Northern Water Project

Department for Infrastructure and Transport

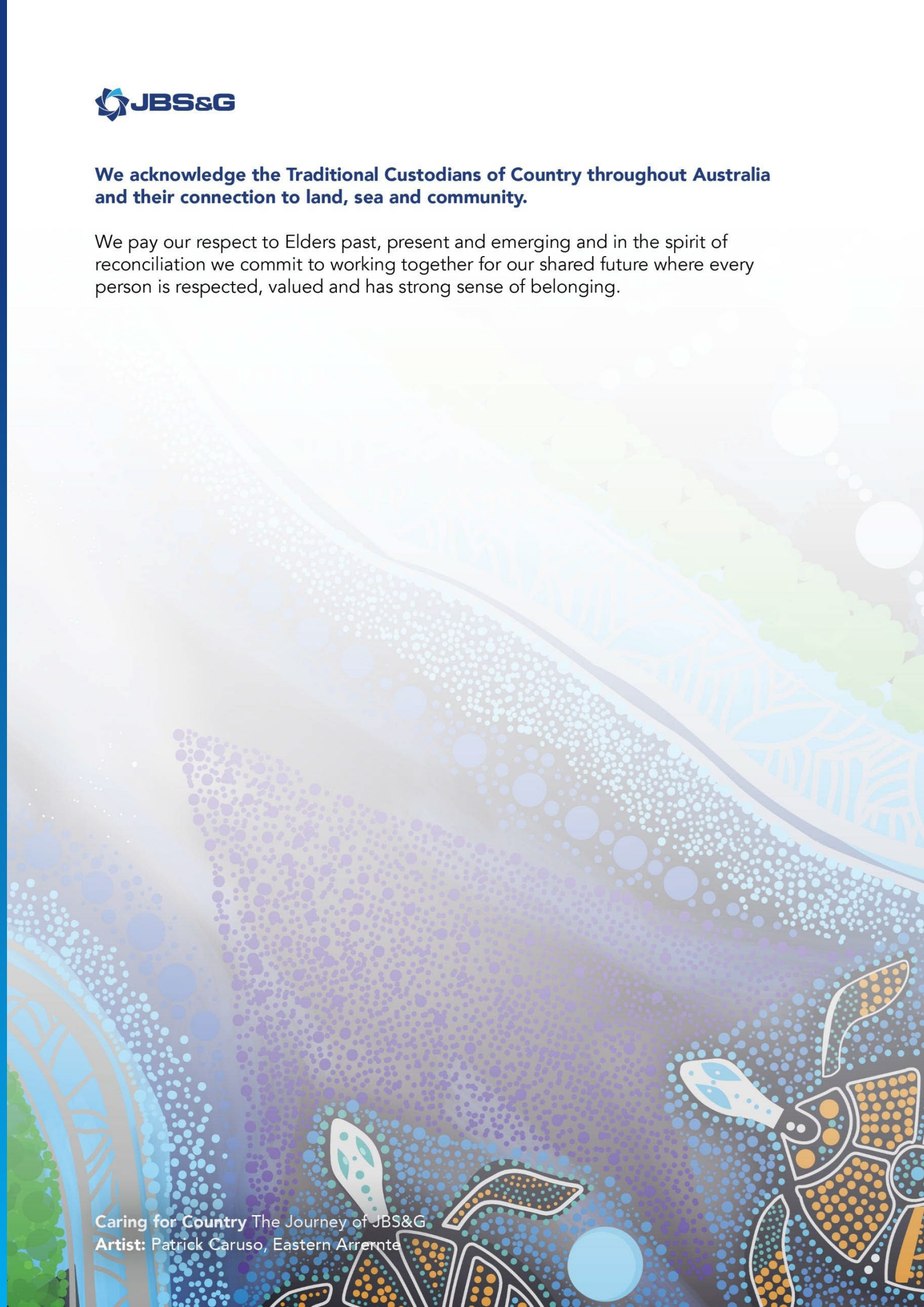
EPBC Referral - National Heritage Assessment

63753 | 172,684 (Rev 0)

17 December 2025

We acknowledge the Traditional Custodians of Country throughout Australia and their connection to land, sea and community.

We pay our respect to Elders past, present and emerging and in the spirit of reconciliation we commit to working together for our shared future where every person is respected, valued and has strong sense of belonging.



Caring for Country The Journey of JBS&G
Artist: Patrick Caruso, Eastern Arrernte

Table of Contents

List of Tables

List of Figures

Abbreviations

Term	Definition
CCSZ	Cuttlefish Coast Sanctuary Zone
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GL/y	gigalitre per year
LAT	Lowest Astronomical Tide
TBM	Tunnel Boring Machine
the Project	Northern Water Project (the Proposed Action)
SARDI	South Australian Research and Development Institute
TSS	Total Suspended Solids
USG	Upper Spencer Gulf

1. Introduction

1.1 Background

The Northern Water Project (the Project) aims to provide a secure, climate resilient water source for industry located in South Australia's Upper Spencer Gulf and Far North. This would 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 delivery of the Project will involve the construction and operation of a 51 gigalitre per year (GL/y) seawater reverse osmosis desalination plant at Mullaquana Station in the Upper Spencer Gulf and its connection to the Far North via approximately 400 km of transfer system (including pipeline, transfer pump stations and water storages) and electricity infrastructure. The proposed desalination site at Mullaquana Station is located approximately 25 km south-west from the centre of Whyalla.

This document presents an assessment of the significance of impacts of the Project on National Heritage Places protected as Matters of National Environmental Significance (MNES under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)). The focus of this report is the Cuttlefish Coast Sanctuary Zone, the only National Heritage Place within 100 km of the Project Area[1].

This document has been prepared in support of an EPBC Act referral for the Project and forms an attachment to the referral.

1.2 Cuttlefish Coast Sanctuary Zone

The Giant Australian Cuttlefish is an iconic species that occurs across the southern coastline of Australia. The Upper Spencer Gulf population of cuttlefish represents a distinct population which forms the largest known breeding aggregation in the world, along a small 8 km stretch of subtidal reef around Point Lowly, ~34 km from the proposed Northern Water desalination plant. On 24 February 2023, this unique aggregation area was declared a National Heritage Place under the EPBC Act as the Cuttlefish Coast Sanctuary Zone (CCSZ) Place ID 106353 and is highly valued from an ecological perspective and by the community of South Australia.

The relevant National Heritage List criteria and key values of the CCSZ as listed in the declaration in the Government Gazette (Commonwealth of Australia 2023) are:

- **Criterion (b) Possession of uncommon, rare or endangered aspects of Australia's natural or cultural history** – "*because each winter, a breeding aggregation of an iconic population of the Giant Australian Cuttlefish, involving tens of thousands of individuals occurs there. This is the largest and densest spawning aggregation of Giant Australian Cuttlefish in the world. During the event, intense competition between male cuttlefish within the aggregation leads to complex behaviours and spectacular massed displays of colour and shapeshifting. A shallow, fringing, rocky reef system within the place may offer a specific, spatially rare resource which benefits spawning success in the Giant Australian Cuttlefish*".
- **Criterion (c) Potential to yield information that will contribute to an understanding of Australia's natural or cultural history –** *" The Cuttlefish Coast Sanctuary Zone in South Australia is of outstanding heritage value to the nation under criterion (c) because the place, and the annual aggregation of Giant Australian Cuttlefish it supports, is likely to yield further information on this iconic marine species, its*

[1] The Project Area is defined in shapefiles included with the EPBC referral, and is based on a 2.5 km buffer of the alignment of linear infrastructure (i.e. a 5 km wide corridor) with isolated areas identified outside of this buffer for potential laydown locations.

habitat, and its role in broader marine ecology. The Giant Australian Cuttlefish exhibits complex and deceptive behaviour within the aggregation, using rapid camouflaging and signaling, which have provided the biological context for potential new bioinspired materials."

Figure 1-1 shows the Upper Spencer Gulf highlighting the location of the Northern Water Project Area in relation to the CCSZ. The CCSZ was not captured in a search of Protected Matters for the Project (which included a 5 km buffer). The Protected Matters Search Tool report is Attachment B of the EPBC referral.

1.3 Purpose and scope of this report

The purpose of this Assessment is to evaluate whether Project activities would have a significant impact on the key values of the CCSZ National Heritage Place.

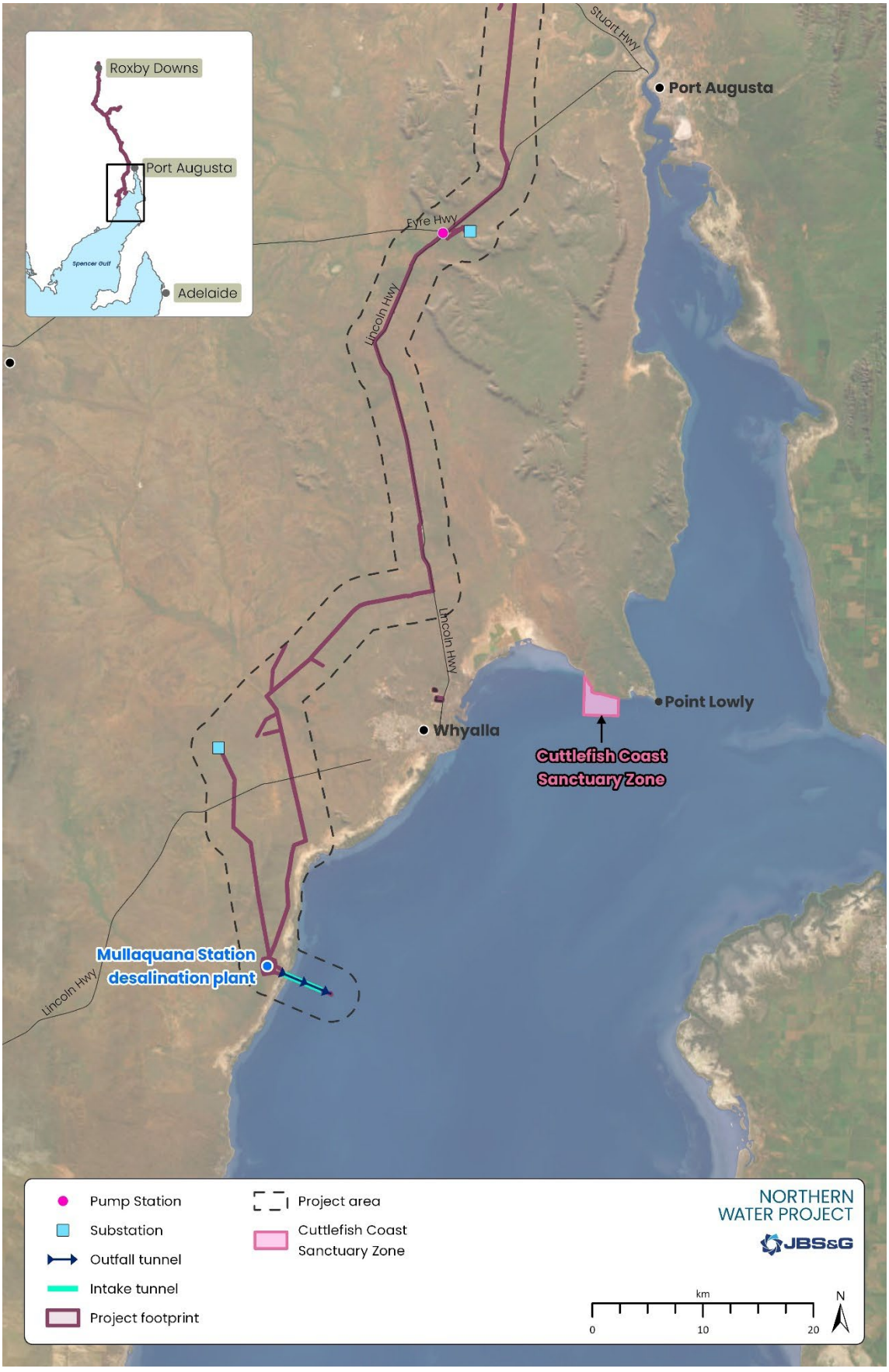


Figure 1-1: Location of the Project Area within the Upper Spencer Gulf and in relation to the Cuttlefish Coast Sanctuary Zone

2. The Project

The Project comprises the following key elements:

- 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 the Spencer Gulf
- diffuser structures for discharge of return water into the 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 storage tanks
- high voltage electricity supply including powerlines, 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.

This assessment focuses on the elements of the Project that have the potential to impact the CCSZ, including the desalination plant, marine infrastructure and terrestrial infrastructure to the extent that it is relevant.

2.1 Subject site description

The subject site for the desalination plant is at Mullaquana Station in the Upper Spencer Gulf (USG). The USG is an inverse estuary (where evaporation exceeds freshwater inputs) with elevated salinities in the upper reaches (Nunes Vas et al. 1990).

The USG supports commercial fisheries, recreational boating and fishing, aquaculture, shipping, industry and tourism. There are also areas managed for conservation purposes under the *Marine Parks Act 2007*. The USG Marine Park is located approximately 8 km north and the Franklin Harbour Marine Park is located approximately 11 km south of the proposed desalination plant marine intake and outfall infrastructure.

The CCSZ National Heritage Place is located adjacent to Port Bonython, within the Upper Spencer Gulf Marine Park approximately 34 km north-east from the proposed location of the desalination plant marine intake and outfall infrastructure.

The benthic habitats at the site are generally sandy and flat with extensive seagrass beds and intertidal mangroves. Habitat mapping has been undertaken for the project and is presented in Figure 2-1. Habitats within the marine Project Area vary along a depth gradient and were generally consistent within each depth range. Mangroves are present in the intertidal zone with areas of bare sand, Posidonia seagrasses dominate the subtidal area to 13 m where the seagrass then transitions to Zostera sp. out to approximately 15 - 16 m depth whereafter bare sand dominates. Bryozoans, algae and other invertebrates are present within sandy areas (Figure 2-1).

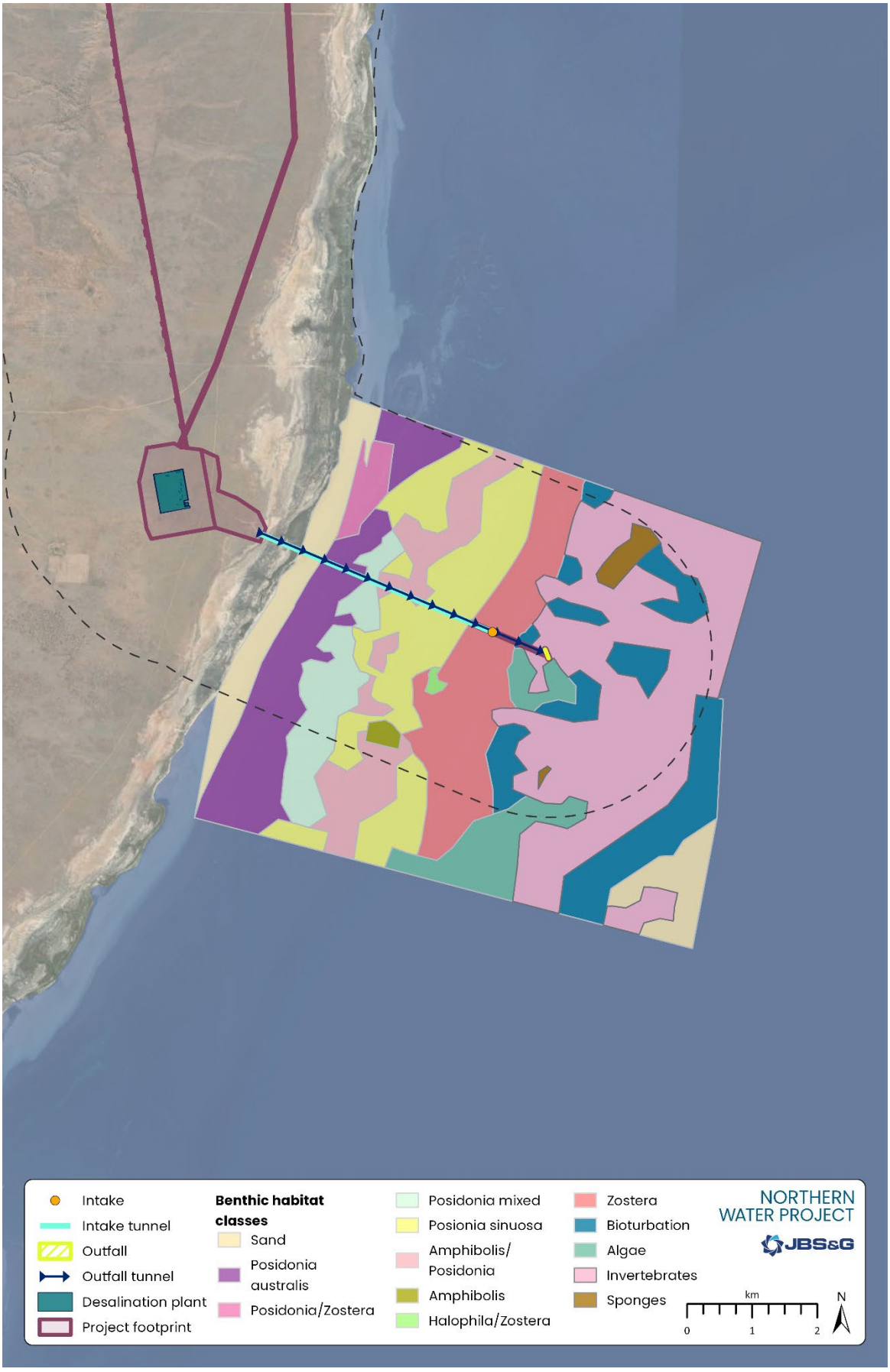


Figure 2-1: Marine benthic habitat classes in the Project Area

2.2 Desalination plant and marine infrastructure

The proposed desalination plant and associated marine infrastructure location is on the western shore of the USG at Mullaquana Station, south-west of Whyalla. The desalination plant includes an intake pump station, the desalination treatment process (pre-treatment and reverse osmosis membranes), product water storage tank(s) and/or pond(s) and ancillary equipment, facilities and power infrastructure at the plant. One of the five transfer system pump stations is also located at the desalination plant site.

Based on the Reference Design (prepared by GHD for the Project in 2025), the Northern Water desalination infrastructure comprises the following key elements relevant to this assessment:

- a 51 GL/y seawater reverse osmosis desalination plant located at Mullaquana Station approximately 25 km south-west of Whyalla
- marine intake and outfall tunnel/s extending under the seabed no less than 3 km (intake) and no more than 5 km (outfall) from the intake pump station
- a water intake head located at a minimum 13 m water depth from the Lowest Astronomical Tide (LAT)
- an outfall riser with diffusers located at minimum 17 m water depth from LAT
- diffuser structures designed to achieve adequate mixing at the outfall for effective dispersal of return water into Spencer Gulf.

2.2.1 Intake and outfall pipe

Marine infrastructure, including tunnels, intake and outfall structures, may extend as far as 5 km from shore, with no infrastructure to be constructed on the seabed within 3 km from the intake pump station. The marine intake and outfall pipes would be constructed under the seabed using tunnel boring machines (TBMs). The marine infrastructure on the seabed would comprise the intake head and the outfall riser with diffuser array.

The exact length of tunnels and location of the intake and outfall structures will be refined with inputs from hydrodynamic modelling and detailed design, but as a minimum the intake structure is expected to be no less than 3 km from the intake pump station and the outfall structure is expected to be no more than 5 km from the intake pump station. The outfall and intake structures would also be sufficient distance apart to avoid recirculation of seawater concentrate back into the plant.

Alternate marine intake and outfall construction methodologies including construction of a single tunnel, rather than two tunnels, and the use of float and sink construction seaward of the intake head may also be considered.

2.2.2 Intake structure

The intake structure facilitates the extraction of seawater for treatment within the desalination plant. Intakes are typically sited to target optimal substrate, benthic, and seawater conditions, and minimise environmental impacts. Intake screens are generally elevated above the seabed to minimise entrainment of sediments and demersal biota. With intake screen velocity of 0.15 m/s the design minimises entrainment and allows mobile organisms to swim away.

The intake is estimated to be 11.5 m diameter and with the intake grill elevated 3 m from seabed, the total height of the structure is set at 6 m from the seabed (Figure 2-2).

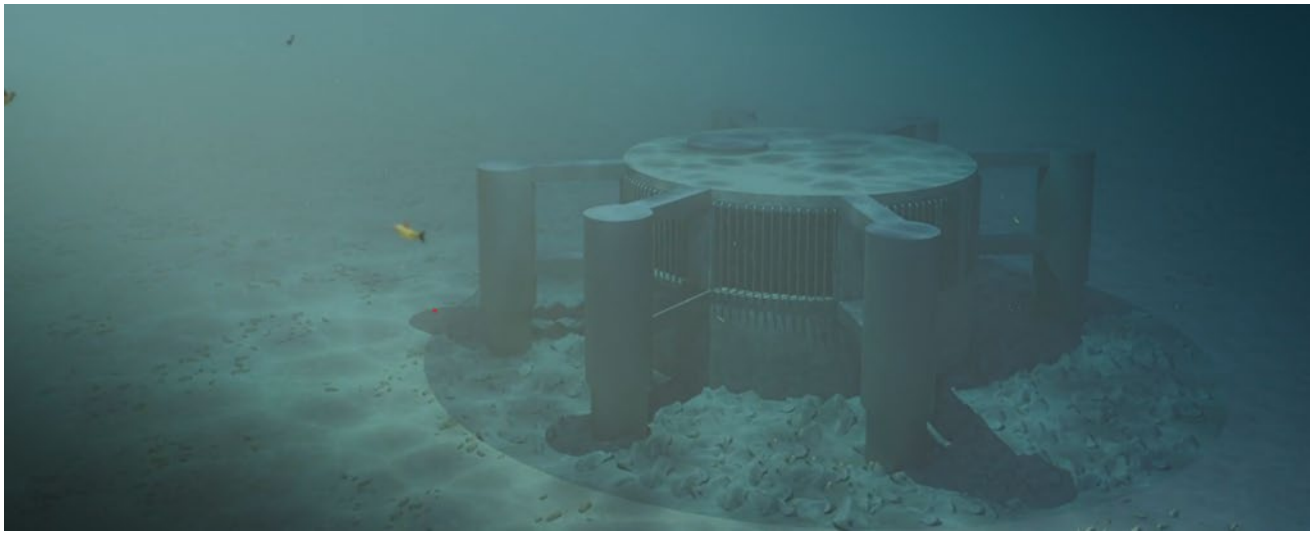


Figure 2-2. Visual representation of intake structure

2.2.3 Outfall and diffuser structure

The desalination plant would discharge the return water back into Spencer Gulf through an outfall tunnel containing a pipe connected to a diffuser array. The diffuser array would be connected to the outfall tunnel and pipe via a riser. A riser cap would be fitted to the riser, and the riser array pipe connected into the riser via a tee-arrangement housing eight diffuser nozzles. The diffuser array would be secured to the seabed using piles, rather than being excavated into the seabed.

The outfall structure and diffuser array (Figure 2-3) has been designed to achieve effective dispersal of return water. Section 3 describes the results of preliminary modelling of the return water.

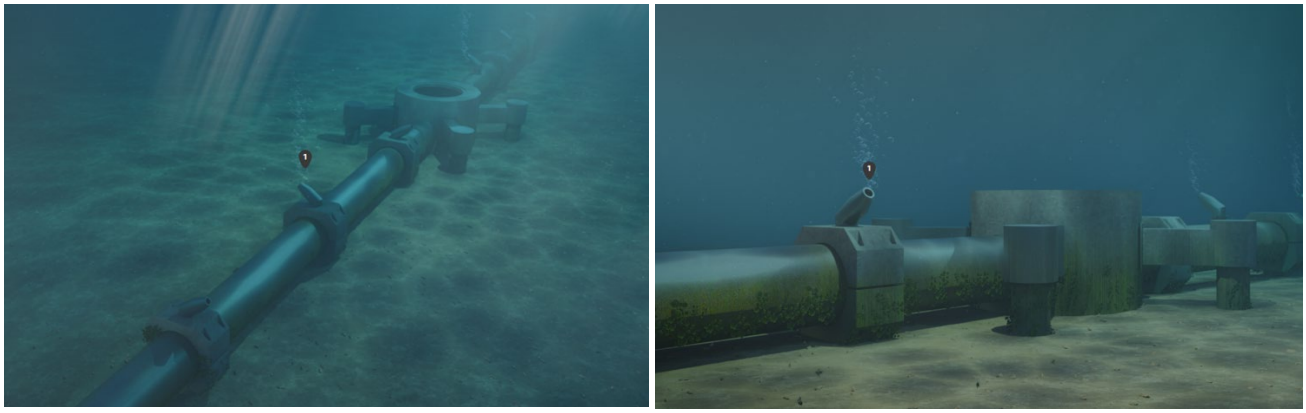


Figure 2-3: Visual representation of outfall diffuser

2.2.4 Key Project operational assumptions

The key assumptions related to Project operation upon which the assessment has been based include:

- Desalination plant design capacity: 51GL/y
- The system is designed as a one pass RO system operating at 40% overall plant recovery
- Intake velocity: 0.15m/s
- Mullaquana Station ambient salinity ranges from 38-41 PSU (<41 PSU 95% of the time)
- Outfall salinity: 65.77 - 70.95 PSU (modelling uses upper limit)
- Outfall return water is largely continuous and contains antiscalants, biocides and cleaning products.

3. Return Water Hydrodynamic Modelling

Modelling of return water dispersion has 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).

Dispersion modelling is conservatively based on upper-end ambient site salinity at 41 PSU, and upper-end predicted return water salinity (70.95 PSU).

3.1.1 Whole of Gulf Model (Farfield model)

A 1 km resolution 3D hydrodynamic model was developed by SARDI for the Spencer Gulf to examine the effect of hydrodynamics on the far-field dispersal of return water discharges, and the connectivity of planktonic larvae with the desalination plant intake at Mullaquana Station.

3.1.2 Return water modelling (Midfield and Nearfield models)

Midfield modelling is being undertaken by Water Technology to simulate the dispersion of the return water in the environment so that the following could be assessed:

- 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 as defined by the salinity change environmental criteria
- Associated 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 model is calibrated and validated against site-specific data demonstrating its ability to represent local hydrodynamic conditions in terms of water levels, currents, temperature and salinity.

The validated model is 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 turn down capacity of 40 ML/day) and a hypothetical highest capacity understood to be 73 GL/y. For conservatism, preliminary modelling results for the 73 GL/y scenario are presented in this Assessment. Demonstrating that model outputs achieve prescribed environmental criteria at the higher capacity scenario provides confidence that environmental performance would be achieved for the capacity being sought in this approval (i.e. 51 GL/y). Noting that a criteria of 95% species protection is expected for the project, and this is subject to confirmation through finalisation of South Australian Government Assessment Requirements.

The following is a summary of the modelled scenarios:

- 51 GL/y or 140 ML/day (at 95% availability)
- 73 GL/y or 200 ML/day (at 95% availability)

- Turn down (40 ML/day).

Simulations are being undertaken for different seasonal periods, and also for instantaneous scenarios including dodge tides.

Simulations including water intake and return water discharges through the outfall are being used to inform impact assessments.

The model will be used to predict impacts at identified receptors including habitats for Mangrove, *Posidonia sinuosa* seagrass, *Posidonia australis* seagrass, Zostera seagrass, Posidonia/Amphibolis seagrass, Sand/bioturbation, Sand/invertebrates/algae, Bryozoan community and the Upper Spencer Gulf Marine Park and Franklin Harbour Marine Park.

Nearfield modelling is being 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. The Nearfield model is used to assess the following:

- 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 Total Suspended Solids (TSS).

3.1.3 Entrainment

Western King Prawn, Snapper and King George Whiting larval entrainment is being 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 are being 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 uses a 1 km radius from the intake (i.e. an area within a 2 km diameter).

3.1.4 Preliminary results of modelling

Modelling is currently in progress and the following are key preliminary outputs from the modelling (which are subject to confirmation as part of the finalised model reports).

Key preliminary modelling outputs:

Near-field (Water Technology – preliminary results): The proposed outfall design will create sufficient mixing to achieve compliance with prescribed environmental criteria. The nearfield modelling showed that salinity beyond the immediate vicinity of the marine discharge diffusers would remain within the range of natural seasonal variability. Dilutions were generally above 99% species protection trigger value criterion, even under low current and low flow conditions. Dilutions below the criterion occurred at distances considerably less than the edge of the nearfield mixing zone (100 m from the outfall).

Mid-field (Water Technology – preliminary results):

Marine hydrodynamic modelling undertaken for the Project demonstrates that return water dilution would be sufficiently high to protect the marine environment/species and achieve prescribed environmental criteria (noting that a criteria of 95% species protection is expected for the project, and this is subject to confirmation through finalisation of South Australian Government Assessment Requirements). Using the recommended dilutions from the ecotoxicology assessment, key preliminary findings from the mid-field modelling, and relevant to this cuttlefish assessment, are as follows:

- 95% of species would be protected from impacts associated with the return water within ~500 m from the diffusers

- Salinity beyond the immediate vicinity of the diffusers would remain within the range of natural seasonal variability
- In addition to the achieving 95% species protection levels in close proximity to the return water discharge, and that salinity changes are within natural seasonal variability, fish, cuttlefish and other mobile marine fauna generally have the ability to move away from the diffuser or osmoregulate in response to elevated salinity
- Total suspended solids modelling results conclude that discharging desalination plant 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 predicted impacts to marine biota from dilutions of return water during dodge tides are considered negligible

Figure 3-1, Figure 3-2 and Figure 3-3 show key preliminary outputs from the mid-field hydrodynamic model that support and justify the key preliminary findings above.

Far-field (SARDI - preliminary results): Gulf wide hydrodynamic modelling concluded that discharges do not accumulate over time and that far-field salinity changes are within the range of natural salinity variability within the gulf. The tides at Mullaquana Station are expected to be effective in dispersing and diluting desalination discharges in the far-field (> 3-5km).

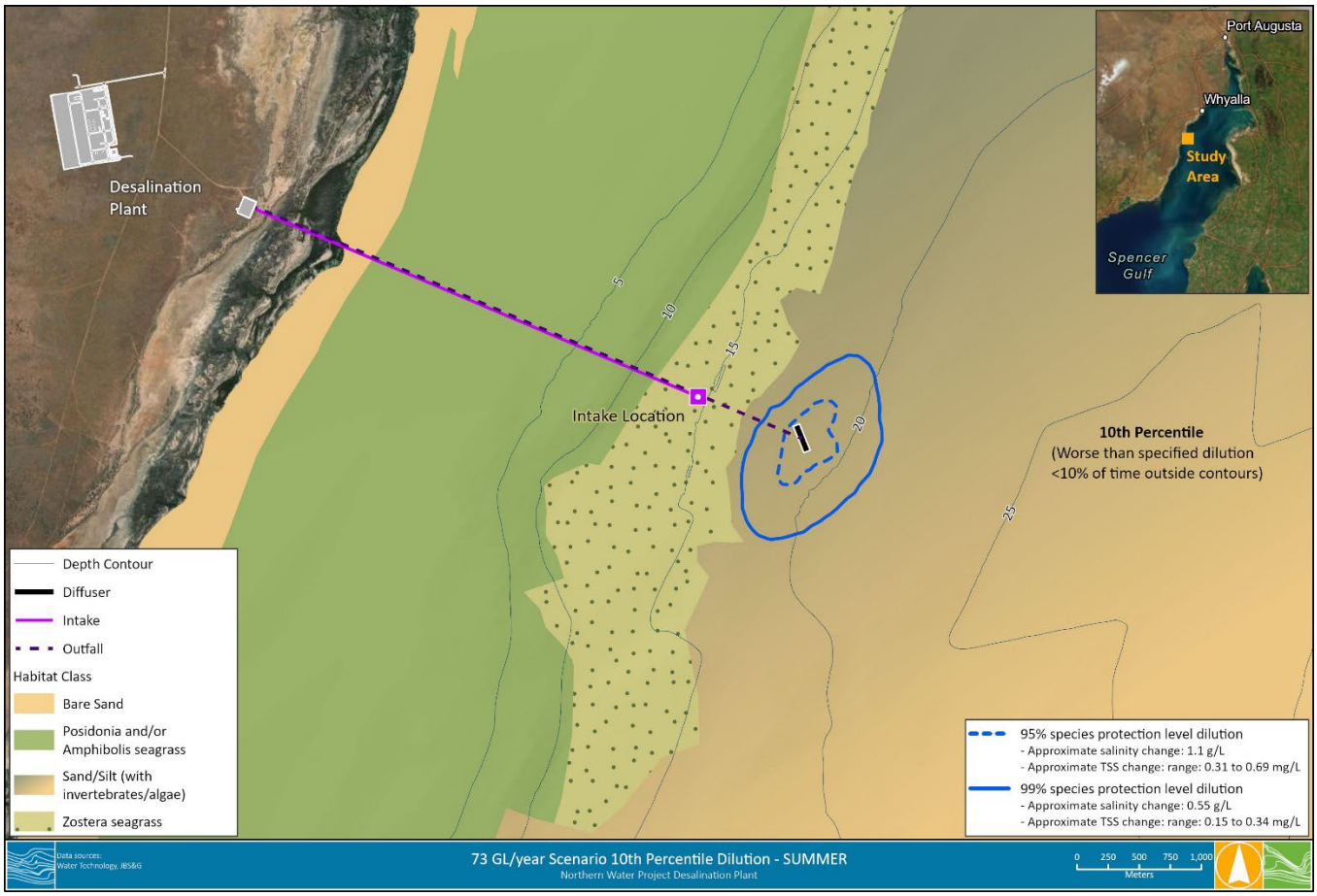


Figure 3-1. 73GL/y – Dilution modelling output for Summer (10th percentile i.e. worse than specified dilution less than 10% of the time outside contours) and TSS change contours

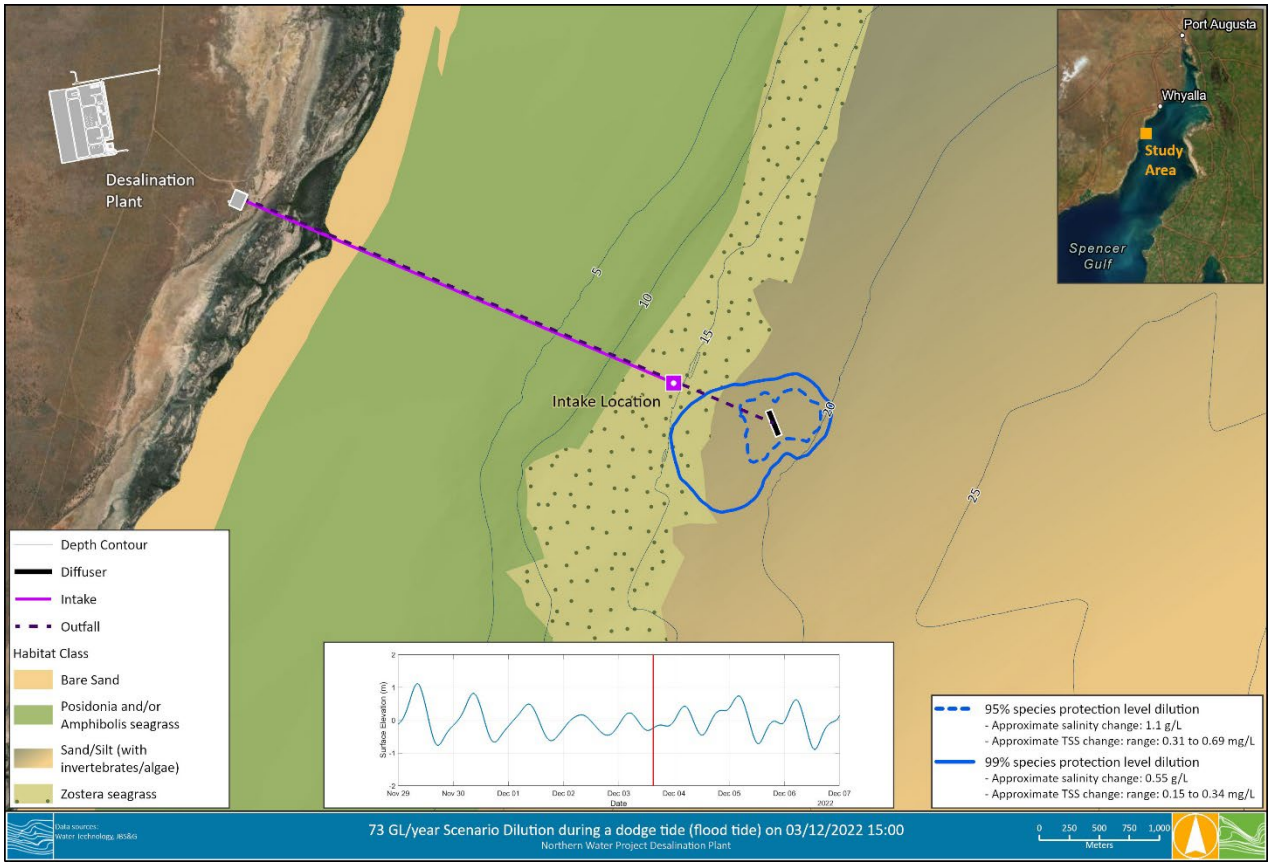


Figure 3-2. 73GL/y – Instantaneous dilution during a dodge tide (flood tide) and TSS change contours

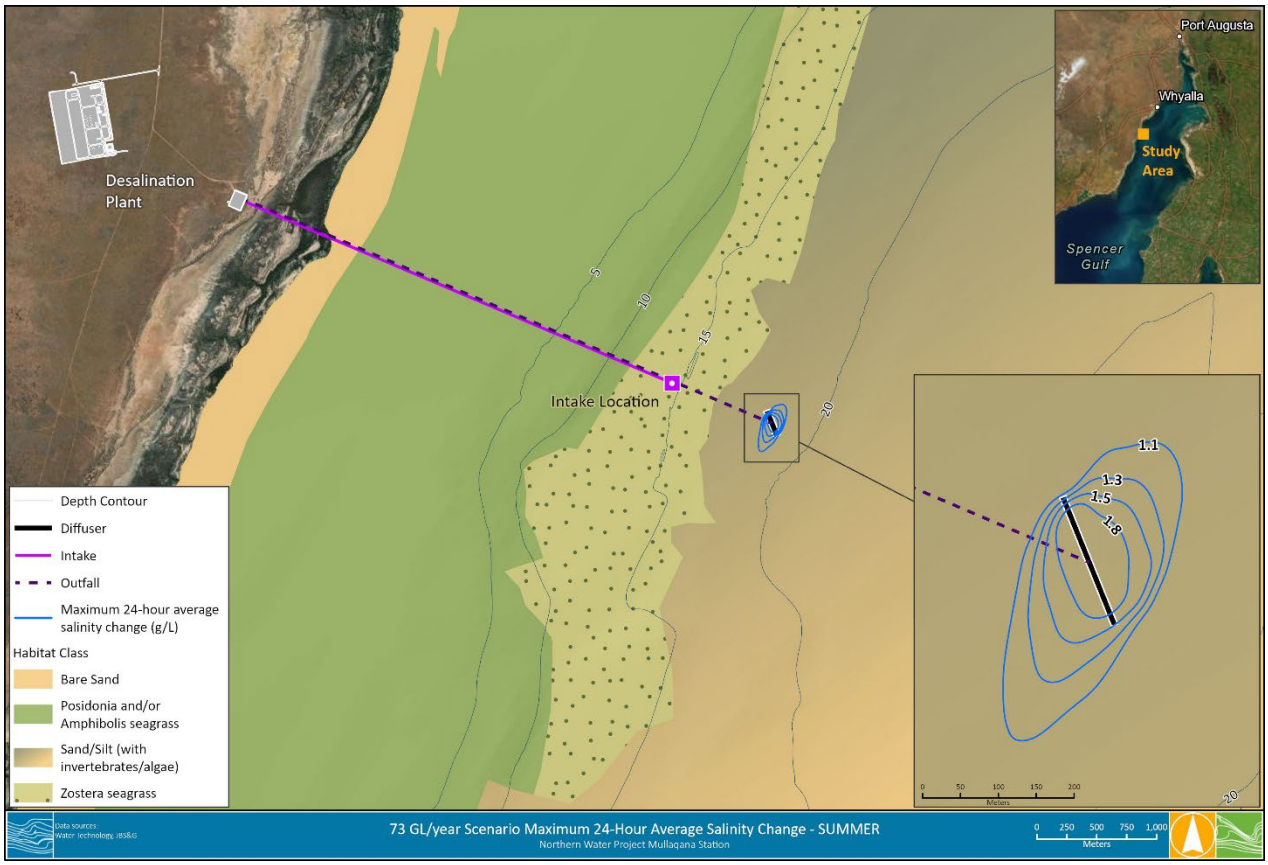


Figure 3-3. 73GL/y – Maximum 24-hour Average Salinity Change (Summer)

4. National Heritage Assessment Methodology

4.1 Desktop review

- **Protected Matters Search Tool (PMST) Report** – identified no listed Heritage Places. **The CCSZ was not captured in a search of Protected Matters for the Project** (which included a 5 km buffer from the Project Area boundary). The Protected Matters Search Tool report is included as Attachment B in the EPBC referral.
- **Review of relevant background literature**. A review of existing literature was conducted to better understand Giant Australian Cuttlefish water quality requirements, breeding ecology and distribution and habitat use in northern Spencer Gulf. Consulted literature included:
    - Peered-reviewed scientific articles
    - Advice Note on Giant Australian Cuttlefish population estimate from SARDI
    - PIRSA Fishery Assessment Reports
    - Olympic Dam Expansion Draft Environmental Impact Statement (BHP 2009).

4.2 Technical assessments undertaken

The assessment of the operation of the proposed desalination plant uses preliminary hydrodynamic modelling undertaken for the Project by both SARDI and Water Technology Pty Ltd as the basis to establish and describe the zone of influence from the desalination return water as described in Section 3.

The zone of influence from the mid-field hydrodynamic modelling, relied on the safe dilutions established in preliminary Ecotoxicology Assessment undertaken by WQ Advice that would protect 95% and 99% of species (noting that a criteria of 95% species protection is expected for the project, and this is subject to confirmation through finalisation of South Australian Government Assessment Requirements).

Other preliminary studies that have been undertaken for the Project and relied upon for this assessment include:

- Marine benthic habitat mapping of the marine Project Area, undertaken by JDiversity (see Figure 2-1)
- Marine ecology survey and assessment of the Project Area, undertaken by JDiversity
- Underwater Noise Assessment, undertaken by Resonate Acoustic Consultants.

4.3 Significant Impact Assessment

The assessment of the likelihood of significant impacts from the Project on the CCSZ follows the process outlined in the MNES Significant Impact Guidelines (DoE 2013).

As per the criteria provided in the guidelines (DoE 2013), the assessment interrogates whether there is a real chance or possibility that activities associated with the Project's construction or operation will cause:

- one or more of the National Heritage values to be lost
- one or more of the National Heritage values to be degraded or damaged, or
- one or more of the National Heritage values to be notably altered, modified, obscured or diminished.

All values associated with Biological and ecological values and Wilderness, aesthetic, or other rare or unique environment values and the relevant values associated with geology or landscapes as defined in the significant impact guidelines have been included in this assessment.

5. Giant Australian Cuttlefish overview

The Giant Australian Cuttlefish (*Sepia*[2] *apama*) is endemic to waters off southern Australia between Western Australia to New South Wales.

Within their broad Australian distribution, genetic studies found that there were distinct populations in New South Wales, South Australia/Victoria and Western Australia (Hall & Fowler 2003), and that cuttlefish from northern Spencer Gulf (above -33.828°, north of Arno Bay/Wallaroo) were a separate population from those in southern Spencer Gulf, and appeared to be the only population represented in the spawning aggregation at Point Lowly (Gillanders *et al.* 2016). The Upper Spencer Gulf cuttlefish population has not been formally described as a distinct species and is not considered to be a distinct species for the purposes of the EPBC Act (TSSC 2011). This report focuses on *Sepia apama* Upper Spencer Gulf (USG cuttlefish).

The cuttlefish that aggregate at the CCSZ are thought to remain in the northern portion of Spencer Gulf (north of Arno Bay) throughout their lifecycle (Gillanders et al. 2016).

During the breeding season between May and August, mature individuals aggregate at the subtidal rocky reefs between Black Point and Point Lowly within USG. Rock crevices provide stable structures for egg attachment, and refuge for hatchlings.

Outside of breeding season, USG cuttlefish generally remain solitary (Gillanders and Payne, 2014), and inhabit various benthic habitats including coral areas, seagrass beds and other open trawl grounds (Jereb and Roper 2005) which can be found throughout Upper Spencer Gulf. A migration 'pathway' for the species is not evident as it appears (predominantly from fisheries bycatch data) that the species aggregates to their breeding site from all areas around northern Spencer Gulf (Gillanders and Payne 2014).

Since monitoring of the cuttlefish breeding aggregation began in 1998, cuttlefish abundance in Spencer Gulf has experienced significant fluctuations ranging from an estimated 13,452 individuals at the aggregation site in 2013 to 247,146 in 2020. The most recent abundance estimate is 63,734 individuals in 2025 (the fifth lowest values on record since 1998 (SARDI 2025).

Cuttlefish are unable to control salt concentrations in their body fluids (i.e. cannot osmoregulate), which makes them vulnerable to variations in water salinity (Gillanders and Payne 2014). Low water salinity has been linked with elevated mortality rate and cellular damage in the Cuttlefish *Sepia pharaonis* (Xin *et al*. 2022), and high salinity was shown to negatively impact cuttlefish embryo development and egg hatching (Gillanders *et al*. 2016). Tolerance levels to water salinity in cuttlefish appears to be species and population specific, with different species showing different optimal ranges.

The USG cuttlefish population is adapted to the higher levels of salinity found in Upper Spencer Gulf, compared with the lower Gulf (Steer et al 2013). Salinity gradients associated with the inverse estuary mean ambient salinities at Point Lowly are much higher than lower in the gulf. Salinities in the upper reaches of Spencer Gulf can reach 48 ppt (Nunes Vas *et al* 1990), suggesting the USG population is adapted to elevated salinity levels.

Ecotoxicological studies on desalination plant discharge indicate that cuttlefish embryos are particularly vulnerable to increased salinities (Gillanders et al., 2016). While mobile adult and juvenile cuttlefish can avoid unsuitable conditions by swimming away, embryos are fixed to the substrate and thus more susceptible to localised increases in salinity.

[2] Genus has recently changed to *Ascarosepion*. Species name is now '*Ascarosepion apama'* (MolluscaBase 2025) but this report uses '*Sepia apama*' for consistency with EPBC Act documentation.

The marine Project Area off the coast of Mullaquana Station does not provide important, unique or breeding habitat for USG cuttlefish and the species is not known to regularly utilise the area (based on data from seasonal surveys undertaken for the Project by JDiversity (2025)).

6. CCSZ Impact Assessment

6.1 Identified sources of potential impact and key findings

The assessment of potential impacts to the National Heritage values of the CCSZ identified the following potential sources for impact:

- **Desalination plant return water during operation potentially impacting water quality in the CCSZ.** The distance between the proposed desalination plant and the CCSZ means there is no real chance or possibility that return water from operational activities could adversely affect the CCSZ. This was confirmed with hydrodynamic modelling of the return water (see Figure 3-1, Figure 3-2 and Figure 3-3).
- **Noise from construction or operational activities potentially impacting cuttlefish within the CCSZ**. The distance between construction activities and the CCSZ means there is no real chance or possibility that noise from construction or operational activities could adversely affect the CCSZ.
- **Increased shipping from the desalination site to Whyalla during construction potentially impacting cuttlefish within the CCSZ**. This was assessed as negligible due to the anticipated low traffic volumes relative to existing traffic near the CCSZ, the temporary nature of the increased shipping activity, and the implementation of appropriate control measures.
- **Spills of fuel or chemicals in the Project Area potentially impacting the CCSZ**. This risk is regarded as low given the large distance to the CCSZ and the low quantities of fuel and chemicals used.
- **Disturbance of sediments or erosion on the terrestrial pipeline alignment during construction and operation potentially impacting water quality within the CCSZ through sediment transport**. The distance between the location of the Project Area and the CCSZ mean there is no real chance or possibility that sedimentation from the Project Area could adversely affect the CCSZ.

There are no direct impacts from the Project on the CCSZ. At its closest point, the CCSZ is ~34 km from the proposed desalination plant and more than 15 km from the nearest proposed terrestrial infrastructure (water transfer system and transmission line).

In terms of the population of USG cuttlefish more broadly, although it is acknowledged that individual transient cuttlefish may be present from time to time, the marine Project Area off the coast of Mullaquana Station does not provide important, unique or breeding habitat for USG cuttlefish and the species is not known to regularly utilise the area (based on data from seasonal surveys undertaken for the Project by JDiversity (2025)).

6.2 CCSZ impact assessment

6.2.1 Return water during desalination plant operation

There is no real chance or possibility that return water from operational activities could adversely affect the CCSZ.

The operation of the desalination plant has the potential to locally change water quality through elevated salinity and water temperature of the return water discharge, and inclusion of low levels of chemical contaminants including antiscalants, biocides and cleaning agents from plant processing.

The values of the CCSZ would not be affected by the desalination return water, as the desalination plant is ~34 km from the CCSZ. This is well outside the zone of any direct or indirect impact to the marine environment from the desalination plant.

Preliminary mid-field modelling shows salinity at the desalination plant marine discharge returns to within the normal range of local ambient conditions within the immediate vicinity of the outfall. The mid-field hydrodynamic modelling indicates that 95% of species would be protected from impacts associated with the return water within ~500 m from the diffusers.

Discharge of cleaning chemicals or antiscalants in the return water is not expected to affect marine biota, as these additives generally make a negligible contribution to the toxicity of return water. The cleaning chemicals and antiscalants proposed to be used for the Project are in line with those approved by the South Australian Environment Protection Authority (the EPA) for use at the Adelaide desalination plant. Previous studies have found that the toxicity of desalination plant return water is driven by the high salt concentrations, and chemical additives contribute very little to the toxicity for most species (WQ Advice 2025). Therefore, the safe dilution rates derived for salinity ecotoxicity are likely to also be protective for antiscalant and CIP chemical toxicity (WQ Advice).

The EPA has strict compliance limits and monitoring requirements as part of the environmental licence to operate a desalination plant. The Project would implement a program for operational compliance and water quality monitoring to meet the requirements of the EPA and to reduce environmental risk from the operation of the desalination plant and associated return water.

Distance from the CCSZ was a key consideration in the site selection process to ensure the desalination plant return water did not interact with this National Heritage Place.

Far-field modelling shows the desalination return water from the outfall at Mullaquana Station has no impact on salinity in the vicinity of the CCSZ or other areas in the Upper Spencer Gulf. Impact of desalination return water to the cuttlefish within the CCSZ is therefore considered unlikely.

In addition, no Cuttlefish were recorded in surveys of the Project Area off Mullaquana Station. 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.

6.2.2 Noise from construction and operational activities

There is no real chance or possibility that noise from construction and operational activities could adversely affect cuttlefish within the CCSZ.

Construction of the Project would generate both terrestrial and underwater noise which is not expected to be audible at the CCSZ. Earthmoving equipment, vehicles delivering pipeline and fill material, cranes and other machinery would be the main terrestrial noise generating sources. There is no risk that terrestrial construction noise could adversely impact cuttlefish underwater in the CCSZ given the separation distance from the Project Area of at least 15 km to the nearest terrestrial pipeline location.

Underwater construction activities would be undertaken at the desalination plant site and would involve tunnel boring, drilling, support vessels and impact piling. An underwater noise and vibration assessment was undertaken for the Project, which conservatively identified the potential for physiological and/or behavioural effect on cephalopods (cuttlefish) within a 4,750 m radius of impact piling activities (Resonate 2025). Impact piling would be of limited duration during construction, and undertaken ~34 km from the CCSZ and is therefore not expected to impact cuttlefish in the CCSZ, or developing cuttlefish embryos. Noise associated with increased vessel movements is covered in 6.2.3.

The main terrestrial operational noise sources include the operation of the desalination plant and the pump stations. Water-borne operational noise would derive from the intake pump. The Project infrastructure is located over 15 kilometres from the CCSZ at its nearest point (terrestrial). As such, it is considered unlikely

that terrestrial operational noise would be audible at the CCSZ. Operational underwater noise from the operation of the intake pump was assessed as unlikely to impact cephalopods (Resonate 2025).

Generation of underwater noise during operation is limited to operation of the intake pumps. These are ~34 km from the CCSZ and there is no real chance or possibility of impacts on the CCSZ.

6.2.3 Increased vessel movements during construction

Increased marine traffic is not expected to adversely affect cuttlefish within the CCSZ during construction.

Project-related marine traffic from the desalination plant site to and from Whyalla Port would increase temporarily during construction of the desalination plant. Construction of the intake and outfall structures would require a jack-up barge (JUB) stationed at the site, plus support vessels (supply barge, up to 3 tugs, line boat, safety boat and spoil barge). Construction for the risers is expected to take approximately 21 months. Approximately 3,000 m^3 of spoil removed for construction of the risers would be transported from the desalination site to Whyalla via a barge, which would generate an estimated 6 to 7 trips in total. The expected daily increase in vessel movements during marine construction considered negligible in relation to the existing/current volume of shipping movements in the USG. The fact the USG cuttlefish aggregate adjacent to the Port Bonython jetty, an existing hydrocarbon import/export terminal that has been operating for over 40 years, suggests the USG cuttlefish are tolerant of marine traffic.

No impact to the CCSZ from Project construction vessels is anticipated. Whyalla Port is over 10 km from the CCSZ. The temporary increase in the number of vessels may increase the possibility of introducing invasive marine species that could negatively impact cuttlefish and their breeding habitat in the CCSZ. However, the risk of introducing or contributing to the spread of invasive marine species in the CCSZ would be adequately controlled and managed as per the measures detailed in the Invasive Marine Species Risk Assessment being undertaken for the Project (by Aquatic Biosecurity).The existing/current volume of marine traffic in the vicinity of the USG cuttlefish aggregation area suggests that the population would not be impacted by a small increase of traffic greater than 10 km from the CCSZ.

There is no real chance or possibility that Project related marine traffic could adversely impact the CCSZ.

6.2.4 Risk of spills in the Project Area

The risk that potential spills of fuel or chemicals in the Project Area reach the CCSZ and adversely impact cuttlefish is low.

Construction of the Project would involve relatively small quantities of chemicals and the risks to surface and marine waters associated with minor spills is generally low. Potential pathways of spills of fuel or chemicals into the environment include:

- chemicals and hydrocarbons used during construction, such as fuels, lubricants, and cleaning agents, could be accidentally released into the marine environment from terrestrial or marine-based construction activities
- accidental discharges from temporary facilities or construction runoff.

Management measures would be implemented to maintain the risk of spills to as low as reasonably practicable, and would include:

- avoid terrestrial vehicle refuelling in close proximity to watercourses
- no refuelling in the marine environment
- implement terrestrial and marine measures for fuel, oil and chemical management, spill prevention, response and clean-up, trench/dredge dewatering, hydrotest water disposal and management of contaminated water (e.g. leachate from acid sulfate soils)

- support vessels and safety boats onsite during construction prepared to deploy countermeasures in the event of an accidental oil/fuel spill.
- conduct regular inspections and maintenance of equipment to prevent failures during terrestrial and marine-based construction activities
- undertake field screening to determine presence of acid sulfate soils if excavating in a risk area and apply procedures as needed.

The risk of any spill of fuel or chemicals impacting the CCSZ is further mitigated by the distance of the Project Area from the CCSZ. In addition, the Project terrestrial infrastructure would not disturb any watercourse that discharges directly into Spencer Gulf.

Given the above, the risk to the CCSZ from spills of chemicals or fuels is considered to be low.

6.2.5 Sedimentation and water quality within the CCSZ

There is no real chance or possibility that sedimentation from the Project Area could adversely impact water quality within the CCSZ

Sedimentation from the Project construction is unlikely to impact the CCSZ due to the distance of the Project Area from the CCSZ, the sediment and erosion controls in place during construction, and the limited duration of construction activities.

Sedimentation in the marine environment is not anticipated as a result of terrestrial construction of the desalination plant. Detention basins would be installed and a site-specific Soil Erosion and Drainage Management Plan (SEDMP) developed to contain and manage stormwater onsite and minimise the risk of sedimentation at the desalination plant site to as low as reasonably practicable.

The proposed terrestrial pipeline and transmission line are located more than 15 km from the CCSZ and are not crossed by any watercourses that discharge directly into the CCSZ. There is no pathway for terrestrial elements of the Project to result in surface water run off to the marine environment at or near the CCSZ. Notwithstanding that, during Project construction, appropriate sediment and erosion controls (such as berms on slopes, hay bales and geotextile fencing) would be in place to control erosion in accordance with the Stormwater Management Plan (prepared by GHD for the Project).

Seabed disturbance during construction of the intake and outfall risers may locally increase turbidity and suspended sediment in the Project Area (~34 km from the CCSZ), however seabed disturbance has been minimised through constructing the tunnel/s below the seabed via tunnel boring machine (TBM). For operation, preliminary results from the mid-field hydrodynamic model indicate that modelled changes in total suspended solids are small and within natural variation within close proximity of the outfall (see Figure 3-1 and Figure 3-2).

Turbidity curtains would be used to control the spread of turbid water, and management measures will be incorporated into a Marine and Coastal Construction Environment Management Plan, Marine Water Quality and Monitoring Management Plan and Dredge Management Plan. Implementation of control measures would minimise potential impacts of turbidity and silt deposition arising from installation of the intake and outfall risers.

There is no real chance or possibility that sedimentation from the Project Area could adversely affect the CCSZ.

6.3 Cumulative impacts

The National Heritage Assessment in Section 6.2 concludes that the Northern Water desalination plant and pipeline would not impact the CCSZ, hence, there are no cumulative impacts that arise from the Project.

The USG has a strong industrial history with existing iron and steel making facilities and port infrastructure. Heavy industry and resources (mining, steel, energy) support the coastal cities of Whyalla, Port Pirie and Port Augusta, alongside significant commercial and recreational fishing (prawns, crabs, snapper, whiting), as well as tourism operations. With the heavy focus on USG as an industrial hub, there are several proposed developments in the area. The proposed Port Bonython Hydrogen Hub is a proposed adjacent the CCSZ, and would involve an export facility and large-scale clean hydrogen production precinct.

Cuttlefish have co-existed with industry in the USG, particularly near Whyalla and Port Bonython where the following activities occur, shipping and ports, ecotourism, commercial fishing (with restrictions) and the Whyalla Steelworks. The CCSZ breeding aggregation area is immediately adjacent an existing hydrocarbon import/export terminal that has been operating for over 40 years.

The Whyalla Steelworks is also set to be upgraded, with a large investment from the SA Government.

Also of note, Alligator Energy is currently undertaking 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).

Projects in the vicinity of the CCSZ 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 (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)
- Eyre Peninsula Transmission Line upgrade (ElectraNet, Eyre Peninsula Upgrade | ElectraNet)

Activities associated with Project's marine construction and operations at Mullaquana Station are ~34 km away from the CCSZ and not expected to impact the CCSZ. The Project desalination plant operation would not add to any cumulative effect of existing and proposed industry.

6.4 Assessment of impact significance and risk

The following table provides an assessment of the significance of potential impacts to the CCSZ against the guidance criteria for National Heritage places provided in DoE (2013).

Table 6-1: Assessment against significant impact criteria for EPBC Act National Heritage places

Criteria	Assessment of potential impact
An action is likely to have a significant impact on the National Heritage values of a National Heritage place if there is a real chance or possibility that it will:	
General	
• cause one or more of the National Heritage values to be lost	There is no real chance or possibility that the Project could cause one or more of the National Heritage values to be lost.
• cause one or more of the National Heritage values to be degraded or damaged, or	There is no real chance or possibility that the Project could cause one or more of the National Heritage values to be degraded or damaged.

Criteria	Assessment of potential impact
• cause one or more of the National Heritage values to be notably altered, modified, obscured or diminished.	There is no real chance or possibility that the Project could cause one or more of the National Heritage values to be notably altered, modified, obscured or diminished.
Criteria for National heritage places with natural heritage values*	
• substantially increase concentrations of suspended sediment, nutrients, heavy metals, hydrocarbons, or other pollutants or substances in a river, wetland or water body in a National Heritage place	**No significant impact expected.** The values of the CCSZ would not be affected by operational discharge, potential sedimentation or spills during the Project construction. The desalination plant is located ~34 km from the CCSZ and the nearest terrestrial works are 15 km from the CCSZ. Risk of spill and sedimentation into the environment during the Project construction will be adequately managed. Refer to Sections 6.2.1, 6.2.4,and 6.2.5.
• modify or inhibit ecological processes in a National Heritage place	**No significant impact expected.** The Project is unlikely to impact cuttlefish breeding and spawning in the CCSZ (refer to Section 6.2). Considering there is no known migration 'pathway' for the cuttlefish, with individuals likely to aggregate from all areas around northern Spencer Gulf (Gillanders and Payne 2014), it is considered unlikely the Project would prevent the cuttlefish from aggregating to the CCSZ.
• reduce the diversity or modify the composition of plant and animal species in a National Heritage place	**No significant impact expected.** The Project is unlikely to impact the cuttlefish within the CCSZ (refer to Section 6.2). The Project is unlikely to impact the cuttlefish outside the CCSZ and unlikely to prevent this species from aggregating in the CCSZ during the breeding season.
• fragment or damage habitat important for the conservation of biological diversity in a National Heritage place	**No significant impact expected.** The proposed desalination plant and pipeline are located ~34 km and 15 km from the CCSZ respectively. Construction and operation of the project is unlikely to fragment or deteriorate habitat in the CCSZ (refer to Section 6.2).
• cause a long-term reduction in rare, endemic or unique plant or animal populations or species in a National Heritage place	**No significant impact expected.**
• fragment, isolate or substantially damage habitat for rare, endemic or unique animal populations or species in a National Heritage place.	**No significant impact expected.** The proposed desalination plant and pipeline are located ~34 km and 15 km from the CCSZ respectively. Construction and operation of the project is unlikely to affect breeding habitat for the cuttlefish within the CCSZ (Section 6.2).
• involve construction of buildings, roads or other structures, vegetation clearance, or other actions with substantial and/or long-term impacts on relevant values	**No significant impact expected.**
• introduce noise, odours, pollutants or other intrusive elements with substantial and/or long-term impacts on relevant values	**No significant impact expected.** As discussed in Section 6.2.2 there is no real chance or possibility that noise from construction and operational activities could adversely affect cuttlefish within the CCSZ.

* All criteria for *Biological and ecological values and Wilderness, aesthetic, or other rare or unique environment values* and the relevant criteria for *Values associated with geology or landscapes* have been included.

7. Conclusion

The construction and operation of the proposed desalination plant and associated intake and outfall structures at Mullaquana Station is expected to have negligible impact on the USG cuttlefish population. The National Heritage-listed CCSZ would not be affected by the Project.

The anticipated temporary and localised effects during construction would not impact the population of USG cuttlefish as they are not known to rely on the area for aggregation and were not recorded during seasonal site surveys (JDiversity 2025). The site does not provide suitable habitat for Cuttlefish egg attachment and there is no suggestion of a migration pathway. Notwithstanding that, it is possible for individuals to transit through the area, and if they were to be present, they are highly mobile and able to swim away from the area near the return water discharge.

Additionally, mid-field hydrodynamic modelling indicates that salinity beyond the immediate vicinity of the diffusers would remain within the range of natural seasonal variability. Ambient salinities at Point Lowly where the cuttlefish aggregate for breeding are much higher than at Mullaquana Station, suggesting that the USG population are physiologically adapted to high salinities (Steer et al 2013), and therefore likely to be tolerant to salinity conditions in the area near the return water discharge.

It is not anticipated that the desalination plant return water would have any material impact on USG cuttlefish moving through the gulf. The outfall location, distance away from breeding aggregation sites, USG cuttlefish tolerance to existing ambient salinity gradients within the Gulf, temporal nature of construction and the Project's operational parameters suggest that any potential effects would be localised to the immediate area surrounding the outfall and the risk of impact to the USG cuttlefish population or breeding habitat would be negligible.

During operation, the Project would adhere to strict compliance limits and monitoring requirements as part of the EPA environmental licence to operate the desalination plant. These measures would be set out in the Project Operational Environmental Management Plan and would seek to reduce environmental risk from the operation of the desalination plant, and associated return water. Mitigation and management measures to avoid or minimise environmental impacts during construction would be incorporated into the Project's Construction Environment Management Plan.

The construction and operation of the Northern Water desalination plant is not expected to have a significant impact on the EPBC Act National Heritage listed CCSZ, and EPBC Act National Heritage values would remain unaffected.

8. Limitations

Scope of services

This report ("the report") 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 report 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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Environmental conclusions

Within the limitations imposed by the scope of services, the preparation of this report has been undertaken and performed in a professional manner, in accordance with generally accepted environmental consulting practices. No other warranty, whether express or implied, is made, including to any third parties, and no liability will be accepted for use or interpretation of this report by any third party.

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Document Status

Rev No.	Author	Reviewer	Approved for Issue		
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0	MM, AM	A. Querzoli	A. Querzoli		17/12/2025

www.jbsg.com.au

JBS&G

Adelaide

Kaurna Country | 100 Hutt Street,
Adelaide, SA 5000
T: 08 8431 7113

Brisbane

Turrbal/Yuggera Country | Level 37,
123 Eagle Street, Brisbane, QLD 4000
T: 07 3211 5350

Bunbury

Wardandi Country | 177 Spencer Street,
Bunbury, WA 6230
T: 08 9792 4797

Byron Bay

Bundjalung Country | 1/64 Kingsley Street,
Byron Bay NSW 2481
T: 07 3211 5350

Gold Coast

Yugambeh Country | Level 2,
14 Edgewater Court, Robina, QLD 4226
T: 07 3329 7329

Hobart

Muwinina Country | Level 2,
137 Liverpool Street, Hobart, TAS 7000
T: 03 6208 3700

Melbourne

Wurundjeri Country | Level 19,
31 Queen Street, Melbourne, VIC 3000
T: 03 9642 0599

Perth

Whadjuk Country | Allendale Square,
Level 9, 77 St Georges Terrace, WA 6000
T: 08 9380 3100

Sydney

Gadigal Country | Level 8,
179 Elizabeth Street, Sydney, NSW 2000
T: 02 8245 0300

Wollongong

Dharawal Country | Suite 406, Level 4,
43 Burelli Street, Wollongong, NSW 2500
T: 02 4225 2647