times for the workforce at no longer than 40 minutes each way and would typically include temporary accommodation facilities, office building, sewage treatment systems, amenities (e.g. kitchen and laundry facilities) and recreational areas.

Three main camps are proposed at Whyalla, Port Augusta and Pimba, however camp sizes and locations will be subject to refinement by the DBOM Contractor. In Whyalla and Port Augusta, several potential sites with access to existing water, sewer and power infrastructure have been identified and will be subject to further negotiations with the landholders.

Due to safe travel distance requirements and the absence of townships along the transfer system alignment, temporary camps may also be established at intervals along the pipeline alignment. Consultation with landholders along the alignment has identified locations where

temporary construction camps may be located, which will be subject to further refinement by the DBOM Contractor.

The expected impacts are in the **Negligible** category. Uncertainty in the predicted impact (due to uncertainty about temporary accommodation locations, workforce size, and timing and duration of workforce mobilisation and demobilisation) has been evaluated in Appendix M and the level of risk is **Low**.

Accommodation of operational workforce

Impacts to local housing availability and affordability from the operational workforce will be negligible due to the relatively small number of long-term staff required.

During operations, there will be a small number of long-term staff (estimated 45) associated with management of the desalination plant, and maintenance of the pipeline and associated infrastructure. Depots are proposed to be located at the desalination plant site and at Port Augusta, with potential for a third maintenance depot located in the Woomera / Roxby Downs area. It is expected that these workers would be housed permanently in local communities. Final locations of depots would be subject to discussions with the operational contractor.

There are potential benefits associated with additional permanent workers which will depend on whether they are FIFO or locally based, with the latter likely to generate moderate benefits to the sustainability and viability to the local community. Where practicable, opportunities for locally based operational employment will be maximised to reduce accommodation demand and support long-term community and economic benefits.

The expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer to Appendix M).

23.5.3 Local business and industry procurement

Project requirements for local procurement will benefit local communities by providing opportunities for local industries, businesses, service providers and workforce.

The Project represents a significant economic opportunity for the Upper Spencer Gulf and Far North, with the potential to generate substantial demand for labour, goods and services across an extended construction period.

At peak construction, the Project is expected to require a workforce of approximately 1,500 FTE positions, with a smaller ongoing workforce during operation. This demand spans a range of occupations and skill levels, from civil, marine and tunnelling trades through to plant operation, logistics, professional and support roles, creating opportunities for local employment, training and business participation across the study area.

A Local Industry Engagement Plan and Tailored Industry Participation Plan for the Project will be prepared to address the approach to local industry and business participation during construction and operation.

Supply of goods and services and details of engagement with local business, workforce and industry stakeholders is provided in Chapter 22 Economic Environment.

Indigenous employment and training opportunities are also addressed in Chapter 22 Economic Environment.

Employment

Employment and business participation emerged as two of the most prominent themes raised through community and stakeholder engagement, emphasising the importance of maximising local workforce participation and meaningful access for regional businesses throughout procurement and delivery.

Positive sentiment has been associated particularly with the Project's potential workforce, employment and local business participation opportunities and with the broader economic benefits for the Upper Spencer Gulf and Far North. This sentiment is most evident in Whyalla, where the Project is widely viewed as a positive socio-economic opportunity for the community.

Whyalla in particular, has historically recorded comparatively low workforce participation rates, especially among women, with access to childcare identified as a barrier. A large, sustained construction program offers the potential to support local skills development, attract and retain workers, and strengthen the regional labour market. Realising these benefits will depend on coordinated workforce planning, including training pathways aligned to Project needs and measures that enable broader local participation.

Local businesses

Local business opportunities would change over the various stages of the Project, however opportunities to provide goods and services include fuel suppliers, engineering and construction services (e.g. road and track maintenance; light earthworks); transport and logistics, and the supply of goods, services and consumables to the construction camps.

During engagement business stakeholders emphasised expectations around early visibility of procurement opportunities, reasonable contract packaging to enable local businesses to compete, and clear requirements for contractors to prioritise local suppliers and workers wherever practicable.

Proactive and wide-ranging requests for interest in provision of goods and services have been made across the Project Area and Adelaide, and it is anticipated that businesses and services would experience a benefit from an increase in demand for goods and services.

The presence of the construction workforce (which is likely to be relatively highly paid), new consumption expenditure in the region associated with construction activities and locally employed Project workers may also bring opportunities for expansion of local business / services.

As the Project is expected to provide a net social benefit through local business and industry procurement, the methodology for assessing impacts set out in Chapter 8 Impact Assessment Methodology does not apply.

23.5.4 Health and community wellbeing

Presence of construction workforce is not expected to negatively impact access to local services.

The presence of the construction workforce has the potential to place pressure on local services (e.g. social and medical services) and businesses, reducing availability to existing residents or shortages of business services to these communities (e.g. retail and recreation).

In the Project Area, existing health services are already stretched compared to availability in the Adelaide metropolitan area and other regions of South Australia.

Health services

During engagement, representatives of local government across the Project Area have raised concerns about the capacity of health services to meet a growing population, particularly in the context of the cumulative impacts of major projects in the Upper Spencer Gulf. While some areas are better serviced than others, the Far North and Eyre Peninsula regions are considered remote and do not have the range of services found in metropolitan areas. It is therefore heavily reliant on Adelaide, particularly for specialist and some emergency services.

During construction, the Project will provide its own health services to its workforce, including potential emergency air services to Adelaide. Key demands on local services are likely to be associated with short-term initial emergency care and would be for the duration of construction. Relevant health service providers and emergency services will be consulted during workforce mobilisation and project planning, and opportunities to support shared health, wellbeing and mental health initiatives will be investigated with relevant service providers (where practical and mutually beneficial).

The expected impacts are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer to Appendix M).

Emergency services

Self-contained construction camps will provide on-site first aid / basic medical resources to reduce the demand on services and facilities in nearby townships. There is, however, the potential for additional demand on medical and emergency services in the event of a serious injury, illness, workplace accident or natural disaster. For locations in proximity to more urbanised areas such as Whyalla and Port Augusta, response capacities are likely to be higher compared with more remote locations in the Far North or Eyre Peninsula.

Regardless of workforce location, emergency response planning would be a critical component of pre-mobilisation activities, and close collaboration with emergency services providers would be undertaken during the earliest phases to ensure that response protocols are in place.

The expected impacts are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer to Appendix M).

Education services

There is a potential that the Project (combined with other projects in the region) could generate a demand for locally provided tertiary education and workforce training, particularly if a goal of the Project is to develop a local skills base.

A detailed assessment of the Project's training and skills needs is being undertaken as part of an industry participation plan, required as part of the procurement process. Ongoing collaboration with local education providers and institutions regarding workforce capability would help maximise investment in local skills development to the benefit of local community

wellbeing and minimise the potential impacts associated with competing with local businesses for skilled personnel.

The expected impacts are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer to Appendix M).

The Project has the potential to contribute to broader economic revitalisation and to reinforce community confidence, sense of place and resilience across the Project Area.

The flow-on impacts associated with economic revitalisation, identity and sense of place, increased workforce participation, community connection and improved community facilities and services are expected to deliver positive outcomes to the Project Area. These positive impacts will transfer well beyond construction and into the operational phase, particularly if the Project incorporates legacy elements designed to ensure the flow of benefits to local communities.

Economic revitalisation

Beyond direct employment and procurement, the Project has the potential to contribute to broader economic revitalisation and to reinforce community confidence, sense of place and resilience across the study area, and particularly in Whyalla. As a long-established industrial city, Whyalla's identity is closely tied to its role in steel production and heavy industry, and the community has, and continues to navigate a period of significant change and uncertainty in relation to the future of the Whyalla Steelworks. Substantial Commonwealth and State Government investment is now supporting the steelworks' transition toward a lower-emissions future, alongside associated developments such as magnetite supply and broader industrial growth in the Upper Spencer Gulf.

By providing a secure, climate-independent water supply to underpin industry and mining across the region, the Project aligns with and supports this wider transformation agenda. In doing so, it has the potential to strengthen long-term economic confidence, support local skills development and employment pathways, and contribute positively to the sense of stability, optimism and renewal within communities that have experienced considerable change. Realising these flow-on benefits and ensuring they are delivered locally will depend on coordinated regional planning and on the Project being delivered in a way that complements other major initiatives across the Upper Spencer Gulf.

As the Project is expected to provide a net social benefit through economic revitalisation, the methodology for assessing impacts set out in Chapter 8 Impact Assessment Methodology has not been applied.

Sense of place

Sense of place and identity describes how residents feel about the place they live in, including their attachment to and dependency on that place, social interactions and activity, place identity, community connectedness, community participation, and sense of belonging. A strong sense of identity and attachment translates to a sense of belonging, pride and continuity. However, this can also make communities more sensitive to change. Major change and disruption to places with strong community identity and attachment has the potential to create feelings of alienation, loss of identity, anxiety and social disruption, and potentially public opposition to a major project.

Appendix K-1 provides a description of the strong sense of place in the Project Area associated with regional towns and settlements, recreational places along the coast, and the USG marine environment. In the Far North, there is also a strong demonstrated sense of place, identity and attachment associated with the arid lands, remote townships, outback tracks, Aboriginal culture and heritage, pastoral history and environmental custodianship. Many of the townships across the Upper Spencer Gulf, Far North and Eastern Eyre Peninsula demonstrate a very strong place attachment for communities that extend beyond the townships themselves, including intergenerational bonds and connections developed over long periods of time.

The importance and value to the community of the Upper Spencer Gulf's marine environment is the most frequently raised issue by stakeholders and Traditional Owners. The Gulf marine waters are integral to local community and cultural identity, providing livelihoods through tourism and commercial fishing, as an accessible and highly valued recreational asset and as the dominant environmental context for Whyalla in particular. The coastline, its conservation, recreation and commercial values combine to create a strong sense of place attachment, identity and dependence that extends beyond the local community to encompass communities across the State.

For many people, the threat (real or perceived) posed by recent HAB events have served to reinforce the importance of the marine environment, not only for its economic value but also its intrinsic contribution to the community identity of places such as Whyalla. Perceived or actual harm to the marine environment would impact the sense of community wellbeing, affect confidence for the local fishing and tourism industries and cultural connection. Accordingly, understanding how the Project is likely to interact with the marine environment has been a critical focus. The key marine environmental values include marine water quality, mangroves and intertidal flats and seagrass beds, some of which provide nursery and recruitment areas for important fisheries.

The need to ensure that marine values are protected has driven Project location, design, construction methodology and operational parameters. Extensive baseline studies and surveys, modelling, and monitoring over seasons has informed the design process to ensure that there is a solid understanding of the nature and extent of potential impacts to the marine environment and how those impacts will be avoided or managed most effectively.

In consultation with relevant stakeholders and community, opportunities for community benefit or legacy initiatives that support local amenity and community wellbeing will be considered by the Project as part of its approach to mitigating or offsetting the impact of the Project on sense of place and attachment for communities in the Project Area.

Overall the expected impacts to sense of place are in the **Minor** category. Uncertainty in the predicted impact (due to the range of impacts that maybe experienced across the Project Area) has been evaluated in Appendix M and the level of risk is **Low**.

Impacts to community amenity (e.g. air quality, noise, traffic, visual and the marine environment) have been assessed in the EIS and, with proposed mitigation measures in place, the overall impacts to community amenity are expected to be minor.

Large infrastructure developments can be perceived as having a major impact when they are located in an area of high amenity or community value, are close to residential

populations, are perceived to negatively impact established local industries or are not seen as having benefits for local communities. For the Upper Spencer Gulf region, this is exacerbated by the potential for a cumulative impact from a number of large projects that together generate significant change and 'project fatigue' for local communities.

Potential impacts to community amenity from construction and operation of the Project have been assessed in the EIS. These impacts include noise, vibration, visual amenity, air emissions, increased traffic on roads and perceived changes to current lifestyles.

Assessment in this EIS predicts that overall (with mitigation measures in place) these impacts to amenity will be minor and readily managed. Key findings in the EIS in relation to amenity across the Project include:

- Land Access Management Plans and property-specific Land Management Plans developed in consultation with landholders will minimise the potential for disruption to landholder operations, amenity and property infrastructure during the construction phase (refer Chapter 9 Use of Land and Marine Waters).
- Although dust will be generated by construction activities, the region traversed by the Project is generally sparsely populated, with only three locations where sensitive receptors are within 250 m of construction activities (including potential laydown locations) (refer Chapter 18 Air Quality).
- Potential impacts to the amenity of sensitive terrestrial receptors due to construction noise will be minimised through implementation of noise mitigation measures in Project design and construction activity planning (refer Chapter 19 Noise and Vibration).
- A Construction Traffic Management Plan (CTMP) will be developed by the DBOM Contractor in consultation with DIT and relevant councils to minimise the impacts of Project vehicle movements within towns, and on highways and local roads (refer Chapter 20 Traffic and Transport).
- At Mullaquana Station, once constructed, the desalination plant, new transmission line and substation have been assessed as having a minor impact overall on landscape character and visual amenity for some onshore and offshore sensitive receptor locations. Depending on the location, these include Cowleds Landing, Nonowie Station homestead, travellers on the Lincoln Highway, and users of marine waters. Visual impacts of the desalination plant are generally mitigated by the distance from sensitive receptors.
    - Mullaquana Station is the closest sensitive receptor and will therefore experience the most significant change to visual amenity both as a working pastoral property and place of occupation (refer Chapter 20 Landscape Character and Visual Amenity).

Overall the expected impacts to community amenity are in the **Minor** category. Uncertainty in the predicted impact (due to the range of impacts that maybe experienced across the Project Area) has been evaluated in Appendix M and the level of risk is **Low**.

23.5.5 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in the relevant post approval management plans (including the CEMP, OEMP and other relevant plans).

Table 23-3: Key mitigation measures – social environment

Mitigation measure	Construction	Operation
Workforce management		
Develop and implement a Community and Stakeholder Engagement Plan that supports transparent communication, ongoing consultation and enquiry, issue and grievance management processes.	✓	✓
Prepare and adopt codes of conduct, induction processes and internal behavioural management practices for the Project construction workforce.	✓	
Where practicable, maximise opportunities for locally based operational employment to support long-term community benefit and economic benefits.		✓
Housing and accommodation		
Develop an Accommodation Strategy in consultation with local authorities, accommodation providers, regional stakeholders and other major projects to manage workforce accommodation with the objective of minimising reliance on local residential housing stock and reducing impacts on housing availability, affordability and community access to housing.	✓	✓
Develop and implement an Accommodation Strategy in consultation with local authorities, accommodation providers, regional stakeholders and other major projects to manage workforce accommodation demand and minimise impacts on tourism accommodation availability and affordability.	✓	✓
Accommodate the majority of non-local construction workers through a combination of workforce accommodation arrangements, existing short-stay accommodation and other suitable accommodation options with the objective of minimising reliance on local residential housing stock, reducing impacts on housing availability, affordability and community access to housing, and minimises impacts on tourism accommodation availability during peak visitor periods.	✓	
Engage with accommodation providers, tourism industry representatives and local authorities to understand seasonal demand patterns and identify measures that minimise impacts on visitors and tourism businesses.	✓	
Collaborate through established regional coordination mechanisms, including the Whyalla Delivery Co-ordination Group, Spencer Gulf Cities and other forums, to manage cumulative housing and	✓	✓

Mitigation measure	Construction	Operation
workforce accommodation pressures associated with major projects.		
Monitor workforce use of tourism accommodation and, where required, adapt accommodation arrangements to minimise impacts on accommodation availability and affordability during periods of peak visitor demand.	✓	
Investigate opportunities for workforce accommodation solutions to deliver accommodation capacity or other longer-term community benefits beyond the construction phase, where practical and economically viable.	✓	✓
Local business and industry procurement		
Prepare a Tailored Industry Participation Plan addressing the approach to local industry participation during construction and operation.	✓	✓
Prepare a Local Industry Engagement Plan which details the approach to addressing targets for local and regional industry participation.	✓	✓
Continue engagement with Traditional Owners and deliver commitments arising from cultural heritage processes, Native Title discussions and the Indigenous Land Use Agreements.	✓	✓
Prepare an Aboriginal Employment Strategy outlining how the Project will achieve opportunities for businesses, training, employment and retention of Traditional Owners and other Aboriginal People during construction and operation of the Project.	✓	✓
Continue engagement with regional stakeholders regarding local employment, workforce development and industry participation opportunities. Where appropriate, collaborate with regional planning and development organisations.	✓	✓
Health and community wellbeing		
Investigate opportunities to support shared health, wellbeing and mental health initiatives where practical, mutually beneficial and developed in consultation with relevant service providers	✓	✓
Engage with relevant health service providers and emergency services during workforce mobilisation and project planning.	✓	✓
Ensure workforce health and emergency response arrangements are appropriate to the size, location and nature of the workforce.	✓	✓
Undertake emergency response planning in consultation with relevant emergency service providers.	✓	✓
Maintain ongoing coordination with emergency services regarding project activities and workforce presence.	✓	✓

Mitigation measure	Construction	Operation
In consultation with relevant stakeholders and community, consider opportunities for community benefit or legacy initiatives that support local amenity and community wellbeing.	✓	✓
Continue to engage with recreational users, commercial fishers, tourism stakeholders and local communities regarding Project design, construction activities and operations.	✓	✓
Implement appropriate environmental management measures in accordance with approvals to address impacts to air quality, noise emissions, traffic and changes to visual amenity.	✓	✓
In consultation with affected landholders, prepare and implement Landholder Management Plans with the aim of capturing measures than can minimise disturbance. Where relevant, incorporate measures into construction planning and other management plans.	✓	✓

23.6 Conclusion

The Project will result in varying degrees of temporary and permanent change to amenity, housing affordability and availability, social cohesion and the demand on local businesses and services. These changes can be experienced both positively and negatively by local communities and will differ in nature and extent across the wide geographic area covered by Project infrastructure.

The establishment of several self-contained construction camps throughout the Project area will reduce potential impacts on the availability and affordability of housing and tourist accommodation and demand on local services. The application of other mitigation measures including working with communities, peak businesses and emergency services groups will further reduce impacts and optimise benefits, including to amenity and social cohesion.

The Project will supply a new climate resilient water source for industry in South Australia's Upper Spencer Gulf and Far North, particularly the copper mines of Carrapateena and Olympic Dam. The provision of the water source will provide water security and can provide an alternative supply to water currently sourced from the Great Artesian Basin and the Murray Darling Basin.



Chapter 24

Climate Change and Sustainability

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

24 CLIMATE CHANGE AND SUSTAINABILITY 24-1

24.1 Key Findings 24-1

24.2 Setting the Context 24-2

24.2.1 Requirements in legislation and other guidance documents 24-3

24.2.2 Views of stakeholders 24-7

24.3 Climate Change Risk Assessment 24-7

24.3.1 Assessment methodology 24-7

24.3.2 Existing climate conditions and projections 24-9

24.3.3 Climate change risk assessment summary 24-15

24.4 Greenhouse Gas Emissions 24-22

24.4.1 Assessment methodology 24-22

24.4.2 Construction stage emissions 24-26

24.4.3 Operation stage emissions 24-27

24.4.4 Uncertainty assessment 24-28

24.4.5 Greenhouse gas emission mitigation 24-28

24.4.6 Summary of the Project's carbon footprint 24-29

24.5 Sustainability and Efficient Use of Resources 24-31

24.5.1 Sustainability 24-31

24.5.2 Efficient Use of Resources 24-33

24.6 Waste Management 24-37

24.7 Conclusion 24-44

LIST OF TABLES

Table 24-1: Legislation and guidance relevant to the Project sustainability framework 24-5

Table 24-2: Current temperature conditions 24-10

Table 24-3: Adopted climate change projections – increase to average daily maximum 24-10

Table 24-4: Adopted climate change projections – annual number of days over 40°C 24-10

Table 24-5: Climate projections for ocean pH 24-13

Table 24-6: Scope 1, 2 and 3 emissions for Project phases 24-22

Table 24-7: Sources of GHG emissions – construction inventory 24-24

Table 24-8: Sources GHG emissions – operational inventory 24-25
Table 24-9: Construction stage emissions breakdown by scope 24-26
Table 24-10: Operational emissions scope breakdown by operational scenario 24-27
Table 24-11: Northern Water Project sustainability objectives 24-31
Table 24-12: Material sustainability issues for the Project 24-33
Table 24-13: Circular economy and sustainability considerations in the Project 24-34
Table 24-14: Key waste streams generated by the Project 24-39

LIST OF FIGURES

Figure 24-1: Summary of maximum temperature projections 24-11
Figure 24-2: Summary of average rainfall projections 24-11
Figure 24-3: Summary of extreme rainfall projections 24-12
Figure 24-4: Summary of the projected number of severe fire danger days 24-13
Figure 24-5 Projected sea level rise under multiple climate scenarios and CPB policy 24-14
Figure 24-6: Sources of whole life carbon emission and definitions of use 24-23
Figure 24-7: Construction stage emissions source contributions 24-26
Figure 24-8: Operational GHG emissions (over a 100-year period) by source 24-27
Figure 24-9: South Australia's circular economy in the built environment 24-34
Figure 24-10: Waste management hierarchy 24-37

24 CLIMATE CHANGE AND SUSTAINABILITY

This chapter addresses those aspects of the Project which are relevant to the effects on the environment of the use of energy and other resources, the Project's carbon footprint, sourcing of materials, waste generation, and how the Project's approach to sustainability will seek to meet government objectives and community expectations.

The chapter provides an assessment of the Project's vulnerabilities to predicted future changes in climate over the period from construction to the end of useful life of Project assets. The Project's projected energy use and activities likely to generate greenhouse gas emissions are assessed, and the chapter sets out how the Project proposes to approach sustainable procurement, efficient use of resources and management of waste.

24.1 Key Findings

Climate change adaptation

- The primary climate variables with potential to impact the Project are increased ambient temperatures, increased frequency and intensity of heatwaves, increased rainfall intensity and surface water flooding, and changing marine conditions.
- No residual extreme or high risks for the Project are expected from projected climate change impacts. Climate adaptation design and system controls are already planned and incorporated into the Project.
- Under a continued high-emissions scenario (RCP 8.5), regional climate-driven salinity increase is predicted to substantially exceed the contribution from the desalination plant alone. Any changes to background conditions would have proportional impacts on desalination plant outfall return water and are not expected to result in any cumulative impacts.
- Residual risks from climate change to the Project have been assessed as Low to Medium and acceptable.
- During detailed design, further consideration will be given to changing climate conditions relevant to Project infrastructure components and evaluation of the appropriateness of design and engineering changes.

Greenhouse gas emissions

- Project construction is estimated to result in approximately 1.14 $MtCO_2e$ (mega tonnes of carbon dioxide equivalent) emissions, largely due to the manufacture of pipeline and other construction materials. Opportunities to reduce greenhouse gas (GHG) emissions during construction through use of low emission construction materials (such low emission concrete) are being investigated.
- Electricity use, primarily for water treatment and distribution, is the largest GHG contributor during operations. The emission impacts of this energy use will be mitigated through the Project's commitment to use 100% renewable electricity during operations, reducing total life of project emissions from 4.8 $MtCO_2e$ to approximately 3.2 $MtCO_2e$.

- Use of renewable electricity during operations will enable emissions reduction of over 33% compared to a case in which electricity was procured from the regular SA grid mix.
- Whilst the Project will result in an increase in the State's GHG emissions overall, it will provide a climate-resilient water supply to enable the continued operation and growth of industries that will contribute to decarbonisation efforts such as production of copper and critical minerals.

Sustainability and efficient use of resources

- Sustainability objectives have been integrated into the design, build, operate and maintain (DBOM) contract to ensure they are considered throughout the life of the Project.
- The primary contribution of the Project to the South Australian circular economy and sustainability in the use of resources is by avoiding or optimising the use of raw materials.
- Specific circular economy strategies and sustainability principles have been integrated into the Project including design (climate resilience, efficiency and longevity), low emission / sustainable / locally sourced materials, water and energy conservation and emissions reduction.

Waste management

- Project waste streams will be managed in accordance with Environment Protection Authority (EPA) requirements and the Waste Management Hierarchy. Waste materials will be separated to maximise opportunities for reuse or recycling. Storage and categorisation will ensure waste is handled, transported and disposed of appropriately and efficiently. A Waste Management Plan will be prepared for Project construction and operation.

24.2 Setting the Context

The EIS Assessment Requirements require the EIS to address how the Project will respond to a range of aspects relating to climate change, greenhouse gas emissions, sustainable use of resources and waste management. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodologies used for the climate risk assessment and greenhouse gas emission calculations are set out in Section 24.3 and Section 24.4.

24.2.1 Requirements in legislation and other guidance documents

Climate change risk assessment

Commonwealth guidance

The *National Adaptation Plan* (DCCEEW 2025) aims to better anticipate, manage, and adapt to a changing climate across natural, built, social and economic domains. A key objective of the plan is to reduce the impacts of climate change and to accelerate and mainstream adaptation action.

The *National Disaster Risk Reduction Framework* (NEMA 2018) sets out a collaborative approach to reducing and minimising new and existing disaster risks, and also to increase climate and disaster risk understanding. The framework prioritises holding all sectors of society accountable for making risk-informed decisions and encourages collaborative investment in risk reduction measures.

State guidance

The *Guide to Climate Projections for Risk Assessment and Planning in South Australia* (DEW 2022d) provides a summary of up-to-date climate change projections for South Australia to assist in planning for the future. It summarises projected changes in key climate variables, including temperature, rainfall and sea level rises.

The *Environment Protection Act 1993* was amended in 2023 to include climate change mitigation and adaptation in the Act's objects, and a specific Environment Protection Policy (EPP) for climate change mitigation and adaptation is being developed by the Environment Protection Authority. Depending on the timing, the EPP may be relevant to any licensing requirements that may be determined for the Project.

The State Planning Policies for South Australia (SPPs) (SPC 2025b) set out frameworks for land use that aim to improve the liveability, sustainability, and prosperity of the State. *SPP 5: Climate Change*, seeks to provide for development that is climate ready so that the State's economy, communities and environment will be resilient to climate change impacts.

The SPPs are supported by regional plans which set out a 15-30 year vision for each region including provisions for the integration of land use, transport infrastructure and the public realm. The Project passes through areas covered by the Eyre and Western Regional Plan and the Far North Regional Plan. Both regional plans focus on the importance of climate ready development and development that minimises GHG emissions over its life cycle as well as being adapted for predicted future climate conditions. The Far North Regional Plan also has a strong emphasis on ensuring alternative sustainable water with the Northern Water Project listed in the plan as an alternate sustainable water supply.

The Coast Protection Board Policy (CPB 2022) emphasises the importance of considering sea level rise, coastal recession and storm erosion in new developments. It recommends adopting a sea level rise of 0.3 m by 2050 and 1 m by 2100 for most planning and design purposes.

Other relevant guidance

Other standards and guidelines that are relevant to the climate change risk assessment include:

- AS 5334-2013 *Climate change adaptation for settlements and infrastructure – a risk-based approach*
- AS ISO 31000:2018 *Risk Management – Guidelines*
- *Australian Rainfall and Runoff: A Guide to Flood Estimation* (Ball et al. 2019)
- *Second National Action Plan to implement the National Disaster Risk Reduction Framework* (NEMA 2023)
- *Sendai Framework for Disaster Risk Reduction 2015 – 2030* (UNDRR 2015)
- *Far North and Outback SA Climate Change Adaptation Plan* (RDA Far North SA 2016)
- *Regional Climate Change Adaptation Plan for the Eyre Peninsula* (Siebentritt et al. 2014)
- Premier and Cabinet Circular PC007 – Climate Ready Government
- *South Australian Government Climate Change Resilience and Adaptation Actions* (GoSA 2024c).
- *2024 Statewide Climate Change Risk and Opportunity Assessment for South Australia*, (Deloitte, 2024).

Greenhouse gas emissions

Australia is a signatory to the Paris Agreement, a legally binding international treaty on climate change adopted at the United Nations Climate Change Conference in 2015. The goal of the agreement is to keep global warming well below 2°C, with an aspirational goal of 1.5°C (UNFCCC 2016). Under the Agreement, Australia is required to submit Nationally Determined Contributions, outlining its emission reduction targets. Accordingly Australia has committed to reduce emissions by 43% below 2005 levels by 2030 and to achieve net zero emissions by 2050 (DISER 2022). This commitment is also set out in the *Climate Change Act 2022* (Cth).

The South Australian *Climate Change and Greenhouse Gas Emissions Reduction Act 2007* aims to address climate change issues and promote sustainable development by setting targets to reduce greenhouse gas emissions. The principal target under the Act is to achieve net zero greenhouse gas emissions within the State by 31 December 2050. Related legislated targets are a reduction in greenhouse gas emissions to at least 60% below 2005 levels by 31 December 2030, and achievement of 100% net renewable electricity generation in the State by 31 December 2027.

In May 2022, South Australia committed to restoring a safe climate by transforming the economy to net zero emissions. The South Australian government's *Net Zero Strategy* (GoSA 2024a) proposes action to build a strong, climate ready economy, further reduce greenhouse gas emissions, and support adaptation to a changing climate.

Other standards and guidelines relevant to the GHG Assessment include:

- *National Greenhouse and Energy Reporting Act 2007* which establishes a national framework for industry to report greenhouse gas emissions, abatement actions and energy consumption and production
- *Climate Ready Government Net Zero Emissions for Government Operations Program* (GoSA 2024b)
- The *Greenhouse Gas Protocol* (WBCSD and WRI 2004 and 2011) which establishes comprehensive global standardised frameworks to measure and manage GHG

emissions from private and public sector operations, value chains and mitigation actions

- ISO 14064-1: *2018 Greenhouse gases Part 1: Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removals* (ISO 2018)
- Premier and Cabinet Circular PC007 – Climate Ready Government
- *2024 Statewide Climate Change Risk and Opportunity Assessment for South Australia, prepared for Department for Environment and Water* (Deloitte, 2024).

Sustainability

Principles for Ecologically Sustainable Development are included in both the *Environment Protection Act 1993* (SA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). Development of the sustainability framework for the Project has drawn from these legislative drivers as well as globally recognised sustainability standards and frameworks including:

- United Nations Sustainable Development Goals (UN SDGs)
- Global Reporting Initiative (GRI)
- Australian Sustainability Reporting Standards (ASRS)
- International Financial Reporting Standards (IFRS)
- Sustainability Accounting Standards Board (SASB) Sustainability Disclosure Standards
- Taskforce on Nature-related Financial Disclosures.

Other legislation, standards and guidelines relevant to the Project's sustainability framework are set out in Table 24-1

Table 24-1: Legislation and guidance relevant to the Project sustainability framework

Legislation / guidance	Description
Commonwealth legislation and guidance	
Climate Change Act 2022	Creates a legally binding framework for climate action in Australia, through codifying national GHG emissions reduction targets, and establishing an accountability framework to ensure progress towards the goals
Corporations Act 2001 (referring to the Australian Sustainability Reporting Standard, AASB S2)	Drives transparency and accountability on climate (and potentially in the future, on biodiversity, water and other areas) by mandating disclosure of risks, opportunities, management and governance
Environment Protection and Biodiversity Conservation Act 1999	Protects nationally significant biodiversity by requiring assessment of impacts on threatened species, ecological communities, and protected areas
Modern Slavery Act 2018	Transparency framework requiring large businesses and government entities to publicly report annually on the modern slavery risks in their supply chains and the actions taken to address them.

Legislation / guidance	Description
National Greenhouse Gas and Energy Reporting Act 2007	Establishes a national framework for industry to report greenhouse gas emissions, abatement actions and energy consumption and production
Native Title Act 1993 (Cth) and *Native Title Act 1994* (SA)	Recognises and protects Native Title
Renewable Energy (Electricity) Act 2000	Reduces greenhouse gas emissions by incentivising renewable energy use and allowing desalination projects to offset their electricity consumption
Water Act 2007 and Murray-Darling Basin Plan	Promotes sustainable water use and healthy river systems by regulating water allocation and supporting environmental flows, including substitution with desalinated water
Infrastructure Australia's *Sustainability Principles Infrastructure Australia's approach to sustainability for infrastructure* (Infrastructure Australia, 2021c)	Outlines the role infrastructure networks play in promoting a sustainable community and has been considered in the development of the Project's sustainability and ESG objectives
State legislation and guidance	
Aboriginal Heritage Act 1988	Provides protection for any Aboriginal sites, objects or remains (whether previously recorded or not)
National Parks and Wildlife Act 1972, Native Vegetation Act 1991 and Biodiversity Act 2025[1]	Provide protections for native plants and animals. Once in force the Biodiversity Act will consolidate and strengthen existing biodiversity protections currently provided under these Acts.
Climate Change and Greenhouse Emissions Reduction Act 2007	Assists in achieving ecologically sustainable development in the State by addressing issues associated with climate change, in particular through the reduction of greenhouse gas emissions and an increase in renewable energy
Environment Protection Act 1993	Principles of ecologically sustainable development included in the Act's objects
Marine Parks Act 2007	Protects marine biodiversity and habitats by restricting activities that could harm marine parks
Natural Resources Management Act 2004	Ensures sustainable use of water resources and protection of natural ecosystems
Planning Development and Infrastructure Act 2016	integrates sustainability into land use planning and development, requiring environmental impact assessments that address water and biodiversity impacts
South Australia's Waste Strategy 2025-2030 (SA Waste Strategy) produced by Green Industries South Australia	The strategy encourages waste management and resource recovery, and supports actions to continue and further develop the reuse and recycling of waste products produced within the State (Green Industries, 2025)

[1] This legislation has been enacted but has not come into operation at the time of writing.

Legislation / guidance	Description
DIT's Sustainability Manual (Planning and Technical Services, 2026)	

Waste management

Waste management and resource use in South Australia is regulated by the *Environment Protection Act 1993* (EP Act) which sets out the general environmental duty and addresses all aspects of waste management activities and products which may cause environmental harm. The EP Act also sets out listed wastes which have specific requirements due to their potentially contaminating nature.

The *Environment Protection (Waste to Resources) Policy 2010* (Waste to Resources EPP) provides the regulatory underpinning for the SA Waste Strategy and promotes the implementation of the waste management hierarchy, improved resource recovery and reduced waste going to landfill.

The SA Waste Strategy (Green Industries, 2025) aligns with the principles of ecologically sustainable development as set out in the EP Act and the concepts of circular economy.

24.2.2 Views of stakeholders

An extensive program of stakeholder engagement has been undertaken for the Project which has included engagement with communities and businesses, local councils, Traditional Owners and affected landholders.

The most frequently raised issues during community engagement relating to climate change and resource sustainability include:

- energy sources for the Project
- use of renewable energy and management of waste
- cumulative impacts on the marine environment of desalination plant outfall return water and increased salinity as a result of climate change
- impacts of sea level rise on project infrastructure.

Details of stakeholder engagement and community consultation are set out in further detailed in Chapter 4 Stakeholder Engagement.

24.3 Climate Change Risk Assessment

24.3.1 Assessment methodology

A risk assessment was undertaken to address the implications of climate change for the Project, based on the methodology set out in the Climate Change Risk Assessment provided at Appendix L-1. The Study Area for the purposes of the climate change risk assessment included South Australia and, where applicable, the Project Area which was defined as follows:

- southern section: Mullaquana Station to Lake Dutton (KP0 to KP 195)
- northern Section: Lake Dutton to Olympic Dam (KP 195 to KP 359).

The methodology was drawn from the principles of AS 5334:2013 and AS ISO 31000:2018 and involved:

1. Identification of historical climate conditions, and climate change projections for representative sites in the southern and northern sections of the Project Area.
2. Identification of risks to the Project based on the climate projections calculated in step 1. Risks were assessed against standard mitigation measures including procedures and protocols anticipated to be part of the Project. These controls were identified through a risk workshop and stakeholder engagement.
3. Where high risks remained after step 2, climate resilience adaptations were proposed for treating priority climate change risks. The residual risk after applying these measures was also assessed.

Climate data and projections

Climate change projections have been primarily sourced from the *Guide to Climate Projections for Risk Assessment and Planning in South Australia* (DEW 2022d). This document references the Climate Change in Australia (CCIA) cluster regions[2] (which largely reflect South Australian Landscape Regions) that are used in the climate change projections. For the purposes of the Project, the relevant cluster regions are the Southern and South Western Flatlands (East) (representing the area of the Project south of and including Port Augusta) and the Rangelands South (representing the area north of Port Augusta) (refer Figure 9 in Appendix L-1).

Given the approximately 406 km length of the Project Area, the assessment also used climate data and projections from Whyalla and Port Augusta, (representing the southern section) and Woomera (representing the northern section) to account for the range of climatic conditions within the Project Area. These sites were chosen based on availability of baseline and future climate projection data.

Extreme rainfall assessments are based on the methodology for design flood estimation in the latest version of Australian Rainfall and Runoff (ARR) (Ball et al. 2019). The methodology recommends an increase to design rainfall intensity of 15% per degree of local warming for short duration (<1 hour) events, reducing to 8% increase in intensity for longer duration events (~ 24 hour) for Shared Socio-economic Pathway (SSP) 3 – 7.0.

The projections used for the assessment were primarily based on the method set out in DEW 2022d. Climate projections to 2050 were used for assets with a design life of 0 to 40 years, and projections to 2090 were used for design lives over 40 years. The trend to 2090 was used to inform risks beyond this, to address the full assessment period to 2130.

Climate Scenarios

The basis for selecting future scenarios is established by the Intergovernmental Panel on Climate Change (IPCC), known as Representative Concentration Pathways (RCPs). IPCC (2013) introduced these RCPs to provide parameters for different GHG emission trajectories.

[2] Cluster regions were defined by the CSIRO and Bureau of Meteorology 'Climate Change in Australia' project which can be accessed at https://www.climatechangeinaustralia.gov.au/en/

RCP 4.5 and RCP 8.5 have been adopted for this climate change risk assessment, which aligns with the Project-specific ARs.

RCP 4.5 represents a moderate GHG emissions pathway, which assumes global emissions will peak around 2040 and then decline, leading to a stabilisation of radiative forcing after 2100. This scenario is associated with a global temperature increase of around 2°C by the end of the 21st century.

RCP 8.5 represents a high GHG emissions pathway, and assumes a continued increase in emissions throughout the 21st century without any mitigation efforts. This scenario leads to a significant rise in global temperatures, with projections exceeding 4°C by the end of the 21st century.

DEW 2022d identifies RCP 4.5 and 8.5 as the key climate scenarios for assessment in South Australia[3]. The following exceptions to these scenarios were made:

- Extreme rainfall events have been assessed for SSP 3-7.0 (for high emission scenario) and SSP 2-4.5 (for low emission scenario) in accordance with the Australian Rainfall and Runoff (ARR) Guidelines (Ball et al, 2019). As the ARR guidelines are the primary source for extreme rainfall projections this is considered appropriate.
- Sea level rise has been assessed in accordance with the Coastal Protection Board Policy which requires assessments against 0.3 m sea level rise by 2050 and 1.0 m sea level rise by 2100. Noting current sea level rise under high emissions scenario (RCP 8.5) indicated a likely sea level rise of 0.59 m by 2090, the policy is considered a conservative estimate.

Risk evaluation and hazard identification

The risk evaluation included consideration of the severity of consequences in relation to environmental impact, health and safety, operational reliability and legal and compliance implications. The assessment of risk likelihood was conducted cumulatively over the relevant asset lifespan. The likelihood and consequence of each risk was used to determine the risk rating as set out in Appendix M.

Hazards were identified and ranked based on climate variables such as rainfall, temperature, bushfire and marine conditions. The hazards assessed were those climate or climate-influenced attributes that could affect the Project's operation and maintenance. Components of the Project that would be impacted by the hazard were identified as receptors, which could also include Project users and affected elements of the surrounding environment.

24.3.2 Existing climate conditions and projections

Baseline historical climate data is required prior to overlaying projections to determine future climate statistics. Data and projections for temperature, rainfall, bushfire, wind speed and marine conditions are provided below.

[3] Further discussion regarding selection of climate change scenarios is included in Appendix L-1 Climate Change Risk Assessment.

Temperature

Temperatures drawn from historical data for Whyalla, Port Augusta and Woomera (as the three representative Project Area locations) are detailed in Table 24-2. In general, temperatures are warm in summer and cool in winter, and increase further north in the Project Area. Extreme heat can be experienced in all locations, typically in the summer months.

Under the RCP 4.5 and RCP 8.5 climate scenarios, average daily temperatures, the number of days over 40°C and maximum temperatures are projected to increase. Extreme temperatures are projected to increase at a similar rate to mean temperature, with a substantial increase in the temperature reached on hot days, the frequency of hot days, and the duration of warm spells. The changes are more pronounced in the north of the Project Area (refer Table 24-3, Table 24-4 and Figure 24-1). Further detail is provided in Appendix L-1.

Table 24-2: Current temperature conditions

Location	Average max. (Jan)	Average max. (Jul)	Highest
Whyalla (1986 to 2005)	30°C	17°C	47°C
Port Augusta (1986 to 2005)	30°C	17°C	47°C
Woomera (1976 to 2015)	37°C	19°C	48°C

Table 24-3: Adopted climate change projections – increase to average daily maximum

Increase to average daily maximum temperature (+°C)						
Year	2030		2050		2090	
Location	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Whyalla	1.1	1.1	1.6	1.8	2.0	3.7
Port Augusta	1.3	1.3	1.7	1.8	2.3	4.2
Woomera	1.4	1.3	1.8	2.2	2.5	4.7

Table 24-4: Adopted climate change projections – annual number of days over 40°C

Increase to average annual number of days of 40°C or above						
Year	2030		2050		2090	
Location	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Whyalla	4	3.5	6	6.6	7	16.2
Port Augusta	6	6	10	11.3	13	27
Woomera	9	9	13.8	17	19	41

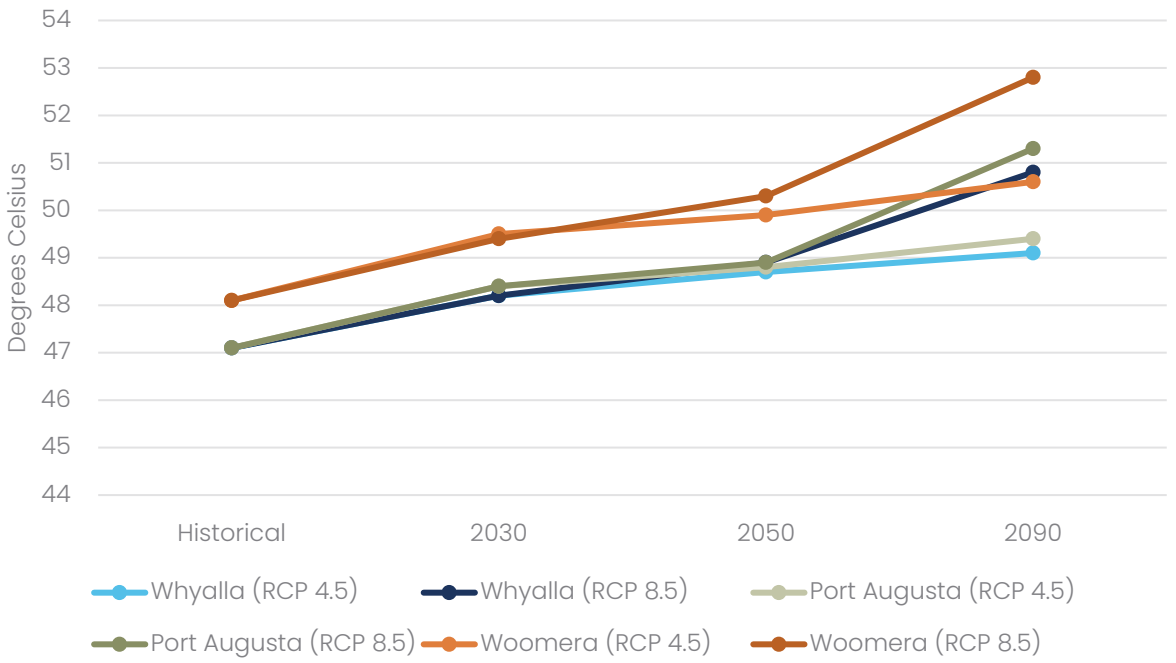


Figure 24-1: Summary of maximum temperature projections

Rainfall

Rainfall patterns vary across the Project Area, with the southern section of the Project Area receiving more rainfall than the northern section. Under climate projections, average annual rainfall will decrease, with this change being more pronounced in the southern section under the RCP 8.5 scenario (refer Figure 24-2 and Appendix L-1).

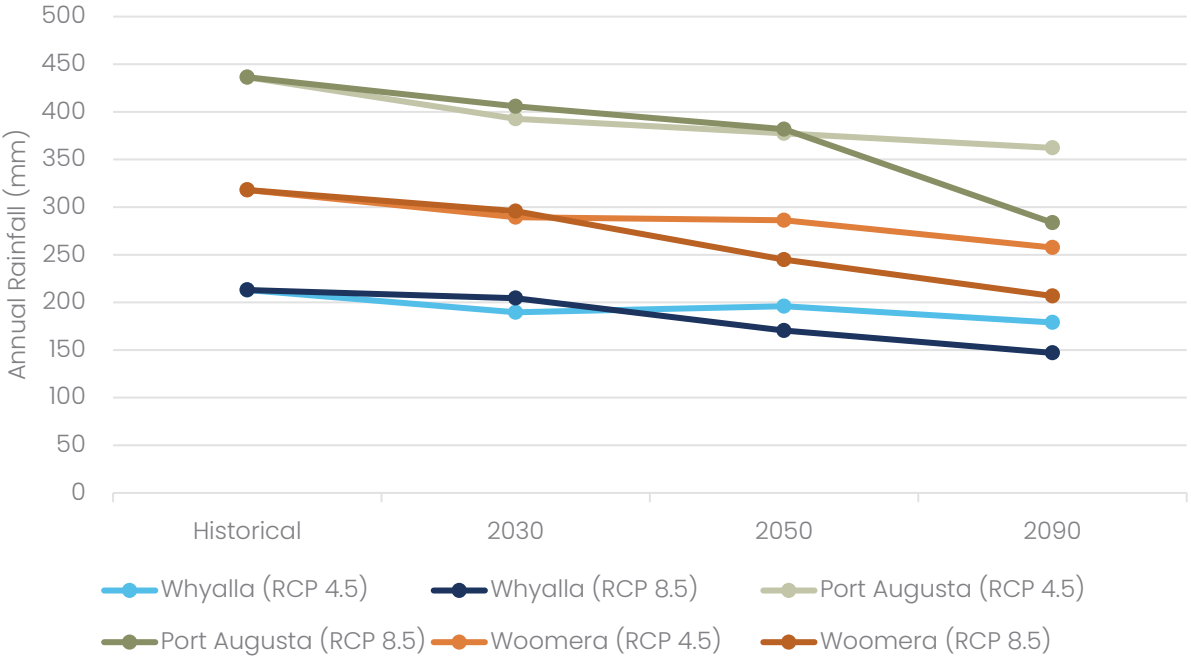


Figure 24-2: Summary of average rainfall projections

Despite the decrease in average rainfall, extreme rainfall events are likely to increase in intensity. Figure 24-3 shows the projected increase across the selected sites.

As noted in Section 24.3.1, the primary methodology for extreme rainfall projections is currently under review by the Commonwealth Department of Climate Change, Energy, Environment and Water. A change in methodology has the potential to increase the expected changes to extreme rainfall and flooding events. This will be considered in future stages of design.

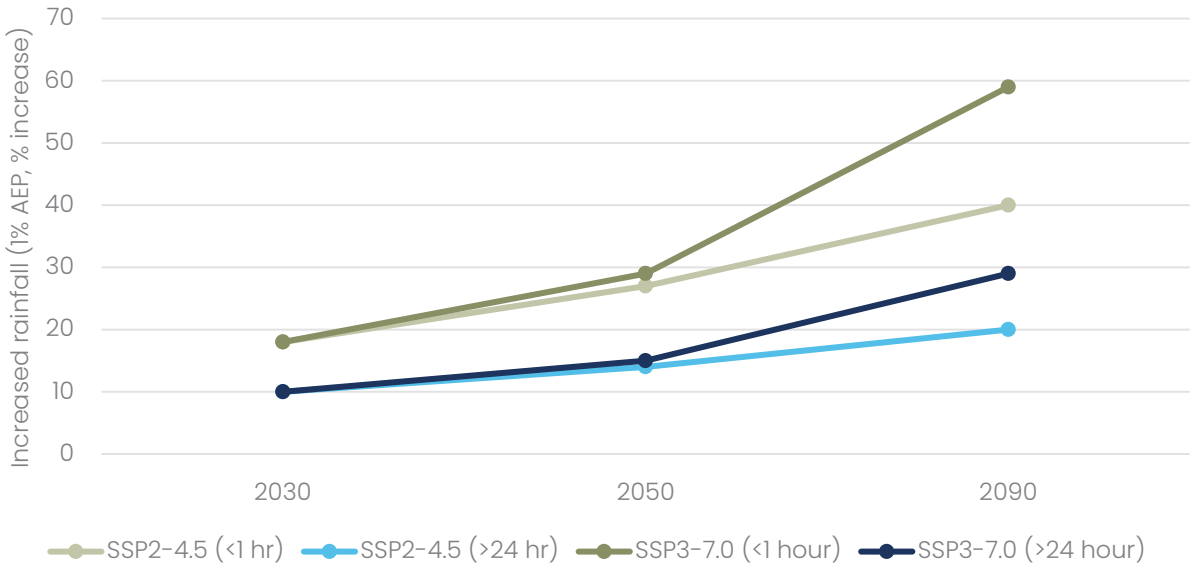


Figure 24-3: Summary of extreme rainfall projections

Wind Speed

Variations in wind speed in are expected to be small, generally within 5%, in both the Southern and South Western Flatlands East region and the Rangelands South region. Median values show the potential for small increases in seasonal winds in the Rangelands, and small decreases in the South Western Flatlands.

Bushfire danger

The Forest Fire Danger Index takes measures of fuel dryness, temperature and wind speed to provide a measure of the potential danger of a bushfire on a given day and location, over a range from 0 to 100. When the index exceeds 50, the fire danger is classed as severe (roughly equivalent to 'Extreme' under the new Australian Fire Danger Rating System (AFDRS)) (DEW 2022d). The new AFDRS was introduced post-publication of the guideline. While specific predictions for the new system are not available, the broad trend is still considered relevant for the purpose of this assessment.

Baseline conditions and climate change projections are shown in Figure 24-4.

There is a high level of confidence that climate change will result in a harsher fire-weather climate in the future, however, the magnitude of the change is strongly dependent on the summer rainfall projection. Bushfire in the Rangelands region is highly dependent on fuel availability, which in turn is reliant on rainfall. Extensive bushfire activity occurs after extended

wet periods which lead to vegetation growth that burns after the wet period ends. When bushfires occur, more extreme fire behaviour can be expected (Jacobs 2026f).

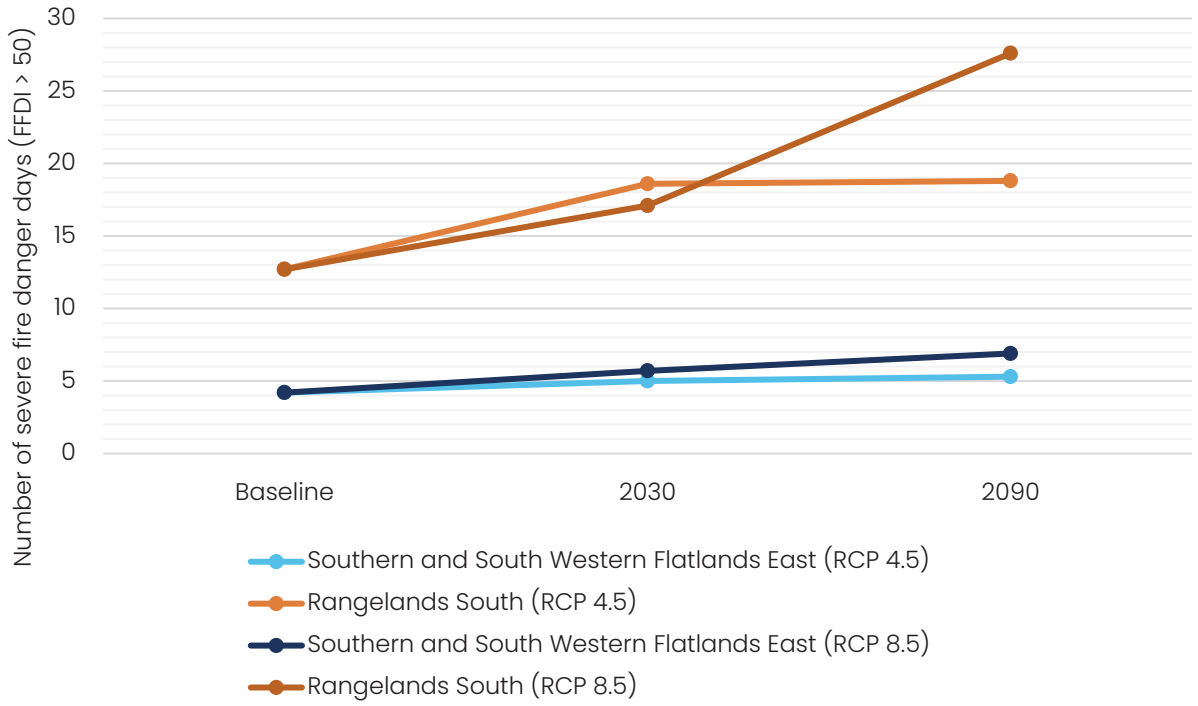


Figure 24-4: Summary of the projected number of severe fire danger days

Marine conditions

Climate change will have a range of effects on marine conditions including ocean acidity, sea surface temperature, salinity, algal blooms and sea level rise.

Acidity

There is very high level of confidence that the marine waters around Australia will see a decrease in ocean pH, making marine waters more acidic. The rate of ocean acidification in the marine Project Area is expected to be proportional to increases in carbon dioxide emissions and is detailed in Table 24-5.

Table 24-5: Climate projections for ocean pH

Change to ocean pH						
Year	**2030**		**2050**		**2090**	
Location	**RCP 4.5**	**RCP 8.5**	**RCP 4.5**	**RCP 8.5**	**RCP 4.5**	**RCP 8.5**
Port Augusta	-0.07	-0.08	N/A	N/A	-0.15	-0.32

Sea surface temperature

Sea surface temperatures have been increasing significantly across the globe in recent decades and there is a very high confidence that this warming trend will continue. Modelling undertaken by the South Australian Research and Development Institute (SARDI) for a future period centred on 2081 relative to baseline conditions centred on 1990 shows a median

change in temperatures close to the Project site at Mullaquana Station of 1 – 2°C (SARDI, 2026e). This is most pronounced in September with a median change of 2°C and least pronounced in January with a median change of 1.4°C.

Ocean salinity

Ocean salinity in coastal waters is expected to be affected by changes in rainfall and evaporation. This can impact stratification, mixing and nutrient supply in coastal waters. Projections for salinity changes in South Australian waters including the Spencer Gulf, vary with possible increases and decreases, particularly under higher emission scenarios.

Project modelling shows changes in salinity are more pronounced at the seabed than at the surface (SARDI 2026e). Long-term salinity close to the bottom of the water column is projected to have a median change of 0.3 – 0.8 PSS (Practical Salinity Scale 1978, dimensionless). This change is more significant in April with a median change of 0.8 PSS while July is the least changed with a median change predicted to be 0.3 PSS (SARDI 2026e).

Algal blooms

Climate change is a driver for increased frequency, intensity and duration of Harmful Algal Blooms (HABs). During 2025 and 2026, South Australia experienced a significant HAB event which resulted in extensive impacts to the marine environments along the State's coastlines. Given this recent experience, the Project has taken learnings and observations from this HAB event to inform desalination plant planning and design to ensure future HABs can be appropriately managed (as it relates to the Project). Further information on the HAB and desalination plants is provided in Chapter 11 Marine Environment and Chapter 25 Hazards and Risks.

Sea level rise

Specific projections for sea level rise at Mullaquana Station are not available. The Project has assumed a 1 m sea level rise by 2100 in accordance with the Coastal Protection Board Policy (2022). This sea level rise is slightly above the RCP 8.5 predicted scenarios but within the uncertainty range (CPB 2022) and considered appropriate for the purpose of assessment.

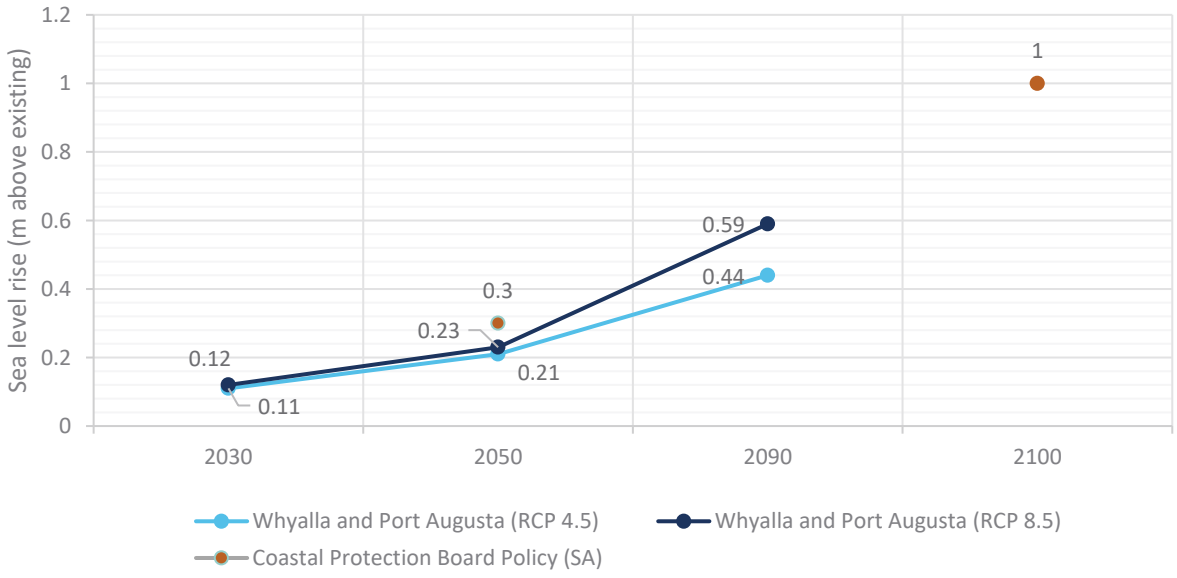


Figure 24-5 Projected sea level rise under multiple climate scenarios and CPB policy

24.3.3 Climate change risk assessment summary

Residual extreme or high risks for the Project are not expected due to Project design and system controls already in place, and further evaluation to accommodate changing climate conditions during detailed design.

The risk assessment process described in Section 24.3.1 identified 48 climate-related risks with potential to impact the Project over its lifetime (Jacobs 2026f).

Risks that were rated as inherently Low have generally already been considered or accommodated as part of the Project infrastructure and system design and will be addressed through proposed standard controls and procedures, without the requirement for additional mitigation. These risks are summarised in Table B-1 of the Climate Change Risk Assessment (Appendix L-1) and have not been considered further in this chapter.

The following section focuses on the risks with an inherent rating of Medium or High out to 2090, together with the standard controls that will be applied as part of Project design and management. Additional adaptation measures will be considered during Project detailed design to further reduce these risks to an acceptable level. No inherent risks were categorised as High (see **Changing marine conditions** below).

The key climate variables resulting in climate risks rated as Medium[4] were:

- increased ambient temperatures and frequency and intensity of heatwaves
- increased rainfall intensity and surface water flooding
- changing marine conditions
- decreases in average rainfall and relative humidity, and increased occurrence of drought
- increase in frequency and intensity of bushfires.

Increased ambient temperatures and heatwaves

Twelve risks relating to increased temperatures were assessed, considering the likelihood and consequence of impacts on the Project by 2090 (refer Table B-1 Appendix L-1). The following six inherent risks were categorised as Medium and are discussed below:

- An increase in hot days leads to overheating of power supply. Consequences could lead to thermal runaway and fires from overheating of equipment.
- An increase in hot days leads to overheating of power supply. Consequences include loss of ability to treat water (unable to provide water treatment) but no damage to equipment.
- Higher temperatures and proximity to the ocean may have a combined effect of increased humidity and change in marine conditions to cause accelerated damage to exposed components, reducing the design life and requiring more frequent or expensive repairs.
- Increased ambient temperatures and frequency of heatwaves could lead to higher internal temperatures at the pump stations leading to equipment outages. There

[4] Risks associated with wind speed were considered to be inherently Low and are not considered further in this chapter.

would be an inability to provide treatment during the outage period but no damage to equipment.

- Increased ambient temperatures and frequency of heatwaves could cause potential for uncovered Project storages to have increased evaporation. Potential for inadequate sizing of storage.
- Combined effects of increased temperatures and decreased rainfall may result in additional demands beyond the capacity of the Northern Water Project.

Risk assessment

Climate change is projected to cause average, minimum and maximum temperatures to increase across the whole Project Area. The number of extreme heat days is predicted to increase over the entire Project Area.

Increased, extreme or extended periods of high temperatures have the potential to cause higher internal temperatures in Project buildings such as the desalination plant and pump stations, leading to overheating and possible shutdown of power supply or pumping station components. Pump stations will be naturally ventilated to assist in maintaining appropriate internal temperatures. Overheating risks will be reduced by equipment design which incorporates shutdowns and appropriate protection from over energisation from the network when operating temperatures are excessive. The risk of thermal runaway and fires from overheating of equipment within buildings will be reduced through installation of fire detection and suppression systems.

Increased evaporation caused by elevated temperatures has the potential to raise local humidity levels and potentially accelerate corrosion of exposed components, reducing design life and necessitating more frequent or expensive repairs. This risk will be reduced through specification of durability requirements and minimum standards for corrosion control and material selection during Project procurement.

Extended periods of high temperatures combined with decreased rainfall have the potential to increase the demand for water beyond the capacity of the Project. This risk will be reduced through appropriate management of offtake contracts to accommodate the Project's capacity over time. Increased demand from off-takers or water loss due to increased evaporation from uncovered storage will be managed by ensuring that all Project storages are designed to be covered to reduce evaporation and that off-takers identify their demand requirements during negotiations with the Project inclusive of many demand varying factors.

Potential adaptation measures

Detailed design will consider the relevant changing climate conditions and evaluate the need for design and engineering changes to accommodate the expected increase in ambient temperatures and frequency / intensity of heatwaves. Additional adaptation measures may include sizing of ventilation and air conditioning systems designed to control future temperatures and assessment of the feasibility of vegetating pump station surroundings to assist with passive cooling.

Increased rainfall intensity and flooding

Fourteen risks were assessed relating to increasing rainfall intensity and flooding, considering the likelihood and consequence of impacts on the Project by 2090 (refer Table B-1

Appendix L-1). The following five inherent risks were categorised as Medium and are discussed below:

- A reduction in rainwater infiltration on the site combined with potential future increases in extreme rainfall could result in the drainage systems becoming inadequate and causing flash flooding and pooling which could damage ground level assets and equipment.
- Increase of rainfall intensity and surface water flooding events creating greater local erosion causing a risk to pipeline infrastructure due to exposure of pipeline to impact and/or degradation of footings around waterway crossings.
- Cumulative effect of storm surge and high rainfall and/or flooding damaging transfer system infrastructure through debris impact and accelerated corrosion causing temporary loss of service.
- An increase in surface flooding events causes a greater risk of overland flows entering pipes through air valves, resulting in contamination of product water.
- Combined impacts of increased rainfall intensity with impacts of heat and drought resilience causing damage to pipeline infrastructure due to increased corrosion potential.

Risk assessment

Climate change is projected to cause an increase in the intensity of extreme rainfall events across the Project Area resulting in potentially destructive surface water flooding.

Flash flooding at the desalination plant site has the potential to overwhelm onsite drainage and stormwater detention systems leading to damage to ground level assets and equipment. These risks will be reduced through strategic landscaping design to encourage natural rainwater infiltration and the implementation of stormwater management measures such as retention ponds or bioswales appropriately designed to manage increased stormwater runoff under a SSP 3-7.0 climate change scenario. Stormwater modelling has considered the increasing intensity of rainfall as a result of climate change including calculation of increased storage volumes that may be required under the SSP 3-7.0 climate model in line with ARR guidelines.

The potential for erosion may be increased by the combination of increased rainfall intensity and impacts of heat and drought. Pipeline design will consider selection of erosion-resistant backfill materials and corrosion-resistant pipeline materials. Local erosion due to increased rainfall and flooding events has the potential to expose or degrade pipeline footings around or at waterway crossings. This risk will be reduced through appropriate engineering and reinforcement of pipeline structures to resist erosion. Disturbed areas will be backfilled and recontoured to approximately match pre-construction levels to ensure stabilised soils and to reinforce natural environments.

Design of air valves on the pipeline will assume overland flow and be designed to prevent impacts to water quality in the pipeline through flooding of air valves.

The risk of power supply failure due to flooding at substations causing disruption of water treatment or distribution will be reduced through appropriate flood mitigation design controls. These measures include site selection in areas of low flood impact, bunding,

elevated platforms, flood barriers and drainage systems to ensure the continued function of critical electrical infrastructure. Design and maintenance of access tracks and appropriate selection of operations and maintenance vehicles will reduce the risk of loss of site access due to erosion of access tracks following flood events.

A combination of storm surge and high rainfall and / or flooding has the potential to damage the intake pump station, causing temporary loss of service. Engineering and design approaches to reduce this risk are discussed below under **Changing marine conditions** below.

Potential adaptation measures

Detailed design will consider the relevant changing climate conditions and evaluate the appropriateness of design and engineering changes to accommodate the expected increased rainfall intensity and occurrence of surface water flooding. Additional adaptation measures may include design of detention basins with capacity for longer term climate conditions or provision for future expansion and regular inspections of erosion and sedimentation controls along watercourses until the rehabilitated areas have stabilised.

Changing marine conditions

Twelve risks were assessed relating to changing marine conditions, considering the likelihood and consequence of impacts on the Project by 2090 (refer Table B-1 Appendix L-1). The following five risks were categorised as Medium and are assessed below:

- Increase in sea surface temperatures as a result of climate change could promote additional sea life growth which could result in higher growth rates of fouling organisms or higher rates of other intake organisms such as jellyfish. This could increase the roughness and decrease the effective diameter of the intake tunnel or block intake screens, reducing the available water intake rates.
- Change in Spencer Gulf pH and salinity causing corrosion and associated damage of riser and intake marine structures causing increased level of repair and maintenance.
- Compounding effect of storm surge and high rainfall/flooding causing potential impacts to intake / outfall pump station.
- Higher sea surface temperature and acidification may reduce the facility life due to failure of irreplaceable components (e.g. tunnel linings).
- Increased frequency and intensity of marine heatwaves and / or more frequent and intense extreme rainfall and catchment flooding result in reduced quality of intake water supply. This can lead to additional pretreatment requirements, chemical and energy usage, which may accelerate degradation of membranes and require more frequent replacements. The increase in chemical and / or reagent demand may also exceed site storage requirements, leading to the facility being unable to meet the desired treatment capacity.

Risk assessment

Projected climate change impacts on marine conditions in the Spencer Gulf include a likely decrease in pH (acidification), an increase in sea surface temperatures, possible changes to sea salinity, and sea level rise.

At the desalination plant, higher sea surface temperatures and acidification have the potential to reduce facility life due to failure of irreplaceable components (e.g. tunnel linings). Similarly changes in the pH of Spencer Gulf waters and salinity have the potential to cause degradation of riser and intake pump infrastructure increasing the need for repairs and maintenance. These risks will be reduced through high-level durability design requirements incorporating specifications for corrosion control and material selection. This would include designing infrastructure with corrosion-resistant coatings and redundancy, selection of durable materials, and adherence to stringent design standards.

The risk of impacts to intake water quality due to changing marine conditions will be addressed through water treatment processes that are adaptable (with the ability to retrofit additional treatment options) and scalable. Ongoing water quality monitoring and modelling will proactively identify and address any deviations in water quality. Facility design will consider the ability to retrofit additional storage capacity, if needed, to address the risk of an increase in chemical or reagent demand due to changes in pH, salinity and ocean temperature.

The Project Design Report (GHD 2025a) assessed tidal levels, tidal currents, 100- year Average Recurrence Interval (1% Annual Exceedance Probability) storm event, storm surge, extreme wave height and projected sea level rise when developing the marine works design criteria for the selected site at Mullaquana Station. The Project is constructed above the 1 m sea level rise at 2100 set out in Coastal Protection Board Policy.

The Project has incorporated a conservative scenario of sea level rise into the desalination plant location and design (RCP 8.5). This will address the risk that the water level within the inlet screen and seawater pumping station exceeds the height of the screens, allowing the entry of unscreened water into the intake system and damaging downstream process systems. Additional control measures include operational and maintenance shutdown procedures.

Changing marine conditions have the potential to result in increased growth rates of fouling organisms (including HAB) or the incidence of intake species such as jellyfish. This could reduce water intake rates through a reduction in the effective diameter of the intake tunnel or blocked intake screens. This risk will be reduced by including chlorine dosing in the intake design to disinfect and prevent fouling, establishment of regular maintenance regimes and frequencies for cleaning intake tunnels, and designing intake systems which provide accessibility for maintenance tasks.

Cumulative impacts of discharge of return water

Concerns have been raised in stakeholder engagement in relation to potential cumulative impacts from the desalination plant's outfall return water and changes in Spencer Gulf salinity, temperature or pH levels due to climate change on the marine environment, and fisheries in particular.

Modelling of the impacts of the desalination plant was completed with and without the project changes (including salinity, temperature and sea level rise) under an RCP 8.5 scenario (SARDI, 2026e). Desalination return water is predicted to make a secondary and localised contribution to salinity, with bottom salinity increases of less than 0.5 PSS at Mullaquana Station, generally confined within approximately 2 to 8 km of the outfall and

diluting to less than 0.03 salinity units beyond this. Under future climate conditions (RCP 8.5), the plume is expected to behave broadly consistently with present-day dispersion patterns, although it may extend further north-east and closer to the coast (SARDI 2026e).

Farfield and oceanographic climate modelling indicate that climate change and discharge effects are predicted to be approximately linear and additive at the site and in the long-term mean. The climate signal is the dominant influence, contributing about 60% of the combined salinity increase (SARDI 2026e). Combined salinity and temperature changes are predicted to commonly exceed 1 PSS and 1.4°C relative to current conditions, particularly in summer and autumn. However, under a continued high-emissions scenario, the regional climate-driven salinity increase would substantially exceed the contribution from the desalination plant alone.

The risk assessment for the Project did not consider this to be a risk as any changes to background conditions would have proportional impacts on the return water and are not expected to result in any cumulative impacts. This is mitigated through the following existing designs and controls:

- site specific and fit-for-purpose plant design to ensure effective management of return water concentrations
- optimising diffuser design to ensure return water meets regulatory standards
- selecting the outfall tunnel location to avoid potential areas of higher impact
- ongoing water quality monitoring.

Potential adaptation measures

The Project will comply with requirements under the Coast Protection Board Policy (2022), and the detailed design will account for a sea level rise of 1 m by 2100, noting that climate projections under the RCP 8.5 scenario did not exceed this rise.

The detailed design phase for the desalination plant and marine infrastructure will consider climate projections for rising sea levels and changing marine conditions and evaluate the appropriateness of design changes.

Decreases in average rainfall and increased occurrence of drought

Four risks were assessed relating to decreased average rainfall, considering the likelihood and consequence of impacts on the Project by 2090 (refer Table B-1 Appendix L-1). The risk listed below was assessed as Medium against the three categories of Project infrastructure. All risks were not reached until 2090.

- Long term change in average rainfall and drought conditions leading to a change in geotechnical properties of the infrastructure foundations leading to potential lack of asset / structural integrity.

Risk assessment

Average rainfall is expected to decrease and occurrence of drought conditions to increase across the Project Area due to changing climate conditions.

The main risk identified for Project infrastructure is changes in the geotechnical properties of infrastructure foundations, leading to impacts to structural integrity.

A range of ground moisture conditions and shrink-swell impacts will be identified in geotechnical assessments undertaken for infrastructure design for the desalination plant, transfer system and power supply. Design standards will consider and account for changing conditions across seasons.

Potential adaptation measures

Additional adaptation measures that may be considered in detailed design include incorporating expected long-term decreases to average rainfall in geotechnical assessments for Project infrastructure.

Increase in frequency and intensity of bushfires

Seven risks were assessed relating to increased risk of bushfire, considering the likelihood and consequence of impacts on the Project by 2090 (refer Table B-1 Appendix L-1). The two risks listed here were categorised as Medium and are assessed below. For water storage and distribution infrastructure this risk was reached by 2050, however, for utilities and power supply this was not reached until 2090.

- More frequent and more severe bushfires cause risks to larger power lines at a more regional scale which could disrupt power supply over longer time scales.
- Increase in frequency and intensity of bushfires causes extreme heat around the pipeline or infrastructure affecting structural integrity.

Risk assessment

The climate change scenarios modelled showed an increase to the number of days with an extreme fire danger rating. Higher temperatures and lower rainfall can lead to the increase in frequency and intensity of bushfires.

There is a risk of damage to Project electricity infrastructure as well as regional transmission infrastructure from more frequent and severe bushfires, potentially impacting operation of the desalination plant and pump stations. Outages over the short to medium term can be mitigated to some extent by back-up and / or renewable power generation at pump stations, and storages in within the system to manage temporary outage periods in supply.

The risk of extreme heat from bushfires on the structural integrity of the pipeline and other infrastructure will be reduced through the provision of vegetation clearance zones and buffers at aboveground sites. Further detail of bushfire management planning and prevention and preparedness measures is provided in Chapter 25 Hazards and Risk.

Potential adaptation measures

Detailed design will evaluate the appropriateness of changes to the design to accommodate the expected increase in frequency and intensity of bushfires.

24.4 Greenhouse Gas Emissions

Increasing concentrations of GHGs in the atmosphere are known to contribute to climate change. Reducing these emissions across the life cycle of the Project would reduce the potential of the Project to contribute to GHG-related climate change.

24.4.1 Assessment methodology

The assessment of GHG emissions for construction and operation of the Project discussed in this chapter was based on the methodology and assumptions set out in the Greenhouse Gas Assessment provided in Appendix L-2.

GHG emissions were calculated in accordance with the principles of the internationally accepted GHG Protocol (WBCSD and WRI 2004 and 2011) and national guidance *Embodied Carbon Measurement for Infrastructure* (ITM 2024). All GHGs were aggregated and reported as a single number of carbon dioxide equivalents (CO_2e).

Scope 1, 2 and 3 emissions

There are three types of GHG emissions outlined by the GHG Protocol.

Scope 1 emissions are the direct emissions of GHGs from sources that are owned or operated by a reporting organisation. Scope 2 emissions are comprised of the indirect emissions associated with the import of energy from another source, while Scope 3 emissions are made up of indirect emissions (other than energy imports) that are a direct result of the operations of the organisation, but from sources not owned or operated by them.

For the purposes of the Project GHG emission assessment, Scope 1, Scope 2, and selected Scope 3 emissions (where they represent a material, or greater than 1% contribution to the overall GHG footprint) have been determined for all operating and construction scenarios (refer Table 24-6).

The assessment scope included all material emission sources associated with construction and operation of the Project[5]. In line with ITM (2024) guidelines the stage of the Project during which emissions are expected was also specified (refer Figure 24-6 for lifecycle module definitions).

Table 24-6: Scope 1, 2 and 3 emissions for Project phases

Life cycle module	Activity	Scope	Included in assessment
Construction and commissioning			
A1-3	Manufacturing of construction products and materials	3	Y
A4	Transport of construction materials	3	Y
A5	Construction and installation – fuel consumption plant and equipment	1 and 3	Y
A5	Construction and installation – purchased energy (if relevant) for commissioning	2 and 3	Y

[5] End of life, including decommissioning and demolition or deconstruction, were not assessed and would be the subject of future assessment.

Life cycle module	Activity	Scope	Included in assessment
A5	Construction and installation – other (e.g. vegetation clearance, water use and waste generation, workforce commute)	1 and 3	Y
Operations			
B1	Use of desalination plant – chemical reagents, waste management	3	Y
B2	Maintenance	3	Y
B3-5	Repair, refurbishment & replacement	3	Y
B6	Operational Energy	2 and 3	Y
B7	Operational Water	3	Y
B8	Emissions enabled by use of infrastructure (e.g. mining enabled by supply of water)	-	N
Decommissioning and Closure			
C1	Deconstruction and decommissioning	3	N
C2	Transport of decommissioned plant / waste from demolition	3	N
C3	Waste processing from end of life	3	N
C4	Disposal of deconstructed / demolished infrastructure	3	N
D	Benefits from reuse, recovery and recycling	N/A	N

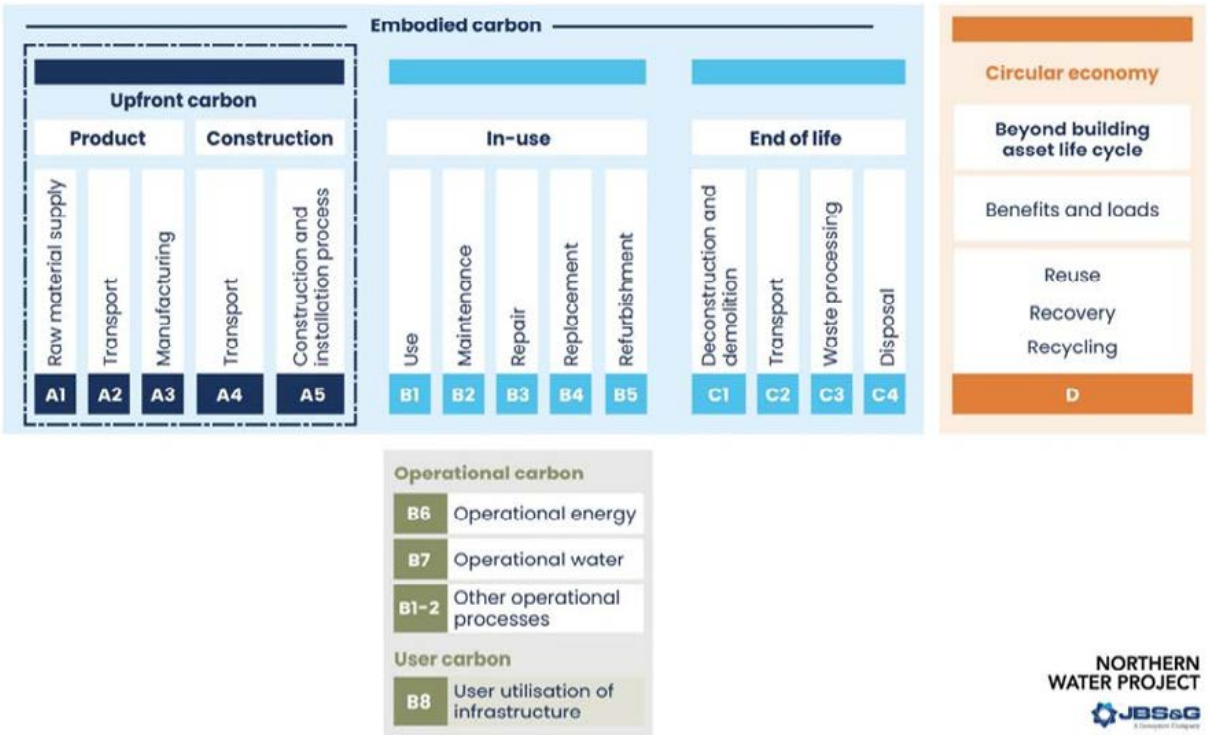


Figure 24-6: Sources of whole life carbon emission and definitions of use
[Source: ITM 2024]

Construction inventory

The construction GHG inventory included an assessment of all material Scope 1, 2 and 3 emissions associated with construction activities within the Project site boundary, and upstream and downstream enabling activities within the Project's value chain. These are provided in Table 24-7.

Table 24-7: Sources of GHG emissions – construction inventory

Emission source	Activity	In inventory?	Scope 1	Scope 2	Scope 3
Carbon sinks	Land clearing and soil disturbance	Yes			•
Construction materials	Embodied emissions of materials used in construction	Yes			•
Landfill	Construction waste disposed at landfill	No			•
Purchased electricity	Electricity consumed in construction plant and equipment	Yes		•	
Stationary fuel	Fuel consumed by construction plant and equipment	Yes	•		•
Stationary fuel	Fuel consumed for operation of temporary workforce accommodation	Yes	•		•
Transport fuel	Fuel consumed in site management vehicles (utility vehicles)	Yes	•		•
Transport fuel	Fuel consumed for construction materials delivery, spoil and rock removal	Yes			•
Transport fuel	Workforce air travel	Yes			•

Operational inventory

Emissions associated with operation of the Project are largely the result of electricity consumed for the operation of desalination plant equipment (predominantly for pumps for intake, treatment and transfer systems and miscellaneous equipment). It also includes other direct sources of emissions, such as fuel consumption for maintenance activities, and indirect sources such as the production and transport of chemicals, or losses in transmission and distribution of electricity. Operations were modelled over a 100-year period. The

boundary of emissions sources considered for the operation of the Project is presented in Table 24-8.[6]

Table 24-8: Sources GHG emissions – operational inventory

Emission source	Activity	In inventory?	Scope 1	Scope 2	Scope 3
Embodied emissions	Emissions associated with production of chemicals used in the water filtration and treatment activities	Yes			•
Embodied emissions	Emissions associated with the production of replacement materials and equipment over the facility life	Yes			•
Fugitive emissions	Emissions associated with leakage of gases or vapours	No	•		
Purchased electricity	Electricity consumed for facility operations including water pumping, filtration, treatment and distribution	Yes		•	
Stationary fuel	Fuel consumed by maintenance plant and equipment	No	•		•
Stationary fuel	Fuel consumed by permanent plant and equipment (e.g. generators)	Yes	•		
Transport fuel	Commuting of staff to the facility	Yes			•
Transport fuel	Fuel consumed by inspection vehicles	Yes			•
Transport fuel	Fuel consumed for the transportation of operational waste and chemicals	Yes			•
Waste emissions	Emissions associated with the disposal of residual solid waste from the facility operations	Yes			•

[6] Impacts associated with activities enabled by the Project (e.g. continued, expanded or enabled production of the mining industry) are outside of the scope of assessment as they are assumed to be subject to their own approvals and environmental assessments.

24.4.2 Construction stage emissions

The GHG inventory for the construction stage of the Project considered the sources outlined in Table 24-7. The primary contribution to construction stage emissions is associated with the production of construction materials (33%).

Construction energy use is the next largest impact at 24% followed by vegetation clearance at 20%. The GHG impacts associated with vegetation clearing accounts for both the carbon that exists in the vegetation at the time of clearing (assuming decomposition and release) and the carbon that could have been sequestered in the future if the vegetation was not cleared (Jacobs 2026g).

A breakdown of construction emissions by scope is presented in Table 24-9 in tonnes of carbon dioxide equivalent (t CO_2e) and relative contribution to construction emissions by source is shown in Figure 24-7. Total emissions over the construction period is 1,159,981 t CO_2e.

Table 24-9: Construction stage emissions breakdown by scope

Scope	Average Annual Emissions during construction (t CO_2e/year)
Scope 1	113,856
Scope 2	-
Scope 3	132,433
Total annual average	276,259

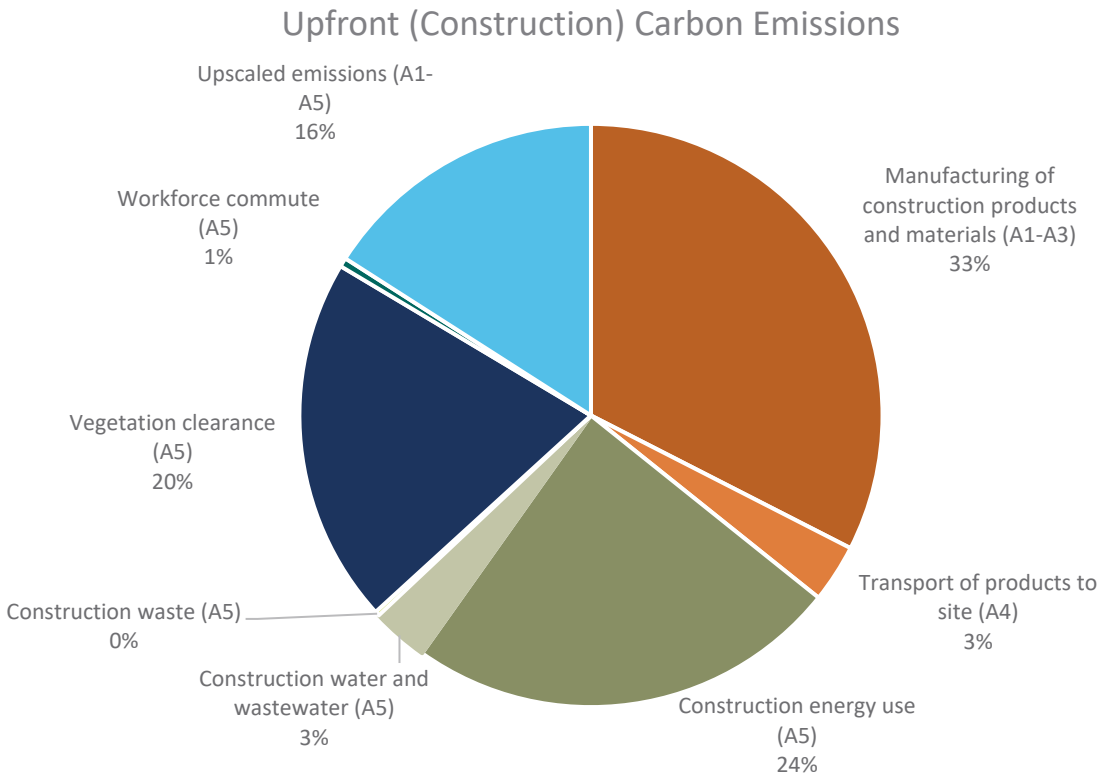


Figure 24-7: Construction stage emissions source contributions
[Source: Appendix L-2]

24.4.3 Operation stage emissions

The GHG inventory for the operation of the Project considered the sources outlined in Table 24-8 over a 100-year period. Two scenarios were considered for operations - sourcing electricity from the South Australian grid mix or 100% renewable energy. The Project has committed to use of 100% renewable electricity during operations and this is the selected option for this EIS. For the SA grid mix, most of the emissions are associated with electricity consumption whilst, for the selected option, the primary contributor to operational emissions is the consumption of chemicals.

The operational emissions by scope are presented in Table 24-10 and a summary of the key contributors to emissions during the operations stage is presented in Figure 24-8.

Table 24-10: Operational emissions scope breakdown by operational scenario

Scope	Grid sourced electricity (t CO_2e)	100% Renewable electricity (t CO_2e) – selected option
Scope 1 Emissions	459,147	459,147-
Scope 2 Emissions	1,161,248	-
Scope 3 Emissions	3,106,059	2,722,809
Total operational emissions	***4,726,453***	***3,181,956***
Average annual emissions	***47,264***	***31,819***

The annual emissions are expected to be variable, as the emissions linked to production will be higher in years with higher demand. Years where any major replacements occur are likely to have higher emissions than years without replacements.

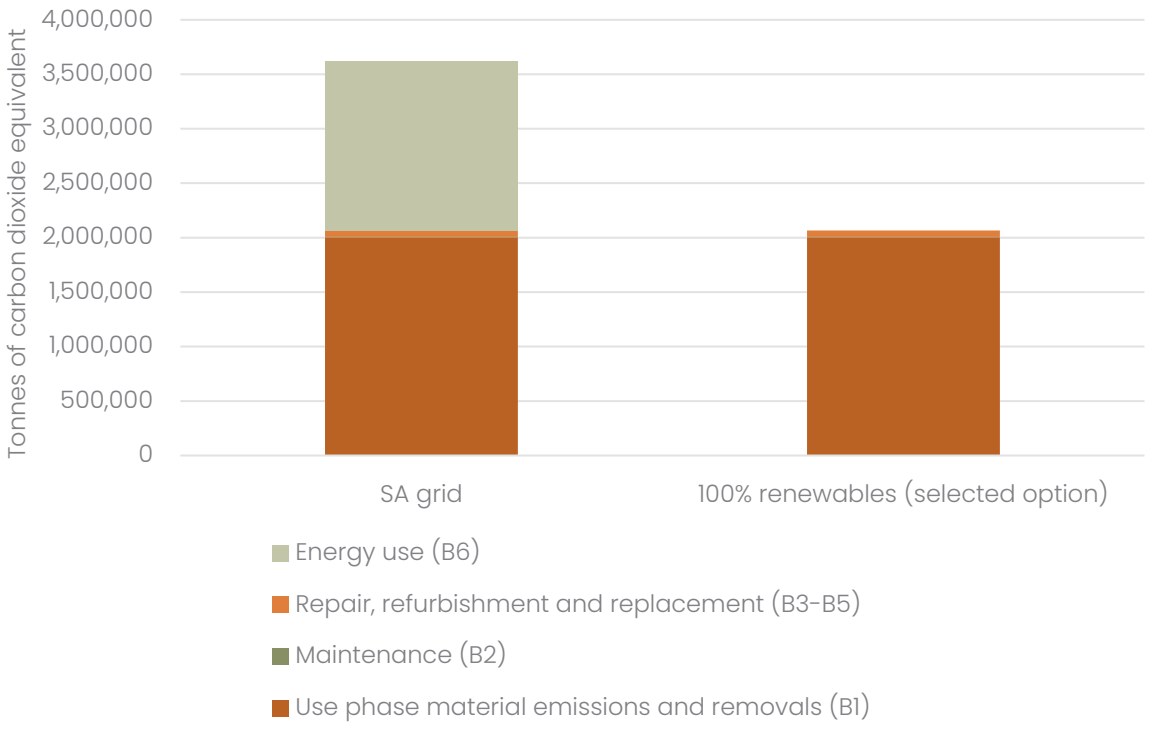


Figure 24-8: Operational GHG emissions (over a 100-year period) by source

Over the life of the Project (including construction and 100 years of operation) total GHG emissions are expected to be approximately 3.2 $MtCO_2e$. This is 67% of the emissions for a scenario where electricity was procured from the regular SA grid mix, which would have a lifetime impact of 4.8 $MtCO_2e$.

24.4.4 Uncertainty assessment

The uncertainty in the GHG assessment is linked to:

- **Uncertainty in the activity data**: refers to the estimated quantities of materials, plant and equipment requirements, chemical dosage, etc which will change as the design is refined.
- **Uncertainty in emissions intensity**: refers to the generic emission factors that have been assigned to some materials to reflect average conditions. As final materials are specified and suppliers confirmed, more specific emission factors can be obtained.

There are likely to be changes related to both these areas of uncertainty as the assessment has been undertaken prior to engagement of a construction contractor, detailed design and procurement of materials, plant and machinery. However, it is considered that the magnitude and relative scale of emissions have been appropriately identified to inform key areas for mitigation. Variations in these assumptions are not expected to significantly alter the required mitigation measures recommended for the Project. To account for uncertainty due to early stage of design, an upscaling factor has been applied to emissions in accordance with the requirements of ITM (2024).

Additional assessment refinements in later stages of the Project will improve the accuracy of the findings and key opportunities for GHG emission reduction.

24.4.5 Greenhouse gas emission mitigation

The Project has committed to the use of 100% renewable electricity in operations, likely to be sourced through a mix of onsite renewable infrastructure, Purchased Power Agreements and Large-Scale Renewable Energy Certificates. At low power sites (e.g. water storages) use of onsite solar panels to meet power supply will be considered.

With electricity requirements between 184 and 225 GWh / annum for the desalination plant and 179 GWh / annum for the transfer system, the Project is creating a large additional electricity demand. To the extent reasonably practicable, sourcing of renewable electricity for the Project would seek supply that is additional to existing supply.

Opportunities to minimise the Project's emissions impact and further align with the State's emissions reduction commitments that may be investigated and implemented in the detailed design and construction stages of the Project include:

- optimising desalination plant layout to support hydraulic performance and maximise gravity flows
- optimisation of pipework sizing and layout to improve energy efficiency
- selection of high efficiency pump, fan, and motor systems
- appropriate sizing of pumps, fans, and motors to reduce inefficiencies
- integration of criteria for local and / or low-carbon sourcing in chemical procurement arrangements

- regular inspections, maintenance, and audits of high energy use systems
- integration of on-site renewable electricity and storage
- optimising the time of operations sensitive to peak renewable energy periods and peak grid demand periods.
- minimising vegetation clearance on the pipeline alignment
- evaluating opportunities for the use of lower-carbon materials for construction including pipeline material
- maximising reuse of excavated material as backfill to minimise haulage and use of new aggregates
- use of electrified or alternative fuel vehicles, plant and equipment during the construction and operation stages.
- Maximise efficient water use and reuse where practicable.

24.4.6 Summary of the Project's carbon footprint

The construction stage of the Project is estimated result in 1.2 $MtCO_2e$ (mega tonnes of carbon dioxide equivalent) emissions.

During construction of the Project, the largest contribution to GHG emissions (33%) is associated with the embodied energy of materials used in construction (i.e. associated with their manufacture / production). The major source is the extensive use of mild-steel cement lined pipe for the transfer system pipeline (Jacobs 2026f). Construction energy (i.e. use of diesel generators) and clearance of vegetation (also largely for the pipeline) are the next largest contributors, accounting for 24% and 20% respectively. The significant length of the Project pipeline alignment contributes to the scale of each of these GHG emission sources.

Minimisation of impacts to native vegetation was a key driver in the process of infrastructure site selection and route alignment as outlined in Chapter 5 Project Siting, Alignment and Optimisation. Where possible existing roads / access tracks, previously disturbed areas and fence lines have been utilised to minimise vegetation clearance.

Opportunities currently being investigated to further reduce construction GHG emissions include potential use of low emission construction materials. These will be part of the Environment, Social and Governance (ESG) strategy and implementation currently under development and discussed in Section 24.5.1.

Operation of the Project over a 100-year lifespan will result in 2.1 $MtCO_2e$ emissions under the proposed 100% renewable electricity scenario.

During operation of the Project, electricity use is the largest contributor to GHG emissions with predictions of 184 - 225 GWh/annum for the desalination plant operation and 179 GWh/annum for the transfer system. Direct and indirect emissions sources are related to fuel consumption, chemical production and transport, and electricity distribution.

These emissions will be mitigated by the commitments made by the Project to 100% renewable electricity for the Project's operation. While the exact source of renewables has not been determined it will likely be sourced through a mix of onsite renewable infrastructure, Power Purchase Agreements and Large-Scale Generation Certificates.

Under the selected option (in which electricity is procured from renewable energy sources) the main source of operational GHG emissions is significantly reduced, moving from electricity consumption to other operational sources including chemicals usage, emissions associated with materials and waste treatment. There are opportunities to further reduce emissions and promote the recycling, reuse and treatment of waste during operations as outlined in Section 24.5 and Section 24.6.

The Project has been designed to contribute to meeting South Australia's GHG emission reduction targets.

Project design has incorporated opportunities to reduce GHG emissions, as detailed in Section 24.4.5. While sourcing 100% renewable energy is not a viable option during construction due to the number of remote construction sites along the pipeline, the Project is committed to the use of 100% renewable electricity during operations which is consistent with South Australia's emissions reduction targets for 2030 and 2050[7].

Further opportunities to reduce emissions will be identified and developed through the development of the ESG strategy in alignment with South Australia's target of net zero emissions by 2050.

The Project's commitment to 100% renewable electricity during operations has the potential to contribute to increased economic activity in the renewables sector in the region. The new sustainable water supply will support projects that are part of the broader global decarbonisation transition such as critical minerals extraction.

The Project's potential impacts on climate change are considered in the context of the Project's anticipated benefits to State, national and global decarbonisation efforts.

Over the life of the Project, including construction and 100 years of operation, total GHG emissions are predicted to be approximately 3.2 $MtCO_2e$. Section 24.4.5 outlines a range of mitigations that will be considered during detailed Project design to reduce these emissions and their impact on climate change.

Whist the Project will result in an increase in the State's GHG emissions overall, it will support the continued operation and growth of industries which contribute to decarbonisation efforts such as production of copper and critical minerals.

Currently mining and other industry in the South Australian Arid Lands Landscape Region is reliant upon extracting water from the River Murray, Great Artesian Basin (GAB) and other deep saline groundwater resources. In the South Australia Arid Lands region, climate change is forecast to reduce mean annual rainfall by 9% by 2030 and 19% by 2099 under a medium emission scenario[8]. As a secure, climate-resilient water source for industry in the region, the Project will potentially reduce the overall level of demand and reliance on the GAB and the River Murray as sources of water.

[7] The State's 100% renewable electricity by 2027 target is not applicable to the Project as it will not be operational within that timeframe.

[8] New climate projections for South Australia, maps and key findings 2022. Available at: https://data.environment.sa.gov.au/Content/Publications/New%20climate%20change%20projections%20for%20SA%20maps%20and%20findings%202022.pdf

24.5 Sustainability and Efficient Use of Resources

24.5.1 Sustainability

Project objectives

The Project is committed to supporting positive sustainability outcomes and long-term benefits. Principles for Ecologically Sustainable development are included in both the *Environment Protection Act 1993* (SA) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth). In developing its sustainability framework, and key sustainability objectives the Project has drawn from these key legislative drivers as well as globally recognised sustainability standards and frameworks. The sustainability principles that have informed the Project's sustainability framework include:

- United Nations Sustainable Development Goals (UN SDGs)
- Global Reporting Initiative (GRI);
- Australian Sustainability Reporting Standards (ASRS),
- International Financial Reporting Standards (IFRS)
- Sustainability Accounting Standards Board (SASB) Sustainability Disclosure Standards; and
- Taskforce on Nature-related Financial Disclosures.

To inform the development of the Project's sustainability priorities and objectives, a materiality assessment aligned with these leading sustainability standards and guidelines was undertaken. This process considered the sustainability context, risks, opportunities and outcomes most relevant to the Project and its stakeholders.

The materiality assessment identified a range of 'material' topics for the Project which were further refined into seven priority sustainability topics. For each priority topic sustainability objectives have been identified. The sustainability objectives have been integrated into the design, build, operate and maintain (DBOM) contract to ensure they are considered throughout the life of the Project. The priority areas and objectives are listed in Table 24-11.

Table 24-11: Northern Water Project sustainability objectives

Priority topic	Sustainability objectives
Emissions reduction and resource efficiency	• Power operations with 100% renewable electricity • Minimise greenhouse gases across the asset lifecycle • Contribute to circular economy outcomes by optimising the use of resources, avoiding and reducing waste and using recycled materials where feasible; • Optimise energy use across the asset lifecycle • Maximise efficient water use and water reuse
Resilience and Risk Management	• Ensure infrastructure is 'right-sized' by balancing efficient delivery with a solution that is flexible enough to address future demand needs • Design to be resilient to a changing climate
Environment and biodiversity protection	• Reduce extractions from climate dependent water sources and associated ecosystems.

Priority topic	Sustainability objectives
	• Protect the natural environment by minimising adverse environmental impacts through design, construction and operation. • Facilitate opportunities to enhance environmental values • Meet or exceed environmental approval requirements during design, construction and operation.
First Nations outcomes	• Engagement with Traditional Owners founded on free and prior informed consent (FPIC) • Recognise, respect and protect Aboriginal Cultural Heritage. • Embed acknowledgment that Project occurs on the Traditional lands of the Kokatha and Barngarla People and co-design the development and delivery of opportunities to incorporate cultural values and knowledge into the Project's design and delivery • Identify and implement initiatives that facilitate positive outcomes including employment, training and supply chain opportunities for Traditional Owner groups and the broader Aboriginal community
Workforce, supply chains and economy	• Maximise local opportunities for local suppliers and workforce involvement by engaging early, investigating local options and building capacity where appropriate. • Understand and proactively manage supply chain risks to enhance resilience, maintain quality and address ethical sourcing including modern slavery risks. • Embed consideration of sustainability aspects in procurement policies, contracts and processes and work with key suppliers and contractors to identify and implement actions to improve sustainability outcomes. • Embed and enforce workforce safety, diversity and inclusion and the fair and equitable treatment of workforce and suppliers.
Community outcomes	• Build and maintain community trust and support through proactive engagement and proactively identifying and responding to priority issues • Minimise negative impacts to local businesses and the community as part of design, delivery and construction • Identify opportunities to work with community on positive outcomes and community benefits
Governance and Transparency	• Ensure transparent decision making and strong governance to manage risks • Set measurable targets and measure, monitor, verify and track performance; • Report on sustainability performance; • Foster a culture of learning, innovation, and adaptive management; and • Share knowledge and lessons learnt on sustainability outcomes.

Implementation of sustainability objectives

Sustainability requirements, including governance systems, structures, and processes that enable the achievement of identified sustainability objectives and the management of related risks and opportunities. have been integrated into the DBOM contract.

This includes a requirement that the detailed design development and construction methodology must address sustainability risks and detail how identified sustainability objectives are being realised. This process includes taking into account whole-of-life environmental, social and economic outcomes in significant design decisions.

Sustainability management plans including focused carbon management plans will be developed to support the effective integration of sustainability outcomes into Project processes. These plans will set out details on nominated sustainability commitments, actions, responsibilities, performance targets and measures to support achievement of identified sustainability objectives. Regular monitoring of sustainability performance will be undertaken to track and report on progress over the life of the Project.

Table 24-12 provides details of material sustainability issues and where these topics are addressed in the EIS.

Table 24-12: Material sustainability issues for the Project

Sustainability areas	Material issues identified during initial assessment	Relevant EIS chapter
Emissions reduction and resource efficiency	Whole of life greenhouse gas emissions and decarbonisation	Chapter 24
	Energy management	Chapter 24
	Climate resilience	Chapter 24
Workforce, supply chains and economy	Product circularity	Chapter 24
	Waste management and recycling	Chapter 24
	Water use and management	Chapter 13
	Workforce participation, diversity, local skills and industry development	Chapter 22
Environment and biodiversity	Marine biodiversity	Chapter 11
	Terrestrial biodiversity	Chapter 15
Community outcomes	Working on Country and cultural heritage	Chapter 16
	Community and social outcomes	Chapter 23

24.5.2 Efficient Use of Resources

Sustainable procurement and efficient use of resources requires consideration of inputs of natural resources, energy and water and the pollution produced from the manufacture, use and disposal of goods (such as the toxicity of the materials used and greenhouse gas emissions), and biodiversity loss resulting from removal or alteration of natural resources.

Sustainable use of resources in South Australia is guided by the waste strategy (Green Industries SA 2025) which focuses on transitioning to a circular economy. The concept of a

circular economy is a self-sustaining system, as opposed to a linear economy where energy and resources are lost at every stage of production and consumption. Continual reuse and recycling of materials reduces and prevents depletion of virgin materials and minimises disposal of waste. Figure 24-9 demonstrate the key elements.

Focus area 6 of the waste strategy, 'build a circular built environment', is further supported by the *Circular economy in South Australia's built environment action plan* developed by Green Building Council Australia (GBCA 2023). This action plan identifies the key opportunities to incorporate circular economic thinking for each of the Project phases set out in Figure 24-9.

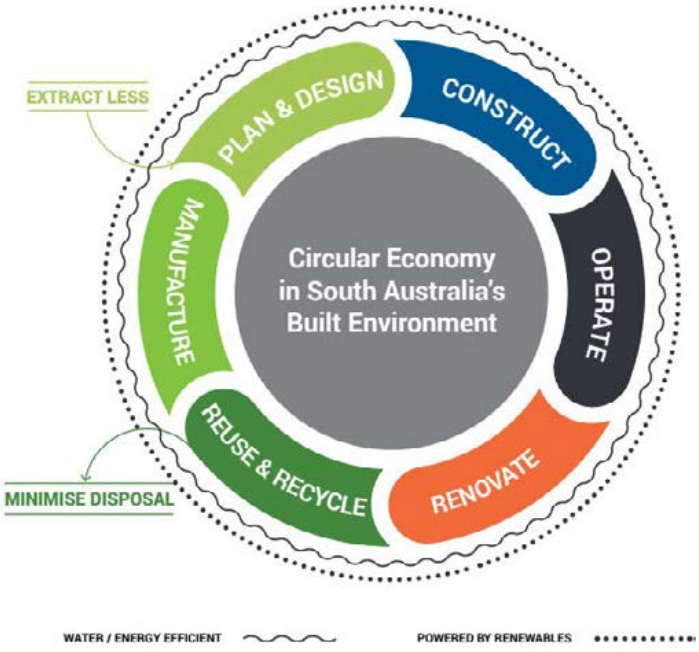


Figure 24-9: South Australia's circular economy in the built environment
[Source: GBCA 2023]

Northern Water Project and the South Australian circular economy

The primary contribution of the Project to the South Australian circular economy and sustainability in the use of resources is by avoiding or optimising the use of raw materials (extract less) (refer Figure 24-9).

Specific circular economy strategies and sustainability principles that have been integrated into the Project are detailed in Table 24-13, grouped by the key opportunities identified in Circular economy in SA's built environment (GBCA 2023).

Table 24-13: Circular economy and sustainability considerations in the Project

Circular economy	Sustainability considerations
Planning and Design	
Design for climate resilience	The climate change risk assessment for the Project (Appendix L-1) identified design and system adaptations to reduce impacts of climate change on the Project. Design principles for climate resilience include siting terrestrial desalination plant infrastructure above the high tide mark

Circular economy	Sustainability considerations
	considering a potential 1 m sea level rise and ensuring desalination plant design standards and marine modelling include consideration of the changing marine environment.
Design for efficiency	Energy efficiency measures incorporated into desalination plant and transfer system design include: • Energy recovery devices to capture energy entrained in pressurised water • Variable speed pumps to allow energy usage to be reduced to only what is necessary.
Design for longevity	Design life of Project infrastructure is up to 100 years, with concrete assets, below ground pipework and intake and outfall tunnels designed for over 80 years. Other parts such as membranes and electrical plant are likely to require refurbishment or replacement during the design life during which time new technology to increase efficiency will be investigated. Material selection has also considered the design life as well as the proposed environment.
Low emission / sustainable materials	Sustainable procurement policies will be adopted to encourage the use of low emission and sustainably sourced materials. More sustainable materials that may be investigated as part of design development include green steel and low carbon concrete.
Modularity / flexibility	While the Project is seeking approval to process up to 51 GL/y, sizing of key marine components incorporates a larger capacity and excess space has been allowed for onsite to enable increased production. Doing so would allow modular additions to the processing plant without the need to reconstruct tunnels.
Locally sourced materials	Requirements for maximising the involvement of local businesses is embedded in procurement requirements.
Construction	
Recovering materials for reuse, re-manufacturing and recycling	Waste management has been designed in accordance with the waste management hierarchy (avoid, minimise, recycle, reduce, treat, dispose), as discussed in Section 24.6. Specific construction wastes and materials proposed to be reused or recycled include: • Spoil from pipeline trenching and desalination site earthworks to be used as fill onsite. • Spoil from Jack-up Barge (JUB) and Tunnel Boring Machine (TBM) intake / outfall tunnel construction to be treated to reduce water content and investigated for potential beneficial reuse including waste derived fill. • Cleared vegetation to be placed over rehabilitated and landscaped areas either as is or following mulching to stabilise soil and provide organic matter and seedbank.

Circular economy	Sustainability considerations
	• Waste construction materials (e.g. wood, steel) to be taken by contractors for reuse or recycled as scrap steel / mulched material. • Construction buildings (e.g. offices at construction laydown sites) to be transportable and be deconstructed for use at other sites.
Operate	
Conserve energy	The Project has committed to using 100% renewable electricity during operations. This is anticipated to be delivered using a combination of purchased power agreements and large-scale renewable energy certificates and potentially onsite renewable energy generation.
Conserve water	Water efficiency and conservation measures onsite include: • Opportunities to treat and reuse water during construction phase for activities such as dust suppression. • Capturing and using rainwater for site facilities via tanks on buildings to capture water for use in grey water • regular inspection of the pipeline to identify and repair leaks or other possible water loss points. • water stored in covered storages to reduce evaporation.
Reduce emissions	The largest GHG emission sources identified during operations were energy usage and embedded emissions in the chemicals used in the process (refer Section 24.4). The Project is focusing efforts to reduce the main emission sources including commitment to use of 100% renewable electricity during operations. Procurement policies that integrate sustainability principles and are designed to favour low emission inputs to the process are being developed and are outlined in Section 24.5.1.
Maintain longevity	Asset management and maintenance plans will be developed which will focus on ensuring infrastructure is inspected, maintained and renewed ensuring reliability and prolonging the life of the asset.
Recycle	
Minimise waste	Waste management has been designed in accordance with the waste management hierarchy (avoid, minimise, recycle, reduce, treat, dispose), as discussed in Section 24.6.
Maximise energy recovery	The reverse osmosis process requires all water to be under high pressure. To recover some of the energy used to pressurise the water, an energy recovery device has been designed to use the pressure from the return water leaving the process to pressurise the intake stream.
Disposal	
Minimise disposal	Consideration will be given to purchasing materials in bulk to reduce packaging requirements per unit.

24.6 Waste Management

Wastes generated by construction and operation of the Project will be managed in accordance with the waste management hierarchy (refer Figure 24-10) which underpins the objectives of the Wastes to Resources EPP and in line with the SA Waste Strategy (refer Section 24.5.1).

The waste management hierarchy prescribes waste to be managed, in order of priority, as follows:

1. Avoidance of the production of waste
1. Minimisation of the production of waste
2. Reuse of waste
3. Recycling of waste
4. Recovery of energy and other resources from waste
5. Treatment of waste to reduce potentially degrading impacts
6. Disposal of waste in an environmentally sound manner.

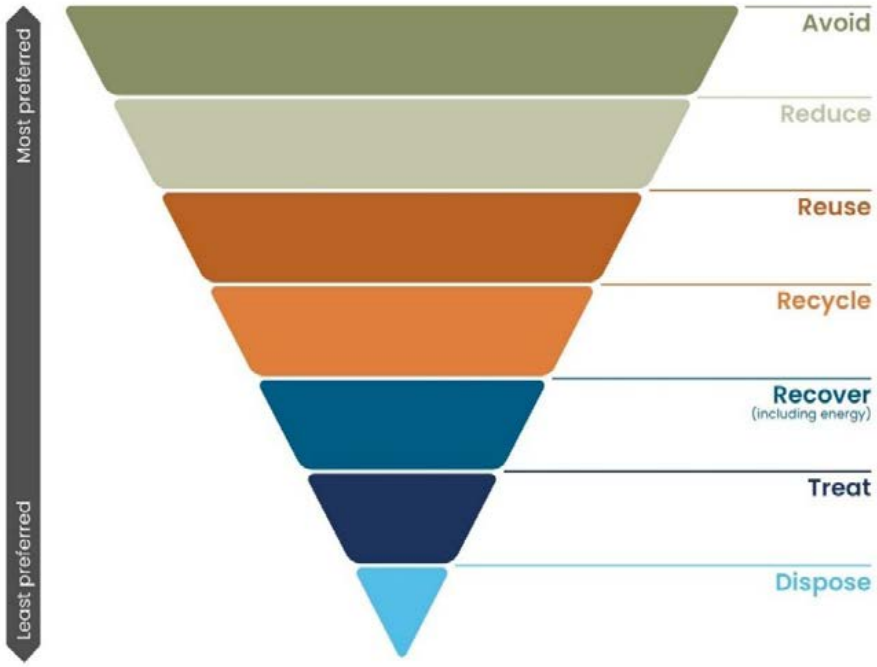


Figure 24-10: Waste management hierarchy

The waste management approach will be set out in a Waste Management Plan (WMP) for the Project as discussed in Chapter 26 Environmental Management Framework. The Waste Management Plan will address:

- avoiding or minimising waste generated e.g. through ordering consumables in bulk to reduce the amount of packaging required per unit
- separation of waste streams, containment at source and onsite storage while awaiting transport for recycling or disposal. Designated waste management areas will be identified in the WMP.

- waste storage areas will consider hard stand or concrete base, bunding and containment depending on the type of waste and hazards presented e.g. residual lime sludge from the desalination plant process will require containment that meets EPA bunding and spill management guidelines
- licenced contractors will collect domestic waste and recycling from construction laydown areas, camps and the desalination plant for offsite reuse, recycling or disposal
- waste that will be reused onsite (such as reuse of spoil as waste derived fill) will be tested and managed in accordance with EPA standards.

Wastes generated during construction, operation and maintenance of the Project have been detailed in Table 24-14. During construction waste will be stored in designated laydown areas, and in the administration and workshop area of the desalination plant during operations. Location of stockpiles during construction is provided in Chapter 6 Project Description

As the Project life is 100 years, management of waste generated from decommissioning and rehabilitation would be dependent upon available technologies at the time. A detailed waste management plan for decommissioning will be prepared prior to this occurring to take advantage of opportunities that may have developed over the life of the Project and in line with any future land use plans.

Table 24-14: Key waste streams generated by the Project

Waste Stream	Storage locations	Approximate quantity / rate of production	Waste hierarchy considerations	Project phase	
				Construction	Operation
TBM spoil and abstracted water	Desalination plant site	~110,000 m^3	**Reuse** – use of spoil as fill onsite or offsite subject to compliance with EPA Standard for Waste Derived Fill (EPA, 2013). Approximately 15-20% of water will be reused onsite for washdown water or similar. **Treatment** – water and spoil placed in spoil storage retention basins to dry spoil and settle out turbidity from water to allow for beneficial reuse. Basins to be designed in accordance with EPA standards. **Dispose** – remaining water to be diverted to evaporation pond onsite. If spoil is unsuitable for reuse after treatment it will be disposed of at a licenced EPA facility.	✓	
Spoil on JUB from constructing marine risers	Onboard JUB Desalination plant site	~2,150 m^3	**Reuse** – sediments from the JUB will be transported to shore where it would be incorporated into spoil wastewater retention basin and treated with the TBM spoil, described above. **Treatment** – on water treatment will occur (either on the JUB or an adjacent barge). **Dispose** – following treatment clean water will be discharged directly from the JUB, subject to treatment to comply with Water Quality EPP, Australia and New Zealand Guidelines (ANZG 2018) and baseline marine water quality.	✓	

Waste Stream	Storage locations	Approximate quantity / rate of production	Waste hierarchy considerations	Project phase	
				Construction	Operation
Vegetation and organic matter from land clearance	Stockpiles along construction footprint	~2,000 ha of disturbance	**Reduce –** the area of vegetation requiring clearance has been minimised (refer to Chapter 15 Terrestrial Flora and Fauna for details on the steps taken to minimise clearance). **Reuse –** vegetation matter to be mulched, if required, and respread over rehabilitated land (e.g. backfilled pipeline trench), landscaped areas of desalination plant, pumps stations and substations. This includes the benefits of retaining seed bank, encouraging regrowth and minimising erosion of rehabilitated soils. **Dispose** – noxious weeds to be disposed of in accordance with relevant guidelines / requirements	✓	
Pipeline spoil	Stockpiles along construction footprint	2,292,750 m^3	**Reuse –** soil to be used to backfill the trench and pipeline. If there is an excess of spoil in an area it will be tested against requirements for Waste Derived Fill (WDF) for reuse. If not suitable as WDF then material will be disposed of at an appropriately licenced EPA facility.	✓	
Contaminated soils (including from Potentially Contaminating Activity areas, accidental spills or acid sulfate soil)	Stockpiles along construction footprint	Unable to determine (to be confirmed as part of detailed design)	**Storage -** storage of potentially contaminated soils would be separated from other stockpiles where reuse is possible to prevent cross contamination of waste streams. This soil will be tested and classified by an appropriately qualified environmental practitioner in line with best practice and in accordance with the Construction Environmental Management Plan.	✓	

Waste Stream	Storage locations	Approximate quantity / rate of production	Waste hierarchy considerations	Project phase	
				Construction	Operation
			Treatment / Disposal – In the event that contaminated soil is encountered the testing described above will determine whether soil is remediated or disposed of in accordance with appropriate legislation.		
Construction waste (packaging, excess construction materials including steel, timber etc) **Temporary buildings**	Desalination plant site, laydowns and temporary accommodation camps	Unable to determine (to be confirmed as part of detailed design)	**Reduce –** consideration of the volume of construction materials required to be ordered and packaging associated with order (for example ordering bulk volumes can reduce amount of packaging required). **Reuse** – excess construction materials (including steel and timber) could be reused at other sites either within the Project or for other construction projects in the area. Temporary buildings (e.g. construction site offices) will be transported to another site for reuse. **Recycle** – some packaging or construction waste may be suitable for recycling (e.g. scrap metals or cardboard packaging). Untreated timber and cardboard packaging may be suitable for mulching and use in rehabilitation of temporary construction areas. **Dispose** – any waste that cannot be managed using the above options will be disposed of at an appropriately licenced facility. Waste concrete will be collected in washout bays, solidified and transported to a licensed facility for reuse or disposal.	✓	

Waste Stream	Storage locations	Approximate quantity / rate of production	Waste hierarchy considerations	Project phase	
				Construction	Operation
Conductor drums, electrical conductors, insulators	Construction laydowns	Unable to determine, not expected to be significant quantities.	**Reuse** –Returned to the supplier for reuse.	✓	
Domestic waste	Desalination plant site, laydowns and temporary accommodation camps	Unable to determine (to be confirmed as part of detailed design)	**Recycle –** multiple bins will be provided in crib rooms, accommodation etc. to encourage separation of recycling at the source. **Treatment** – all onsite septic systems will be constructed in accordance with SA Health On-site Wastewater Systems Code. **Disposal** – waste will be trucked to a licenced facility as required.	✓	✓
Outfall return water	Desalination plant site	Up to 228 ML/d	**Dispose** – discharge to the Spencer Gulf via the outfall diffusers. Assessment of the impacts of this waste stream on the environment is in Chapter 11 Marine Environment.		✓
Residual lime sludge from desalination process	Desalination plant site	0.01 ML/d	**Reuse –** Opportunities for reuse of lime sludge will be considered through detailed design. **Reduce** – Sludge will be dewatered to reduce the volume of waste requiring transport and disposal. **Dispose** – concentrate of lime sludge will be trucked to an appropriately licenced facility for disposal.		✓
Screening materials from pre-treatment process (shells, sand and other oversize material).	Desalination plant site	Unable to determine, not expected to be significant quantities.	**Reuse –** Opportunities for reuse as a compost facility or bioreactor will be considered during detailed design. Potentially restricted due to salinity content. **Disposal** – disposed of at an appropriately licenced facility.		✓

Waste Stream	Storage locations	Approximate quantity / rate of production	Waste hierarchy considerations	Project phase	
				Construction	Operation
Clean in place (CIP) waste	Desalination plant site	Unable to determine, not expected to be significant quantities.	**Treatment –** CIP waste is neutralised before being discharged into the outlet stream. The CIP solution discharge will have a lower TDS than the return water stream.		
Solid waste from washdown processes	Desalination plant site	Unable to determine, not expected to be significant quantities.	**Reuse –** Opportunities for reuse as a compost facility or bioreactor will be investigated during detailed design. Potentially restricted due to salinity content. **Disposal –** disposed of at an appropriately licenced facility.		✓
Waste from routine replacement of reverse osmosis membranes and pre-filtration system filters.	Desalination plant site	Replaced ~ 5 yearly	**Recycling –** where possible filters and membranes will be recycled. **Dispose** - any waste that cannot be managed using the above options will be disposed of at an appropriately licenced facility.		✓
Excess hazardous materials and chemicals	See Chapter 25 Hazards and Risks	See Chapter 25 Hazards and Risks	**Dispose** – dispose of all waste hazardous substances to a suitably licensed facility by an appropriately licensed transport contractor, in line with state legislation and EPA SA requirements. Collect waste from construction vehicle and plant maintenance activities and store in designated waste storage areas for collection by an authorised contractor for offsite disposal. Designated waste storage areas to comply with relevant Safety Data Sheet requirements and EPA bunding and spill management guideline. Wastes to be segregated and consider separation of containers storing reactive materials as appropriate.	✓	✓

24.7 Conclusion

The Project has been designed to adapt to predicted future climate scenarios with further consideration proposed through detailed design. GHG emissions from the Project are estimated at 3.2 $MtCO_2e$ with 1.14 $MtCO_2e$ being attributable to construction. Sustainability objectives have been identified to address key sustainability risks and opportunities for the Project. These objectives ensure management of climate risks and emission reduction are monitored, updated and refined throughout the life of Project.

Waste management has considered the principles of a circular economy with maximisation of reuse and recycling where possible. Detailed plans for waste management, GHG mitigation and climate risk will be developed prior to construction.



Chapter 25

Hazards and Risks

NORTHERN
WATER PROJECT

JBS&G
A Geosyntec Company

TABLE OF CONTENTS

25 HAZARDS AND RISKS 25-1

25.1 Key Findings 25-1

25.2 Setting the Context 25-2

25.2.1 Requirements in legislation and other standards 25-3

25.2.2 Views of stakeholders 25-4

25.3 Assessment Method 25-4

25.3.1 Hazard Assessment Process 25-5

25.3.2 Bushfire risk assessment 25-6

25.3.3 Flood impact assessment 25-6

25.3.4 Preliminary Site Investigation 25-6

25.3.5 Harmful algal bloom 25-7

25.4 Evaluation of Hazards 25-7

25.4.1 Bushfire 25-7

25.4.2 Flooding 25-9

25.4.3 Site and groundwater contamination 25-16

25.4.4 Marine spills 25-20

25.4.5 Harmful Algal Bloom (HAB) 25-20

25.4.6 Dangerous substances 25-23

25.4.7 Management of hazards and emergency response on Department of Defence land 25-30

25.4.8 Other hazards 25-32

25.4.9 Summary of key mitigation measures 25-39

25.5 Conclusion 25-41

LIST OF TABLES

Table 25-1: Bushfire risk mitigation and management measures 25-8

Table 25-2: Flood risk assessment substations and pump stations 25-12

Table 25-3: Potential sources of existing contamination along the Project alignment 25-16

Table 25-4: Assessment of spills by key receptor 25-18

Table 25-5: Indicative dangerous substances for construction and operations 25-25

Table 25-6 Project infrastructure security measures 25-38

Table 25-7: Key mitigation measures – hazards and risks 25-39

LIST OF FIGURES

Figure 25-1: Hierarchy of controls 25-6

Figure 25-2: Catchment area of desalination plant and surrounding catchments 25-10

Figure 25-3: Location of potentially contaminating activities along the Project alignment 25-19

Figure 25-4: Location of hazardous substances storage 25-24

Figure 25-5: Peak ground acceleration of 1/500 annual probability of exceedance seismic events 25-36

25 HAZARDS AND RISKS

This chapter provides an overview of hazards and risk management for the Project. It evaluates a range of potential and perceived hazards and outlines the Project's risk assessment and management framework.

In accordance with the Project-specific EIS Assessment Requirements, the assessment has considered hazards from bushfire, flooding, site and groundwater contamination, and dangerous substances (including marine spill management). A range of other hazards have also been considered including Harmful Algal Bloom (HAB), seismicity and unexploded ordnance.

A climate change risk assessment undertaken for the Project (refer Appendix L-1) has been summarised in Chapter 24 Climate Change and Sustainability. This assessment also considered some of the natural hazards like increase in rainfall intensity and flooding, increase in frequency and intensity of bushfires.

The assessment has considered the design, construction and operational phases of the Project.

25.1 Key Findings

Bushfire

- There is a medium risk of Project construction activities accidently causing a bushfire. Industry standard control strategies set out in the Bushfire Risk Management Plan (BRMP) will reduce this risk to as low as reasonably practicable (ALARP).

Flooding

- Historical flooding risk at the desalination plant site is low. Desalination plant design will ensure that stormwater management will not increase the flood risk compared to existing conditions.
- The pipeline will generally be located underground and will not change the flood risk to people, property, infrastructure, and the environment along the transfer system alignment.
- Pump stations and substations have been located to minimise the risk of flooding and impacts to surface water flows.
- Stormwater management will not increase the flood risk at Project sites compared to existing baseline conditions.

Site and groundwater contamination

- There is a low risk of impacts to the environment caused by disturbance of existing known contamination during Project construction or operations.

Dangerous substances (including marine spill management)

- Transport, storage and disposal of dangerous substances will be in accordance with industry standard practice to reduce the risk to public safety to ALARP.
- Public exposure to the risk of uncontrolled blasts will be avoided through transport, storage and use of explosives in accordance with relevant legislation, standards and codes of practice
- Due to implementation of appropriate storage and handling of fuels and chemicals, there is a low risk of marine spills associated with the Project. In the event of a marine spill from a construction vessel industry standard control and mitigation measures will be implemented.

Harmful algal bloom (HAB)

- The Project design includes measures to remove algal organic matter and high suspended solids to maintain effective plant operation in case of a bloom.
- Localised changes to marine water quality are unlikely to result in conditions that would contribute to the onset of a HAB.

Department of Defence land

- Hazards management and emergency response in relation to Department of Defence land will be in accordance with the Project's broader health, safety and environmental management frameworks, and the Third Party Agreement between the Project and Defence.
- Exclusion zones will ensure no members of the public are close enough to construction to be impacted by potential UXO on former Defence land.

Electrocution

- One hazard remains classified as a high risk following the implementation of control measures, specifically relating to the risk of electrocution from high voltage electrical infrastructure. The control strategies proposed have reduced the risk to ALARP.

25.2 Setting the Context

The EIS Assessment Requirements require a hazard and risk assessment to be undertaken for the Project. Key matters addressed include bushfire risk, flood risk, site and groundwater contamination and dangerous substances (including marine spills), and HABs. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

This section provides the information needed to explain the context within which the impact assessment is undertaken. It describes:

- relevant requirements in legislation and other standards
- views of stakeholders and the environmental and social outcomes they would like the Project to meet.

The assessment methodology used for the hazard risk assessment and to assess potential or perceived hazards is set out in Section 25.3.

25.2.1 Requirements in legislation and other standards

Bushfire

The *Fire and Emergency Services Act 2005* sets out the governance, structure and areas of responsibility for the SA Country Fire Service (CFS) which maintains responsibility for the Project Area, including the development of Bushfire Management Area Plans and fire prevention standards and guidance (including *Australian Standard AS2187.1 Explosives - Storage, transport and use – storage*). A full list of bushfire management plans and guidance can be found in section 1.5 of the Bushfire Risk Management Plan (BRMP) (Appendix N).

Flooding

Flooding hazards are addressed in planning controls through Overlays under the Planning and Design Code, enacted under the *Planning, Development and Infrastructure Act 2016 (SA)*. These include:

- *Hazards (Flooding - Evidence Required) Overlay*: this Overlay adopts a precautionary approach to potential risk to people, infrastructure and the environment from flooding.
- *Hazards (Flooding) Overlay*: this Overlay applies to areas of the State known to be regularly subject to flooding. It requires development to respond to specific flood risks and avoid placement of development in areas that pose a risk of unacceptable impacts to people, infrastructure and the environment.

All terrestrial Project infrastructure occurs within the Hazards (Flooding - Evidence Required) Overlay. This overlay requires that development is protected from undue damage in the event of a flood, and that structures that will contain or store hazardous materials are designed to prevent hazardous substances being mobilised to the environment in the event of a flood.

Site contamination

The *Environment Protection Act 1993* (EP Act) is the key legislation relating to site contamination and sets out a General Environmental Duty to protect the environment as well as regulating potentially contaminating activities. The EP Act also sets out the requirements to test, record, remediate and monitor contaminated sites, and provides the basis for the State register for contaminated sites, in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (Cth).

Dangerous substances

The key legislation relating to dangerous substances includes the *Dangerous Goods Act 1979* which regulates the keeping, handling and transporting of dangerous substances, the *Work Health and Safety Act 2012* (for safety risks) and the *Environment Protection Act 1993* (for environmental risks.

Schedule 15 of the *Work Health and Safety Regulations 2012* (SA) sets out a list of hazardous chemicals and quantities that require notification to Safework SA and thresholds for declaration of a Major Hazard Facility (which requires additional oversight). These quantities are detailed below in Section 25.4.4.

Transport of dangerous goods is regulated at the national level under the Australian Dangerous Goods Code. This code of practice sits beneath the *Heavy Vehicle National Law (South Australia) Act 2013*. Other relevant legislation includes the *Explosives Act 1936*[1], as explosives are likely to be required for construction of the intake and outfall launch shafts. This legislation and subsidiary regulations and guidance cover standards required for obtaining, storing and using explosives.

Other legislation

The *Electricity Act 1996* sets out the safety requirements for installation of electrical infrastructure and is regulated by the Office of the Technical Regulator.

Electrical and magnetic radiation is regulated by the *Radiation Protection and Control Act 2021* which is regulated by the Environment Protection Authority (EPA). Key industry bodies providing standards include Australian Radiation Protection and Nuclear Safety Agency and the International Commission on Non-Ionising Radiation Protection.

Marine vessels must comply with following relevant legislation, policies and standards:

- *International Convention for the Prevention of Pollution from Ships (MARPOL) (IMO 1973)*
- *Pollution of Marine Waters (Prevention of Pollution from Ships) Act 1987*
- *Australian Maritime Safety Authority Act 1990*
- AS 1940-2017 The storage and handling of flammable and combustible liquids.

25.2.2 Views of stakeholders

Protection of the Upper Spencer Gulf marine environment was the most prominent theme raised by stakeholder groups during engagement, including from commercial and recreational fishers, environmental organisations and local communities. In the context of hazards and risks, the primary issue raised was in relation to the potential for cumulative impacts of Harmful Algal Bloom (HAB) events in combination with desalination activities and other ecosystem pressures in the USG, on the general marine environment and the commercial fishing industry. This risk is discussed further in Section 25.3.5

To date, concerns specific to other hazards and risks addressed in this chapter (e.g. bushfire, flooding, site and groundwater contamination and dangerous substances) due to the Project have not been raised during stakeholder engagement.

Details of stakeholder engagement and community consultation are set out in further detailed in Chapter 4 Stakeholder Engagement.

25.3 Assessment Method

The potential and perceived hazards associated with the construction and operational phases of the Project were evaluated with consideration of the existing environment and the anticipated type of activities that would take place in the Project Area.

The Bushfire Risk Assessment was undertaken in accordance with ISO 31000:2018 *Risk Management – Principles and Guidelines* with the method set out in Section 5.2 of Appendix

[1] As the *Explosives Act 2024* has yet to come into operation, the *Explosives Act 1936* remains in force. Development of supporting regulations and licensing system will be required prior to the Act coming into operation.

N. All other hazards were assessed under the impact and uncertainty methodology set out in Chapter 8.

25.3.1 Hazard Assessment Process

The EIS process is only one part of the broader Project development and risk management process. Multiple hazard and risk reviews will be undertaken during the design and execution phases, including Hazard and Operability study (HAZOP), Construction Hazard Assessment and Implication Review (CHAIR) and Control Hazard and Operability Study (CHAZOP).

The risk assessments conducted to date and reported in the EIS should be seen within this broader perspective. For the purposes of this assessment, a 'hazard' is defined as any situation, substance, event, or environment with the potential to harm people, property, or the environment. Hazards may arise from the working methods, the working environment, plant and equipment, or materials and substances.

The hazard and risk assessment undertook four key steps:

1. Review and collate identified risks.
2. Develop draft risk register (including preliminary assessments).
3. Hazard and risk workshops (using a series of guidewords to ensure a systematic approach to identifying all potential risks).
4. Finalise risk register.

The outcomes of the hazard and risk workshop and Project risk register have been used in developing this chapter of the EIS.

The hazard and risk assessment considers unplanned events or conditions (referred to as hazards) and applies a semi-quantitative assessment of the likelihood that the hazard might occur, and the magnitude of potential consequences should the hazard occur, to determine an overall risk rating. This is a widely applied approach to risk assessment and provides a consistent assessment of the size of each risk so that they can be ranked against other risks.

Control of hazards has followed the hierarchy of controls (Figure 25-1) with elimination, substitution and engineering controls favoured as inherent controls providing a higher level of protection.

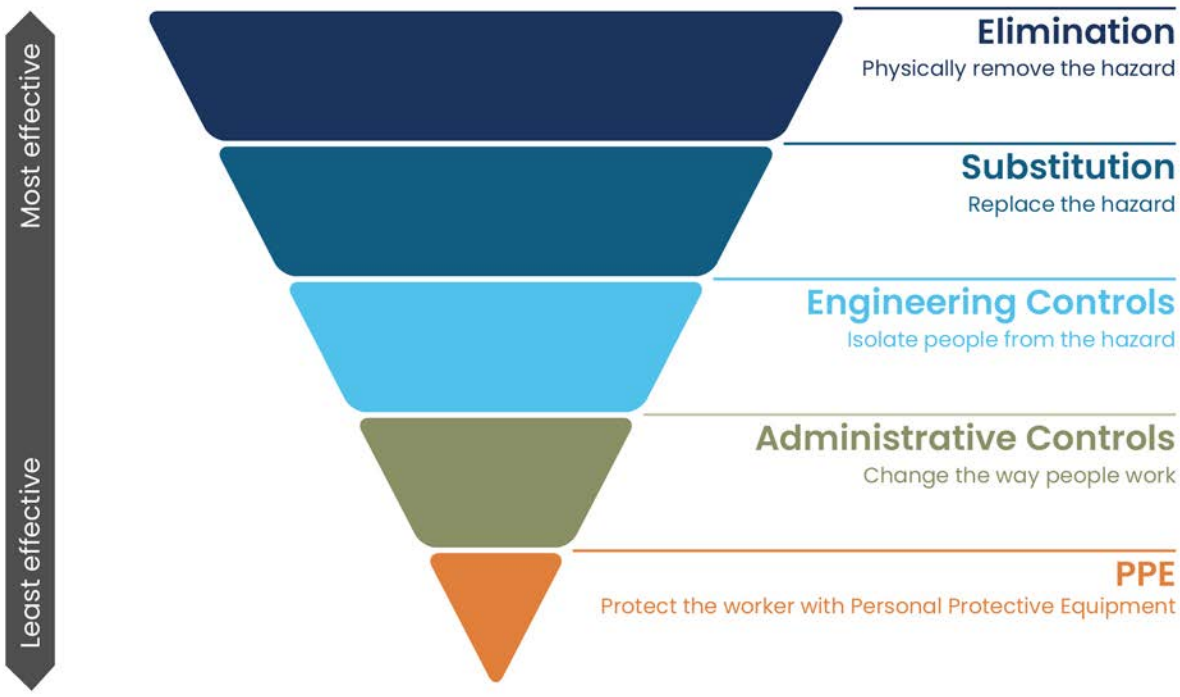


Figure 25-1: Hierarchy of controls

25.3.2 Bushfire risk assessment

The evaluation of bushfire risk was undertaken in accordance with the method set out in Section 5.2 of Appendix N. The assessment classified the bushfire risk is based on:

- bushfire history of the Project Area
- potential ignition sources during construction and operations
- risk of external ignition impacting the Project
- landscape scale fire risks based on vegetation types and slopes.

25.3.3 Flood impact assessment

A qualitative flood assessment was undertaken for substations and pump stations along the alignment. This included review of satellite imagery from 1986 to present to identify the presence of water (Geoscience Australia 2026). If water was detected in ~80% of images, it was considered to indicate a permanent water body, detection in ~5% of images was considered an intermittent water body; and detection in ~1% of images was considered a common flood scenario (Geoscience Australia 2026).

The topography of the area was also reviewed to identify potential upstream catchments and likely flow paths and pooling areas of water.

25.3.4 Preliminary Site Investigation

A preliminary site investigation (PSI) was undertaken for contaminated land in the Project Area. The purpose of the investigation was to identify the reasonable likelihood of human health or environmental risks which may be encountered during Project construction

activities by identifying potentially contaminating activities (PCAs) within the proposed construction areas (JBS&G 2026d[2], refer Appendix H-2).

The transfer system alignment was assessed based on land uses identified in current aerial imagery and register searches. Assessment of the desalination plant and pump stations included a review of historical aerial imagery, geological, groundwater and soil mapping, landownership and a review of SA EPA registers for site contamination.

Identification of PCAs included a search of a register of current and former land owned by the Department of Defence to identify potential for unexploded ordnance.

Field surveys involved drilling of 27 bores to a depth of 10 m bgl with 28 test pits excavated to a depth of 3 m bgl at approximately 5 km spacing along the Project Area (Fyfe 2025a and Fyfe 2025b).

25.3.5 Harmful algal bloom

The Marine Environment Chapter (Chapter 11) describes the existing abundance and composition of algal cysts and resting cells of harmful algal species within sediments, as well as the plankton composition and abundance in water column of the marine study area. The impact of algal blooms affecting the desalination plant, and the operation of the desalination plant leading to the onset of a HAB were assessed, drawing on the Project design detail, hydrodynamic modelling undertaken for the Project and literature review.

25.4 Evaluation of Hazards

Hazards are described below based on their source including a natural event impacting Project infrastructure (bushfire or flooding), existing site contamination being disturbed by the Project, management of dangerous substances onsite and other hazards arising from construction and operation of Project infrastructure.

These hazards would primarily impact workers but could present a risk to the public if the site is accessed without appropriate authorisation. Control strategies proposed would reduce the likelihood to as low as reasonably practicable (ALARP).

The hazards assessment identified one hazard that remains as a high risk after implementation of control measures, namely the risk of electric shock. This is due to the potential consequence of a human casualty.

25.4.1 Bushfire

There is a medium risk to the environment from bushfire ignition due to construction activities. Bushfire management will be integrated into the Construction Environmental Management Plan (CEMP) to manage this risk to ALARP levels (medium risk ranking determined as per Table 5-5 Appendix N).

Bushfires are a natural occurrence in the region. They often result from lightning but can also be due to reignition or escape of prescribed burns, improperly extinguished or out of season campfires or arson.

[2] Note this report was completed in 2025, and finalised for the EIS in 2026.

The level of bushfire risk is based on a number of factors including the fuel load from vegetation (which is in turn influenced by the vegetation type and amount of recent rainfall), slope / topography of landscape, and climate. Worst-case bushfire weather conditions usually occur during the summer months, following previous seasons of plentiful rainfall with high temperatures, low relative humidity, and strong winds.

The Project passes through two key Bushfire Management Areas (BMA) – the Upper Eyre Peninsula BMA and Outback BMA.

Fires in the Upper Eyre Peninsula BMA are predominantly fuelled by grassland, shrubland and Mallee with potential for landscape scale fires (evidenced most recently by the 2005 Wangary Bushfire). As the Project Area moves north (through the Outback BMA), the predominant fuel type is shrubland and Mallee, which contributes to more intensive fire behaviour, with lower risk of intense bushfire behaviour in chenopod shrublands (due to the inherently low flammability of this vegetation type). Bushfires in the Outback BMA frequently affect large areas within the landscape due to lack of fire suppression activities resulting from the remoteness and sparse population.

The Project has the potential to alter the fire risk by introducing new ignition sources to the landscape and construction activities have a higher risk of ignition than operational activities throughout the Project Area. The key potential ignition sources during construction are:

- sparks or exhaust systems from heavy machinery
- 'hot works' such as welding and grinding
- electrical faults during transmission line construction
- flammable materials stored in laydown areas.

During operation ignition sources would be limited to interaction of transmission line and substation infrastructure with vegetation, extreme weather events (including lighting and wind) and electrically induced fires.

Industry standard control strategies will be implemented to reduce risks to humans, communities, environment and infrastructure. Recommended strategies are detailed in section 6 of the Project BRMP (refer Appendix N) and summarised in Table 25-1. The management measures described are designed to both reduce the likelihood of a fire occurring and restrict the potential for fire to spread, limiting the impacts. These measures will be further developed and refined within the future Bushfire Management Plans prepared to support the construction and operation stages of the Project and any other required or non-statutory bushfire risk / emergency management plans prepared at later stages (refer Appendix N).

Table 25-1: Bushfire risk mitigation and management measures

Risk mitigation type	Summary
Prevention	• Vegetation management including fire breaks around construction zones and maintaining appropriate clearance around electrical infrastructure. • Construction of buildings and infrastructure to the appropriate Bushfire Attack Level (BAL) in accordance with Australian Standard AS3959.

Risk mitigation type	Summary
	• Ongoing inspections and maintenance of all Project elements to identify potential fire ignition risks including defects or poor vegetation management. • Additional controls on Total Fire Ban Days (declared by CFS) including no hot works, vehicle movements in bushland or paddocks outside of designated roads/tracks.
Preparedness	• Ensure access roads are capable of providing two-wheel drive access for evacuation and access by firefighting appliances. • Develop site-specific bushfire evacuation plans for the desalination plant, all substations, pumping stations, proposed worker's camps and laydowns for the relevant stages of development.
Procedures	• Procedures to be developed for monitoring of bushfire conditions (including modified operations during Total Fire Ban days), communication protocols and road closures. • Personnel training to include bushfire awareness and response. • Scheduled routine maintenance and testing for bushfire suppression equipment onsite. • Pre-bushfire season audits to confirm site readiness.
Response	• On-site fire suppression capabilities will be considered especially for high-risk areas (e.g. desalination, substations). • Firefighting resources could include mobile firefighting units, dedicated water tanker / firefighting truck or stationary water tanks.
Recovery	• Recovery plans to be developed if applicable.

With the above measures implemented, the consequence of a fire occurring during construction is **Minor** due to preventative measures and quick control responses to prevent spread. As risk of bushfire remains possible, the overall risk is **Medium** (refer to Appendix M). During operations, the reduced ignition-causing activities will reduce the likelihood further. There is a **high** level of **certainty** in this assessment as impacts and mitigations are well understood and used widely throughout the industry.

25.4.2 Flooding

Desalination plant

Historical flooding risk at the site is low. Desalination plant design will ensure that stormwater management will not increase the flood risk compared to existing conditions.

The desalination plant site is on a gently sloping plain, separated from the coast by sand dunes which parallel the coastline and encompass a coastal swamp system. Catchments in the area are extremely small with those directly upgradient of the desalination plant ranging from 7.7 to 66 ha in area and separated by minor, ephemeral drainage lines (refer Figure 25-2).

Limited information is available regarding flooding at Mullaquana Station. Significant flood events on the Eyre Peninsula have included the January 2022 flood event where Whyalla recorded 101 mm over a 6-hour period on 22 January, and the September 2016 statewide

storm and flood event, with associated flooding across the Eyre Peninsula and statewide blackout due to damaged electricity infrastructure.

Flood mapping for Mullaquana Station has relied on the Elevation Information System (ELVIS) which has a spatial resolution of 30 m. Review of historical aerial imagery showed no history of flooding in the area of the desalination plant, however, a samphire intertidal swamp system[3], located approximately 800 m east of the intake pump station location, is subject to periodic inundation (with water detected in up to 50% of satellite observations (Geoscience Australia 2026)). This area is approximately 3 - 4 m below the intake and outfall pump station ground level.

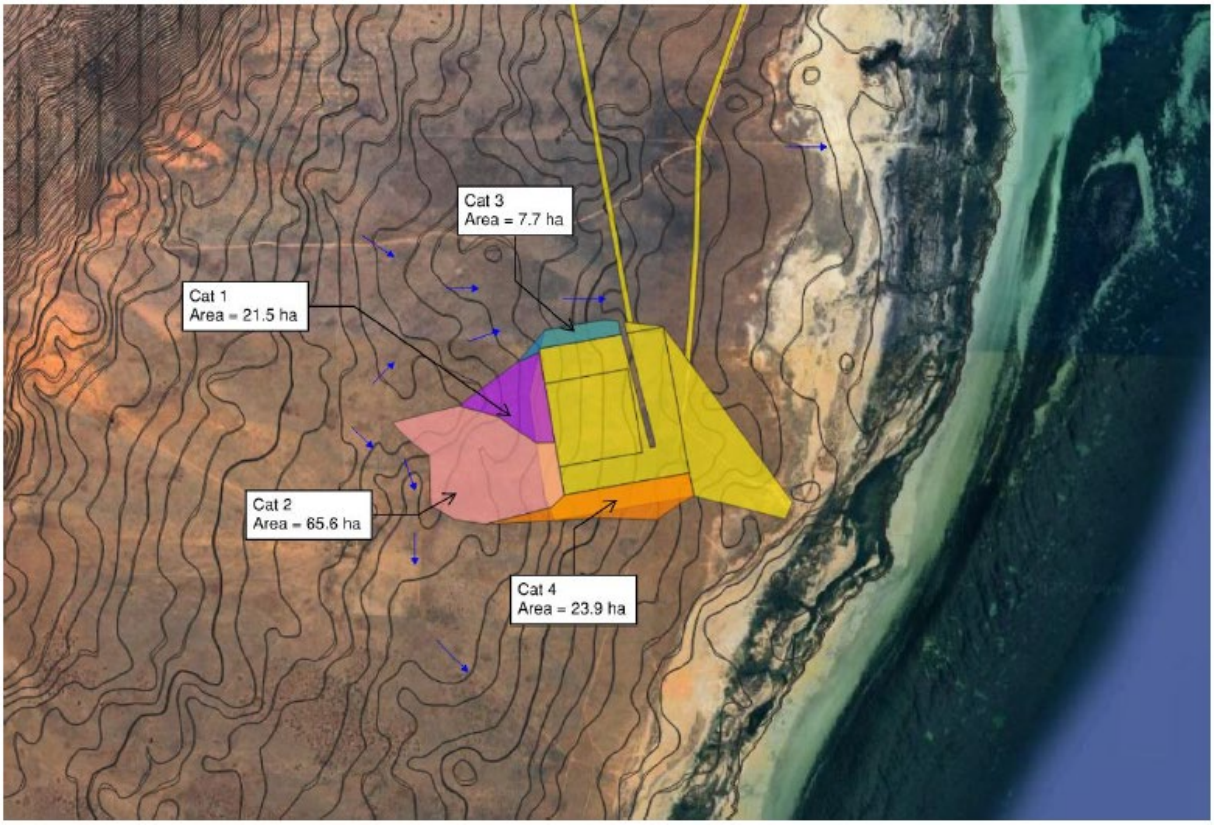


Figure 25-2: Catchment area of desalination plant and surrounding catchments
[Source: GHD 2025]

Potential for flooding impacts due to sea level rise and storm surge have been assessed in Chapter 24 Climate Change and Sustainability.

Upstream, clean water will be diverted around the desalination plant site using a combination of bunds and swales which have been sized to convey peak run off for the 1% Annual Exceedance Probability (AEP) event in 2100 assuming a 7.0 SSP climate scenario (aligning with Australian Rainfall and Runoff 2019 guidance). Modelling of run-off for each of the catchments identified the 6.5 hour run off was the peak volume requiring conveyance.

No infrastructure, residences or water sensitive vegetation that could be impacted in the event of a flood are present downgradient of the desalination plant. Regional mapping has identified a potential Terrestrial Groundwater Dependent Ecosystem east of the intake and

[3] Surface water features at the desalination plant site are addressed further in Chapter 13 Surface Water.

outfall pump station, however, it is located on the seaward side of the sand dune system and thus reduction in surface water associated with redirection of stormwater will not impact this system.

Historical flooding risk for this area is low. Rainfall that falls within the site will be managed as described in Chapter 13 Surface Water and is designed to ensure discharge of stormwater will meet the *Environment Protection (Water Quality) Policy* 2015 and not increase the 5-year annual recurrence interval (ARI) peak flow or the flood risk for the 100-year ARI peak flow compared with existing pre-development conditions.

The predicted impacts from flooding are in the **Negligible** category and the level of **certainty** in the assessment of predicted impact is **High** (refer to Appendix M).

Transfer system alignment

The pipeline will generally be located underground and will not change the flood risk to people, property, infrastructure, and the environment along the alignment.

Despite the semi-arid to arid nature of the climate and environment in the Project Area, flooding in the Eyre Peninsula and Far North Regions of the State has historically occurred, including the following events (GoSA 2024d):

- January 2022 Far North Flood: major damage was caused in 45 Council areas with the most extensive damage on the Eyre Peninsula and North-west Pastoral areas. Flooding closed the Stuart Highway and interstate rail lines to the Northern Territory and Western Australia.
- September 2016 Statewide storm and flood event: major flooding across the state with ~75% of local government areas suffering some impact. Damage to electrical infrastructure resulted in a State-wide power blackout event.
- 1967 Central Australia: flooding was focused on the Western Lake Eyre basin.

These flood events are all associated with high levels of rainfall either in the region or in the upper catchments of these basins (GoSA 2024d). Due to the remote nature of the northern extents of the Project, it is likely additional, smaller flood events have been experienced but not reported due to lack of disruption to services or significant impacts to infrastructure.

The pipeline will generally be installed below ground, and following construction, the land will be recontoured to match the surrounding landform and natural drainage lines reinstated. Consequently, there will be no significant change to flooding extent or depth during operations due to pipeline installation.

An option for the Carrapateena lateral branch pipeline to be constructed above ground is being considered. Should this option be selected, the pipe will be designed to prevent disruption to flow paths during major flooding events. Flooding that occurs in this location tends to be widespread and a single pipeline of ~50 cm would not represent a barrier to flood waters. As the pipeline carries clean water, should flooding result in damage to the pipe, no impacts to surface water are expected.

The expected impacts from flooding during operation of the transfer system are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer to Appendix M).

Due to the relatively short timeframes for construction of transfer system infrastructure, the likelihood of a significant flood event during the construction period at a given location is low. It is possible that construction works would need to cease following a significant rainfall event as the more remote areas of the pipeline may become inaccessible.

Potential impacts to surface water from unexpected floods disturbing a construction site have been assessed in Chapter 13 Surface Water.

Pump stations and substations have been located to minimise the risk of flooding and impacts to surface water flows.

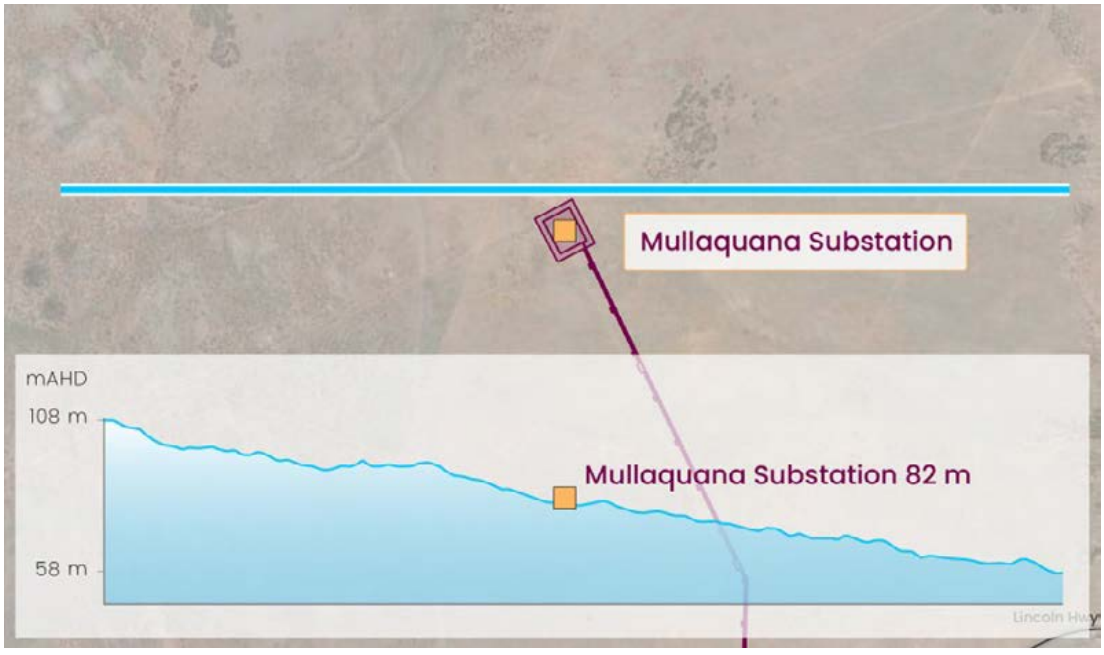
Construction of the substations and pump stations along the transfer system alignment will incorporate bunding upgradient to prevent water inflow to the site and key infrastructure / built form will be raised to the 1% AEP flood level (subject to detailed design). Stormwater management strategies adopted at each substation and pump station will ensure there is no material increase in volumes or flow velocities compared with pre-development levels. As the maximum size of the permanent footprint for a substation is less than 6 ha, this does not present a substantial area or development within each catchment.

Assessment of flooding risk for each substation and pump station site is presented in Table 25-2. As noted in Section 25.3.3 satellite imagery held by Geoscience Australia from 1986 to present was viewed to identify the presence of water (Geoscience Australia 2026).

Table 25-2: Flood risk assessment substations and pump stations

Mullaquana substation flood risk assessment

The Mullaquana substation is located on a shallow hill sloping to the north-east. There are no adjacent buildings, land uses or infrastructure that would be impacted by diverting water around the substation. No evidence of surface water at this location was identified in current or historic satellite imagery.



Corraberra Hill substation flood risk assessment

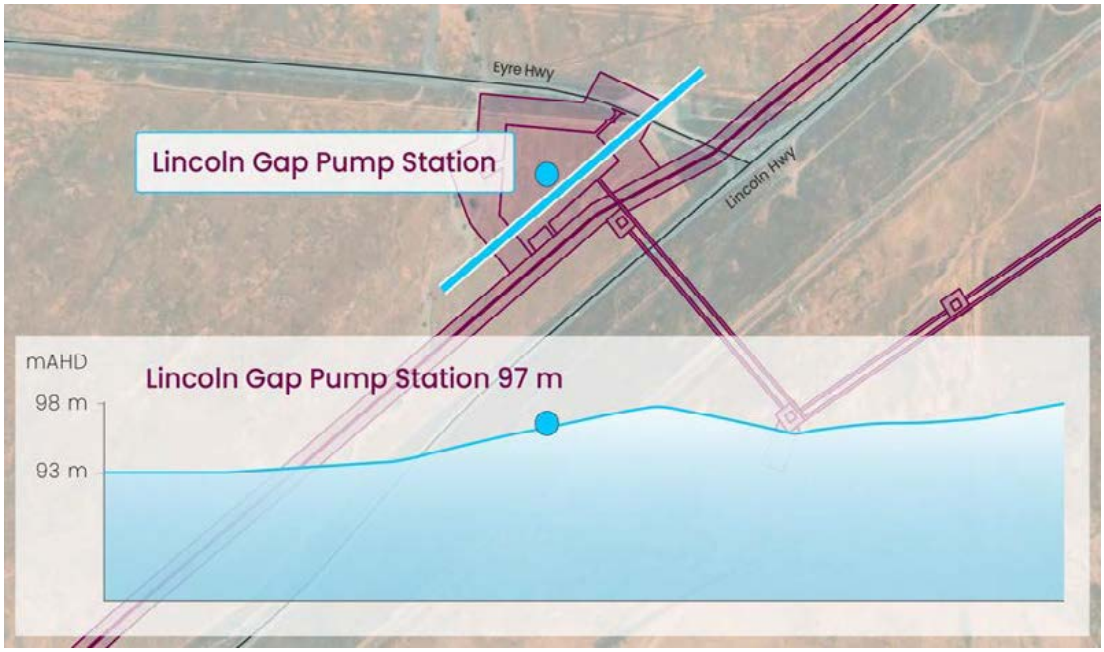
The Corraberra Hill substation is an extension to the existing substation and existing flood management controls will apply. The substation involves a minor addition of land to the internal

catchment of the substation and will not noticeably reduce the amount of water reporting to the south-western drainage line. The nearest land subject to flooding identified in Nature Maps (DEW 2024a) is the drainage line approximately 2.2 km south of the proposed substation extension. No evidence of surface water at this location was identified in current or historic satellite imagery.



Lincoln Gap pump station flood risk assessment

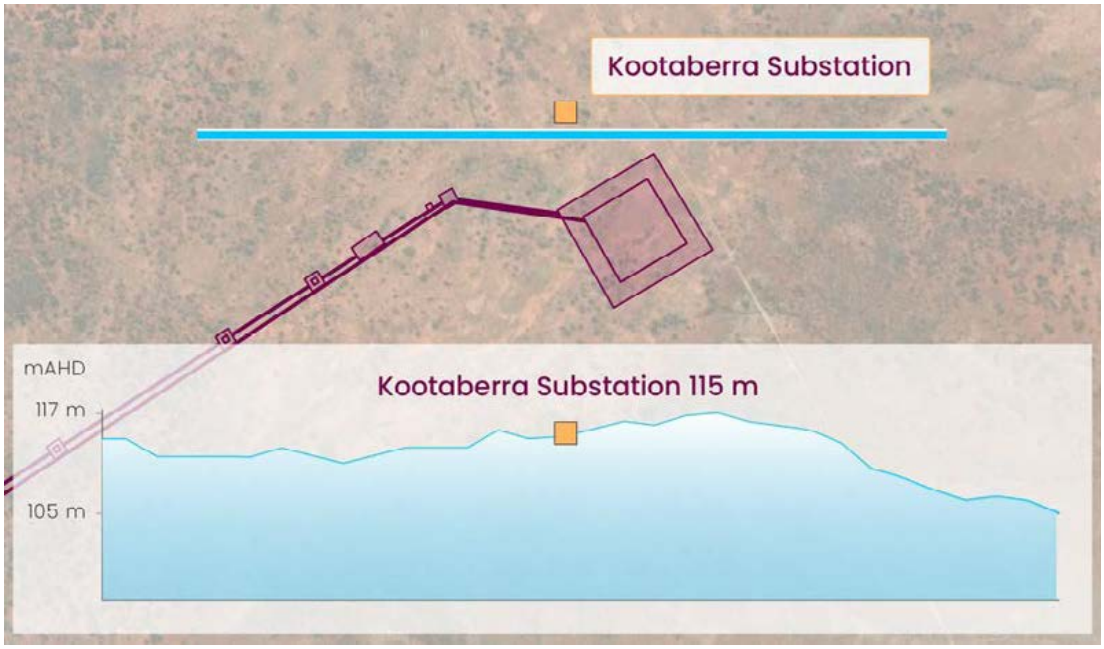
Lincoln Gap pump station is located on a gently sloping hill with drainage towards the south-west (away from the adjacent highways). Several minor drainage lines surrounding the site will limit the upstream catchment, thus reducing flooding onsite. There are no adjacent buildings, land uses or infrastructure that would be impacted by diverting water around the pump station. No evidence of surface water at this location was identified in current or historic satellite imagery.



Kootaberra substation flood risk assessment

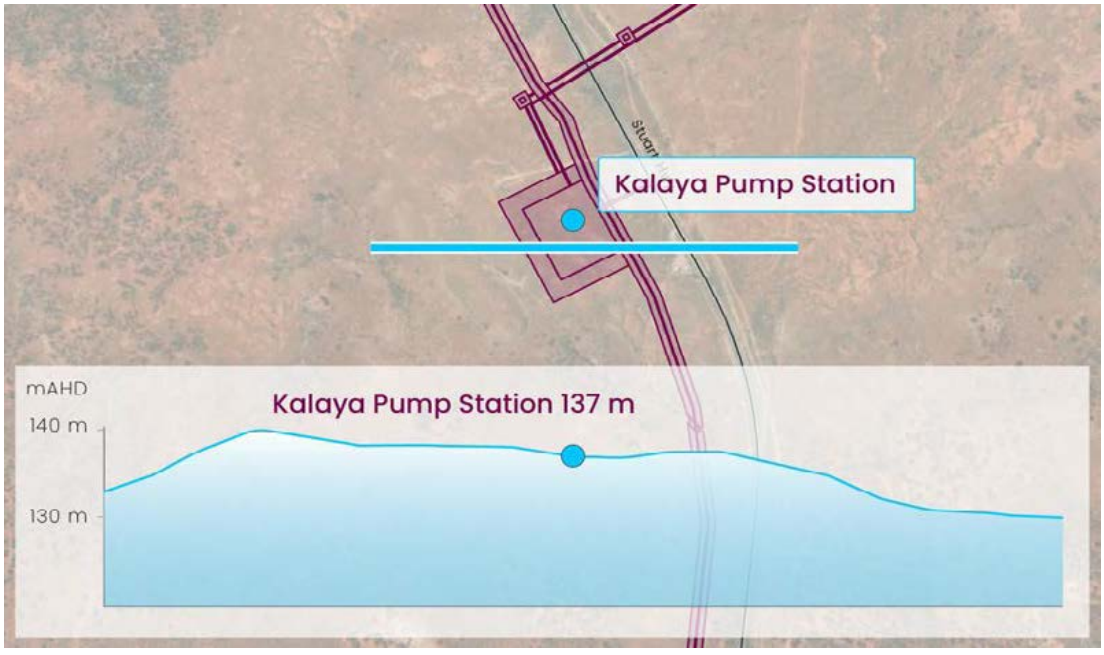
Kootaberra substation is located on a regional high spot with very little upgradient catchment which could flow onto the site. There are no adjacent buildings, land uses or infrastructure that would be

impacted by diverting water around the substation. No evidence of surface water at this location was identified in current or historic satellite imagery.



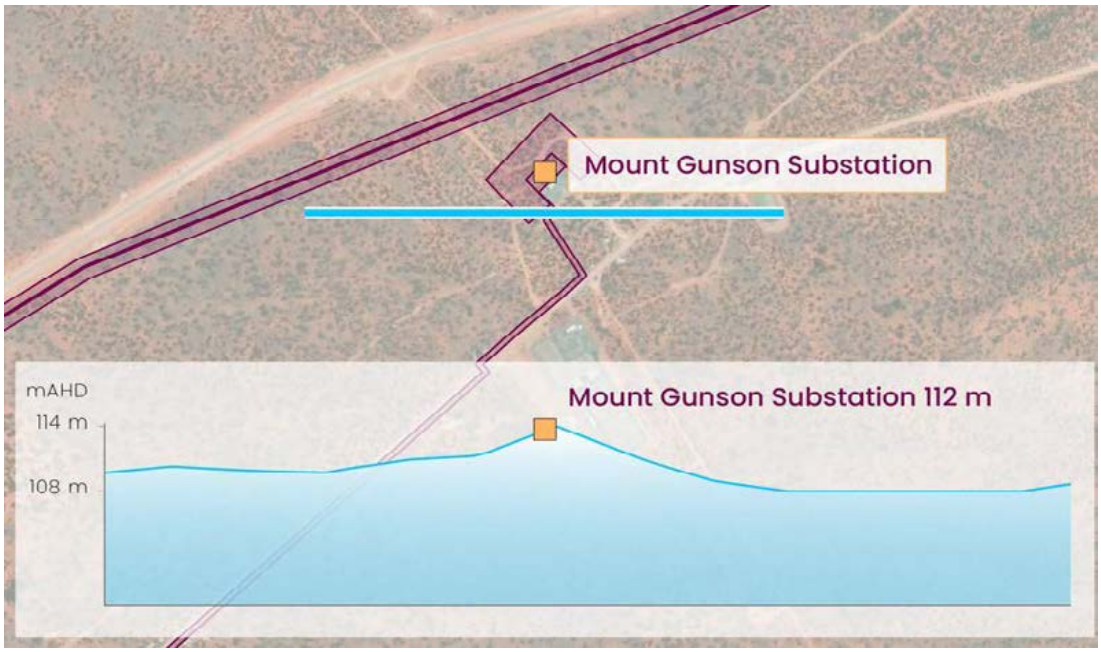
Kalaya pump station flood risk assessment

At the Kalaya pump station, the ground slopes towards the south-west, away from the highway and telecommunications tower, hence no expected flooding of infrastructure is expected for this pump station. No evidence of surface water at this location was identified in current or historic satellite imagery.



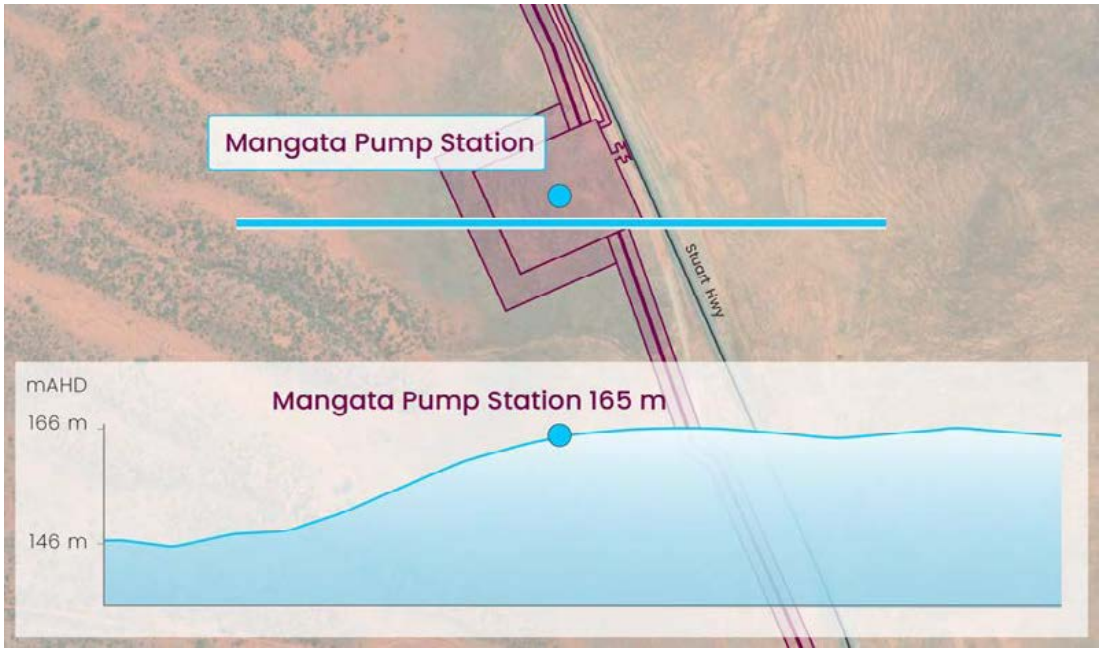
Mount Gunson substation risk assessment

The Mount Gunson substation is an upgrade to the existing substation and will comply with the surface water management and flood mitigations which apply to the existing substation.



Mangata pump station flood risk assessment

Mangata pump station is located on a shallow slope to the west, away from the Stuart Highway. There is no expected flooding of the highway or associated infrastructure. No evidence of surface water at this location was identified in current or historic satellite imagery.



The placement of built structures along the transfer system is not anticipated to result in an increased risk of flooding of roads, infrastructure or buildings. Water upgradient of the sites will be diverted around each site using earthen bunds designed to direct water to existing structures or dissipate water over a large area to prevent impacts. Stormwater from within each site will be contained to prevent contaminated run off and erosion from concentrated flow (refer to Chapter 13 Surface Water for further details) and will not increase runoff volumes and flood risk relative to that of the undeveloped site.

The expected impacts from flooding along the transfer system are in the **Negligible** category. Uncertainty in the expected impact (based on uncertainty in placement of infrastructure or application of construction methodologies) has been evaluated in Appendix M and the level of risk is **Low**.

25.4.3 Site and groundwater contamination

There is a low risk of impacts to the environment caused by disturbance of existing known contamination during Project construction or operations.

The Preliminary Site Investigation (PSI) (refer Appendix H-2) assessed the likelihood of potentially contaminating activities (PCA) having occurred at the desalination plant site, pump station locations and along the transfer system alignment. Soil sampling undertaken on site did not identify signs of site contamination (Kleinfelder, 2025).

A marine sediment baseline assessment for the marine Project Area detected nutrient / chemical / metal concentrations that reflect the background concentrations in the broader area and there was no exceedance to relevant criteria (refer Appendix G-5).

Locations within the Project Area with chemicals of potential concern associated with PCAs are described in Table 25-3 with locations shown in Figure 25-3. These chemicals are most likely to impact soils but it is possible groundwater could also interact with potential sources of contamination in the southern portions of the Project where groundwater is closer to the surface.

Areas of Potential Acid Sulfate Soils have not been included in the below table as they are assessed in Chapter 12 Soils, Landform and Geology.

Table 25-3: Potential sources of existing contamination along the Project alignment

KP or Project Element	Location	Potential source of existing contamination
Southern section (KP 0 - 195)		
Desalination plant	Mullaquana Station	Broad range of sources from agricultural activities including pesticides, herbicides, heavy metals, petroleum hydrocarbons, PAHs, nutrients.
Pipeline KP 25 - 75	Pipeline alignment south-west of Port Augusta to Whyalla	Interaction with the Cultana Training Area currently used by Department of Defence. While specific activities that have occurred here are unknown, there is potential for unexploded ordinance (UXO), explosive residues, heavy metals, petroleum hydrocarbons and PFAS.
Pipeline and Pandurra transmission line KP 80 - 82	Pipeline alignment west of Port Augusta Airport	Interaction with land identified as Lincoln Park which was gazetted for defence use in the 1960s. While specific activities that have occurred here are unknown there is potential for UXO, explosive residues, heavy metals, petroleum hydrocarbons and PFAS.
Pipeline KP 144-145, 178-179	Railway operations	Railway operations have potential to impact soils due to residual herbicides, pesticides, heavy metals, hydrocarbons and asbestos.

KP or Project Element	Location	Potential source of existing contamination
Northern section (KP 195 – 360, CA 1-46)		
Pipeline KP 201-202, 236 – 244, 264-266	Railway operations	Railway operations have potential to impact soils due to residual herbicides, pesticides, heavy metals, hydrocarbons asbestos.
KP 237+	Pipeline alignment north of Pernatty Lagoon	Interaction with former Woomera Prohibited Area. While specific activities that have occurred here are unknown there is potential for UXO, explosive residues, heavy metals, petroleum hydrocarbons and PFAS.
KP CA 2-10	Carrapateena lateral branch and access road	Section 83A notification pertaining to electrical substation. Potential for heavy metals, polychlorinated biphenyls and petroleum hydrocarbons. Mount Gunson Mine – potential failure of tailings dam with material run off.
Marine infrastructure		
Mullaquana Station - intake and outfall	Marine disturbance area	As discussed above, baseline marine sediment sampling did not indicate elevated nutrient / chemical / metal concentrations. However, disturbance of the seabed is a consideration in regard to potential contaminants.

The PSI concluded that the overall risk of site contamination being present at the desalination plant and pump station sites is considered to be **low**. The risk of historical practices and activities to have caused site contamination along the proposed pipeline alignment is generally considered to be **low** with the exception of locations of railway operations and the Mount Gunson substation (electrical transformers) which are considered to have moderate potential to have caused site contamination. Again, and in support of the conclusions of the PSI, soil sampling undertaken every 1 km along the transfer system did not identify signs of site contamination (Kleinfelder, 2025, Fyfe 2025a and Fyfe 2025b).

If known, management strategies will focus on avoiding disturbance of existing areas of contamination. If disturbance is required, management measures will prevent uncontrolled reuse of contaminated soil. If contaminated material is identified, the Project Construction Environmental Management Plan (CEMP) will address management of these potential hazards and unexpected finds during construction works.

Baseline marine sediment sampling did not indicate elevated nutrient / chemical / metal concentrations, hence there is a low risk of disturbing existing known contamination from marine construction works.

Management of existing contamination is also addressed in Chapter 12 Soils, Landform and Geology. Waste management is addressed in Chapter 24 Climate Change and Sustainability - Waste Management. Assessment of the risk of UXO is addressed below in Section 25.4.8.

The predicted impacts from existing contamination are in the **Negligible** category. Uncertainty in the predicted impact (based on limited site-specific data) has been evaluated in Appendix M and the level of risk is **Low**.

Leaks and spills

Accidental leaks and spills during Project construction and operation activities have the potential to be a source of pollution and contamination and have been assessed in several EIS chapters depending on the key receptor (refer Table 25-4). The assessments in these chapters address:

- transport, storage and handling of fuels, chemicals and hazardous wastes at construction sites and at the operational desalination plant site
- containment, reporting and clean up actions
- spill and emergency response plan and procedures.

Table 25-4: Assessment of spills by key receptor

Source of spill	Chapter assessing spills
Leaks / spills from equipment and temporary fuel storage during construction and operation	Chapter 12 Soils, Landform and Geology
Leaks / spills of abstracted water and spoil from construction of launch shafts and Tunnel Boring Machines (TBM)	Chapter 12 Soils, Landform and Geology
Discharge of high pH water from hydrotesting (pipeline commissioning) or flushing	Chapter 13 Surface Water
Leaks / spills from sewage facilities at construction camps	Chapter 24 Climate Change and Sustainability
Loss of dredging spoil from Jack-Up-Barge during transport to land	Chapter 11 Marine Environment
Leaks / spills from marine vessels during construction or maintenance	Section 25.4.4 Hazards and Risks

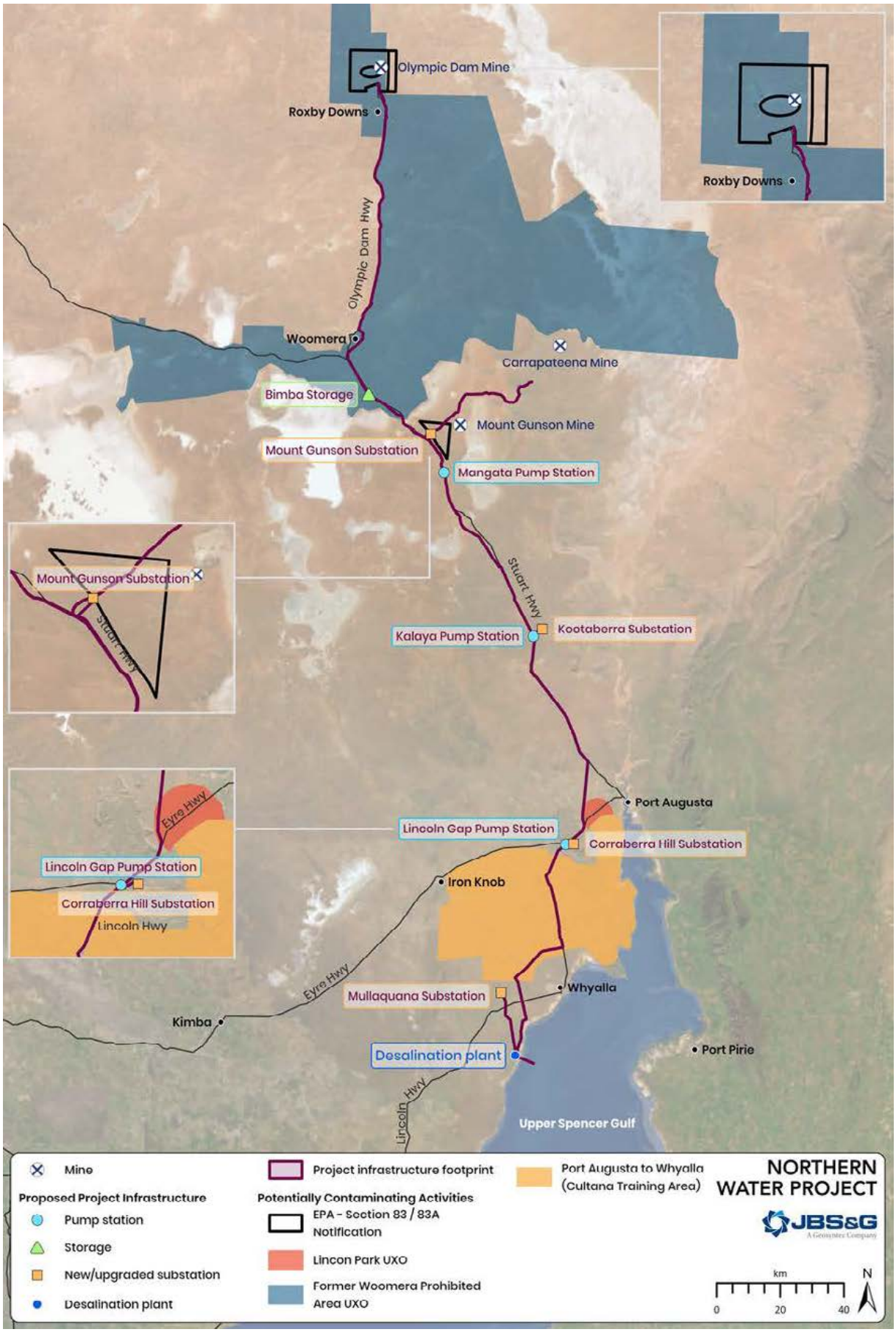


Figure 25-3: Location of potentially contaminating activities along the Project alignment

25.4.4 Marine spills

Due to implementation of appropriate storage and handling of fuels and chemicals, there is a low risk of marine spills associated with the Project.

Marine spills may occur from the accidental release of fuels, oils and other hydrocarbons from vessels operating within the marine Project Area. Vessel activity will peak during the construction phase, with significantly fewer vessel movements during operation, limited to routine inspections and maintenance of the marine intake and outfall infrastructure.

Potential pollutants associated with marine vessels are diesel, petrol, lubricating oils and hydraulic fluids. When released into marine waters, these substances have the potential to affect marine water quality, habitats and fauna.

Given the scale and nature of Project activities, vessels operating in the Project Area are expected to be of small to moderate size and hence carry relatively small fuel loads. Spill scenarios would therefore be limited to minor leaks or small-volume spills during routine vessel operations, refuelling, equipment handling, or as a result of equipment failure.

The Project will implement a range of environmental management measures detailed in construction and operations Marine Environmental Management Plans to minimise the risk of spills and to ensure an effective response, should an incident occur. Vessel operators will be required hold appropriate qualifications and will be responsible for implementing best-practice operational controls to minimise spill risk. Management measures are likely to include:

- use of well-maintained vessels and equipment, operated by appropriately licensed personnel
- appropriate storage and handling of fuels and lubricants
- conducting regular inspections of hazardous material storage on marine vessels
- equipping larger vessels (e.g. tugs and jack-up barges) with alarms and automatic shut-down systems
- ensuring vessels are equipped with appropriate spill response and clean-up kits.

With the implementation of standard maritime environmental management practices and spill response procedures. The expected impacts from marine spills are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

25.4.5 Harmful Algal Bloom (HAB)

The relationship between Harmful Algal Blooms (HABs) and seawater desalination plants is often discussed. HABs can impair the operation of desalination plants due to an increase in suspended solids and organic material entering the plant via the marine intake. Desalination plants can adopt standard pre-treatment engineering solutions to address scenarios with higher than normal suspended solids and organic matter (see Chapter 6 Project Description for more information about pre-treatment).

Desalination plant return water is designed to diffuse and disperse quickly – returning to ambient conditions within close proximity from the discharge point. The SA EPA has undertaken extensive research into the operation of the Adelaide Desalination Plant (ADP)

and concluded that "there is no evidence to support a causal link between the desalination plant and HABs"[4].

There is the potential for remobilisation of resting cells or dinoflagellate cysts from marine sediments, if disturbed during marine construction. HAB species in both the planktonic community as well as dormant or resting cells in sediments were investigated as part of plankton studies and marine sediment investigations for the Project (see Chapter 11 Marine Environment).

HAB species were detected in both the water column and the sediments at the Project site at levels typical of similar coastal areas (refer Appendix G-4, Appendix G-5 and Chapter 11 Marine Environment). It is known that a significant HAB, predominantly of the genus *Karenia* started in South Australian coastal waters around March 2025 due to a mix of factors including a period of prolonged environmental preconditioning and an unprecedented marine heatwave (PIRSA 2026a, SARDI 2026e). The water quality data, and that of PIRSA (2026a) did indicate that a phytoplankton bloom may have passed though the Project location in late Spring 2025, though peak dinoflagellate abundances were not specifically recorded by the monthly Project specific baseline sampling regime.

The Project design includes measures to remove algal organic matter and high suspended solids to maintain effective plant operation in case of a bloom.

Algal Blooms can significantly impair the operation of desalination plants, particularly through filter clogging and membrane fouling (UNESCO 2017). The presence of algal organic matter in seawater can lead to increased turbidity, which may cause operational challenges for reverse osmosis membranes if not effectively managed.

To mitigate these impacts in the case of future blooms, the Project design includes a flexible pre-treatment system that can be configured to manage algal blooms or high suspended solids (e.g. upwellings) scenarios (refer Chapter 6 Project Description and Chapter 11 Marine Environment). The flexible pre-treatment process is designed to remove algal organic matter and particulates from seawater before it enters the desalination plant's filtration systems.

In scenarios where the seawater quality has higher organic load or suspended solids, there is no marine discharge of algal or organic matter collected by the pre-treatment system, with solids collected and managed on land. An adaptive management plan will be developed as part of the Operational Environmental Management Plan (OEMP) with early detection systems for algal blooms and high suspended solid events in the vicinity (e.g. satellite imaging, water sampling), trigger levels and operational adjustments (e.g. adjusted pre-treatment operations) for managing these events.

During these scenarios other operational adjustments may be required including increase frequency of backwash strategies and more frequent maintenance or CIP.

The desalination plant pre-treatment configuration will be confirmed as part of detailed design. Adaptive management measures will be developed and set out in the Project OEMP.

With industry standard design protections and management measures in place, the desalination plant will effectively manage fouling as a result of an algal bloom and high

[4] https://www.epa.sa.gov.au/environmental_info/water_quality/harmful-algal-blooms

suspended solid events. Algal matter, in the case of a bloom, will be removed by the pre-treatment process and will not be returned to the marine environment.

The expected impacts from an algal bloom or high suspended solids event on the desalination plant are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer to Appendix M).

Localised changes to water quality resulting from the operation of the desalination plant are unlikely to result in conditions that would contribute to the onset of a HAB.

The construction and operation of a desalination plant can introduce changes to localised water quality conditions. Construction impacts on marine water quality are generally minor and short-term due to the implementation of standard maritime environmental management practices and spill response procedures (as mentioned above in Section 25.4.4). As stated above, in relation to the operation of ADP, the South Australian EPA and concluded that "there is no evidence to support a causal link between the desalination plant and HABs"[5].

Return water

The typical local oceanographic conditions at the Mullaquana Station outfall location are not considered to be favourable conditions to instigate an algal bloom (as a result of the Project), as there is an effective tidal, current and flushing system (refer Chapter 10 Coastal Processes and Chapter 11 Marine Environment for additional information).

Return water from the operation of the desalination plant will alter salinity levels and water quality in the area immediately surrounding the outfall. Results of hydrodynamic modelling at the Mullaquana Station site (refer Chapter 11 Marine Environment) show that the action of the diffusers and the local hydrological conditions work to effectively disperse the return water. Salinity, suspended solids and temperature all quickly return to ambient conditions within a short distance from the desalination plant outfall (within hundreds of metres). Hence, it is highly unlikely that the Project's desalination plant return water could contribute to conditions suitable for the onset of a HAB.

The seawater bypass system (described in Chapter 6 Project Description and Chapter 11 Marine Environment) provides an additional operational control to support dilution and dispersion performance during low-flow or turndown operation which will assist in minimising stratification.

The expected impacts from the desalination plant return water (in relation to causing a HAB) are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer Appendix M).

Sediment disturbance

Marine construction activities associated with seabed disturbance have the potential to remobilise algal cysts or resting cells should they exist in suspended sediments. Disturbing sediments can release dormant algae into the water column, potentially initiating new blooms if suitable conditions are present. Note that the desalination plant diffusers are designed not to disturb sediments during operation of the desalination plant. As mentioned

[5] https://www.epa.sa.gov.au/environmental_info/water_quality/harmful-algal-blooms

above, the effective tidal system in the marine Project Area is not considered favourable for the onset of an algal bloom (as a result of the Project).

The investigation into dinoflagellate resting cells and cysts in marine sediment (see Marine Environment Chapter 11 and Appendix G-5 - Sediment Characterisation Report) concluded that while some toxin-producing species were present, their composition and abundance was typical of southern Australian waters (outside of HAB conditions), and many were not viable in germination experiments. This sediment characterisation baseline survey was undertaken prior to the South Australian HAB potentially effecting the Project area. Hence, the observations from this study are representative of a pre-HAB baseline environment.

Based on the current Project baseline sediment survey results, the likelihood that sediment disturbance from marine construction could lead to a HAB is unlikely due to the local hydrodynamic conditions, and further mitigated by the low abundance, low viability and typical distribution of HAB species at the site.

Sediment disturbing activities (i.e. dredging) would be managed under a Dredge Management Plan and would require compliance with EPA licence conditions. An adaptive management program involving turbidity trigger levels will be implemented as part of the Dredge Management Plan, with 'alarm' and 'hold' triggers and responses set in line with EPA guidance and based on local conditions. This will limit the spread of suspended sediments (and therefore potential algal cysts or resting cells) during construction.

Prior to construction, consideration will be given to undertaking a subsequent investigation into dinoflagellate resting cells and cysts in marine sediments to provide a second baseline survey for comparison with the pre-HAB survey. If viable cysts or cells are identified in marine sediments, additional mitigation and management strategies may be considered and adopted as part of the Marine and Coastal CEMP.

The expected impact from disturbance of marine sediments (in relation to causing a HAB) is in the **Minor** category. Uncertainty in the expected impact (based on the commitment to undertake a second sediment baseline survey) has been evaluated in Appendix M and the level of risk is **Low**.

25.4.6 Dangerous substances

Dangerous substances that may be required onsite during construction and operation have been identified, including but not limited to those listed in Table 25-5.

Full details will be determined during detailed design and will be managed in accordance with the relevant Safety Data Sheet (SDS) and relevant Safework requirements.

The proposed locations of hazardous substances storage are shown in Figure 25-4.

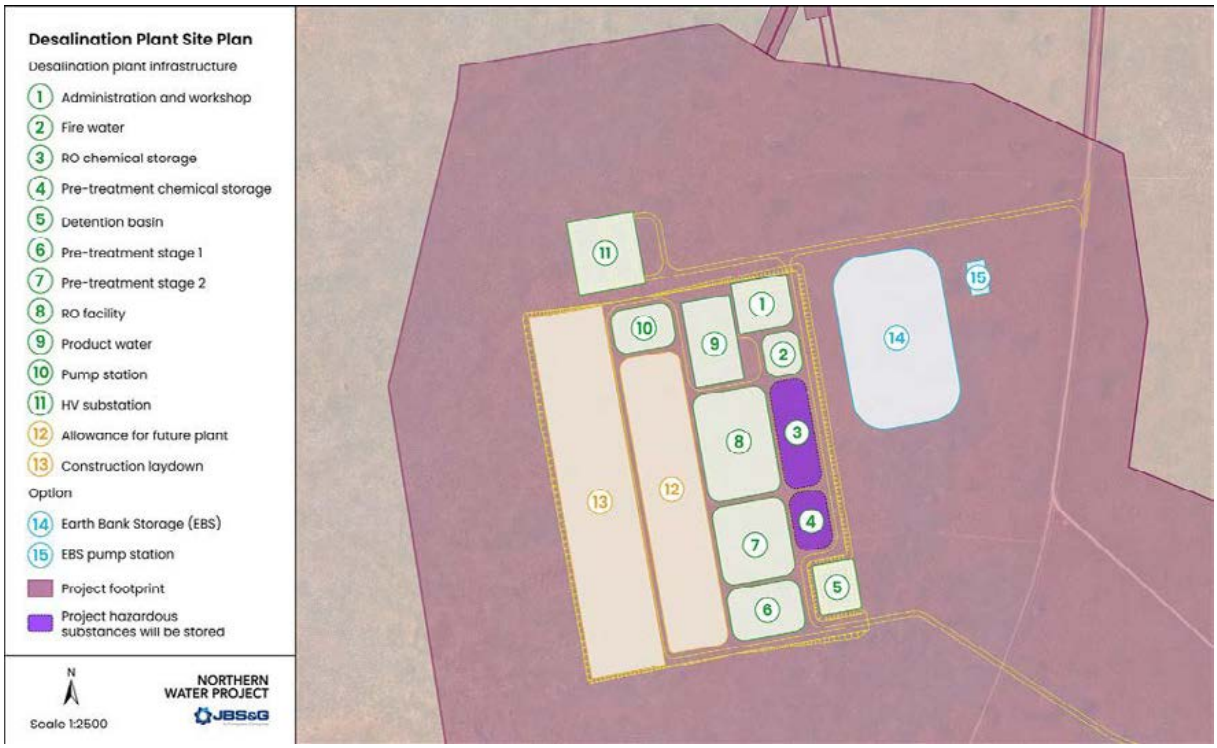


Figure 25-4: Location of hazardous substances storage

Table 25-5: Indicative dangerous substances for construction and operations

Chemical	Use	Storage location and total site storage volume	Hazard Class	Maximum rate of usage
Construction				
Explosives – type to be determined by licensed blasting contractor	Sections of trenching where mechanical equipment are not sufficient to extract material.	Not stored onsite, brought to site by licensed blasting contractor as required.	1 – Explosives	To be determined by licensed blasting contractor, likely single blast in any one location.
Oils, greases, hydraulic fluid	Maintenance and repairs	Nominal amounts Workshop areas of construction laydowns.	3 – Flammable liquid	To be determined as part of engineering design.
Operations and Maintenance (CIP) – Desalination Plant				
Chlorine (100% concentration as liquified gas)	Disinfection	12 x 920 kg drums Chlorine building Chlorine gas detectors linked to ventilation fans and carbon scrubbers. Gas line pressure relief directed to carbon scrubber. Temperature controlled storage room.	2.3 – Toxic Gas 5.1 – Oxidising Substance 8 - Corrosive	Chlorine contact 3.0 mg/L
Citric Acid (50% concentration)	Clean in place (CIP), pH adjustment	2 x 10 m^3 Ultra Filtration (UF) and Reverse Osmosis (RO) areas	8 - Corrosive	UF CIP 1,820 kg/CIP RO CIP 1,880 kg/CIP
Hydrochloric acid (33% concentration)	CIP, pH adjustment	17 m^3 UF and RO areas Air vent to be directed to a water seal.	8 - Corrosive	UF CEB 1000 mg/L UF CIP 90 kg/CIP RO CIP 220 kg/CIP

Chemical	Use	Storage location and total site storage volume	Hazard Class	Maximum rate of usage
				RO CIP Neutralisation – as required
Sodium bisulphite (SBS) (30% concentration)	CIP and Chlorine quenching	180 m^3 UF area	8 - Corrosive	RO Feed (chlorine quenching) 25 mg/L UF Chemically Enhanced Backwash (CEB) and CIP quenching estimated as a daily average of Cl_2
Sulphuric acid (98% concentration)	CIP and pH adjustment	180 m^3	8 – Corrosive	UF Feed acidification 53 mg/L
Sodium hydroxide (30% concentration)	CIP and Neutralisation	26 m^3 UF areas	8 - Corrosive	UF CIP neutralisation 90 kg/CIP RO CIP 110 kg/CIP RO CIP neutralisation – as required.
Sodium hypochlorite (12.5% concentration)	Intake shock chlorination UF CIP chlorination	17 m^3 UF area	8 - Corrosive	Intake shock chlorination – 12.5 mg/L as Cl_2 UF CEB 100 mg/L as Cl_2 UF CIP 90 kg/CIP
RO Anti-scalant (100% concentration)	Prevention of scale and build up	25 m^3 RO area	-	4.0 mg/L
Carbon dioxide (100% as liquified gas)	Stabilisation	2 x 75t Post treatment area	-	56 mg/L;

Chemical	Use	Storage location and total site storage volume	Hazard Class	Maximum rate of usage
Polymer	Lime clarification Centrifuge sludge dewatering	100 kg (clarification) and 280 kg (dewatering) in Lime centrifuge building	-	Lime clarification 1 mg/L Centrifuge sludge dewatering 11 kg/tDS
Lime (calcium hydroxide, 92% concentration)	Stabilisation	3 x 50 t lime silos	-	54 mg/L
Sodium silicate (25% concentration)	Lime slurry system	5 m^3 RO chemical storage	-	13 mg/L
Dewatered lime sludge	Waste product from lime slurry, temporary storage prior to disposal	Storage volumes to be determined as part of detailed design.	-	0.3 m^3/hour at a density of 20% solids (w/w)
Oils, greases, hydraulic fluid	Maintenance and repairs	Nominal amounts Workshop areas at desalination plant, substations and pump stations.	3 – Flammable liquid	To be determined through detailed design.
Septic tank system	Ablutions	Office and workshop areas	Biological	To be determined through detailed design.
Operations – Water Delivery Infrastructure				
Oils, greases, hydraulic fluid	Maintenance and repairs	Nominal amounts Workshop areas at desalination plant, substations and pump stations.	3 – Flammable liquid	To be determined through detailed design.
Battery	Energy Storage	Pump stations – battery room Ventilated to ensure hydrogen levels are below the Lower Explosive Limit.	TBC	TBC

Chemical	Use	Storage location and total site storage volume	Hazard Class	Maximum rate of usage
Septic tank system	Ablutions	Pump stations	Biological	To be determined through detailed design.
Ad Hoc / Maintenance Requirements				
Sodium Thiosulphate	Dechlorination during pipeline draining.	Storage at pump stations and brought to scour valves when required.	-	To be determined through detailed design. Anticipated every 5 years.
Ascorbic acid	Dechlorination during pipeline draining.	Storage at pump stations and brought to scour valves when required.	-	To be determined through detailed design. Anticipated every 5 years.
Sodium Hypochlorite	Tank disinfections	Storage at pump stations and brought to tanks when required.	8 - Corrosive	To be determined through detailed design. Anticipated every 5 years.

Transport, storage and disposal of dangerous substances will be in accordance with industry standard practice to reduce the risk to public safety to ALARP.

A number of hazardous substances will be required at the desalination plant as part of the treatment process (refer Table 25-5). Hazardous substances broadly fall under the hazardous goods classes of Corrosive (class 8), Oxidising Substance (class 5.1) and Toxic Gas (class 2.3).

Transport of these substances to site will be via licensed contractors and in accordance with the *Dangerous Substances Act 1979, Dangerous Substances (Dangerous Goods Transport) Regulations 2023* and the Australian Dangerous Goods Code (National Transport Commission, 2023).

Onsite storage of hazardous substances will be in accordance with the relevant SDS, EPA bunding and spill management guidelines (EPA080/16) and *Dangerous Substances Regulations 2017*. Bunds will be sized to meet 120% of the net capacity of the largest tank within the bund in accordance with the EPA guideline. Site inductions will include information about the procedures and processes to be followed regarding hazardous chemicals. Spill kits will be present onsite and in mobile equipment (e.g. diesel generators during construction). Risk specific storage management strategies include:

- Chlorine: chlorine gas detectors linked to ventilation fans and carbon scrubbers; gas line pressure relief directed to carbon scrubber; temperature controlled storage room
- hydrochloric acid: air vent to be directed to a water seal.
- sulphuric acid: desiccant drier included on the air vent.
- batteries (if used): battery rooms ventilated to ensure hydrogen levels are below the Lower Explosive Limit.

The desalination plant is located in an area that is isolated from population centres, and the nearest residential property is located approximately 5 km away. Access to the site will be restricted and site security (i.e. security fencing and gates) will prevent members of the public from gaining unauthorised access to the site. Workers and site visitors will receive site inductions around hazardous chemicals including risks, storage, use and disposal to manage risks relevant to their interaction with these chemicals. Terrestrial spill management is addressed in Chapter 12 Soils, Landform and Geology.

Transport of dangerous substances to site will be via licensed contractors and in accordance with legislation. While the expected impact of accidents involving dangerous substances and members of the public is in the **Negligible** category (as no interaction is anticipated), uncertainty in the predicted impact (based on potential for the public to bypass security access to the desalination plant site) has been evaluated in Appendix M and the level of risk is **Medium**.

The risk is considered ALARP as the control measures will reduce the likelihood as far as reasonably practicable with the risk being solely due to the worst case, unexpected consequence which cannot be lowered further.

Public exposure to the risk of uncontrolled blasts will be avoided through transport, storage and use of explosives in accordance with relevant legislation, standards and codes of practice.

Blasting may be required during construction of the transfer system and electricity infrastructure depending upon the underlying geology, however this is not expected to be extensively required. Single, isolated blasts may be required where the pipeline trench is unable to be excavated using standard mechanical equipment such as rock breakers. The key risks to public safety from this activity include:

- appropriate storage of explosives when present onsite
- management of blasting to ensure no members of the public are within areas potentially impacted by fly rock during blasting.

If explosives are required during construction they will be transported to site by a licensed contractor in accordance with relevant legislation, standards (AS 2187.2-2006) and codes of practice (refer Section 25.4.8). It is not expected that explosives will need to be stored onsite for extended periods of time (other than prior to a blast).

Prior to blasting, any nearby residential receptors will be consulted and appropriate blast exclusion zones established to ensure any fly rock from blasting will remain within the blast exclusion zone. No site personnel or members of the public will be permitted within the exclusion zone, which will be confirmed prior to blasting taking place.

The expected impacts from blasting with the above controls implemented are in the **Negligible** category and the level of **certainty** in the assessment of the expected impact is **High** (refer to Appendix M).

25.4.7 Management of hazards and emergency response on Department of Defence land

Hazards management and emergency response in relation to Department of Defence land will be in accordance with the Project's broader health, safety and environmental management frameworks, and the Third Party Agreement between the Project and the Department of Defence.

Emergency and hazard management arrangements for the Project infrastructure located within Defence land will be governed through the Project's broader health, safety and environmental management frameworks, together with the Third Party Agreement between the Project and the Department of Defence. The Third Party Agreement establishes the specific safety, security, emergency management and coordination obligations that apply to activities undertaken on Defence land and provides the primary mechanism through which emergency response interfaces between the Project and Defence will be managed during both construction and operation.

The Project traverses Defence land within the Cultana Training Area (CUTA) and adjacent land to the east of Woomera. Activities undertaken within CUTA will be subject to the requirements of the Third Party Agreement. These arrangements require the Project to undertake its activities in a manner that protects the safety of all personnel, contractors, Defence assets and infrastructure, while also ensuring that Defence operations and training activities can continue safely and effectively. The agreement expressly recognises that the

safety of personnel and the security of Defence operations are paramount considerations and requires Project activities to be planned and undertaken in a manner that supports the coexistence of Defence and Project operations.

A key component of the emergency management framework is the requirement for the Project to develop, implement and maintain a Work Health and Safety (WHS) Emergency Plan. The WHS Emergency Plan will be prepared in accordance with applicable WHS legislation and will be provided to Defence for review and coordination purposes. The plan will define emergency response procedures, communication pathways, escalation arrangements, responsibilities and coordination measures relevant to activities occurring on Defence land. Emergency management arrangements will be integrated with the Project's broader emergency response framework and will be communicated to all personnel working within Defence-controlled areas.

The Third Party Agreement establishes clear obligations for consultation, cooperation and coordination between the Project and Defence in relation to WHS matters. The Project will be required to comply with all relevant WHS laws, applicable Defence safety procedures and any reasonable Defence directions relating to safety, security or emergency management. The agreement also requires ongoing consultation and coordination between the Project, Defence and any other parties holding relevant WHS duties to ensure hazards are appropriately identified, assessed and managed throughout the lifecycle of the Project.

Construction

During construction, authorised personnel accessing Defence land will be required to participate in Defence-specific safety and security inductions prior to commencing work. In addition to initial inductions, personnel will be required to undertake annual refresher briefings and attend any additional safety or security briefings required by Defence. These arrangements are intended to ensure all personnel understand Defence operational requirements, emergency response expectations, site-specific hazards, access restrictions and incident reporting obligations. The Project will also be responsible for ensuring that all authorised persons are fully informed of, and comply with, the obligations established under the Third Party Agreement.

Unexploded ordnance (UXO)

Regarding the potential presence of UXO and other Defence-related hazards, the Third Party Agreement establishes detailed requirements for the identification and management of these hazards. Prior to accessing Defence land, the Project will undertake appropriate UXO risk assessments to determine whether UXO clearance is required for access routes or work areas. Should UXO or another hazard be identified during construction or operational activities, the Project must immediately notify Defence and provide details regarding the location and nature of the hazard, including GPS coordinates where practicable. Personnel will not be permitted to interfere with, move or otherwise manage such hazards independently. Instead, all directions issued by Defence regarding the management of UXO or other hazards must be complied with, ensuring that hazard management is undertaken in accordance with Defence protocols and specialist requirements.

Incident notification and reporting

The agreement also establishes formal incident notification and reporting obligations. Any accident, notifiable incident, injury or property damage occurring within the pipeline easement area must be reported to the relevant Defence representatives as soon as reasonably practicable and no later than 24 hours after the event. These notification requirements operate in addition to the Project's obligations under applicable WHS legislation. Where an incident occurs, the Project will undertake appropriate investigations and provide Defence with investigation findings, including the identified causes of the incident and any corrective or preventative actions. Progress reporting on completion of corrective actions may also be required to demonstrate that identified risks have been appropriately addressed, and that lessons learned have been incorporated into future activities.

Defence retains authority to manage access to Defence land in circumstances where safety, security or operational requirements necessitate intervention. Under the agreement, Defence may refuse access, withdraw access permissions or impose conditions on access where required to protect personnel or property, maintain security, preserve operational capability or respond to emergencies. In the event of an emergency, Defence may temporarily suspend access to affected areas until the emergency has been resolved, and Defence determines that activities can safely recommence. These provisions ensure that Defence emergency response protocols and operational requirements take precedence where necessary to protect Defence interests and public safety.

Operations

During operations, emergency and hazard management arrangements will continue to be implemented through the Project's operational management systems and the requirements of the Third Party Agreement. Ongoing communication and coordination with Defence will be maintained to ensure that emergency response arrangements remain effective and responsive to changes in operational conditions, Defence activities or identified risks. Through these mechanisms, the Project will maintain a coordinated approach to emergency preparedness, hazard management, and incident response that aligns with Defence safety, security and operational requirements throughout the life of the Project.

Further information on UXO in the Project Area is also provided in Section 25.4.8.

The expected impacts from construction and operation of the Project on Defence land from with the above plans and procedures implemented are in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer to Appendix M).

25.4.8 Other hazards

Additional hazards have been identified which may have the potential to impact on the environment and public health:

- presence of open trenches during construction of pipeline
- accidental damage to adjacent hydrocarbon pipelines during construction
- potential presence for UXO
- seismicity

- electromagnetic fields (EMF)
- electric shock
- unauthorised access to Project infrastructure.

Open trenches during construction

Open trenches will be secured outside of work hours to prevent impacts to public safety.

Construction of the transfer system will require trenches up to ~2.5 m depth for laying of the pipeline over the majority of the pipeline corridor. Trenchless excavation or above ground construction (which will be used at some sensitive locations) will remove this hazard in these cases. While trench reinstatement will follow directly behind pipe-laying it is anticipated that lengths of open trench will remain for a period up to 24 hours after excavation and before the laying crews catch-up.

During the day, construction workers will be present at pipeline trench work sites, and the site will be secured in accordance with Safework SA requirements outside of work hours.

Access and egress ramps at appropriate locations along the pipeline trench will be provided, to assist fauna that may access the trench. Assessment of the potential impacts of open trenches on fauna is provided in Chapter 15 Terrestrial Flora and Fauna.

With the above controls implemented, the expected impacts from open trenches during construction are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer to Appendix M).

Accidental damage to Moomba-Port Bonython Liquids Pipeline

Construction methodologies to prevent accidental damage and avoid impacts to the operation of the Moomba-Port Bonython Liquids Pipeline will be developed in consultation with the pipeline operator.

The transfer system alignment crosses the Moomba-Port Bonython Liquids Pipeline (MPBLL) at KP 80 and KP 89 and parallels it between these points. The MBPLL carries hydrocarbon liquids from Moomba for processing at Port Bonython and damage to the MPBLL from Project construction could result in explosion, fire or loss of supply for processing and export.

Prior to the commencement of construction activities within the MPBLL easement, the pipeline operator will be consulted regarding notification, access or other requirements to ensure that the operation and integrity of the MBPLL are not impacted. Access routes for Project construction purposes will avoid crossing the pipeline except where crossings with a sufficient load rating are present.

Fire control measures will be in place onsite and all construction workers will be inducted in safety protocols related to hydrocarbon pipelines and fire management.

The expected impacts on the MBPLL from construction of the transfer system are in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer to Appendix M).

Unexploded ordnance on former Department of Defence land (UXO)

Exclusion zones will ensure no members of the public are close enough to construction to be impacted by potential UXO on former Defence land.

Unexploded ordnance (UXO) on former Defence land poses a potential risk to Project investigations and proposed construction activities. While none of the pump station sites or the desalination plant site recorded potential UXO on the Defence UXO mapping[6], three areas formerly under the care and control Defence which are crossed by or adjacent to the pipeline alignment were identified in the PSI as potential for UXO (refer Appendix H-2 and Figure 25-3):

- the former Woomera Prohibited Area (comprising the east side of the Stuart Highway north of approximately Pernatty Lagoon to and including Roxby Downs and Olympic Dam), Woomera Village and west of Woomera Village
- 'Lincon Park' located west of Port Augusta airport and previously gazetted for Department of Defence use in the 1960's
- former Cultana Training Area land between the Port Augusta Airport, west to Iron Knob and south to approximately 5 km north of Whyalla.

These locations were assessed as having slight to moderate explosive potential. Intrusive surveys undertaken by GHD for the Project did not identify any live explosive items or evidence of UXO producing activities, such as fragmentation, weapon parts or impact craters (refer Appendix H-2).

These areas will be clearly identified in the Project CEMP and, as noted above, works will be conducted in accordance with the Third Party Agreement between the Project and the Department of Defence. As UXO is unpredictable and may detonate unexpectedly if deliberately disturbed or mishandled, any discovery of suspected UXO must not be touched, tampered with or otherwise disturbed. The CEMP will include induction and awareness training and procedures for unexpected finds including immediate notification to Defence.

The risks associated with UXO in the context of the Project are aligned with worker safety as members of the public would not generally be close enough to the work zone to be impacted due to Defence security arrangements and Project controls on public access.

The expected impacts to members of the public from construction interacting with UXO in the **Negligible** category and the level of certainty in the assessment of expected impact is **High** (refer to Appendix M).

Seismicity

Design tolerance is well above the 1 in 500 year seismic event and the consequence would be limited to discharge of product water.

The National Seismic Hazard Assessment mapping (Geoscience Australia 2018) indicates that the Project is predicted to be in an area with a seismic hazard equivalent to or below levels for the Adelaide region, and is not in an area of elevated seismic hazard (refer Figure 25-5).

Seismic hazard during construction will be managed through standard worker safety mitigations and management strategies and potential risks are analogous to other

[6] https://uxo-map.defence.gov.au/

construction activities undertaken in areas where seismic hazard is not elevated (Geoscience Australia 2018).

All Project structures will be designed in accordance with Australian Standard *AS1170.4 Structural design actions, Part 4: Earthquake actions in Australia* to ensure that seismic hazard is appropriately addressed. Desktop assessment of seismic risk along the Project alignment has identified peak ground acceleration of 0.04 mm/s at a probability of 1 in 500-year exceedance risk (refer to Figure 25-5).

Pipelines will be constructed to Australian Standard (AS1170.4) which require infrastructure to withstand a 0.08 mm/s peak ground acceleration, which far exceeds the seismic risk. Peak ground acceleration at Mullaquana Station is 0.02 mm/s which is lower than the average for the pipeline alignment (0.03 mm/s).

It is noted there are a number of faults, predominantly between Mullaquana Station and Whyalla that intersect the water transfer system infrastructure. Seismic activity that could cause further slip along the fault is considered extremely unlikely.

Should seismic activity cause the pipeline to rupture, the consequence would be limited to discharge of desalinated product water to the environment. The expected impact is in the **Negligible** category and the level of **certainty** in the assessment of expected impact is **High** (refer to Appendix M).

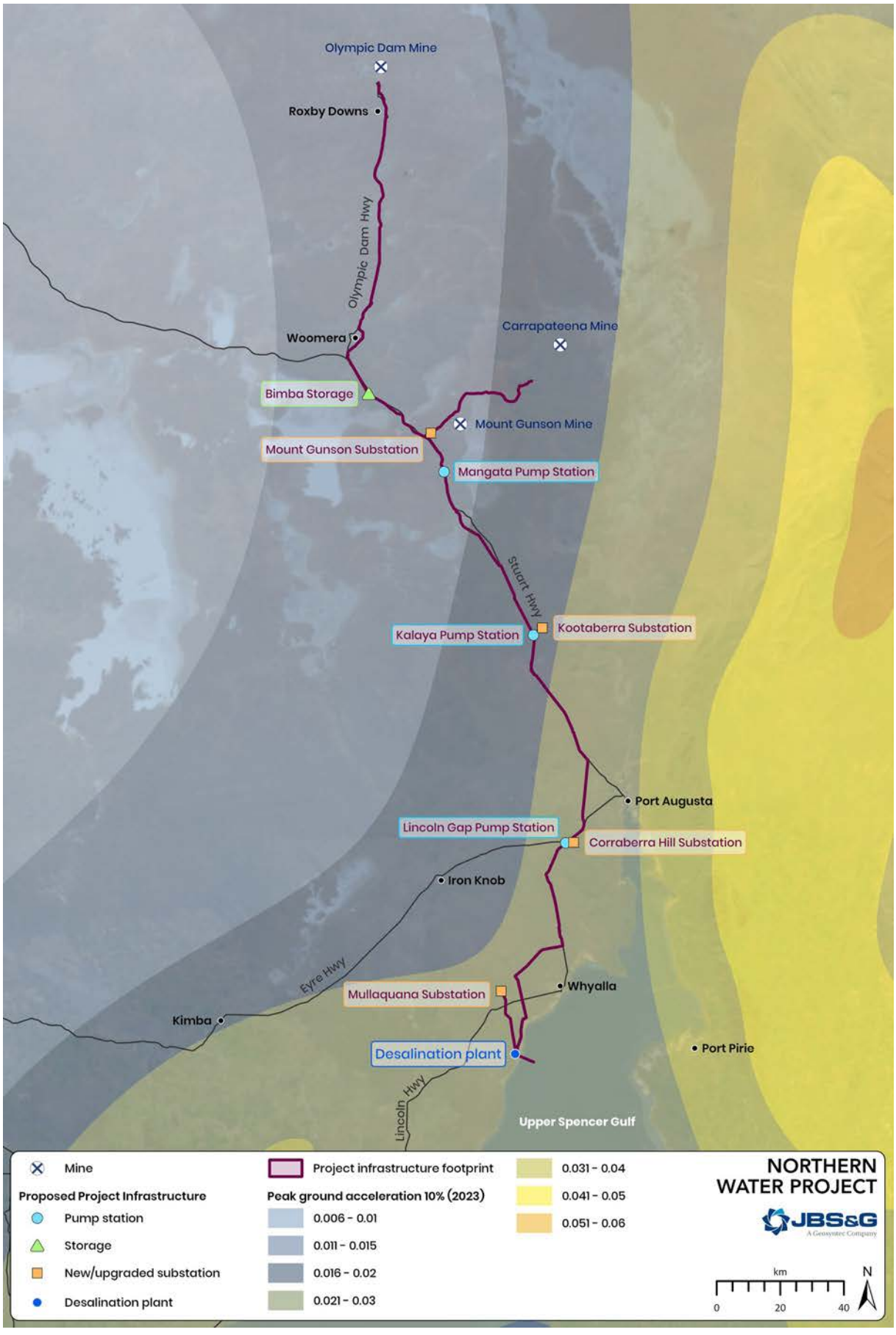


Figure 25-5: Peak ground acceleration of 1/500 annual probability of exceedance seismic events

Electromagnetic fields (transmission lines)

Electrical infrastructure will be designed to ensure exposure of the public to Electromagnetic fields (EMF) is well below acceptable limits.

EMFs exist wherever electricity is generated, transmitted or distributed in power lines or cables, or used in electrical appliances. EMFs reduce rapidly with distance from their source. For transmission lines, EMFs are between approximately four to eight times lower for every doubling of distance from a line.

EMFs induce internal electric fields and currents in the body. If the external fields are strong enough, these induced electric fields can interfere with the body's nervous system causing nerve and muscle stimulation and changes in nerve cell excitability in the central nervous system. These effects occur at field strengths well above field strengths found below a transmission line.

Exposure limit guidelines for EMFs have been developed by the International Commission for Non-Ionising Radiation Protection (ICNIRP). These guidelines are recommended for use by the Australian Radiation Protection and Nuclear Safety Authority, which is the Commonwealth Government agency responsible for protecting the health and safety of people and the environment from radiation. The limiting thresholds for the general public set out in the ICNIRP guideline are widely accepted as providing complete protection against all known adverse health effects of electric and magnetic fields (BECA 2020).

The engineering design for the power supply will meet all relevant Australian Standards and Guidelines. Standards require exposure to EMF for a person standing directly below a transmission line to meet the ICNIRP general public exposure reference limit. The nearest resident to the transmission line will be ~1 km from the easement and thus will be well below that limit. The transmission lines are generally located on land used for stock grazing, in sparsely populated and remote areas, which are not usually accessed by members of the public.

The expected impact of EMFs is in the **Negligible** category and the level of certainty in the expected impact is **High** (refer Appendix M).

Electric shock (electricity infrastructure)

Electrical infrastructure will be designed to relevant Australian Standards to reduce the risk of electrocution to as low as reasonably practicable.

The transmission line will be designed and operated in accordance with Australian and International Standards to protect the public against the risk of electric shock. The height of the towers and conductors, and the protection systems will minimise this risk.

Electrical shock can occur from people or equipment making contact with uninsulated electrical infrastructure. Common hazards include tall farm machinery hitting overhead transmission lines or members of the public accessing infrastructure that is uninsulated at ground level.

Lower voltage towers (33 and 66 kV) will be supported by 30 – 40 m tall poles/towers and higher voltages will be supported by 45 – 60 m tall towers (subject to detailed design). Some tall machinery (e.g. agricultural or quarry equipment) may be able to interact with lines. This is a common hazard associated with these vehicles and standard strategies include

ensuring minimum safe clearance distances are maintained in accordance with the *Electricity (General) Regulations 2012*. This will manage this risk to as low as reasonably practicable.

Substations, transformers and transmission feeders will be fenced to prevent unauthorised public access and designed so that Personal Protection Equipment is only required within the fenced exclusion zone. Personnel or member of the public outside this zone will not be exposed to hazardous levels of electricity.

Electrical infrastructure is designed to prevent access by members of the public and the expected impact is in the **Negligible** category. However, uncertainty in the expected impact (based on the potential for a person to bypass security measures and gain unauthorised access to electrical infrastructure) has been evaluated in Appendix M and the level of risk is **High**.

The risk is considered ALARP as the control measures will reduce the likelihood as far as reasonably practicable with the risk being solely due to the worst-case, unexpected consequence which cannot be lowered further. This is a well-known hazard with multiple substations and transmission lines operating in the Project Area with no known impacts.

Unauthorised access to Project infrastructure

Public access to Project facilities and infrastructure will be restricted using measures described in Table 25-6 (which will be confirmed as part of detailed design and in the Project management plans). Security measures are designed on a risk basis with higher risks requiring higher security standards. Potential impact as a result of public access to infrastructure has been assessed above under electric shock and dangerous chemicals.

Table 25-6 Project infrastructure security measures

Infrastructure	Security measures
Desalination plant	• 3 m high chain link fence with 3 strands of barbed wire • galvanised steel security gates (automatic) • security systems which meet current standards for bulk storage of hazardous goods codes • active surveillance / CCTV with security personnel present onsite as required
Pipeline	• majority of pipeline below ground • locking of air and scour valves when not in use • installation of chain mesh security fencing at pump stations
Electrical infrastructure	• fitting substations with fencing, razor wire and CCTV cameras • compliance with *ENA Doc 015 National Guidelines for Prevention of Unauthorised access to electricity infrastructure for security guidelines* (noting that this guideline includes mitigation measures for transmission lines)
Marine infrastructure	• intake screen located at a minimum 13 m water depth from Lowest Astronomical Tide (LAT) to prevent accidental damage from marine vessels

Infrastructure	Security measures
	• outfall diffuser located approximately 17 m depth from LAT to prevent accidental damage from marine vessels • establishment of an exclusion zone around the marine intake and outfall structures with appropriate demarcation with buoys and on charts

25.4.9 Summary of key mitigation measures

The following mitigation measures are subject to detailed design and will be confirmed in post approval Project management plans (including the CEMP and OEMP).

Table 25-7: Key mitigation measures – hazards and risks

Mitigation measure	Construction	Operation
Bushfire		
Vegetation management including fire breaks around construction zones and maintaining appropriate clearance around electrical infrastructure.	✓	✓
Constructing buildings and infrastructure to the appropriate BAL in accordance with Australian Standard AS3959.	✓	
Ongoing inspections and maintenance of all Project elements to identify potential fire ignition risks including defects or poor vegetation management.	✓	✓
Additional controls on Total Fire Ban Days (declared by CFS) including no hot works, vehicle movements in bushland or paddocks outside of designated roads/tracks.	✓	✓
Ensure access roads are capable of providing two wheel drive access for evacuation and access by firefighting appliances.	✓	✓
Develop and maintain site-specific bushfire evacuation plans for the desalination plant, all substations, pumping stations, proposed worker's camps and laydowns for the relevant stages of development.	✓	✓
Procedures to be developed for monitoring of bushfire conditions (including modified operations during Total Fire Ban days), communication protocols and road closures.	✓	✓
Personnel training to include bushfire awareness and response.	✓	✓
Scheduled routine maintenance and testing for bushfire suppression equipment onsite.	✓	✓
Pre-bushfire season audits to confirm site readiness.	✓	✓
On-site fire suppression capabilities will be considered especially for high risk areas (e.g. desalination, substations).	✓	✓
Firefighting resources could include mobile firefighting units, dedicated water tanker / firefighting truck or stationary water tanks.	✓	✓
Site and groundwater contamination		

Mitigation measure	Construction	Operation
Detailed construction design and CEMP to outline unexpected finds protocols and measures to contain, manage and treat (if applicable) potentially contaminated soils.	✓	
Management of fuels and chemical, including bunding, equipment maintenance and use of spill kits in accordance with EPA guidelines.	✓	✓
Management of spoil and wastewater, including treatment, storage and reuse in accordance with EPA guidelines.	✓	
Implementation of standard maritime environmental management practices and marine spill response procedures.	✓	✓
Any water to be discharged to marine environment to comply with ANZG water quality criteria prior to discharge.	✓	
Flooding		
Coastal flooding hazard at the intake pump station will be mitigated by raising the minimum site and floor levels to meet or exceed the Coast Protection Board minimum requirements to 2100 - 1% AEP seawater flooding event.	✓	✓
Dangerous substances		
Dangerous substances management to comply with the relevant SDS.	✓	✓
HAB		
The Project design includes desalination plant pre-treatment measures to remove algal organic matter and high suspended solids.		✓
Prior to construction, a subsequent investigation into dinoflagellate resting cells and cysts in marine sediments to be undertaken to provide a second baseline survey for comparison with the pre-HAB survey. If viable cysts or cells are identified in marine sediments, additional mitigation and management strategies may be considered and adopted as part of the CEMP.	✓	
Other hazards		
Heavy Vehicle access routes to avoid crossing existing gas pipelines except where sufficient load ratings are present.	✓	
Any explosives required will be sourced, transported and used by an appropriate qualified expert and will not be kept onsite. Appropriate blast exclusion zones established prior to all blasts.	✓	
Third Party Agreement in place with Defence addressing hazards and emergency response.	✓	✓
Project designed in accordance with AS/NZS 1170.2 and AS1170.4.	✓	
Project designed to comply with limiting thresholds for the general public as specified in the ICNIRP guidelines.	✓	

Mitigation measure	Construction	Operation
Level 2 electrical hazard assessment to be conducted as part of detailed design to identify specific control measures required.	✓	
Management of unauthorised access to site in accordance with Table 25-6.	✓	✓

25.5 Conclusion

A number of hazards have been identified through design, construction and operations. These hazards are well understood and can be managed using industry standard control measures to as low as reasonably practicable.



Chapter 26

Environmental Management Framework

NORTHERN
WATER PROJECT

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TABLE OF CONTENTS

26 ENVIRONMENTAL MANAGEMENT FRAMEWORK 26-1

26.1 Setting the Context 26-1

26.1.1 EIS Context for environmental management 26-1

26.2 Northern Water Project Environmental Management Systems 26-2

26.2.1 Environmental management system 26-2

26.2.2 Northern Water Project Environment Policy 26-3

26.2.3 Health and safety management 26-4

26.3 Environmental Management Framework for the Project 26-4

26.3.1 Assessment Requirements – environmental management 26-4

26.3.2 Northern Water Project Environmental Management Plans 26-5

26.3.3 General content of the CEMPs and OEMPs 26-7

26.4 Environmental Management Plan Implementation 26-10

26.4.1 Roles and responsibilities 26-10

26.4.2 Environmental monitoring 26-12

26.4.3 Training and induction 26-12

26.4.1 Emergency response 26-13

26.4.2 Records and reporting 26-13

26.4.1 Stakeholder engagement and complaint management 26-14

26.4.2 Review of EMPs 26-14

LIST OF TABLES

Table 26-1: Proposed CEMPs, OEMPs and associated sub-plan overview 26-6

Table 26-2: Key management issues - land-based activities CEMP and OEMP 26-8

Table 26-3: Key management issues - Marine and Coastal CEMP and OEMP 26-9

Table 26-4: Indicative roles and responsibilities during Project construction 26-10

LIST OF FIGURES

Figure 26-1: Example process for approval and review of EMPs (for information only) 26-15

26 ENVIRONMENTAL MANAGEMENT FRAMEWORK

This chapter describes the environmental management framework that will be applied during construction and operation of the Project. It describes the process for the development and implementation for a range of environmental management plans including those referred to in the EIS Assessment Requirements.

The environmental management plans will be developed to manage the potential environmental impacts of the construction and operation phases of the Project and will incorporate the appropriate measures identified by the impact assessment process, consultation with regulators and other stakeholders and any conditions of approval.

26.1 Setting the Context

The EIS Assessment Requirements require the environmental management arrangements for the construction and operational phases (including Environmental Management and Monitoring Plans) to be identified in the EIS. Relevant Assessment Requirements have been covered in this chapter as set out in Appendix A-2.

26.1.1 EIS Context for environmental management

The environmental management plans referred to in the Project-specific Assessment Requirements (refer Appendix A-1), and any additional plans that would be required if the Project is approved would be based on the proposed environmental management measures specifically addressed in relevant EIS chapters.

These chapters set out the details of the predicted impacts on an environmental aspect from construction, operation, maintenance and decommissioning activities, and the environmental management measures which are proposed to mitigate impacts. The expected effectiveness of the identified management measures in addressing impacts, and consideration of proven or new approaches are also discussed in the chapters for each environmental aspect.

Chapter 6 Project Description describes the construction techniques and technologies that are proposed to minimise environmental impacts, and which have been considered in the design of Project infrastructure and associated activities. Identification of management measures has taken into account the specific requirements for delivery of the Project, the nature of the affected terrestrial and marine habitats, current and future uses of land and waters where Project infrastructure is located, and protection of the amenity of local communities.

The measures proposed to manage the predicted environmental impacts will be incorporated into a series of Environmental Management Plans (EMPs) which are discussed further in Section 26.3.

26.2 Northern Water Project Environmental Management Systems

26.2.1 Environmental management system

The Department for Infrastructure and Transport (DIT) is the Proponent for the EIS and is responsible for procurement and delivery of the design, build, operate and maintain (DBOM) contract for the Project. DIT will likely remain as the responsible agency for the purpose of the design and build phase of the contract. Ownership and responsibility for the operation and maintenance phase of the Project will also remain with the South Australian Government, albeit that the agency and / or organisational level responsibilities are still to be finalised.

DIT has an assured record of responsible environmental management and performance and a strong environmental compliance record, remaining in compliance with all conditions of previous environmental approvals granted.

Operations are undertaken in accordance with objectives for environmental protection, sustainability and continual improvement in environmental performance. DIT has a system and project management framework and Master Specification for managing environmental impacts and risks, operating under various environment-related policies, procedures and guidelines.

DIT manages construction of infrastructure under DBOM contracts using the following:

1. Master Specifications
2. Principal's Requirements and contract scope
3. Program and Project Management Framework
4. Engineering Design Management Framework
5. Environment and Heritage Technical Manual (EHTM)
6. Sustainability Manual.

These documents provide the key elements of an Environmental Management System (EMS) relevant to Departmental requirements, thereby ensuring that the Department and those that deliver on the Department's behalf are aware of required legislative compliance, approval pathways and risk identification and management. Through this framework, environmental risks and opportunities associated with Project activities can be identified, managed and monitored, equivalent to an EMS. Copies of the EHTM, Master Specifications and the Sustainability Manual can be accessed via DIT's website[1].

Environment and Heritage Technical Manual (EHTM)

The EHTM sets out processes and approvals specific to DIT Projects including the minimum requirements, performance outcomes and process to be followed for environment and heritage assessments. The objective of the EHTM is to ensure all relevant environment and heritage impact assessments and mitigation measures are identified, developed and integrated into design development process and used to inform decision-making throughout the project lifecycle. The EHTM also sets out requirements for management

[1] https://www.dit.sa.gov.au/standards/manuals and https://dit.sa.gov.au/contractor-documents/master-specifications

during construction including requirements for a Construction Environmental Management Plan (CEMP) and environmental auditing against the CEMP.

While the EHTM considers some sustainability aspects (e.g. circular economy, greenhouse gas emission reduction and climate change resilience), DIT also have a separate Sustainability Manual which sets out further requirements.

Sustainability Manual

The Sustainability Manual sets out key tasks and tools required to deliver improved outcomes in line with DIT's climate change priorities. Relevant focus areas for the Project include:

- net zero alignment
- carbon reduction hierarchy
- sustainable procurement
- waste hierarchy and the circular economy
- use of non-potable water
- climate change resilience.

Environmental Risk Assessment

DIT manage environmental risk within their existing risk management framework (DIT internal reference: DP086). This framework sets out requirements for assessing, minimising and mitigating risk through design and setting environmental expectations for contractors to comply with during construction and operation. The EHTM is a tool used to ensure the appropriate level of environmental risk management has been undertaken throughout project proving, pre-delivery and operation. It also provides a framework for continual risk assessment through inspections, audits and monitoring of the environmental performance of contractors during construction.

26.2.2 Northern Water Project Environment Policy

The DBOM Contractor must comply with the relevant environmental legislation and have an EMS in accordance with AS/NZS ISO 14001, in accordance with DIT Master Specification PC-ENV1. As such, all design, build, operator and maintain operations will be undertaken in accordance with the Environmental Policy development as part of the EMS certification. The policy will outline commitments to developing and maintaining an EMS that delivers improved environmental performance in accordance with the *Environment Protection Act 1993* and other relevant legislation, regulations, standards and codes of practice. Minimum Environment Protection requirements are specified through DIT's Master Specification PC-ENV2.

The policy will address:

- establishment, implementation and maintenance of the EMS in accordance with AS/NZS ISO 14001 to meet or exceed environmental compliance obligations
- identification and implementation of mitigation measures to protect ecosystems and prevent pollution within the local environments in which the Project operates

- development, documentation and maintenance of robust standards and procedures
- effective measurement, monitoring and reporting on environmental performance
- listening, learning and sharing knowledge on environmental matters across the Project, with stakeholders and industry peers
- continuous seeking of opportunities to improve environmental outcomes and contribute to creating a lasting legacy for the environment.

26.2.3 Health and safety management

The *Work Health and Safety Act 2012* governs health and safety management requirements in South Australia. The Project will be constructed and operated under a work health and safety framework which meets the requirements of the Work Health and Safety Act. The DIT Master Specification for Work Health and Safety (PC-WHS1 and BPWHSR) provides minimum requirements including a Work Health and Safety (WHS) Management System, WHS Management Plan and Safe Work Methods. The framework must comply with AS/NZS ISO 45001:2018 *Occupational Health and safety Management Systems – Requirements with guidance for use*, *AS/NZS ISO 31000 Risk management – Guidelines*, the *National Construction Code* and other relevant Australian Standards.

In addition to providing guidance on health and safety expectations for contractors, DIT representatives undertake inspections and audits (both regular inspections and ad hoc, unannounced inspections and audits) to confirm the contractor is complying with their approved safety documentation. Safety coaching, training and monitoring is also part of the health and safety management framework.

26.3 Environmental Management Framework for the Project

26.3.1 Assessment Requirements – environmental management

There is a general requirement in the Assessment Requirements that the EIS includes management arrangements for the construction and operations phases of the Project (including Environmental Management and Monitoring Plans).

If the Project is approved, the Post Decision Requirements section of the Assessment Requirements (Section 7) states that Project-specific plans will be required through reserved matters or conditions pursuant to section 115(6) and 115(7) of the *Planning, Development and Infrastructure Act 2016*, to the satisfaction of the Minister for Planning. The Commonwealth government has also included a series of plans in the list in relation to the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*.

The plans identified in the Project-specific Assessment Requirements are:

- Construction Environmental Management Plan (CEMP)
- Traffic Management Plan (TMP)
- Post Construction Rehabilitation Plan
- Coastal and Marine Management Plan
- Hazard and Emergency Management Plan (s)

- Flora and Fauna Management Plan(s)
- Native Vegetation Clearance Data report (final) including a Significant Environmental Benefit (SEB) Management Plan
- Threatened Species Management Plan (Protected Matters CEMP)
- Offset Strategy and Offset Management Plans for Matters of National Environmental Significance (MNES)
- Cultural Heritage Management Plan (CHMP)
- Greenhouse Gas Emissions Mitigation Plan
- Operations Environmental Management Plan (OEMP)
- Decommissioning and Rehabilitation Plan (DRP).

26.3.2 Northern Water Project Environmental Management Plans

Taking into account the guidance in the ARs as to the EMPs expected to be required through reserved matters and approval conditions, the Project proposes preparation of the EMPs listed in Table 26-1.

The EMPs would be developed and implemented in line with the Project's Environmental Policy, DIT Guideline for the Preparation of a Contractor's Environmental Management Plan (16524926, Attachment 10A of DIT's EHTM) the Project's overarching approach to environmental management and in compliance with Project approvals, relevant legislation and other regulatory requirements.

Plans would be prepared in consultation with State agencies, the National Environmental Protection Agency, local councils, Traditional Owners and other relevant stakeholders. All measures to avoid, mitigate, manage, offset and / or monitor environmental impacts during construction and operation of the Project that have been identified in the EIS, the Response Document and the DHUD Chief Executive's Assessment Report will be addressed in these plans.

It is anticipated that separate CEMPs would be required for terrestrial and marine construction, and the same may be implemented for operation. The terrestrial activities CEMP will also include information as advised in the Construction Environmental Management Plan Guideline (EPA 1095/24) (EPA 2024) and Environmental Management Plan Guidelines prepared by the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW 2024).

An overview of EMPs has been developed for the EIS to provide guidance on the required content and coverage of the plans. The overview will be used to assist the DBOM Contractors in the preparation of the required plans for submission to relevant government regulators for approval prior to commencement of Project construction or operation activities. The EMP overview is provided in Table 26-1, Table 26-2 and in Section 26.3.3.

Table 26-1: Proposed CEMPs, OEMPs and associated sub-plan overview

Environmental Management Plan
Land-based Activities EMP Overview
The CEMP (land-based activities) and sub-plans which address management of:
• Soil erosion and drainage
• Acid sulfate soils
• Spills
• Potentially contaminated areas
• Contamination remediation
• Terrestrial flora and fauna
• Weeds, pests and diseases
• Groundwater and dewatering
• Air quality including dust
• Noise and vibration
• Nightworks
• Non-Aboriginal cultural heritage
• Waste management and minimisation
• Hazardous materials (including fuel)
• Wastewater
• Stormwater (Refer to Appendix H-7 for EIS Plan)
• Water quality
• Spoil
Operations Environmental Management Plan (OEMP) (land-based activities)
Traffic and Access Management Plan (TMP)
Bushfire Management Plan (Refer to Appendix N for Bushfire Risk Management Plan)
Greenhouse Gas Emissions Mitigation Plan
Carbon Management Plan
Cultural Heritage Management Plan
Emergency Management and Incident Response Management Plan
Complaints Handling and Management Plan
Decommissioning and Rehabilitation Plan
Ecology EMPs
Flora and Fauna Management Plan(s)
Restoration, Rehabilitation, Recovery and Monitoring Plan
Protected Matter Construction Environmental Management Plan (PMCEMP)

Environmental Management Plan	
Native Vegetation Clearance Data Report including a Significant Environmental Benefit (SEB) Management Plan	Refer to Appendix I-5 for Draft Native Vegetation Clearance Data Report Refer to Appendix I-9 for Preliminary SEB Offset Strategy
Threatened Species Management Plan	Refer to Appendix I-8 for Threatened Species Management Strategy
Offset Strategy and Offset Management Plans for MNES	Refer to Appendix I-7 for Draft EPBC Act offset strategy
Marine-based Activities EMP Overview	
Marine and Coastal Construction Environmental Management Plan (MCCEMP)	
Marine and Coastal Operations Environmental Management Plan (MCOEMP)	
Marine and Coastal Flora and Fauna EMP	
Marine Threatened Species Construction Environmental Management Plan (MTSCEMP)	
Marine Threatened Species Operational Environmental Management Plan	
Marine Vegetation Clearance Minimisation and Management Plan	
Marine Megafauna Monitoring Plan	
Marine Vessel Management Plan including Marine Weed, Pest and Disease Management Plan	
Underwater Noise and Vibration Management Plan	
Marine Water Quality and Monitoring Management Plan	
Marine Pest and Disease Management Plan	
Dredging Management Plan	

26.3.3 General content of the CEMPs and OEMPs

As a guide it is expected that the general content of the CEMPs and OEMPs will include the following:

- brief background on the Project – relevant Project components, key Project activities environmental aspects / values that require protection
- an introductory overview of the key issues requiring management
- key legislation, policies, standards, contractual and other requirements that apply to the environmental aspect
- relevant environmental values that require protection
- identification and analysis of potential environmental impacts, including environmental hazards and risks
- any performance goals the EMP is seeking to achieve in order to avoid or mitigate impacts

- an overview of the management measures that will be utilised to meet the objectives and their timing. Where required, specific plans will be developed for aspects requiring further detail
- specification of the required level of performance to meet environmental / legislative and Project-specific standards
- procedures to monitor, measure and record performance (e.g. inspections and auditing) with associated remediation / rectification procedures for non-conformances
- reporting requirements to DIT, regulators, the community and other stakeholders for the environmental aspect and the responsible parties.
- procedures to be undertaken if performance indicators are not met.

The final CEMPs and OEMPs for the Project will address management of environmental aspects identified and discussed in the EIS. Key issues to be addressed in the EMPs are summarised in Table 26-2 and Table 26-3.

Table 26-2: Key management issues - land-based activities CEMP and OEMP

Key Issue		CEMP	OEMP	Chapter
Land disturbance	Sedimentation and soil erosion	✓	✓	Chapter 13 Surface Water
	Aboriginal cultural heritage	✓	✓	Chapter 16 Aboriginal Cultural Heritage
	Acid sulphate soils	✓		Chapter 12 Soils, Landform and Geology
	Watercourse bank and channel stability (pipeline)	✓	✓	Chapter 12 Soils, Landform and Geology
	Surface water flows (pipeline)	✓	✓	Chapter 13 Surface Water
	Rehabilitation (general)	✓	✓	Chapter 6 Project Description Chapter 15 Terrestrial Flora and Fauna
	Rehabilitation (pipeline)	✓		Chapter 6 Project Description Chapter 15 Terrestrial Flora and Fauna
Interaction with natural resources	Interactions with terrestrial fauna (collisions), light spill	✓	✓	Chapter 15 Terrestrial Flora and Fauna
	Threatened species management	✓	✓	Chapter 15 Terrestrial Flora and Fauna
	Pipeline trench (native fauna)	✓		Chapter 15 Terrestrial Flora and Fauna
	Vegetation clearance	✓		Chapter 15 Terrestrial Flora and Fauna

Key Issue		CEMP	OEMP	Chapter
	Pests, diseases and weeds	✓	✓	Chapter 15 Terrestrial Flora and Fauna
	Pipeline trench (dewatering)	✓		Chapter 13 Surface Water
Emissions	Dust and air emissions	✓	✓	Chapter 18 Air Quality
	Noise and vibration	✓	✓	Chapter 19 Noise and Vibration
Generation of wastes and discharges	Wastewater	✓		Chapter 6 Project Description Chapter 24 Climate Change and Sustainability
	Stormwater	✓	✓	Chapter 13 Surface Water
	Spills, incidents and emergency response	✓	✓	Chapter 13 Surface Water
	Waste	✓	✓	Chapter 24 Climate Change and Sustainability
Community amenity	Landholder notification and access arrangements	✓	✓	Chapter 4 Community and Stakeholder Engagement Chapter 9 Use of Land and Marine Waters
	Interactions with livestock	✓		Chapter 9 Use of Land and Marine Waters
	Fire risk	✓	✓	Chapter 25 Hazards and Risk
	Traffic and access	✓		Chapter 22 Traffic and Transport
	Soil or groundwater contamination	✓	✓	Chapter 12 Soils, Landform and Geology
	Addressing community concerns	✓	✓	Chapter 4 Community and Stakeholder Engagement
	Public safety	✓	✓	Chapter 25 Hazards and Risk

Table 26-3: Key management issues - Marine and Coastal CEMP and OEMP

Issue		CEMP	OEMP	Chapter
Interaction with coastal and marine natural resources	Interactions with marine mammals (collisions, light spill)	✓		Chapter 11 Marine Environment
	Protected species management	✓		Chapter 11 Marine Environment
	Native vegetation clearance	✓		Chapter 11 Marine Environment
	Turbidity	✓		Chapter 11 Marine Environment
	Marine pests and diseases	✓		Chapter 11 Marine Environment

Issue		CEMP	OEMP	Chapter
	Underwater noise and vibration	✓		Chapter 11 Marine Environment
Generation of wastes and discharges	Wastewater	✓		Chapter 24 Climate Change and Sustainability
	Stormwater	✓	✓	Chapter 13 Surface Water
	Spills, incidents and emergency response	✓	✓	Chapter 13 Surface Water Chapter 25 Hazards and Risk
	Waste	✓	✓	Chapter 24 Climate Change and Sustainability
Community amenity	Maritime notifications and exclusions zones	✓	✓	Chapter 9 Use of Land and Marine Waters
	Addressing community concerns	✓	✓	Chapter 4 Community and Stakeholder Engagement
	Public safety	✓	✓	Chapter 25 Hazards and Risk

26.4 Environmental Management Plan Implementation

The EMPs will provide the environmental management requirements for delivery and operations of the project which would include, but not be limited to:

- demonstrating leadership and clear accountability for commitments to the environment
- ensuring environmental aspects are considered in key decisions
- regularly reporting performance against environmental targets
- effectively monitoring environmental management measures
- regularly reviewing and auditing activities to ensure environmental compliance.

The role and responsibilities, training and communication mechanisms that underpin implementation of the EMPs are set out below.

26.4.1 Roles and responsibilities

All personnel involved in the Project, including subcontractors are required to undertake work in accordance with the CEMP(s), OEMP(s) and the EMS. Indicative key roles and responsibilities for the implementation of the EMS during Project construction are presented in Table 26-4. These will be refined as the Project EMS is developed.

Table 26-4: Indicative roles and responsibilities during Project construction

Indicative Role	Responsibilities
General Manager	• Promoting a culture of environmental management / protection and providing clear expectations and guidance • Overseeing involvement of all internal and external stakeholders

Indicative Role	Responsibilities
	• Supporting the Project Director in organising and resourcing Project teams • Ensuring resources are provided to implement the EIS
Project Director (Construction)	• Acting as the management representative for the EMS • Promoting a culture of environmental management/protection • Overseeing environmental management and risk on the Project • Overseeing training • Monitoring performance and consolidated reporting of progress against Project objectives
Environment Manager	• Ensuring all systems, standards and processes are aligned across the Project • Providing general environmental support • Engaging with stakeholders • Conducting environmental incident investigations • Performing environmental risk assessments • Managing any required environmental approval or compliance processes • Overall implementation of the EMPs for the Project • Coordinating management reviews, external and internal audits and reporting progress against environmental targets and objectives
Construction Project Manager (Terrestrial)	• Overseeing on-site/terrestrial construction activities • Ensuring compliance of construction activities with conditions of relevant Project licences, permits and the CEMP • Ensuring all environmental guidelines and requirements are met
Construction Project Manager (Marine)	• Overseeing all marine construction activities • Ensuring compliance of construction activities with conditions of relevant Project licences, permits and the CEMP • Ensuring all environmental guidelines and requirements are met
Cultural Heritage Advisor	• Liaise with appropriate Traditional Owner stakeholders and organise surveys/monitoring activities as appropriate and required through agreements • Participate in Incident Cause Analysis Method (ICAM) investigations alongside the Contractor's representatives as required • Liaise with on-site cultural heritage representatives as appropriate • Escalate any issues not resolved on site to the Environment Manager or General Manager
Community and stakeholder engagement	• Oversee all community and stakeholder engagement and activities • Liaise with community and stakeholders • Escalate any issues not resolved on site to the Environment Manager or General Manager
Land Access and Landholder liaison	• Obtain any landowner approvals and agreements required prior to construction

Indicative Role	Responsibilities
	• Liaise with appropriate landholders and organise surveys/monitoring activities as appropriate • Participate in ICAM investigations alongside the Contractor's representatives as required • Escalate any issues not resolved on site to Environment Manager or General Manager
Staff and Contractors	• Understanding and complying with the requirements of the environmental management plans • Undertaking inductions where required • Understanding and complying with emergency procedures and responses (if required)

26.4.2 Environmental monitoring

Ongoing monitoring, auditing and reporting will be undertaken to determine whether environmental protection measures are being implemented and are performing effectively, and whether environmental risks are being managed, minimised or where reasonably possible, eliminated. The EMS will require preparation of an audit schedule detailing the type and number of audits and inspections to be conducted and their timing.

Monitoring programs in the CEMPs and OEMPs will be designed to assess compliance with environmental commitments, approval conditions and regulatory requirements and would typically include aspects such as:

- compliance with regulatory requirements
- integrity of bunding and containment systems
- cultural heritage
- site contamination
- flora and fauna
- noise and air quality
- control of weeds and pests
- vegetation regeneration
- bushfire prevention.

26.4.3 Training and induction

All Project personnel involved in construction and operation activities will be required to undergo training in environmental management including cultural heritage and respect, and safety requirements as part of their induction on to the site and prior to commencement of construction or operations activities. Job-specific training relevant to roles will also be undertaken and records maintained of induction and attendees. Specific training and induction requirements will be set out in the CEMP(s).

26.4.1 Emergency response

Processes and plans for responding to potential or actual emergency situations will be documented in an Emergency Response Plan (ERP). ERPs for specific Project construction and operation activities will also be developed.

The ERPs will address all potential risks associated with the Project and will include:

- identification of appropriate emergency services
- measures to undertake consultation with local emergency services
- protocols for notification of appropriate authorities and detailed incident and emergency procedures.

ERPs will be reviewed and updated on a regular basis to incorporate new information arising from any incidents, near misses, hazards and emergency response simulation training. Emergency drills will also be undertaken at regular intervals to ensure personnel are familiar with the plans and types of emergency response procedures.

Emergency preparedness and response is discussed in further detail in Chapter 25 Hazards and Risk Management.

26.4.2 Records and reporting

An appropriate and auditable record system will be maintained during all phases of the Project. This will occur monthly in accordance with PC-ENV1. Environmental records would typically include:

- non-conformance reports
- incident reports including remedial actions taken following incidents
- inspection reports and monitoring results
- training and induction attendance
- consultation records and complaints register
- annual regulatory compliance reports
- audit reports.

Environmental reporting will be conducted in accordance with commitments contained in the EIS and relevant approval conditions. The EMS will include internal and external reporting procedures to ensure that environmental issues and / or incidents are appropriately responded to, and processes for recording, reporting and tracking corrective actions for incidents and hazards. Contractors will be responsible for progress reports and reporting all safety and environmental incidents (including any notice received from a government agency).

Procedures setting out the process and responsibilities for raising non-conformances or opportunities for improvement will also be established.

26.4.1 Stakeholder engagement and complaint management

Consultation and communication between the Project and affected landholders will be ongoing during construction. Protocols for accessing and working on land will be established with each landholder where construction activities are planned and appropriate access arrangements will be agreed and communicated to all contractors and construction crews.

All Project employees, contractors and visitors who interact with members of the local community are expected to respect the cultural environments of the communities in which Project activities are being undertaken.

A community feedback and complaints process will be set out in the EMPs to ensure that all feedback and complaints are appropriately recorded and addressed.

26.4.2 Review of EMPs

It is expected that initial approval of EMPs will be a condition of Project approval. This process is expected to involve the formation of a Technical Working Group. In addition to the requirement to meet conditional matters approval, DIT has a mature engineering and design management framework (governed by Master Specification Part NW-PC-EDM1 to 5) which includes the certification and verification of key documents (i.e. design and a raft of management plans including those for the environment) by an Independent Certifier (IC). The IC is required to release documents prior to provision to the Authority.

EMPs are a live document and as such, post meeting conditions matters, they will be subject to regular review and a process of continuous improvement. These reviews are undertaken on an ongoing basis and in accordance with a formal review schedule developed as the Project progresses. An example EMP process is shown in Figure 26-1 (note, this is an example only and does not reflect the likely process followed by the DBOM contractor, which will include additional steps as set out above (i.e. the Technical Working Group and IC processes)).

A review of the EMP may also be triggered in the event of:

- changes to the scope and design of the Project
- changes in EMS objectives
- changes in regulatory standards
- environmental incidents, reported non-compliances or in response to complaints
- environmental audit outcomes which warrant improvement.

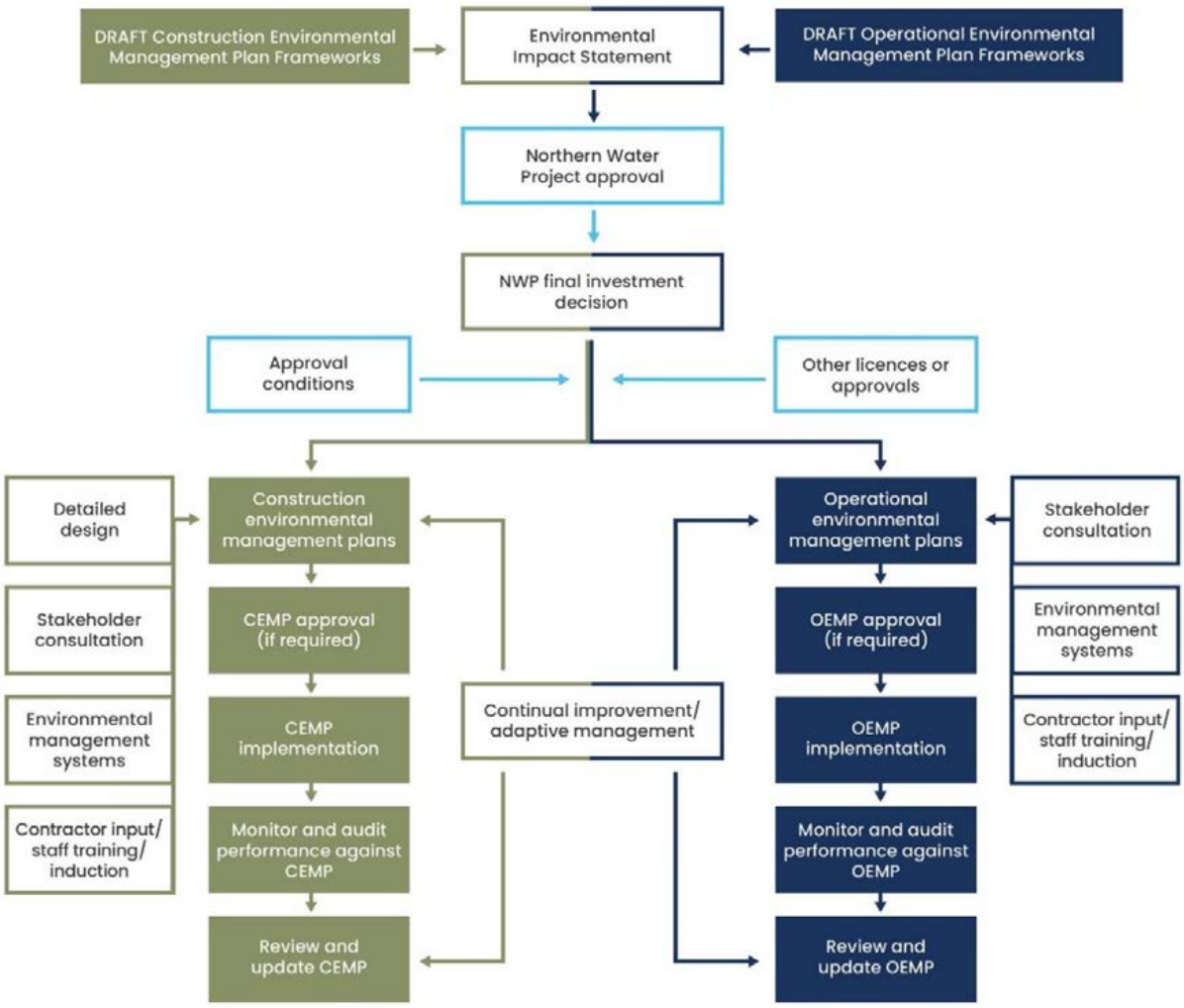


Figure 26-1: Example process for approval and review of EMPs (for information only)



Chapter 27

Conclusion

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27 CONCLUSION

The Northern Water Environmental Impact Statement (EIS) provides a comprehensive assessment of the Project and the expected effects on the receiving environment at a local, regional, state and national level. The EIS process is the highest level of assessment under the *Planning, Development and Infrastructure Act 2016* (PDI Act) and enables the holistic consideration of projects that are considered to be of economic, social or environmental importance to South Australia.

The Commonwealth Environment Minister has accredited the EIS process under the PDI Act to assess the controlled action for the Project. The State and Commonwealth governments liaised on the draft Assessment Requirements (ARs) for the EIS to ensure they met the requirements of South Australian and Commonwealth legislation. One EIS has been prepared, one period of public consultation is being undertaken, one Response Document and one Assessment Report will be developed to satisfy the legislative requirements of each jurisdiction.

The EIS is based on a significant body of technical studies and assessments. All of the EIS ARs set by the State and Commonwealth governments have been addressed through the application of sound science, evidence and reasoning.

Secure and reliable water supply is a critical constraint on development in regional South Australia, identified in SA's *Copper Strategy* and the State Government's *Water Security Statement 2022 – Water for Sustainable Growth.* Both strategies identify long-term water security as fundamental to economic growth and climate adaptation in South Australia. The current and future demand scenarios for copper, mining and green industries underpin the economics of the Project.

If approved, the Northern Water Project would provide a climate-resilient water source to northern South Australia while delivering benefits to the Upper Spencer Gulf and Far North regions of the state. Project benefits include:

- **Increased economic activity**
  - Increased Gross Regional Product by $3.3 billion on average between 2026-2062 and creation of an average 2,000 full time equivalent positions. Most of these benefits will be within Northern South Australia
  - Enabling greater investment in exploration and mining in the Gawler Craton region which hosts copper and other critical mineral deposits
- **Reduced reliance on existing water sources** including the Great Artesian Basin, creating an opportunity to support the long-term protection of culturally significant water sources such as GAB mound springs
- **Improved liveability for communities in the Whyalla and Northern South Australia regions** associated with increased economic growth.

Baseline studies, surveys, modelling and assessments have been undertaken to identify all potential environmental, social and economic impacts. Measures proposed to avoid,

minimise, manage and offset those impacts are identified throughout the EIS and will be further developed as part of the future detailed design and incorporated into Project-specific environmental management plans.

Protection of the marine environment is a high priority for the local community and understanding how the Project is likely to interact with the marine environment is a key focus for the Project. Extensive marine studies and surveys have informed the Reference Design of the desalination plant marine infrastructure with consideration given to the presence of sensitive marine habitats and key commercial fishery species in the vicinity of the marine infrastructure. Overall the assessment demonstrates that the Project is expected to have only minor effects within a highly localised zone around the diffuser, with negligible impacts beyond that area.

Stakeholder and community engagement for the Project has been wide-ranging, inclusive and ongoing, involving government departments, local councils, industry, key stakeholders, Traditional Owners and local communities and businesses. Early and ongoing engagement with local providers of goods and services has provided a good understanding of the opportunities to maximise local employment, procurement, business participation and economic benefit to the community.

Engagement with Traditional Owners has resulted in agreements for ongoing Project engagement and processes for working collaboratively on identification and management of areas of cultural heritage significance, economic development and skills, training and employment opportunities.

Consultation with affected and interested parties will be ongoing.

The conclusion from the EIS, is that the environmental and social impacts of the Project are considered acceptable, including in relation to the relevant Matters of National Environmental Significance under the *Environment Protection Biodiversity Conservation Act 1999* identified by the Commonwealth. The EIS also demonstrates that the Project would be consistent with the objects of the *Environment Protection Act 1993*, the general environmental duty under that Act and relevant environment protection policies under that Act.

If approved, the Project will provide a significant positive impact to regional and State economic performance and regional prosperity, expected to last well beyond the initial investment in the Project.



Chapter 28

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LIMITATIONS

Scope of services

This Environmental Impact Statement ("the EIS") has been prepared by JBS&G in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and JBS&G. In some circumstances, a range of factors such as time, budget, access and/or site disturbance constraints may have limited the scope of services. This EIS is strictly limited to the matters stated in it and is not to be read as extending, by implication, to any other matter in connection with the matters addressed in it.

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