Tantabiddi Boating Facility Environmental Referral Supporting Document

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Tantabiddi Boating Facility Environmental Referral Supporting Document

Prepared for

Department of Transport

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Cover: View of Tantabiddi site (20 June 2023)

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Executive Summary

The Department of Transport (DoT) is proposing to build a new boating facility ~300 m south of Tantabiddi Creek, Exmouth. This initiative aims to replace the existing two-lane boat ramp to improve launch and retrieval conditions, meet demand for recreational and small commercial vessels, enhance safety and improve environmental management through formalised parking. The Tantabiddi Boating Facility (TBF) provides marine and terrestrial facilities to support trailerable vessels up to 8 m in length and larger vessels (nominally ~25 m) may access the facility for passenger transfers, boat pens and/or the service jetty. The TBF will comprise the following main elements:

- Rubble-mound breakwaters and revetments
- Dredged harbour basin and entrance channel
- Navigation markers
- Boat ramps, jetties and fishing platform
- Land area for entrance road, utilities/amenities area, parking, facilities and public open space

The TBF will not include fuel storage or vessel sullage pump-out facilities and all fresh water for both construction and operations will be trucked to site. Waste from toilet facilities will be collected in sealed containers and transported offsite for disposal. The existing Tantabiddi Boat Ramp will be decommissioned, including removal of the boat ramps, finger jetties and ramp revetment. Where possible, materials from the Tantabiddi Boat Ramp will be recovered for reuse in construction of the TBF. In addition, the existing vehicle access and carpark will be remodelled and revegetated using material from the existing dredge material stockpile at this site.

The proposed TBF (and the existing Tantabiddi Boat Ramp) are in the Jurabi Coastal Park, Ningaloo Marine Park (State Waters), Ningaloo Coast National Heritage Area and Ningaloo Coast World Heritage Area. The DoT and Shire of Exmouth have undertaken significant community and stakeholder engagement regarding this project and there is a strong level of support from both recreational and commercial users. The project is also supported by the Traditional Owners and has received Section 18 Consent under the *Aboriginal Heritage Act 1972*.

The following Key Environmental Factors may be impacted by the proposal:

- Benthic Communities & Habitats
- Coastal Processes
- Marine Environmental Quality
- Marine Fauna
- Flora and Vegetation
- Social Surroundings

The following Matters of National Environmental Significance may also be affected by the project:

- World Heritage Property—The project is in the Ningaloo Coast World Heritage Area
- National Heritage Place—The project is in the Ningaloo Coast National Heritage Area
- Listed Threatened Species—Listed threatened species may occur in the area
- Migratory Species—Listed migratory species may occur in the area

The assessment of the World Heritage Property and National Heritage Place are included in the consideration of the Social Surroundings Environmental Factor and the assessment of the Listed Threatened Species and Migratory Species are covered in the assessment of the Marine Fauna Environmental Factor. 15 threatened (2 fish, 9 birds and 4 reptiles) and 31 migratory species (2 fish, 21 birds, 4 marine mammals and 4 reptiles), as listed under the EPBC Act, have a medium to high likelihood of occurring in the vicinity of the proposed TBF.

The potential impacts identified for each key environmental factor are summarised in the following tables with details of the proposed management measures and outcomes.

Environmental Factor	Benthic Communities and Habitats (BCH)
EPA Objective	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained
Potential Impacts	Permanent loss of BCH due to dredging and reclamation and serious impacts to adjacent BCH from turbid plumes during construction activities
Mitigation and Management	• The TBF will be in an area largely dominated by macroalgae habitats to minimise the potential impacts on coral or seagrass communities • Construction of the breakwaters will be staged and undertaken prior to dredging the harbour basin to minimise the impact of the dredge plume on benthic habitats and communities • A silt curtain will be deployed during construction of the inner (northern breakwater), revetments and dredging in the harbour basin where practicable to limit plume dispersion of sediments beyond the harbour basin
Environmental Outcome	Loss of 23.79 ha of BCH, which is predominantly ephemeral macroalgae, and which represents 0.39% of the Local Assessment Unit (LAU)

Environmental Factor	Coastal Processes
EPA Objective	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected
Potential Impacts	• Interruption of the longshore sediment transport resulting in areas of sediment accretion and erosion at the shoreline adjacent to the facility • Modification of wave and current patterns resulting in changes in local sedimentation patterns
Mitigation and Management	• TBF has been moved away from the mouth of Tantabiddi Creek to minimise interruption of intermittent flood events at this site • TBF will be in an area where sediment availability is relatively limited as the nearshore area is characterised by a thin veneer of sediments overlying pavement reef and the shoreline is also underlain by limestone pavement • Annual monitoring of shoreline position and nearshore bathymetry • Sediment bypassing as required to transfer sediment accumulation from the south of the facility to the shoreline north of the facility • Occasional dredging of the entrance channel may be required to maintain safe navigable passage. The dredged sediment shall be placed to the shoreline north of the facility
Environmental Outcome	• Sediment accumulation at the shoreline immediately south of the TBF and minor accumulation at the shoreline immediately north that will be managed by sand bypassing • Reinstatement of natural coastal process at the mouth of Tantabiddi Creek that will restore the natural flushing frequency of this intermittently closed and open lagoon

Environmental Factor	Marine Environmental Quality
EPA Objective	To maintain the quality of water, sediment and biota so that environmental values are protected
Potential Impacts	Reduced water quality during construction activities and the potential for release of toxins into the water column Reduced flushing in the harbour basin causing decrease in water quality
Mitigation and Management	• Construction of the breakwaters will be staged and undertaken prior to dredging the harbour basin to minimise the impact of the dredge plume on marine environmental quality • The location of the facility ensures that the required volume of imported fill material is minimised • Dredge material disposal will be to an onshore reclamation area that will be bunded and decant water will be drained from the decant pond back to the harbour basin • Testing has been completed to ensure the sediment in the proposed dredging footprint is free of contaminants. All imported materials will be sourced from a registered quarry and tested to ensure no contaminants are introduced • Water quality monitoring during construction with management triggers, including pausing dredging activities if thresholds are likely to be exceeded • No fuel storage will be included at the facility

Environmental Factor	Marine Environmental Quality
	• Regular marine environmental quality monitoring will be undertaken during operations in accordance with the North West Cape Environmental Quality Management Framework (EQMF)
Environmental Outcomes	Achieve Environmental Quality Objectives for ecosystem integrity for moderate (within the boating facility) and high (beyond the immediate boating facility) levels of ecosystem protection during operations

Environmental Factor	Marine Fauna
EPA Objective	To protect marine fauna so that biological diversity and ecological integrity are maintained
Potential Impacts	• Underwater noise generated during the construction piling and dredging activities causes behavioural and/or temporary or permanent hearing threshold shift in marine fauna • During operation anthropogenic light induces behavioural or physiological changes to reduced survivorship or reproductive output • Other potential impacts include, habitat modification, changes in water quality, potential for vessel collision, release of marine debris and the introduction of invasive species
Mitigation and Management	• Any impact piling required within the basin will be undertaken following installation of the breakwaters to minimise sound transmission • The use of alternative construction methods, with reduced underwater noise generation (e.g. backhoe dredge and/or screw piling), will be implemented where practicable • Construction activities likely to cause significant underwater noise impact (e.g. piling outside the breakwater) will be undertaken outside of the Southern Humpback Whale migration season when mother-calf pairs are at their greatest densities: In August to November. • Soft start-up procedures will be implemented for all impact piling activities • A dedicated Marine Fauna Observer (MFO) will be on site during all piling and dredging operations to pause operations if marine fauna exclusion zones are breached • Underwater noise will be monitored at the commencement of dredging and piling activities and the observation and exclusions zones will be modified if necessary • Construction activity will mostly be undertaken during daylight hours, with nighttime activities only occurring within the harbour basin and where lighting will be controlled to minimise risk to marine fauna • Operational lighting will only be used as necessary and will be designed in accordance with best practice guidelines • All contractor vessels will be in good working order with adequate emergency and containment equipment and procedures in the event of a spill. Chemicals will only be used/transferred in proximity to the marine environment as required and all chemicals will be managed and stored appropriately • Construction vessels will be largely restricted to the project footprint and vessel speed restrictions will apply • All construction vessels will be thoroughly cleaned and inspected prior to mobilisation to site • Rubbish collection points will be included at the TBF
Environmental Outcomes	• Marine Fauna Observer present to ensure marine construction works managed so that no impacts on marine fauna occur • Design and use of anthropogenic lighting to ensure no significant impacts on marine fauna

Environmental Factor	Flora and Vegetation
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained
Potential Impacts	• Vegetation loss and fragmentation due to the project footprint • Potential for dune erosion at the cleared edges abutting the development • Potential for weed spread
Mitigation and Management	• The selection of the facility site minimises impact on the Tantabiddi Midden Site 1 and associated terrestrial flora and vegetation • Waste from toilet facilities will be collected in sealed containers and transported offsite for disposal at a registered facility • Construction management (including signage, fencing, induction) to ensure clearing only occurs within the approved development area

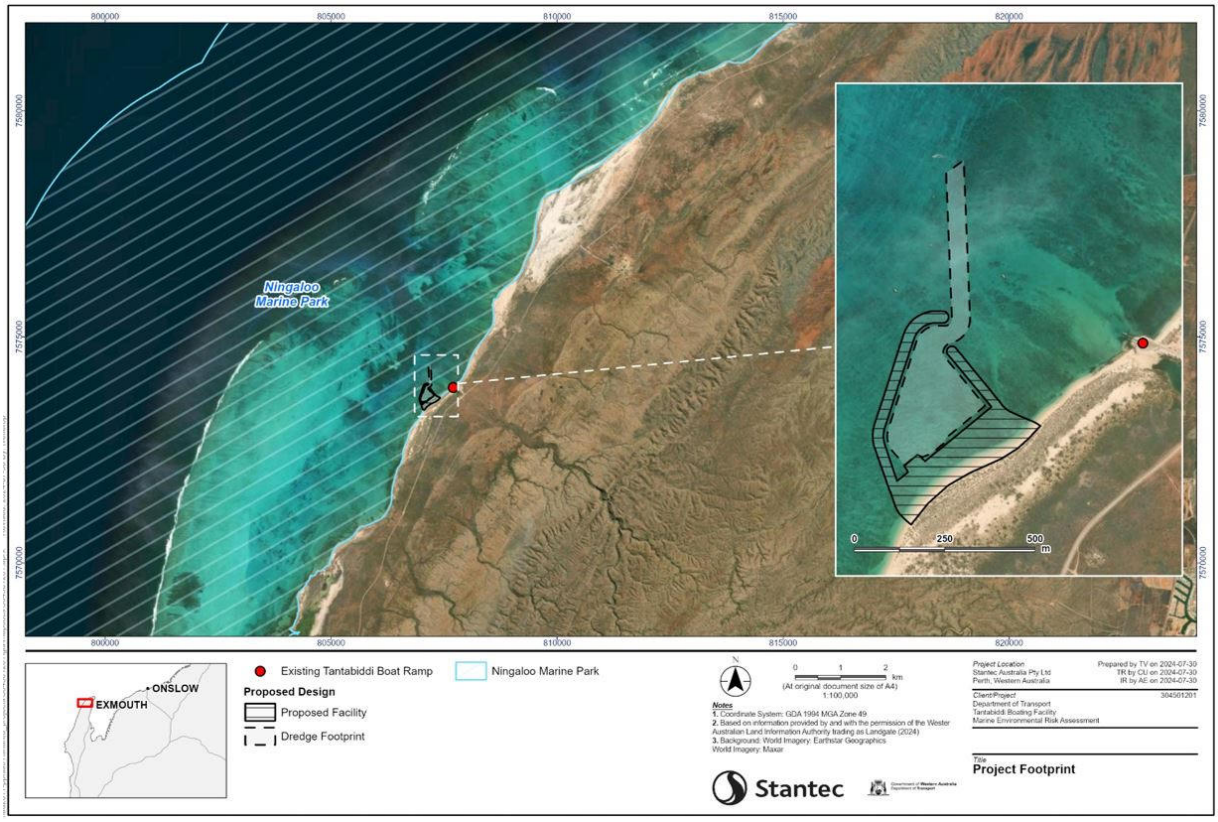
Environmental Factor	Flora and Vegetation
	• Undertake weed management actions as part of the Construction Environmental Management Plan (CEMP) including construction traffic management to minimise potential for weed spread, particularly along the edge of Yardie Creek Road • Undertake rehabilitation actions as part of the CEMP including methods to alleviate soil compaction, topsoil management, species selection, revegetation and dune stabilisation methods • Align the access road and utilities area to minimise, and if possible, avoid, impacts to the potentially significant vegetation community FpSv2 • Avoid any construction related impacts to the Tantabiddi Sinkhole and surrounds to protect the area of *Sporobolus virginicus* tussock grassland in this area • Undertake rehabilitation at the existing Tantabiddi Boat Ramp to reinstate the landform and vegetation types in this area
Environmental Outcome	• Clearing of up to 5.6 ha of native vegetation • Rehabilitation of about 1.3 ha at the Tantabiddi Boat Ramp • Minimise direct impact to potentially significant vegetation community FpSv2 to 0.029 ha or less • No impact to conservation significant flora • No impact to the Tantabiddi Sinkhole and associated of *Sporobolus virginicus* tussock grassland

Environmental Factor	Social Surroundings
EPA Objective	To protect social surrounding from significant harm
Potential Impacts	• Overlays an area of the Tantabiddi Midden 1 site • Contamination of Tantabiddi Sinkhole from construction/operation activities • Impact on the natural values of the Ningaloo Coast World Heritage Area and the Ningaloo Coast National Heritage Area
Mitigation and Management	• Location of the facility adjacent to an existing access node to not impact on more pristine areas of the Ningaloo coast • TBF located following consultation and agreement with Traditional Owners to minimise impact on the Tantabiddi Midden 1 site. Furthermore, minimal bulk excavation works are to be undertaken and the land-side development shall be constructed using fill from dredge material resulting in a lift from natural elevation • Baiyungu representatives to be consulted regarding final design and identify opportunities for Baiyungu and Yinnigurrura businesses, employment and training opportunities • Construction activities to be restricted to project footprint using a range of management measures, including: site inductions for all construction personnel and clear demarcation/fencing of clearing areas. Barriers will also be included to minimise offroad parking adjacent to the facility • Traditional Owner monitors will be engaged during any ground-disturbing works • Any artefacts identified in the project footprint shall be relocated to other areas within the Tantabiddi Midden 1 site so they are retained in the area • Environmental monitoring program to ensure water quality at the Tantabiddi Sinkhole is not affected during construction
Environmental Outcome	• Project footprint will overlay 0.2 ha (3.3%) of Tantabiddi Midden 1 site • No impact to the Tantabiddi Sinkhole • The TBF may impact on some of the values of the Ningaloo Coast World Heritage Area and Ningaloo Coast National Heritage Area. These impacts are considered within the Key Environmental Factors and are anticipated to be low at both a local and regional scale • The proposal will maintain an existing access node to facilitate visitor access to the conservation reserves whilst improving boating amenity, safety and equity of access

1. Introduction

Tantabiddi Boat Ramp is located in the Shire of Exmouth (SoE) approximately 15 km west of the Town of Exmouth (or about 40 km by road). The ramp is situated immediately north of Tantabiddi Creek and is the only formal boat ramp located on the west coast of the North-West Cape. The Ramp is located within the Jurabi Coastal Park (onshore; jointly managed by SoE/Department for Biodiversity Conservation and Attractions [DBCA]), Ningaloo Marine Park (offshore; managed by DBCA), the Ningaloo Coast National Heritage Place and the Ningaloo Coast World Heritage Area. Significant operational issues have emerged with the boat ramp due to sedimentation from flooding events as well as significant pressure during periods of peak demand including overflow parking onto the Yardie Creek Road which creates a safety risk and is a cause of concern for the Traditional Custodians. The existing two lane ramp and small car park was intially built as a recreational facility and usage has grown beyond its capcity. In addition to recreational users, large volumes of marine tourism passengers and commercial operators are now using the facility. Further, the existing facility does not provide universal access facilities for users.

In 2018 the SoE commissioned a study of the boating capacity and facilities at Tantabiddi to understand the current/projected usage and infrastructure needs to address the future requirements (MP Rogers & Associates, 2018). This report highlighted a number of issues associated with the current facility, including conflict of use, safety and access. Consequently, the Tantabiddi Taskforce was established, Chaired by the Director General of DoT, and comprises representatives from the SoE, DBCA, Tourism WA, Department of Primary Industries and Regional Develoment–Fisheries and Gascoyne Development Commission. The role of the Taskforce is to consider the design and management of a suitable facility to meet the recreational and commercial demands. The Tantabiddi Taskforce established an Agency Working Group (led by the DoT) to progress the investigation and planning works. Following review of a number of sites the Taskforce has supported development of the Tantabiddi Boating Facility (TBF) at a location ~300 m south of the existing Tantabiddi Boat Ramp (Figure 1). The State Government has provided funding under the WA Recovery Plan to undertake planning studies to support this redevelopment.



Source: Stantec (2025)

Figure 1 Site of the proposed Tantabiddi Boating Facility

1.1 Site History

A boat ramp at Tantabiddi was originally constructed in 1969 together with ablution facilities (Exmouth Gulf Fishing Club, 2023). In the 1990s the Tantabiddi Boat Ramp was formalised with a single-lane ramp and the facility has had several enhancements to address issues associated with increased usage and sedimentation. A significant upgrade of the facility was completed in 2012 and included: installation of a second ramp (to the north of the original); 10 m extension of the ramps; installation of two finger jetties; rock revetments and additional scour protection; raising the top of the ramp to +3.4m AHD; and an enlarged turning area. A new ablution block was constructed in 2013 and in 2015 revetment maintenance works were completed. The facility also includes an informal car/trailer parking and 36 offshore moorings (Figure 2 and Figure 3).

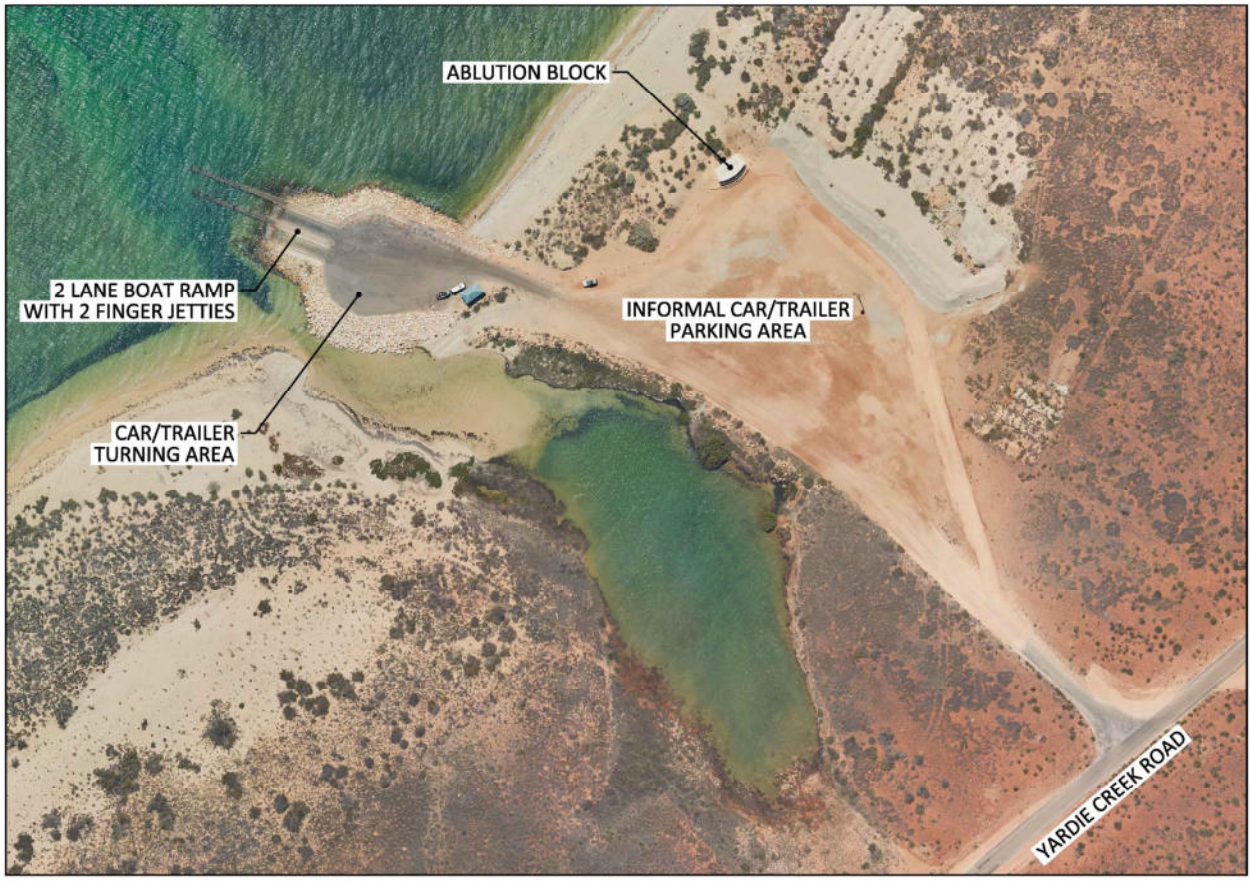


Figure 2 Existing Tantabiddi Boat Ramp

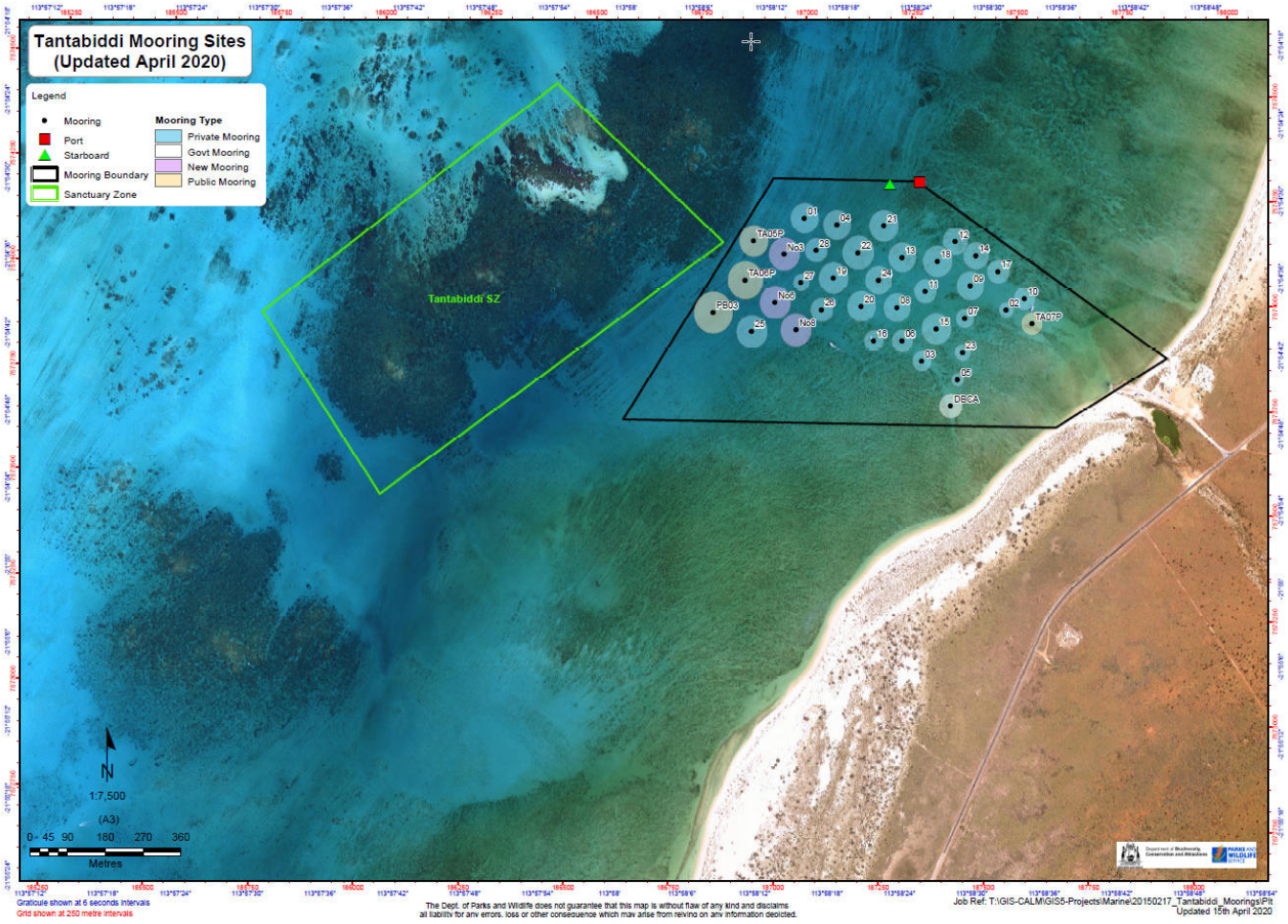


Figure 3 Existing moorings at Tantabiddi

Boat launching access for recreational and commercial users at Tantabiddi Boat Ramp has often been compromised due to sedimentation of the ramp (DPI, 2004). Regular maintenance dredging works have been required at the Tantabiddi Boat Ramp since construction. During these dredging works, sediment has typically been removed from the boat ramp and areas south and transferred to the beach/dunes to the north of the informal carpark (MP Rogers & Associates, 2018). Prior to 2014 these works were completed by the SoE (up to four times per year), typically using a long-reach excavator. In April 2014 a heavy rainfall event caused major flooding of Tantabiddi Creek and sedimentation of the boat ramp which rendered the ramp unusable for launching vessels (Figure 4). Immediately following this event a long-reach excavator was used to remove ~1,500 m^3 of material from the toe of the ramp and this material was placed on land to the north. A further 3,500 m^3 of material, located further offshore, was removed using a cutter-suction dredge between June and September 2015 and placed on the beach to the north of the ramp (URS, 2016).

Source: Fishwrecked (2020)

Figure 4 Flooding of Tantabiddi Creek and sedimentation at the boat ramp caused by the April 2014 flood

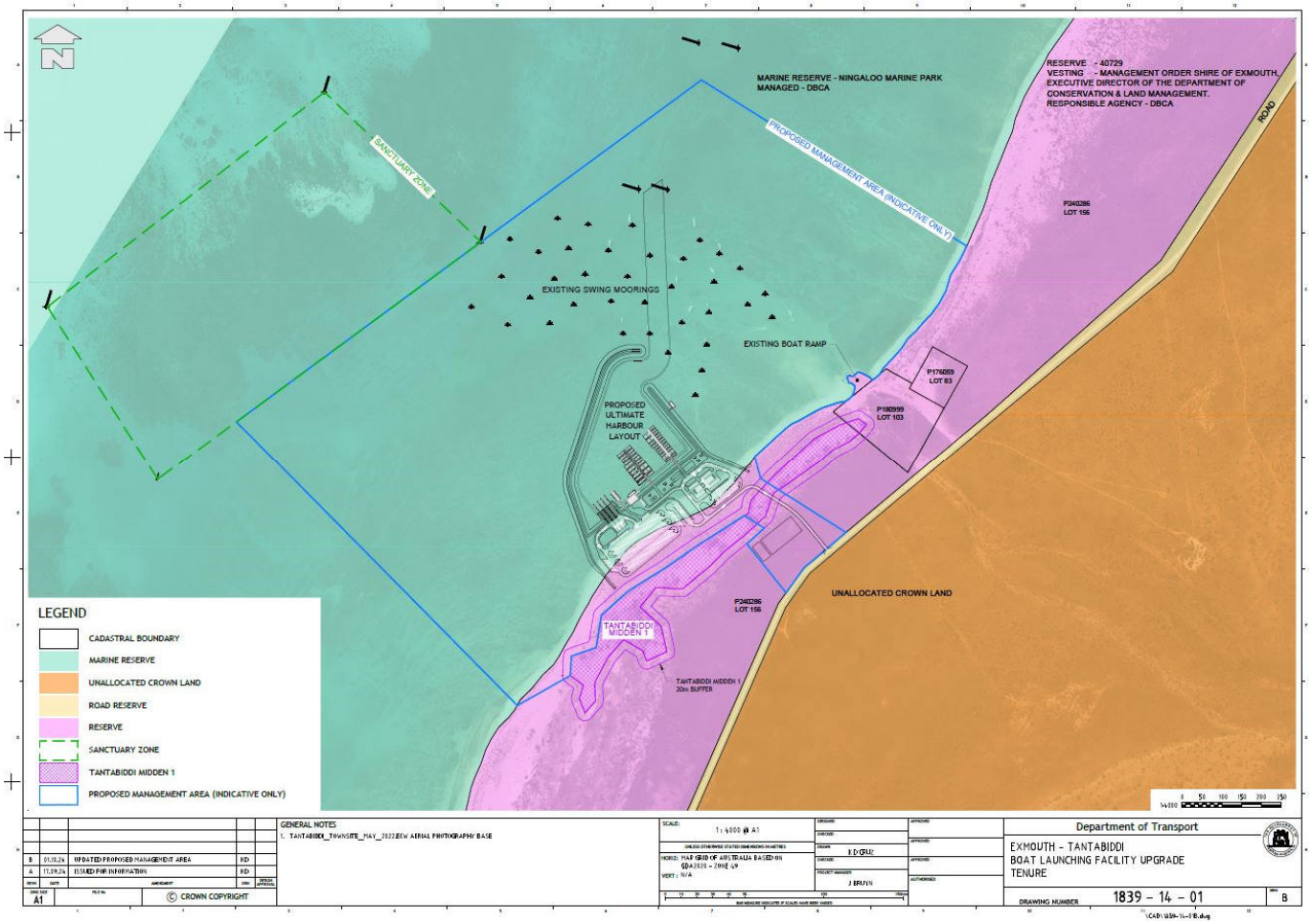
1.2 Document Purpose and Scope

This document has been prepared to support the environmental referral of the proposed TBF under the *Western Australian Environmental Protection Act 1986* and *Commonwealth Environmental Protection and Biodiversity Act 2000*. This document identifies and assesses the key environmental factors and Matters of National Environmental Significance which may be impacted by this proposal. This referral support document also outlines potential mitigation measures which may be implemented during construction and operation of the facility.

1.3 Proponent

Management of the existing Tantabiddi Boat Ramp (including operational costs and sand removal/management) is presently the responsibility of the SoE. The SoE is seeking financial assistance or an alternative model for managing the facility. The proposed relocated TBF is an initiative of the Tantabiddi Taskforce (at the direction of the Minister for Transport) and the DoT is the nominated proponent. On completion of the TBF the DoT will be responsible for the operational management. DBCA and SoE will continue to have responsibility for the overall management of adjacent areas.

The land-side of the TBF will be located on Lot 156 within Reserve 40729 (Jurabi Coastal Park) which is gazetted for the purpose of Recreation and Coastal Management and jointly managed by the SoE and DBCA (Figure 5). The marine elements of the TBF will be located within the Ningaloo Marine Park and it is anticipated that a harbour boundary will be declared. Consideration may be given to excising an area (of sufficient size to enable operation and maintenance activities) from the Ningaloo Marine Park to accommodate the TBF. Any proposal to excise this area from the Marine Park would require consultation with the Conservation and Parks Commission, Nganhurra Thanardi Garrbu Aboriginal Corporation and agreement from the Minister for Environment and the WA Parliament. Alternatively, the facility may be operated through a Management Agreement between the DoT and DBCA under the *CALM Act 1984*.



Note: The Management Area shown is indicative; the DoT will liaise with the marine park managers to determine the precise location of this boundary.

Figure 5 Land tenure in the vicinity of the proposed TBF

1.4 Proposal

The proposed TBF will be a new facility located ~300 m south of the existing Tantabiddi Boat Ramp and will address the needs of both recreational and commercial users and provide universal access for all users. The TBF has an indicative disturbance footprint of up to 22.6 ha within a Development Envelope of 58.4 ha and will include the following main elements (Figure 6):

- Rubble-mound breakwaters and revetments (3.5 ha)
- Harbour basin and entrance channel (9.7 ha)
- Boat ramp (0.2 ha and up to 6 ramps)
- Land area for entrance road, utilities area, parking, facilities and open space (9.0 ha, including 5.6 ha of vegetation clearing)
- Navigation marks (3 piled lateral marks, 2 breakwater beacons)

Periodic maintenance works will be required to bypass sediment around the harbour and dredging undertaken navigable depths are maintained through the entrance channel (MP. Rogers & Associates, 2023b). The material from these operations will be placed on the beach (above the low-tide level) to the north of the TBF. It is predicted that up to 6,000 m^3 (with a 50% contingency) of sediment is bypassed (using land-based equipment[1]) twice yearly. Dredging of the entrance channel is initially proposed to occur every four years (estimated volume 16,000 m^3) using a floating dredge. For comparison, bypassing operations are undertaken at the Exmouth Boat Harbour by the DoT

[1] *Subsurface pipework may be installed during construction to facilitate bypassing operations, and this will be considered during further design stages*

approximately every three years with an effective rate of 15,000 m^3/yr. However, sediment transport rates are highly dependent on the local setting, including metocean conditions (tides, current and waves), coastal geomorphology and sediment characteristics. Additionally, Tantabiddi is located within a cyclone zone and as such could experience severe episodic events causing higher rates of sediment transport. Consequently, the frequency and volume of future bypassing and dredging operations will be determined by ongoing bathymetric surveys and monitoring of beach profiles as part of DoT's facility management program.

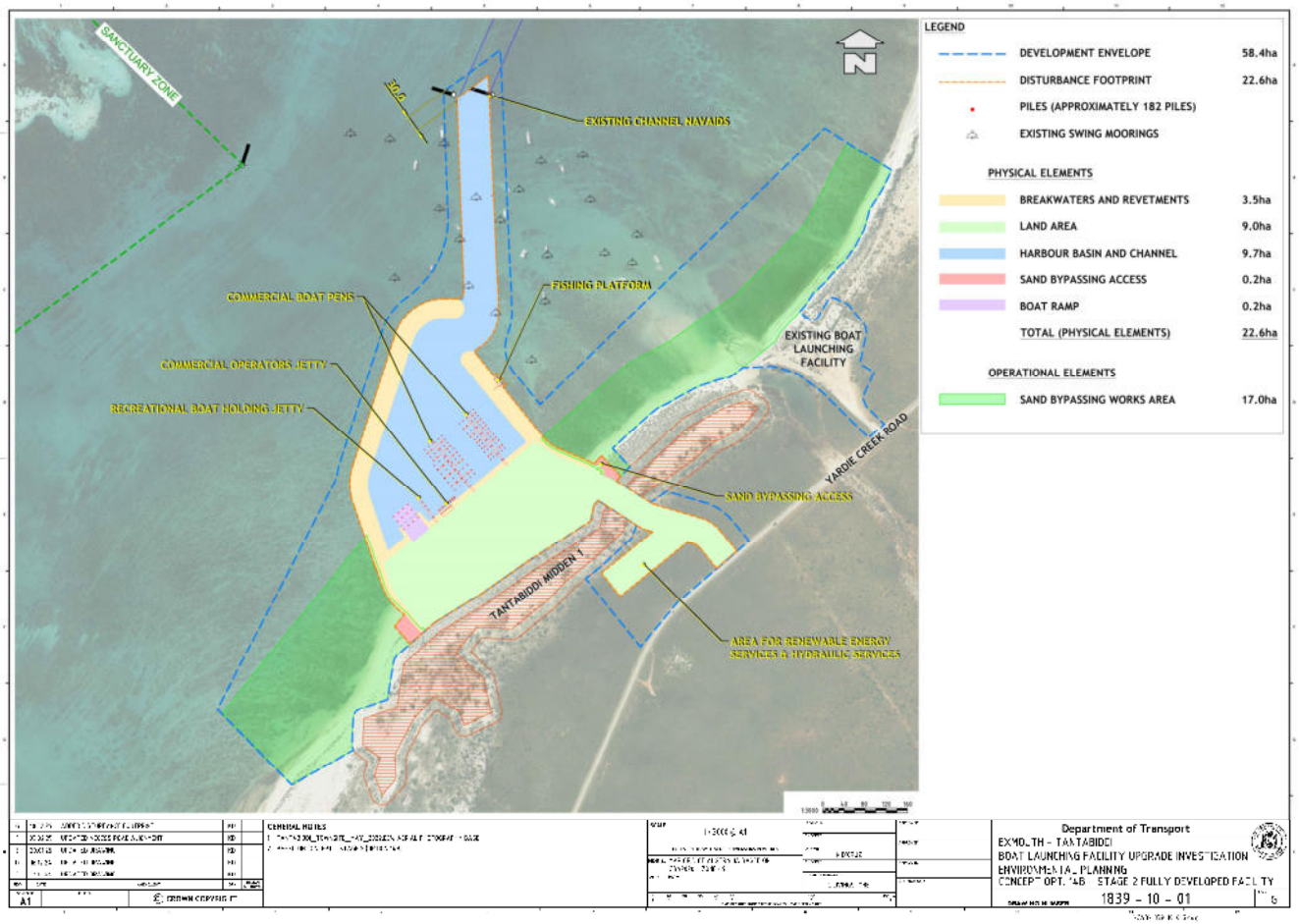


Figure 6 Development envelope and project elements of the Tantabiddi Boating Facility

The TBF includes a range of recreational and commercial facilities (Figure 7). Depending on funding, construction of the TBF may be undertaken in two stages with the Initial Stage (Stage 1) constructed as a minimum (Table 1). All freshwater for both construction and operations shall be trucked to site and held in onsite water storage tanks. Site power will be provided by a solar/battery array (Stage 2). The TBF will not include fuel or sullage storage facilities, and it is anticipated these services will be provided by mobile plant.

Table 1 Tantabiddi Boating Facility Infrastructure

Facility	Initial Stage (Stage 1)	Fully Developed (Stage 2)
Boat ramps	4	6
Finger jetties	3	4
Recreational boat holding jetty	Yes	As per Stage 1
Car/trailer parking	160 bays	240 bays
Fishing platform	Yes	As per Stage 1

Facility	Initial Stage (Stage 1)	Fully Developed (Stage 2)
Commercial operators' jetty and parking	Yes	As per Stage 1
Passenger transfer jetty/boat pens	Passenger transfer jetty (8 berths)	Boat Pens (42)
Bus pickup/drop off bays	Yes	As per Stage 1
Bus parking	Yes	As per Stage 1
Interpretive/information area	Yes	As per Stage 1
Toilets	Yes	As per Stage 1
Seating, shelters, pedestrian congregation area	Yes	As per Stage 1
Multipurpose building including pen holder amenities	No	Yes
Renewable energy services	No	Yes
Hydraulic services (water tanks and fire response)	No	Yes

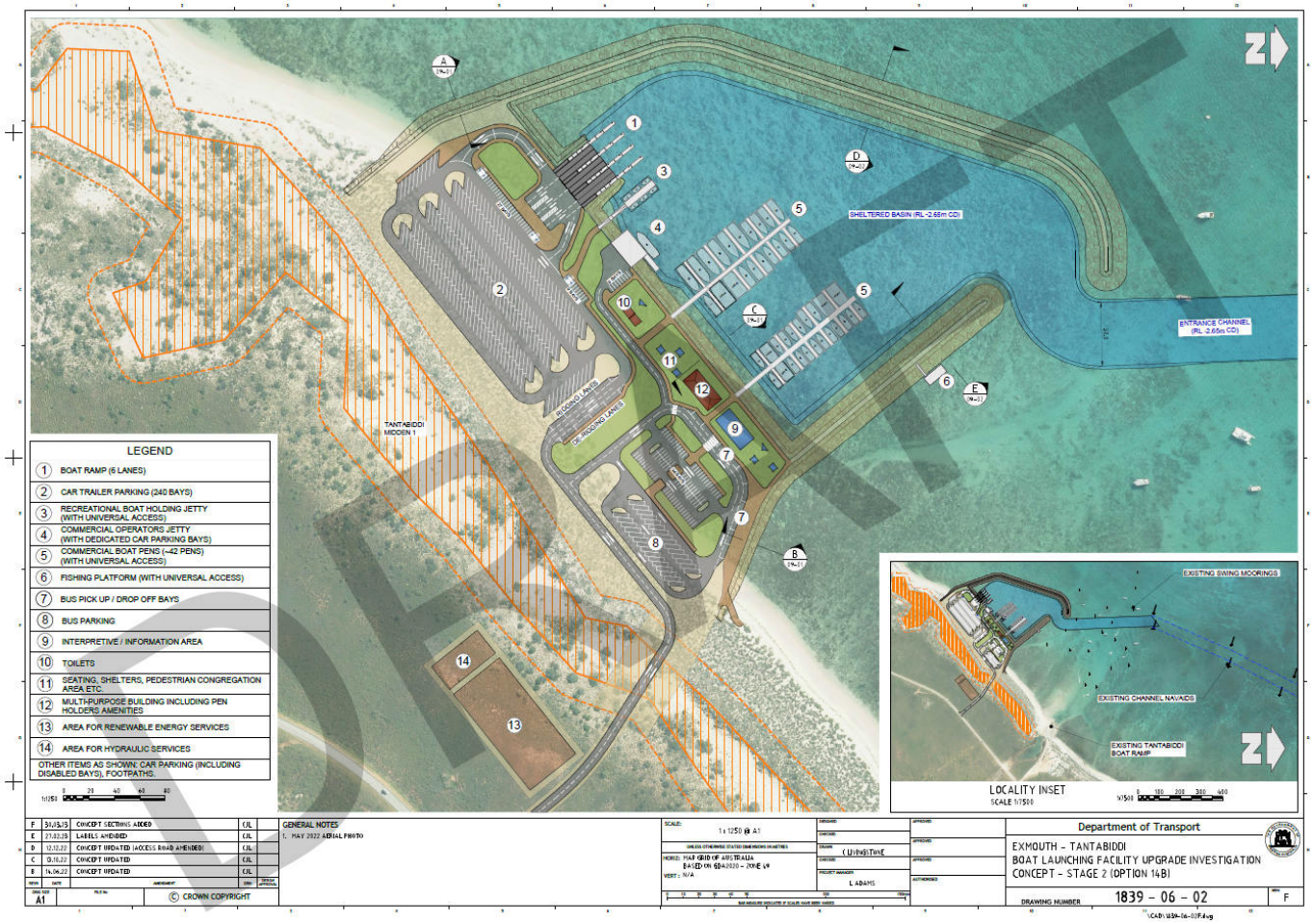


Figure 7 Concept design for Tantabiddi Boating Facility (Stage 2)

Construction will require dredging to achieve a water depth of -2.65 meters Chart Datum (mCD) through both the harbour basin and entrance channel. A total of up to ~153,000 m^3 of dredging[2] will be undertaken; ~130,000 m^3 from the harbour basin and 23,000 m^3 along the entrance channel (MP Rogers & Associates, 2025). The entrance channel will be 50 m wide and will extend (~400 m) until natural water depths are attained and the channel will

[2] *These volumes include a vertical overdredge allowance of 0.3 m to allow for positional tolerances of the dredging equipment*

then align with the existing navigation channel which presently provides access to the existing Tantabiddi Boat Ramp. All dredge material will be disposed of to land within the project footprint to be used as fill material. The new entrance channel alignment will require the removal of a limited number of existing moorings and if required they will be replaced with environmentally friendly moorings (whereby the moving parts of the mooring are raised off the seabed to prevent chain drag and scouring) outside the alignment of the entrance channel. However, the fully developed (Stage 2) TBF includes floating pens in the facility and will thereby reduce the number of offshore swing moorings.

Materials for the breakwaters and revetments and additional fill for road base and construction sands shall be sourced from licenced local quarries (Trinacria, 2024). These materials will be tested to confirm they are clean of contaminants prior to delivery to site. The construction methods are yet to be finalised and will be agreed with the contractor once they are appointed. It is likely that the breakwaters and revetment will be constructed using land methods via a series of lifts (MP Rogers & Associates, 2023a). The geotechnical data review noted that the dredging works may be undertaken using either a cutter suction dredge or backhoe dredge (Searle Consulting, 2022); however the constructability assessment recommended the use of a backhoe dredge (MP Rogers & Associates, 2025) (see Section 6.3.3 for further information). The excavated material will be transferred to shore via barges where all dredged material shall be disposed of onshore within the development footprint and used as construction fill.

About 182 piles (subject to detailed design) are estimated be required (Stage 2 completion) for the installation of the finger jetties, recreational boat holding jetty, commercial operators jetty, commercial boat pens, fishing platform and navigation makers (Figure 6). The geotechnical data review recommended that piles be installed using screw drilling methods in place of impact driving (Searle Consulting, 2022).

It is anticipated that construction of the TBF will commence during 2027 and be scheduled to accommodate potential interruptions due to the cyclone season (Table 2). The exact date for the commencement of construction is subject to funding approvals and agreements. Breakwater construction (at least to a level above the water line) will be undertaken prior to dredging and piling within the harbour basin. Construction of the breakwaters and revetment walls is anticipated to take a total of ~35 weeks, including ~18 weeks of construction activity below the water line when turbidity generation will be greatest. It is anticipated that the offshore (southern) breakwater will be constructed (anticipated to take ~6 weeks of the ~18 weeks of below-water-line construction activities) prior to construction of the inner (northern) breakwater. This sequencing will help to minimise turbidity impacts as construction of the revetment areas and inner breakwater will be undertaken in the shelter of the outer breakwater where current speeds and wave action will be reduced. This will also facilitate the installation of a silt curtain from the outer breakwater to shore to enclose the revetment and inner breakwater construction areas and thereby minimise offsite turbidity effects.. Dredging of the harbour basin and entrance channel is anticipated to take up to ~16 weeks and 4 weeks, respectively (MP Rogers & Associates, 2023a). Construction activities will be mainly restricted to daylight hours, but some nighttime construction within the harbour basin may occur which will then reduce the duration of construction.

This proposal also includes decommissioning of the existing Tantabiddi Boat Ramp, including removal of the boat ramps, finger jetties and ramp revetment (Figure 8). Where possible, materials will be recovered for reuse in construction of the TBF. In addition, the existing vehicle access and carpark will be recontoured and revegetated (1.3 ha) using material from the existing dredge material stockpile. These decommissioning works will be coordinated to ensure recreational and commercial boating access in this area is maintained throughout the period of construction of the TBF. Some of the existing infrastructure at the Tantabiddi Boat Ramp (e.g. Tantabiddi Creek scour protection and toilet amenities) may remain in place pending development plans for this site as a day use

area which are not part of this proposal. Once rehabilitation is complete the site will revert to a day use area as part of the Jurabi Coastal Park.

Figure 8 Artist's impression of the existing Tantabiddi Boat Ramp area following decommissioning

Table 2 Anticipated construction schedule for Tantabiddi Boating Facility

FINANCIAL YEAR	2025-26				2026-27				2027-28				2028-29				2029-30			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
APPROVALS:																			
DETAILED DESIGN:																			
Coastal Structures																			
Civil Works																			
Buildings, Shelters, Furniture and Ancillary																			
CONSTRUCTION:																			
Coastal Structures (Breakwaters Internal and External Revetments)																			
Dredging and Reclamation																			
Maritime Structure (Boat Ramps, Jetties and Boat Pens)																			
Civil Works (Drainage, Carparks, Services Installation etc)																			
Buildings, Shelters, Furniture and Ancillary																			
Decomissioning of Existing Facility																			
Environmental and Heritage Monitoring and Management																			

LEGEND
Tender Process
Contract Deliver
Contingency
Mobilisation

1.5 Background and Justification

The existing Tantabiddi Boat Ramp (Figure 9) is the only formal boat ramp on the west coast of the North-West Cape and provides access to a natural gap in the reef through a marked channel, the Tantabiddi Passage. The land and marine infrastructure at the Tantabiddi Boat Ramp are jointly managed by the SoE and the DBCA. The SoE maintains the boat ramp infrastructure but does not receive any government funding or other revenue to support maintenance of this facility. The DBCA licences commercial operators that use this facility and collects licence fees (note that the facility is located outside of the Cape Range National Park and park entry fees do not apply).

The existing ramp has two boat launch lanes and was initially designed to support a low level of recreational use. However, usage has continued to increase and in recent years the facility now also accommodates commercial operators (including whale shark and glass-bottom boat tours as well as government agencies). This facility is under significant pressure to meet the high level of demand during peak times and there are conflicts of use between the recreational users and tourism operators. The existing facility does not meet Australian Standard (AS3962) relating to the design of maritime infrastructure and the lack of segregation between pedestrians and vehicles creates significant safety risks.

A study to understand the current/projected usage and future infrastructure needs found (MP Rogers & Associates, 2018):

- The existing ramp is used by approximately 50% recreational and 50% commercial operators and there are existing and a projected increase in conflicts between these two user groups;
- Peak seasonal usage of the facility occurs between March and October;
- Peak daily usage of the facility occurs between 06:00 and 10:00 (launching) and between 14:00 and 18:00 (retrieval);
- During peak times, usage of the facility can include 100–125 trailered vessels, 250–300 vehicles and 500–600 commercial passengers;
- During these peak times the effective capacity of the facility is exceeded;
- The ramp is exposed to a relatively high level of wave energy; and
- There is a high-level of support for improvements from both recreational and commercial uses of the facility.

Exmouth has a resident population of approximately 2,800 which can triple during winter due to the influx of visitors; in 2020 the visitor numbers increased to approximately 15,000 with many Western Australians holidaying at home due to Covid 19 travel restrictions. Commercial operators also access the Tantabiddi Boat Ramp including 12 whale shark operators who annually transfer ~30,000 passengers for daily charter activities (Synergies, 2020). Additional commercial operators include humpback whale tours, glass bottom boat tours, dive/fishing charters and kayak tours. Wait times to retrieve a vessel can be up to two hours during peak days (Synergies, 2020). The majority (56%) of vessels using the facility are local and the greatest proportion (42%) of passengers using the facility are commercial tourists (analysis of this peak usage data (Synergies, 2020). Recreational boating registrations are forecast to increase by 45% from 2020 to 2036 and there continues to be an increase in visitors to the boat ramp and to Exmouth (Synergies, 2020; Department of Transport, 2021).

The Department of Primary Industries and Regional Development (DPIRD) has undertaken remote camera monitoring at the Tantabiddi Boat Ramp since 2022. Preliminary analysis of the data from 2022 to 2024 suggests an average of 12,233 boat retrievals per year (Table 3). The highest number of retrievals were observed between May and August with greater than 1,500 retrievals per month compared to November to February which had less than 750 per month.

Table 3 Annual count of boat retrievals from Tantabiddi Boat Ramp

Year	Retrievals	95 % Confidence interval
2022	11,100	10,600–11,700
2023	13,600	13,100–14,100
2024	12,000	11,400–12,500
Annual Average	**12,233**	

Source: DPIRD (pers comms Steve Bradshaw); results due to be published in mid-2025.

20 June 2023

Figure 9 Existing Tantabiddi Boat Ramp

13 August 2020, 07:56am

Figure 10 Tantabiddi Boat Ramp during period of high usage

The location of the existing ramp, adjacent to the mouth of Tantabiddi Creek, creates additional vulnerabilities. As noted above, heavy rainfall events can trigger significant overland flow in Tantabiddi Creek resulting in sedimentation at the facility (affecting navigable access) as well as undermining of the rock armour on the southern side of the facility (Advisian/Hydrobiology, 2020). The impact of these events has required significant maintenance works since the boat ramp was constructed. The Shire of Exmouth undertakes sand bypassing operations four times per year, typically over three consecutive days coinciding with period of low water level (MP Rogers & Associates, 2023b)[3]. These campaigns are estimated to remove ~2,500 m^3 per campaign resulting in ~10,000 m^3 year of maintenance dredging.

Further, several safety issues at the current facility have also been identified (Synergies, 2020):

- The concrete slab on the right-hand ramp has sunk
- During tour loading ~240 people are accessing tourist vessels from the one small jetty
- The location of the information shelter increases interaction between pedestrians and vehicles
- There is no disability access for boat boarding/exit
- The finger jetty is at a fixed height and can be difficult to access during low tide
- During periods of high usage, the limited facilities increases the risk of boat collision.

The TBF has been proposed to address the usage pressures, maintenance requirements and safety issues outlined above. The TBF will also provide a suite of environmental benefits, including:

- Reduced idle time of vessels/vehicles waiting for launch/retrieval which will result in a reduction of fuel use, anchoring, underwater noise and risk of vessel fauna strikes
- Expanded parking facilities and edge treatments/traffic control will reduce informal vehicle parking
- No interruption of Tantabiddi Creek flows.

[3] *Tantabiddi Boat Ramp Sand Bypassing was referred under the EPBC Act and determined to be Not a Controlled Action (EPBC Referral 2015/7411) in February 2015*

1.6 Conservation Significance

The proposed TBF, and the existing Tantabiddi Boat Ramp, are both located in the following conservation areas (Figure 11):

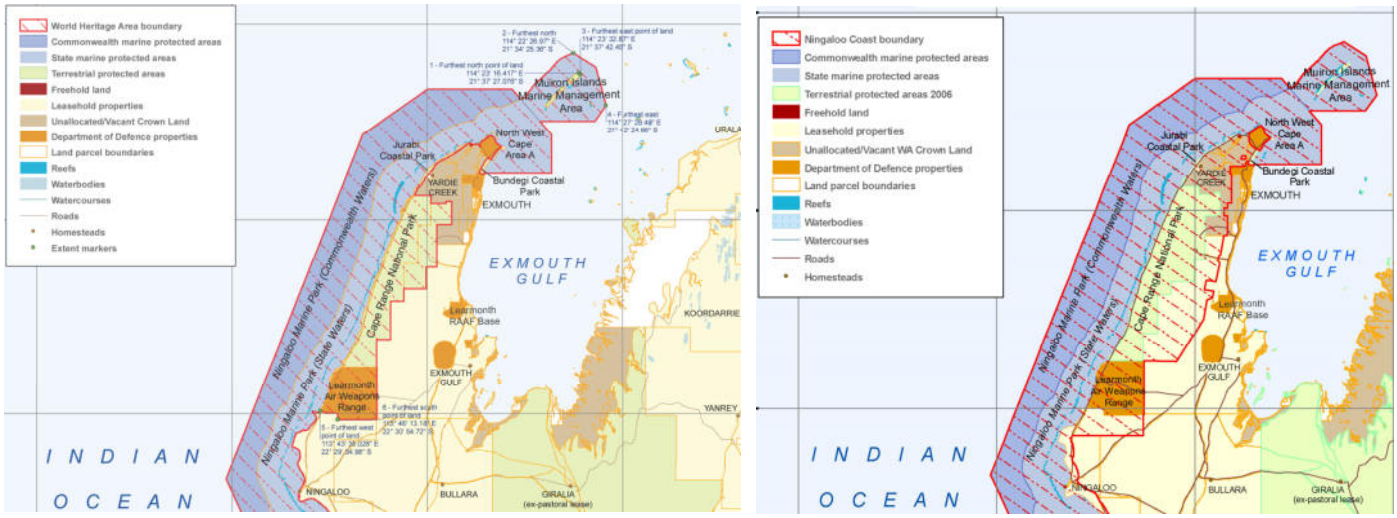
- Jurabi Coastal Park
- Ningaloo Marine Park (State Waters)
- Ningaloo Coast National Heritage Place
- Ningaloo Coast World Heritage Area.

The Jurabi Coastal Park is located on the western side of the Cape Range peninsula and extends westward from Yardie Creek Road to the high-water mark. This Coastal Park is jointly vested in the SoE and the Department of Biodiversity, Conservation and Attractions (DBCA) as a reserve for the purpose of recreation and coastal management. The Tantabiddi area is in a Recreation Zone of the Jurabi Coastal Park in which motorised and pedestrian access is permitted in defined areas linking recreational sites and facilities (SoE & CALM, 1999). Commercial facilities and operations, including moorings, are permitted under licence within the Ningaloo Marine Park and Jurabi Coastal Park.

The Ningaloo Marine Park (State Waters) was gazetted in 1987 for the purpose of managing and protecting the marine environment so that it may be used for conservation, recreational, scientific and commercial purposes. In the Tantabiddi area the Ningaloo Marine Park extends offshore from the high-water mark to the limit of State waters. The Tantabiddi area is in a Recreational Use Zone of the Ningaloo Marine Park (State Waters) which allows for a range of activities including boating (including charter vessel fishing and operation). Marine infrastructure development and small-scale dredging (for the purpose of public access and safety) may also permitted following assessment (Marine Parks Reserves Authority, 2005). The Tantabiddi Sanctuary Zone is located ~1 km offshore of the project area which provides total protection for marine life and fishing is prohibited.

The Ningaloo Marine Park (Commonwealth Waters) was declared in 1987 and is located immediately offshore of the Ningaloo Marine Park (State Waters) and the Gascoyne Marine Park is located further offshore of the Ningaloo Marine Park (Commonwealth Waters) (Environment Australia, 2002).

The Ningaloo Coast National Heritage Place includes a coastal strip from North West Cape to Red Bluff and the adjacent marine areas, reefs and islands including Jurabi Coastal Park, Ningaloo Maine Park (State Waters) and Ningaloo Marine Park (Commonwealth Waters). The Ningaloo Coast World Heritage Area includes the Jurabi Coastal Park, Ningaloo Marine Park (State Waters) and Ningaloo Marine Park (Commonwealth Waters). The World Heritage Area is overseen by the Ningaloo Coast World Heritage Advisory Committee which provides advice to management agencies and government ministers to assist in protecting the recognised values.



(a) Showing World Heritage Area **(b) Showing National Heritage Area**

Figure 11 Conservation management areas adjacent to the Tantabiddi Boat Launching Facility

1.7 Other Projects

Other than the adjacent Tantabiddi boat ramp, which the TBF will replace, the nearest formal boat launching facilities are the Coral Bay Boating Facility[4] (~140 km south), Bundegi Boat Ramp (22 km by road), and the Exmouth Boat Harbour[5] (~40 km by road, on the east coast of the North West Cape). The only other marine infrastructure in the vicinity of Tantabiddi is the Navy Pier located towards the north eastern tip of the North West Cape (~23 km north east of Tantabiddi) which has no public access.

In August 2021 the Environmental Protection Authority (EPA) completed a strategic review of the potential cumulative impacts of proposed activities and developments in Exmouth Gulf (EPA, 2021a). In December 2021 the State Government announced plans to implement the recommendations of this review including the establishment of a new marine park on the eastern and southern portions of the Gulf and Class A reserves for the protection of local areas of significance including Qualing Pool, Camerons Cave and the islands of the Gulf. This strategic review identified several project proposals in the area and these are summarised below.

In October 2016, the Ashburton Salt Project was referred under the *EP Act* and it was determined that it shall be assessed as a Public Environmental Review in November 2016. The project was also referred under the *EPBC Act* and was deemed to be a Controlled Action and shall be assessed as an accredited assessment under Part IV of the *EP Act*. This project is still undergoing assessment and has had several agreed changes to the proposal during this period (most recently in December 2021).

In March 2020 the Gascoyne Gateway Ltd submitted a referral under the *EP Act* to build and operate a single jetty deep-water port and renewable energy hub 10 km south of Exmouth. In June 2021 the EPA set the level of assessment to be Public Environmental Review. This project was also referred under the *EPBC Act* in June 2021 and in August 2021 the project was deemed to be a Controlled Action to be assessed as an accredited assessment under Part IV of the *EP Act*. On the 17 February 2025 the EPA approved a change to proposal during assessment under S.43A of the *EP Act 1986*. This project is still undergoing assessment.

In March 2021 Z1Z Resorts Pty Ltd submitted a referral to undertake redevelopment of the Ningaloo Lighthouse Resort (formerly Ningaloo Lighthouse Holiday Park) which will include clearing of 3.28 ha of native vegetation. This

[4] *Approved under the EP Act in June 2005 (Ministerial Statement, 652)*

[5] *Approved under the EP Act in January 1992 (Ministerial Statement 212) and modified in March 1996 (Ministerial Statement 406)*

project was also referred under the *EPBC Act* in August 2020 and the project was deemed to be a controlled action to be assessed by an accredited assessment process under the *EP Act* at the level of Public Environmental Review. This project received Ministerial approval under the *EP Act* on 15 December 2023 (MS 1215). This project was assessed as a Controlled Action and was approved under the *EPBC Act* on 16 April 2024. The proposal has yet to be implemented.

In July 2021 Main Roads Western Australia submitted a referral to realign Yardie Creek Road (~17 km north east of Tantabiddi) under both the *EP Act* and *EPBC Act*. In August 2021 it was determined that this project is a Controlled Action and shall be assessed at the level of Public Environmental Report/Review under the *EP Act* and *EPBC Act*, respectively. At the request of the proponent (Main Roads) and pursuant to S.40A of the *Environmental Protection Act 1986* this proposal was terminated in January 2023.

1.8 Alternatives Considered

Four potential redevelopment sites were identified in the 2018 study of usage, infrastructure needs and future requirements at Tantabiddi (MP Rogers & Associates, 2018) (Figure 12):

- Tantabiddi Creek (existing site)
- Tantabiddi Channel (Alternative Site 1)
- North of Jurabi Point (Alternative Site 2)
- Wobiri Carpark (Alternative Site 3)

Figure 12 Alternative sites investigated in 2018

These four sites were reviewed to determine the preferred location for the redevelopment of the Tantabiddi Boating Facility (Teal/Seashore, 2020). Following a review of environmental, coastal stability and maritime safety

factors for the four sites it was concluded that the Tantabiddi Creek (existing location) was the initial preferred site. The key factors which informed this preference were:

Environmental

- Upgrade to existing facility therefore reduced 'greenfield' impact on both marine and terrestrial areas
- Existing navigation channel so that capital dredging needs are significantly reduced
- Not known as a significant site for turtle and/or bird aggregation and roosting area
- The potential for sediment from Tantabiddi Creek to impact on the ramp was noted.
- Area is already a recognised boating facility.

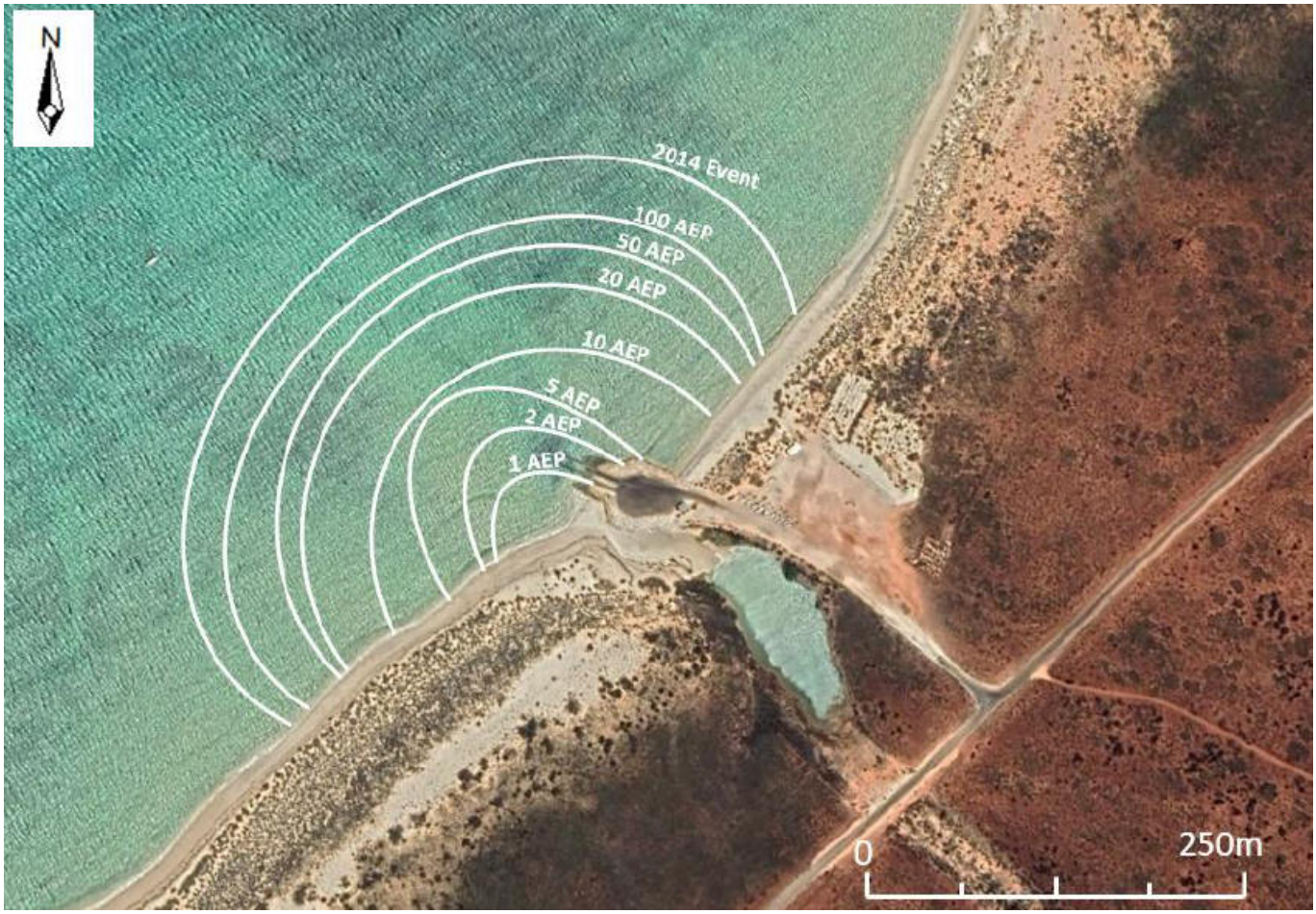
Coastal Stability

- The area is not located on significant cuspate foreland which are known areas of coastal instability. However, the risk continued influence of creek flow causing sporadic sedimentation on the facility was noted.

Maritime Safety

- Access to existing Tantabiddi Passage provides navigable access outside the lagoon with minimal additional navigation aids or navigation safety requirements.

To further inform project planning and design at Tantabiddi Creek a detailed hydrology and geomorphology study of the creek was completed (Advisian & Hydrobiology, 2020). This study demonstrated, using the severe 2014 flood event for validation, that local sedimentation of the boat ramp is estimated to occur for rainfall events with 2 to 5 years recurrence, with a wider area of impact predicted for more severe rainfall events. Numerical modelling a 1 in 100 Annual Exceedance Probability (AEP) flood indicated approximately 1,400 m^3 of sediment could be deposited within an area up to 300 m from the existing boat ramp (Figure 13). Sediment released from Tantabiddi Creek is generally expected to move northward, under the influence of currents and waves in the lagoon inside the reef. Consequently, relocating the facility more than 300 m south of Tantabiddi Creek avoids the impact from these sedimentation events. Further, shifting the facility from Tantabiddi Creek will also help to minimise further impacts on the ecologically sensitive creek area.



Source: Advisian & Hydrobiology (2020)

Figure 13 Radii of modelled sedimentation for events with increasing Annual Exceedance Probability (AEP) together with the 2014 event

Several preliminary concept designs were developed for this site (300 m south of Tantabiddi Creek) which seek to address the shortcomings of the existing facility and accommodate future recreational and commercial demand. The main attributes of the concept designs were:

- Provide an area of sheltered water
- Minimise dredging required for both the harbour basin and entrance channel
- Separate recreational users from commercial operators and passengers on both the marine and land-side
- Allow for future expansion
- Provide user amenities including shelters, seating, toilets, barbeques, viewing areas, information panels
- Floating marine infrastructure for safer operations
- Dedicated passenger loading/unloading jetties with universal access
- Loading wharf for commercial operators.

Several concept iterations have been developed by the DoT and included modifications to the entrance channel design to reduce the capital and maintenance dredging requirements. The location of the facility has also been shifted approximately 50 m offshore to minimise impact on a midden site (see Section 3). This offshore relocation also offers the added benefits of reducing the required vegetation clearing and ensuring a more balanced cut-and-fill earthworks, and decreases the amount of fill material that needs to be brought to the site. The reuse of dredge material onshore also avoids the need for offshore disposal and thereby reducing impacts to the marine environment.

2. Environmental Impact Assessment Framework

The *Environmental Protection Act 1986* (*EP Act*) is the primary legislation that governs environmental impact assessment (EIA) and environmental protection in Western Australia. EIA in Western Australia is conducted by the Environmental Protection Authority (EPA) which has prepared administrative procedures for the purposes of establishing the practices of EIA. Proposals likely to have a significant impact on the environment are required to be referred to the EPA under Section 38 of the *EP Act*.

Any actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES); which include internationally important flora, fauna, ecological communities and heritage places; are required to be assessed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). A search of the Protected Matters Search Tool indicates several Matters of National Environmental Significance may be affected by the project (Table 4). Consequently, this project will also be referred for assessment under the EPBC Act.

Table 4 Matters of National Environmental Significance which may be affected by the proposed TBF

Matter of National Environmental Significance	Existing Understanding
World Heritage Property	The project is in the Ningaloo World Heritage Area
National Heritage Place	The project is in the Ningaloo Coast National Heritage Place
Wetlands of International Importance	Not applicable. The nearest Ramsar Wetland is located at 80 Mile Beach, ~640 km northeast of the project area
The Great Barrier Reef Marine Park	Not Applicable
Commonwealth Marine Area	Not Applicable. The Ningaloo Marine Park (Commonwealth Waters) is located ~9 km offshore from the project area
Listed Threatened Ecological Communities	Not Applicable
Listed Threatened Species	15 listed threatened species have a medium to high likelihood of occurring in the area
Migratory Species	31 listed migratory species have a medium to high likelihood of occurring in the area

The assessment of the World Heritage Property and National Heritage Place are included in the consideration of the Social Surroundings (Section 6.6). The assessment of the Listed Threatened Species and Migratory Species are covered in the assessment of the Marine Fauna (Section 6.4). The use of the MNES assessment framework for threatened and migratory species is equivalent to, exceeds the rigour of the EPA's approach to assessing impacts to Marine Fauna and is therefore considered robust for the purposes of this assessment.

2.1 Other Decision-Making Authorities and Approvals

In addition to the *EP Act* and *EPBC Act* environmental approvals the following other key decision-making authorities have been identified:

- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Planning, Land and Heritage (DPLH)
- Department of Transport (DoT)
- Department of Water and Environmental Regulation (DWER)
- Main Roads Western Australia
- Shire of Exmouth (SoE)

These decision-making authorities are responsible for several key approvals statutory approvals relating to the proposed TBF (Table 5). The EPA will consider the coverage of these other statutory decision-making process to mitigate against potential environmental impacts (EPA, 2021c).

Table 5 Other key approvals potentially required for the TBF

Proposal Activities	Type of Approval	Legislation Regulating the Activity	Regulatory Authority
Project footprint and moorings	Licence Agreement	*Conservation and Land Management Act 1984 (CALM Act)*	DBCA
Project footprint	Section 18 Consent	*Aboriginal Heritage Act 1972*	DPLH
Project footprint	Development Approval	*Planning and Development Act 2005*	SoE and DPLH
Clearing of Native Vegetation		*EP Act Part V*	DWER
Operation	Jetty Licence	*Jetties Act 1926*	DoT
Access road	Application to undertake works within road reserve	*Main Roads Act 1930*	Main Roads Western Australia
Demolition of Tantabiddi Boat Ramp marine structures	Demolition Approval Lawful Authority	*Building Act 2011 and Regulations* *Conservation and Land Management Act 1984 (CALM Act)*	SoE DBCA

Notes: [1] Not required if project formally assessed under Part IV of EP Act; [2] Only required if regulatory thresholds are exceeded

This document has been prepared to support referral of this project for assessment under Part IV of the *EP Act* and the *EPBC Act*. This document draws on a significant number of site-specific investigations which have been undertaken to support the planning and development of the TBF:

- Stantec, 2025. Tantabiddi Boating Facility Redevelopment—Marine Environmental Impact Assessment. Prepared for Department of Transport, Report Ref site-tantabiddi-2023-01, 9 January 2025 (Appendix C)
- M.P. Rogers & Associates, 2025. Tantabiddi Dredge Plume Modelling Report. Prepared for Department of Transport, Report R1817 Rev 3, 21 January 2025 (Appendix D)
- Trinacria Consulting, 2024. Exmouth: Proposed Tantabiddi Boating Facility Assessment of Local Quarries. Report prepared for Department of Transport, Report 0401/2024, 24 April 2024 (CONFIDENTIAL)
- Talis Consultants, 2024. Tantabiddi Boating Facility: Underwater Noise Modelling and Assessment. Prepared for Teal Solutions on behalf of Department of Transport, Report Ref TN22040-1 Tantabiddi UWN Assessment_5.0, 2 April 2024 (Appendix E)
- M.P. Rogers & Associates, 2023a. Tantabiddi Dredging and Coastal Structures Constructability Assessment. Prepared for Department of Transport, Report R1762 Rev 1, 8 August 2023 CONFIDENTIAL
- M.P. Rogers & Associates, 2023b. Tantabiddi Creek Coastal Processes Study. Prepared for Department of Transport, Report R1518 Rev 0, 17 January 2023 (Appendix F)
- Cardno, 2022. Sampling, Analysis and Quality Plan: Tantabiddi Boating Facility – Marine Environmental Quality Investigations & Benthic Communities and Habitat Assessment. Tantabiddi Boating Facility-Marine Environmental Investigations. Prepared for Department of Transport, Report Reference CW1188500, 28 March 2022 (Appendix G)
- Searle Consulting, 2022. Tantabiddi Boating Facility Geotechnical Interpretive Report. Prepared for Department of Transport, Report 2021-10-01, 16 February 2022 (Appendix H)
- Vicky Long & Associates, 2021. Tantabiddi Boating Facility Project, Western Australia Flora and Vegetation Surveys. Prepared for Department of Transport, Report: vla82rv01_Rev0_05112, 15 November 2021 (Appendix I)
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- Acacia Cultural Heritage Consulting, 2022b. Ethnographic Cultural Heritage Assessment Report: Work Area Clearance Ethnographic Assessment of the Tantabiddi Boating Facility Project Area within Jurabi Coastal Park (Reserve 40729), Cape Range Peninsula, Gascoyne Region, WA. Report NTGAC522-2, 16 December 2022 (CONFIDENTIAL)

3. Stakeholder Engagement

The Tantabiddi Taskforce was established in 2019 to consider the design and management of a suitable facility to meet the growing recreational and commercial demands in the area. The Taskforce is chaired by the Managing Director of DoT, and comprises representatives from the SoE, DBCA, Tourism WA, Department of Primary Industries and Regional Development–Fisheries and Gascoyne Development Commission and is supported by an Agency Working Group. The Taskforce meets regularly and together with the Agency Working Group provides a forum for these agencies to liaise directly regarding the design, planning investigations and approvals necessary to progress the TBF. The DoT and SoE have both undertaken significant engagement on this project with the local community and key stakeholders. Public information and updates on the project status have been provided via dedicated websites hosted by both the DoT[6] and SoE[7]. The SoE website also provides contact details and encourages interested parties contact the Shire if they have any further questions regarding the proposed TBF.

Online surveys of recreational and commercial users of the existing facility were conducted to understand current and future boating demands in the region (MP Rogers & Associates, 2018). The survey of recreational users received over 1000 responses from both residents (29%) and visitors (71%) to Exmouth with 90% expressing supporting the upgrade of the facilities. Most commercial operations licenced to use the facility responded to the commercial survey and 90% also supported upgrading of the facilities (MP Rogers & Associates, 2018).

An online community survey was conducted by the SoE between 14 June and 17 July 2022 and received 338 responses (Survey Monkey, 2022). The majority of these were residential recreational boat owners (55%), and non-resident recreational boat owners (36%). Over 77% of respondents were supportive or highly supportive of relocation of the existing facility to the south and only 4.8% were opposed to this relocation. 70% of respondents would like to see more visitor and public amenity/open space at a new facility; including (in order of support level) charter passenger assembly area, ablutions, shade shelters and public open space.

The DoT and SoE have undertaken ongoing consultation regarding the TBF proposal, including key stakeholder groups across a range of interest areas (Table 6, Table 7). Several stakeholders have provided letters of support for this project (Table 7 and Appendix A).

Table 6 Key stakeholders groups consulted regarding the TBF proposal

Key Interest Area	Stakeholder
Environment	• Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) • Department of Water and Environmental Regulation (DWER, EPA Services) • Department of Biodiversity, Conservation and Attractions (DBCA) • Ningaloo Coast World Heritage Advisory Committee • Nyinggulu Coast Joint Management Body (consisting of DBCA, SoE and Traditional Owners) • Department of Primary Industries and Regional Development–Fisheries (DPIRD) • Cape Conservation Group • Exmouth Gulf Taskforce
Heritage	• Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) • Traditional Owners from the Baiyungu and Yinnigurrura People
Access and Amenity	• Marine Rescue Exmouth • Exmouth Adventure Co

[6] https://www.transport.wa.gov.au/imarine/tantabiddi-boating-facility.asp

[7] https://www.exmouth.wa.gov.au/tantabiddi-boat-ramp-redevelopment.aspx

Key Interest Area	Stakeholder
	• 3 Islands Whale Shark Dive • Exmouth Diving Centre • Live Ningaloo • Exmouth Game Fishing Club (EGFC) • Recfishwest • Tourism WA • Other commercial operators using the existing Tantabiddi Boat Ramp
Economic	• Gascoyne Development Commission • Shire of Exmouth • Exmouth Chamber of Commerce and Industry • Tourism WA

DoT have already engaged with environmental regulators regarding the proposed TBF. The Ningaloo Coast World Heritage Committee was the first key stakeholder group to be engaged and received a presentation on the project in December 2020. Meetings were held with EPA Services (11 April 2022) and Department of Department of Climate Change, Energy the Environment and Water (DCCEEW, formerly Department of Agriculture, Water and the Environment; 26 April 2022) to introduce the project. On 24 May 2022 a site visit was undertaken with representatives of EPA Services and DCCEEW. A pre-referral meeting was held with EPA Services on 19 September 2024. Pre-referral meetings were held with EPA Services on 19 September and 12 November 2024 and with representatives from DCCEEW on 6 December 2024.

The project was introduced to the Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) during a presentation in March 2021 and a site visit was subsequently undertaken with NTGAC representatives in August 2021. On 2–4 June 2022 a cultural heritage survey was undertaken of the site together with nominated members of the Bayungu and Yinnigurrura People appointed by the NTGAC. A post-survey workshop with Traditional Owners was held on 20 October 2022 where it was agreed to proceed with project planning. Site surveys were undertaken in 2021 and 2022 with NTGAC representatives and the Yamatji Marlpa Aboriginal Corporation (YMAC)[8] confirmed their support for the project to proceed (Appendix A) including the location of the access road through an identified midden site (see also Section 6.6). During the cultural heritage survey the Traditional Owners expressed the wish that the existing Tantabiddi Boat Ramp be completely removed, the site rehabilitated and the mouth of Tantabiddi Creek restored to its original state (Acacia Heritage, 2022).

An information session was held in June 2021 with Commercial Operators of the existing facility with a follow up briefing in May 2022.

Table 7 Summary of stakeholder engagement and their position regarding the proposed TBF

Stakeholders	Type of Briefing	Position
Minister for Transport	Regular Project Briefings by DoT Senior Executive & Briefing Notes	WA Labour Election Commitment 2025
Shire of Exmouth	Actively engaged on Tantabiddi Taskforce and Working Group – Ongoing	High Priority Project – letter of support
DBCA	Actively engaged on Tantabiddi Taskforce and Working Group – Ongoing	Active member of Taskforce providing advice to support planning
Gascoyne Development Commission	Actively engaged on Tantabiddi Taskforce and Working Group – Ongoing	Member of Taskforce & letter of support

[8] *YMAC are the agent for NTGAC who are the prescribed body corporate for the Gnulli Native Title Determination area which includes the location for the proposed TBF*

Stakeholders	Type of Briefing	Position
Tourism WA	Actively engaged on Tantabiddi Taskforce and Working Group – Ongoing	Member of Taskforce & letter of support
DPIRD (Fisheries)	Actively engaged on Tantabiddi Taskforce and Working Group – Ongoing	Member of Taskforce
Ningaloo Coast World Heritage Committee	Presentation December 2020 & communications Presentation June 2022	Very interested in project & studies undertaken. Position pending environmental referral
Exmouth Game Fishing Club	Briefing in May 2022	Letter of support
Commercial Operators	Briefing June 2021. Follow up briefing May 2022	Letters of support
Nganhurra Thanardi Garrbu Aboriginal Prescribed Body Corporate (NTCAC) PBC	• Presentation March 2021 • Site Visit August 2021 • Cultural Survey June 2022 • Post Survey Workshop October 2022 • Site Identification Survey November 2022 • Email query to PBC regarding new Exmouth Cape Range – Site 39191 & impact on Section 18 Notice. A letter was received from Chair of PBC confirming S18 only required for access road area impacting Tantabiddi Midden Site 1	Overall support with conditions on heritage values Letter of support Letter received clarifying Section 18 Notice area Section 18 consent received December 2023
Nyinggulu Coast Joint Management Body (JMB) – DBCA, SoE & Traditional Owners	• Presentation on the project & investigations December 2021 • Briefing to JMB Dec 2022 regarding Section 18	Overall support
Recfishwest	Briefing 9 March 2022	Letter of support
Exmouth Chamber Commerce & Industry	Briefing 31 March 2022	Letter of support
EPA/DWER (State environmental protection authority)	Project Briefing 11 April 2022 Site Visit 24 May 2022 Pre-referral meeting 19 September 2024 Meeting with representatives of Marine Ecosystems Branch 12 November 2024	Position pending environmental referrals
DCCEEW (Commonwealth environmental approval authority)	Project Briefing 26 April 2022 Site Visit 24 May 2022 Pre-referral meeting 6 December 2024	Position pending environmental referrals
Cape Conservation Group	Briefing on 10 May 2022	General support with environmental considerations
Community Engagement & Survey	May 2022 Community Survey July 2022	Support. Community Survey closed July 2022 with 75% overall support

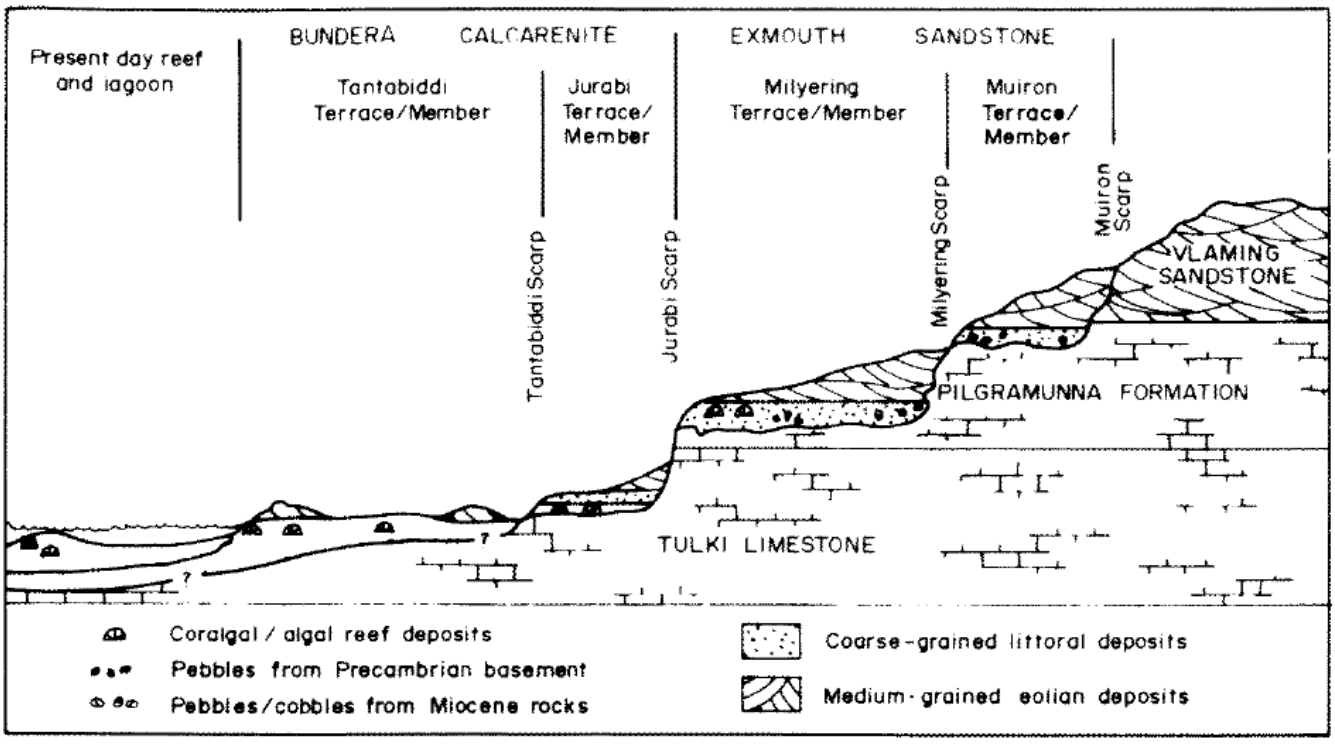
4. Environmental Setting

4.1 Geology and Geomorphology

Tantabiddi is located along the northern Ningaloo coast along the western coast of North West Cape. The area is situated in the Yanrey-Ningaloo geological zone and is dominated by limestone and calcarenite with sandstone formations also common (Ditchfield and Ward, 2019). The geology of the area is characterised by a sequence of marine limestone conglomerates, laid down 10–30 million years ago, including the regionally present Mandu, Tulki and Trealla limestones, as well as the local coral-rich Pilgramunna Formation (Hocking et al. 1988). Uplift of the Cape Range combined with sea level changes has resulted in a stepped geological formation (Figure 14), overlain by sandstone and calcareous sediment (Wyrwoll et al., 1993). The stepped structure of Cape Range is intermittently deeply cut by local drainage channels, forming an extensive set of short gorges and alluvial fans. The surface geology in the vicinity of Tantabiddi Creek may be summarised as:

- Cape Range ridges composed of reddish/yellowish shallow marine partly clayey foraminiferal calcarenite packstone known as the Tulki Limestone
- The Tantabiddi Terrace composed of calcarenites and calcirudites and shallow marine and minor aeolian coralgal reef deposits
- Beaches and dunes consisting of light grey unconsolidated and poorly consolidated quartzose calcarenite
- Ningaloo Reef offshore composed of living coralgal reef

Uplift of Cape Range provided conditions for development of karstic limestone, creating an extensive cave system underneath the range, which supports a freshwater lens overlying saline groundwater (Allen, 1993). The karstic network, including the Tantabiddi Sinkhole (east of Yardie Creek Road and ~400 m east of the project site), provides a significant underground habitat, occupied by a range of unique stygofauna (Hamilton-Smith et al., 1998).

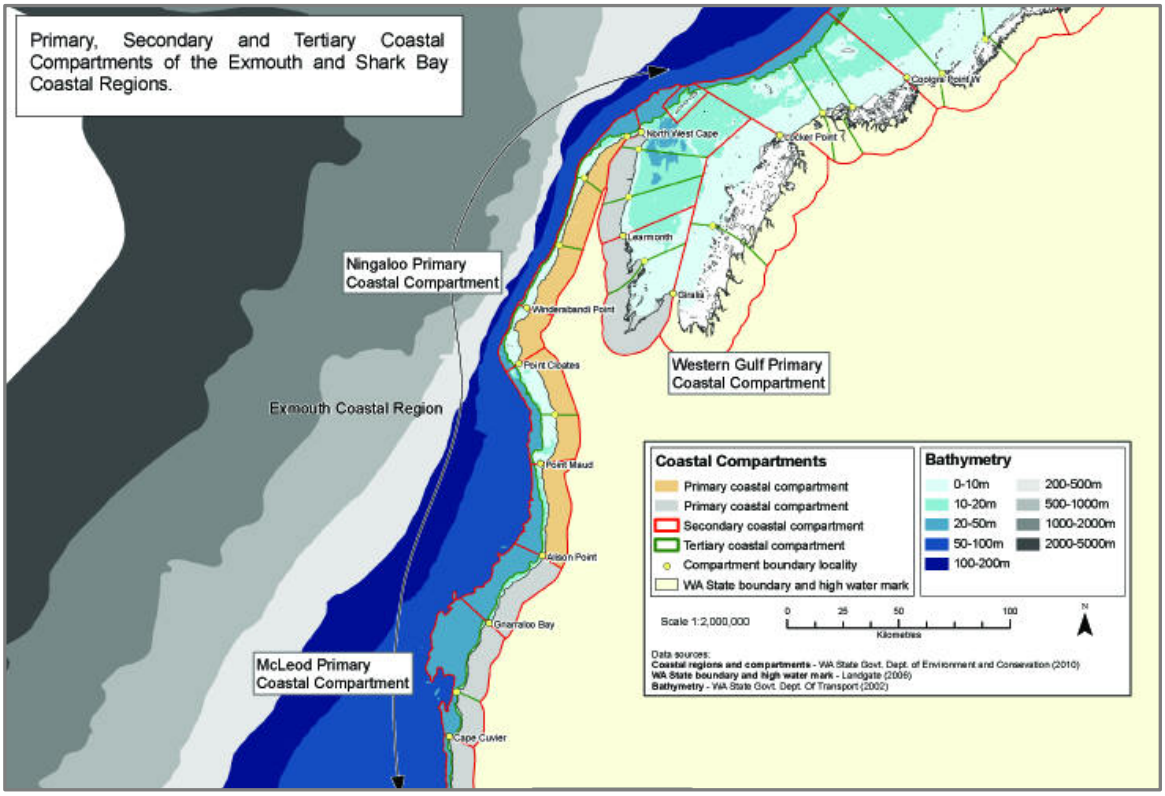


Source: Wyrwoll *et al*. (1993), based on van de Graaff *et al*. (1976)

Figure 14 Idealised geological cross-section of the western flank of the Cape Range

The formation of the Ningaloo Reef commenced about 7,500 years Before Present (BP) as sea level reached the current level (Collins et al., 2003; Twiggs and Collins, 2010). The Ningaloo Reef unit forms the existing coastal

margin as a narrow calcareous reef chain, extending hundreds of kilometres along the Ningaloo coast. Marine sediment input through the reef chain, primarily developed through weathering and biogenic sources, combines with the alluvial deposits to form a complex coastal plain around the range (Allen 1993). The proposed TBF will be located within the Winderabandi Point to North West Cape secondary sediment compartment (Eliot et al., 2012; Figure 15). The inshore lagoon and shoreline in the vicinity of the proposed TBF is characterised by a thin veneer of marine sediments overlaying a limestone pavement (CMW Geosciences, 2021; Searle Consulting, 2022; MP Rogers & Associates, 2023b).



Source: Eliot et al. (2012)

Figure 15 Exmouth region coastal compartments

Series of sandy beaches paralleled by fringing reef located typically 1–1.5 km offshore; in the vicinity of Tantabiddi the fringing reef (Ningaloo Reef) is located ~3.5 km from shore and is intersected by Tantabiddi Channel which has been used for boating access beyond the lagoon. The morphology of the coastal plain is strongly influenced by the structure of Ningaloo Reef, which creates a series of shallow coastal lagoons, generally underlain by a calcareous rock platform (Eliot et al., 2012). Variable wave sheltering, provided by discontinuities in the reef chain and changes in reef height, creates alternating embayment and cuspate foreland development (Sanderson & Eliot 1996), with the landward extent of embayments often bounded by a calcareous terrace, forming soft-medium strength cliffs typically 3–5 m above existing sea level. Dune development has occurred in areas of relative coastal stability, with lower-lying sedimentary features including sand spits occurring inside the lagoon in areas of irregular sediment movement, and deeper sand splays typically present at large gaps in the reef due to variable wave conditions. Some lagoon areas are sheltered, with reasonable flushing but low sediment transport, providing ideal habitat for coral growth, with extensive coral fields present in several bays.

Sediments across the lagoon are typically medium sands (0.23–0.5 mm) dominated by coral fragments, crustose coralline algae and molluscs (Cuttler, et al., 2019). Sediment is moved onshore under wave action and then transported alongshore, via current circulation within the lagoon, with a net sediment transport to the north east (with some seasonal reversal) (MP Rogers & Associates, 2023b). The existing boat ramp interrupts this longshore sediment transport as sediment accumulates on the southern side (MP Rogers & Associates, 2018).

Variation of currents and waves due to the gaps between reefs provides local-scale influence on the bathymetry and underlying stratigraphy. Amplified tidal currents and waves have scoured the bed at the reef gaps, causing greater depth to the cemented surface, which can be partly infilled by sand. This forms a preferential pathway for floodwaters to release and has resulted in the formation of paleochannels across the coastal lagoon. These features are not widely evident for many smaller ephemeral creeks west of Cape Range, with alluvial fans across the subtidal rock platforms apparent at many locations.

4.2 Climate

The climate of the Ningaloo coast reflects its location between the tropical low-pressure belt and the sub-tropical high-pressure belt, with its northern limit at the boundary between the temperate and tropical coast regions. The region experiences a semi-arid to arid climate, with hot summers and mild winters. Monthly maximum temperatures range from ~23°C in July to ~36°C in January (Rockwater, 2021).

The seasonal cycle is occasional influenced by tropical cyclones and tropical lows, both of which have greater incidence towards the north (Gentilli 1971). Rainfall is highly irregular, mainly distributed between two seasons from May to July and January to March, reflecting the relative influence of mid-latitude and tropical systems, respectively. The average annual rainfall at Exmouth is 283 mm with the highest monthly average in June (61.5 mm) and the lowest in October (1.3 mm) (Rockwater, 2021). Rainfall analysis to support the Exmouth Floodplain Management Strategy (SKM 2007) demonstrated that extreme events, with rainfall exceeding 100 mm/day were caused almost equally by tropical cyclones and mid-latitude storms, with an annual average rainfall of only 230 mm. Average evaporation exceeds rainfall in every month and by a factor of nine over the whole year (Rockwater, 2021).

The Ningaloo Region is in a zone of transition between temperate and tropical drivers of coastal hazard. Regionally, weather is affected by the latitudinal shift of the sub-tropical high-pressure belt, in combination with the summer continental heat trough (Gentilli 1971). As a result, the region may experience occasional (1–2 per year) tropical cyclones during summer months, but more frequently experiences the northerly extent of mid-latitude storms in winter, including frontal systems. In addition to these sources of extreme coastal conditions, the latitude and climate of this location strengthen the influence of thermally-driven winds, particularly southerly sea breezes. Land and sea breezes produce prevailing coastal winds in the region and produce moderate strength prevailing coastal winds. Consequently, they are recognised to play a significant role in ambient environmental forcing (Pattiaratchi et al. 1997).

4.3 Hydrology

The crest of the Cape Range forms a regional divide separating ephemeral drainage systems to the east and west which flow following high rainfall events. The western side of Cape Range has a relatively steep and short catchment (~8 to 12 km from the crest of the range to the shoreline). In the upper catchment, flows are influenced by the terraced morphology, with flow collecting along terrace segments, draining through deeply incised channels on each scarp. The resulting gorges are rocky and commonly exhibit a splay of gravel and sands at their downstream end. The lower terraces are wider and relatively level, supporting greater channel sinuosity and enabling breakout flows to occur under extreme floods. The lowest part of the catchment is a narrow coastal floodplain, bounded to seaward by coastal dunes, forming a set of elongated basins running parallel to the coast. These basins have irregular breakout points, many of which are blocked by coastal sand bars, and only breach under high flow conditions.

Tantabiddi Creek is one of approximately 14 estuarine systems between North West Cape (north) to Red Bluff (south) and is an intermittently closed and open lagoon. The deeply scoured section of the channel adjacent to the boat ramp provides permanent water, which is variably influenced by the tide depending on the continuity of the

sandbar at the Creek entrance. Tidal inundation is sufficient to support samphire flats in the basin adjacent to the channel.

Tantabiddi Creek north of the Cape Range National Park and has a catchment area of 27 km^2 (Advisian & Hydrobiology 2020). Minor catchments to the north (6 km^2) and south (9 km^2) (located on the Tantabiddi Terrace geological unit) may also contribute minor flows to Tantabiddi Creek flows during extreme events (MP Rogers & Associates, 2023b). The catchment is rocky, short and moderately steep, subject to brief periods of heavy rainfall and long periods of no rainfall. These features collectively make Tantabiddi Creek prone to flash flooding which can occur two to six hours following a period of intense rainfall.

Hydraulic modelling of Tantabiddi Creek indicates that the peak flow for the 1 in 100 Annual Exceedance Probability (AEP) flood event is 146 m^3/s at the Yardie Creek Road floodway (Advisian & Hydrobiology, 2020). On 26 April 2014 a slow-moving thunderstorm caused the highest daily April rainfall (206 mm, exceeding the previous record of 136 mm set 43 years earlier) in Exmouth. Anecdotal evidence suggests up to 400 mm of rainfall may have fallen in the Cape Range area to the west of Exmouth. Flow observations during this event (est. 168 m^3/s) provide a basis with which to project the hydrologic and geomorphic response to severe rainfall events. Sediment transport modelling of this 2014 flood event suggested 4,260 m^3 of sediment and alluvial material was transported from the creek and deposited near the Tantabiddi Boat Ramp and navigation channel. This approximately corresponds to the volume of subsequent maintenance dredging undertaken by the Shire of Exmouth (URS, 2016).

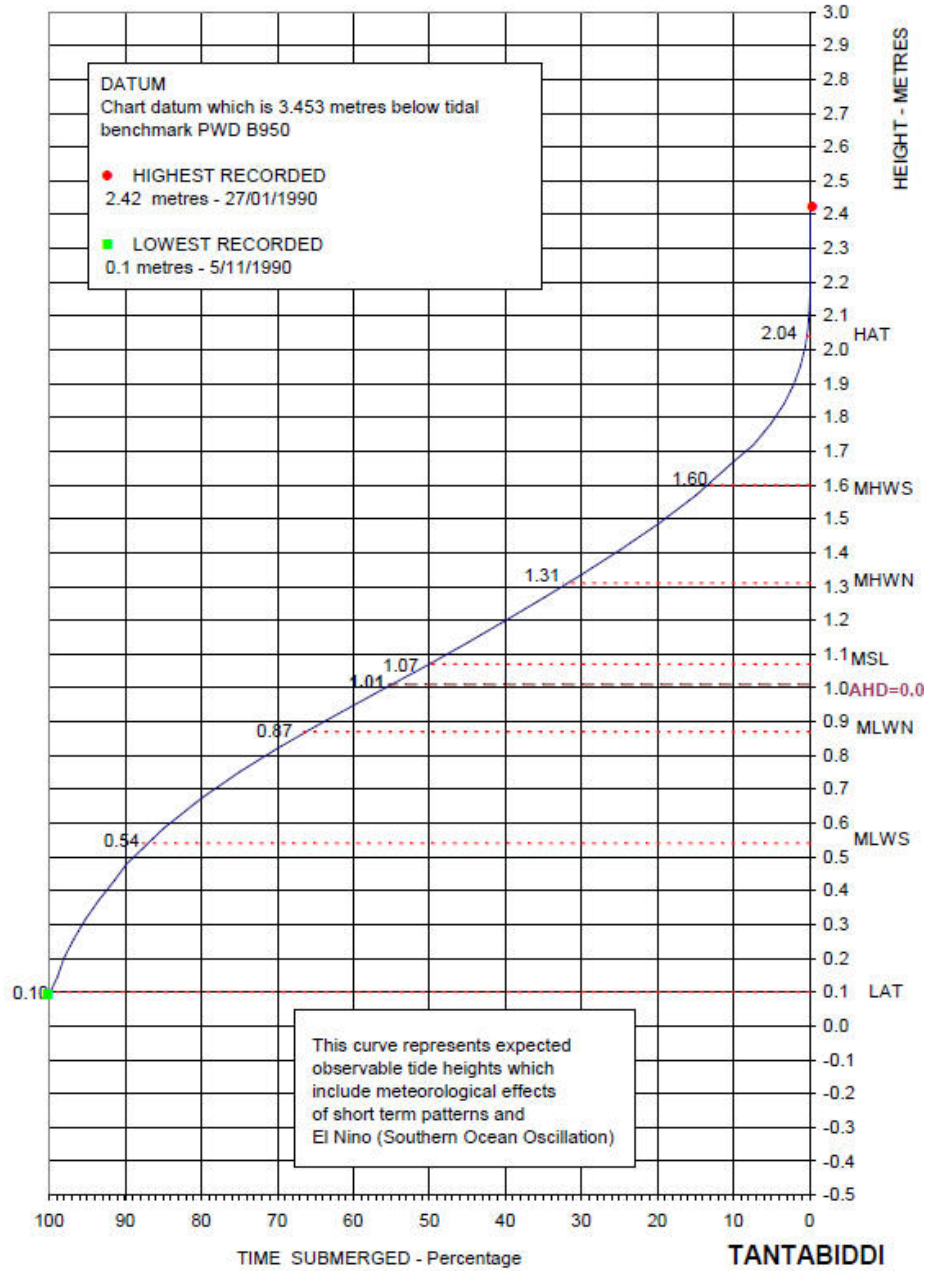
Hydraulic modelling was undertaken to estimate the volume of sediment likely to be deposited near the boat ramp for different intensity events (Advisian & Hydrobiology, 2020). This generally showed increasing volume and area of offshore deposition for larger flow conditions, with the 1 in 100 AEP flood event estimated to affect a radial area within 300 m of the creek mouth, with approximately 1,400 m^3 being deposited in the vicinity of the ramp and existing navigational pathway (Figure 12).

Uplift of Cape Range provided conditions for development of karstic limestone, creating an extensive cave system underneath the range, which supports a freshwater lens overlying saline groundwater (Allen, 1993). Near the coast a thin layer of low salinity groundwater overlays brackish and saline groundwater with the thickness of the surface layer increasing inland (Rockwater, 2021). The Tantabiddi Sinkhole is located ~400 m from the coast but is known to have a subterranean connection to the ocean (Bamford, 2021).

4.4 MetOcean Conditions

The position of the Ningaloo Coast, at the intersection of the north facing Pilbara coast and the west facing Gascoyne coast, has a high level of oceanographic complexity (Woo et al. 2006), which is enhanced by the narrow continental shelf associated with geological uplifting of the Cape Range. The regional wave climate is predominantly characterised by strong wind waves, occasionally subject to large swells propagating from the southern Indian Ocean (Wandres et al. 2017). Tropical cyclones affect the coast relatively rarely but are typically the cause of the most extreme winds, waves and water levels.

The tides at Tantabiddi are microtidal and classified as mixed, predominantly semi-diurnal with a Lowest Astronomical Tide to Highest Astronomical Tide range of 1.94 m (D'Adamo and Simpson, 2001; MP Rogers & Associates, 2022). The mean spring and neap tide ranges are 1.06 m and 0.44 m, respectively (Figure 16).



Source: DoT, DPI 696-75-01, 1 November 2006

Figure 16 Tantabiddi submergence curve

Coastal processes, including erosion and inundation, are strongly influenced by the semi-continuous sections of nearshore reef. Complex swell diffraction and refraction patterns through the discontinuous reef system, are superimposed on wind- and tide-driven circulation in the lagoons, locally generated wind waves and transport offshore through gaps in the reef (Sanderson 2000; Lowe et al. 2009). Under ambient conditions, wind-driven circulation is dominant throughout much of the lagoon system, with a northwards flow occurring during most afternoons. Nearshore waters exit the lagoon via regular breaks in the outer reef (including the Tantabiddi Passage), some of this water may be recirculated back into the lagoon, though the majority outflows to deeper water (Stantec, 2025).

Although tidal exchange is sufficient for effective flushing within the shallow lagoons, the moderate tidal range generally produces only slow flows. Stronger tidal flows occur for areas where there is an extended length of continuous reef, or where there is a narrow break in the reef. Substantially accelerated flow conditions may occur during high wave conditions, when 'wave pumping' across the reefs creates a set-up within the lagoon (Hearn 1999;

Taebi et al. 2011). It is likely that the most severe wave conditions experienced at the TBF will be associated with north-westerly wave events (MP Rogers & Associates, 2022).

Wave conditions inside the coastal lagoons are strongly controlled by the fringing reef structure, which generally acts to dampen the more variable and energetic offshore wave conditions:

- Wave transmission across areas of high reef provides wave scattering, which can result in long-period (infragravity) wave generation (Pomeroy et al. 2018).
- For areas where the elevation of the reef is lower, transmission is dampened by wave breaking and frictional loss, producing wave variability, but generally less energetic conditions, whose occurrence is modulated by water levels with extremes occurring when waves and high tides are coincident.
- Small breaks in the reef induce a radial pattern of wave diffraction with wave energy reducing with distance from the reef break.
- Larger breaks in the reef allow waves to pass through with less damping. High wave conditions are typically evident along the alignment of prevailing swell (i.e. to the northeast of the break in the reef) which is often associated with an embayment at the shoreline. Variable wave directions, such as caused by tropical cyclones or exceptional northerly winter storms, can cause wave transmission through the reef from a different direction, usually causing sudden coastal change on the sections of coast which are normally sheltered (Cuttler et al. 2018).

The presence of the fringing Ningaloo Reef causes significant attenuation of wave energy due to breaking and frictional losses as the waves propagate onshore. Wave attenuation provided by segments of Ningaloo Reef have been reported (Cuttler et al. 2018) for Coral Bay and Sandy Beach, 4.5 km north-northeast of Tantabiddi Creek. For Coral Bay, an offshore wave with a 3.0 m significant wave height was reduced to 0.8 m through transmission across the reef; however, this was strongly modulated by the tidal level with larger waves propagating onshore during periods of higher tide. At Sandy Beach, a chain of pressure sensors was in place during the passage of TC Olwyn (March 2015), where a 5.8 m significant wave height outside the reef was recorded at less than 1.0 m inside the lagoon.

Sediment dynamics of the Ningaloo coast are characteristically local, with nearshore reefs and rocky shores prevalent along both the McLeod and Ningaloo Coastal Compartments (Figure 15). Narrowing of the shelf width and change in shoreline aspect at Point Cloates are associated with a significant change in coastal character, suggesting limited alongshore sediment transfer, with a limited volume likely to be transported along the seaward face of the reef, generally at depths of more than 10 m. The seasonal variation in nearshore sediment transport may be largely attributed to the seasonality of the sea breeze system which drives northerly sediment transport in spring/summer (MP Rogers & Associates, 2023b).

Inside the lagoon, there is substantial differences to both sediment transport and sediment availability, including sediment supply from local creek systems or marine inputs through gaps in the reef. These factors result in the development of discrete sedimentary features, particularly in areas sheltered from waves and currents, often aligned to provide minimal sediment transport (i.e. approximately parallel to the reef line). The presence of some lowland areas onshore of a beach ridge sequence indicates a capacity for higher rates of alongshore sediment transport, likely associated with mobility of sand released from creeks.

In this setting, the concept of wave-driven littoral transport is substantially less meaningful than on an open coast. However, there is a general tendency for northwards alongshore transport to occur within the Ningaloo coast lagoons, suggested by landform structure and evolution of coastal features. An indicative alongshore transport rate of 5,000 m^3/yr has been suggested (MP Rogers & Associates 2018), however no supporting basis has been provided. For the Coral Bay Boating Facility, a best estimate for alongshore sediment transport of 2,000 m^3/yr was

modelled based upon lagoon currents (Damara WA 2006), with an observed accumulation rate of approximately 200 m^3/yr subsequently measured (Department of Transport 2018).

4.5 Marine Environment

The Ningaloo Marine Park exhibits a diverse range of benthic habitats including intertidal reef, mudflat, sandflat, inshore lagoon and fringing coral reef (LeProvost, Dames & Moore, 2000). The highest diversity coral communities occur in the fringing reef and inshore lagoon areas on the west coast of the Cape Range peninsula (Vernon and Marsh, 1988). Broadscale mapping of the benthic habitats shows that the inshore areas of the norther area of North West Cape are characterised by subtidal reef, coral reef communities and sand (Kobryn et al., 2017; MPRA 2015; URS 2015). In the immediate vicinity of Tantabiddi Creek the benthic habitats were dominated by limestone pavement with macroalgae, rubble or sand (typically as a thin, 50–100 mm, veneer over the pavement) and area of hard coral (Kobryn et al, 2017).

The Ningaloo Coast is characterised by a high abundance and diversity of marine fauna. The area is recognised for a wide range of iconic fauna, including: whale shark, sharks, rays, shorebirds, turtles and stygofauna; many of which have a high conservation significance.

4.6 Terrestrial Environment

The proposed TBF will be located within the Cape Range subregion of the Carnarvon bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Department of the Environment and Energy, 2018). The vegetation is characterised by *Acacia* shrublands (*Acacia stuartii* or *A. bivenosa*) over *Triodia* on limestone and red dunefields, *Triodia* hummock grasslands with sparse Eucalyptus trees and shrubs on the Cape Range and extensive hummock grasslands (Triodia) on the Cape Range and eastern dunefields (Kendrick & Mau, 2002). The area is semi-arid and location within the Eremean Botanical Province and comprises spinifex grasslands (*Triodia* and *Plechtrachne*), low woodlands, coastal strand vegetation, low shrublands and mangroves (Kobryn et al., 2017). The Beard vegetation mapping described the area as (System Association 663) hummock grassland with scattered shrubs or mallee, including *Triodia* spp., *Grevillea* spp., and *Eucalyptus* spp. (Long, 2021a) (Table 8).

Table 8 Pre-European and current extent of vegetation association 663

Region	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent Protected (IUCN I-IV) as a Proportion of Pre-European Extent
Western Australia	30,474	25,977	85.2	22.3
Shire of Exmouth	30,474	25,977	85.2	22.3
IBRA Biogeographic Region (Carnarvon)	29,068	25,866	89.0	23.3
IBRA Biogeographic Subregion (Cape Range)	29,068	25,866	89.0	23.3

Source: Long (2021a)

A desktop assessment identified 383 vertebrate species could potentially occur within 20 km of the project site, two freshwater fish, five frogs, 111 reptiles, 221 birds and 44 mammals (Bamford, 2021; Table 9). However, at least one bird and 19 mammal species are now considered locally extinct (Bamford, 2021). The extant vertebrate fauna assemblage (363 species) includes 55 species of conservation significance (Table 9). There are six species listed as priority (CS2), the majority of these are reptiles. Only eight of these conservation significant species are likely to be resident (Bamford, 2021).

Table 9 Potential occurrence of vertebrate species and their conservation significance

Taxon	Expected Species	Locally extinct	Conservation Significance			
			CS1	CS2	CS3	Total
Freshwater fish	2		2	0	0	**2**
Frogs	5 (1)	0	0	0	0	**0**
Reptiles	111 (1)	0	6	4	0	**10**
Birds	221 (2)	1	40	1	0	**41**
Mammals	44 (7)	19	1	1	0	**2**
Total	**383**	**20**	**49**	**6**	**0**	**55**

Source: Bamford (2021); Conservation Significance (CS) levels: CS1 = listed under WA State and/or Commonwealth legislation; CS2 = listed as Priority by DBCA; CS3 = considered locally significant

Table 10 Conservation significant vertebrate species expected to occur in the project area

Species	Common Name	Conservation Significance	WA Status	EPBC Status	Expected Occurrence
Milyeringa veritas	Blind Cave Gudgeon	CS1	S3 (V)	V	Resident
Ophisternon candidum	Blind Cave Eel	CS1	S3 (V)	V	Resident
Chelonia mydas	Green Turtle	CS1	S3 (V) S5 (M)	V,M	Irregular Visitor
Caretta caretta	Loggerhead Turtle	CS1	S2 (E) S5 (M)	E,M	Irregular Visitor
Eretmochelys imbricata	Hawksbill Turtle	CS1	S2 (E) S5 (M)	E,M	Irregular Visitor
Natator depressus	Flathead Turtle	CS1	S3 (V) S5 (M)	V,M	Irregular Visitor
Dermochelys coriacea	Leatherback Turtle	CS1	S2 (E) S5 (M)	E,M	Vagrant
Diplodactylus capensis	Cape Range Stone Gecko	CS2	P2		Resident
Lerista allochira	Cape Range Slider	CS2	P3		Resident
Lerista planiventralis maryani	Keeled Slider	CS2	P1		Resident
Anilios sp. 'Cape Range'	Blind snake 'Cape Range'	CS2	P1		Resident
Aipysurus apraefrontalis	Short-nosed Sea-Snake	CS1	S1 (Cr)	Cr	Irregular Visitor
Fregata ariel	Lesser Frigatebird	CS1	S5 (M)	M	Irregular visitor
Phaethon rubricauda	Red-tailed Tropicbird	CS2	P4		Irregular visitor
Limosa limosa	Black-tailed Godwit	CS1	S5 (M)	M	Regular visitor
Limosa lapponica	Bar-tailed Godwit	CS1	S1 (Cr) S5 (M)	Cr, M	Regular visitor
Numenius madagascariensis	Eastern Curlew	CS1	S1 (Cr) S5 (M)	Cr, M	Regular visitor
Calidris ferruginea	Curlew Sandpiper	CS1	S1 (Cr) S5 (M)	Cr, M	Regular visitor
Calidris acuminata	Sharp-tailed Sandpiper	CS1	S5 (M)	M	Regular visitor
Actitis hypoleucos	Common Sandpiper	CS1	S5 (M)	M	Regular visitor
Numenius minutus	Little Curlew	CS1	S5 (M)	M	Irregular visitor

Species	Common Name	Conservation Significance	WA Status	EPBC Status	Expected Occurrence
Tringa stagnatilis	Marsh Sandpiper	CS1	S5 (M)	M	Regular visitor
Tringa glareola	Wood Sandpiper	CS1	S5 (M)	M	Regular visitor
Calidris falcinellus	Broad-billed Sandpiper	CS1	S5 (M)	M	Irregular visitor
Xenus cinereus	Terek Sandpiper	CS1	S5 (M)	M	Regular visitor
Tringa nebularia	Common Greenshank	CS1	S5 (M)I	M	Regular visitor
Calidris subminuta	Long-toed Stint	CS1	S5 (M)I	M	Vagrant
Tringa brevipes	Grey-tailed Tattler	CS1	S5 (M)I	M	Regular visitor
Calidris alba	Sanderling	CS1	S5 (M)I	M	Regular visitor
Numenius phaeopus	Whimbrel	CS1	S5 (M)I	M	Regular visitor
Arenaria interpres	Ruddy Turnstone	CS1	S5 (M)I	M	Regular visitor
Calidris ruficollis	Red-necked Stint	CS1	S5 (M)I	M	Regular visitor
Calidris tenuirostris	Great Knot	CS1	S1 (Cr) S5 (M)	Cr, M	Regular visitor
Calidris canutus	Red Knot	CS1	S2 (E) S5 (M)I	E, M	Regular visitor
Glareola maldivarum	Oriental Pratincole	CS1	S5 (M)	M	Irregular visitor
Rostratula australis	Australian Painted-snipe	CS1	S2 (E)	E	Vagrant
Pluvialis fulva	Pacific Golden Plover	CS1	S5 (M)	M	Regular visitor
Charadrius leschenaultii	Greater Sand Plover	CS1	S5 (M)	M	Regular visitor
Charadrius veredus	Oriental Plover	CS1	S5 (M)	M	Irregular visitor
Pluvialis squatarola	Grey Plover	CS1	S5 (M)	M	Regular visitor
Charadrius mongolus	Lesser Sand Plover	CS1	S2 (E) S5 (M)	E	Regular visitor
Hydroprogne caspia	Caspian Tern	CS1	S5 (M)	M	Regular visitor
Sternula nereis	Fairy Tern	CS1	S3 (V)	V	Regular visitor
Sternula albifrons	Little Tern	CS1	S5 (M)	M	Irregular visitor
Chlidonias leucopterus	White-winged Black Tern	CS1	S5 (M)	M	Regular visitor
Sterna dougallii	Roseate Tern	CS1	S5 (M)	M	Regular visitor
Thalasseus bergii	Crested Tern	CS1	S5 (M)	M	Regular visitor
Anous stolidus	Common Noddy	CS1	S5 (M)	M	Irregular visitor
Pandion haliaetus†	Osprey	CS1	S5 (M)	M	Resident
Falco peregrinus	Peregrine Falcon	CS1	S7		Regular visitor
Falco hypoleucos	Grey Falcon	CS1	S3 (V)	V	Irregular visitor
Pezoporus occidentalis	Night Parrot	CS1	S1 (Cr)	E	Vagrant
Apus pacificus	Fork-tailed Swift	CS1	S5 (M)	M	Irregular visitor
Dasycercus blythi	Brush-tailed Mulgara	CS2	P4		Resident
Petrogale lateralis	Black-footed Rock-Wallaby	CS1	S2 (E)	E	Irregular visitor

Source: Bamford (2021). Conservation Significance (CS) levels: CS1 = listed under WA State and/or Commonwealth legislation; CS2 = listed as Priority by DBCA; CS3 = considered locally significant; WA Status: Schedules 1 (S1) to 7 (S7) of Biodiversity Conservation Act 2016; EPBC Status: C = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory. † otherwise known as *Pandion haliaetus cristatus, Pandion cristatus* or Eastern Osprey

4.7 Socioeconomics

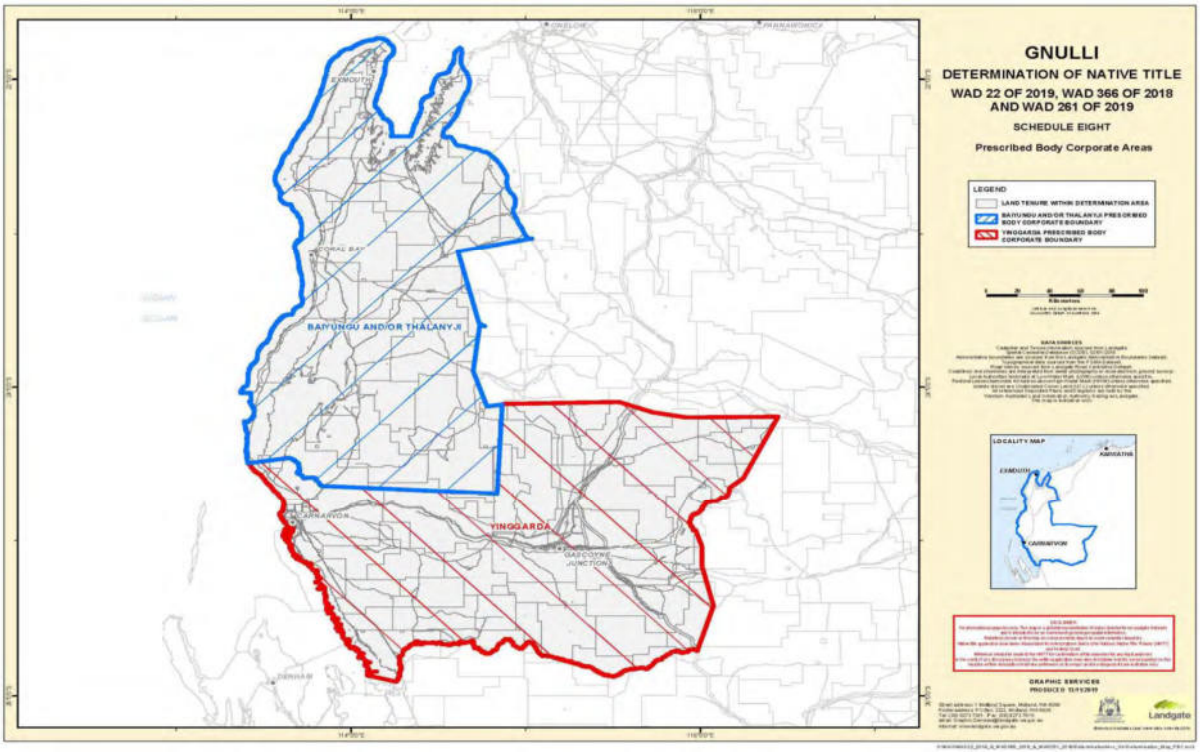
The Shire of Exmouth has a population of ~2,900 but this can rise to ~7,000 during peak season (March to October). The Ningaloo region is widely acknowledged as a globally significant tourism destination and this was recognised in 2022 with the gold medal ecotourism at the Australian Tourism Awards. The average annual number of visitors to Exmouth during 2020/2021 was 152,000; over 80% of visitors are domestic holidaymakers (Tourism WA, 2022; Deloitte, 2020). The average trip length of these visitors was 5.2 days. Furthermore, Tourism Research Australia identified that 73.4% of visitors to Exmouth in 2017–2019 period engaged in a marine activity, for international visitors this rose to 95.7%.

Over 160,000 people visited the Tantabiddi Boat Ramp in 2018/2019 and the vast majority of visitors undertake marine-related recreational activities (Deloitte, 2020). 60% of visitors to the Ningaloo region rated access to the reef as an extremely important aspect of their experience (Deloitte, 2020). Surveys of the Tantabiddi Boat Ramp show the highest usage between March and August with the median number of trailers typically between 20–35 and a maximum in excess of 70 trailers (Smallwood, 2022).

4.8 Heritage

4.8.1 Aboriginal Heritage

The proposed area is located within the Gnulli Yinggarda, Baiyungu and Thalannyji People Native Title Determination Area (WCD2019/016) held by the Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) and Yinggarda Aboriginal Corporation (YAC) (Figure 17). The Cape Range area hosts a nationally significant and unique archaeological record and is the only location on the Australian continent that preserves a record of the pre-glacial Pliestocene to the Holocene (Big Island Research, 2022a & b). Archaeological record for the area is dominated by surveys of rockshelters and midden sites on the west coast of the Cape Range peninsula and show that human occupation of this region began ca. 40,000 years BP (Big Island Research, 2022a & b). At this time sea levels were ca. 75 m lower than at present.



Source: National Native Title Tribunal. The area shown in blue is held by the Baiyungu/Thalanyji and the area in red by the Yinggaarda. The native title determination area extends three nautical miles offshore.

Figure 17 Native title determination area of the Gnulli Yinggarda, Baiyungu and Thalannyji Peoples

A search of the Aboriginal Heritage Inquiry System did not identify any registered Aboriginal sites to the west of Yardie Creek Road between Wobiri and Tantabiddi. The closest sites to Tantabiddi Creek were the Yardie Creek Caravan Burial site (site ID 6017) and Yardie Creek Station engraving (Site ID 11400); both located ~3 km east of the Tantabiddi Creek mouth. A search for other heritage sites shows a coastal midden site (Five Mile; ID 11801) is located between Jansz Beach and Five Mile Beach.

Several ethnographic assessments have previously been undertaken of discrete areas of the Cape Range (Norris & Stevens, 2022; Morgan & McGann, 2019; Randolph 1987, 1988; Warren 1993; Veth & Wright 1998; Murphy 1995; Mattner 1995; Morse 1990; Turner 1985 [as referenced in Acadia, 2022a]). However, none of these covered the development area. In June 2022 an ethnographic survey of the site was undertaken together with male and female Baiyungu representatives (Acacia, 2022a & b). The Tantabiddi Sinkhole was the only identified place of ethnographic significance; which although not within the project area, it will be important to ensure that this site is not affected by the development. The Tantabiddi Midden Site was identified during the 2022 archaeological heritage assessment (Big Island Research, 2022b) and has been submitted for registration as a heritage site.

4.8.2 European Heritage

The first known landing of a European on North West Cape was in 1618 by Captain Jacobz from the *Mauritius* (Environment Australia, 2002). American whalers are known to have operated in the area from about the 1790s, through their operations were primarily ship-based. North West Cape was named in 1881 by Captain Phillip Parker King. Grazing in the area commenced in 1876 with the establishment of Minilya Station (which originally included the whole of the Cape Range peninsula) which has subsequently been subdivided into the present station areas of Yardie Creek, Ningaloo, Cardabia and Warroora (Environment Australia, 2002). Two heritage sites are in the vicinity of Tantabiddi Creek: Yardie Creek Homestead which is listed on the Register of the National Estate; and Tantabiddi Well which is listed on the SoE Municipal Inventory (Heritage Council, 2020).

A small (1 m shank) iron admiralty anchor (Jones Anchor) is located off Tantabiddi Creek (WGS84 S 21° 53.59', E 113° 56.72') and is likely associated with late 19th to early 20th century pastoral shipping operations of Yardie Creek Station (WA Museum, 2020).

5. Environmental Principals and Factors

5.1 Environmental Principles

The *EP Act* is designed to ensure protection of the environment of Western Australia having consideration to five environmental principles (EPA, 2023a). The application of these principles for the proposal are outlined in Table 11.

Table 11 Outline of five EP Act principles as they relate to the proposed Tantabiddi Boating Facility

Principle	Considerations
1. Precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b) An assessment of the risk-weighted consequences of various options.	Significant engagement has been undertaken with key government agencies, stakeholders and community groups to identify and consider all social, cultural and environmental risks of the proposal. Further, multiple site-specific investigations have been undertaken to understand and minimise environmental impacts of the project. This has enabled the identification of key risks, information gaps, monitoring and management requirements and to consider alternatives to those aspects of the proposal that posed the greatest environmental risk.
2. Intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations	The Tantabiddi Boating Facility will enable ongoing marine recreation and tourism and will enhance the amenity value of the area for future generations. The proposed Boating Facility significantly improves the safety and amenity of both recreational and commercial operators while also seeking to maximise the separation of these activities. The proposal meets the principle of intergenerational equity by ensuring the health of the environmental values, maintaining ecological functions for future generations, whilst minimising impacts on the environment. The proposal is unlikely to result in any significant environmental impacts that would pose a threat to the health, diversity and productivity of the Ningaloo environment. The existing Tantabiddi Boat Ramp will be decommissioned and the areas revegetated.
3. Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Studies and investigations have been undertaken to ensure the project avoids impacts on areas of high biological and ecological significance including benthic habitats & communities, marine fauna, terrestrial vegetation communities and local cultural heritage.
4. Improved valuation, pricing and incentive mechanisms a) Environmental factors should be included in the valuation of assets and services. b) The polluter pays principles—those who generate pollution and waste should bear the cost of containment, avoidance and abatement. c) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solution and responses to environmental problems.	The State Government will be responsible for implementing and funding the cost of environmental avoidance, mitigation and management measures. Avoidance and minimising impacts to environmental factors was critical to the proposal design and location as outlined in this referral. Where possible, the project will: • Employ appropriately trained local personnel and source local goods and services • Ensure leading best practice standards during construction to minimise emissions and discharges as far as reasonably possible • Source goods and services that have the least environmental impact.
5. Waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Waste generated from the proposal will be minimised through both the construction and operation of the Tantabiddi Boating Facility through the standard hierarchy of waste controls: reduce, re-use, recycle, recover and dispose. All construction dredging material will be reused for reclamation purposes, which will limit the need to import fill material, and negate the need for offshore disposal. Salvage of materials during Tantabiddi boat ramp facility decommissioning for reuse during the final stages of TBF construction.

5.2 Preliminary Key Environmental Factors

The EPA has defined 14 'Environmental Factors' as the basis for assessing the environmental impacts of a proposal (EPA, 2023a). Environmental Factors are those elements of the environment that may be impacted by a proposal and provide a systematic approach to organising environmental information for the purpose of environmental impact assessment (EIA). For each Environmental Factor the EPA has identified an 'Environmental Objective' as the basis on which they determine whether the proposal may have a significant impact on the environment.

An assessment of the Environmental Factors and associated Environmental Objectives for the proposed TBF has identified the following preliminary Key Environmental Factors that may be impacted by the proposal:

- Benthic Communities & Habitats
- Coastal Processes
- Marine Environmental Quality
- Marine Fauna
- Flora and Vegetation
- Social Surroundings

A detailed assessment of each these preliminary key environmental factors are presented below (Section 6).

5.3 Other Environmental Factors

The other Environmental Factors are not likely to be significantly impacted by the proposal (Table 12).

Table 12 Environmental Factors not likely to be significantly impacted by the Tantabiddi Boating Facility

Environmental Factor	Justification
Landforms To maintain the variety and integrity of significant physical landforms so that environmental values are protected.	No impacts to significant Landforms are anticipated. Views of the facility from people in passing vehicles will be mostly obscured by sand. Buildings will be low profile and designed to blend with the surroundings. Rock walls will be made of locally sourced limestone which will blend in with natural rock formations and be less visible from distant beaches and people on boats outside the reef (see Social Surroundings).
Subterranean Fauna To Protect subterranean fauna so that biological diversity and ecological integrity are maintained.	No impacts to Subterranean Environments are anticipated. Project footprint largely located on the seaward side of stygofauna habitat. No dewatering activities required for construction. Operational risks to subterranean fauna are low due to the position low in the catchment (see Inland Waters below).
Inland Waters To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	No significant impacts to Inland Waters are anticipated. No dewatering or local groundwater abstraction will occur. No impacts to incised waterways from the proposal. Due to the elevation of the ranges, there is a gradient that pushes freshwater flows towards the coast, with limited opportunity for chemical contaminants or salt to move inland from the development envelope.
Terrestrial Environmental Quality To maintain the quality of land and soils so that environmental values are protected.	With the application of standard construction management controls, no impacts on Terrestrial Environmental Quality are anticipated. The area has a low risk of acid sulfate soils or historical contamination, so construction risks to TEQ is low.
Terrestrial Fauna To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	With the application of standard construction management controls and best practice design, no significant impacts on Terrestrial Fauna are anticipated.
Air Quality To maintain air quality and minimise emissions so that environmental values are protected.	No significant impacts to Air Quality are anticipated. Some dust will be generated during construction of landside elements such as the access road. There are no sensitive receptors within proximity to the proposed development; the nearest residences are at Yardie Homestead located ~5 km away. The short duration and extent of earthworks and the implementation of standard dust control measures will limit the extent of dust settling on native vegetation.
Greenhouse Gas Emissions To reduce net greenhouse gas emissions in order to minimise	The construction and operational emission of the TBF will generate greenhouse gas emissions; however, these are anticipated to be far less than the threshold of 100,000 t/year. Operational emissions will be similar to the current boat

Environmental Factor	Justification
the risk of environmental harm associated with climate change.	launching/mooring facility with the possibility of reduced emission intensity due to the more efficient functioning of the facility.
Human Health To protect human health from significant harm.	Being a karst geology there are very low levels of nucleotides in the local environment and therefore no impacts to human health are anticipated

6. Environmental Assessment

6.1 Benthic Communities & Habitats

The EPA's objective for BCH is to 'protect benthic communities and habitats so that biological diversity and ecological integrity are maintained' (EPA, 2023a). BCH are a key component of marine ecosystems and are fundamental to the maintenance of the ecological integrity and biological diversity of the whole marine environment. The EPA provides the following guidance regarding coastal processes:

- Environmental Factor Guideline: Benthic Communities and Habitats (EPA, 2016d).
- Technical Guidance: Protection of Benthic Communities and Habitats (EPA, 2016g)
- Technical Guidance: Environmental Impact Assessment of Marine Dredging Proposals (2021a)

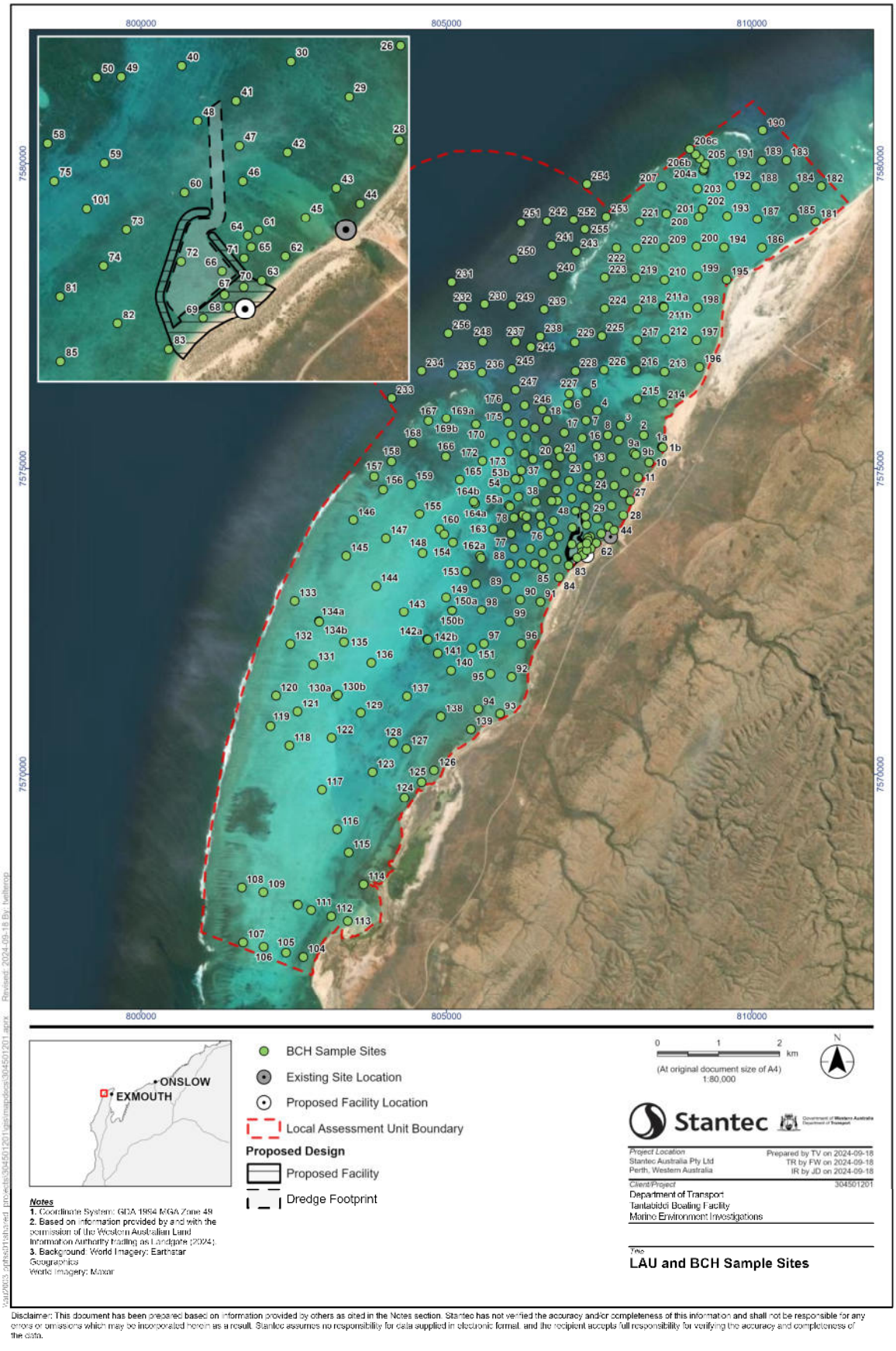
The proposed dredging and land reclamation activities has the potential to cause direct and indirect (some of which may be reversible) impacts to BCH. These impacts are considered in detail below.

6.1.1 Receiving Environment

The mapping and loss assessment of BCH was undertaken within a Local Assessment Unit as per EPA Guidelines (EPA, 2016d). The LAU has an area of 61.65 km^2 and extended approximately 8.8 km south and 6.8 km north of the TBF and from the shoreline to the reef crest with a small westward extension at the Tantabiddi Passage to a water depth of ~60 m (Stantec, 2025; Figure 18). Satellite imagery from 2021 was obtained from the WorldView-2 environmental monitoring satellite with a resolution of 0.5 m to provide a synoptic view of BCH within the LAU. This imagery was ground-truthed with 256 towed video transects (Cardno, 2022; Stantec, 2025; Figure 18).

The ground truth data was combined with the satellite imagery using to identify benthic polygons based on their size, shape and spectral properties. Benthic habitat classes were subsequently defined in accordance with the approach outlined by Seamap Australia (Butler et al., 2017) using a machine-learning algorithm (Stantec, 2025).

The predominant BCHs identified across the LAU were bare sand 48.4% (2,984 ha), macroalgae 30.3% (composing macroalgae [1,187 ha, 19.3%] and macroalgae <25% [676 ha, 11.0%]), coral 8.9% (comprising coral [419 ha, 6.8%] and coral <25% [130 ha, 2.1%]), mixed hard substrata 6.5% (402 ha) and seagrass 3.6% (223 ha) (Table 13; Figure 19).

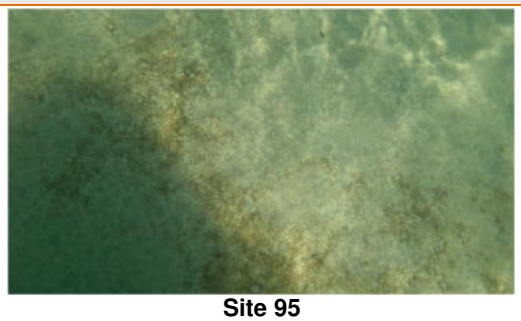
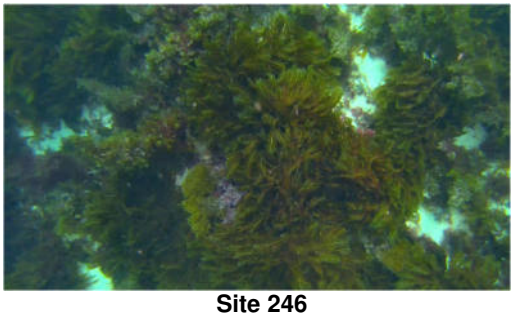
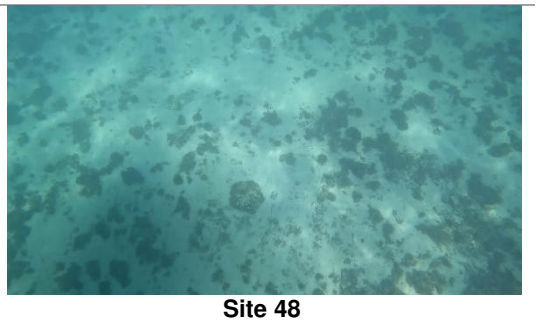


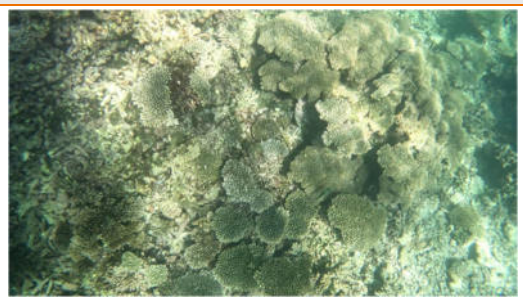
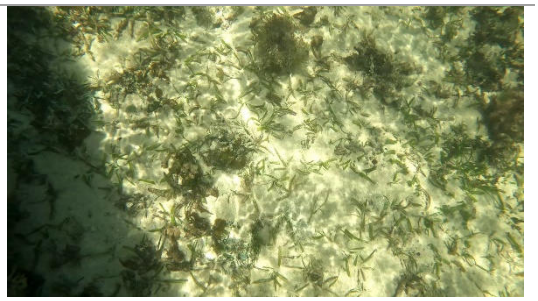
Source: Stantec (2025)

Figure 18 Local Assessment Unit and ground truth sites used for benthic habitat mapping

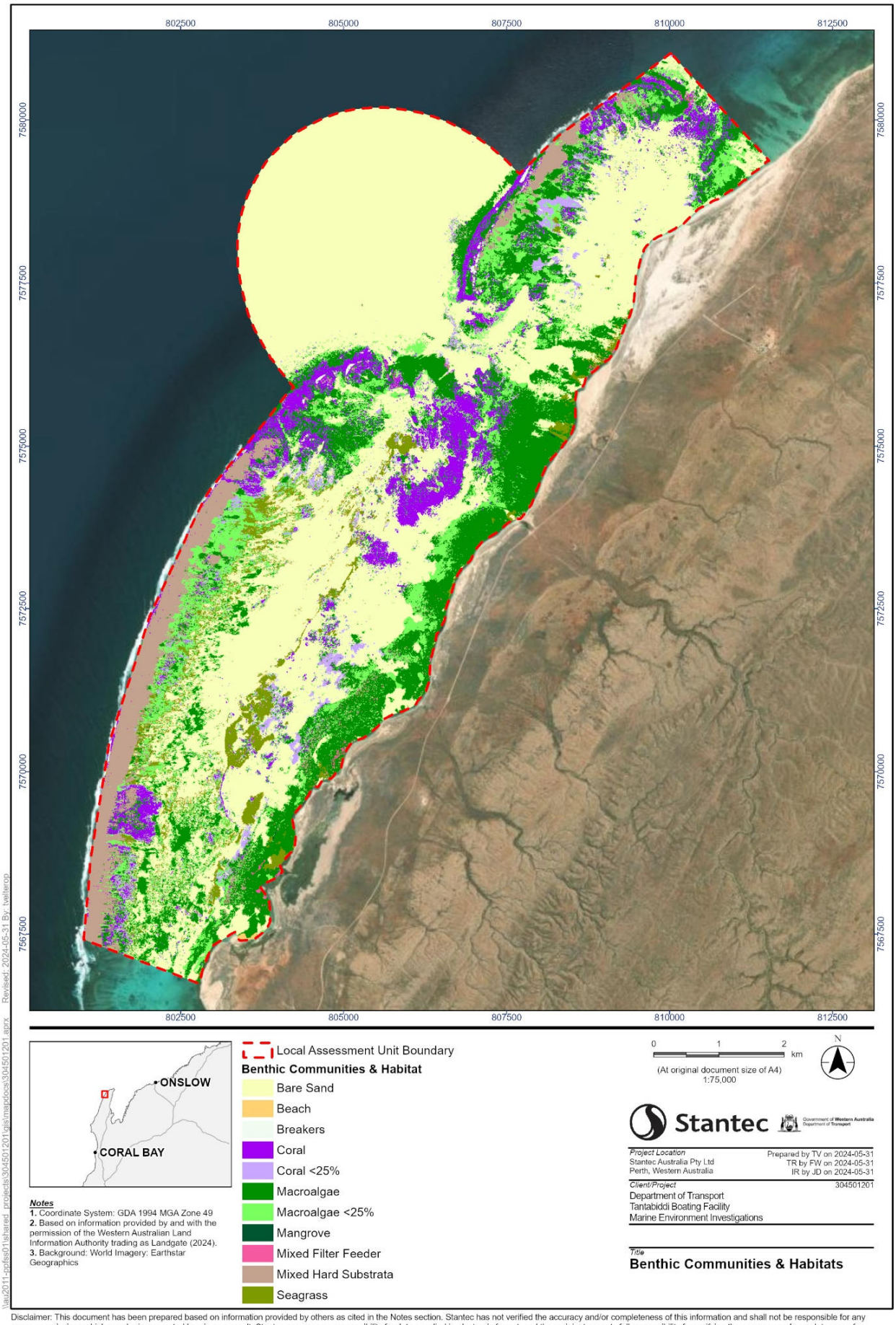
This is consistent with mapping in 2011 between Tantabiddi and Yardie Creek, which revealed a largely patchy distribution of macroalgae amongst sand-covered pavement, dominated by genera *Padina, Hincksia* and *Hydroclathrus* (Van Keulen and Langdon, 2011). In tropical regions these species are fast growing and typically ephemeral (Stantec, 2025). The reef system consists of a narrow reef crest backed by a wide reef flat (150–200 m) inhabited by various coral communities and sandy sediments. The reef flat transitions into a shallow lagoon featuring corals, macroalgae, pavement and sand (Collins et al., 2003). Hard corals comprise of branching (predominantly *Acropora*), sub-massive, encrusting, foliaceous, digitate and massive. Soft coral species are poorly represented in the region, and where present are patchily distributed (Van Keulen and Langdon, 2011). Seagrasses species identified included *Posidonia* sp. and *Halodule* sp., and to a lesser extent *Thalassia hemprichii*.; however, macroalgae was also present at most of the seagrass ground-truthing locations, which may have confounded the training data and the 3.6% of seagrass area may be an overestimate (Stantec, 2025).

Table 13 Benthic communities and habitat classification and extent

Classification	Extent	Example Image
Bare Sand	2,984 ha/48.4%	 Site 95
Macroalgae	1,187 ha/19.3%	 Site 246
Macroalgae < 25%	676 ha/11.0%	 Site 48
Mixed hard substrata	402 ha/6.5%	 Site 92

Classification	Extent	Example Image
Coral	419 ha/6.8%	 Site 35b
Seagrass	223 ha/3.6%	 Site 93
Coral < 25%	130 ha/2.1%	 Site 220
Mixed filter feeder	21 ha/0.3%	 Site 69
Other mapped habitats		
Obscured/Wave breaker zone	61 ha/1.0%	-
Beach (intertidal)	51 ha/0.8%	-
Mangrove	11 ha/0.2%	-
TOTAL	**6,165 ha/100%**	-

Source: Stantec (2025)



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Source: Stantec (2025)

Figure 19 Benthic communities and habitats

6.1.2 Potential Impacts

Dredging in the marine environment has the potential to impact BCHs directly and/or indirectly. Direct impacts typically involve irreversible loss or 'serious damage' to BCH, which is defined as 'damage to benthic communities and/or their habitats that is effectively irreversible or where any recovery, if possible, would be unlikely to occur for at least five years' (EPA, 2016d). For this assessment the irreversible BCH impacts have been partitioned into permanent (impacts due to dredging and reclamation) and serious impacts (loss of BCH for a period exceeding five years). Direct impacts are anticipated to occur within and immediately adjacent to the breakwater construction and dredging areas (EPA 2021). Short-term elevations in turbidity during breakwater construction and dredging may lead to a temporary reduction in light availability at the seabed and thereby cause indirect BCH impacts which may be reversible. Dredging will cause the mobilisation of sediments and thereby induce smothering and indirect loss of immediately adjacent BCH. There is the potential for release of contaminants during the construction activity causing indirect impacts on BCH and this is covered in Section 6.3. Boating activities, interruption of alongshore sediment transport and maintenance dredging/ sand bypassing during the operational phase of the TBF has the potential to cause localised impacts on BCH through similar mechanisms as outlined above for the construction phase; albeit at a much lower magnitude (Stantec, 2025).

6.1.3 Impact Assessment

An assessment of the construction impacts to BCH was based on the likelihood the dredging would result in irreversible or reversible impacts to BCH following exposure to critical levels of TSS in the water column and/or critical volumes of sedimentation at the seabed (Stantec, 2025). The social and ecological value of BCH in the vicinity of the TBF is reflected in its conservation status as a World Heritage Area, National Heritage Place and Marine Park. However, the ecological significance, while important, is not unique to the Tantabiddi area but instead forms part of an extended array of similar fringing reef and lagoonal features found along the entire length of the Ningaloo Reef.

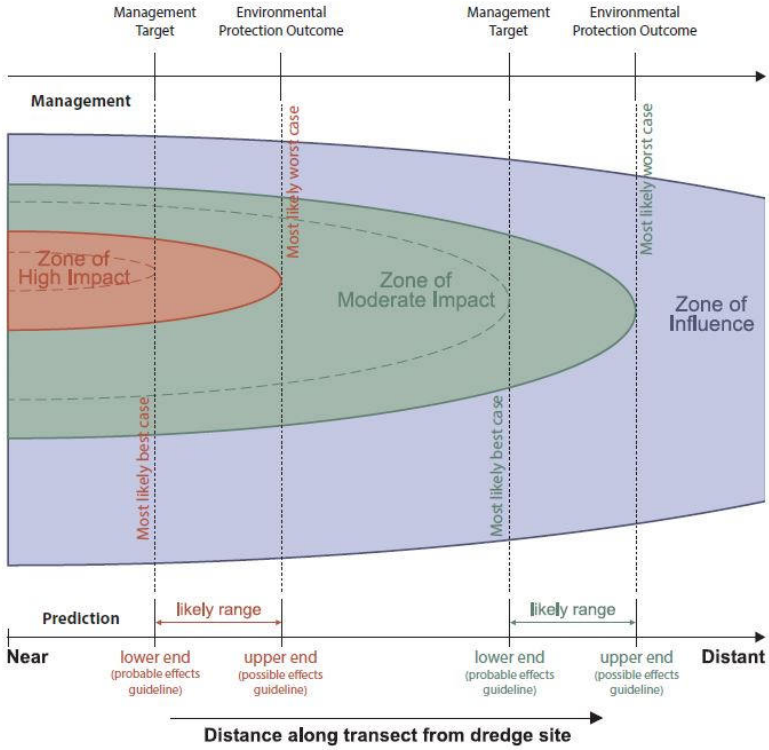
The existing Tantabiddi boat ramp is affected by natural sedimentation processes due to the periodic flooding and overflow of Tantabiddi Creek (Advisian/& Hydrobiology, 2020). This area is therefore subject to natural changes in BCH coverage between bare sand (immediately following a flood event) and sparse macroalgal communities (as the flood sediments are mobilised and dispersed by nearshore currents or sediment bypassing operations, see Section 1.1). Consequently, the BCH mapping presented herein (Figure 19) is considered representative of the BCH both pre- and post-European settlement.

The impact of the dredge plume on the adjacent BCH was assessed in accordance with the EPA's guidelines (EPA, 2021). The following BCH impact zones were determined based on threshold levels (Figure 20):

- **Zone of High Impact (ZoHI)**—Area of permanent loss[9] and serious damage[10] to BCH.
- **Zone of Moderate Impact (ZoMI)**—Areas of BCH likely to experience short-term decline in condition, but with recovery occurring within five years.
- **Zone of Influence (ZoI)**—Area where the dredge sediment plume may be discerned visually but no BCH impacts are anticipated.

[9] *'Permanent loss' occurs as a result of direct removal or smothering of BCH (EPA, 2016d)*

[10] *'Serious damage' typically results from indirect impacts to BCH (e.g. via change in light climate or sedimentation) and where recovery is either unlikely to occur or will take at least five years (EPA, 2016d)*



Source: EPA (2021)

Figure 20 Conceptual representation of BCH impact zones

The BCH impact thresholds (as presented in EPA, 2021) for corals were used as these are more conservative than those for seagrass and the coral BCH had a greater coverage than seagrasses in the Tantabiddi area (Table 14). The EPA's triggers are particularly suited for use in relatively clear water environments (EPA 2021). However, a turbidity gradient has been observed at the Tantabiddi site with increased turbidity in the lagoon and shallow coastal waters (Pomeroy 2018, 2019). Corals and other BCH that are regularly exposed to elevated levels of turbidity are more likely to be tolerant of these conditions (EPA 2021). Hence, the application of the triggers for clear offshore waters to this assessment is considered conservative.

Table 14 Threshold levels for coral impacts from dredge plume turbidity and light reduction

Zone	Impact	Threshold	Cumulative Period (days)	Boundary	TSS criteria (mg/L)
ZoHI	Area of irreversible loss of corals consisting of permanent loss and serious damage	95%ile of daily running mean	10	Probable effect (inner boundary)	>70
ZoHI		95%ile of daily running mean	20	Possible effect (outer boundary)	>70
ZoMI	Area where corals likely to experience short-term decline in condition, but with recovery occurring within five years	95%ile of daily running mean	28	Probable effect (inner boundary)	>13.2
ZoMI		95%ile of daily running mean	28	Possible effect (outer boundary)	>9.3
ZoI	Area where the dredge sediment plume may be discerned visually but no coral impacts are anticipated	95%ile of daily running mean	28	Outer boundary	>5

Source: EPA (2021b) TSS criteria were adjusted to account for the for average background level (1.37 mg/L; see Section 6.3.1) when interrogating the plume modelling dataset which had an assumed background TSS of 0 mg/L

Reclamation and dredging are estimated to cause the permanent loss of 21.63 ha of BCH which represents 0.35% of the LAU (Figure 21, Table 15). Most of this BCH comprises macroalgae (18.19 ha) whereas permanent loss of coral (0.05 ha) and seagrass (0.07 ha) were relatively small.

The potential for "serious damage" to BCH due to changes in turbidity and sedimentation during construction were assessed through the application of the coral impact thresholds (Table 14) to the hydrodynamic modelling outputs (see orange polygons in Figure 21). Two areas of serious damage to BCH are also identified: an area of sediment accretion to the south of the TBF (see Section 6.2.3 and yellow polygon in Figure 21) and a five-metre buffer zone around the area of entrance channel dredging[11] (see red polygon in Figure 21). Sediment accretion due to longshore sediment transport is predicted to occur in the nearshore area to the south of the TBF. A sand monitoring and sediment bypassing program will be implemented to ensure that the sediment build is restricted to within this area. Construction and operation of the TBF is therefore anticipated to cause serious damage to 2.15 ha of BCH, with most of this impact to be to Macroalgae (Figure 21, Table 15).

It is therefore conservatively (noting that the impact thresholds are based on corals) estimated that 23.79 ha of BCH will be subject to permanent loss (21.63 ha) and serious damage (2.15 ha) and represents 0.39% of the LAU (Table 15). The majority (21.9 ha, 91.9%) of this BCH is macroalgae/macroalgae <25% which is largely composed of ephemeral genera including *Padina*, *Hincksia* and *Hydroclathrus* (Stantec, 2025). The impact to coral (0.05 ha) and seagrass (0.11 ha) were relatively small and represent only 0.6% of the total BCH subject to permanent loss and serious damage (Table 15). The total BCH loss due to permanent loss and serious damage (23.79 ha) represents 0.39% of the total mapped area (6,615 ha).

Table 15 Permanent loss and serious damage to BCH due to construction of the TBF

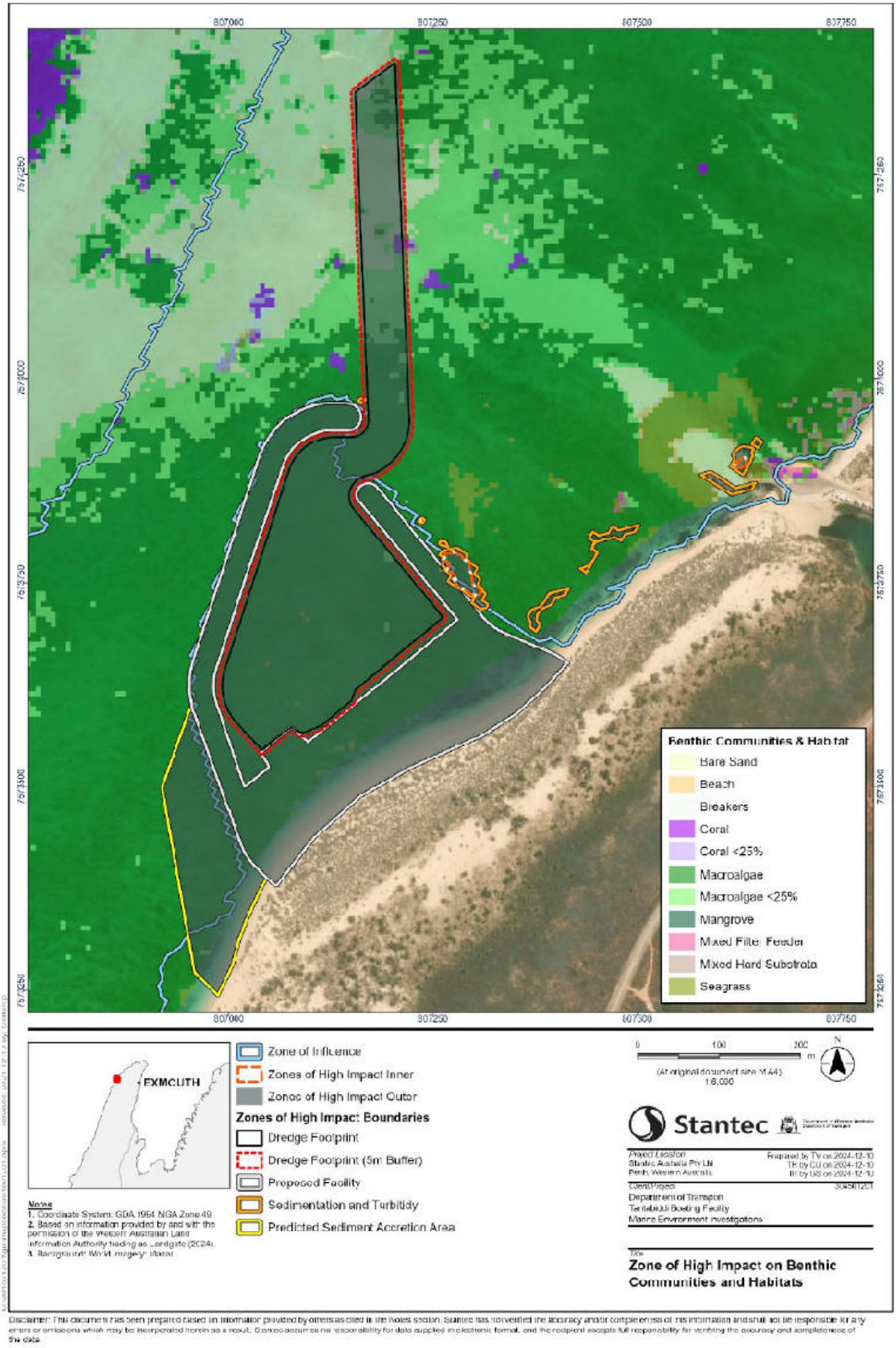
Habitat Type	Mapped Extent (ha)	Permanent Loss		Serious Damage		Total	
		ha	%	ha	%	ha	%
Bare sand	2,984	1.68	0.056%	N/A	N/A	1.68	0.056%
Macroalgae	1,187	18.19	1.532%	2.078	0.175%	20.268	1.707%
Macroalgae <25%	676	1.62	0.240%	0.015	0.002%	1.635	0.242%
Mixed Hard Substrate	402	0.01	0.002%	0.007	0.002%	0.017	0.004%
Coral	419	0.05	0.012%	0	0.000%	0.05	0.012%
Seagrass	223	0.07	0.031%	0.036	0.016%	0.106	0.048%
Breakers	61	0.02	0.033%	0.017	0.028%	0.037	0.061%
Other BCH	213	0	0	0	0	0	0.000%
Total	**6,165**	**21.63**	**0.35%**	**2.153**	**0.035%**	**23.793**	**0.386%**

Source: Stantec (2025). N/A areas of bare sand habitat, when subjected to turbidity and sedimentation, will remain bare sand

The area of reversible impacts to BCH (as defined by the ZoMI) is predicted to extend to the north of the TBF as a relatively narrow tongue within the lagoon (Figure 22). In the worst-case (ZoMI Outer) this tongue extends to just beyond Jurabi Point (~7 km) whereas the probable impact zone (ZoMI Inner) could extend as far as ~3.6 km north

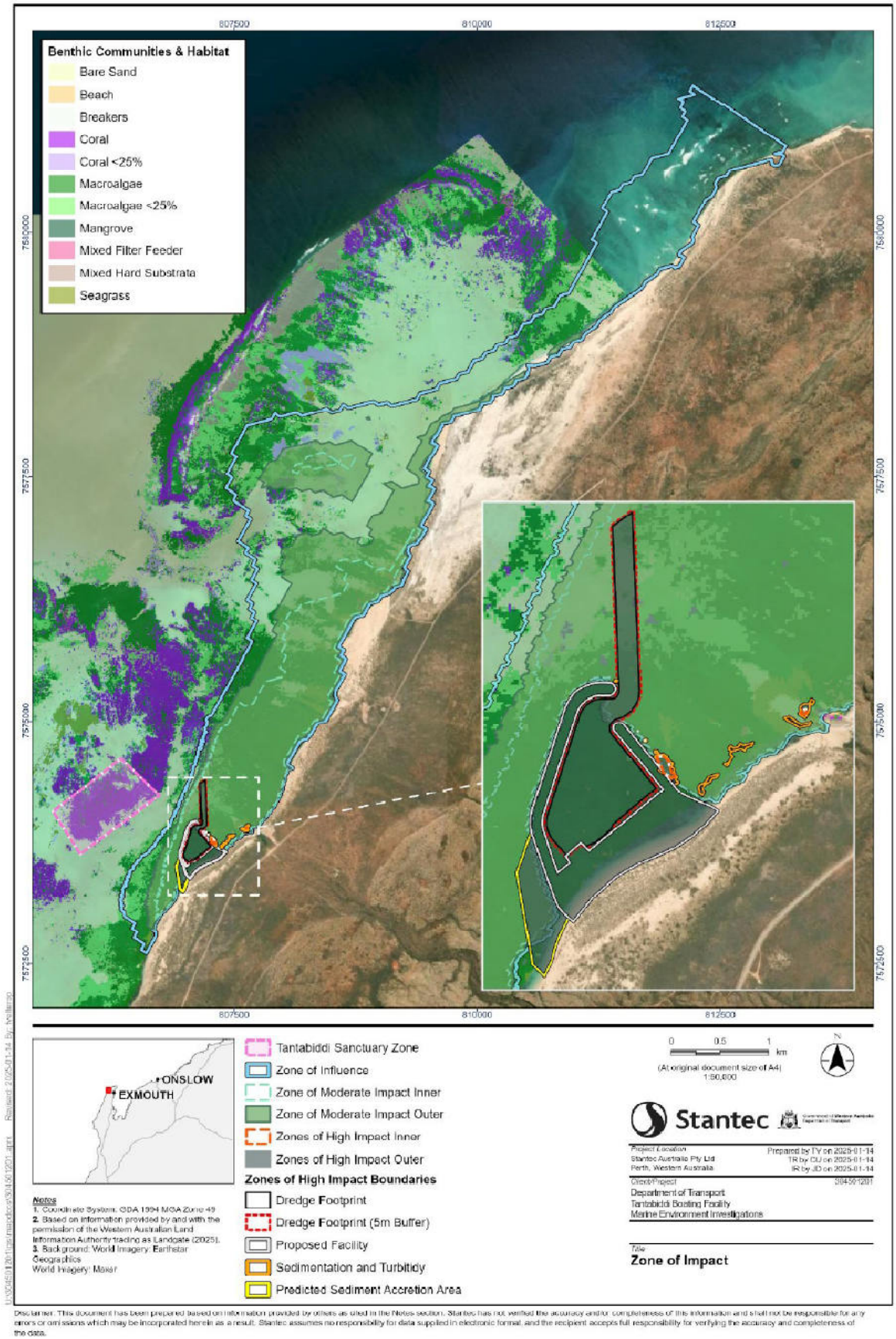
[11] *The extent of this buffer was informed by dredge plume modelling (MP Rogers & Associates, 2025) which simulated the continuous release of particles at four fixed points over a 28-day period. This resulted four small and non-contiguous ZoHI polygons at the release points. However, during the actual construction works the sediment release point will move along the entire length of the entrance channel as dredging works progress over the 28 day construction period. Consequently, turbidity levels will not remain elevated for an extended period for any point along the channel.*

of the TBF with a width of ~750 m (Figure 22). The ZoMI does not impinge on the Tantabiddi Sanctuary Zone. It should be noted that these impact estimates are based on coral thresholds and are likely to be highly conservative as the predominant BCH across the impact areas is nearshore macroalgae which is a community that is considerably more tolerant to elevated turbidity levels. Further, sites for BCH monitoring during construction will include coral communities in proximity to the project. The Zone of Influence (ZoI), where the plume may be visually discernible from background, is predicted to extend in a predominantly northerly direction (Figure 22).



Source: Stantec (2025)

Figure 21 Predicted Zone of High Impact (ZoHI) associated with dredging and reclamation



Source: Stantec (2025)

Figure 22 Predicted Zones of High Impact (ZoHI), Moderate Impact (ZoMI) and Influence (ZoI)

In addition to BCH impacts arising from turbidity caused by breakwater construction and dredge plume, and light reduction consideration was also given to the impacts due to smothering. Smothering has the potential to impact other sessile and/or motile benthic communities, across a broad range of phyla depending on the rate of

sedimentation. For the motile elements of the BCH, an organism's tolerance to sedimentation is based on its ability to escape burial. Most invertebrates can avoid burial where sedimentation is less than 5–10 cm (Nichols et al., 1978 and Miller et al., 2003); though higher values of 11–57 cm have also been suggested (Kranz, 1974). Modelling of the worst-case sedimentation rates at Tantabiddi were within the non-lethal range and most invertebrates should be capable of escaping the effects of the predicted deposition (Stantec, 2025). It is considered unlikely that the sedimentation of dredge material will have a significant impact on invertebrate communities, beyond the immediate dredging footprint and the reclamation area (Stantec, 2025).

Operation of the facility may result in short-term increases in turbidity, reduced light, sediment deposition and toxicity. Periodic maintenance dredging works will be required to bypass sediment around the harbour and ensure navigable depths are maintained through the entrance channel. It is initially estimated that bypassing operations be contracted twice yearly (~6,000 m^3 + 50% contingency using land-based equipment) and dredging of the entrance channel (~16,000 m^3 using floating plant) every four years. This material will be placed on the beach to the north of the TBF. The frequency and volume of future bypassing and dredging operations will be determined by ongoing bathymetric surveys and monitoring of beach profiles. However, the mobilisation of sediments during these maintenance operations of the TBF is expected to be negligible relative to the construction phase. The impact of these operational activities on BCH is likely to be spatially constrained to the boat launching area, short-term and not dissimilar to the perturbations caused by natural processes including afternoon sea-breeze and/or spring tide events (Stantec, 2025). Post-construction monitoring at the Coral Bay Boating Facility indicated that small changes in species composition (including periwinkles, blue-green and sargassum) may occur in the immediate vicinity of the boating facility associated with changing hydrodynamic conditions in this area (Sabal, 2009).

As noted above, the predicted loss of 0.39% of BCH within the LAU which is predominantly (91.9%) macroalgae community and largely composed of ephemeral genera including *Padina*, *Hincksia* and *Hydroclathrus*. However, despite the clear ecological and social values of the Tantabiddi area, the extent and makeup of the BCH within the LAU is not unique, nor does it support endemic species. The BCH within the LAU instead form part of an extended array of similar fringing reef and lagoonal features found along the entire length of the Ningaloo coast. Losses of up to 21.9 ha of macroalgae (comprising primarily ephemeral species) along with relatively small areas of coral (0.05 ha) and seagrass (0.106 ha) are not expected to compromise the EPA's environmental objective for BCH.

6.1.4 Mitigation and Environmental Outcomes

Risks posed by the construction and operation of the facility on the BCHs will be managed via the application of the EPA's mitigation hierarchy (Table 16). Residual risks associated with construction and operations will be managed via a Construction Environmental Management Plan (CEMP) and Marine Environmental Quality Framework (MEQMF), respectively. In consideration of the relatively low risk of impact and the proposed management actions is anticipated that the EPA's objective for benthic habitat and communities can be met.

Table 16 Management measures proposed for benthic communities and habitats

Impact	Avoid	Minimise	Monitoring and Management
CONSTRUCTION PHASE			
Reclamation/Dredging Direct loss of BCH due to dredging and reclamation activities	The facility will be located in an area largely dominated by macroalgae habitats to minimise the potential impacts on coral or seagrass communities. All dredge material will be reused in construction of the facility.	The assessment includes a model to predict the mobilisation and dispersion of dredge material under different conditions. The model will be used to inform the timing of dredging to periods likely to minimise environmental	The approach to monitoring and management during the construction phase will be outlined in the CEMP. The plan will include a series of triggers and management actions including the power to cease dredging operations

Impact	Avoid	Minimise	Monitoring and Management
Increased Turbidity/TSS Elevated turbidity/TSS during construction causing impacts to benthic communities and habitats.	Some reduction in water quality during the marine construction phase is unavoidable. However, these effects will naturally ameliorate once construction has ceased allowing areas of BCH to recover. The development of the TBF is intended to improve the quality of boating facilities in the region and will result in the decommission of the existing Tantabiddi Boat Ramp. Consequently, regular maintenance dredging to remove sedimentation at the boat ramps will cease; resulting in better outcomes for the nearby benthic environment.	impacts associated with changes in water and sediment quality. Construction of the breakwaters will be staged and undertaken prior to dredging the harbour basin to minimise the impact of the dredge plume on marine environmental quality. A silt curtain will be deployed during construction of the inner (norther breakwater), revetments and dredging in the harbour basin where practicable to limit plume dispersion of sediments beyond the harbour basin	in the event the risk thresholds are exceeded. The plan will draw on best practice examples and the findings of the Western Australian Marine Sciences Institute dredging node to ensure a best practice, and conservative approach. All management plans will be prepared in accordance with the EPAs instructions for preparing EMPs and in accordance with the EPA's marine environmental quality management frameworks and relevant threshold and standards.
Reduced Light Increased turbidity/TSS results in a light reduction at the seabed causing impacts to benthic communities and habitats.			
Smothering Smothering of BCH due to the deposition of higher rates of sedimentation.	Dredging inevitably results of the mobilisation and the subsequent deposition of dredge material, potentially leading to smothering. However, impacts to BCH from sedimentation during construction of the TBF are considered low.		
Toxicity Changes in water quality via the release of contaminants from the sediments. Hydrocarbon spills into the sensitive benthic communities and habitats during construction. Discharge of chemicals used in the maintenance of the machinery and utilities during construction.	Testing has been completed to ensure the sediment in the proposed dredging footprint is clean. All dredge material will be reused in the construction of the TBF. Additional fill material required will be tested prior to delivery to site to avoid importing contaminants to the site. The potential for an unplanned spill during construction is unavoidable however, the risk is considered low.	Testing confirmed the sediment in the dredging footprint are clean and free of contaminants. All contractor vessels will be in good working order with adequate emergency and containment equipment and procedures in the event of a spill. Chemicals will only be used/transferred in proximity to the marine environment as required (and ideally within the harbour basin so any spill may be readily contained) and all chemicals will be managed and stored appropriately.	The approach to monitoring and management during the construction phase will be outlined in the CEMP. The plan will include a series of triggers and management actions including the power to cease dredging operations in the event the risk thresholds are exceeded. The plan will draw on best practice examples and the findings of the Western Australian Marine Sciences Institute dredging node to ensure a best practice, and conservative approach. All management plans will be prepared in accordance with the EPAs instructions for preparing EMPs and in accordance with the EPA's marine environmental quality management frameworks and relevant threshold and standards as described in EPA (2016f) and EPA (2017). Management plans will be consistent with management requirements of the Ningaloo Marine Park.
OPERATIONS PHASE			
Reduced Light/Toxicity	Small changes in water and sediment quality during the	The Marine Environmental Quality Management	The approach to monitoring and management will be

Impact	Avoid	Minimise	Monitoring and Management
Reduced water quality due to increased TSS from boat launches or pollution from marine debris/spills.	operations and maintenance are unavoidable.	Framework (MEQMF) will include the requirement for monitoring and management to achieve the Environmental Quality Objectives for ecosystem integrity for moderate and high levels of ecosystem protection. Stormwater drainage will be directed to infiltration basins and designed and constructed to ensure minimal runoff to the marine environment. A Moderate Ecological Protection Area (MEPA) will be established in the immediate vicinity of the facility. A high level of ecosystem integrity will be maintained beyond this MEPA boundary	outlined in the MEQMF in accordance with EPA guidelines and relevant threshold and standards as described in EPA (2016f) and EPA (2017).

6.2 Coastal Processes

The EPA's objective for coastal processes is 'to maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected' (EPA, 2023a). The EPA provides the following guidance statement regarding coastal processes:

- Environmental Factor Guideline: Coastal Processes (EPA 2016a).

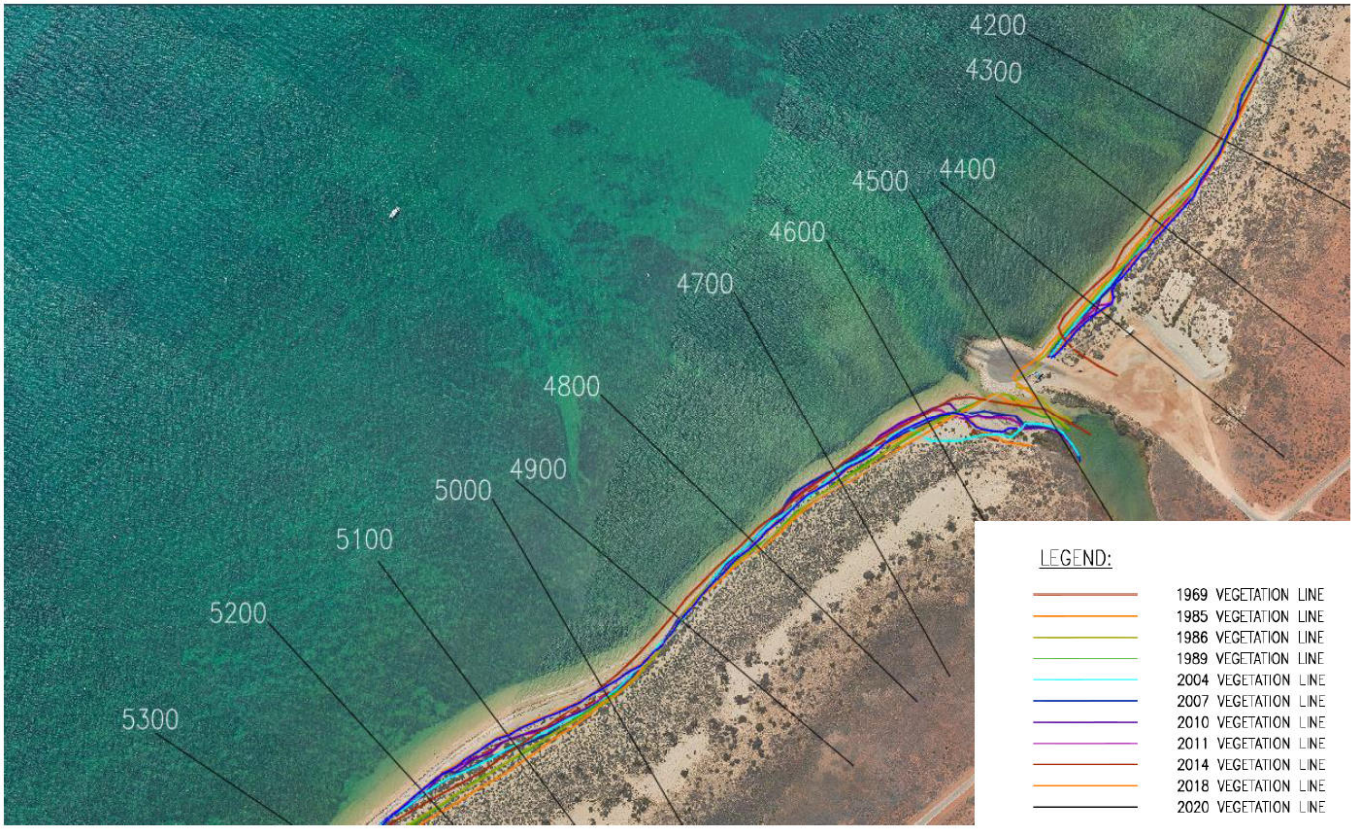
The proposed TBF will result in changes to nearshore waves and currents and thereby has the potential to affect coastal processes on the adjacent beaches. These impacts are considered in detail below.

6.2.1 Receiving Environment

The TBF will be located in the Winderabandi Point to North West Cape secondary sediment compartment and in the Low Point (immediately south of Mangrove Bay) to Vlaming Head tertiary sediment compartment (Eliot, 2012). This secondary compartment has a relatively deep and steep inshore areas which rises to a fringing coral reef, lithified reef platform and shallow lagoon within ~2 km from the shore. Across the lagoon sandy sediments overlie a rocky pavement (Eliot, 2012). The shoreline is characterised by sheltered sandy beaches which are typically perched on intertidal rock platforms, inshore pavement and/or beach rock ramps occasionally interspersed with ephemeral streams. The backshore contains a narrow transgressive dune barrier with partly scarped foredunes and relatively good vegetation cover across the dunes with occasional blowout areas (Eliot, 2012). This sediment compartment was considered to have a low vulnerability to coastal change due to the shelter of the Ningaloo Reef and lagoon and the presence of underlying rock across the coast (Eliot, 2012).

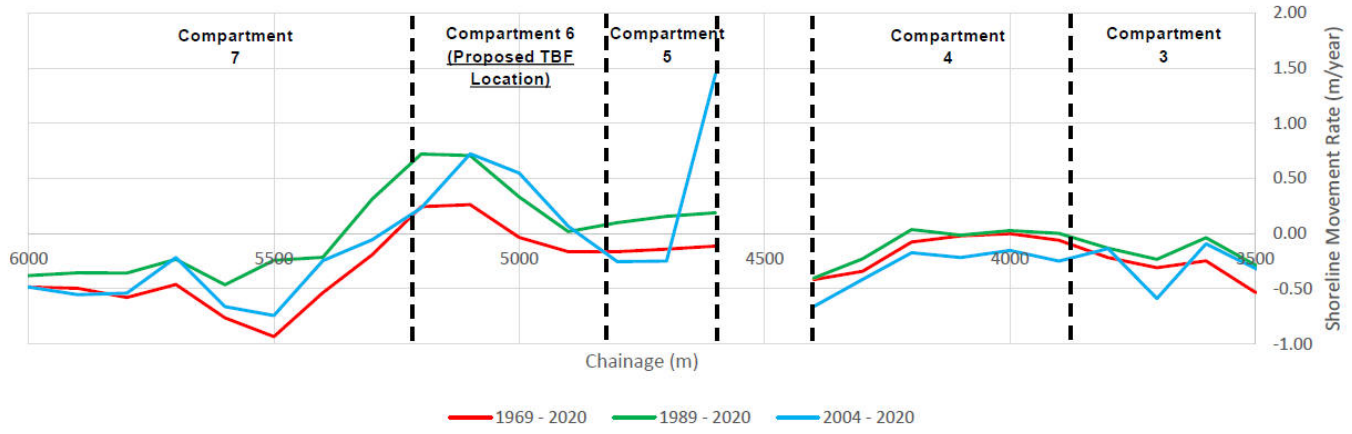
The shoreline position across the Tantabiddi area was determined using aerial imagery over a period of 51 years, from 1969 to 2020 (MP Rogers & Associates, 2023b; Figure 23). Analysis of shoreline change shows that the area around the proposed TBF (chainage 4,800–5,200) shows that the area directly south west of the proposed TBF appears to have gradually accreted (up to ~0.75 m/yr), whereas to the north east there have been periods of both erosion and accretion (MP Rogers & Associates, 2023b). The existing Tantabiddi Boat Ramp and channel (chainage 4,500) act as a barrier to sediment transport and reveals shoreline accretion to the south and erosion to the north indicating northward sediment transport at the shoreline (MP Rogers & Associates, 2023b; Figure 23). A review of shoreline erosion from cyclone impacts indicted that any changes were generally modest due to the sheltering effect of the offshore coral reef (Cuttler, et al., 2018; MP Rogers & Associates, 2023b).

The shoreline movement data, together with estimates for sediment flux entering the area (both alongshore and offshore), sediment bypassing volumes and sediment supply from Tantabiddi Creek, was used to estimate the nearshore sediment budget for the period 2004–2020 (MP Rogers & Associates, 2023b; Figure 25). The location for the proposed TBF experiences a net northward longshore transport of ~12,500 m^3/yr and an accretion of ~400 m^3/yr (with an accuracy of ±100%) (MP Rogers & Associates, 2023b).



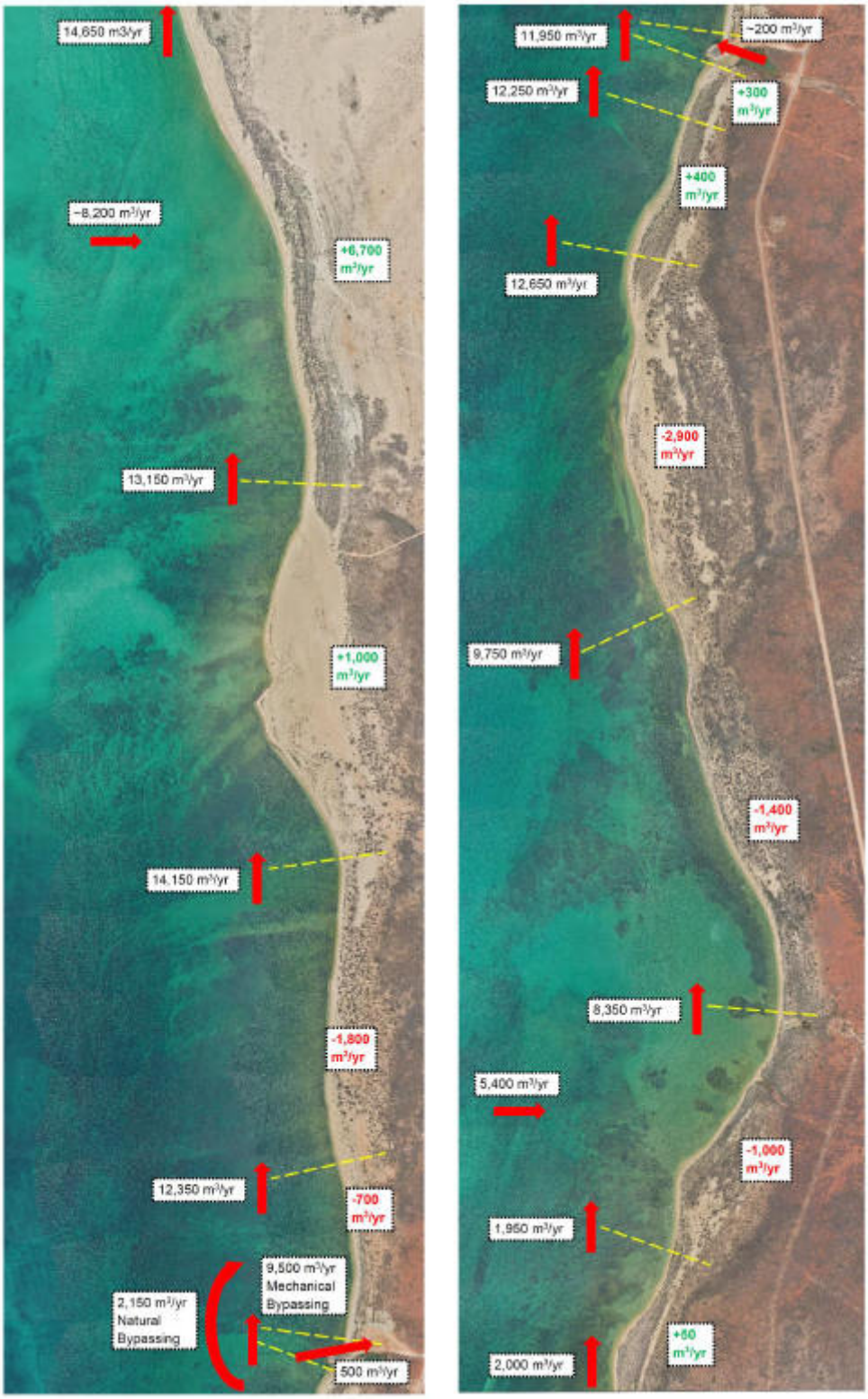
Source: MP Rogers & Associates (2023b)

Figure 23 Shoreline positions between 1969 and 2020 at Tantabiddi



Source: MP Rogers & Associates (2023b). North is to the right in this figure and the region at chainage 4,500 is the existing Tantabiddi Boat Ramp

Figure 24 Shoreline movement rates



Source: MP Rogers & Associates (2023b)

Figure 25 Estimated shoreline sediment budget for the Tantabiddi (2004–2020)

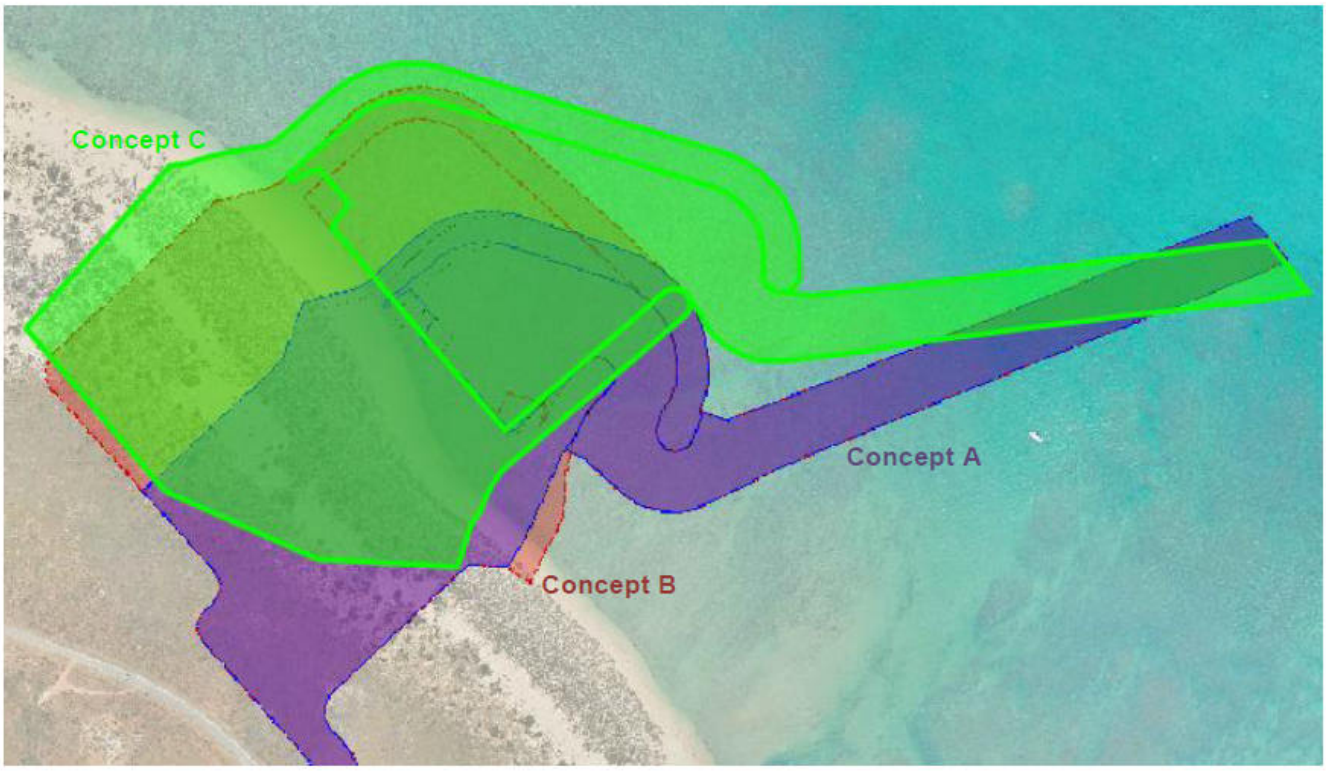
6.2.2 Potential Impacts

The installation of the TBF, including the breakwaters and channel dredging, has the potential to impact on coastal processes in the following ways:

- Interruption of the longshore sediment transport resulting in areas of sediment accretion and erosion at the shoreline adjacent to the facility
- Modification of wave and current patterns resulting in changes in local sedimentation patterns.

6.2.3 Impact Assessment

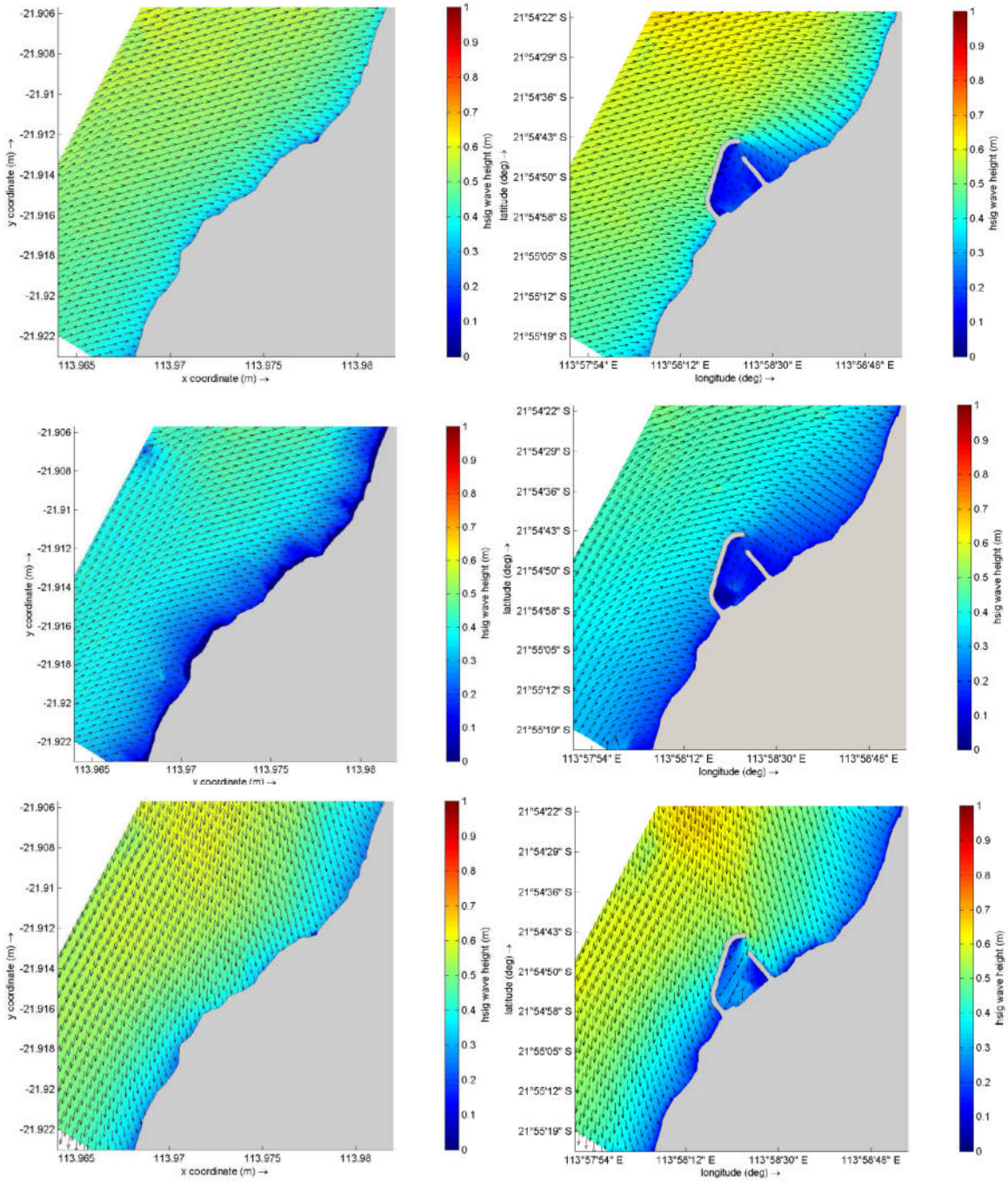
An assessment of coastal processes impacts from the TBF was supported by numerical modelling of waves and currents under a range of metocean conditions. The initial modelling work was undertaken on an early design concept (Concept B); however, following an assessment of this initial modelling, the design concept was modified (Concept C) to decrease the potential for sedimentation of the entrance channel (Figure 26). Further modelling work was then undertaken using Concept C based on the investigations undertake for Concept B. After this modelling work was completed the design concept was translated ~50 m offshore to minimise impact on the Tantabiddi midden site (see Section 3). It is anticipated that the coastal impacts assessed for Concept C are applicable to the proposed concept design (as per Section 1.4).



Source: MP Rogers & Associates (2023)

Figure 26 Design concepts used in coastal processes modelling

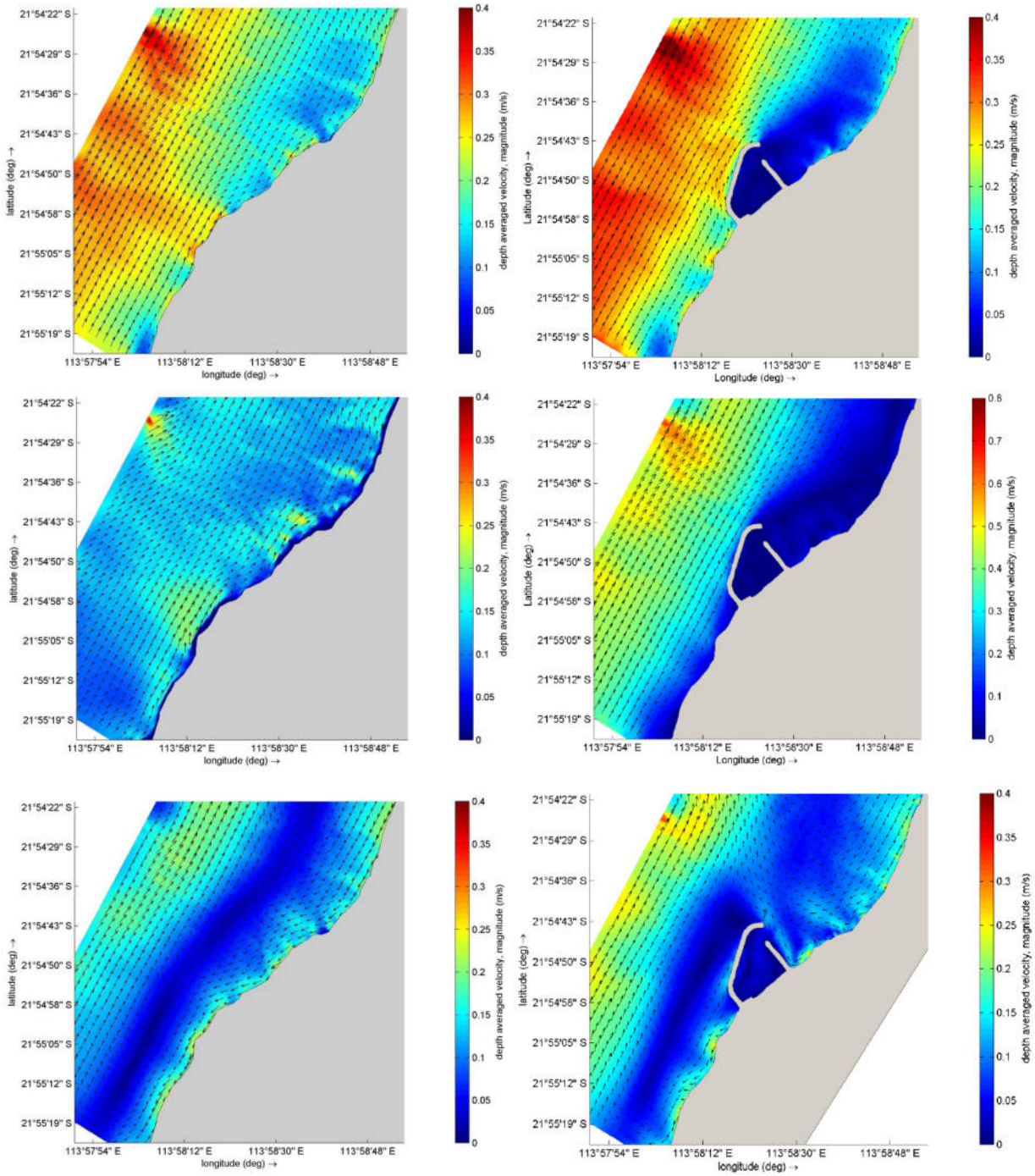
A calibrated wave model was developed to examine the potential changes in conditions caused by the introduction of the TBF under three typical conditions: sea breeze, swell and storm event (MP Rogers & Associates, 2025). This comparison showed that the changes in magnitude and direction of wave conditions would be highly localised (Figure 27).



Source: MP Rogers & Associates (2025)

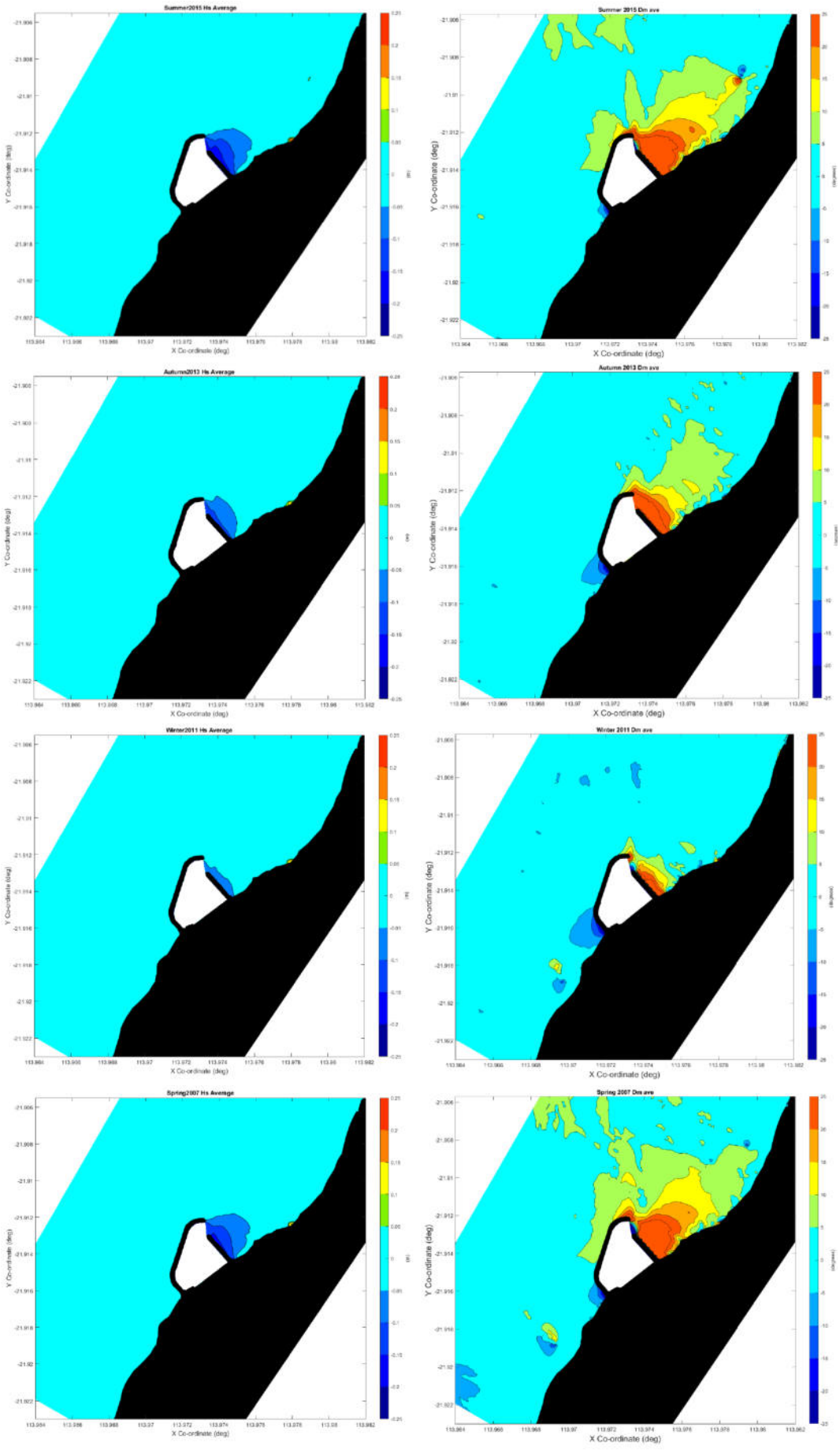
Figure 27 Comparison of modelled wave heights for sea breeze (upper), swell (middle) and storm events (lower)

Modelling of nearshore currents indicated that observable changes were limited to within 500 m of the facility (MP Rogers & Associates, 2025). There was a significant reduction in current velocity inside the breakwaters (as expected) and extending a few hundred metres along the shore to the north and south (Figure 28). The average seasonal changes to current speed and direction are typically restricted to within ~500 m north of the facility and are caused by training of alongshore flow around the facility and breakwater shadowing causing reduced wave currents immediately adjacent to the breakwaters (Figure 29).



Source: MP Rogers & Associates (2025)

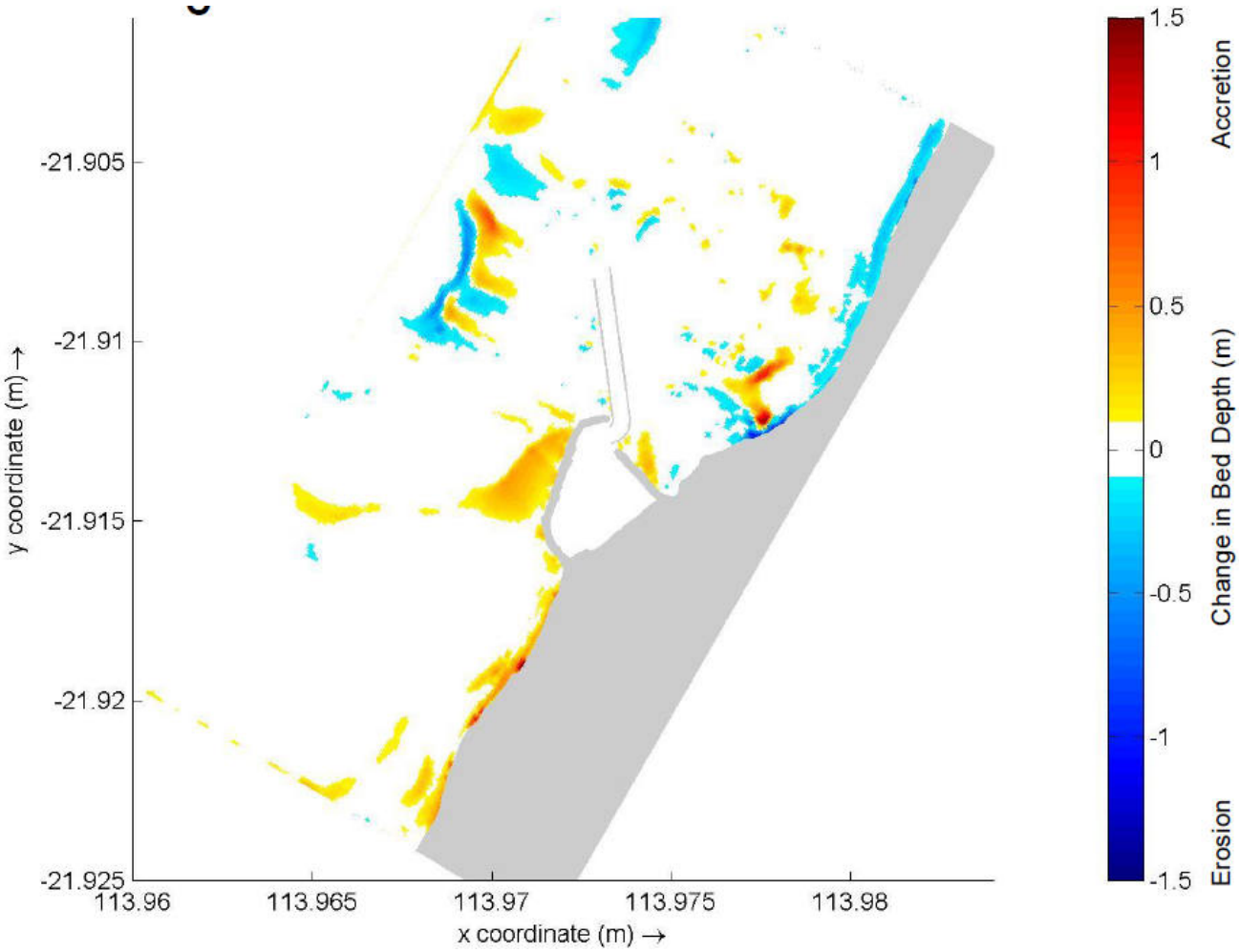
Figure 28 Comparison of depth-averaged current velocity for sea breeze (upper), swell (middle) and storm (lower) events



Source: MP Rogers & Associates (2023b)

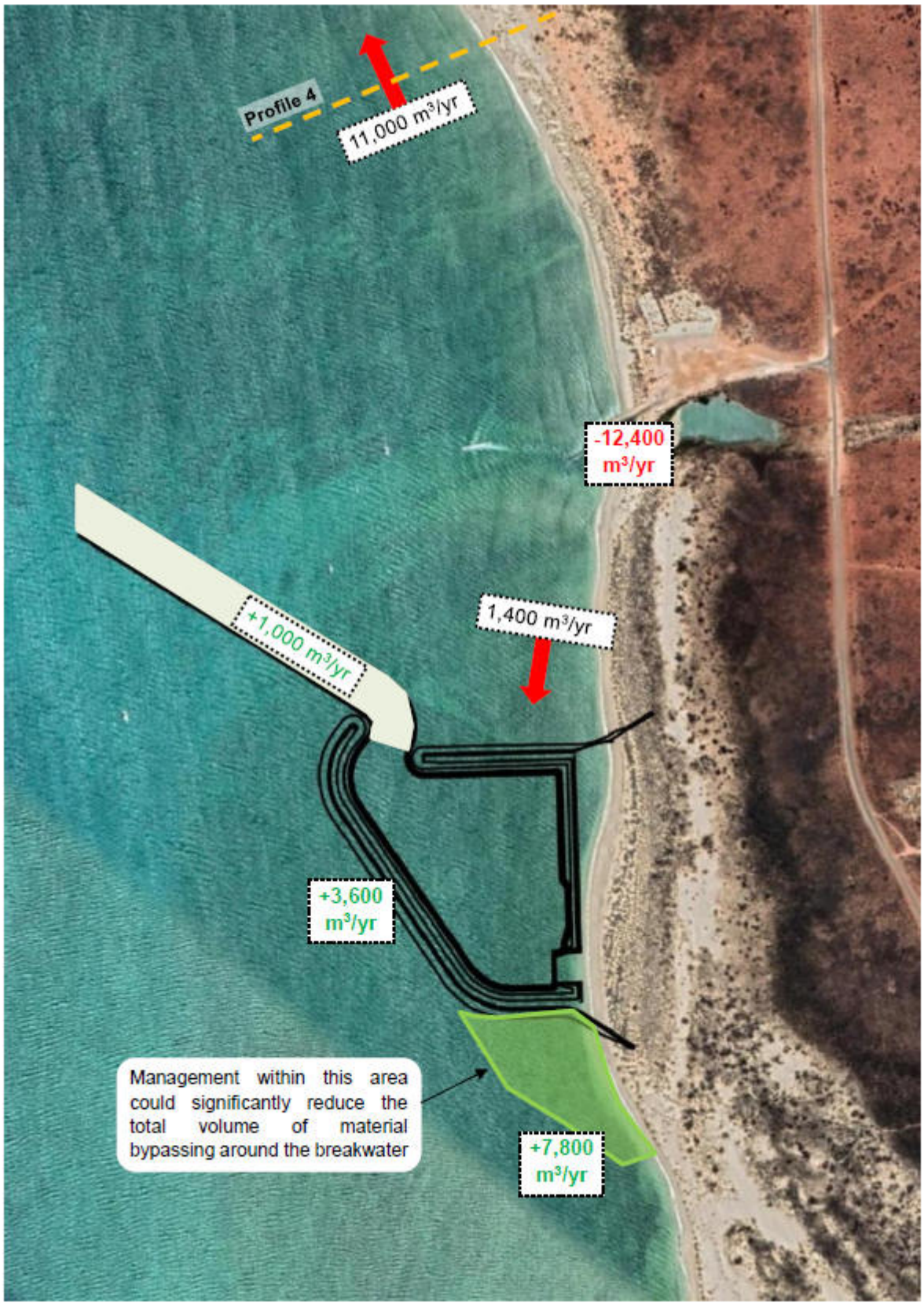
Figure 29 Change in wave height (left) and direction (right) for typical summer (upper), autumn, winter and spring (lower)

Sediment transport modelling was undertaken using the hydrodynamic (wave and current) modelling together with information on the sediment characteristics in the area and this was then calibrated against the estimated sediment budget. Modelling indicated the potential for sediment accumulation on the shore to the south of the facility and immediately offshore of the TBF and some shoreline erosion in the vicinity of Tantabiddi Creek and further north (Figure 30). This modelling work was used to estimate the local average annual sediment budget following the development of the TBF (Figure 31). Without ongoing management (e.g. bypassing and dredging), approximately 8,000 m^3/yr of sediment could accumulate at the shoreline immediately south of the TBF and erosion of ~12,500 m^3/yr may occur in the vicinity of Tantabiddi Creek. Erosion in the vicinity of Tantabiddi Creek may decrease the size of the sand bar and result in more frequent opening of the estuary (MP Rogers & Associates, 2023a).



Source: MP Rogers & Associates (2025)

Figure 30 Modelled change in seabed elevation over a typical year



Source: MP Rogers & Associates (2023b)

Figure 31 Estimated sediment budget following development of the TBF

6.2.4 Mitigation and Environmental Outcomes

To meet the EPA's environmental objectives for coastal processes the following mitigation and management measures will be implemented:

- Relocate facility away from the mouth of Tantabiddi Creek to minimise interruption of intermittent flood events at this site.
- Locate facility in an area where sediment availability is relatively limited. The nearshore area is characterised by a thin veneer of sediments overlying pavement reef. The shoreline is also underlain by limestone pavement.
- Annual monitoring of shoreline position and nearshore bathymetry.
- Sediment bypassing as required to transfer sediment accumulation from the south of the facility to the shoreline north of the facility. The sand bypassing, and the supporting infrastructure, will be refined during final design and be review regularly during operations. It is predicted that up to 6,000 m^3 (with a 50% contingency) of sediment is bypassed (using land-based equipment) twice yearly.
- Occasional dredging of the entrance channel may be required to maintain safe navigable passage. The dredged sediment shall be placed to the shoreline north of the facility. Dredging of the entrance channel is initially proposed to occur every four years (estimated volume 16,000 m^3) using a floating dredge.
- The dredged material (both the shoreline sand bypassing and entrance channel) will be natural sediments which are anticipated to be free of contamination (see Section 6.3.1).

It is anticipated that with regular monitoring and sediment bypassing operations (as required) that the TBF will have limited impact on the coastal processes in the area. It is considered that the EPA's objective for coastal processes can be met.

6.3 Marine Environmental Quality

The EPA's objective for marine environmental quality is to 'maintain the quality of water, sediment and biota so that environmental values are protected' (EPA, 2023a). The EPA provides the following guidance statement regarding marine environmental quality:

- Environmental Factor Guideline: Marine Environmental Quality (EPA 2016f).
- Technical Guidance: Environmental Impact of Marine Dredging Proposals (EPA, 2021b)
- Technical Guidance: Protecting the quality of Western Australia's marine environment (EPA, 2016g)
- Perth's Coastal Waters Environmental Values and Objectives (EPA, 2000)

The proposed construction (dredging and earthworks) and subsequent operation of the TBF has the potential to cause a temporary impact on marine water and sediment quality. These impacts are considered in detail below.

6.3.1 Receiving Environment

The seabed offshore of the TBF generally consists of a thin (~0.1–0.5 m) layer of sand overlying pavement limestone (CMW Geosciences, 2021; Searle, 2022). The surface sediments were sampled in 2022 and found to be generally fine to medium sands with a variable proportion of shell fragments. No samples exceeded the available guideline values for nutrients, metals, butyltin, BTEXN[12], hydrocarbons, pesticides and acid sulphate soils and the sediments were consistent with clean marine sediments (Cardno, 2022).

Water quality sampling in 2022 showed the lagoon waters to be clear, oligotrophic and generally well mixed (Stantec, 2025). No samples exceeded the available guideline values for metals, organotins, BTEXN, hydrocarbons and microbiological concentrations. Variations in turbidity and total suspended solids (TSS) concentrations are strongly influenced by spatial (bathymetry and seabed characteristics) and temporal (wave energy and current speeds) differences. Turbidity levels generally increase towards to the shoreline (Pomeroy et al., 2018). Turbidity levels in the lagoon generally ranged between 0.1 and 1.6 nephelometric turbidity units (NTU) and during January–February 2024 had an average of 0.58 NTU (Stantec, 2025). Higher turbidity values are generally observed during summer and lower values in winter when lower energy conditions prevail. Direct measurements of total suspended solids concentrations in the lagoon generally ranged between 1.4 and 1.8 mg/L (Stantec, 2025). This data was extrapolated for the period July 2019 to June 2023 based on a site-specific relationship with echo data obtained from an Acoustic Wave and Current Profiler (AWAC) deployed at the site. The modelled TSS levels ranged between 1.3 and 1.5 mg/L with a mean value of 1.37 mg/L and, are considered a reasonable representation of the baseline TSS at the site (Stantec, 2025). The Daily Light Integral (DLI) is a measure of the number of photosynthetically active photos reaching a specific area over a 24-hour period. DLI values for the Tantabiddi Lagoon were extrapolated using satellite imagery and the mean seabed DLI values ranged from 0.9 to 41.9 mol m^{-2} d^{-1}, with an average of 24 ± 0.34 mol·m^{-2}·d^{-1} (Stantec, 2025).

6.3.2 Potential Impacts

Construction impacts will be predominantly associated with dredging of the entrance channel and marine basin. These actions will result in short-term changes to marine water quality, including elevated turbidity/TSS levels and sedimentation. These primary effects have the potential to cause secondary effects through increasing water column light attenuation, smothering benthic habitats and toxicity effects. The existing sediments did not contain contaminants and there is therefore minimal risk of contaminant release during construction and/or operations.

[12] *Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene*

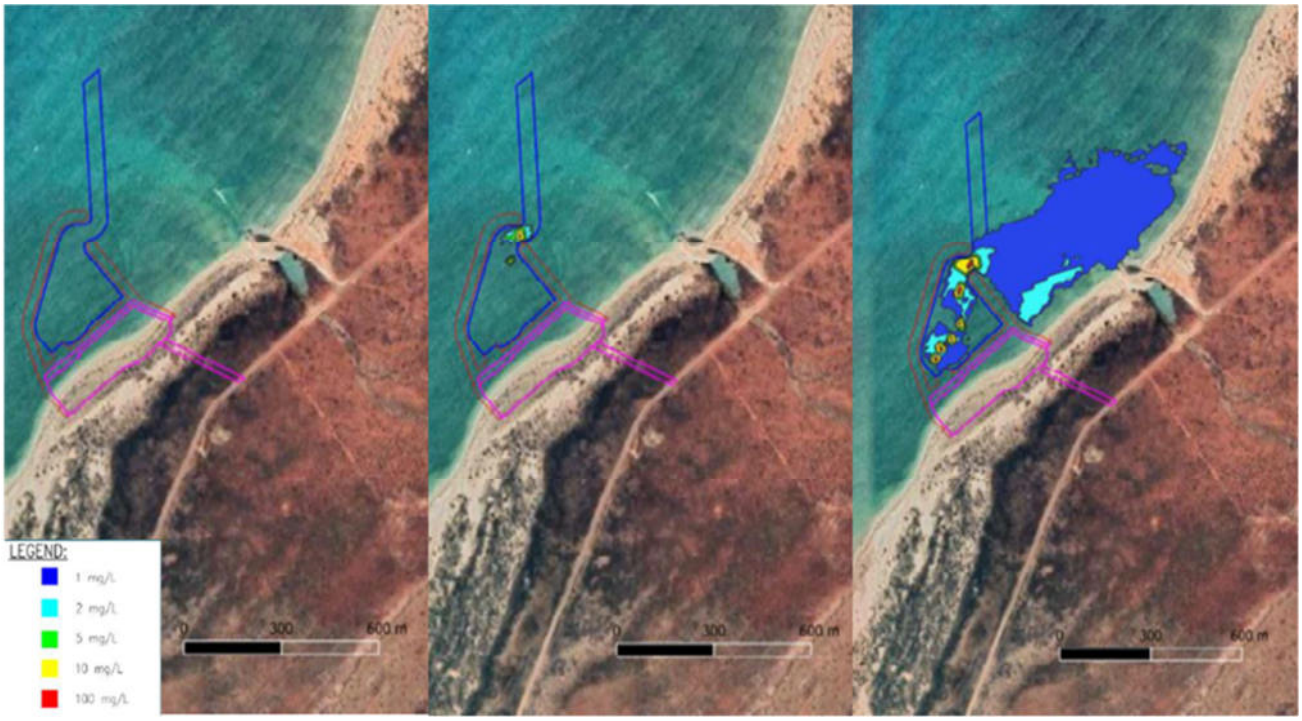
During operation of the TBF impacts to marine environmental quality may also arise from hydrocarbon release from boating activities. Further, water flushing within the enclosed and deepened harbour basin will also be reduced and could result in an impact on marine environmental quality.

6.3.3 Impact Assessment

Impacts to marine environmental quality were assessed using a calibrated hydrodynamic model to simulate the mobilisation, dispersal and settlement of dredge material. Plume modelling assumed the use of a backhoe dredge as a conservative assumption as it was considered that this method would generate a greater plume than a cutter suction dredge (MP Rogers & Associates, 2025). Modelling was undertaken for three environmental scenarios: Typical Winter, Alternate Winter and Summer (Stantec, 2025; MP Rogers & Associates, 2025). For the assessment of impacts on marine environmental quality and benthic habitats the Typical Winter scenario was used as this was considered to conservatively represent a worst case (Stantec, 2025).

Total Suspended Solids

Modelling of turbidity generated during dredging of the harbour basin (anticipated to take up to 16 weeks) showed the turbid plume was largely constrained to the basin. Only rarely (5% exceedance[13]) would a minor elevation of 1-2 mg/L above background levels be expected to occur outside the harbour basin (Figure 32). These plumes were typically associated with dredging near the harbour entrance.



Source: MP Rogers & Associates (2025)

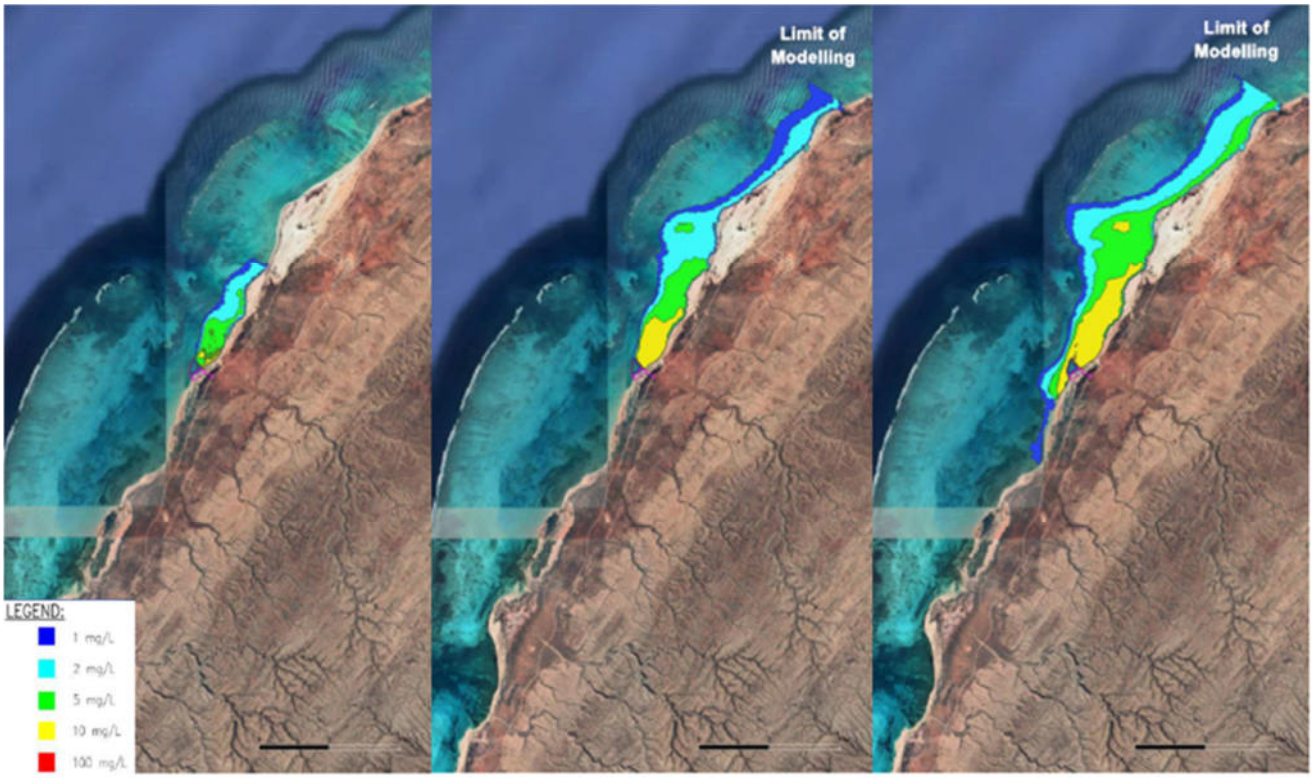
Figure 32 Modelled TSS levels resulting from dredging of the internal basin during typical winter conditions expected up to 50% of the time (left), no more than 20% of the time (middle) and no more than 5% of the time (right)

Dredging of the entrance channel (anticipated to take ~four weeks) is predicted to cause a visible[14] plume which may extend up to nine kilometres north and one kilometre south of the TBF (Figure 33). Turbidity levels more than 10 mg/L above background were restricted to south of Jurabi Point and anticipated to extend in a narrow shore-

[13] *The exceedance plot ratios presented in MP Rogers & Associates (2025) and Stantec (2025) have been inverted for clarity in this report. Hence, 95% exceedance plot presented in MP Rogers & Associates (2025) or Stantec (2025) is herein referred to as a 5% exceedance plot and represents TSS concentrations which might be expected no more than 5% of the time.*

[14] *Noting that the background TSS levels in this area generally ranged between 1.4 and 1.8 mg/L (see Section 6.3.1**Error! Reference source not found.**)*

attached plume up to 2.5 km north no more than 20% or 4.5 km north no more than 5% of the time (Figure 33). These concentrations have the potential to negatively affect the ecosystem and may therefore require management (see Section 6.1).

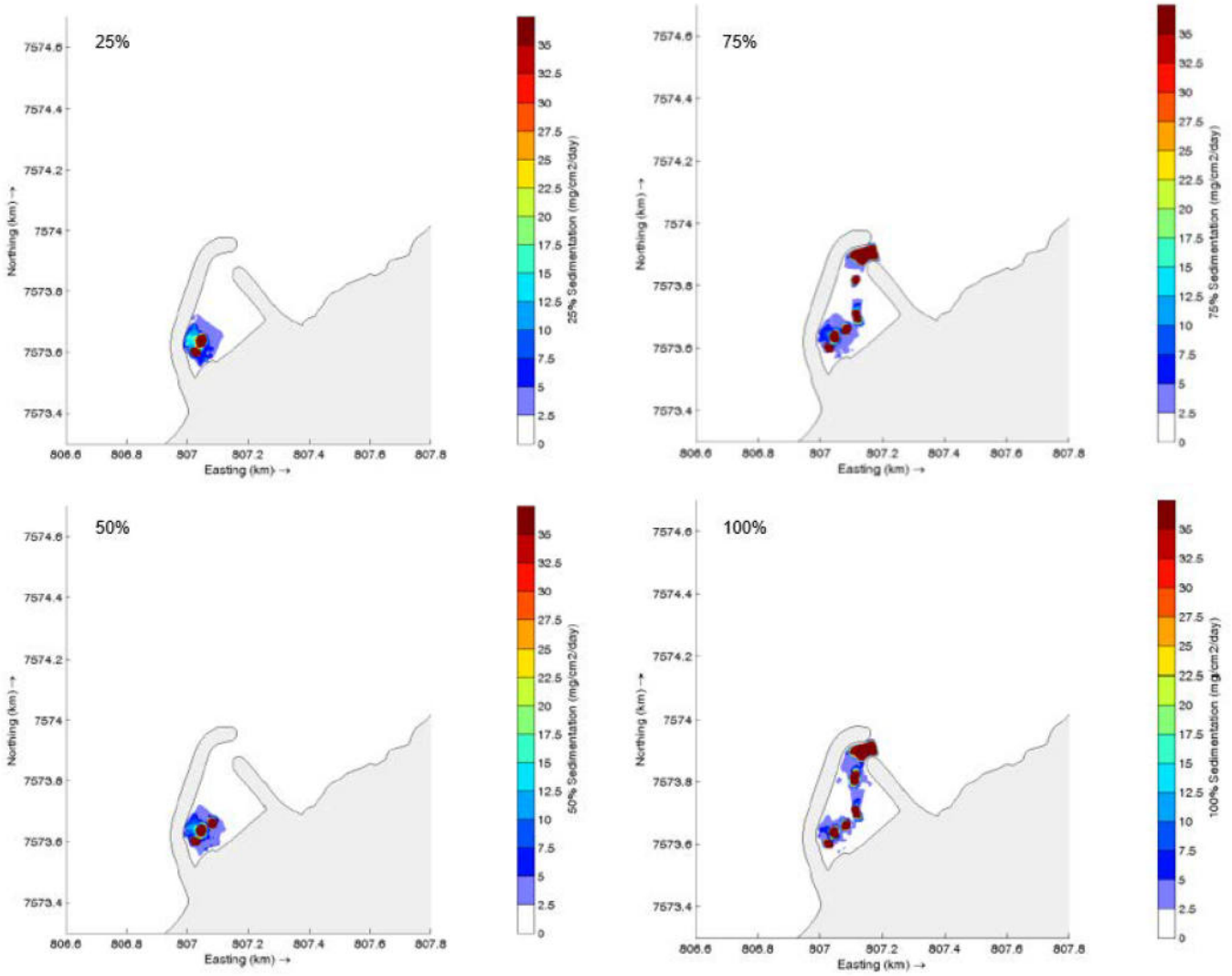


Source: MP Rogers & Associates (2025)

Figure 33 Modelled TSS levels resulting from dredging of the entrance channel during typical winter conditions expected up to 50% of the time (left), no more than 20% of the time (middle) and no more than 5% of the time (right)

Sedimentation

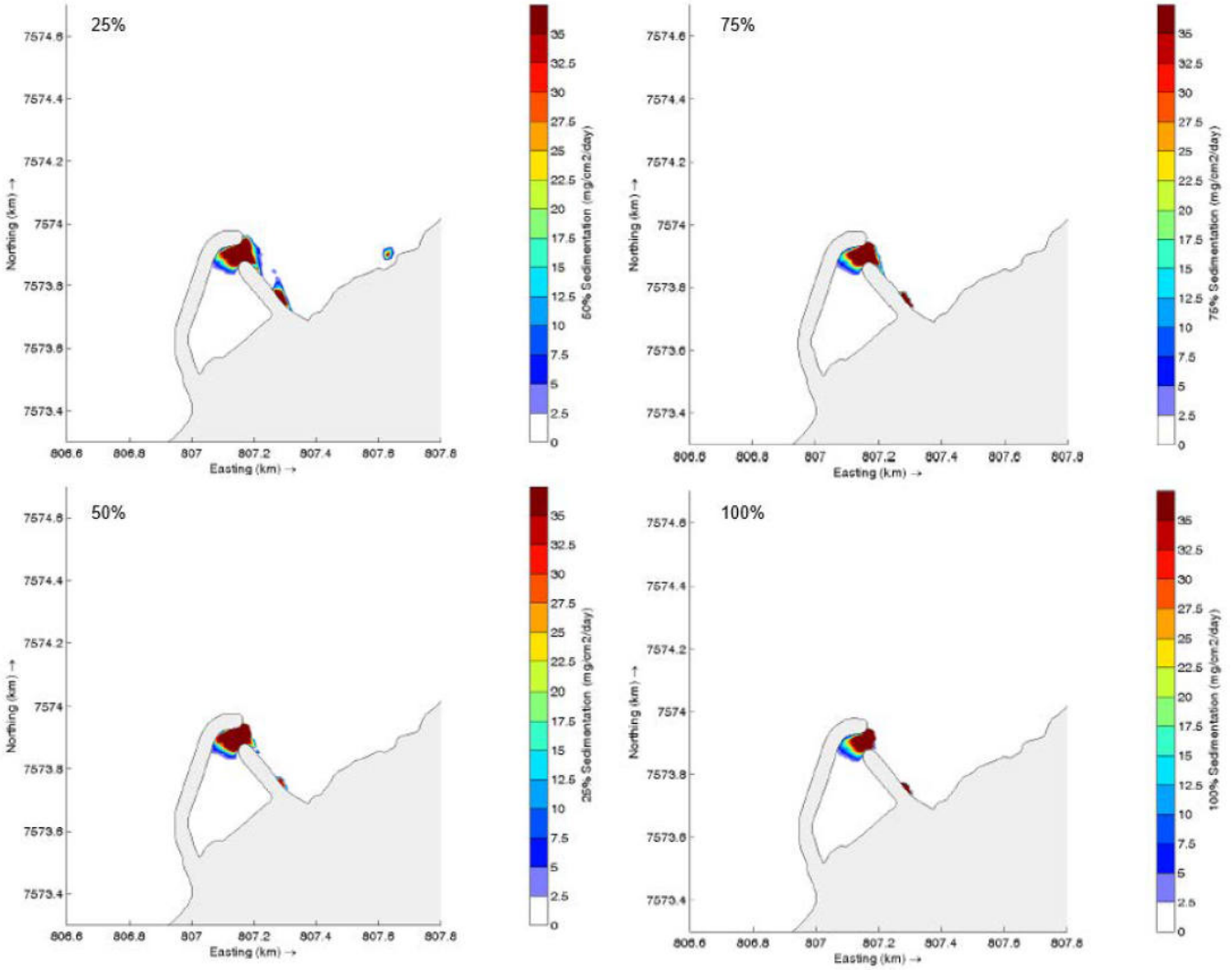
Modelling of dredging of the harbour basin indicated that sedimentation was largely constrained to inside the boating facilities basin with sedimentation up to 35 mg/cm^2/d (Figure 34). Any sedimentation beyond the harbour entrance was estimated to be below 2.5 mg/cm^2/d (equivalent to 0.99 mm vertical accretion over 14 days) which is considered to be within the natural tolerance limits of nearshore coral species (Stantec, 2025; Chevron 2016).



Source: MP Rogers & Associates (2025)

Figure 34 Modelled sedimentation resulting from dredging of the harbour basin during typical winter conditions after 26.25 days (upper left), 52.5 days (upper right), 78.75 days (lower left) and 105 days (lower right)

Dredging of the entrance channel may result in sedimentation along the northern breakwater wall (Figure 35) and potential for limited sedimentation in the lagoon to the north of the TBF (Stantec, 2025). The hydrodynamics of the Tantabiddi lagoon contribute to varying rates of sediment resuspension and transport, with generally higher rates in the shallow nearshore areas (Pomeroy et al., 2017, 2018). The lagoon is therefore characterised by a highly transient sediment surface of unknown thickness and duration (Pomeroy et al. 2017, 2018). Hence, the short period of relatively minor sedimentation is likely to be within the natural range, and therefore within the tolerance thresholds for mobile benthic invertebrates (Stantec, 2025).



Source: MP Rogers & Associates (2025)

Figure 35 Modelled sedimentation resulting from dredging of the entrance channel during typical winter conditions after 9.25 days (upper left), 18.5 days (upper right), 27.75 days (lower left) and 37 days (lower right)

Daily Light Integral

The DLI will vary seasonally and with short-term changes in metocean conditions including turbidity and cloud cover. The proposed dredging is expected to cause short-term increases in turbidity (see above) and thereby affect DLI. The strength of the relationship between turbidity and DLI will vary both spatially and temporally; therefore in the absence of water column light modelling, the potential for deleterious impacts to BCH and marine fauna has been addressed against the EPA's thresholds for TSS and turbidity as a proxy for DLI in Section 6.1.3. Note however, that the DLI shall be monitored during construction.

Toxicity

The material to be dredged consists predominantly of sand and limestone rock. Concentrations of heavy metals in overlying sand lens were either below the laboratory limit of reporting and/or below the relevant guideline values (Stantec, 2025). Small detectable concentrations of hydrocarbons are likely associated with the activities of the existing boating facility. No acid sulphate sediments were detected in the Proposal area. Considering the low concentration of contaminants of potential concern dredging is unlikely to a reduction in marine environmental quality from toxicants (Stantec, 2025). Similarly, the potential for hydrocarbon spills during construction is also considered low. Any spills, if they occur, will be limited to the small volume of fuel/lubricants aboard the construction vessel and can be readily controlled through the application of standard management practices (see

Section 6.3.4). Once the revetment walls are in place the ability to manage any spilled hydrocarbons is significantly improved.

During the operational phase of the TBF the risks associated with toxicity and small hydrocarbons are expected to be low and commensurate with those experienced at similar boating facilities and marinas across the State. These risks are already present for the existing boat launching facility and mooring areas. A benefit of having these operations occurring within the TBF is that spills are easier to detect and manage in the protected waters. Risks to marine environmental quality from spills and disturbance of toxic materials are expected to be low and manageable under the EPA's environmental quality management framework for a moderate level of ecosystem protection, which is typically afforded to marinas and harbours. The DoT are presently preparing an Environmental Quality Management Framework (EQMF) for the monitoring and management of their North West Cape Maritime Facilities. This North West Cape EQMF is being developed consistent with the EPA guidance for ''Protecting the Quality of Western Australia's Marine Environment" and will be based on the principles and guidelines of the National Water Quality Management Strategy (NWQMS), with particular regard to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). The North West Cape EQMF will establish a consistent regional approach to monitoring and management of the NWC Maritime Facilities which will include the TBF.

Flushing

Modelling of the flushing characteristics of the TBF was undertaken using a calibrated hydrodynamic model which included groundwater discharges. Groundwater discharge at the vicinity of the TBF have been estimated to be between 40 m^3/d to 150 m^3/d per 155 m length of shoreline (Rockwater, 2021). The e-folding time is a commonly used measure for the flushing of a water body and represents the time taken for a conservative tracer to reach concentration of 37%. The e-folding time for the TBF (Concept B) was modelled for a range of environmental conditions and ranged from 0.08 days to 1.71 days (with an average of ~1.09 days) (MP Rogers & Associates, 2025). Flushing modelling was not conducted for Concept C; however, flushing times are likely to be in the same order of magnitude (MP Rogers & Associates, 2025). The modelled flushing time for the TBF can be compared with the Exmouth Boat Harbour which was estimated to have a residence time in the order of one to five days (BBG, 1997). Measurements from Hillarys Marina indicated a flushing time of 5 days (Schwartz and Imberger, 1988) and modelling of the Ocean Reef Marina, across a range of environmental conditions, varied from 3 to 7 days, with median flushing times of 5 to 6 days (RPS, 2017).

6.3.4 Mitigation and Environmental Outcomes

The assessment of impacts to marine environmental quality suggested there is potential for short-term, spatially-constrained elevations in turbidity/TSS and smothering during the construction phase. The largest sediment plumes will occur during dredging of the entrance channel which is anticipated to be undertaken within approximately four weeks. The areas at greatest risk were immediately adjacent to the proposed facility and were generally restricted to contiguous areas to the north and south-east. The predicted short-term impacts to water and sediment quality are considered fully recoverable (Stantec, 2025). Recovery of water quality conditions is likely to occur within days and sedimentation effects are likely to recover over a period of weeks to as current energy increases during spring tides and/or storm events. During the operations phase the risks to marine environmental quality outside of the boating facility are minor.

Risks posed by the construction and operation of the facility on marine environmental quality will be managed via the application of the EPA's mitigation hierarchy (Table 17). Residual risks associated with construction and operations will be managed via a CEMP and the North West Cape EQMF, respectively. In consideration of the relatively low risk of impact and the proposed management actions is anticipated that the EPA's objective for marine environmental quality can be met.

Table 17 Management measures proposed for marine environmental quality

Impact	Avoid	Minimise	Monitoring and Management
CONSTRUCTION PHASE			
Elevated Turbidity/TSS Reduced water quality during the construction phase arising from elevated turbidity and TSS for short periods during dredging	The facility has been designed to ensure all dredge material will be reused onshore to avoid marine disposal of dredge material. Some reduction in water quality during the marine construction phase is unavoidable, however, all reasonable steps will be to minimise impacts. The development of the TBF will result in decommissioning of the existing Tantabiddi boat ramp which suffers from rainfall induced sedimentation issues. Consequently, the need for regular maintenance dredging at the original facility will cease, resulting in better outcomes for the nearby benthic environment.	Use the dredge plume model to inform the dredging operation to minimise environmental impacts associated with changes in water and sediment quality if monitoring suggests trigger values are at risk of exceedance. Construction of the breakwaters will be staged and undertaken prior to dredging the harbour basin. The breakwaters are anticipated to retain much of the dredge plume within the breakwaters and prevent it from entering the surrounding marine environment. A silt curtain will be deployed during construction of the inner (norther breakwater), revetments and dredging in the harbour basin where practicable to limit plume dispersion of sediments beyond the harbour basin	Monitoring and management requirements will be outlined in a CEMP. Monitoring will include a range of marine water quality parameters, including deployment of loggers to measure Daily Light Integral. The CEMP will include trigger values and management actions (including to pause dredging operations in the event the risk thresholds are exceeded). The CEMP will draw findings of the Western Australian Marine Sciences Institute dredging node to ensure best practice. All management plans will be prepared in accordance with the EPAs guidelines and in accordance with the EPA's marine environmental quality management framework approach as per EPA (2016g) and EPA (2017).
Sedimentation Sedimentation due to the deposition of dredge materials at rates higher than background	Dredging inevitably results in the mobilisation and the subsequent deposition of dredge material at rates exceeding background levels. DoT is taking all possible steps to minimise the effects of sedimentation using proactive mitigation strategies (see adjoining column).		
Reduced Light Reduced light availability for short periods at the seabed during construction	Some reduction of light availability to the benthic community is unavoidable during construction, however, DoT is taking all possible steps to minimise the reduction. Further, as per comments above, decommissioning of the existing boat ramp will remove the need for regular maintenance dredging at this facility.	The potential for a reduction in DLI is related to the turbidity/TSS levels. See mitigation strategies for TSS above.	
Toxicity Contaminated material or hydrocarbon spills resulting in reduced marine water and sediment quality during the construction phase	The location of the facility ensures that the required volume of imported fill material is minimised. Testing has been completed to ensure the sediment in the proposed dredging footprint is clean. All imported materials will be sourced from registered quarry and tested to ensure not contaminants are introduced. Whilst risks are low, the presence of construction vessels with the potential to cause an unplanned spill is unavoidable.	All contractor vessels will be in good working order with adequate emergency and containment equipment and procedures in the event of a spill. Chemicals will only be used/transferred in proximity to the marine environment as required and all chemicals will be managed and stored appropriately. Previously undertaken modelling could be used to estimate potential impact in the event of a chemical spill.	
OPERATIONS PHASE			

Impact	Avoid	Minimise	Monitoring and Management
Reduced Light/Toxicity Reduced water quality due to increased TSS from boat launches or pollution from marine debris, spills and/or runoff	Current boating operations at the existing facility results in regular small-scale increases in TSS in the marine environment from launching/retrieving and boats holding off from the boat ramp waiting to retrieve. A new facility will reduce these impacts and contain them within the boating facility walls avoiding impacts to the broader marine environment. Small and localised changes in water and sediment quality during the operations and maintenance are unavoidable but these will largely be within the facility.	Monitoring and management will be undertaken to achieve the Environmental Quality Objectives for ecosystem integrity for moderate and high levels of ecosystem protection. The DoT are preparing the North West Cape MEQMF and this will include a Moderate Ecological Protection Area (MEPA) in the immediate vicinity of the facility. A high level of ecosystem integrity will be maintained beyond this MEPA boundary. Stormwater drainage will be designed and constructed to ensure minimal runoff to the marine environment.	The approach to monitoring and management will be outlined in the NW Cape MEQMF and will include the application of the Environmental Quality Management Framework in accordance with EPA guidelines and relevant threshold and standards as described in EPA (2016f) and EPA (2017). The DoT are the lead organisation for marine oil spills and hold response equipment in Exmouth townsite. The TBF will provide improved infrastructure for emergency and pollution response on the west side of the Cape Range peninsular

6.4 Marine Fauna

The EPA's objective for marine fauna is 'to protect marine fauna so that biological diversity and ecological integrity are maintained' (EPA, 2023a). This objective acknowledges the importance of protecting marine fauna for their ecological roles; however, the EPA also recognises that many marine fauna are iconic and have value for social and traditional aboriginal cultural usage. The following are State and Commonwealth guidance statements related to marine fauna:

- Environmental Factor Guideline: Marine Fauna (EPA 2016e).
- Matters of National Environmental Significance Impact Guidelines 1.1 (DoE, 2013).
- Conservation advice and/or recovery plans for MNES species (where available).
- Threat abatement plans (TAPs) for MNES species (where available).

6.4.1 Receiving Environment

The environment adjacent to the TBF support a wide variety of marine fauna many of which are recognised for their conservation significance under the *Western Australian Biodiversity Conservation Act 2016* (*BC Act*) or *Commonwealth EPBC Act 1999*. Several databases were searched to determine the potential marine fauna species in proximity to the proposed TBF, including the EPBC's Protected Matters Search Tool (PMST) (10 km radius), DBCA Dandjoo biodiversity data platform (10 km radius), the DCCEEW threatened species and ecological communities (SPRAT) database (10 km) and the Atlas of Living Australia (50 km radius). A total of 155 marine and migratory species were assessed to determine their likelihood of occurrence in the proposal area; fish (47), birds (58), mammals (30), reptiles (19) and other species (1) (a detailed assessment of these conservation significant species is presented in Stantec, 2025).

Fish

A total of 47 conservation significant fish species were identified consisting of 13 ray and shark species and 34 other fish species (a complete assessment of these is provided in Stantec 2024). Of the ray and shark species three were considered to have at least a medium likelihood[15] of occurrence: Whale Sharks, Scalloped Hammerhead and Reef Manta Ray (Table 18) (Stantec, 2025). Most observations of Whale Sharks have been outside of the lagoon, with

[15] *Individuals of the species have been infrequently recorded in the project area and/or surrounding habitat. The high likelihood of occurrence criteria has not been met; however, suitable (not necessarily preferred) habitat may occur within the project area, or nearby. The surrounding habitat may support individuals or populations of the species*

Whale Sharks typically foraging and migrating along the 200 m isobath between July and November (DSEWPaC 2012a). A Biologically Important Area (BIA) for Whale Shark foraging is located offshore of the Ningaloo reef in the vicinity of the proposed TBF (DSEWPaC 2012a). Many observations of Scalloped Hammerhead have been recorded in the project area (>900 records, ALA 2024). Reef Manta Rays are likely to transit the project area (Stantec, 2025). Green Sawfish inhabit the Exmouth region, with occasional records in the Ningaloo reef lagoon, however their breeding and pupping areas are to the east, in areas such as Exmouth Gulf and the Ashburton River delta (Bateman et al., 2024).

Of the 34 other fish species identified, 18 were assessed to have at least a medium likelihood of occurrence (Table 18). The Blind Gudgeon and Blind Cave Eel are listed as vulnerable and are known to occur at the Tantabiddi Sinkhole. The Tantabiddi Sinkhole is the only known site for *Grandidierella* sp. nov. (Amphipoda: Aoridae); though this is not listed as conservation significant it may be considered 'locally significant' (Bamford, 2021). It is possible that these stygofauna species can access coastal waters through underwater caves; however, it is unlikely that the habitats within the proposal area support a population of these species (Stantec, 2025). 16 sygnathid (pipefish and seahorse) species were also assessed as having a medium likelihood of occurrence, though all have a relatively low conservation status (Table 18). Sygnathid species are distributed across the North-West Bioregion and most species exhibit a preference for habitats with a moderate amount of vertical structure (Lourie et al., 2004).

Table 18 Conservation significant fish

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Shark and Ray Species			
Reef Manta Ray, Coastal Manta Ray (*Mobula alfredi*)	Migratory	Migratory	Medium
Scalloped Hammerhead (*Sphyrna lewini*)	Conservation Dependent	Not Listed	Medium
Whale Shark (*Rhincodon typus*)	Vulnerable, Migratory	Migratory	Medium
Dwarf Sawfish, Queensland Sawfish (*Pristis clavata*)	Vulnerable, Migratory	Priority 1 (P1), Migratory (MI)	Low
Giant Manta Ray (*Mobula birostris*)	Migratory	Migratory	Low
Green Sawfish, Dindagubba, Narrowsnout Sawfish (*Pristis zijsron*)	Vulnerable, Migratory	Vulnerable (VU)	Low
Grey Nurse Shark (West coast population) (*Carcharias taurus*)	Vulnerable, Migratory	Vulnerable	Low
Narrow Sawfish, Knifetooth Sawfish (*Anoxypritis cuspidata*)	Migratory	Migratory	Low
White Shark, Great White Shark (*Carcharodon carcharias*)	Vulnerable, Migratory	Vulnerable	Low
Longfin Mako Shark (*Isurus paucus*)	Migratory	Migratory	Unlikely
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	Migratory	Not Listed	Unlikely
Shortfin Mako Shark (*Isurus oxyrinchus*)	Migratory	Migratory	Unlikely
Porbeagle, Mackerel Shark (*Lamna nasus*)	Migratory	Migratory	Unlikely
Other Fish Species			
Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish (*Trachyrhamphus bicoarctatus)*	Marine		Medium
Blind Cave Eel (*Ophisternon candidum)*	Vulnerable	Vulnerable	Medium
Blind Gudgeon (*Milyeringa veritas)*	Vulnerable	Vulnerable	Medium

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Brock's Pipefish (*Halicampus brocki)*	Marine		Medium
Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish (*Syngnathoides biaculeatus)*	Marine		Medium
Flagtail Pipefish, Masthead Island Pipefish (*Doryrhamphus negrosensis)*	Marine		Medium
Flat-face Seahorse (*Hippocampus planifrons)*	Marine		Medium
Gunther's Pipehorse, Indonesian Pipefish (*Solegnathus lettiensis)*	Marine		Medium
Pacific Short-bodied Pipefish (*Choeroichthys brachysoma)*	Marine		Medium
Pig-snouted Pipefish (*Choeroichthys suillus)*	Marine		Medium
Ribboned Pipehorse, Ribboned Seadragon (*Haliichthys taeniophorus)*	Marine		Medium
Robust Ghostpipefish, Blue-finned Ghost Pipefish (*Solenostomus cyanopterus)*	Marine		Medium
Spiny-snout Pipefish (*Halicampus spinirostris)*	Marine		Medium
Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish (*Trachyrhamphus longirostris)*	Marine		Medium
Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse (*Hippocampus trimaculatus)*	Marine		Medium
Tidepool Pipefish (*Micrognathus micronotopterus)*	Marine		Medium
Tiger Pipefish (*Filicampus tigris)*	Marine		Medium
Western Spiny Seahorse, Narrow-bellied Seahorse (*Hippocampus angustus)*	Marine		Medium
Banded Pipefish, Ringed Pipefish (*Doryrhamphus dactyliophorus)*	Marine		Low
Beady Pipefish, Steep-nosed Pipefish (*Hippichthys penicillus)*	Marine		Low
Black Rock Pipefish (*Phoxocampus belcheri)*	Marine		Low
Braun's Pughead Pipefish (*Bulbonaricus brauna)*	Marine		Low
Cleaner Pipefish, Janss' Pipefish (*Doryrhamphus janssi)*	Marine		Low
Glittering Pipefish (*Halicampus nitidus)*	Marine		Low
Helen's Pygmy Pipehorse *(Acentronura larsonae)*	Marine		Low
Ladder Pipefish (*Festucalex scalaris)*	Marine		Low
Many-banded Pipefish (*Doryrhamphus multiannulatus)*	Marine		Low
Mud Pipefish, Gray's Pipefish (*Halicampus grayi)*	Marine		Low
Muiron Island Pipefish (*Choeroichthys latispinosus)*	Marine		Low

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Pallid Pipehorse, Hardwick's Pipehorse (*Solegnathus hardwickii)*	Marine		Low
Southern Bluefin Tuna (*Thunnus maccoyii)*	Conservation Dependent		Low
Spiny Seahorse, Thorny Seahorse (*Hippocampus histrix)*	Marine		Low
Spotted Seahorse, Yellow Seahorse (*Hippocampus kuda)*	Marine		Low
Three-keel Pipefish (*Campichthys tricaines)*	Marine		Low

Source: Stantec (2025)

Birds

A total of 58 conservation significant bird species were identified from the database search consisting of 53 seabirds and migratory shorebirds and 5 terrestrial species (Table 19; a complete assessment of these is provided in Stantec 2024). Seabirds and migratory shorebirds are found widely along the coastal regions and island in the area which provide refuge and foraging opportunities for a wide array of species. This includes an Osprey nest on an old standpipe in the middle of the Tantabiddi Boat Ramp car park. Despite this, few critical seabird and/or migratory shorebird habitats are found within or are restricted to the project area. 22 species of seabirds and migratory shorebirds had at least a medium likelihood of occurrence and the following 9 have a high conservation status (Table 19):

- Australian Fairy Tern (*Sternula nereis nereis*)—Vulnerable
- Common Greenshank (*Tringa nebularia*)—Endangered
- Eastern Curlew (*Numenius madagascariensis*)—Critically Endangered
- Greater Sand Plover (*Charadrius leschenaultii*)—Vulnerable
- Grey Plover (*Pluvialis squatarola*)—Vulnerable
- Lesser Sand Plover (*Charadrius mongolus*)—Endangered
- Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*)—Endangered
- Red Knot (*Calidris canutus*)—Vulnerable
- Ruddy Turnstone (*Arenaria interpres*)—Vulnerable

Table 19 Conservation significant birds

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Australian Fairy Tern (*Sternula nereis nereis*)	Vulnerable	Vulnerable	Medium
Bar-tailed Godwit (*Limosa lapponica*)	Migratory, Marine	Migratory	Medium
Caspian Tern (*Hydroprogne caspia*)	Migratory, Marine	Migratory	Medium
Common Greenshank, Greenshank (*Tringa nebularia*)	Endangered, Migratory, Marine	Migratory	Medium
Common Sandpiper (*Actitis hypoleucos*)	Migratory, Marine	Migratory	Medium
Common Tern (*Sterna hirundo*)	Migratory, Marine	Migratory	Medium
Crested Tern (*Thalasseus bergii*)	Migratory, Marine	Migratory	Medium
Eastern Curlew, Far Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered, Migratory, Marine	Critically Endangered	Medium
Greater Sand Plover, Large Sand Plover (*Charadrius leschenaultii*)	Vulnerable, Migratory, Marine	Vulnerable	Medium
Grey Plover (*Pluvialis squatarola*)	Vulnerable, Migratory, Marine	Migratory	Medium
Grey-tailed Tattler (*Tringa brevipes*)	Migratory, Marine	P4, Migratory	Medium

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Lesser Sand Plover (*Charadrius mongolus*)	Endangered, Migratory, Marine	Endangered	Medium
Little Tern (*Sternula albifrons*)	Migratory, Marine	Migratory	Medium
Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit (*Limosa lapponica menzbieri*)	Endangered, Migratory	Critically Endangered	Medium
Oriental Plover, Oriental Dotterel (*Charadrius veredus*)	Migratory, Marine	Migratory	Medium
Oriental Pratincole (*Glareola maldivarum*)	Migratory, Marine	Migratory	Medium
Red Knot (*Calidris canutus*)	Vulnerable, Migratory, Marine	Endangered	Medium
Red-necked Stint (*Calidris ruficollis*)	Migratory, Marine	Migratory	Medium
Roseate Tern (*Sterna dougallii*)	Migratory, Marine	Migratory	Medium
Ruddy Turnstone (*Arenaria interpres*)	Vulnerable, Migratory, Marine	Migratory	Medium
Sanderling (*Calidris alba*)	Migratory, Marine	Migratory	Medium
Whimbrel (*Numenius phaeopus*)	Migratory, Marine	Migratory	Medium
Broad-billed Sandpiper (*Limicola falcinellus*))	Migratory, Marine	Migratory	Low
Common Noddy (*Anous stolidus*)	Migratory, Marine	Migratory	Low
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered, Migratory, Marine	Critically Endangered	Low
Flesh-footed Shearwater, Fleshy-footed Shearwater (*Ardenna carneipes*)	Migratory, Marine	Vulnerable	Low
Fork-tailed Swift (*Apus pacificus*)	Migratory, Marine	Migratory	Low
Gull-billed Tern (*Gelochelidon nilotica*)	Migratory, Marine	Migratory	Low
Hutton's Shearwater (*Puffinus huttoni*)	Marine	Endangered	Low
Lesser Frigatebird, Least Frigatebird (*Fregata ariel*)	Migratory, Marine	Migratory	Low
Little Curlew (*Numenius minutus*)	Migratory, Marine	Migratory	Low
Long-toed Stint (*Calidris subminuta*)	Migratory, Marine	Migratory	Low
Marsh sandpiper (*Tringa stagnatilis*)	Migratory, Marine	Migratory	Low
Osprey (*Pandion haliaetus*)	Migratory, Marine	Migratory	Low
Pectoral Sandpiper (*Calidris melanotos*)	Migratory, Marine	Migratory	Low
Sharp-tailed Sandpiper (*Calidris acuminata*)	Vulnerable, Migratory, Marine	Migratory	Low
Soft-plumaged Petrel (*Pterodroma mollis*)	Vulnerable, Marine		Low
Southern Giant-Petrel, Southern Giant Petrel (*Macronectes giganteus*)	Endangered, Migratory, Marine	Migratory	Low
Streaked Shearwater (*Calonectris leucomelas*)	Migratory, Marine	Migratory	Low
Terek Sandpiper (*Xenus cinereus*)	Vulnerable, Migratory, Marine	Migratory	Low
Wedge-tailed Shearwater (*Ardenna pacifica*)	Migratory, Marine	Migratory	Low
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	Marine		Low
White-winged Tern (*Chlidonias leucopterus*)	Migratory, Marine	Migratory	Low
Wood Sandpiper (*Tringa glareola*)	Migratory, Marine	Migratory	Low
Yellow Wagtail (*Motacilla flava*)	Migratory, Marine	Migratory	Low
Australian Painted Snipe (*Rostratula australis*)	Endangered	Endangered	Unlikely
Barn Swallow (*Hirundo rustica*)	Migratory, Marine	Migratory	Unlikely
Christmas Island White-tailed Tropicbird, Golden Bosunbird (*Phaethon lepturus fulvus*)	Endangered, Marine	Migratory	Unlikely

Name	*EPBC Act*	*BC Act*	Likelihood of Occurrence
Grey Wagtail (*Motacilla cinerea*)	Migratory, Marine	Migratory	Unlikely
Pin-tailed Snipe (*Gallinago stenura*)	Migratory, Marine	Migratory	Unlikely
Red-tailed Tropicbird (Indian Ocean) (*Phaethon rubricauda westralis*)	Migratory, Marine	Migratory, P4	Unlikely
Campbell Albatross, Campbell Black-browed Albatross (*Thalassarche impavida*)	Vulnerable, Migratory, Marine	Vulnerable	Unlikely
Indian Yellow-nosed Albatross (*Thalassarche carteri*)	Vulnerable, Migratory, Marine	Endangered	Unlikely

Source: Stantec (2025)

Mammals

The area from Ningaloo Reef to the Montebello Islands has been designated as an Important Marine Mammal Area (IMMA) by the International Union for the Conservation of Nature (IUCN) due to the occurrence of dugongs, inshore dolphins, humpback whales and a variety of other cetacean species. A total of 30 conservation significant marine mammals were identified from the database search, consisting of 8 baleen whale species, 21 dolphin and toothed whale species and the dugong (Table 20; a complete assessment of these is provided in Stantec 2024). The following species had at least a medium likelihood of occurrence in the proposal area (Table 20):

- Australian Humpback Dolphin
- Dugong
- Humpback Whale
- Indo-Pacific Bottlenose Dolphin

The proposal is within a BIA migration corridor for Humpback Whales. Though Humpback Whales were found to have a medium likelihood of occurrence within the proposal area, the shallow waters of the lagoon where the TBF will be situated is unlikely to provide favourable habitat for the species. Humpback Whales were removed from the 'Vulnerable' listing of the *EPBC Act* in 2022. The species is designated as Conservation Dependent and remains a listed migratory species with a high conservation status *BC Act*.

The Australian Humpback Dolphin and Indo-Pacific Bottlenose Dolphin are both coastal dolphins which have been recorded in the proposal area. These highly dispersive mobile species are likely to favour more suitable habitats in the area, including Exmouth Gulf (Stantec, 2025). There is no conservation advice, listing advice, recovery plan or threat abatement plan for either species.

Dugong are likely to occur in the proposal area throughout the year and the proposal area is within BIAs for Reproduction and Foraging for this species. Despite the occurrence of dugongs in the proposal area, the species is preferentially found in higher densities in Exmouth Gulf and Shark Bay where there is a high coverage of suitable foraging habitat (Stantec, 2025).

Table 20 Conservation significant marine mammals

Name	EPBC Act	BC Act	Likelihood of Occurrence
Australian Humpback Dolphin (*Sousa sahulensis*)	Cetacean, Migratory	Migratory, P4	Medium
Dugong (*Dugon dugon*)	Marine, Migratory	Migratory	Medium
Humpback Whale (*Megaptera novaeangliae*)	Cetacean, Migratory	Conservation Dependent, Migratory	Medium

Name	EPBC Act	BC Act	Likelihood of Occurrence
Indo-Pacific Bottlenose Dolphin (*Tursiops aduncus* (Arafura/Timor Sea populations))	Cetacean, Migratory	Migratory	Medium
Bottlenose Dolphin (*Tursiops truncatus s. str.*)	Cetacean	Not Listed	Low
Dwarf Sperm Whale (*Kogia sima*)	Cetacean	Not Listed	Low
False Killer Whale (*Pseudorca crassidens*)	Cetacean	Not Listed	Low
Indo-Pacific Bottlenose Dolphin, Spotted Bottlenose Dolphin, (*Tursiops aduncus*)	Cetacean	Migratory	Low
Killer Whale, Orca (*Orcinus orca*)	Migratory	Migratory	Low
Long-snouted Spinner Dolphin (*Stenella longirostris*)	Cetacean	Migratory, P4	Low
Pygmy Blue Whale (*Balaenoptera musculus*)	Cetacean, Endangered, Migratory	Endangered	Low
Southern Right Whale (*Eubalaena australis*)	Cetacean, Endangered, Migratory	Vulnerable	Low
Antarctic Minke Whale, Dark-shoulder Minke Whale (*Balaenoptera bonaerensis*)	Cetacean, Migratory	Migratory	Unlikely
Blainville's Beaked Whale, Dense-beaked Whale (*Mesoplodon densirostris*)	Cetacean	Not Listed	Unlikely
Bryde's Whale (*Balaenoptera edeni*)	Cetacean, Migratory	Migratory	Unlikely
Common Dolphin, Short-beaked Common Dolphin (*Delphinus delphis*)	Cetacean	Not Listed	Unlikely
Cuvier's Beaked Whale, Goose-beaked Whale (*Ziphius cavirostris*)	Cetacean	Not Listed	Unlikely
Fin Whale (*Balaenoptera physalus*)	Cetacean, Vulnerable, Migratory	Endangered	Unlikely
Fraser's Dolphin, Sarawak Dolphin (*Lagenodelphis hosei*)	Cetacean	Migratory	Unlikely
Melon-headed Whale (*Peponocephala electra*)	Cetacean	Not Listed	Unlikely
Minke Whale (*Balaenoptera acutorostrata*)	Cetacean	Not Listed	Unlikely
Pygmy Killer Whale (*Feresa attenuata*)	Cetacean	Not Listed	Unlikely
Pygmy Sperm Whale (*Kogia breviceps*)	Cetacean	Not Listed	Unlikely
Risso's Dolphin, Grampus (*Grampus griseus*)	Cetacean	Not Listed	Unlikely
Rough-toothed Dolphin (*Steno bredanensis*)	Cetacean	Not Listed	Unlikely
Sei Whale (*Balaenoptera borealis*)	Cetacean, Migratory, Vulnerable	Endangered	Unlikely
Short-finned Pilot Whale (*Globicephala macrorhynchus*)	Cetacean	Not Listed	Unlikely
Sperm Whale (*Physeter macrocephalus*)	Cetacean, Migratory	Vulnerable	Unlikely
Spotted Dolphin, Pantropical Spotted Dolphin (*Stenella attenuata*)	Cetacean	Migratory	Unlikely
Striped Dolphin, Euphrosyne Dolphin (*Stenella coeruleoalba*)	Cetacean	Not Listed	Unlikely

Source: Stantec (2025)

Reptiles

A total of 19 conservation significant marine reptiles were identified from the database search consisting of 5 turtle species and 14 sea snake species (Table 21; a complete assessment of these is provided in Stantec 2024). Three turtle species had a high likelihood of occurrence in the proposal area (Loggerhead, Green and Hawksbill) and one (Flatback) had a medium likelihood of occurrence. The proposal area is located within a Reproduction BIA for each of these turtle species. Two snake species were considered to have a medium likelihood of occurring within the proposal area, the Olive-headed Sea snake and the North-western Mangrove Seasnake. Although both are classified as Marine under the *EPBC Act*, neither of these species are threatened or protected under the *WA BC Act* (see Stantec, 2025 for more details).

Loggerhead Turtles are known to forage in the waters off the Cape Range peninsula and is a high likelihood[16] that the species accesses feeding habitat near the proposal area. However, the species has only been infrequently recorded in the proposal area and no recording of nesting on beaches within the proposal area (Stantec, 2025). There have been recordings of a low number of Loggerhead Turtles nesting to the north of Jurabi Point (~5.4 km north of the proposal area) (DBCA, 2024).

Green Turtles have not been reported nesting in the proposal area and the closest reported nesting is on the eastern side of the North West Cape and Jurabi Point to the north of the proposal areas (DBCA, 2024). Foraging areas for Green Turtles in Western Australia are likely to be considerably underestimated and only overlap with 5% of known foraging BIAs (Ferreira et al., 2021). The species is therefore considered to be highly likely to occur in within or near the proposal area but is unlikely the species will rely solely on the habitats.

Hawksbill Turtle have not been recorded nesting at beaches within the area (Stantec, 2025). The species is likely present year-round within the lagoon, although in smaller numbers compared to Green and Loggerhead Turtles (Stantec, 2025). Though foraging has not been noted in the area, their year-round presence suggests feeding is likely.

Flatback Turtles are widespread across the North West of Australia and are known to nest on various mainland and island beaches in the Pilbara north of the Proposal area (Stantec, 2025). Foraging areas are widely dispersed in Western Australian coastal waters and it is unlikely the species will rely solely on the habitats within or near the proposal area (Stantec, 2025).

Table 21 Conservation significant marine reptiles

Name	EPBC Act	BC Act	Likelihood of Occurrence
Marine Turtles			
Green Turtle (*Chelonia mydas*)	Vulnerable, Migratory	Vulnerable	High
Hawksbill Turtle (*Eretmochelys imbricata*)	Vulnerable, Migratory	Vulnerable	High
Loggerhead Turtle (*Caretta caretta*)	Endangered, Migratory	Endangered	High
Flatback Turtle (*Natator depressus*)	Vulnerable, Migratory	Vulnerable	Medium
Leatherback Turtle (*Dermochelys coriacea*)	Endangered, Migratory	Vulnerable	Low
Sea Snakes			
North-western Mangrove Seasnake (*Ephalophis greyi*)	Marine		Medium
Olive-headed Seasnake (*Hydrophis major,* formerly *Disteira major*)	Marine		Medium
Dubois' Seasnake (*Aipysurus duboisii*)	Marine		Low
Elegant Seasnake (*Hydrophis elegans*)	Marine		Low
Horned Seasnake (*Acalyptophis peronii*)	Marine		Low
Leaf-scaled Seasnake (*Aipysurus foliosquama*)	Critically endangered, Marine	Critically endangered	Low
Olive Seasnake (*Aipysurus laevis*)	Marine		Low
Short-nosed Seasnake (*Aipysurus apraefrontalis*)	Critically endangered, Marine	Critically endangered	Low
Spotted Seasnake, Ornate Seasnake, (*Chitulia ornata*)	Marine		Low

[16] *Individuals of the species have been repeatedly recorded in the project area and/or adjacent habitat. The project area is within the species' known range and surrounding habitat is expected to support populations of the species*

Name	EPBC Act	BC Act	Likelihood of Occurrence
Stokes' Seasnake (*Astrotia stokesii*)	Marine		Low
Spectacled Seasnake (*Hydrophis kingii*, formerly *Disteira kingii*)	Marine		Unlikely
Spine-tailed Seasnake (*Aipysurus eydouxii)*	Marine		Unlikely
Turtle-headed Seasnake (*Emydocephalus annulatus*)	Marine		Unlikely
Yellow-bellied Seasnake (*Hydrophis platurus*, formerly *Pelamis platurus*)	Marine		Unlikely

Source: Stantec (2025)

Other Species

The Cape Range Remipede (see Stantec 2024) is a free-swimming, cave dwelling crustacean, known only from a single remote anchialine (submerged) cave on the Cape Range peninsula of Western Australia, located on a coastal plain, 1.7 km inland. Although this species habitat is known to occur in the surrounds of the proposal, it is unlikely that the species will depend upon habitat in the proposal area and there are no records of the species in the immediate area. With no predicted impacts on groundwater or subterranean habitat it is considered unlikely that the Proposal will impact upon this species (Stantec, 2025).

6.4.2 Potential Impacts

The most significant potential impact on marine fauna is likely to be associated with underwater noise generated during the construction piling and dredging activities. Other impacts on marine fauna may also result from the introduction of anthropogenic light, loss of benthic habitat, changes in water quality, vessel collision, marine debris and the introduction of invasive species (Stantec, 2025). During the operation there is also the potential for these same environmental impacts on marine fauna, typically with a reduced magnitude of impact than that experienced during construction. Operation of the facility could also result in other potential impacts such as an increase to fishing pressure due to greater number of boats launching and changes to near shore habitats.

6.4.3 Impact Assessment

Underwater Noise

The most significant underwater noise sources for construction of the Project will be associated with piling and dredging activities. Rock tipping will be used to build the breakwater, however, the underwater noise generated by this activity is equivalent to the nearshore zone under high-energy wave conditions, and will therefore have a relatively low impact on underwater noise compared to dredging and piling (Talis, 2024). It is anticipated that all piling works in the harbour basin will be undertaken following construction of the rubble-mound breakwaters. The piling method is yet to be confirmed, though the geotechnical data review (Searle, 2022) recommended that piles be installed using drilling methods instead of impact driving. The underwater noise generated by drilling methods is likely to be significantly less than the noise generated by impact driving methods. For the underwater noise impact assessment, it has conservatively been assumed (worst-case) that impact piling will be used. The geotechnical data review also noted that the dredging works may be undertaken using either a cutter suction dredger or backhoe dredger. An assessment of the constructability of the required dredging and coastal structures recommended the use of a backhoe dredger (MP Rogers & Associates, 2023a). The dredging method is yet to be confirmed; however, for the underwater noise impact assessment it was conservatively (worst-case) assumed that a Cutter-Suction Dredger (CSD) would be used (Talis, 2024).

Two types of impacts can occur to marine fauna following exposure to excessive underwater noise, (1) marine fauna behaviour and (2) impacts to hearing ability[17]. Changes in the behaviour of marine fauna because of underwater sound can include alterations in swimming patterns, vocalisation and feeding habits. Behavioural disturbance levels are estimated using the Sound Pressure Level (SPL[18]) root-mean-square. Impacts to the hearing ability may either be in the form of acute changes to hearing sensitivity that recover over time (Temporary Threshold Shift, TTS) or hearing damage which does not recover to pre-noise exposure levels (Permanent Threshold Shift, PTS). These hearing impacts are estimated using the cumulative Sound Exposure Level (SEL[19]) and are typically determined using weighted hearing curves which reflect the sensitivity of a particular marine fauna's auditory system to different sound frequencies. Noise levels at which TTS and PTS occur are dependent on whether the noise being generated is classed as impulsive or non-impulsive (Talis, 2024):

- **Impulsive**—sounds produced are typically transient, brief (less than one second), broadband and consist of high peak pressure with rapid rise time and rapid decay. This noise source is associated with activities such as impact pile driving, seismic activities and underwater blasting and results in some of the most powerful sounds produced underwater.
- **Non-impulsive**—sounds produced can be broadband, narrowband, or tonal, brief or prolonged, continuous or intermittent and typically do not have the high peak sound pressure with rapid rise/decay times that impulsive sounds do. Non-impulsive underwater noise is typically associated with activities such as dredging, vessel noise, drilling and some construction activities.

The impact of underwater noise on marine mammals is also dependent on species traits including sensitivity, mode of communication and behavioural responses. For these purpose of this assessment threshold levels[20] were determined to examine the impact on whales, dolphins, sirenian (including dugong) and turtles (Talis, 2024). The generation and transmission of underwater noise was modelled numerically using the Monterey Miami Parabolic Equation which produced a three-dimensional estimate of the acoustic field at depth and distance from the proposed TBF site (Talis, 2024). Modelling was undertaken for the following three scenarios (Talis, 2024):

- Piling inside the harbour (Harbour)
- Piling of offshore navigation marker (Nav Mark)
- Dredging along the entrance channel

Except for whales, all other marine fauna had a behavioural impact distance of <50 m during the piling works; for whales this distance was 270 m for the offshore pile (Table 22). Whales had the largest exposure ranges with a TTS range of 1,900 m and a PTS range of 760 m associated with piling for installation at the location of Nav Mark (Table 22). The behavioural distances for whales from dredging was 1,750 m due to the relatively low threshold level for non-impulsive sources which is equivalent to ambient noise levels; hence dredge noise levels need to be less than or equal to ambient noise to ensure no behavioural effects on whale (Table 23). Whales also had the most sensitive hearing impact range for the dredging works with a TTS range of 750 m and a PTS range of 110 m (Table 23). It should also be noted that the lagoon adjacent to the proposal is ~3 km wide and whales very rarely venture into the lagoon.

[17] *For human hearing, these may be likened to (1) 'environmental noise' which considers noise impacts on people's amenity, and (2) 'occupational noise' which considers potential for someone's hearing to be impeded.*

[18] *Sound Pressure Level (SPL) root-mean-square is a measure of the average acoustic pressure over a period of time (24 hours was used in this study)*

[19] *Sound exposure levels (SEL) is the level of underwater noise energy taken over a period of time (24 hours was used in this study) and is typically used to assess health and welfare impacts*

[20] *The threshold levels assume that the marine fauna will remain at a fixed location from the noise source for the duration of exposure (24 hours)*

Table 22 Hearing impact and behavioural ranges for piling activity

Species	24 Hour SEL Threshold Levels (dB)	Source	TTS Range (m)	PTS Range (m)	Behavioural Threshold Levels (dB)	Behavioural Range (m)
Whales	TTS = 168 PTS = 183	Harbour	330	230	160	120
		Nav Mark	1,900	760		270
Dolphins	TTS = 170 PTS = 185	Harbour	70	<50	160	<50
		Nav Mark	75	<50		<50
Sirenians	TTS = 175 PTS = 190	Harbour	<50	<50	160	<50
		Nav Mark	<50	<50		<50
Turtles	TTS = 189 PTS = 204	Harbour	120	<50	175	<50
		Nav Mark	220	<50		<50

Source: Talis (2024)

Table 23 Hearing impact and behavioural ranges for dredging activity

Species	24 Hour SEL Threshold Levels (dB)	TTS Range (m)	PTS Range (m)	Behavioural Threshold Levels (dB)	Behavioural Range (m)
Whales	TTS = 179 PTS = 199	750	110	120	1,750
Dolphins	TTS = 178 PTS = 198	<50	<50	120	70
Sirenians	TTS = 186 PTS = 206	<50	<50	120	<50
Turtles	TTS = 200 PTS = 220	100	<50	Distance dependent	Low

Source: Talis (2024)

Anthropogenic Light

Artificial light is known to adversely affect marine fauna by inducing behavioural changes (e.g., attracting, repelling or disorientating species) or physiological changes (e.g. delayed reproduction) which ultimately reduce survivorship or reproductive output (Commonwealth of Australia 2020). Marine turtles are likely at the greatest risk from anthropogenic lighting, with their nesting behaviours recognised to be adversely affected by artificial light (Lohmann et al. 1997; Salmon 2003; Witherington and Martin 2003). Adult turtles may be discouraged to nest on beaches with artificial light skyglow, while turtle hatchlings can become disorientated by artificial light (Commonwealth of Australia 2020; Kamrowski et al. 2012; Thums et al. 2016; Wilson et al. 2018). However, as noted above, the beaches adjacent to the TBF are not known as a turtle nesting area.

To minimise the impact from anthropogenic light most construction activities will be undertaken during day light hours. Some nighttime dredging may occur in the harbour basin, but it will only occur once the breakwaters are at an adequate height to screen the operations. Night lighting will be restricted to required navigational and positional lighting on the dredge and potentially the outer extremities of the breakwater infrastructure. All lighting will be designed using best practice guidelines to avoid or minimise the potential impacts to marine fauna.

Habitat Modification

The coverage of marine habitats within the proposal area are detailed in Section 6.1. Under the MNES assessment framework, the impacts associated with physical habitat modification have been identified as a threat of potential concern for several cetacean species including the Australian Humpback Dolphin, Dugong and most turtle species. The predicted loss of 0.39% (23.79 ha) of BCH within the LAU consists largely (91.6%) of macroalgae community which is predominantly composed of ephemeral genera including *Padina*, *Hincksia* and *Hydroclathrus* (see

Section 6.1). Despite its known relevance as a foraging habitat for marine turtles, the loss of macroalgae from the proposal area is unlikely to result in significant impacts to listed species given its widespread distribution throughout in the LAU. Though marine turtles are known to nest along the Ningaloo coast, the beach at the proposal area is not known as a nesting habitat for marine turtles. Best practice management strategies for the mitigation of possible impacts to turtles will be implemented during the construction and operational phases. The losses of foraging habitats are therefore likely to be relatively insignificant and may be partly offset by the recolonisation of macroalgae on the outer breakwater walls, and the region adjacent to the existing Tantabiddi Boat Ramp, which has historically been impacted by regular maintenance dredging.

Water Quality

As noted above, there is the potential for short-term, spatially constrained elevations in turbidity/TSS and smothering, during the proposed dredging campaign (Section 6.1). The largest sediment plumes will occur during dredging of the entrance channel which is anticipated to be undertaken within approximately four weeks. The areas at greatest risk were immediately adjacent to the proposed facility and were generally restricted to contiguous areas to the north and south-east. While the presence of sediments in the water column may interrupt feeding and sensory processes and reduce visibility for predatory marine fauna, the predicted elevations are both temporally and spatially constrained. Further, the very high mobility of the marine fauna assessed suggests impacts associated with changes in water quality will be either avoidable, or negligible and limited to less motile species proximal to the dredge footprint (Stantec, 2025). The predicted worst-case rates of sedimentation were within the non-lethal range, such that most invertebrates should be capable of escaping the effects of the predicted deposition (Section 6.3.3). It is therefore considered unlikely that the sedimentation during dredging will have a significant impact on invertebrate communities beyond the project footprint.

Impacts on marine fauna from unplanned release of hydrocarbons during the construction are possible but considered unlikely. Habitat loss and/or degradation from water pollution was identified as a threat of potential concern to a number of shorebirds and seabirds (Table 19), the Australian Humpback Dolphin (Table 20) and marine turtles (Table 21). Any spills, if they occur, will be limited to the small volume of fuel/lubricants aboard the construction vessel and can be readily controlled through the application of standard management practices.

Vessel Collision

The potential for impacts on marine fauna from vessel collisions is considered low and manageable (Stantec, 2025). The Marine Bioregional Plan for the North-west Marine Region identifies vessel strike as a potential concern for the Australian Humpback Dolphin, Spotted Bottlenose Dolphin, Humpback Whale, Dugong, Green Turtle, Hawksbill Turtle and Flatback Turtle (DSEWPAC, 2012b). Resting Humpback Whales may be at greater risk of such vessel strike, with the species spending time on the southern migration resting in shallow areas (Bejder et al. 2019). Whale Sharks typically feed and migrate west of the outer reef but have been known to enter the inner reef lagoon and may also be vulnerable to vessel strike (DSEWPaC 2012a). The potential for vessel strikes during the construction phase will be managed using best practice, including speed restriction on construction vessels and the use of Marine Fauna Observers during construction.

Invasive Marine Species

Marine invasive species can indirectly impact marine fauna by changing the community composition of key habitat which can have downstream effects on food availability. Marine pests may be introduced during the construction phase through the disposal of ballast water or dislodgment of biofouling from vessels. The dredge vessel is considered the highest risk as it may have transited from foreign ports in tropical waters (Stantec, 2025). There are 60 non-native marine species that are known to have established in Western Australian marine waters. The majority of these are temperate species and only six are exclusively tropical. Among these tropical invasive species, the Black-Striped Mussel (*Mytilopsis sallei*), and the Asian Green Mussel (*Perna viridis*) may pose a risk to the Ningaloo region. Mitigation measures consistent with the National System for the Prevention and Management of

Marine Pest Incursions, the Australian Ballast Water management requirements and the National biofouling management guidelines for commercial vessels, will be implemented to reduce the reduce the risk of any of incursions. Risks to marine fauna due to the introduction of marine pests will be equivalent to any dredging program in tropical water involving the use of foreign vessels and is considered manageable via the application of best practice mitigation strategies which will be documented in the CEMP.

Osprey Nesting

The old standpipe in the Tantabiddi car park has an Osprey nest which will be retained and the car park positioned away from it. Bulk earthworks required for carpark rehabilitation (eg topsoil cartage and ripping) will not be undertaken adjacent to the nest during the nesting season if a nesting pair is present. In addition, to discourage nesting attempts on infrastructure in the TBF a nesting pole can be installed adjacent to the facility if agreed by the Nyinggulu Coast JMB and NTGAC.

Operational Impacts

Underwater noise during operation of the TBF will be generated from vessel movements and will be concentrated near the facility. Vessels within the facility will operate under low power and speeds not exceeding 5 knots and noise will be significantly attenuated by the presence of the breakwaters. The maximum noise generated by transiting vessels (~130 dB, Olesiuk et al. 2002) is not considered harmful to marine fauna but is likely to be audible and may result in behavioural changes including:

- temporary displacement, increased stress, separation of mother-calf pairings;
- long-term avoidance; and
- masking of sounds (e.g. inhibition predatory/prey responses and obscured communication).

However, it should be noted that the TBF will replace the existing Tantabiddi Boat Ramp which already has significant vessel traffic (see Section 1.5). So, though the TBF may facilitate increased boating usage in that area it is considered that the additional operational underwater noise impacts on marine fauna will be very low to negligible (Stantec, 2025).

Night lighting at the TBF will be restricted to the minimum requirements for safety and amenity and will be designed using best practice technologies, to wherever possible, avoid or minimise the potential impacts to marine fauna. Benthic habitat modification during the operational phase is likely to be very limited and likely restricted to small scale scouring of the sediment near the boat launching facility from propeller wash and occasionally maintenance dredging operations as required. Minor changes in shoreline position are anticipated following construction of the TBF (Section 6.2.3); however, as noted above, this area is not used for turtle nesting.

The operation of the facility may lead to sporadic and localised elevations in turbidity, toxicity, sediment mobilisation and reduced light due to vessel movements. The increases in turbidity during operations are likely to be short-term and spatially constrained and likely of a similar magnitude to that experienced under natural conditions. No fuel storage will be included at the TBF. Hydrocarbon spills are likely to be rare and the magnitude of impact on marine fauna will be limited to the fuel capacity of the vessels involved. Further, the operation of the TBF will include management and equipment to ensure best practice fuel spill response. The DoT are the lead agency for marine hydrocarbon response in WA and have resources in Exmouth to respond to such events. It is envisaged that emergency response equipment will be stored at the TBF to assist in responses to hydrocarbon spills on the west side of Cape Range, which is adjacent to offshore petroleum fields and a busy shipping route. The Resilient Reefs Ningaloo Initiative recommended effective emergency planning and management to support the resilience of the ecosystem and community (DBCA, 2023) and provision of improved infrastructure to access the marine park will help address this.

The TBF has the potential to facilitate greater number of boat movement in the area than the current boat ramp. This in turn the potential for impacts to marine fauna from increased vessel collisions and fishing pressures. However, it is considered in the short- to medium-term that these risks to marine fauna will not be significantly greater than the present risk associated with boating movements from the existing Tantabiddi Boat Ramp. Growth in usage could however occur over the longer term if socio economic factors change, for example the growth in usage from visitors will be constrained by the availability of accommodation in Exmouth townsite. The TBF will be operated consistent with the Ningaloo Coast Strategic Management Plan (Garrett and Faragher, 2010). This includes a number of principles to ensure collaborative and cooperative management between land managers and owners. The management of fishing pressure and threat abatement are undertaken by resource managers and park management under their own Acts, Regulations and licencing. The DoT will monitor ramp usage rates and pass this information onto resource managers to enable them to adaptively manage these pressures. The management of the broader marine park area, in particular fishing pressures and commercial boating, will continue to be led by the marine park managers.

Most of the vessel movements at the TBF will involve local commercial and recreational vessels. Any visits by foreign vessels will be managed under the National System for the Prevention and Management of Marine Pest Incursions, the Australian Ballast Water management requirements and the National biofouling management guidelines for commercial vessels. The introduction of invasive marine species during the operational phase is considered low (Stantec, 2025).

6.4.4 Mitigation and Environmental Outcomes

Risks posed by the construction and operation of the facility on marine fauna will be managed via the application of the EPA's mitigation hierarchy (Table 24). Residual risks associated with construction and operations will be managed via a CEMP and MEQMF, respectively. In consideration of the relatively low risk of impact and the proposed management actions is anticipated that the EPA's objective for marine environmental quality can be met.

Table 24 Management measures proposed for marine fauna

Impact	Avoid	Minimise	Monitoring and Management
CONSTRUCTION PHASE			
Underwater Noise Generation of underwater noise during construction	The use of alternative construction methods with reduced underwater noise generation (e.g. backhoe dredge and/or screw piling) will be implemented if practicable. Construction activities likely to cause significant underwater noise impact (e.g. impact piling of external navigation markers) will be undertaken outside of the Southern Humpback Whale migration season when mother-calf pairs at their greatest densities: August to November.	Soft start-up procedures will be implemented for all impact piling activities. Any dredging and piling within the boating facility basin will be undertaken following installation of the breakwaters to minimise sound transmission.	A dedicated Marine Fauna Observer (MFO) will be on site during all piling and dredging operations. Marine fauna observation and exclusion zones will be established to ensure: Piling/dredging shall only commence when all marine fauna are outside of their respective TTS ranges. Piling/dredging paused if a species comes inside of its PTS distance. Works will only commence (with soft start) after the marine fauna has exited their respective TTS range. Underwater noise will be monitored for 1 week at the commencement of dredging and piling activities and the observation and exclusions
Anthropogenic Light	Most construction activity will be undertaken during daylight hours. Any nighttime construction will only be undertaken within the harbour basin and once the breakwaters are at sufficient height to adequately screen the lighting.	Lighting will only be used as necessary and will be designed in accordance with best practice guidelines	

Impact	Avoid	Minimise	Monitoring and Management
	Further, only the required navigational and positional lighting will be used and designed using best practice guidelines.		zones will be modified if necessary. The approach to monitoring and management during the construction phase will be outlined in the CEMP which will include a series of triggers and management actions including the power to cease dredging operations in the event the risk thresholds are exceeded. The plan will draw on best practice examples and literature to ensure a conservative approach to Marine Fauna management. All management plans will be prepared in accordance with the EPA's instructions for preparing EMPs and in accordance with the EPA's marine environmental quality management frameworks and relevant threshold and standards as described in EPA (2016f) and EPA (2017).
Habitat Modification Project footprint causes modification of benthic habitats Changes in water quality via the release of contaminants from the sediments Water quality stressor effects (i.e. elevated turbidity, TSS) with potential flow on effects to BCH	The development of the TBF is intended to improve the amenity of boating facilities in the region and will result in decommissioning of the existing Tantabiddi boat ramp. Consequently, the need for regular maintenance dredging at the original facility will cease, resulting in better outcomes for the nearby benthic environment. Testing has been completed to ensure the sediment in the proposed dredging footprint is clean.	Construction of the breakwaters will be staged and undertaken prior to dredging the harbour basin to minimise the impact of the dredge plume on benthic habitats and communities. The breakwaters are anticipated to retain much of the dredge plume within the boating facility and prevent it from entering the surrounding marine environment. A silt curtain will be deployed during construction of the inner (northern breakwater), revetments and dredging in the harbour basin where practicable to limit plume dispersion of sediments beyond the harbour basin.	
Water Quality Hydrocarbon spills resulting in reduced marine water and sediment quality during the construction phase	Whilst risks are low, the presence of construction vessels with the potential to cause an unplanned spill is unavoidable.	All contractor vessels will be in good working order with adequate emergency and containment equipment and procedures in the event of a spill. Chemicals will only be used/transferred in proximity to the marine environment as required and all chemicals will be managed and stored appropriately.	
Vessel Collision Collision with marine fauna during construction	Construction vessels may impact marine fauna, though the risk is considered low.	Construction vessels will be largely restricted to the project footprint and vessel speed restrictions will apply.	
Invasive Marine Species Introduction of invasive marine species from construction activities	Construction vessels may result in the introduction of invasive marine species, though the risk is considered low.	The CEMP will require all construction vessels be thoroughly cleaned and inspected prior to mobilisation to site	
OPERATIONS PHASE			
Anthropogenic Light	Lighting of the facility for safety and amenity will be unavoidable	Lighting will only be used as necessary and will be designed in accordance with the National Light Pollution Guidelines for Wildlife (Commonwealth of Australia, 2020).	Regular inspections and audits of the facility will be undertaken and documented to ensure compliance with all monitoring and management actions documented in the NW Cape EQMF.
Habitat Modification Stressor/toxicity effects marine fauna during operations.	Routine maintenance may contribute stressor/toxicants to the marine environment.	The NW Cape EQMF will document management actions, including regular monitoring of the area to identify if toxicity levels increase and cause issues to Marine Fauna. Establish Environmental Protection Areas to ensure marine environmental quality is	

Impact	Avoid	Minimise	Monitoring and Management
		maintained to acceptable levels during operations.	
Vessel Collision Vessel collision with marine fauna	Whilst risks of vessel collisions with marine fauna are low, the presence of vessels in the area is unavoidable.	Vessel speed limits will apply within the vicinity of the TBF.	Commercial vessels must report marine fauna collisions to Australian Marine Safety Authority as a marine incident Information provided within the facility that dead or injured marine fauna to be reported to DBCA via the Wildcare Helpline on 9474 9055 or local office
Marine Debris and Entanglement Introduction of litter into the environment resulting in ingestion or entanglement of marine fauna	Whilst risks to marine fauna from debris or entanglement are low, the presence of vessels is unavoidable.	Rubbish collection points will be included at the TBF. Commercial operators are subject to licence conditions from DBCA, including litter management.	Waste from the TBF shall be regularly removed to a licence waste facility by contractors.
Increase in fishing pressure		Fishing pressures are monitored and managed by DPIRD to ensure sustainable abstraction. Marine Park Management Plans may also be updated over time to respond to changes to the marine pressures.	DoT to monitor ramp usage rates and report to park managers so that trends can be addressed in a timely and adaptive manner.

6.5 Flora and Vegetation

The EPA's objective for flora and vegetation is 'to protect flora and vegetation so that biological diversity and ecological integrity are maintained' (EPA, 2023a). In this context, 'ecological integrity' relates to 'the composition, structure, function and processes of ecosystems, and the natural range of variation of these elements' (EPA 2016b).

The EPA provides the following guidance statement regarding flora and vegetation:

- Environmental Factor Guideline: Flora and Vegetation (EPA 2016a)
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016c).

The project footprint will result in direct loss of flora and vegetation and the increased visitor numbers may cause an indirect impact on the flora and fauna of the adjacent area. These impacts are considered in detail below.

6.5.1 Receiving Environment

A review of NatureMap and the Protected Matters Search tool did not identify any State- or EPBC-listed Threatened Ecological Communities or Priority Ecological Communities (Vicki Long & Associates, 2021a & b). No Threatened flora species were also identified from these searches; though eight Priority 2 (P2), six Priority 3 (P3) and two Priority 4 (P4) species have been recorded within 20 km of the Survey Area (Vicki Long & Associates, 2021a; Table 25).

Table 25 Priority flora in the project area and desktop likelihood of occurrence

Species	Conservation Status	Likelihood of Occurrence (desktop)
Acacia alexandri	P3	Unlikely
Acacia ryaniana	P2	Potential
Acacia startii	P3	Potential
Acanthocarpus rupestris	P2	Unlikely
Brachychiton obtusilobus	P4	Unlikely

Species	Conservation Status	Likelihood of Occurrence (desktop)
Calandrinia sp. Cape Range (F. Obbens FO 10/18)	P2	Unlikely
Corchorus congener	P3	Likely
Daviesia pleurophylla	P2	Likely
Eremophila forrestii subsp. *capensis*	P3	Unlikely
Eremophila occidens	P2	Unlikely
Eremophila youngii subsp. *lepidota*	P4	Unlikely
Grevillea calcicola	P3	Unlikely
Harnieria kempeana subsp. *rhadinophylla*	P2	Unlikely
Phyllanthus fuernrohrii (Sand sponge)	P3	Likely
Tephrosia sp. North West Cape (G. Marsh 81)	P2	Unlikely
Tinospora esiangkara	P2	Unlikely

Source: Vicki Long & Associates (2021a)

Flora and vegetation surveys were undertaken across the site (50.1 ha) in April (Vicki Long & Associates, 2021a) and October (Vicki Long & Associates, 2021b) 2021 and identified eight Floristic Formations which were divided into 14 vegetation types (Figure 36). The vegetation across the dune system and coastal plan within the development footprint is well vegetated and stable. The vegetation condition was variable with large areas of vegetation in Excellent condition on the coastal plain between the secondary dunes and Yardie Creek Road (Figure 37). The vegetation on the primary and landward side of the secondary dune were generally in Very Good condition; although these areas were not weed infested there were some signs of anthropogenic disturbance.

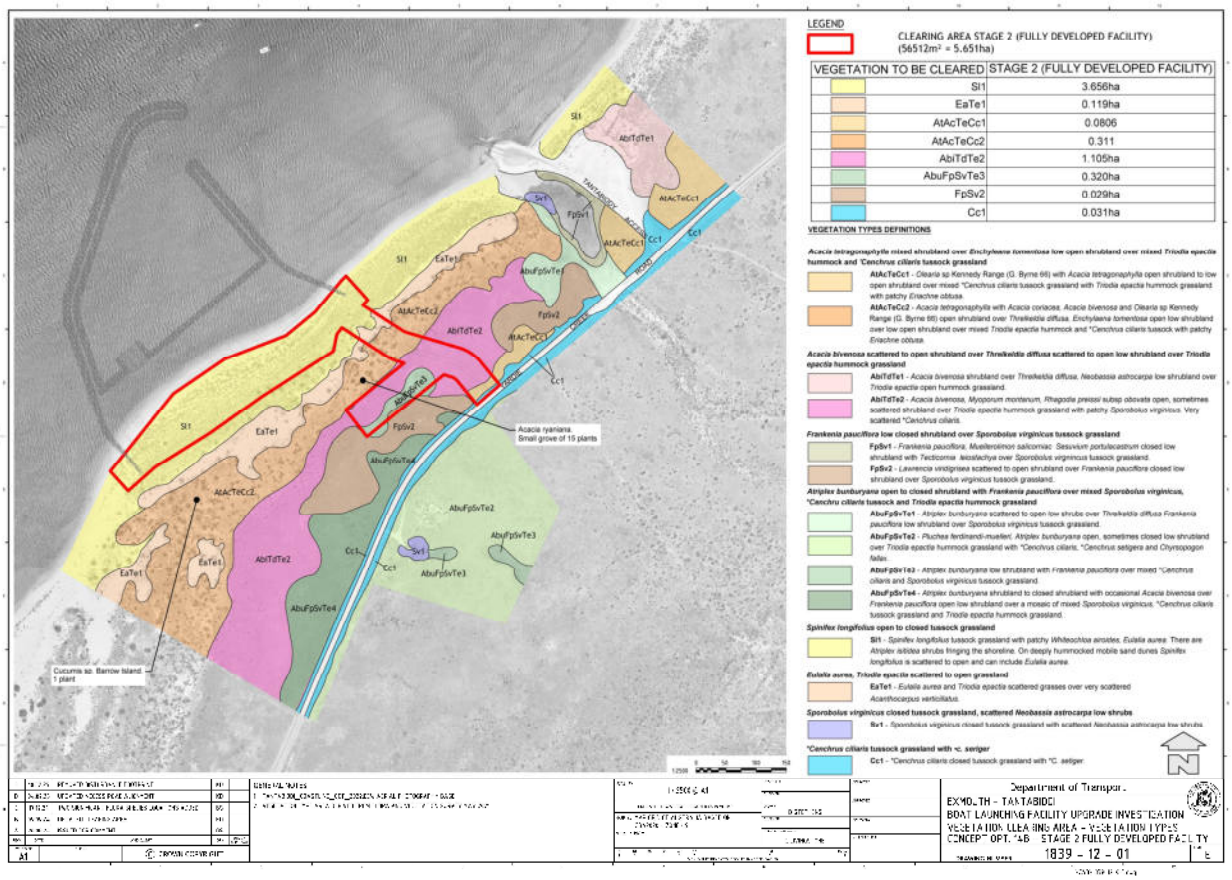


Figure 36 Vegetation types and priority species

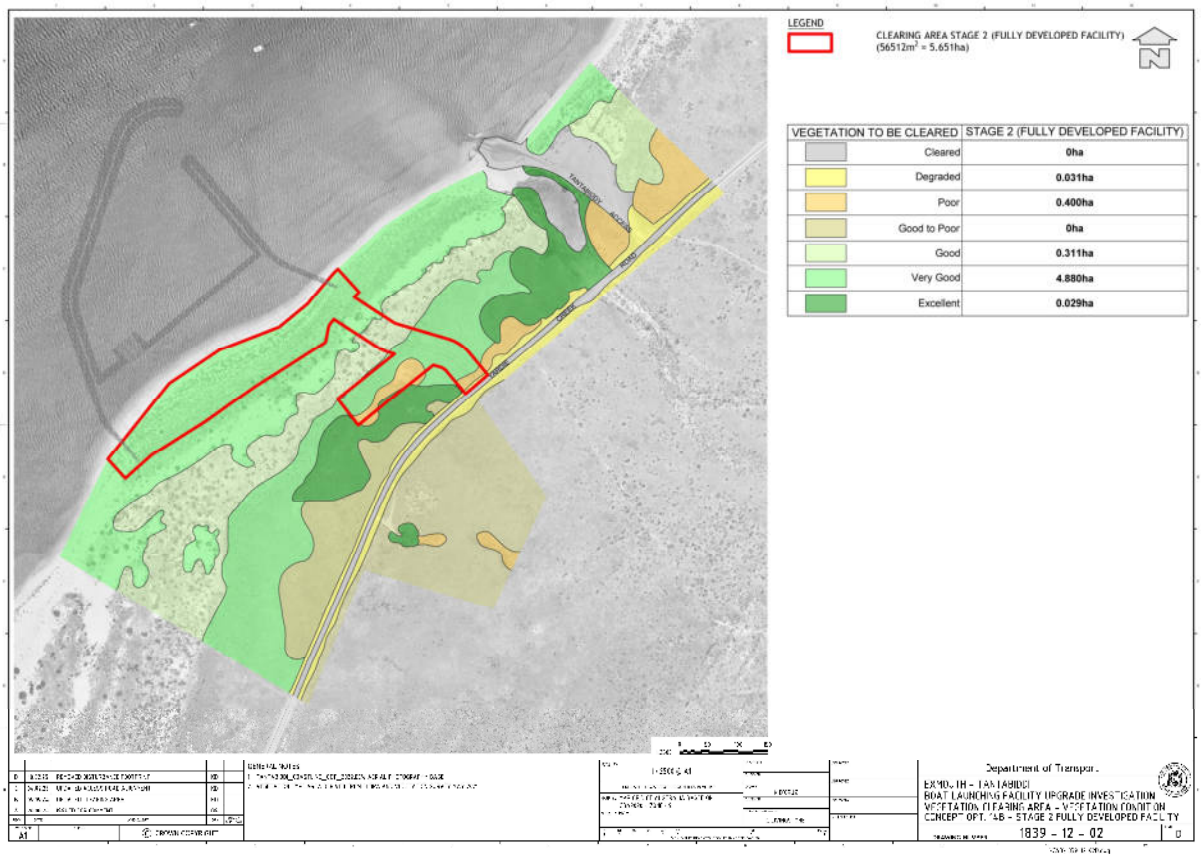


Figure 37 Vegetation condition

None of the vegetation types recorded in the survey area are currently listed as Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC). A small area of *Sporobolus virginicus* tussock grassland in the vicinity of the Tantabiddi Sinkhole has the potential to be declared[21] a PEC. However, this is to the east of Yardie Creek road and is unlikely to be impacted by the development.

The desktop review identified 16 priority species of which three species were considered likely to occur (Table 25). However, no priority flora species were recorded in the survey area in April 2021, although it was considered that *Acanthocarpus rupestris* could potentially occur in the area (Vicki Long & Associates, 2021a). One Priority 2 plant, *Cucumis* sp Barrow Island (DW Godall 1264) was recorded in April 2021 (Figure 36), though no further occurrence of this species was identified during the October 2021 survey (Vicki Long & Associates, 2021b). The October 2021 survey also identified a small grove of *Acacia ryaniana*, a Priority 2 species (Figure 36). This is a spreading prostrate spiny shrub and was found in a swale behind the beach dune (Long, 2021b). Both Priority 2 species are located outside the Development Envelope and will not be impacted by the project.

There was a low diversity of weeds across the survey area and was dominated by buffel (**Cenchrus ciliaris*) and birdwood (**Cenchrus setiger*) grass. The area bordering Yardie Creek Road was particularly heavily infested with these grasses. However, the proposed development footprint had relatively fewer weeds. No Declared Pest species were identified during the surveys.

6.5.2 Potential Impacts

The proposed project footprint will result in some vegetation loss and fragmentation. Further, the clearing required also has the potential to cause dune erosion and weed spread at the cleared edges abutting the development. However, there will be no significant changes to overland water flows and no interruption of incised drainage lines

[21] *the process for verifying this nomination is in progress*

that could result in flow shadowing. If required culverts will be installed under the access road. Though the area of the Tantabiddi Sinkhole will not be directly impacted by the development footprint there is the potential for increased visitation to this site resulting in trampling of vegetation in this area.

6.5.3 Impact Assessment

The pre-European vegetation association of the area (System Association 663) has more than 85% of its original extent remaining across both the state, region, sub-region and local government scales (Table 8). Any clearing associated with the proposed TBF is unlikely to have a significant impact on the remaining extent of this vegetation association (Vicki Long & Associates, 2021a). The relocation of the facility, to minimise impact on the Tantabiddi Midden Site 1, also minimises the impact on sensitive dune vegetation. The total area of vegetation clearing (5.6 ha) is small and the vegetation types affected occur widely outside the area of disturbance (Table 26). The condition of the vegetation to be impacted is mostly Good to Excellent in condition (Table 26).

Table 26 Area of vegetation affected by project footprint

Vegetation Type	Vegetation Condition							Total (ha)
	Cleared	Degraded	Poor	Good to Poor	Good	Very Good	Excellent	
Sl1						3.656		3.656
EaTe1						0.119		0.119
AtAcTeCc1			0.081					0.081
AtAcTeCc2					0.311			0.311
AbiTdTe2						1.105		1.105
AbuFpSvTe3			0.320					0.320
FpSv2							0.029	0.029
Cc1		0.031						0.031
Total (ha)	**0**	**0.031**	**0.401**	**0**	**0.311**	**4.880**	**0.029**	**5.652**

The majority (3.65 ha) of the vegetation to be impacted is Vegetation Type Sl1 "*Spinifex longifolius* tussock grassland with patchy *Whiteochloa airoides*, *Eulalia aurea*" which is in Very Good condition (Table 26). This pioneering coastal vegetation is common throughout the region.

The TBF utilities area may impact 0.029 ha of Vegetation Type FpSv2 "*Lawrencia viridigrisea* scattered to open shrubland over *Frankenia pauciflora* closed low shrubland over *Sporobolus virginicus* tussock grassland". This represents 1.0% of this vegetation type recorded from within the survey area[22]; and this vegetation type was observed to for 200 m south of the study area (Long, 2021b). This vegetation type is not described in any of the available vegetation surveys conducted for the Cape Range Peninsula, nor was it observed outside the immediate study region. Without further survey of the broader region this vegetation may be considered to be locally significant and have a high conservation value (Vicki Long & Associates, 2021a). There are no other know occurrences, but similar habitat exists on Department of Defence lands which could not be accessed for surveys. The placement of the utilities area minimises the impact on FpSv2 and avoids fragmentation by only impacting on the edge of the community. The size of the utilities area will be reviewed during the detailed design phase to consider if the direct impact to FpSv2 can be avoided and impacts to other vegetation communities can be reduced.

[22] *The total mapped area of FpSv2 was 2.88 ha*

Date 6 April 2021

Figure 38 Project footprint area showing *Spinifex longifolius* tussock grassland in Very Good condition

The two Priority 2 species (*Cucumis* sp Barrow Island (D.W. Goodall 1264) and *Acacia ryaniana*) are outside the project development envelope and will not be impacted by the development (Figure 36). These species may occur elsewhere in the region and both species shall be considered for use in the revegetation works.

6.5.4 Mitigation and Environmental Outcomes

To meet the EPA's environmental objectives for flora and vegetation the following mitigation and management measures will be implemented:

- Prepare and implement a CEMP to include measures to ensure clearing only occurs within the approved development area (including signage, fencing, induction).
- Prepare and undertake weed management actions as part of the CEMP and include construction traffic management to minimise potential for weed spread, particularly along the edge of Yardie Creek Road.
- Prepare and undertake site rehabilitation works (as documented in the CEMP) to include methods to alleviate soil compaction, topsoil management, species selection, seed collection from site (with appropriate lead time to ensure sufficient quantity is available), and recommended list of revegetation species (see Vicki Long & Associates, 2021b), edge treatments abutting the development footprint (e.g. geofabric) to minimise dune instability and subsequent vegetation loss.
- Align the access road to avoid direct impact to the potentially significant vegetation community FpSv2 and review the size of the utilities area to potentially avoid all impact.
- Protect the Tantabiddi Sinkhole and associated *Sporobolus virginicus* tussock grassland via:

    - during construction, no access will be available to construction personnel, other than with direct guidance from indigenous representatives.
    - locating the facility entrance away this area to help protect it from increased impacts.
    - the Tantabiddi Taskforce, DBCA and Nyinggulu Coast Joint Management Body to review access and management (e.g. management of access and interpretive signage) in the area.
- Undertake rehabilitation and revegetation (~1.3 ha) around the existing Tantabiddi Boat Ramp to reinstate the natural landform and vegetation types in this area to a state appropriate for the Jurabi Coastal Park.

6.6 Social Surroundings

The EPA's objective for social surroundings is 'to protect social surrounding from significant harm' (EPA, 2023a). The EPA provides the following guidance statement regarding social surroundings:

- Environmental Factor Guideline: Social Surroundings (EPA 2023b)
- Technical Guidance: Environmental Impact Assessment of Social Surroundings—Aboriginal Cultural Heritage (EPA, 2023c).

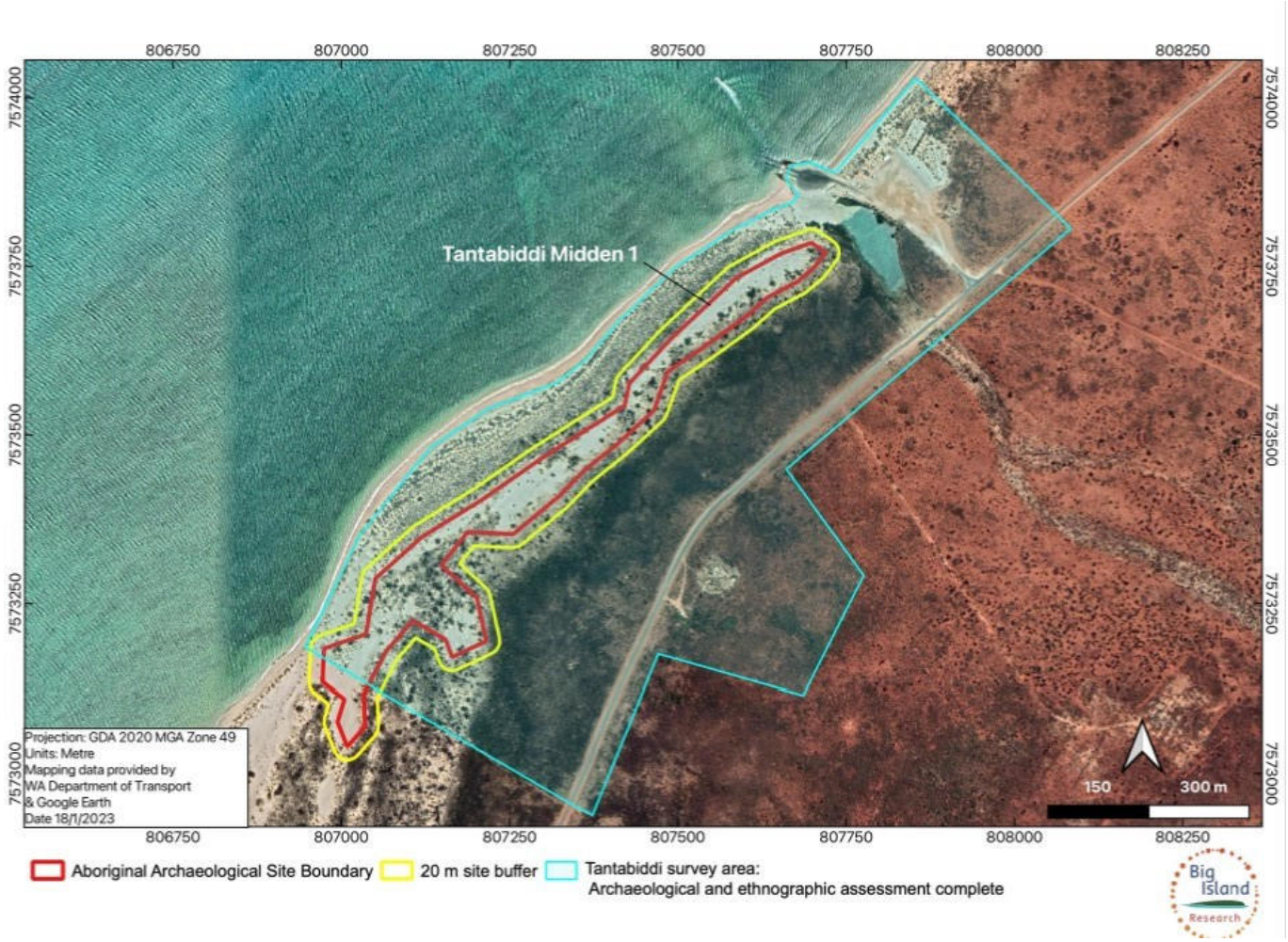
6.6.1 Receiving Environment

The key aspects of social surroundings relevant to the proposed TBF are aboriginal cultural heritage, and historical and natural heritage and these are discussed separately below.

Aboriginal Cultural Heritage

Aboriginal archaeological surveys were conducted of the proposed TBF area in June and November 2022 (Big Island Research, 2022a and b). The surveys were undertaken in conjunction with nominated members of the Baiyungu and Yinnigurrura People appointed by the Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC). The survey identified a new archaeological site, 'Tantabiddi Midden 1', which is a narrow (~150 m) midden that covers an area of 6.03 ha. It consists of an artefact scatter located parallel to the shore in a dune blowout area behind the primary dunes for approximately 1 km south from Tantabiddi Creek (Figure 39). The main artefact component of this site consists of economic shell species (baler, clam, oyster, pearl, chiton and trochus). It is also estimated that ca 100 stone artefacts may be present at this site and are dispersed throughout the site. Tantabiddi Midden 1 is consistent with a chain of middens which occur along the western Cape Range coast (Morse, 1993; Pryzywolnik, 2002). The absence of *Terebralia* sp shells suggest that the site may be dated to the late-Holocene (Big Island Research, 2022a and b). The presence of archaeological material in this dune blowout setting suggest that further archaeological material may be buried at the base of or within the adjacent dunes. This midden site is likely to be considered an Aboriginal heritage site under the *Aboriginal Heritage Act 1972* and it was recorded at a 'Site Avoidance' level during the survey (Big Island Research, 2022a and b).

Aboriginal ethnographic assessments were undertaken for Yamatji Marlpa Aboriginal Corporation (YMAC) as agent for the NTGAC (Acacia Heritage, 2022 a and b). The ethnographic assessment was undertaken together with six Nganhurra Thanardi Garrbu representatives selected by YMAC and NTGAC and was undertaken in conjunction with the archaeological site survey in June and December 2022. The Tantabiddi Sinkhole was identified as a place of ethnographic significance and the Traditional Owners have requested that this site be considered by the Aboriginal Cultural Heritage Committee as an Aboriginal site under *the Aboriginal Heritage Act 1972* (Acacia Heritage, 2022a). The Traditional Owners requested that the Tantabiddi Sinkhole be protected from clearing, contamination and not used for water extraction. Further, it was requested that the area adjacent to the sinkhole be rehabilitated, including removal of imported calcrete and gravel, prevent vehicle access and revegetate tracks (Acacia Heritage, 2022a). No other places of ethnographic significance that may be considered Aboriginal sites under the *Aboriginal Heritage Act 1972* were identified (Acacia Heritage, 2022a).



Source: Big Island Research (2022b)

Figure 39 Tantabiddi Midden 1 identified during the archaeological survey

Natural and Historical Heritage

The TBF will be located within the Ningaloo World Heritage Area and the Ningaloo Coast National Heritage Place. The Ningaloo Coast World Heritage Area was inscribed on the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List in June 2011 and includes the Jurabi Coastal Park, Ningaloo Marine Park (State Waters) and Ningaloo Marine Park (Commonwealth Waters).

The interconnected ocean and arid coast form aesthetically striking landscapes and seascapes. The coastal waters host a major nearshore reef complex whereas onshore the region is characterised by an arid limestone karst system. The World Heritage Area has a high diversity and abundance of marine species and a high level of endemism of terrestrial species. This World Heritage Area was recognised under two of the natural World Heritage Outstanding Universal Value criteria:

> **Criterion (vii)–superlative natural phenomena or natural beauty**: *The landscapes and seascapes of the property are comprised of mostly intact and large-scale marine, coastal and terrestrial environments. The lush and colourful underwater scenery provides a stark and spectacular contrast with the arid and rugged land. The property supports rare and large aggregations of whale sharks along with important aggregations of other fish species and marine mammals. The aggregations in Ningaloo following the mass coral spawning and seasonal nutrient upwelling cause a peak in productivity that leads approximately 300-500 whale sharks to gather, making this the largest documented aggregation in the world.*

Criterion (x)–biodiversity and threatened species: *In addition to the remarkable aggregations of whale sharks the Ningaloo Reef harbours a high marine diversity of more than 300 documented coral species, over 700 reef fish species, roughly 650 mollusc species, as well as around 600 crustacean species and more than 1,000 species of marine algae. The high numbers of 155 sponge species and 25 new species of echinoderms add to the significance of the area. On the ecotone, between tropical and temperate waters, the Ningaloo Coast hosts an unusual diversity of marine turtle species with an estimated 10,000 nests deposited along the coast annually.*

IUCN's Conservation Outlook Assessment (2020) the conservation status of the Ningaloo Coast is 'Good, With Some Concerns'. The IUCN report noted that the area benefits from a high degree of natural protection as a result of its remote location. However, it recognised that climate change was the greatest threat to its long-term conservation through long-term rise in sea temperatures causing coral bleaching, as well as increasing sea levels, wave energy and ocean acidification.

The Ningaloo Coast National Heritage Place was inscribed in January 2010 and includes a coastal strip from North West Cape to Red Bluff and the adjacent marine areas, reefs and islands including Jurabi Coastal Park, Ningaloo Maine Park (State Waters) and Ningaloo Marine Park (Commonwealth Waters). This National Heritage Place recognises the following five criteria for their natural and indigenous values (DAWE, 2022):

EVENTS AND PROCESSES (Criterion A)–the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history

Natural Values

Demonstrating late-Quaternary deformation at a passive continental margin, the uplifted Neogene wave-cut terraces and fossil reefs which fringe Exmouth Peninsula and the submerged fossil reef terraces which form the substrate of the modern reef, in immediate juxtaposition with the undeformed modern Ningaloo Reef, and late Pleistocene Tantabiddi terrace, have outstanding heritage value to the nation for their contribution to understanding mechanisms which led to the modern character of the west coast of Australia.

During the Neogene period (beginning about 25 million years ago) Australia was subject to increasing post-Gondwanan isolation and the expansion of aridity. The subterranean faunas and rangeland communities of Exmouth Peninsula exemplify both these evolutionary drivers and highlight the intimate ties between ecology and geological history more vividly than any other place in Australia. Demonstrating speciation and adaptation since the break up of the supercontinent Gondwana and the opening of the ancient Tethys sea more than 250 million years ago, the expansion of aridity in Australia and continued biogeographic isolation during the Quaternary (the last 2.6 million years), the subterranean and terrestrial ecosystems of Exmouth Peninsula help translate a complicated biogeographical story. These communities have outstanding heritage value to the nation for their importance in demonstrating the pattern of Australia's natural history.

Indigenous Values

Elsewhere in Australia, records of early human occupation have been submerged with the post-glacial return of the sea over the broad coastal areas exposed during the last glacial maximum. Exmouth Peninsula's proximity to the continental shelf during the last ice age, when sea levels were lower, ensured that the Cape Range was never far from marine resources. Archaeological materials in the rock shelters on Cape Range show Aboriginal people had a comprehensive and sophisticated knowledge of edible and non-edible marine resources between 35,000 and 17,000 years BP. The rock shelters of Exmouth peninsula have outstanding heritage value to the nation because they provide the best evidence in Australia for the use of marine resources during the Pleistocene including their uses as food and for personal adornment.

RARITY (Criterion B)–the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

Natural Values

Anchialine communities characterised by the presence of remipede crustaceans are internationally rare, limited to Bundera Sinkhole on the Ningaloo Coast, the volcanic anchialine setting of Lanzarote in the Canary Islands, and some sites in the Caribbean and Mediterranean Seas, Cuba and Mexico. The taxonomic composition of the anchialine community of Bundera Sinkhole, while characteristic of remipede communities, is unique in the southern hemisphere and Indo-West Pacific. Bundera Sinkhole is outstanding for its unique anchialine community, reflecting its unusual hydrology, geological history, and stable environment over thousands of millennia.

The presence of active karst solution as a result of seawater incursion is rare in Australia. The Ningaloo Coast is one of the best examples in Australia of this globally significant process. As the only example in Australia of a Tertiary orogenic karst and a rare example of active marine karst solution, the Ningaloo Coast contains rare aspects of Australia's natural history.

RESEARCH (Criterion C)–the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history

Natural Values

Anchialine and groundwater ecosystems are of considerable scientific interest globally, yielding important information about the evolution of life on earth. The Exmouth Peninsula subterranean estuary has outstanding heritage value to the nation for supporting the most diverse and the richest anchialine and groundwater fauna in Australia, among the richest in the world. These ecosystems and the troglobites and stygofauna they support have the potential to yield information about biogeography, evolution and changing climates in Australia over hundreds of millions of years, from the late Palaeozoic to the present.

Indigenous Values

Research on the freshwater subterranean fauna of the Ningaloo Coast suggests that even in times of greater aridity than the present day semi-desert terrestrial environment, freshwater may have been widely available across the emergent coastal plain bordering Cape Range. The steep topography of Cape Range has protected Pleistocene occupation sites from the destructive effects of rising sea levels; while the alkaline environment of the limestone geology has acted to preserve archaeological evidence of human occupation.

Given that only a handful of the caves and rock shelters of the Exmouth Peninsula region has been investigated the place has outstanding heritage value to the nation because of its potential to provide further insights into marine resource use by Aboriginal people in the Pleistocene and the less well understood last glacial maximum.

EXEMPLAR (Criterion D)–the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments

Natural Values

Biologically unique in the southern hemisphere and the Indo-Pacific region, characteristic of the remipede crustacean-type of anchialine community, the Ningaloo Coast has outstanding heritage value to the nation under criterion (d) for demonstrating the principal characteristics of a Tertiary karst environment in Australia, including a high concentration of karst features and subterranean ecosystems of global importance, unparalleled in Australia.

The integration of the Ningaloo Reef and Exmouth Peninsula karst system as a cohesive limestone structure is at the heart of the natural heritage significance of the Ningaloo Coast. The modern Ningaloo Reef, Exmouth Peninsula karst, and the wave-cut terraces, limestone plains, Pleistocene reef sediments of Exmouth Peninsula and associated marine, terrestrial and subterranean ecosystems, including the Muiron Islands, have outstanding heritage value to the nation under criterion (d) for demonstrating a geological, hydrological and ecological unity which harmonises the region's present ecosystem functions with its evolutionary history as a time-series of coral reefs and an evolving karst system.

CREATIVE/TECHNICAL DEVELOPMENT (Criterion F)– the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period

Indigenous Values

The evidence for standardisation in size and manufacture of the shell beads found at Mandu Mandu Creek rock shelter, coupled with the fact they provide the earliest unequivocal evidence for the creation of personal ornaments in Australia, demonstrates a high degree of creative and technical achievement.

6.6.2 Potential Impacts

Aboriginal Cultural Heritage

The proposed TBF has the potential to impact on Aboriginal Cultural Heritage elements of the Social Surroundings environmental factor via the following pathways:

- The project footprint will directly intersect with Tantabiddi Midden 1 site
- Contamination of Tantabiddi Sinkhole from construction/operation activities.

The proposed footprint of the TBF is wholly located on the coastal fringe and no impacts to the rock shelters of the Exmouth peninsula (and the associated Indigenous Values of the Ningaloo National Heritage Place) are anticipated.

Natural and Historical Heritage

The environmental assessment of impacts and mitigation measures relating to the natural values of the Ningaloo World Heritage Area and Ningaloo National Heritage Place is addressed above against the relevant environmental factors as summarised in Table 27.

Table 27 Summary of impacts on the natural values of World Heritage Area and National Heritage Place

Criteria and Natural Values	Potential Impact	Impact Assessment
Ningaloo Coast World Heritage Area		
Superlative natural phenomena Criterion (vii) The landscapes and seascapes of the property are comprised of mostly intact and large-scale marine, coastal and terrestrial environments. The property supports rare and large aggregations of whale sharks along with important aggregations of other fish species and marine mammals	Clearing of native vegetation Impacts from underwater noise, anthropogenic light, habitat modification, water quality, vessel collision or invasive marine species Modification of benthic communities and habitats	Section 6.1 Section 6.4 Section6.5
Ningaloo Reef harbours a high marine diversity Criterion (x)	Impacts from underwater noise, anthropogenic light, habitat modification, water quality, vessel collision or invasive marine species	Section 6.4
Ningaloo Coast National Heritage Place		
Criterion A The subterranean faunas and rangeland communities of Exmouth Peninsula exemplify both these evolutionary drivers and accentuate the intimate ties between ecology and geological	Toxicant release during construction or operation results in reduction in ground water quality	Section 6.4

Criteria and Natural Values	Potential Impact	Impact Assessment
history more vividly than any other place in Australia		
Criterion B Anchialine communities characterised by the presence of remipede crustaceans are internationally rare, limited to Bundera Sinkhole on the Ningaloo Coast	Toxicant release during construction or operation results in reduction in ground water quality. No impacts on the Bundera Sinkhole are anticipated which is located ~55 km south of the proposed TBF	Section 6.6
Criterion C The Exmouth Peninsula subterranean estuary has outstanding heritage value to the nation for supporting the most diverse and the richest anchialine and groundwater fauna in Australia, among the richest in the world	Toxicant release during construction or operation results in reduction in ground water quality	Section 6.6
Criterion D The modern Ningaloo Reef, Exmouth Peninsula karst, and the wave-cut terraces, limestone plains, Pleistocene reef sediments of Exmouth Peninsula and associated marine, terrestrial and subterranean ecosystems … have outstanding heritage value to the nation	Clearing of native vegetation Modification of benthic communities and habitats	Section 6.1 Section 6.5

6.6.3 Impact Assessment

Aboriginal Cultural Heritage

Following the archaeological (Big Island Research, 2022a) and ethnographic (Acacia Heritage, 2022a) surveys and subsequent consultation with the Traditional Owners (see Section 3) the design footprint of the TBF was relocated ~50 m offshore to avoid the Tantabiddi Midden 1 site and associated buffer zone (Figure 6). Following a meeting (October 2022) and site visit (November 2022), the location of the access road was agreed with the NTAGC Board to minimise the impact on the Tantabiddi Midden 1; the access road traverses the midden for a length of ~40 m and has a width of ~50 m (0.2 ha). The landside earthworks for the project will include only minor excavation works (including at the landside tie in of the breakwaters, trimming the tops of the dunes and minor disturbance associated with vegetation clearing) hence disturbance of the underlying sediments and materials is expected to be minimal.

The Tantabiddi Sink hole is located on the east side of Yardie Creek Road and is not directly impacted by the proposal. Further there will be no extraction of groundwater from the area during construction or operation of the TBF so there will be no impact to groundwater levels or quality.

The proposed TBF has received Section 18 consent under the *Aboriginal Heritage Act 1972* in December 2023 (Appendix B) with requirements to include heritage monitors to be present during land disturbing activities, limiting the extent of disturbance to the midden site, as well as other control and reporting actions.

Natural and Historical Heritage

As noted above, the TBF will be located within the Ningaloo Coast World Heritage Area and the Ningaloo Coast National Heritage Place. These heritage areas are recognised for a range of natural and cultural values and impacts to these values have been considered elsewhere throughout this report (see Section 6.6.2). It is considered that the proposed TBF will not significantly impact on any of the values of the Ningaloo Coast World Heritage Area and the Ningaloo Coast National Heritage Place. The existing boat ramp facility was built in 1969 and decommissioning of this facility will not impact on any historical heritage value. Further, there are no know shipwreck or other western historical sites likely to be impacted by the development.

Amenity

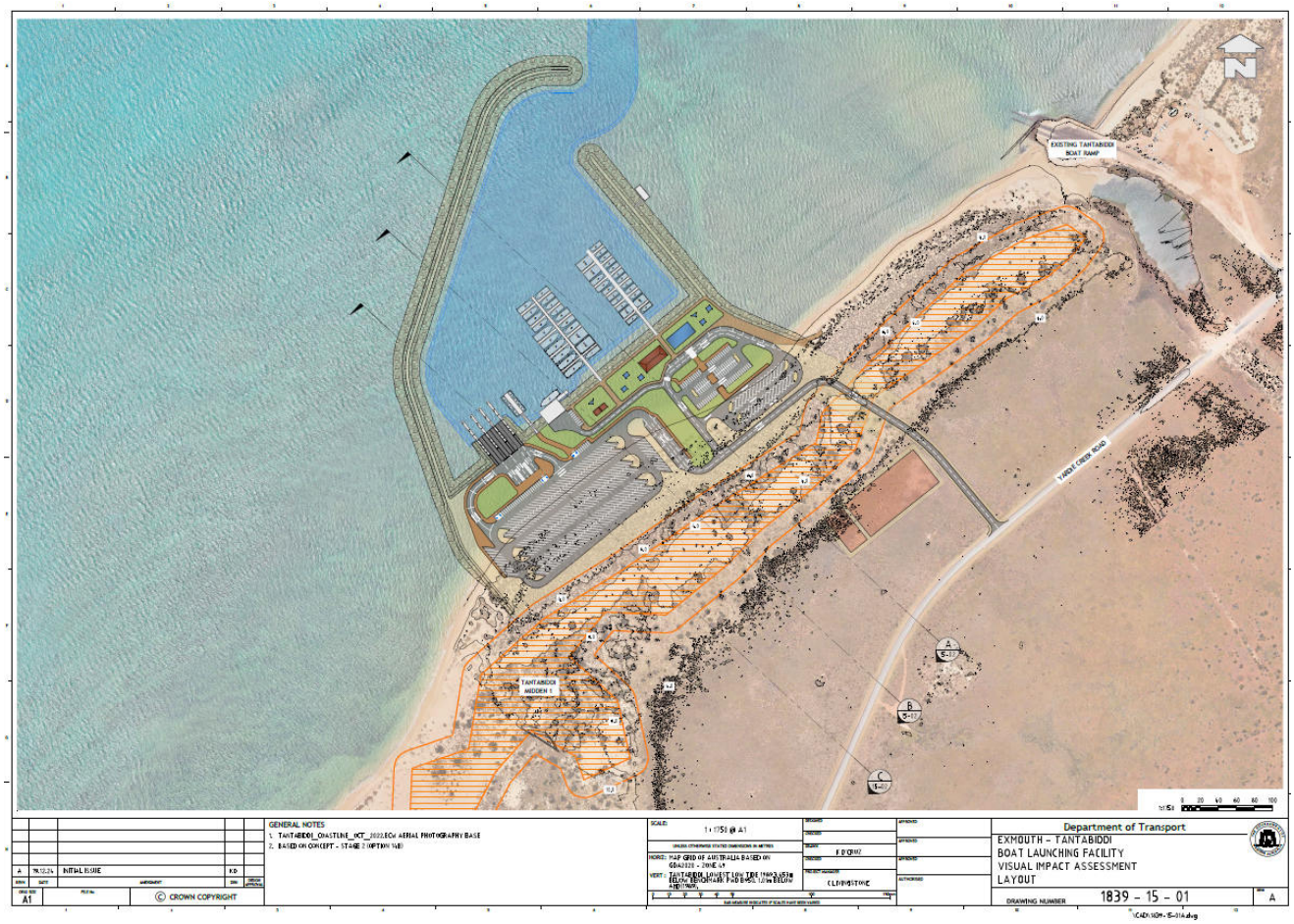
The existing boat ramp facility and associated car park is highly visible from the road, and during peak usage periods car parking can overflow along the main access road, causing traffic to slow and an increased the risk of accidents.

The car parking is informal and the location of the interpretive display in the turning circle results in an unacceptable risk of pedestrian/vehicle interactions.

The TBF will be designed to modern standards to that prioritises users' health, welfare, convenience and comfort to access the waters of the Ningaloo Marine Park. It will also provide a significant improvement in access to people with limited mobility who currently are not able to board boats at the existing boat ramp due to exposure to waves and the height difference between walkways and boats (particularly around low tide).

The TBF will be more visible compared to the existing boat launching facility, due to its increased footprint. By placing it close to the existing facility its impacts to the landscape and seascape aesthetics are not as much as if placed on a previously unmodified stretch of coastline.

The TBF will be effectively screened by the primary dune when viewed from Yardie Creek Road (Figure 40). The facility will only be briefly visible to south bound road traffic when passing Tantabiddi Creek. By also being lower than the adjacent sand dunes it will not be visible above the skyline when viewed from offshore of the fringing reef.



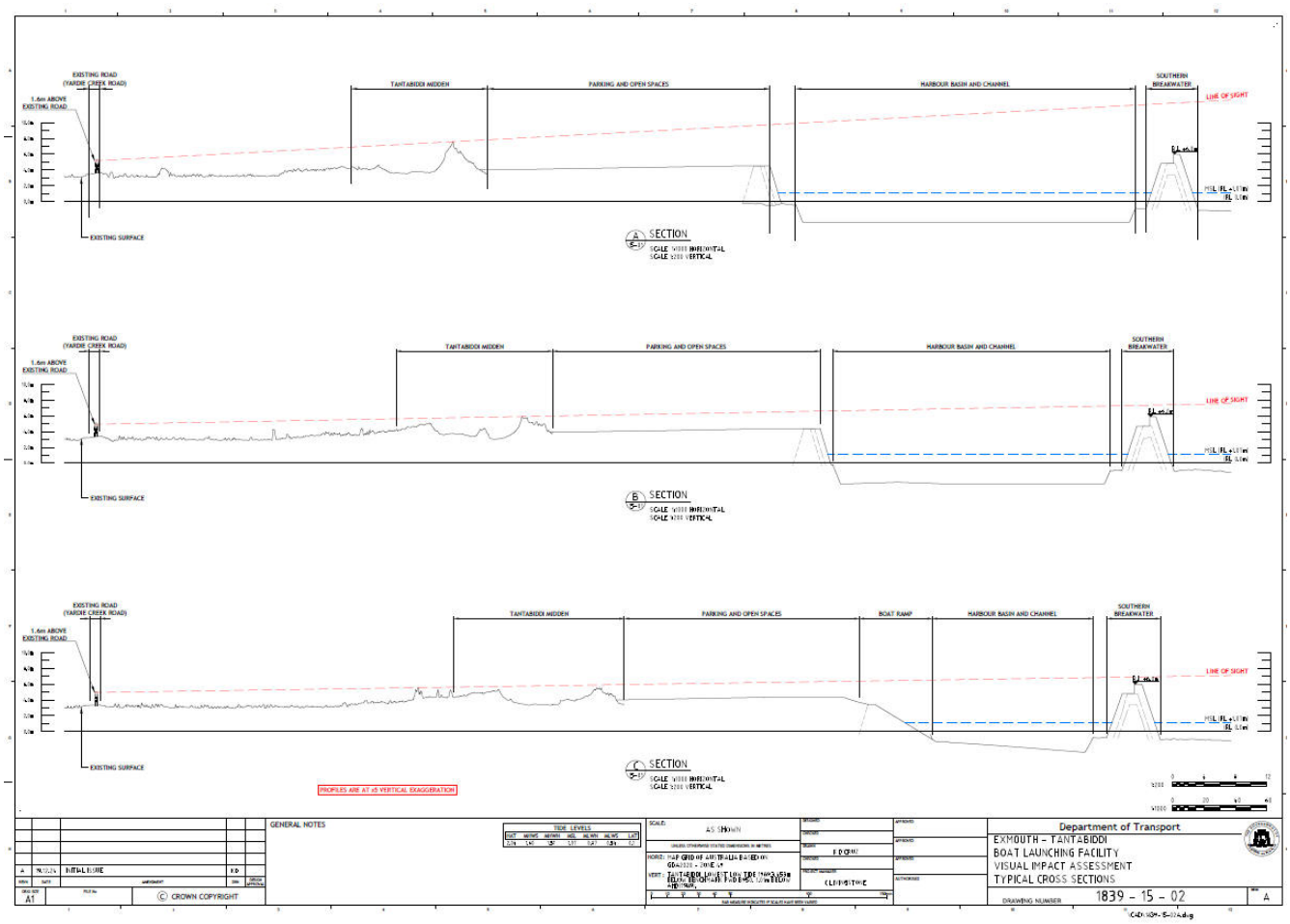


Figure 40 Line of sight analysis from main road looking west across to boating facility

6.6.4 Mitigation and Environmental Outcomes

To meet the EPA's environmental objectives for social surroundings the following mitigation and management measures will be implemented.

Aboriginal Cultural Heritage

The Traditional Owners are supportive of the TBF project proceeding and look forward to continuing to work collaboratively as the project progresses. The DoT will liaise with the NTGAC to seek the formation of a purpose-specific committee that includes appropriate Baiyungu representatives and other stakeholders to support the timely progression and finalisation of facility design and identify opportunities for Baiyungu and Yinnigurrura businesses, employment and training opportunities.

To ensure the development footprint is restricted to the proposed footprint the CEMP will include a range of management measures, including: site inductions for all construction personnel and clear demarcation/fencing of clearing areas. Barriers will also be included to minimise offroad parking adjacent to the facility and in the vicinity of the Tantabiddi Sinkhole.

The CEMP will also include the requirement to engage Traditional Owner monitors (to be endorsed by NTGAC) during any ground-disturbing works. Any artefacts identified in the project footprint shall be relocated to other areas within the Tantabiddi Midden 1 site so they are retained in the area.

Only minor excavation works are expected to occur during construction. However, if any archaeological material is encountered during ground-disturbing work all work in the vicinity shall be stopped and the archaeological material left in situ until an agreed management processes determined in consultation with Baiyungu and

Yinnigurrura People (with professional assistance as required). If human skeletal material is uncovered the police shall be notified immediately. The Department of Planning, Lands and Heritage and Baiyungu and Yinnigurrura People shall also be notified to enable, if required, culturally appropriate management of buried material.

There will be no fuel or other bulk chemical storage at the facility hence groundwater contamination impacts are not anticipated. Nonetheless, the CEMP will include a monitoring program to ensure that water quality at the Tantabiddi Sinkhole is not affected during construction and post commissioning. If a serious spill was to occur an appropriate monitoring regime would be put in place to determine if the sinkhole was affected. It is envisaged that DBCA and traditional owners will continue to lead management at the Tantabiddi Sinkhole and they will consider future options such as rehabilitation, interpretive signate, fencing and boardwalks to protect this area. The co-location of interpretive materials (both environmental and cultural) at the Tantabiddi Boating Facility is envisaged as part of the broader environmental educational messaging.

There has been ongoing consultation with Aboriginal peoples regarding this project and these consultations will continue. The NTGAC have provided a letter of support and the project has received Section 18 approval under the *Aboriginal Heritage Act 1972*. There are no anticipated physical or biological impacts which would cause significant harm to Aboriginal Cultural Heritage values outside the immediate project area.

It is anticipated that with the TBF will have limited impact on the social surroundings in the area and it is considered that the EPA's objective for social surroundings will be met.

Natural and Historical Heritage

A range of measures have been undertaken to minimise impacts on the natural and heritage values of the Ningaloo Coast World Heritage Area and Ningaloo Coast National Heritage Place, including:

- The project site was selected to ensure minimal impact to environmentally sensitivities areas, including corals, mangroves, rocky headlands and turtle nesting sites
- The proposed location will be 300 m south of the existing Tantabiddi access node and therefore does not further impact on the integrity/intactness of the landscape and ecosystems of areas that are free from previous human disturbances and infrastructure
- Decommissioning of the existing Tantabiddi boat ramp reduces cumulative impacts on values of the area and returns the site to an end state that is aligned with the Jurabi Coastal Park
- The use of the natural Tantabiddi Passage for boating traffic ensures minimal dredging to access the lagoon and outer reef
- Relocation of the facility away from the mouth of the Tantabiddi Creek ensures no interruption of fluvial processes
- There are no predicted impacts to groundwater and therefore no impacts to the stygofauna community are anticipated
- The use of natural limestone provides a similar substrate for settlement of marine life to that of the adjacent marine areas
- The Resilience Strategy for the Ningaloo Coast identified the need for effective emergency planning and management to support the resilience of the ecosystem and community (DBCA, 2023). DoT are the lead organisation for marine oil spills and hold response equipment in Exmouth townsite. The TBF will also provide improved infrastructure for emergency and pollution response on the west side of the Cape Range peninsula, which is adjacent to offshore petroleum fields and busy shipping routes.

Amenity

Decommissioning of the boat ramp facility and rehabilitation of this area to a low-key day use area to access the beach maintains public access to the beach and separates users from boating traffic, this will improve amenity of this area to the public. Further consultation will be undertaken with Nyinggulu Coast JMB and NTGAC to further

refine what facilities will be retained at the existing boat ramp and the management of access to informal sites such as the Tantabiddi sinkhole.

The height of the TBF breakwaters will not be significantly different to the Tantabiddi Boat Ramp so that the viewshed will align with the user's current perception of the area. The height of the structures associated with the TBF will be below that of the adjacent sand dunes so the TBF will be largely screened from the road and will also not be silhouetted against the horizon when viewed from offshore. The visual amenity is further aided through the use of natural limestone for the breakwaters which provides a visually similar appearance to that of the existing landscape elements such as limestone cliffs.

There is the potential for indirect impacts to fish stocks if the facility contributed to an increase in fishing pressure (Section 6.4.2). Access to quality recreational and charter fishing is also an important amenity value of the region. The commercial boat tourism and fishing pressures will continue to be licenced and managed by DBCA and DPIRD (Fisheries). DoT will monitor usage rate of the facility and share these with marine park managers to provide information on usage rates as well as real time monitoring of users. This is undertaken at many other DoT marine facilities across Western Australia.

6.7 Cumulative Environmental Impact

Cumulative impacts, including the possibly of synergistic and additive effects of nearby projects are limited given the TBF is situated in an area of high conservation value and is located within the following conservation reserves: Jurabi Coastal Park, Ningaloo Marine Park (State Waters), Ningaloo Coast National Heritage Place and Ningaloo Coast World Heritage Area. The only known proposed activity in area is the Ningaloo Lighthouse Resort project which is located ~19 km north east of the proposed TBF. The Ningaloo Lighthouse Resort (NLR) project was approved under the *EP Act* in December 2023 and under the *EPBC Act* in April 2024. The NLR development includes clearing of 3.98 ha of native vegetation and groundwater abstraction but does not include any marine elements. Due to the separation distance and lack of marine elements it is considered unlikely that the NLR will have any long-term cumulative impact on the key environmental elements of the TBF.

The decommissioning of the existing Tantabiddi Boat Ramp (300 m north of the TBF) will result in a net decrease in cumulative environmental impacts in the area. The removal of the coastal infrastructure will reduce the interruption of coastal processes at the mouth of the Tantabiddi Creek. The regular maintenance dredging will also no longer be undertaken at this site which will provide a net benefit to the adjacent benthic communities and habitats and marine fauna. Further, the remodeling and revegetation of the vehicle access, carpark and dredge material stockpile will result in a positive outcome for terrestrial flora and vegetation and terrestrial fauna at this site.

Consequently, the potential for environmental impacts arising from adjacent projects is considered negligible.

6.8 Holistic Impact Assessment

Holistic impact assessment has been undertaken to consider the connections and interactions between impacts, and the overall impact of the proposal on the environment as a whole. The proposed TBF has been designed to improve boating facilities in the area and minimise construction and environmental impacts. This project provides a significant upgrade to public facilities in the region and will be a primary gateway for visitors seeking to access the marine environment of the Ningaloo Marine Park, Ningaloo Coast Heritage Place and the Ningaloo Coast World Heritage Area. The key environmental factors for this project are Benthic Communities & Habitats, Coastal Processes, Marine Environmental Quality, Marine Fauna, Flora and Vegetation and Social Surroundings. A consideration of the proposed activities and primary impacts across these environmental factors is presented in

Table 28. A summary of the predicted environmental outcomes and their relationship to the EPA's environmental principles is presented in Table 29.

Table 28 Primary environmental impacts and interaction of key environmental factors

Actions	Benthic Communities & Habitats	Coastal Processes	Marine Environmental Quality	Marine Fauna	Flora & Vegetation	Social Surroundings
Clearing of 5.6 ha of native vegetation. Limit impact to FpSv2 to 0.029 ha or less Revegetation of 1.3 ha at existing Tantabiddi Boating Facility following decommissioning	Not applicable	Not applicable	Not applicable	Not applicable	No impact on two Priority 2 species. These species could be included in revegetation works. Limit impact to vegetation communities of potential conservation significance and review final design to try an avoid direct impact. No significant change to the remaining extent of the pre-European vegetation association of the area	Access road will impact on 0.2 ha of Tantabiddi Midden 1. Location of this road agreed with Traditional Owners. There will not be any disturbance of underlying sediments and materials. Loss of 5.6 ha of native vegetation in the Ningaloo Coast National Heritage Place and Ningaloo Coast World Heritage Area. Rehabilitation of existing boat ramp and car park to a day use area.
Marine construction, including: 1.0 ha breakwaters/revetments, 8.3 ha of dredging, up to 153,000 m^3 dredging and piling works, and sediment accretion to the at the shoreline to the south of the facility	Permanent loss and serious damage to 23.79 ha of BCH which is predominantly macroalgal community composed of ephemeral genera.	Without ongoing management (e.g. bypassing and dredging) accumulation of ~8,000 m^3/yr sediment at the shoreline immediately south of the TBF and erosion of ~12,500 m^3/yr in the vicinity of Tantabiddi Creek.	Elevated turbidity during entrance channel dredging extending in a narrow short-attached plume. Short periods of relatively minor sedimentation likely within the tolerance thresholds for mobile invertebrates.	Offshore piling works has the potential to impact marine fauna. Whales are the most sensitive species with a behavioural response within 270 m, TTS within 1,900 m and PTS within 760 m. Night dredging within the harbour basin has the potential to cause anthropogenic light impacts on marine fauna	Not applicable	Facility will be a primary gateway for visitors accessing the marine elements of the Ningaloo Coast National Heritage Place and Ningaloo Coast World Heritage Area
Operation of TBF	Turbid plume during maintenance dredging. However, plume expected to be	~6,000 m^3 sediment bypassed (using land-based equipment) twice yearly. Dredging of the entrance channel every four years (estimated	Accidental toxicity or hydrocarbon release. Commensurate with risks from similar boating facilities around the state.	Vessel movements causing underwater noise impacts, considered to be negligible.	Potential for weed spread.	Facility will be a primary gateway for visitors accessing the marine elements of the Ningaloo Coast National Heritage Place and Ningaloo Coast World Heritage Area.

Actions	Benthic Communities & Habitats	Coastal Processes	Marine Environmental Quality	Marine Fauna	Flora & Vegetation	Social Surroundings
	small-scale, short-term and similar magnitude to that experienced during natural events.	volume 16,000 m^3) using a floating dredge. Frequency and volume of future bypassing and dredging operations determined by ongoing monitoring Dredge material to be placed on the shoreline	Turbid plume during maintenance dredging expected to be small-scale, short-term and similar magnitude to that experienced during natural events. DoT are the lead organisation for marine oil spills and hold response equipment in Exmouth townsite. The TBF will provide improved infrastructure for emergency and pollution response on the west side of the Cape Range peninsula.	Anthropogenic lighting to be aligned with best practice guidelines to minimise impact on marine fauna. Monitoring of usage rates to understand and manage human pressures on the values of Ningaloo Marine Park		Improved health, welfare, convenience and comfort of boating facility users. Improved universal access to the marine park.

Table 29 Predicted environmental outcomes and the environmental principles

Principle	Environmental Outcome
1. Precautionary principle **2 Intergenerational equity** **3. Conservation of biological diversity and ecological integrity**	**Benthic Communities & Habitats** • Loss of 23.79 ha of BCH, which is predominantly ephemeral macroalgae, and which represents 0.39% of the LAU **Coastal Processes** • Sediment accumulation at the shoreline immediately south of the TBF and minor accumulation at the shoreline immediately north • Reduced artificial modification of coastal processes at Tantabiddi Creek and the potential for minor erosion to cause increase in the frequency of opening of the Tantabiddi Creek estuary **Marine Environmental Quality** • Achieve Environmental Quality Objectives for ecosystem integrity for moderate (within the boating facility) and high (beyond the immediate boating facility) levels of ecosystem protection during operations **Marine Fauna** • Marine Fauna Observer present to ensure marine construction works managed so that no impacts on marine fauna occur • Design and use of anthropogenic lighting to ensure no impacts on marine fauna **Flora and Vegetation** • Clearing of up to 5.6 ha of native vegetation • Limit clearing to vegetation community FpSv2 to 0.029 ha or less • Rehabilitation and revegetation of Tantabiddi Boat Ramp (1.3 ha) **Social Surroundings** • Project footprint will overlay 0.2 ha of Tantabiddi Midden 1 site • The TBF will be located within several conservation reserves, including the Ningaloo Coast World Heritage Area and Ningaloo Coast National Heritage Place • The TBF may indirectly impact on some of the environmental values of these conservation reserves. These impacts are considered within the Key Environmental Factors and are anticipated to be low at both a local and regional scale • The proposal will significantly improve boating amenity and visitor experience in these conservation reserves
4. Improved valuation, pricing and incentive mechanisms	This project will be a significant government investment to improve public facilities in the region and enhance the amenity and safety for locals and visitors to the Ningaloo area. The project provides opportunities for environmental and cultural education through the design and signage throughout the public areas. Commercial users of the facility will pay a lease/usage fee to cover operational costs, including waste management. Where possible, the project will: • Employ appropriately trained local personnel and source local goods and services • Ensure leading best practice standards during construction to minimise emissions and discharges as far as reasonably possible • Source goods and services that have the least environmental impact.
5. Waste minimisation	Waste generated from the proposal will be minimised through both the construction and operation of the Tantabiddi Boating Facility through the standard hierarchy of waste controls: reduce, re-use, recycle, recover and dispose. All waste generated at the TBF will be removed for treatment/disposal at appropriate facilities off-site.

7. Conclusion

This environmental referral support document presents a summary of the existing environment, potential environmental impacts and proposed mitigation measures. The Department of Transport has completed a comprehensive suite of site-specific environmental investigations which have informed the design, implementation and environmental management of the construction and operation phase of the Tantabiddi Boating Facility.

A detailed impact assessment has been undertaken of the following Preliminary Key Environmental Factors that may be significantly impacted by the proposal:

- Benthic Communities & Habitats
- Coastal Processes
- Marine Environmental Quality
- Marine Fauna
- Flora and Vegetation
- Social Surroundings

This assessment also includes a consideration of impacts on the following Matters of National Environmental Significance:

- World Heritage Property
- National Heritage Place
- Listed Threatened Species
- Migratory Species

The environmental mitigation hierarchy has been applied though this assessment and residual impacts and environmental outcomes in relation to each environmental factor have been assessed and it is considered that the Tantabiddi Boating Facility can be appropriately implemented and managed to ensure that the objectives of the *EPA* and *EPBC Act* can be met.

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Appendix A Letters of Support

Appendix B Section 18 Consent

Appendix C Tantabiddi Boating Facility Redevelopment—Marine Environmental Impact Assessment

Appendix D Tantabiddi Dredge Plume Modelling Report

Appendix E Tantabiddi Boating Facility Underwater Noise Modelling and Assessment

Appendix F Tantabiddi Creek Coastal Processes Study

Appendix G Sampling, Analysis and Quality Plan. Tantabiddi Boating Facility-Marine Environmental Investigations

Appendix H Tantabiddi Boating Facility Geotechnical Interpretive Report

Appendix I Tantabiddi Boating Facility Project, Western Australia Flora and Vegetation Surveys

Appendix J Tantabiddi Boating Facility Project, Western Australia Flora and Vegetation Surveys—Addendum

Appendix K Tantabiddi Boating Facility: Estimation of Groundwater Flows to Coast

Appendix L Tantabiddi Boating Facility, North West Cape, WA: Factual Geotechnical Investigation

Appendix M Tantabiddi Boating Facility Project: Terrestrial Fauna and Stygofauna Assessment

Appendix N Tantabiddi Creek Hydrology and Geomorphology Study

Appendix O Tantabiddi Boat Launching Facility Investigation

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