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Acronyms

Acronyms	
80 th percentile	Value below which 80% of the observations are found
CD	Chart datum
CEO	Chief Executive Officer of the Office of the Environmental Protection Authority (now Department of Water and Environmental Regulation)
CoB	City of Busselton
DoH	Western Australian Department of Health
DoT	Western Australian Department of Transport
DWER	Western Australian Department of Water and Environmental Regulation
EAG	Environmental Assessment Guideline
EMF	Department of Transport Maintenance Dredging – Environmental Management Framework
EMMP	Environmental Monitoring and Management Plan
EMP	Environmental Management Plan
EPA	Western Australian Environmental Protection Authority
GPS	Global positioning system
H ₂ S	Hydrogen sulfide gas
LAC	Light attenuation coefficient; a measure of the attenuation of light with depth through the water column
OEPA	Office of the Environmental Protection Authority (now Department of Water and Environmental Regulation)
PGCMA	Port Geographe Coastal Management Area
ppm	Parts per million
Rolling two-year period	A period of 24 consecutive months measured backward from the current date
UWA	The University of Western Australia

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1 Summary

This Environmental Monitoring and Management Plan (EMMP) is submitted in accordance with Ministerial Statement 990 (Annex A), Condition 7 for the Port Geographe Development Coastal Structures by the Department of Transport (DoT) on behalf of the Minister for Transport. The EMMP also addresses Conditions 4, 5 and 6 of Ministerial Statement 990 (Annex A).

The content and format of this EMMP is consistent with the Environmental Protection Authority's (EPA) Environmental Assessment Guideline for Preparation of management plans under Part IV of the *Environmental Protection Act 1986* (EPA 2015). This guideline has been superseded by the EPA's Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2021a), it is intended that this EMMP will be revised to align with these guidelines should it require substantial changes be made to the management triggers or management actions in the future.

The environmental management targets to measure achievement of the condition environmental objectives for seagrass wrack management, sediment movement, and the harbour entrance channel, that must be met through implementation of this EMMP, are outlined in Table 1.1.

Table 1.1 Summary of the Port Geographe Development Coastal Structures project, and associated condition environmental objectives and environmental management targets

Title of proposal	Port Geographe Development Coastal Structures
Proponent	Minister for Transport
Ministerial Statement number	990
Purpose of this EMMP	To fulfil the requirements of Conditions 7 of Ministerial Statement 990. This EMMP also addresses Conditions 4, 5 and 6 of Ministerial Statement 990
EPA's environmental objectives for the key environmental factors	<p><u>Coastal processes</u> To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.</p> <p><u>Marine environmental quality</u> To maintain the quality of water, sediment and biota so that the environmental values are protected.</p> <p><u>Benthic communities and habitat</u> To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.</p> <p><u>Air quality</u> To maintain air quality and minimise emissions so that environmental values are protected.</p> <p><u>Social surroundings</u> To protect social surroundings from significant harm.</p> <p><u>Human health</u> To protect human health from significant harm.</p>

Seagrass wrack management	
Condition environmental objective	Minimise the impact on the environment and human health due to trapped seagrass wrack.
Management targets	<ol style="list-style-type: none"> 1 Maintain natural beachfront wrack dynamics by ensuring less than 60 000 m³ of wrack is on the Western Beach by December each year. 2 24 hour average H₂S concentrations adjacent to the Western Beach do not exceed Department of Health guidelines of 0.1 ppm. 3 Median NTU measured weekly at impact sites does not exceed 80th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works). 4 No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works).
Sediment movement	
Condition environmental objective	Minimise the impact on the environment and coastal processes due to interruption to sediment movement by the reconfigured coastal structures.
Management targets	<ol style="list-style-type: none"> 1 Maintain natural alongshore sediment movement by ensuring less than 30 000 m³ erosion within Wonnerup Beach (to the eastern extent of the Port Geographe Coastal Management Area) at the end of a rolling two-year period (when compared to the November 2014 survey). 2 Median NTU measured weekly at impact sites does not exceed 80th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works). 3 No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works).
Harbour entrance channel	
Condition environmental objective	Minimise the impact on the environment due to the restricted exchange of water through the harbour entrance channel
Management targets	<ol style="list-style-type: none"> 1 Maintain cross sectional area of harbour entrance channel (below mean sea level) to no less than 120 m² for two consecutive surveys. 2 Median NTU measured weekly at impact sites does not exceed 80th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works). 3 No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works).

Note:

1. EMMP = Environmental Monitoring and Management Plan; EPA = Environmental Protection Authority; H₂S = hydrogen sulfide; ppm = parts per million.

2 Context, Scope and Rationale

2.1 Project description

The Port Geographe development is located ~3 km east of Busselton, Western Australia. Developed in the 1990s, the original project saw the construction of breakwaters and groynes extending into Geographe Bay, together with a series of residential canals and a private marina. In 1991, Ministerial Statement 391 was issued to Tallwood Nominees Pty Ltd (Tallwood Nominees) for the construction of Port Geographe. The development has been progressively developed since the early 1990s. However, before completion, Tallwood Nominees experienced financial difficulties and the development ceased in mid-2009.

The original design of the breakwater impeded the natural eastward littoral drift of sediment and wrack at the shoreline, causing large amounts of material to accumulate on the beach to the west of the harbour entrance channel (hereafter referred to as the 'Western Beach'). Decomposition of the accumulated wrack reduced the public amenity of this beach and resulted in reduced air quality in the surrounding area. The interrupted eastward littoral drift also led to erosion at Wonnerup Beach to the east of the development, presenting a risk to public and private infrastructure adjacent to the beach. Wrack and sediment deposition in the harbour entrance channel affected the flushing characteristics of the Port Geographe artificial waterways.

In 2013, DoT became a joint proponent for Ministerial Statement 391. Responsibility for the coastal structures component of the development, resided with DoT and responsibility for the land development and canal structures component with Tallwood Nominees, until the land was purchased by Aigle Royal Developments in April 2015.

In 2013 and 2014, DoT completed construction and capital dredging campaigns to re-align the breakwaters in order to facilitate natural eastward littoral drift, thereby reducing the social and environmental impacts caused by the previous design. The reconfigured Port Geographe coast has two breakwaters (eastern and western) forming the entrance channel, a revetment along the eastern shoreline to Wonnerup and a small lagoon formed at the junction of the eastern breakwater and revetment (Figure 2.1, Figure 2.2). In 2013, Ministerial Statement 391 was amended to clarify the conditions within the statement, confirm the modifications to the coastal structures, and allow greater flexibility around the dredging volumes required for the reconfiguration.

In November 2014, the Office of the Environmental Protection Authority (OEPA¹) split Ministerial Statement 391 into two separate Ministerial Statements: Statement 989, for the management of the canal developments by the landowner; and Statement 990, for the management of the coastal structures by DoT. The proponent for Ministerial Statement 990 is the Minister for Transport and DoT completes environmental management on the Minister's behalf.

To ensure the conditions of Ministerial Statement 990 are met, DoT intends to maintain the area within the Port Geographe Coastal Management Area (PGCMA; Figure 2.1, Figure 2.2) that extends east and west of the reconfigured entrance channel, via periodic seagrass wrack and sediment management and harbour entrance channel maintenance dredging campaigns (summarised in sections below). These campaigns are facilitated by the presence of a permanent bypassing pipeline which, when deemed necessary, allows material to be pumped from one side of the development to the other (Figure 2.2).

¹ As of July 2017 OEPA merged with Department of Environmental Regulation and Department of Water to form Department of Water and Environmental Regulation



Figure 2.1 The Port Geographe Coastal Management Area and reconfigured breakwaters (updated version from Figure 1 in Ministerial Statement 990)

2.1.1 Seagrass wrack management

Storms and energetic sea conditions may result in trapped wrack on the Western Beach. Wrack management works may need to be completed to reduce trapped wrack on the beach when it has the potential to cause an environmental impact, primarily due to the production of hydrogen sulfide gas (H₂S). Aerobic decay of dry wrack generates substantially smaller amounts of H₂S than anaerobic decay (which occurs when wet wrack decays at the waterline). The method used to remove trapped wrack from the Western Beach will be dependent on the volume accumulated. Operationally, DoT may implement wrack management activities when accumulated volumes are above 30 000 m³.

Historically ~60 000–80 000 m³ of seagrass wrack can accumulate each winter on the Western Beach (BMT JFA 2015a), requiring management. Smaller volumes of trapped wrack may be moved into the littoral zone above the low water mark using mechanical equipment.

Larger volumes of trapped wrack (>80 000 m³) may be removed from the Western Beach using mechanical equipment such as dozers, pumping equipment, cutter-suction dredge and/or trucking. Nearshore marine disposal is preferred (littoral zone of the Western Beach or in front of the eastern revetment), however; if these options are not suitable, material will be disposed offshore or trucked offsite. The proposed offshore disposal area is a previously utilised area in the 2013–2014 capital dredging campaign realigned to be within the PGCMA (Table 2.1, Figure 2.2). The footprint of the offshore disposal area was extended in 2020 to match that of the 2013–2014 capital dredging campaign in order to increase its capacity to receive dredged material and considered to present low environmental risk (BMT 2020). Where possible, seagrass wrack management options will ensure that the nutrients provided by wrack remain within Geographe Bay. However, if disposal of material within the PGCMA is not appropriate, i.e. for very large volumes of wrack accumulation, material may be trucked offsite to be disposed of or beneficial reuse.

The timing of works will vary year to year due to the seasonal and interannual variability of coastal processes and wrack dynamics. Works will typically occur outside of school holidays when beach use will be high. However, occasionally works may be required during holiday periods to effectively manage the shoreline within the PGCMA and the Port Geographe coastal structures to meet the requirements of Ministerial Statement 990. Prior to these occasions, DoT will consult with the City of Busselton and relevant community stakeholder representatives.

Table 2.1 Coordinates of Port Geographe offshore disposal area

Corner points ¹	Offshore disposal area position (GDA 94 UTM 50)	
	Easting	Northing
A	350813	6278360
B	351070	6278509
C	351400	6278513
D	351400	6278338
E	350985	6278337
F	350913	6278283

Notes:

1. Proceeding clockwise started from westernmost point.
2. See Figure 2.2 for Offshore Disposal Area location in Port Geographe Coastal Management Area.

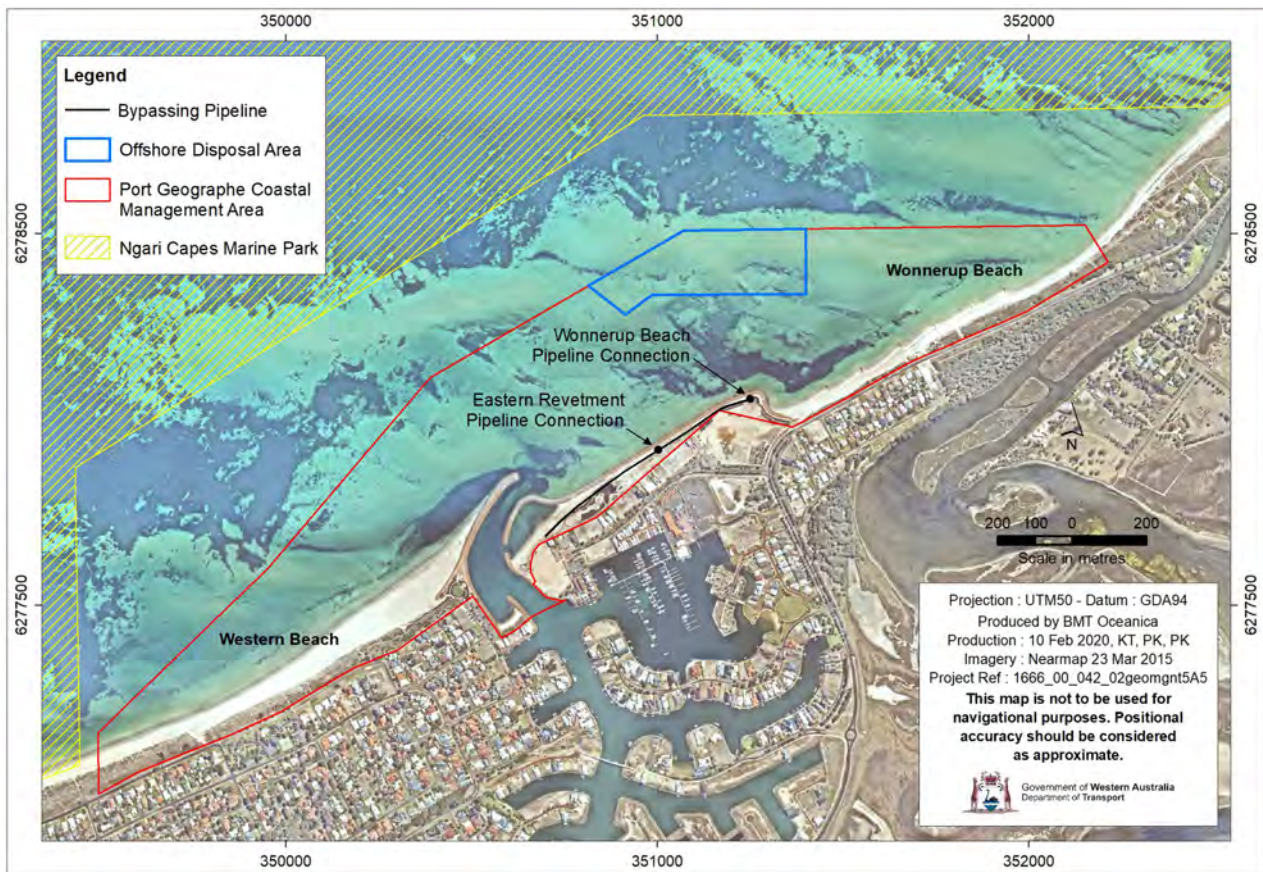


Figure 2.2 Port Geographe Coastal Management Area, permanently installed bypassing pipeline, offshore disposal area, and Ngari Capes Marine Park exclusion zone

2.1.2 Sediment management

Following the realignment of the Port Geographe coastal structures, it is likely that the eastern beaches will require additional nourishment. The primary location for nourishment will be the western end of Wonnerup Beach, to allow natural eastward littoral drift of material along the shoreline.

The supply options for nourishment material include internal sources from inside the PGCMA or external sources from outside the PGCMA (such as local quarries, nearby port sand traps or sand pits). Internal sources of sand supply for beach nourishment should be investigated for all nourishment to minimise potential transport impacts to local residents and cost. However, if surveys indicate smaller volumes are required for beach nourishment (e.g. 10 000–30 000 m³), material from external sources outside the PGCMA (such as local quarries, sand pits) may be used.

Sources from within the PGCMA include sand built-up on the Western Beach (mechanically bypassed via pipeline or trucks), the material dredged from the harbour entrance channel (via pipeline) and dredging of sand previously placed in the offshore disposal area during maintenance and capital campaigns (via pipeline). Sand from the Western Beach and the harbour entrance channel can have a high wrack content, therefore use of these sources should consider the impact based on the wrack content and mitigate such impacts as necessary.

It is intended that mechanical bypassing of sand from the Western Beach will be utilised only in instances where the removal of sediment will not be anticipated to impact the natural bypassing performance of the breakwaters. Therefore, there will need to be due consideration of:

- the beach profiles required to achieve natural bypassing of the reconfigured structures; and
- the propensity of this surplus sand to move into the entrance channel and cause a navigation hazard.

The justification for using the offshore disposal area as a sand source and the associated environmental impact assessment was approved in the 2020 EMMP revisions as detailed in BMT (2020). Use of this sand source is considered to present low environmental risk and sand will only be removed above a historic baseline to ensure the naturally occurring sand bar is not impacted (BMT 2020).

In all instances, the relative impacts of the sand supply options on the environment, social surrounds and operational requirements will be assessed to determine the most appropriate method and the relevant approvals obtained on a per-campaign basis. Any sand sourced for nourishment will consist of predominantly fine to medium grain sand, and will be free from contamination and debris.

To facilitate the effective nourishment of Wonnerup Beach and to ensure beach amenity post-nourishment, small amounts of wrack that may have accumulated on Wonnerup Beach may be redistributed into the littoral zone prior to nourishment works. This will avoid its burial during nourishment, which would otherwise have the potential to lead to future anoxic conditions and H₂S generation.

The timing of works will vary year to year due to the seasonal and interannual variability of coastal processes and wrack dynamics at the site. Works will typically occur outside of school holidays when beach use will be high. However, occasionally works may be required during holiday periods to effectively manage the shoreline within the PGCMA and the Port Geographe coastal structures to meet the requirements of Ministerial Statement 990. Prior to these occasions, DoT will consult with the City of Busselton and relevant community stakeholder representatives.

2.1.3 Harbour entrance channel management

Maintenance dredging campaigns will be completed primarily to maintain the cross-sectional area of the harbour entrance channel to ensure safe navigation and adequate flushing and water circulation of the Marina. Material may also be dredged from areas adjacent to the harbour entrance channel to prevent infill if necessary.

In most cases, a cutter-suction dredge will be used, and the disposal area will be dependent on the wrack content of the dredged material. If the scope only requires the removal of small volumes or isolated high spots, alternative methods such as wrack trawling or seabed ploughing may be considered. If the dredged material is expected to be suitable for beach nourishment (Section 2.1.2), it will be pumped through the bypassing pipeline and deposited through the Wonnerup Beach pipeline connection (Figure 2.2). If the wrack content of the material is expected to be high, it will be deposited in front of the eastern revetment via the established pipeline connection (Figure 2.2), after which the sandy material is anticipated to separate out and move eastwards to Wonnerup Beach. Both of these options are considered to minimise the risk of erosion on Wonnerup Beach. Nearshore disposal is preferred, however; if nearshore disposal options are not suitable due to predominantly low sand content, the material will be disposed offshore. The offshore disposal area is within the PGCMA (Figure 2.2) and the location has been chosen to avoid and minimise impacts to seagrass meadows (refer to Section 2.1.1). Small-scale remedial dredging of low volumes may be required following disposal to the offshore disposal area if high spots are generated during disposal as observed from hydrographic survey data on campaign completion to maintain safe navigability.

Each maintenance dredging campaign will remove ~15 000–60 000 m³ of fine to medium grain sand and wrack from the harbour entrance channel.

The timing of works will vary year to year due to the seasonal and interannual variability of coastal processes and wrack dynamics. Works will typically occur outside of school holidays when beach use will be high. However, occasionally works may be required during holiday periods to effectively manage the shoreline within the PGCMA and the Port Geographe coastal structures to meet the requirements of Ministerial Statement 990. Prior to these occasions, DoT will consult with the City of Busselton and relevant community stakeholder representatives.

2.1.4 Summary

A summary of the proposed campaigns at Port Geographe is outlined in Table 2.1. All details of the maintenance campaigns are indicative and will require review prior to each campaign.

Table 2.1 Summary of proposed maintenance dredging, wrack management and sand bypassing/nourishment campaigns at Port Geographe

Management	Location	Method	Disposal area	Campaign volume	Duration (weeks)
Seagrass wrack management	Western Beach	Moved into littoral zone using mechanical equipment Removed using earthmoving equipment, pumping equipment and/or cutter suction dredge and/or trucking	Western Beach littoral zone Eastern revetment pipeline connection Eastern end of Wonnerup Beach Offshore disposal area Appropriate disposal offsite and/or beneficial reuse	~30 000– 50 000 m ³	1–12 Comprising multiple non-consecutive wrack work episodes (less than 5 days per episode) to coincide with appropriate weather events
Sediment management	External sources outside the PGCMA (such as local sand pits/quarries/accreting local shoreline) Internal sources inside the PGCMA (such as the Western Beach, entrance channel, offshore disposal area)	Trucking Bypassing (pumping equipment) Dredging (cutter suction dredge)	Wonnerup Beach	~10 000– 50 000 m ³	2–8 May comprise multiple smaller campaigns utilising external and/or internal sources separate to or coinciding with other campaign types



Management	Location	Method	Disposal area	Campaign volume	Duration (weeks)
Harbour entrance channel management	Entrance channel and adjacent areas	Cutter suction dredge	Wonnerup Beach pipeline connection Eastern revetment pipeline connection Offshore disposal area	~15 000– 60 000 m ³	4–14

Notes:

1. 'PGCMA' = Port Geographe Coastal Management Area

2.2 Key environmental factors

This EMMP considers six key environmental factors that relate to the environmental management of the Port Geographe coastal structures. These factors are (EPA 2021b):

- coastal processes
- marine environmental quality
- benthic communities and habitat
- air quality
- social surroundings
- human health.

The following sections describe the EPA's objectives for the protection of these key environmental factors and outline why they are relevant to the Port Geographe coastal structures and the ongoing maintenance of this development. The EMMP management approach outlines how the condition environmental objectives and associated management targets protect these four key environmental factors (Section 2.4.4).

2.2.1 Coastal processes

EPA's objective for coastal processes: To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.

The original design of the Port Geographe coastal structures impeded the natural eastward littoral drift of sediment and wrack at the shoreline, causing large amounts of material to accumulate on the beach to the west of the harbour entrance channel (Western Beach). The interrupted eastward littoral drift led to erosion at Wonnerup Beach to the east of the development. The reconfiguration of the Port Geographe breakwaters was intended to facilitate natural eastward littoral drift along the Geographe Bay coast and ensure that the mechanisms for the transport of sand and wrack from beaches west of the development to beaches east of the development are reinstated. The natural coastal processes are therefore monitored to ensure the reconfigured breakwaters are effectively promoting natural eastward littoral drift. However, maintenance works may also be required (see Section 2.1) before the beaches of the PGCMA reach equilibrium with the new coastal structures.

2.2.2 Marine environmental quality

EPA's objective for marine environmental quality: To maintain the quality of water, sediment and biota so that the environmental values are protected.

The eastward transport of sand and wrack along the alignment of the Port Geographe coastal structures may cause material to settle in the harbour entrance channel. This material may accumulate, reduce the cross-sectional area of the channel, and potentially reduce water exchange between Geographe Bay marine waters and the Port Geographe waterways. Management of the harbour entrance channel depths may involve maintenance dredging to maintain safe navigation and adequate flushing of the artificial waterways. Maintenance dredging works may potentially cause localised environmental impacts to biota, water and sediment quality at the dredging and disposal areas.

The presence of the Port Geographe coastal structures may cause large accumulations of trapped wrack. Therefore, in addition to maintenance dredging, further management activities may be required to maintain coastal processes and manage water and sediment quality within the PGCMA (Section 2.1). These activities may include the mechanical bypassing of sediment and wrack from the Western Beach and sand nourishment of Wonnerup Beach. Bypassing and nourishment works have the potential to cause localised environmental impacts to biota, water and sediment quality in the vicinity of the works.

2.2.3 Benthic communities and habitat

EPA's objective for benthic communities and habitat: To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.

Extensive seagrass meadows exist in Geographe Bay and offshore of the Port Geographe coastal structures (outside of the PGCMA). Maintenance works that involve offshore disposal of material have the potential to cause environmental impacts on seagrass meadows in the vicinity of the offshore disposal area. These impacts are mainly related to short-term turbidity and potential smothering of seagrass meadows.

2.2.4 Air quality, social surroundings and human health

EPA's objective for air quality: To maintain air quality and minimise emissions so that environmental values are protected.

EPA's objective for social surroundings: To protect social surroundings from significant harm.

EPA's objective for human health: To protect human health from significant harm.

The presence of the Port Geographe coastal structures may cause large accumulations of trapped wrack and during decomposition may impact air quality and visual amenity in the surrounding area. The physical appearance of wrack on the Western Beach and decomposition by anaerobic bacteria reduces public amenity and potential reduced air quality from the generation of H₂S. Therefore, maintenance works may be required to manage the wrack accumulation. Additionally, during maintenance works (such as mechanical wrack bypassing), large quantities of H₂S can be released over a short period of time which can potentially result in adverse health effects (ChemCentre 2010).

2.3 Requirements of the conditions

This EMMP is submitted in accordance with Ministerial Statement 990, Conditions 4 to 7 for the Port Geographe Coastal Structures Development. The requirements of these conditions are addressed in sections of the EMMP as outlined in Table 2.2. The approach to how management actions have been developed to meet these conditions such that they follow the mitigation hierarchy and are protective of the EPA's key environmental factors, is explained in Section 2.4.4 and Section 2.4.5.

Table 2.2 Conditions of Ministerial Statement 990 and where they are addressed in this Environmental Monitoring and Management Plan

Ministerial Statement 990 Condition	Section in EMMP
4-1 Where determined to be project attributable, the proponent shall maintain beach profiles on beaches east and west of the development, within the project area shown in Schedule 1, Figure 1, to the requirements of the CEO.	Section 2.1.2 Section 3.2
5-1 The proponent shall, unless otherwise approved by the CEO, annually bypass, dredge or remove trapped seagrass wrack and or sediment accumulated west of or within the harbour entrance, to the requirements of the CEO.	Section 2.1, Section 3
5-2 The proponent shall transfer sufficient sand to Wonnerup Beach for coastal protection, to the requirements of the CEO.	Section 2.1.2 Section 3.2
6-1 The proponent is to maintain the harbour entrance channel as per Schedule 1, to ensure adequate flushing and water circulation of the artificial waterways within the Port Geographe development, to the requirements of the CEO.	Section 2.1.3, Section 3.3

Ministerial Statement 990 Condition	Section in EMMP
7-1 The proponent shall ensure impacts to the environment are minimised through the implementation of Conditions 7-2 to 7-8.	Entire document
7-2 Within three calendar months following the issue of the Ministerial Statement, unless otherwise approved by the CEO, the proponent shall prepare an Environmental Management and Monitoring Plan to the requirements of the CEO. The Plan shall: <ol style="list-style-type: none"> 1 when implemented, substantiate whether Condition 7-1 is being met. 2 detail measures to manage water and sediment quality impacts to Geographe Bay associated with coastal management activities including dredging and bypassing. 3 detail measures to manage trapped seagrass wrack accumulation on the beaches adjacent to the development, as shown in Schedule 1, Figure 1. 4 detail measures to manage significant environmental impacts with regard to coastal processes and sediment movement as a result of the development. 5 determine trigger levels for implementation of management measures to ensure Condition 7-1 is met. 6 identify management measures to be implemented in the event that criteria identified required by Condition 7-2(5) have been exceeded. 	Entire document
7-3 The proponent shall implement the approved Environmental Management and Monitoring Plan required by Conditions 7-2, unless otherwise approved by the CEO.	Entire document
7-4 In the event that monitoring required by Condition 7-2 indicates trigger criteria have been exceeded, the proponent shall investigate to determine the likely cause(s) and provide a report that describes the investigation to the CEO within 10 days along with a description of the corrective management actions to be taken.	Section 3.1.6, Section 3.2.6, Section 3.3.6
7-5 The proponent shall implement the management actions identified in Condition 7-4 until the CEO determines that the remedial actions may cease.	Section 3.1.5, Section 3.2.5, Section 3.3.5
7-6 The proponent shall review the Environmental Management and Monitoring Plan annually, and revise where required, or as directed by the CEO.	Section 4
7-7 The proponent shall implement the approved revisions of the Environmental Management and Monitoring Plan required by Condition 7-6 until advised otherwise by the CEO.	Section 4
7-8 The Proponent shall make the Environmental Management and Monitoring Plan, required by 7-2 publicly available in a manner approved by the CEO.	Section 5

Note:

1. EMMP = Environmental Monitoring and Management Plan, CEO = Chief Executive Officer of the Department of Water and Environmental Regulation.

2.4 Rationale and approach of the EMMP

This document is intended to meet the requirements of several conditions in Ministerial Statement 990. The EMMP aims to ensure the breakwater reconfiguration is effective in enhancing natural coastal processes and outlines the maintenance works that may be required to ensure optimal performance of the coastal structures and minimise impacts on the environment in the PGCMA. The maintenance (as described in Section 2.1) will be carried out in accordance with the EMMP and Environmental Management Plan (EMP) to ensure minimal impact on the environment.

The following sections provide background information and details on the Port Geographe development that have been used to develop the management approach for this EMMP. Results of baseline studies, modelling investigations, and reviews of historic and recent datasets have been used to inform the management approach for meeting the condition environmental objectives stated in Section 1. The section below also outlines a number of assumptions and uncertainties associated with the development and the proposed management approach. The management actions, management targets, and monitoring commitments in the subsequent sections of this EMMP are aligned with the overall management approach presented below.

2.4.1 Baseline studies

A number of technical studies completed in the Geographe Bay region prior to the 2013/14 reconfiguration of the Port Geographe coastal structures help to provide an understanding of the possible impacts of the reconfiguration on the existing environment, hydrodynamics, and natural coastal processes. Modelling studies and environmental, metocean, and engineering investigations completed over a number of years, have informed the monitoring and management approach for this EMMP (Table 2.3). Brief summaries of the results of these studies are provided below.

Table 2.3 Environmental, metocean, and engineering studies completed for the Port Geographe coastal structures development

Study type	Organisation (and reference)	Timeframe	Key outcomes
Seagrass wrack dynamics in Geographe Bay	The University of Western Australia Seashore Engineering Pty Ltd BMT JFA Consultants Pty Ltd (Oldham et al. 2010, Pattiaratchi et al. 2011, Seashore Engineering 2014, BMT JFA 2015a)	2010–2015	<ul style="list-style-type: none"> • Wrack accumulation in large quantities on Geographe Bay beaches is a natural occurrence • Seagrass wrack is generally removed from the beaches when the offshore supply of available seagrass is exhausted • Average accumulation of wrack on beaches west of Port Geographe is ~60 000–80 000 m³ per annum
Hydrogen sulfide (H ₂ S) generation	ChemCentre The University of Western Australia Seashore Engineering Pty Ltd (ChemCentre 2010, Oldham et al. 2010, Seashore Engineering 2015)	2010–2014	<ul style="list-style-type: none"> • H₂S generation when large accumulations of wrack in nearshore saturated zone • Some exceedances of H₂S guideline levels during previous bypassing campaigns with northerly winds
Port Geographe Sand and Seagrass Wrack Modelling Study	The University of Western Australia (Pattiaratchi & Wijeratne 2011)	2011	<ul style="list-style-type: none"> • Curved breakwater configuration would accelerate and enhance wrack and sand transport processes • Optimum performance of the reconfiguration will be achieved once adjacent beach profiles and offshore bathymetry stabilise around the new structures • Maintenance works will shift from bypassing of sand and wrack to

Study type	Organisation (and reference)	Timeframe	Key outcomes
			management of harbour entrance channel accumulations
Port Geographe harbour entrance channel flushing	The University of Western Australia (Pattiaratchi & Wijeratne 2016)	2016	<ul style="list-style-type: none"> The modelled e-folding times for the existing configuration of the coastal structures ranged from three days (close to the entrance to the artificial waterways) to ~20 days (for locations furthest from the entrance to the waterways) Depth variations in the entrance channel caused a larger difference in the e-folding times between entrance configurations of -1.8 m chart datum (CD) and -1.3 m CD Movements of particles inside the artificial waterways were strongly affected by tidal and seiche-induced currents
Shoreline movement and sediment transport in Geographe Bay	Riedel & Byrne Consulting Engineers Pty Ltd Damara WA Pty Ltd Shore Coastal Pty Ltd Seashore Engineering Pty Ltd BMT JFA Consultants Pty Ltd (Riedel & Byrne 1990, Damara WA 2010, 2011; Shore Coastal 2010, 2014; Seashore Engineering 2014, BMT JFA 2015b)	1941–2015	<ul style="list-style-type: none"> Historical shoreline movement highly dynamic Predominantly eastward alongshore sediment transport Sand supply from offshore Wonnerup sand bar Sediment budget for Port Geographe indicates 20 000–65 000 m³ naturally bypassed per year
Metocean conditions	BMT JFA Consultants Pty Ltd (BMT JFA 2015c)	Metocean conditions	<ul style="list-style-type: none"> Eastward surface currents across the Port Geographe development Ebb and flood tide currents in the harbour entrance channel show oscillations of 30–40 min periods
Sediment and wrack quality	BMT Oceanica Pty Ltd (Oceanica & BMT JFA 2012, Oceanica 2013, BMT Oceanica 2014a, 2015a)	2012–2015	<ul style="list-style-type: none"> Sediment and wrack material within the PGCMA is generally clean and contains no contaminants at levels of concern
Environmental monitoring during maintenance works	BMT JFA Consultants Pty Ltd BMT Oceanica Pty Ltd (BMT JFA 2015d,e)	2012–2014	<ul style="list-style-type: none"> Seagrass meadow edge changes during capital and maintenance works within expected natural variability Minor impacts on marine environmental quality and

Study type	Organisation (and reference)	Timeframe	Key outcomes
			recreational amenity from temporary/localised increased water column turbidity

Metocean conditions

Wave and current measurements were collected at three locations in the Port Geographe development and using GPS drogues from October–December 2014 following the breakwater reconfiguration (BMT JFA 2015c). Current measurements outside of the harbour entrance channel showed evidence of ebb and flood tides in addition to predominantly easterly nearshore currents along the coast. Wind conditions and tides were found to influence currents and occasional long periods of easterly flow along the coast (BMT JFA 2015c).

Within the inner entrance channel and the Port Geographe canals, ebb and flood tide currents were aligned with the channel direction. A consistent oscillation at 30–40 minutes was measured at the inner entrance channel, with initial observations suggesting this is related to periods of increased swell waves (BMT JFA 2015c).

Shoreline movement

Shoreline movement along Geographe Bay is highly dynamic, being influenced by coastal structures, offshore sand bars, drain outlets and variability in climatic conditions. Prior to construction of the Port Geographe development, the erosion from updrift groyne fields and the eastward migration of salients (typically associated with large offshore sand bars) influenced the shoreline in the vicinity of Port Geographe (Shore Coastal 2010, Damara WA 2011). The construction of Port Geographe in the late 1990s introduced the requirement for the alongshore sediment supply to downdrift beaches in the Wonnerup area to be provided by mechanical sand bypassing. Modelling by The University of Western Australia (UWA) found that the 2013/2014 reconfiguration of the Port Geographe breakwaters and realignment of the adjacent beaches would facilitate the eastward movement of sediment across the development once the Western Beach was saturated with sand and the new equilibrium beach profile was achieved (see below for more detail; Pattiaratchi & Wijeratne 2011).

Sediment transport

Sediment transport rates across Geographe Bay are influenced by the direction of storm events and the interaction with varying coastal orientations and exposure (Damara WA 2011). There are summer/winter cycles in cross shore sediment transport in Geographe Bay with onshore transport in summer and offshore transport in winter (Damara WA 2010). This leads to the formation of beach erosion scarps and offshore sand bars over winter, with gradual onshore migration of the sand bar and restoration of the beach profile in summer (Damara WA 2010).

A sediment budget for Port Geographe was developed using aerial imagery of Geographe Bay from 1941 to 2008 (Damara WA 2011). This analysis concluded that 20 000–30 000 m³ was bypassed eastwards at Port Geographe annually. A sediment budget of Wonnerup found that the Wonnerup sand bar feeds 25 000–35 000 m³ into the Wonnerup area annually; there is 15 000–20 000 m³ of eastward alongshore sediment supply into Wonnerup annually; and 40 000–50 000 m³ of eastward alongshore sediment transport out of the Wonnerup area annually.

Historical estimates of the required bypassing volumes at Port Geographe are based on annual longshore sediment transport rates varying from 20 000–65 000 m³. Between 2009 and 2012 an average annual volume of ~55 000 m³ of sand was removed from the Western Beach and deposited at Wonnerup Beach during bypassing campaigns (BMT JFA 2015b). During the management of multiple dredging and sand bypassing campaigns at Port Geographe over recent years, specialist consultants have estimated an

average annual alongshore sediment transport rate of 65 000 m³ (Seashore Engineering 2014, BMT JFA 2015b).

Wrack and sand transport modelling

The recommended layout of the Port Geographe breakwater reconfiguration was modelled by UWA to determine whether it would accelerate and enhance wrack and sand transport processes, and reduce seagrass wrack accumulation (Pattiaratchi & Wijeratne 2011). The modelling exercise found the following:

- Natural bypassing of sand and seagrass wrack from west to east across the development can occur once the Western Beach is saturated with sand. The performance of the reconfiguration will not be optimised until this occurs.
- Occasional trapping of small quantities of seagrass wrack may occur from time to time across the development.
- The recommended layout was predicted to cause the least amount of siltation in the harbour entrance channel compared to other reconfiguration options.
- The design of the eastern end of the revetment improves conditions that previously caused erosion to the western end of Wonnerup Beach.
- The reconfiguration will potentially alter the coastal management focus from bypassing of seagrass wrack and sediment from the Western Beach to sediment management within the harbour entrance channel.

Harbour entrance channel modelling

Hydrodynamic modelling studies have been completed by UWA to understand the influence of obstructions within the harbour entrance channel on water exchange and flushing (Pattiaratchi & Wijeratne 2016). The study modelled four different scenarios for the cross-sectional area of the Port Geographe harbour entrance channel with depths at -2.8 m chart datum (CD; the design depth of the channel), -2.3 m CD, -1.8 m CD and -1.3 m CD. The study found that there was a substantial change in flushing and water exchange characteristics in the artificial waterways between the results from the -1.8 m CD and -1.3 m CD scenarios. Mean tidal amplitudes within the artificial waterways decreased by 5% for the -1.8 m CD scenario and by 15% for the -1.3 m CD scenario, when compared with the modelled results from the scenario with a design depth of -2.8 m CD. E-folding flushing times increased by 12% for the -1.8 m CD scenario and 35% for the -1.3 m CD scenario when compared with the modelled results from the scenario with a design depth of -2.8 m CD.

Nearshore bathymetry

Since 2013, the nearshore bathymetry in the vicinity of Port Geographe has been influenced by the reconfiguration works. Changes observed from comparison of pre- and post-reconfiguration hydrographic surveys have shown widening of the Western Beach, re-alignment of the breakwaters, relocation and reorientation of the navigable entrance channel, release of sediment trapped in pocket beaches and the disposal of sediments in offshore, nearshore and beach areas (BMT JFA 2015e).

A post-construction and beach nourishment hydrographic and topographic survey was completed in November 2014 across the entire PGCMA. These data are considered to be the initial benchmark survey and will be used to assess future performance of the reconfigured coastal structures and comparison with future surveys will assist with identifying the need for maintenance works.

Benthic habitats

The benthic habitat within Geographe Bay is predominantly seagrass beds (Oldham et al. 2010). The most common seagrasses within Geographe Bay are *Posidonia australis*, which covers 60% of the bay,

and *Amphibolis antarctica* (Oldham et al. 2010). Seagrass meadows are present ~600 m offshore of the Port Geographe development (outside of the PGCMA), with some smaller patches of seagrass closer to shore (Figure 2.1). The remaining substrate within Geographe Bay is typically bare sand, with some patches of shallow limestone outcrops (DAL et al. 1995, DEC 2013).

Seagrasses within Geographe Bay shed their leaves annually and these leaves are stored offshore in seagrass meadows and unvegetated zones during spring, summer, and autumn (Oldham et al. 2010). During storms in late-autumn and winter each year, the leaves are transported inshore and large quantities of wrack are deposited on Geographe Bay beaches as a result of energetic sea conditions and high-water levels (Oldham et al. 2010). It is estimated that 32 600–35 200 tonnes of seagrass wrack is generated annually in Geographe Bay (Oldham et al. 2010).

Wrack will usually remain on the beach for days or weeks until a subsequent storm transports the wrack alongshore. Smaller, thin aggregations of seagrass wrack below high-water level are likely to be moved naturally while larger aggregations (>1 m) above high water level are only likely to move during storm events and high-water periods such as spring tides (Oldham et al. 2010). Seagrass wrack is generally removed from the beaches when the offshore supply of available seagrass is exhausted (Pattiaratchi et al. 2011). Physical and chemical degradation of the material takes place as the wrack is transported on and off beaches, with nutrients ultimately returned to the marine environment.

During the management of multiple wrack bypassing campaigns at Port Geographe, specialist consultants have estimated that the average accumulation of wrack on the beaches in the western section of the PGCMA has previously been in the order of ~60 000–80 000 m³ annually (Seashore Engineering 2014, BMT JFA 2015a).

Hydrogen sulfide generation

The Department of Health (DoH) provides odour guidelines relating to human health effects from exposure to H₂S (Table 2.4). The DoH notes that the 2 ppm H₂S limit is associated with bronchial effects in some asthmatics. The other limit values include safety margins and therefore an exceedance does not necessarily mean a health consequence (DoH 2015).

Table 2.4 Recommended hydrogen sulfide exposure limits for public protection

Limit (ppm)	Averaging timeframe ¹
2	30 minutes
0.1	24 hours
0.014	90 days

Source: DoH (2015)

Notes:

1. The averaging timeframe is the time over which the measured level of H₂S in air is averaged and relates to potential short- or long-term effects.
2. ppm = parts per million

Monitoring of H₂S generation during wrack bypassing works has been completed since 2008. During maintenance works (such as mechanical bypassing), large quantities of H₂S can be released over a short period of time which can potentially result in adverse health effects (ChemCentre 2010). Investigations by Oldham et al. (2010) found that H₂S production is likely to be greatest in accumulations of fresh seagrass wrack within the nearshore saturated zone. Data collected from 2010–2014 were examined to determine past exceedances of DoH guidelines during the works (Seashore Engineering 2015). The review found three recorded occasions where the DoH 30 minute guideline of 2.0 ppm H₂S was exceeded. These three occasions coincided with light, northerly winds during the bypassing works (Seashore Engineering 2015). There were up to 11 recorded occasions where the 24-hour guideline of

0.1 ppm H₂S was exceeded, though some of the 2010 exceedances were considered to be associated with instrument/calculation error (Seashore Engineering 2015).

Water and sediment quality

Geographe Bay generally experiences high water clarity, however episodes of naturally high levels of turbidity occur between autumn and spring due to the mobilisation of wrack and sediment into the water column during storm events. Sediment and wrack sampling and analyses have been completed on numerous occasions within the PGCMA to assess for elevated levels of contaminants:

- wrack sampled from the harbour entrance channel in January 2012 prior to maintenance dredging works (Oceanica & BMT JFA 2012)
- sediment sampled from the Port Geographe marina and proposed capital dredging channel and breakwater footprint in December 2012 (Oceanica 2013)
- sediment sampled from the Port Geographe canals in May 2014 for proposed maintenance dredging (BMT Oceanica 2014a)
- sediment sampled from the Western Beach, nearshore & offshore areas of the PGCMA, and Wonnerup Beach in August 2015 and May 2019 for proposed maintenance dredging and bypassing works (BMT Oceanica 2015a; BMT 2019).

All of the sampling results indicated that the sediments and wrack were generally clean and concentrations of metals, organotins, and hydrocarbons were all below the relevant guidelines (Oceanica & BMT JFA 2012, Oceanica 2013, BMT Oceanica 2014a, BMT Oceanica 2015a). External sediment sources for nourishment (e.g. local sand pits) have previously been sampled and analysed for potential contaminants and physical suitability prior to use (BMT 2021). The results were combined into a memorandum and show that concentrations of metals, organotins, and hydrocarbons were all below the relevant guidelines (BMT 2021). Prior to use, new external sediment sources will be sampled and analysed for contaminants and the memorandum updated.

2.4.2 Environmental monitoring during works

The environmental impact assessments prepared for previous maintenance dredging and bypassing campaigns identified increased water column turbidity and potential smothering of seagrass meadows during offshore disposal as key environmental issues (Oceanica 2013, BMT Oceanica 2014a, 2015a). These issues were actively monitored and managed during the previous maintenance campaigns in accordance with Environmental Management Plans (BMT Oceanica 2014b,c).

The bypassing and capital and maintenance dredging close-out reports (BMT JFA 2015d,e) describe the results of environmental monitoring during works and demonstrated the risk of significant environmental impacts is low. Turbidity monitoring indicated that water clarity at the dredging and disposal areas recovered within a few days (BMT JFA 2015d,e). Monitoring of the seagrass meadows in the vicinity of the offshore disposal area indicated some areas of change in the seagrass meadow edge. After detailed analysis of multi-beam back scatter data from 2013–2014, the changes were found to be within the expected natural variability of seagrass movements and/or likely to be caused by natural physical disturbances, such as storms, rough conditions or localised currents (BMT JFA 2015e).

The risk of significant environmental impacts during maintenance works is low as demonstrated from environmental monitoring data collected since implementation of the EMMP and prior to for the capital works. DoT have completed light attenuation coefficient (LAC) monitoring within seagrass meadows since 2018 when disposal to the Offshore Disposal Area (Figure 2.1) commenced. The Management Target for seagrass health has not been exceeded from maintenance works attributable to dredging and disposal and the risk of impacts to seagrass meadows is considered low. DoT have completed a review of the LAC monitoring data (BMT 2022) and revised the monitoring effort for benthic communities and

habitat in this EMMP Revision (Section 3) based on realised impact and demonstrated low risk. This change is aligned with monitoring methods outlined in the EMF for State-wide maintenance works (BMT 2023; BMT 2022). Should there be a substantial change to dredging equipment (e.g., significantly increased flow rates) or volumes outside the historical range, DoT will reassess the risk to benthic communities and habitat associated with the change and any monitoring requirements.

2.4.3 Key assumptions and uncertainties

There are a number of key assumptions and uncertainties associated with the reconfigured Port Geographe coastal structures and their ongoing management. They are primarily related to the wrack and sand modelling completed prior to the reconfiguration works (Pattiaratchi & Wijeratne 2011, Section 2.4.1), and the ongoing maintenance requirements of the development.

It is anticipated that the reconfiguration will enhance the natural coastal processes of wrack and sediment movement, and facilitate adequate water exchange through the harbour entrance channel as predicted by the modelling study (Pattiaratchi & Wijeratne 2011, 2016; Section 2.4.1). If this occurs, then it is anticipated that minimal maintenance works will be required, and in some years, no maintenance works will be needed as the reconfiguration is performing as designed under typical metocean conditions. If any maintenance works are required to fulfil DoT's commitments under Ministerial Statement 990, it is expected that these works will be of small-scale and short duration, and therefore significant environmental impacts are not expected (based on results of environmental monitoring completed for previous maintenance dredging and bypassing campaigns at Port Geographe, Section 2.4.1).

It is assumed from the results of the modelling study (Pattiaratchi & Wijeratne 2011) that:

- The conceptual modelling work will translate to the physical site bringing about improved natural bypassing of sediment and wrack.
- The reconfigured entrance channel delivers satisfactory flushing rates and water exchange to artificial waterways, maintaining water, sediment and biota quality.
- There will be occasional trapping of small quantities of seagrass wrack across the development.
- Drifting of sediment and wrack across the face of the development will not considerably impact water exchange between marine waters and the artificial waterways.

However, some uncertainties remain:

- Littoral drift capacity from the Western Beach to Wonnerup Beach is uncertain.
- It is uncertain to what degree H₂S levels will be lowered by the reduction in saturated wrack volumes on the Western Beach.
- Impacts of natural bypassing of sediment across the harbour entrance channel are uncertain with some increase in sediment management expected due to siltation. This could affect timing of maintenance dredging works required to maintain navigational safety.

Understanding of the project attributable impacts on wrack and sediment movement continue to improve as the natural coastal processes adjust to the reconfigured coastal structures. Adaptive monitoring and management is ongoing in three key areas of the PGCMA – the Western Beach, Wonnerup Beach and the harbour entrance channel – to assist with this understanding. Flexible and adaptive management and maintenance works will be required to manage these ongoing uncertainties.

2.4.4 Management approach

The management of Port Geographe via this EMMP is focused on monitoring and management of three key components:

- seagrass wrack accumulations
- sediment movement
- harbour entrance channel depths.

These three components are directly related to Conditions 4–7 in Ministerial Statement 990, and are addressed in separate implementation sections of the EMMP (see Section 3). Each of the condition environmental objectives for seagrass wrack management, sediment movement and the harbour entrance channel are intended to be protective of the EPA environmental factors (and corresponding environmental objectives, EPA 2021b) described in Section 2.2. The risk-based management actions (see Sections 3.1.2, 3.2.2 and 3.3.2) and the reviewed and revised management actions (see Sections 3.1.5, 3.2.5 and 3.3.5) have been developed in accordance with the mitigation hierarchy (avoid, minimise, rehabilitate, offset; as per Section 6.3.2 of EAG17; EPA 2015) to ensure the condition environmental objectives (and the EPA environmental objectives) can be met (Section 2.4.5). DoT recognises that there is some overlap of the monitoring and management actions between the three components, but for completeness, they are repeated in the individual component sections in Section 3 to ensure that it is clear how the condition environmental objective for each component (and ultimately the EPA environmental objective for each key environmental factor) will be met.

There are potential impacts on the environment due to the presence of the Port Geographe coastal structures development. DoT also recognises that completing maintenance works to alleviate these environmental impacts also has the potential to affect the environment. Therefore, it is proposed that monitoring and management under the EMMP is implemented through a staged approach. This will allow for adequate consideration of the causal factors and determination of the most appropriate management responses. The first stage involves routine monitoring and management to determine the performance of the reconfigured coastal structures in enhancing natural coastal processes, and the need to complete maintenance works based on the results of the monitoring. The second stage of monitoring and management is required when maintenance works are deemed necessary, and it will focus on the potential impact on the environment during the maintenance works.

Prior to the start of any maintenance works, an EMP specific to the type of maintenance is required based on monitoring and management detailed in this EMMP. This will include the current monitoring and management requirements, but will also be amended, if necessary, to include additional requirements if future sampling or reviews indicate environmental or social issues that have not been previously identified.

2.4.5 Rationale for choice of management actions

The management targets and management actions identified in the following sections of the EMMP have been developed based on the mitigation hierarchy (avoid, minimise, rehabilitate, offset; EPA 2015), and detailed reviews of the various baseline studies, modelling studies, and environmental, metocean, and engineering investigations completed for the Port Geographe development over a number of years (Section 2.4.1). Previous dredging, bypassing and nourishment campaigns completed at Port Geographe informed the various management targets for seagrass wrack management, sediment movement, and maintenance of the harbour entrance channel. For each of these campaigns, the close-out reports, results of environmental monitoring, and subsequent recommendations were reviewed to assist with developing the most appropriate management targets and management actions to ensure the impact on the environment from the presence of the Port Geographe coastal structures and any required maintenance works is firstly avoided, and then minimised as far as practicable.

The staged management approach presented in Section 2.4.4 and the monitoring and management actions outlined in the EMMP are considered to be consistent with DoT's Maintenance Dredging Environmental Management Framework (EMF; BMT 2023, Annex B) which applies to DoT's ongoing state-wide maintenance dredging program. Previous revisions of the EMF has been regularly reviewed,

revised, and provided to environmental regulatory authorities (such as Department of Biodiversity, Conservation and Attractions and Department of Water and Environmental Regulation [DWER]). The EMF has previously been acknowledged by DWER as a reasonable management framework for managing the maintenance works being completed at Port Geographe from 2013–2016 prior to the development and implementation of this EMMP (letter dated 8/10/14; reference: ST07-2013-0007).

DoT has had a long association with the Port Geographe development and its environmental issues, and has been responsible for coastal management works since 2009. Based on that experience, previous studies, and the anticipated short-term duration and small-scale nature of the anticipated maintenance works, the choice of management actions and targets are considered to be appropriate to minimise and mitigate any environmental impacts, and ensure effective and efficient environmental management in order to achieve the environmental objectives stated in Section 2.2.

3 Implementation of the EMMP

3.1 Seagrass wrack management

Seagrass wrack is deposited on Geographe Bay beaches and is transported naturally alongshore. The reconfigured Port Geographe coastal structures aim to enhance this natural transport of wrack alongshore. If wrack accumulates in large quantities against the coastal structures, the degradation of this material can release H₂S and affect beach amenity and air quality. Management of wrack at Port Geographe may involve mechanical bypassing of material from the western side to the eastern side of the Port Geographe coastal structures.

3.1.1 Condition environmental objective

Minimise the impact on the environment and human health due to trapped seagrass wrack.

3.1.2 Management actions

Risk-based management actions (Table 3.1) have been identified and prioritised to achieve the condition environmental objective stated above (Section 3.1.1), and the EPA's environmental objectives (Section 2.2). These management actions focus the greatest management effort on minimising large accumulations of wrack on the Western Beach and reducing the impacts on seagrass meadows if maintenance works (mechanical bypassing and offshore disposal) are required. These management actions were specifically developed to minimise the impact on the environment and human health due to trapped seagrass wrack. The management actions assist with achieving the EPA's environmental objectives outlined in Section 2.2 by:

- ensuring littoral transport is not interrupted by monitoring coastal conditions and completing maintenance works (key environmental factor: coastal processes)
- removing large accumulations of wrack on the coast that generate harmful levels of H₂S (key environmental factor: air quality, social surroundings, human health)
- completing environmental monitoring of water quality for the maintenance works (key environmental factor: marine environmental quality)
- completing environmental monitoring of turbidity during maintenance works to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats)
- completing environmental monitoring of seagrass meadows for the maintenance works (when disposing offshore) to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats).

These management actions will be implemented by DoT for the Port Geographe development.

Table 3.1 Risk-based management actions that will be implemented to meet the condition environmental objective relating to seagrass wrack management

Environmental factor	Environmental objective	Impacts	Management actions	Risk-based priority	Timing
Coastal processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected	Interrupted littoral transport and accumulation of wrack	Implement coastal monitoring program (Table 3.3)	Medium, adverse impact	All project phases
Air quality/Social surroundings/Human health	To maintain air quality and minimise emissions so that environmental values are protected To protect social surroundings from significant harm To protect human health from significant harm	Increased H ₂ S levels from accumulated wrack	Monitor H ₂ S levels	Medium, adverse impact	Annually, Autumn to Spring
Marine environmental quality	To maintain the quality of water, sediment and biota so that the environmental values are protected	Reduced water clarity due to suspended sediment and wrack	Complete maintenance works in accordance with an Environmental Management Plan Complete turbidity monitoring (nearshore & offshore dredging/disposal)	Low, adverse impact	During maintenance works (nearshore and offshore dredging/disposal)

Environmental factor	Environmental objective	Impacts	Management actions	Risk-based priority	Timing
Benthic communities and habitat	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained	Smothering/reduced water clarity to nearby seagrass meadows during maintenance works (with offshore disposal)	<p>Complete maintenance works in accordance with an Environmental Management Plan</p> <p>Complete turbidity monitoring (nearshore & offshore dredging/disposal)</p> <p>Complete seagrass meadow monitoring (offshore dredging/disposal)</p>	Low, adverse impact	Before, during, and after maintenance works (offshore dredging/disposal)

Notes:

1. H2S = hydrogen sulphide.
2. Environmental objectives as defined in EPA (2021b).

3.1.3 Management targets

A number of management targets will be employed to measure and report against achievement of the condition environmental objective (Table 3.2). The outcomes of the Port Geographe capital dredging and breakwater reconfiguration project and previous wrack bypassing campaigns (Section 2.4) have informed the specific management targets.

Table 3.2 Management targets to measure the efficacy of management actions related to the seagrass wrack management condition environmental objective

Condition environmental objective	Minimise the impact on the environment and human health due to trapped seagrass wrack
Management target #1	Maintain natural beachfront wrack dynamics by ensuring less than 60 000 m ³ of wrack is on the Western Beach by December each year
Management target #2	24-hour average H ₂ S concentrations adjacent to the Western Beach do not exceed Department of Health guidelines of 0.1 ppm
Management target #3	Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)
Management target #4	No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)

Note:

1. H₂S = hydrogen sulfide gas, ppm = parts per million.

3.1.4 Monitoring

The purpose of the monitoring program is to inform, through the management targets, if the condition environmental objective is being achieved and when management actions will have to be reviewed and revised. This section describes how DoT will complete routine monitoring to assess the performance of the Port Geographe coastal structures in promoting natural wrack dynamics, and also the monitoring that will be completed during maintenance works (if required) to determine whether the management targets are achieved.

Routine monitoring

Routine monitoring tasks will be completed by DoT. DoT will implement a routine coastal monitoring program that will involve collecting, analysing and interpreting a number of coastal datasets over various timeframes (Table 3.3). Routine H₂S monitoring will be completed between Autumn and Spring adjacent to the Western Beach (Table 3.3).

Table 3.3 Routine monitoring to measure the efficacy of management actions against the management targets for seagrass wrack management

Parameter	Method	Location	Frequency
Seagrass wrack accumulation	Aerial photography	Western Beach (Freycinet Drive to Guerin Street)	At least once between Autumn and Spring each year
	Site inspections by coastal technical advisor and photo monitoring		Approximately monthly, Autumn to Spring

Parameter	Method	Location	Frequency
	Hydrographic and/or topographic surveys		Three times per year
Hydrogen sulfide (H ₂ S) generation	H ₂ S monitoring using in situ measuring and data logging device	Adjacent to Western Beach	Annually, Autumn to Spring

If the results of the routine monitoring indicate that the relevant management targets have not been met, then maintenance works (mechanical wrack bypassing) will likely be completed (as outlined in Section 2.1.1).

During-works monitoring

Monitoring during maintenance works will be completed in accordance with the methods in Table 3.4 and described in detail in an EMP. Monitoring will focus on the key issues of water column turbidity, smothering and reduction of light for seagrass meadows, and H₂S generation. The EMP will also consider other environmental management measures to further reduce the impact of the works on the environment as per the EMF (BMT 2023, Annex B).

Weekly environmental monitoring checklists will be prepared during the maintenance works to identify any environmental issues, assess conformance with the EMP, and communicate any issues with collection of environmental monitoring data. Results of the during-works monitoring are reviewed frequently to determine whether there is any need to review and revise the management actions as per Section 3.1.5.

Table 3.4 During-works monitoring to measure the efficacy of management actions against the management targets for seagrass wrack management

Parameter	Method	Location	Frequency
Water column turbidity	Site photographs	Dredging and disposal areas	Daily during works
	Plume sketches ¹		Daily during works
	Aerial photography		Once during works
	Water quality monitoring (NTU)	Impact sites in seagrass meadow adjacent to offshore disposal area and reference sites	Weekly during works
Seagrass meadow edge ²	Multi-beam surveys and/or towed video surveys	Seagrass meadow edge adjacent to offshore disposal area	Before and after offshore disposal
Hydrogen sulfide (H ₂ S) generation ³	H ₂ S monitoring using in situ measuring and data logging device	Adjacent to Western Beach	Daily during works

Notes:

1. See Annex C for an example plume sketch template.
2. If offshore dredging/disposal is undertaken, the seagrass meadow edge position will be monitored at 2–4 locations outside of the predicted zone of influence of the offshore disposal area. The monitoring sites will likely be to the west of Port Geographe (Figure 2.2).
3. Odour monitoring will be required if wrack is expected to be present in the material to be bypassed and monitoring will be completed. Odour monitoring during maintenance works will be completed using 1 odour logger adjacent to the Western Beach on a continuous basis. This area is considered to pose the highest risk for potential odour issues.

3.1.5 Review and revision of management actions

Where the management target(s) are not met or exceeded, DoT will review and revise the risk assessment and management actions and potentially identify additional management actions in accordance with the mitigation hierarchy (avoid, minimise, rehabilitate, offset; as per Section 6.3.2 of EAG17; EPA 2015), where necessary. During this process, the risks, key impacts, and associated management actions for seagrass wrack management will be reviewed and revised. The following are examples of revised and additional management actions for each of the impacts listed in Table 3.1:

1. Interrupted littoral transport and accumulation of wrack
 - i. Increase frequency of coastal monitoring program
 - ii. Revise coastal monitoring program
 - iii. Revise method/frequency/timing of maintenance works to reduce accumulated wrack volumes
 - iv. Issue community notice and install appropriate warning signs regarding conditions.
2. Increased H₂S levels from accumulation of wrack
 - i. Push seagrass wrack to the back of the beach as far as practicable to reduce potential for H₂S generation
 - ii. Revise H₂S monitoring program
 - iii. Issue community notice and install appropriate warning signs regarding potential odour issues.
3. Smothering or reduction of light penetration on nearby seagrass meadows during maintenance works (with offshore disposal)
 - i. Revise dredging and/or disposal methods and/or locations
 - ii. Consider seagrass shoot density monitoring adjacent to offshore disposal area (and at reference sites) in consultation with the DWER
 - iii. Seagrass meadow edge monitoring after end of maintenance works.

Reviewed and revised management actions will be implemented by DoT to mitigate and manage any impacts so that the management targets and the condition environmental objective for seagrass wrack management are met.

3.1.6 Reporting

Annual reporting

The annual Statement of Compliance, required to be submitted by DoT to fulfil Condition 3-6 of Ministerial Statement 990, will state whether the condition environmental objective for seagrass wrack management has been met (Table 3.5). In the event that the condition environmental objective is not achieved during the reporting period, the Statement of Compliance will include a description of the effectiveness of revised and/or additional management actions implemented by DoT and an analysis of the trends from the monitoring results.

The annual Statement of Compliance will be submitted by 26 February each year in accordance with Condition 3-6 of Ministerial Statement 990.

Table 3.5 EMMP reporting table for condition environmental objective relating to seagrass wrack management

Key environmental factors: Coastal processes, marine environmental quality, benthic communities and habitat, air quality, social surroundings and human health (Ministerial Statement 990, Conditions 5-1, 6, 7)		
Management targets for seagrass wrack management	Reporting on the management target	Status
Management target #1: Maintain natural beachfront wrack dynamics by ensuring less than 60 000 m ³ of wrack is on the Western Beach by December each year	Natural beachfront wrack dynamics were/were not maintained	<p>■ YES</p> <p>■ NO</p>
Management target #2: 24-hour average H ₂ S concentrations adjacent to the Western Beach do not exceed Department of Health guidelines of 0.1 ppm	Department of Health H ₂ S 24-hour average guidelines were/were not exceeded	<p>■ YES</p> <p>■ NO</p>
Management target #3: Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)	Weekly median NTU at impact sites did/did not exceed the 80 th percentile of the reference sites for two consecutive weeks	<p>■ YES</p> <p>■ NO</p>
Management target #4: No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)	Seagrass meadow edge position did/did not change beyond natural variability	<p>■ YES</p> <p>■ NO</p>

Notes:

- The status of achievement of the condition environmental objective is indicated by the following symbols: ■ = achieved ■ = not achieved.
- H₂S = hydrogen sulphide; ppm = parts per million.

Reporting on exceedances of management targets

If a management target related to seagrass wrack management is exceeded (or not met), the CEO of DWER will be notified within ten days of identification of the exceedance. An investigation report will be prepared that describes the investigation into the exceedance and the corrective management actions in accordance with Condition 7-4 of Ministerial Statement 990.

3.2 Sediment movement

Alongshore sediment transport at Port Geographe is in a predominantly eastward direction. The reconfigured Port Geographe coastal structures aim to enhance this natural transport of sediment alongshore. If sediment accumulates in large quantities against coastal structures, it can indicate an interruption to natural sediment transport processes and result in erosion of downdrift beaches. Management of sediment at Port Geographe may involve mechanical bypassing of material from the western side to the eastern side of the development (see Section 2.1.2) to avoid/remediate erosion on downdrift Wonnerup Beach.

3.2.1 Condition environmental objective

Minimise the impact on the environment and coastal processes due to interruption to sediment movement by the reconfigured coastal structures.

3.2.2 Management actions

Risk-based management actions (Table 3.6) have been identified and prioritised to achieve the condition environmental objective stated above (Section 3.2.1), and the EPA's environmental objectives (Section 2.2). These management actions focus the greatest management effort on minimising project attributable erosion in the PGCMA and reducing the impacts on seagrass meadows if maintenance works (mechanical bypassing and offshore dredging/disposal, and/or nourishment) are required. These management actions were specifically developed to minimise the impact on the environment and coastal processes due to the interruption to sediment movement by the reconfigured coastal structures. The management actions assist with achieving the EPA's environmental objectives outlined in Section 2.2 by:

- ensuring littoral transport is not interrupted by monitoring coastal conditions and completing maintenance works (key environmental factor: coastal processes)
- completing environmental monitoring of water and sediment quality for the maintenance works (key environmental factor: marine environmental quality)
- completing environmental monitoring of turbidity during maintenance works to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats)
- completing environmental monitoring of seagrass meadows for the maintenance works (when dredging/disposing offshore) to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats).

These management actions will be implemented by DoT for the Port Geographe development.

Table 3.6 Risk-based management actions that will be implemented to meet the condition environmental objective relating to sediment movement

Environmental factor	Environmental objective	Impacts	Management actions	Risk-based priority	Timing
Coastal processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected	Project attributable erosion at Wonnerup Beach	Implement coastal monitoring program (Table 3.8)	Medium, adverse impact	All project phases
		Project attributable accretion at Western Beach	Implement coastal monitoring program (Table 3.8)	Low, adverse impact	All project phases
Marine environmental quality	To maintain the quality of water, sediment and biota so that the environmental values are protected	Reduced water clarity due to suspended sediment and wrack	Complete maintenance works in accordance with an Environmental Management Plan Complete turbidity monitoring (nearshore and offshore dredging/disposal)	Low, adverse impact	During maintenance works (nearshore and offshore dredging/disposal)
Benthic communities and habitat	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained	Smothering/reduced water clarity to nearby seagrass meadows during maintenance works (with offshore dredging/disposal)	Complete maintenance works in accordance with an Environmental Management Plan Complete turbidity monitoring (nearshore and offshore dredging/disposal) Complete seagrass meadow monitoring (when dredging)	Low, adverse impact	Before, during, and after maintenance works (offshore dredging/disposal)

Note:

1. Environmental objectives as defined in EPA (2021).

3.2.3 Management targets

A number of management targets will be employed to measure and report against achievement of the condition environmental objective (Table 3.7). The outcomes of the Port Geographe capital dredging and breakwater reconfiguration project and previous sediment bypassing campaigns (Section 2.4) have informed the specific management targets.

Table 3.7 Management targets to measure the efficacy of management actions related to the sediment movement condition environmental objective

Condition environmental objective	Minimise the impact on the environment and coastal processes due to interruption to sediment movement by the reconfigured coastal structures
Management target #1	Maintain natural alongshore sediment movement by ensuring less than 30 000 m ³ erosion within Wonnerup Beach (to the eastern extent of the Port Geographe Coastal Management Area) at the end of a rolling two-year period (when compared to the November 2014 survey)
Management target #2	Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)
Management target #3	No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)

3.2.4 Monitoring

The purpose of the monitoring program is to inform, through the management targets, if the condition environmental objective is being achieved and when management actions will have to be reviewed and revised. This section describes how DoT will complete routine monitoring to assess the performance of the Port Geographe coastal structures in promoting natural sediment transport, and also the monitoring that will be completed during maintenance works (if required) to determine whether the management targets are achieved.

Routine monitoring

Routine monitoring tasks will be completed by DoT. DoT will implement a routine coastal monitoring program that will involve collecting, analysing and interpreting a number of coastal datasets over various timeframes (Table 3.8). If the results of the routine monitoring indicate that the relevant management targets have not been met, then maintenance works (mechanical sand bypassing/nourishment) will likely be completed (as outlined in Section 2.1.2).

Table 3.8 Routine monitoring to measure the efficacy of management actions against the management targets for sediment movement

Parameter	Method	Location	Frequency
General beach condition	Site inspections by coastal technical advisor and photo monitoring	Beaches within and adjacent to PGCMA	~monthly, Autumn to Spring
	Aerial photography	PGCMA	At least once between Autumn and Spring each year

Parameter	Method	Location	Frequency
Beach face and nearshore seabed elevations	Hydrographic and/or topographic surveys	PGCMA and surrounds (large-scale)	Annually (November or December)
		PGCMA (small-scale)	Biannually (in addition to large-scale survey)
Natural sediment transport volumes	Analysis of changes in hydrographic and/or topographic survey data	PGCMA	Annually
Sediment contaminant status	Sediment sampling and analysis as per DoT's Maintenance Dredging Environmental Management Framework (BMT 2023, Annex B)	Proposed sand bypassing area on Western Beach	Every five years (or prior to maintenance works if period between works is greater than five years)

Note:

1. PGCMA = Port Geographe Coastal Management Area; DoT = Department of Transport.

During-works monitoring

Monitoring during maintenance works will be completed in accordance with the methods in Table 3.9 and described in detail in EMP. Monitoring will focus on the key issues of water column turbidity, and smothering and reduction of light for seagrass meadows. The EMP will also consider other environmental management measures to further reduce the impact of the works on the environment as per the EMF (BMT 2023; Annex B).

Weekly environmental monitoring checklists will be prepared during the maintenance works to identify any environmental issues, assess conformance with the EMP, and communicate any issues with collection of environmental monitoring data. Results of the during-works monitoring tasks are reviewed frequently to determine whether there is any need to review and revise the management actions as per Section 3.2.5 below.

Table 3.9 During-works monitoring to measure the efficacy of management actions against the management targets for sediment movement

Parameter	Method	Location	Frequency
Water column turbidity	Site photographs	Dredging and disposal site	Daily during works
	Plume sketches ¹		Daily during works
	Aerial photographs		Once during works
	Water quality monitoring (NTU)	Impact sites in seagrass meadow adjacent to offshore disposal area and reference sites	Weekly during works
Seagrass meadow edge ²	Multi-beam surveys and/or towed video surveys	Seagrass meadow edge adjacent to offshore disposal area	Before and after offshore dredging/disposal
Hydrogen sulfide (H ₂ S) generation ³	H ₂ S monitoring using in situ measuring and data logging device	Adjacent to Western Beach	Daily during works (if required)

Notes:

1. See Annex C for an example plume sketch template.
2. If offshore dredging/disposal is undertaken, the seagrass meadow edge position will be monitored at 2–4 locations outside of the predicted zone of influence of the offshore disposal area. The monitoring sites will likely be to the west of Port Geographe (Figure 2.2).
3. Odour monitoring will be required if wrack is expected to be present in the material to be bypassed and monitoring will be completed. Odour monitoring during maintenance works will be completed using 1 odour logger adjacent to the Western Beach on a continuous basis. This area is considered to pose the highest risk for potential odour issues.

3.2.5 Review and revision of management actions

Where the management target(s) are not met or exceeded, DoT will review and revise the risk assessment and management actions and potentially identify additional management actions in accordance with the mitigation hierarchy (avoid, minimise, rehabilitate, offset; as per Section 6.3.2 of EAG17; EPA 2015), where necessary. During this process, the risks, key impacts, and associated management actions for sediment movement will be reviewed and revised. The following are examples of revised and additional management actions for each of the impacts listed in Table 3.6.

1. Project attributable erosion at Wonnerup Beach
 - i. Increase frequency of coastal monitoring program
 - ii. Revise coastal monitoring program
 - iii. Revise method/frequency/timing of sediment management works to minimise erosion impacts
2. Project attributable accretion at Western Beach
 - i. Increase frequency of coastal monitoring program
 - ii. Revise coastal monitoring program
 - iii. Revise method/frequency/timing of sediment management works to minimise accretion impacts
3. Smothering or reduction of light penetration on nearby seagrass meadows during maintenance works (with offshore dredging/disposal)
 - i. Revise dredging and/or disposal methods and/or locations
 - ii. Consider seagrass shoot density monitoring adjacent to offshore disposal area (and at reference sites) in consultation with DWER
 - iii. Seagrass meadow monitoring after end of maintenance works.

Reviewed and revised management actions will be implemented by DoT to mitigate and manage any impacts so that the management targets and the condition environmental objective for sediment movement are met.

3.2.6 Reporting

Annual reporting

The annual Statement of Compliance, required to be submitted by DoT to fulfil Condition 3-6 of Ministerial Statement 990 will state whether the condition environmental objective for sediment movement has been met (Table 3.10). In the event that the condition environmental objective is not achieved during the reporting period, the Statement of Compliance will include a description of the effectiveness of revised and/or additional management actions implemented by DoT and an analysis of the trends from the monitoring results.

The Statement of Compliance will be submitted annually by the 26 February in accordance with Condition 3-6 of Ministerial Statement 990.

Table 3.10 EMMP reporting table for condition environmental objective relating to sediment movement

Key environmental factors: Coastal processes, marine environmental quality and benthic communities and habitat (Ministerial Statement 990, Conditions 4–7)		
Management targets for sediment movement	Reporting on the management target	Status ¹
Management target #1: Maintain natural alongshore sediment movement by ensuring less than 30 000 m ³ erosion within Wonnerup Beach (to the eastern extent of the Port Geographe Coastal Management Area) at the end of a rolling a two-year period (when compared to the November 2014 survey)	Natural alongshore sediment transport was/was not maintained	<p>■ YES</p> <p>■ NO</p>
Management target #2: Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)	Weekly median NTU at impact sites did/did not exceed the 80 th percentile of the reference sites for two consecutive weeks	<p>■ YES</p> <p>■ NO</p>
Management target #3: No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)	Seagrass meadow edge position did/did not change beyond natural variability	<p>■ YES</p> <p>■ NO</p>

Note:

- The status of achievement of the condition environmental objective is indicated by the following symbols: ■ = achieved, ■ = not achieved.

Reporting on exceedances of management targets

If a management target related to sediment movement is exceeded (or not met), the CEO of DWER will be notified within ten days of identification of the exceedance. An investigation report will be prepared that describes the investigation into the exceedance and the corrective management actions in accordance with Condition 7-4 of Ministerial Statement 990.

3.3 Harbour entrance channel

Maintaining the cross-sectional area of the Port Geographe harbour entrance channel will ensure that water exchange between Geographe Bay and the artificial waterways and canals is not restricted. Any substantial restriction of the cross-sectional area of the harbour entrance channel as a result of sand and seagrass wrack accumulation may need to be managed through maintenance dredging campaigns.

3.3.1 Condition environmental objective

Minimise the impact on the environment due to the restricted exchange of water through the harbour entrance channel.

3.3.2 Management actions

Risk-based management actions (Table 3.11) have been identified and prioritised to achieve the condition environmental objective stated above (Section 3.3.1), and the EPA's environmental objectives (Section 2.2). These management actions focus the greatest management effort on minimising restricted exchange of water through the harbour entrance channel and reducing the impacts on seagrass

meadows if maintenance works (maintenance dredging and offshore disposal) are required. These management actions were specifically developed to minimise the impact on the environment due to the restricted exchange of water through the harbour entrance channel. The management actions assist with achieving the EPA's environmental objectives outlined in Section 2.2 by:

- ensuring harbour entrance channel is not restricted by monitoring channel depths and completing maintenance dredging works (key environmental factor: marine environmental quality)
- completing environmental monitoring of water and sediment quality for the maintenance works (key environmental factor: marine environmental quality)
- completing environmental monitoring of turbidity during maintenance works to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats)
- completing environmental monitoring of seagrass meadows for maintenance works (when disposing offshore) to avoid and minimise impacts to seagrass (key environmental factor: benthic communities and habitats).

These management actions will be implemented by DoT for the Port Geographe development.

Table 3.11 Risk-based management actions that will be implemented to meet the condition environmental objective relating to the harbour entrance channel

Environmental factor	Environmental objective ¹	Impacts	Management actions	Risk-based priority	Timing
Marine environmental quality	To maintain the quality of water, sediment and biota so that the environmental values are protected.	Restricted flushing and water circulation leading to poor water quality	Implement coastal monitoring program (Table 3.13)	Medium, adverse impact	All project phases
		Reduced water clarity due to suspended sediment and wrack	Complete maintenance works in accordance with an Environmental Management Plan Complete turbidity monitoring (nearshore and offshore disposal)	Low, adverse impact	During maintenance works (nearshore and offshore disposal)
Benthic communities and habitat	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained	Smothering/reduced water clarity to nearby seagrass meadows during maintenance works (with offshore disposal)	Complete maintenance works in accordance with an Environmental Management Plan Complete turbidity monitoring (nearshore and offshore disposal) Complete seagrass meadow monitoring (offshore disposal)	Low, adverse impact	Before, during, and after maintenance works (offshore disposal)

Note:

1. Environmental objectives as defined in EPA (2021b).

3.3.3 Management targets

A number of management targets will be employed to measure and report against achievement of the condition environmental objective (Table 3.12). The outcomes of the Port Geographe capital dredging and breakwater reconfiguration project, previous maintenance dredging campaigns and research completed by UWA on water exchange through the entrance channel (Pattiaratchi & Wijeratne 2016, Section 2.4.1) have informed the specific management targets.

Table 3.12 Management targets to measure the efficacy of management actions relative to the harbour entrance channel condition environmental objective

Condition environmental objective	Minimise the impact on the environment due to the restricted exchange of water through the harbour entrance channel
Management target #1	Maintain cross sectional area of harbour entrance channel (below mean sea level) to no less than 120 m ² for two consecutive surveys.
Management target #2	Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)
Management target #3	No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)

3.3.4 Monitoring

The purpose of the monitoring program is to inform, through the management targets, if the condition environmental objective is being achieved and when management actions will have to be reviewed and revised. This section describes how DoT will complete routine monitoring to assess the performance of the Port Geographe coastal structures in maintaining the functionality of the harbour entrance channel, and also the monitoring that will be completed during the maintenance works (if required) to determine whether the management targets are achieved.

Routine monitoring

Routine monitoring tasks will be completed by DoT. DoT will implement a routine coastal monitoring program that will involve collecting, analysing and interpreting a number of coastal datasets over various timeframes (Table 3.13). If the results of the routine monitoring indicate that the relevant management targets have not been met, then maintenance works (maintenance dredging) will likely be completed (as outlined in Section 2.1.3).

Table 3.13 Routine monitoring to measure the efficacy of management actions against the management targets for the harbour entrance channel

Parameter	Method	Location	Frequency
Harbour entrance channel sand/wrack accumulation	Site inspections by coastal technical advisor and photo monitoring	Harbour entrance channel	Approximately monthly, Autumn to Spring
Harbour entrance channel cross-sectional area	Hydrographic surveys	Harbour entrance channel	Three times per year

Parameter	Method	Location	Frequency
General water quality	Visual observations during site inspections	Harbour entrance channel and adjacent coastal waters	Approximately monthly, Autumn to Spring
Sediment/wrack contaminant status	Sediment sampling and analysis as per DoT's ¹ Maintenance Dredging Environmental Management Framework (BMT 2020, Annex B)	Proposed dredging areas in harbour entrance channel	Every five years (or prior to dredging campaign if period between works is greater than five years)

Note:

1. DoT = Department of Transport.

During-works monitoring

Monitoring during maintenance works will be completed in accordance with the methods in Table 3.14 and described in detail in an EMP. Monitoring will focus on the key issues of water column turbidity, smothering and reduction of light for seagrass meadows, and H₂S generation. The EMP will also consider various other environmental management measures to further reduce the impact of the works on the environment as per the EMF (BMT 2023, Annex B).

Weekly environmental monitoring checklists will be prepared during the maintenance works to identify any environmental issues, assess conformance with the EMP and communicate any issues with collection of environmental monitoring data. Results of the during-works monitoring tasks are reviewed frequently to determine whether there is any need to review and revise the management actions as per Section 3.3.5 below.

Table 3.14 During-works monitoring to measure the efficacy of management actions against the management targets for the harbour entrance channel

Parameter	Method	Location	Frequency
Water column turbidity	Site photographs	Dredging and disposal site	Daily during works
	Plume sketches ¹		Daily during works
	Aerial photographs		Once during works
	Water quality monitoring (NTU)	Impact sites in seagrass meadow adjacent to offshore disposal area and reference sites	Weekly during works
Seagrass meadow edge ²	Multi-beam surveys and/or towed video	Seagrass meadow edge adjacent to offshore disposal area	Prior to and after offshore disposal
Hydrogen sulfide (H ₂ S) generation ³	H ₂ S monitoring using in situ measuring and data logging device	Adjacent to Western Beach	Daily during works (if wrack is expected to be present)

Notes:

1. See Annex C for an example plume sketch template.
2. If offshore dredging/disposal is undertaken, the seagrass meadow edge position will be monitored at 2–4 locations outside of the predicted zone of influence of the offshore disposal area. The monitoring sites will likely be to the west of Port Geographe (Figure 2.2).

Odour monitoring will be required if wrack is expected to be present in the material to be bypassed and monitoring will be completed. Odour monitoring during maintenance works will be completed using 1 odour logger adjacent to the Western Beach on a continuous basis. This area is considered to pose the highest risk for potential odour issues.

3.3.5 Review and revision of management actions

Where the management target(s) are not met or exceeded, DoT will review and revise the risk assessment and management actions and potentially identify additional management actions in accordance with the mitigation hierarchy (avoid, minimise, rehabilitate, offset; as per Section 6.3.2 of EAG17; EPA 2015), where necessary. During this process, the risks, key impacts, and associated management actions for maintaining the harbour entrance channel will be reviewed and revised. The following are examples of revised and additional management actions for each of the impacts listed in Table 3.11:

1. Restricted flushing and water circulation leading to poor water quality
 - i. Increase frequency of coastal monitoring program
 - ii. Revise coastal monitoring program
 - iii. Revise method/frequency/timing of maintenance works
 - iv. Modify dredging depth and areas to reduce risk/likelihood of sediment/wrack accumulation in harbour entrance channel
 - v. Modify management of Western Beach sediment accumulation to reduce transport of material into harbour entrance channel
2. Smothering or reduction of light penetration on nearby seagrass meadows during maintenance works (with offshore disposal)
 - i. Revise dredging and/or disposal methods and/or locations
 - ii. Consider seagrass shoot density monitoring adjacent to offshore disposal area (and at reference sites) in consultation with the DWER
 - iii. Seagrass meadow monitoring after end of maintenance works.

Reviewed and revised management actions will be implemented by DoT to mitigate and manage any impacts so that the management targets and the condition environmental objective for the harbour entrance channel are met.

3.3.6 Reporting

Annual reporting

The annual Statement of Compliance required to be submitted by DoT to fulfil Condition 3-6 of Ministerial Statement 990 will state whether the condition environmental objective for the harbour entrance channel has been met (Table 3.15). In the event that the condition environmental objective is not achieved during the reporting period, the Statement of Compliance will include a description of the effectiveness of revised and/or additional management actions implemented by DoT and an analysis of the trends from the monitoring results.

The annual Statement of Compliance will be submitted by 26 February each year in accordance with Condition 3-6 of Ministerial Statement 990.

Table 3.15 EMMP reporting table for condition environmental objective relating to the harbour entrance channel

Key environmental factors: marine environmental quality and benthic communities and habitat, (Ministerial Statement 990, Condition 6, 7)		
Management targets for sediment movement	Reporting on the management target	Status ¹
Management target #1: Maintain cross sectional area of harbour entrance channel (below mean sea level) to no less than 120 m ² for two consecutive surveys	Harbour entrance channel cross sectional area was/was not maintained	<p>■ YES</p> <p>■ NO</p>
Management target #2: Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)	Weekly median NTU at impact sites did/did not exceed the 80 th percentile of the reference sites for two consecutive weeks	<p>■ YES</p> <p>■ NO</p>
Management target #3: No change in position of seagrass meadow edge outside of the predicted zone of influence of the offshore disposal area beyond natural variability (if completing offshore disposal during maintenance works)	Seagrass meadow edge position did/did not change beyond natural variability	<p>■ YES</p> <p>■ NO</p>

Note:

- The status of achievement of the condition environmental objective is indicated by the following symbols: ■ = achieved, ■ = not achieved.

Reporting on exceedances of management targets

If a management target related to the harbour entrance channel is exceeded (or not met), the CEO of DWER will be notified within ten days of identification of the exceedance. An investigation report will be prepared that describes the investigation into the exceedance and the corrective management actions in accordance with Condition 7-4 of Ministerial Statement 990.

4 Adaptive Management and Reviews

DoT will implement adaptive management to learn from the monitoring and evaluation against management targets, and the implementation of revised management measures, to more effectively meet the three condition environmental objectives relating to seagrass wrack management, sediment movement, and the harbour entrance channel. The extent to which natural coastal processes will replicate the modelling results is likely to evolve as the coastal system adjusts to the reconfiguration and may vary from year to year in response to natural weather variability, and will require ongoing monitoring to establish whether natural wrack and sediment movement are enhanced by the reconfigured coastal structures.

Each year there will be natural variability in the coastal processes at Port Geographe. As a result, the interaction between natural sediment and seagrass wrack movement, and the reconfigured structures will change from year to year, requiring flexible and adaptive management approaches. The adaptive approach to be followed is described below:

- Systematic evaluation of routine monitoring data and comparison to benchmark data and modelling results on an annual basis to assist with:
 - assessing the proposal impacts and corresponding risk-based management actions
 - verifying whether responses to the proposal impacts are similar to modelled predictions
 - assessing the need to modify the November 2014 initial benchmark survey due to equilibration of the coast to reconfigured coastal structures and/or larger scale coastal changes (for example climate change and sea level rise).
- An increased understanding of the sediment and wrack transport dynamics and entrance channel flushing characteristics will arise from routine monitoring results and further data collection and research by DoT. This will assist with reducing the various assumptions and uncertainties listed in Section 2.4.3, and for planning and refining maintenance works.
- Management measures will be considered in EMPs to address unforeseen circumstances such as public complaints or environmental incidents such as hydrocarbon spills etc.
- Any environmental issues and recommendations arising from the close-out reports from maintenance works will be reviewed in detail to improve management of future campaigns.
- In accordance with Condition 7-6 of Ministerial Statement 990, the EMMP will be reviewed annually, or as directed by the CEO of DWER, and revised by DoT where required. In accordance with Condition 7 7 of Ministerial Statement 990, DoT will implement the approved revisions of the EMMP until advised otherwise by the CEO of DWER.
- The annual review of the EMMP and preparation of the annual Statement of Compliance will assess the effectiveness of the management targets, management actions and general performance of the EMMP to identify the need to revise the management approach.
- Amendments to the EMMP will also ensure best practice methods continue to be applied as knowledge, technology and requirements change. This may include amended or new environmental policies, new environmental guidelines, improved environmental understanding and outcomes following the annual Statement of Compliance reporting. Amendments to the EMMP are documented in Annex D.
- The EMMP references a number of appendices, external management plans and environmental frameworks (e.g. BMT 2021; Annex B). Any changes to these documents that may require subsequent changes to this document will be incorporated into the annual review of the EMMP.

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- DoT may review the frequency and methods of the monitoring and maintenance programs outlined in this EMMP (to the approval of the CEO of DWER) if the reconfigured coastal structures are shown to be effective in minimising the impacts to the environment from trapped wrack, the harbour entrance channel is flushing naturally and natural shoreline equilibrium is achieved on the Western Beach and Wonnerup Beach.
- As outlined in DoT's approved Compliance Assessment Plan for Ministerial Statement 990 (BMT Oceanica 2015b), and in accordance with the EPA's Post Assessment Guideline 2 (EPA 2012a), the life of the proposal for the Port Geographe project was expected to extend to 2020, however; this was subject to demonstration that natural coastal processes have been reinstated at Port Geographe with minimal project attributable impacts, which has not been realised. The need to continue implementation of this EMMP will be reviewed on an ongoing basis and, in discussion with the CEO of DWER.

5 Stakeholder Consultation

The Port Geographe capital dredging and breakwater reconfiguration project has involved extensive and ongoing stakeholder consultation with community, industry and government since 2004. DoT has consulted with stakeholders while developing this EMMP to ensure consistency with the EPA's expectations on the principles of the environmental impact assessment process. This section provides a summary of consultation that has occurred for the Port Geographe project, which has involved extensive and ongoing stakeholder engagement with community, industry and government since 2004. The comments raised during consultations with stakeholders were considered in the development of the EMMP (Table 5.1).

DoT will ensure the EMMP is made publicly available via DoT's website in accordance with EPA (2012b) and within 28 days of its approval by the CEO to fulfil Condition 7-8.

DoT will consult with relevant stakeholders including the City of Busselton and community representatives prior to and during each management activity, as appropriate.

Table 5.1 Stakeholder consultation, comments and responses to the Port Geographe Environmental Monitoring and Management Plan

Organisation	Type of consultation & date	Stakeholder comments ¹	DoT response to comments
Port Geographe Community Consultation Forum	Regular meetings since 2009	<p>Wonnerup Beach should remain a priority for replenishment and protection</p> <p>Beach amenity is important to the community</p> <p>Reduced levels of Hydrogen sulfide (H₂S) from trapped seagrass remains a community priority</p> <p>Entrance channel needs to remain navigable</p>	Noted; and all elements addressed in this EMMP (Section 3)
City of Busselton (CoB)	Meeting in April 2015	<p>Protection of coastal infrastructure is essential</p> <p>Desire for community input into EMMP management measures</p> <p>CoB to integrate new lagoon area into bacterial sampling program</p>	<p>Coastal protection is integral part of the EMMP sediment management and beach nourishment(Section 3.2)</p> <p>EMMP will be released for public comment and consultation</p> <p>Noted; EMMP does not need to include bacterial sampling program in the new lagoon area</p>
General public and stakeholders	Ongoing via dedicated email inbox and project phone line	<p>Wonnerup Beach sand nourishment required to protect infrastructure</p> <p>Protect Wonnerup foreshore vegetation</p>	<p>Coastal protection is integral part of the EMMP sediment management and beach nourishment (Section 3.2)</p> <p>Vegetation will be managed primarily as per EMPs (Section 2.4.4)</p>

Organisation	Type of consultation & date	Stakeholder comments ¹	DoT response to comments
		Post-reconfiguration coastal maintenance works on the Western Beach should be minimal	Noted; need for works will be carefully considered (Section 2.1.2)
General public and stakeholders	Consultation on Draft EMMP	No works should be undertaken to bypass sand from the Western Beach to Wonnerup Beach.	Clarification provided in EMMP as to when bypassing sand from Western Beach may be necessary (Section 2.1.2).
		Alternate sand sources i.e. offshore sand bars and estuary inlet sand sources should be defined within the EMMP as possible sand sources.	Clarification provided in EMMP detailing the consideration of alternative sources of nourishment material (Section 2.1.2).
		There should be no pumping or pushing of seagrass wrack off the Western Beach from December onwards.	Clarification provided in EMMP detailing the timing of wrack management, including the contingency measures that may be required if the management targets are not met (Section 2.1.1).
		Future wrack and sand management works (mechanical intervention) in the PGCMA should be minimised and only undertaken when necessary.	The management targets within the EMMP have been carefully considered and developed to avoid unnecessary mechanical (human) intervention whilst meeting the environmental objectives.
		Volume management targets for future wrack and sand management works (mechanical intervention) in the PGCMA should be lowered.	The monitoring tasks and the management targets within the EMMP have been carefully considered and developed to allow for necessary mechanical (human) intervention to meet the environmental objectives.
		The PGCMA in which the EMMP is applicable should be aligned to management areas associated with the original development (under Ministerial Statement 391), thereby limiting the area of potential works and associated costs.	A PGCMA was established as part of Ministerial Statement 990 which replaces and supersedes all previous conditions and commitments under Ministerial Statement 391. It is a regulatory requirement and is considered appropriate for the implementation of the Port Geographe Reconfiguration Project to ensure any potential project attributable impacts can be appropriately managed.

Notes:

1. The stakeholder comments listed here are a summary of the key comments received by DoT that are directly relevant to the EMMP.
2. DoT = Department of Transport; H₂S = hydrogen sulfide gas; EMMP = Environmental Monitoring and Management Plan; EMP = Environmental Management Plan.

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Annex A Ministerial Statement 990: Port Geographe Development Coastal Structures



Hon Albert Jacob MLA
Minister for Environment; Heritage

Statement No: 990

**STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL
(PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE
ENVIRONMENTAL PROTECTION ACT 1986)**

**PORT GEOGRAPHE DEVELOPMENT COASTAL STRUCTURES
CITY OF BUSSELTON**

Proposal: The proposal is for the construction of coastal structures to establish a harbour entrance to the Port Geographe Development with reduced trapping of seagrass wrack, 3 kilometres east of the town of Busselton.

The key components of the Proposal are further documented in Schedule 1.

Proponent: Minister for Transport

Proponent Address: 13th Floor, Dumas House, 2 Havelock Street, WEST PERTH WA 6005

Assessment Number: 1977

Previous Assessment Number: 936

Report of the Environmental Protection Authority: 1509

Previous Report Number: 783

Previous Ministerial Statement Number: 391

The implementation of the proposal to which the above report of the Environmental Protection Authority relate is subject to the following conditions and procedures, which replace and supersede all previous conditions and commitments of Statement 391.

Published on:

1 Proposal Implementation

- 1-1 The proponent shall implement the proposal as documented and described in Schedule 1 of this statement subject to the implementation conditions and procedures of this statement.

2 Proponent Nomination and Contact Details

- 2-1 The proponent shall notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within 28 days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

3 Compliance Reporting

- 3-1 At least six calendar months prior to the first Statement of Compliance required pursuant to Condition 3-6 the proponent shall:
- (1) prepare a Compliance Assessment Plan in accordance with the OEPA's Post Assessment Guideline for Preparing a Compliance Assessment Plan, as amended from time to time and to the approval of the CEO; and
 - (2) submit the Compliance Assessment Plan required pursuant to Condition 3-1(1) to the CEO.
- 3-2 The proponent shall revise the approved Compliance Assessment Plan in accordance with the OEPA's Post Assessment Guideline for Preparing a Compliance Assessment Plan, as amended from time to time, and submit the revised Compliance Assessment Plan to the approval of the CEO.
- 3-3 The proponent shall assess compliance in accordance with the approved Compliance Assessment Plan.
- 3-4 The proponent shall collect and maintain information and documentation in accordance with the approved Compliance Assessment Plan.
- 3-5 The proponent shall advise the CEO of any non-compliance or potential non-compliance within seven days of such awareness.
- 3-6 The proponent shall prepare a Statement of Compliance for each consecutive 12 month period commencing on the date of the Statement and submit each Statement of Compliance to the CEO no later than three months following the end of each 12 month period it addresses.
- 3-7 The proponent shall ensure that each Statement of Compliance is made available to the public in accordance with the approved Compliance Assessment Plan and within twenty eight days of its submission pursuant to Condition 3-6.

3-8 The proponent shall ensure that each Statement of Compliance:

- (1) indicates the extent to which the proponent has complied with the implementation conditions contained in this Statement in the preceding twelve month period;
- (2) is prepared using the OEPA's Post Assessment Form for a Statement of Compliance, as amended from time to time;
- (3) provides all information required by the OEPA's Post Assessment Form for a Statement of Compliance, as amended from time to time; and
- (4) is signed by the proponent, if the proponent is an individual, or a person who is a director or the director's delegate, if the proponent is a public body, company or association or body of persons, corporate or unincorporated.

3-9 The CEO has the discretion to, by notice in writing:

- (1) require the proponent to submit a Statement of Compliance more or less frequently than annually and alter the period addressed by the Statement of Compliance;
- (2) alter the due date of the Statement of Compliance;
- (3) prescribe the manner in which Statement of Compliance is made available to the public, should this be necessary; and
- (4) where a Statement of Compliance contains trade secrets or documentation that would reveal information of a commercial value, waive the requirement to make any of the Statement of Compliance, in part or wholly, publicly available, should this be requested by the proponent.

4 Foreshore

4-1 Where determined to be project attributable, the proponent shall maintain beach profiles on beaches east and west of the development, within the project area shown in Schedule 1, Figure 1, to the requirements of the CEO.

5 Sand Trap, Harbour Entrance Channel and Sand Bypass

5-1 The proponent shall, unless otherwise approved by the CEO, annually bypass, dredge or remove trapped seagrass wrack and or sediment accumulated west of or within the harbour entrance, to the requirements of the CEO.

5-2 The proponent shall transfer sufficient sand to Wonnerup Beach for coastal protection, to the requirements of the CEO.

6 Flushing of Artificial Waterways

- 6-1 The proponent is to maintain the harbour entrance channel as per Schedule 1, to ensure adequate flushing and water circulation of the artificial waterways within the Port Geographe development, to the requirements of the CEO.

7 Environmental Management and Monitoring Plan

- 7-1 The proponent shall ensure impacts to the environment are minimised through the implementation of Conditions 7-2 to 7-8.
- 7-2 Within three calendar months following the issue of the Ministerial Statement, unless otherwise approved by the CEO, the proponent shall prepare an Environmental Management and Monitoring Plan to the requirements of the CEO. The Plan shall:
- (1) when implemented, substantiate whether Condition 7-1 is being met.
 - (2) detail measures to manage water and sediment quality impacts to Geographe Bay associated with coastal management activities including dredging and bypassing.
 - (3) detail measures to manage trapped seagrass wrack accumulation on the beaches adjacent to the development, as shown in Schedule 1, Figure 1.
 - (4) detail measures to manage significant environmental impacts with regard to coastal processes and sediment movement as a result of the development.
 - (5) determine trigger levels for implementation of management measures to ensure Condition 7-1 is met.
 - (6) identify management measures to be implemented in the event that criteria identified required by Condition 7-2(5) have been exceeded.
- 7-3 The proponent shall implement the approved Environmental Management and Monitoring Plan required by Conditions 7-2, unless otherwise approved by the CEO.
- 7-4 In the event that monitoring required by Condition 7-2 indicates trigger criteria have been exceeded, the proponent shall investigate to determine the likely cause(s) and provide a report that describes the investigation to the CEO within 10 days along with a description of the corrective management actions to be taken.
- 7-5 The proponent shall implement the management actions identified in Condition 7-4 until the CEO determines that the remedial actions may cease .
- 7-6 The proponent shall review the Environmental Management and Monitoring Plan annually, and revise where required, or as directed by the CEO.

- 7-7 The proponent shall implement the approved revisions of the Environmental Management and Monitoring Plan required by Condition 7-6 until advised otherwise by the CEO.
- 7-8 The Proponent shall make the Environmental Management and Monitoring Plan, required by 7-2 publically available in a manner approved by the CEO.



HON ALBERT P JACOB JP MLA
MINISTER FOR ENVIRONMENT; HERITAGE

26 NOV 2014

The proposal is for the construction of coastal structures to establish a harbour entrance to the Port Geographe Development with reduced trapping of seagrass wrack, 3 kilometres east of the town of Busselton. (see Figure 1). The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Key Characteristics Table

Element	Description of proposal
Location	Geographe Bay, East of Busselton (see Figure 1)
Infrastructure	Coastal structures including: - Western training wall, and - Eastern seawall.
Channel dimensions	Channel detailed in Figure 1. Design depth: -2.8m Chart Datum (to a maximum -3.3m Chart Datum with over dredge).
Excavation works	Capital dredge material transferred to beach and/or offshore disposal area.
Area of seabed disturbance	Channel area detailed in Figure 1.

Table 2: Abbreviations

Abbreviation	Term
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the <i>Environmental Protection Act 1986</i> , or their delegate.
m	metres

Figures (attached)

Figure 1: Port Geographe Coastal Structures and Management Zone



POINT	METRES EAST	METRES NORTH
BOUNDARY COORDINATES		
1	347470	627893
2	350532	627754
3	352532	627712
4	352633	627712
5	353732	627754
6	351167	627804
7	32364	627791
8	32274	627824
9	32370	627850
10	35030	627850
11	350337	627815
12	349953	627760
13	349182	627757

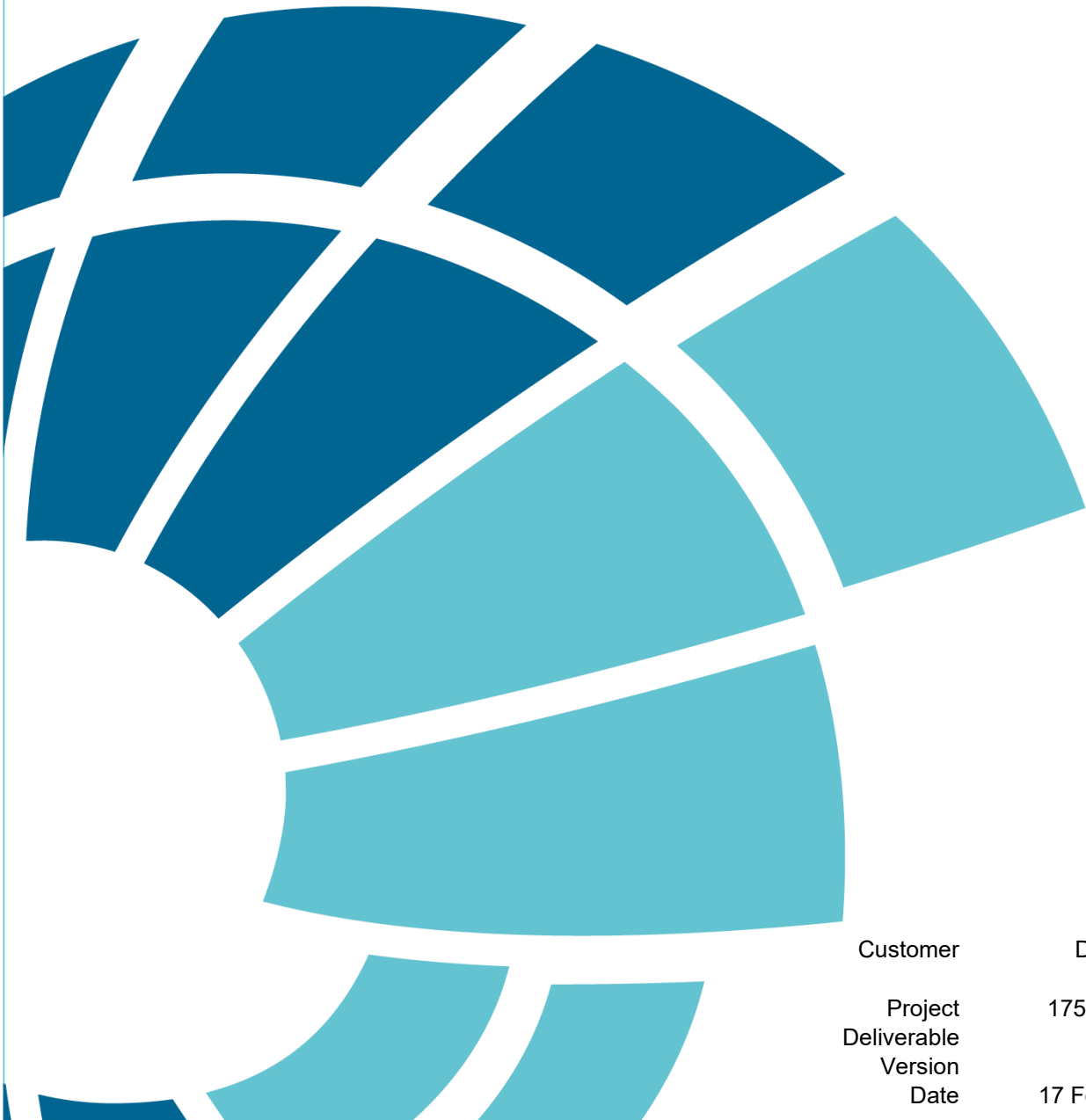
PROJECT TITLE PORT GEOGRAPHE COASTAL MANAGEMENT AREA FOR SAND & SEAGRASS		DEPARTMENT OF TRANSPORT PORT GEOGRAPHE COASTAL MANAGEMENT AREA FOR SAND & SEAGRASS	
PROJECT NO. 1526-15-01	PROJECT NAME PORT GEOGRAPHE COASTAL MANAGEMENT AREA FOR SAND & SEAGRASS	PROJECT LOCATION PORT GEOGRAPHE	PROJECT SCALE 1:5000
PROJECT AUTHOR DEPARTMENT OF TRANSPORT	PROJECT DATE 2015	PROJECT STATUS PRELIMINARY	PROJECT NUMBER 1526-15-01
PREPARED BY: [Name] CHECKED BY: [Name] DATE: [Date]			

Figure 1: Port Geographe Coastal Structures and Management Zone



Annex B Department of Transport Maintenance Dredging – Environmental Management Framework (February 2023)

Department of Transport Maintenance Dredging Environmental Management Framework



Customer	Department of Transport
Project	175502.000_001
Deliverable	R-1755_02-6
Version	0
Date	17 February 2023

Document Control

Document Identification

Title	Department of Transport Maintenance Dredging Environmental Management Framework
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Customer Contact	A Patel, S Mettam
Classification	BMT (OFFICIAL)
Author	S Cochrane
Reviewed By	A Kempton, L Synnot
Project Manager	L Synnot

Amendment Record

The Amendment Record below records the history and issue status of this document.

Version	Version Date	Distribution	Record
A	02 November 2022	A Kempton	Technical and editorial review
B	19 December 2022	L Synnot	Director review
D	02 February 2023	A Patel, S Mettam	Client Review
0	17 February 2023	A Patel, S Mettam	Final Revision

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Acronyms and Definitions

Acronym	Definition
Capital dredging	Removal and relocation of natural previously undisturbed seabed to increase water depth for the Department of Transport's navigational waterways and/or channels, swing basins and berth pockets
DBCA	Western Australian Department of Biodiversity Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
DoT	Western Australian Department of Transport
DPLH	Western Australian Department of Planning, Lands and Heritage
DWER	Western Australian Department of Water and Environmental Regulation
EMF	Department of Transport's Maintenance Dredging Environmental Management Framework
IDER	Initial Desktop Environmental Review
ILUA	Indigenous Land Use Agreement
Maintenance dredging	Dredging to maintain Department of Transport's design depths at existing sites, previously disturbed seabed areas, navigational waterways and/or channels, swing basins and berth pockets
NAGD	National Assessment Guidelines for Dredging
SAP	Sampling and Analysis Plan
TNtM	Temporary Notice to Mariners
WA	Western Australia

Executive Summary

The Western Australian Department of Transport (DoT) is responsible for the management of a number of coastal facilities and small craft waterways around Western Australia. A fundamental component of the DoT's maintenance responsibilities is the requirement to maintain safe navigable waters at these sites, which is facilitated by a state-wide maintenance dredging program. Maintenance dredging is undertaken in accordance with this Environmental Management Framework (EMF). DoT has the authority to carry out maintenance dredging under the *Marine and Harbours Act 1981* and, as the managing department, is responsible for environmental protection.

The purpose of this EMF is to guide DoT in effective and efficient environmental management and monitoring of maintenance dredging for pre-determined design depths and/or historic depths at DoT sites. The EMF outlines:

- the DoT's maintenance dredging program and typical works completed at the various sites
- the steps required to determine maintenance dredging requirements
- environmental regulatory context, relevant guidelines and approvals for maintenance dredging
- typical environmental management and monitoring.

Capital dredging within DoT sites and/or seabed lease areas may align with the underlying environmental principles of this EMF; however, these projects should follow appropriate regulatory processes, requirements, approvals and advice that may supersede this document. Capital dredging undertaken by third-party leaseholders within DoT sites, and the required environmental regulatory processes and approvals, is the responsibility of the lessees, unless otherwise agreed with DoT.

Compliance with this EMF is audited ~annually. Following the completion of each audit, the EMF will be reviewed and updated as appropriate to ensure it incorporates amended or new environmental policies; new environmental guidelines; improved environmental understandings; and improved dredging processes. This review schedule ensures the evolution and application of best practice environmental management to the DoT's maintenance dredging program.

This EMF revision includes minor changes based on the findings of the 2020/2021 and 2021/2022 EMF internal audits and updates to include risk assessment framework for projects that occur within an Indigenous Land Use Agreement (ILUA).

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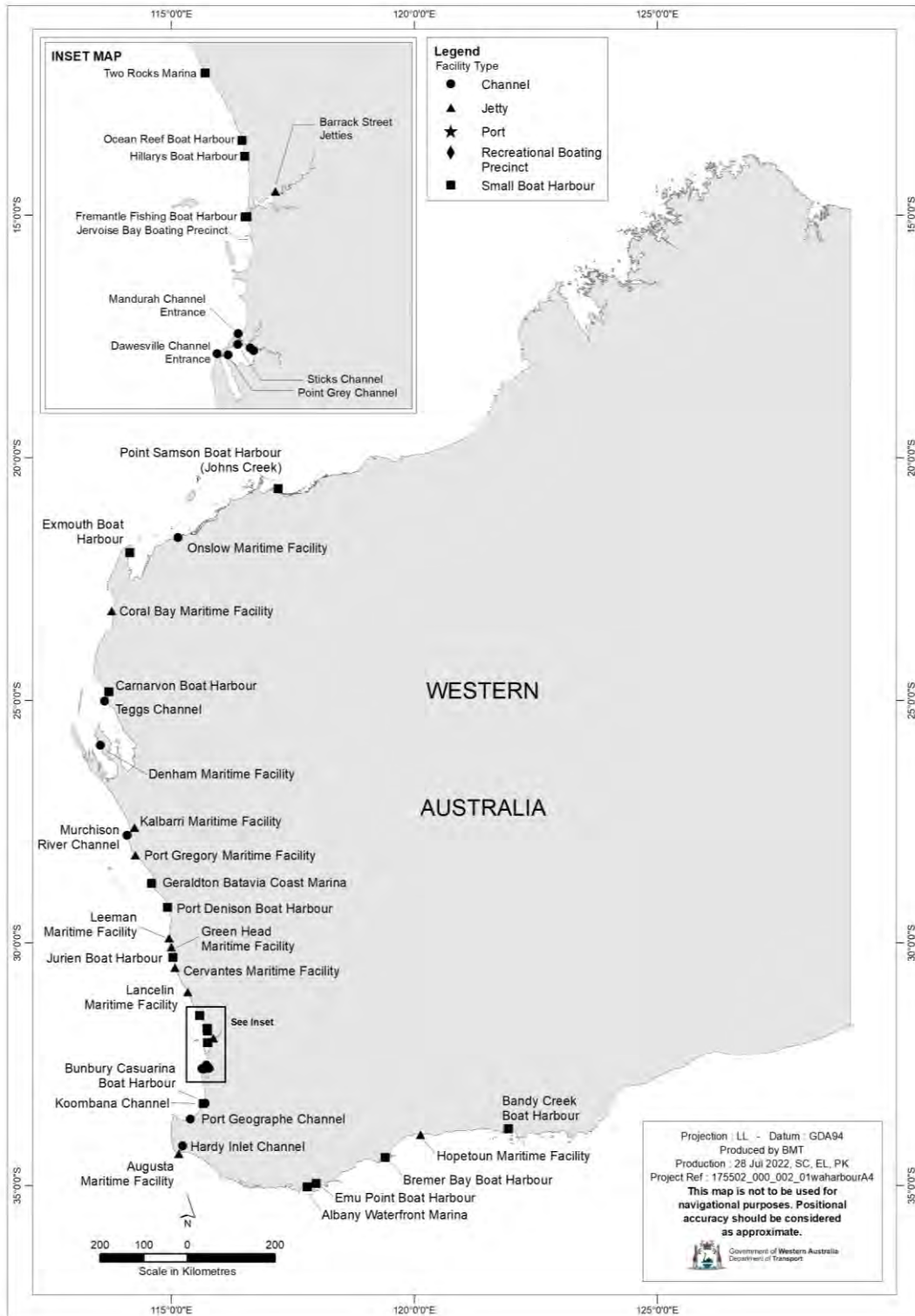
1 Introduction

1.1 Maintenance dredging program

The Western Australia Department of Transport (DoT) is responsible for the management of a number of coastal facilities and small craft waterways around Western Australia (WA; Figure 1.1). A fundamental component of DoT's management responsibilities is to maintain safe navigable waters at these sites, which is facilitated by a state-wide maintenance dredging program. DoT's maintenance dredging program is critical to the viability of the state's commercial fishing and marine tourism industry and to maintain safe use of waterways by recreational boat users. The specific maintenance dredging requirements at each site are determined by facility user feedback and the rate of siltation. The rate of natural siltation is dependent on the frequency and intensity of metocean events and is periodically monitored and assessed at each site using hydrographic and topographic surveys.

DoT manages maintenance dredging (the removal of material from an ocean, estuary, riverbed, beach or bank, including bypassing and seabed levelling methods) of pre-determined design and historic depths at numerous sites around WA (Table 1.1, Figure 1.1) under Section 5(1) of the *Marine and Harbours Act 1981*. DoT as the managing department for maintenance dredging activities at these sites has a responsibility to ensure the environment is protected and to minimise potential environmental impacts from maintenance dredging projects.

Many of DoT's maintenance dredging projects are executed using hydraulic methods where material is removed by a small cutter suction dredge and pumped as a hydraulic slurry to a disposal area via a combination of flexible floating, submerged, inland or buried pipelines (Table 1.2). Some sites, such as sand bypassing sites in Mandurah and Dawesville, use hybrid mechanical collection and hydraulic methods. Material is mechanically collected using land-based excavators and hydraulically pumped and delivered as a slurry to a disposal area via a pump and pipe arrangement (Table 1.2). Other sites use land-based mechanical methods to remove material from the collection area and deliver it to the disposal area. Material is collected via excavators, loaded onto trucks by wheel loaders and carted to disposal area by road trucks and/or articulated dump trucks (Table 1.2). Some sites require water-based mechanical methods to level isolated high-spots using a sweep-bar/plough attached to a vessel. Wrack material may also be removed from the seabed and water column using a trawl net or redistributed in the nearshore environment using land-based excavators (Table 1.2).



Note: From July 2021 Wyndham and Derby Port are no longer Department of Transport managed sites

Figure 1.1 Department of Transport managed coastal sites and facilities in Western Australia

Table 1.1 Department of Transport maintenance dredging sites and typical dredge frequency

Region	Site	Asset/facility	Typical dredge frequency
Pilbara	Point Samson Boat Harbour (John's Creek)	Small Boat Harbour	Infrequent
	Onslow Maritime Facility	Channel and Harbour Basin	5–10 years
Gascoyne	Exmouth Boat Harbour	Small Boat Harbour	5 years (channel) 2–3 years (sand trap)
	Coral Bay Maritime Facility	Jetty	No previous maintenance dredging
	Carnarvon Boat Harbour	Small Boat Harbour	10 years
	Teggs Channel	Channel	5–10 years
	Denham Maritime Facility	Channel and Harbour Basin	7–10 years
Mid-West	Kalbarri Maritime Facility	Jetty	Infrequent
	Murchison River Channel (Kalbarri)	Channel	Biennial
	Port Gregory Maritime Facility	Jetty	No previous maintenance dredging
	Geraldton Batavia Coast Marina	Small Boat Harbour	No previous maintenance dredging
	Port Denison Boat Harbour	Small Boat Harbour	Infrequent
	Leeman Maritime Facility	Jetty	No previous maintenance dredging
	Green Head Maritime Facility	Jetty	Infrequent
Wheatbelt	Jurien Bay Boat Harbour	Small Boat Harbour	Infrequent wrack trawling 5–10 years dredging
	Cervantes Maritime Facility	Jetty	Infrequent
	Lancelin Maritime Facility	Jetty	3–5 years
Metropolitan	Two Rocks Marina	Small Boat Harbour	Infrequent
	Ocean Reef Boat Harbour	Small Boat Harbour	Biennial
	Hillarys Boat Harbour	Small Boat Harbour	No previous maintenance dredging
	Barrack Street Jetties	Jetty	No previous maintenance dredging
	Fremantle Fishing Boat Harbour	Small Boat Harbour	No previous maintenance dredging
	Jervoise Bay	Recreational Boating Precinct	Infrequent





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Region	Site	Asset/facility	Typical dredge frequency
Peel	Mandurah Entrance Channel ²	Channel	Annual
	Sticks Channel	Channel	Infrequent
	Point Grey Channel	Channel	5–10 years
	Dawesville Entrance Channel	Channel	Annual
South West	Bunbury Casuarina Boat Harbour	Small Boat Harbour	No previous maintenance dredging
South West	Koombana Channel (Bunbury Cut)	Channel	Infrequent
South West	Port Geographe Channel	Small Boat Harbour	Annual
South West	Augusta Maritime Facility	Jetty	Infrequent
South West	Hardy Inlet Channel	Channel	5–10 years
South West	Augusta Boat Harbour	Small Boat Harbour	No previous maintenance dredging
Great Southern	Albany Waterfront Marina	Small Boat Harbour	No previous maintenance dredging
Great Southern	Emu Point Boat Harbour (Albany)	Small Boat Harbour	Infrequent
Great Southern	Bremer Bay Boat Harbour	Small Boat Harbour	Infrequent
Goldfields/ Esperance	Hopetoun Maritime Facility	Jetty	No previous maintenance dredging
Goldfields/ Esperance	Bandy Creek Boat Harbour (Esperance)	Small Boat Harbour	Biennial

Notes:

1. Sites listed in order of coastal location from north to south
2. Joint management with local government/shire

Table 1.2 Dredge methods utilised by Department of Transport

Hydraulic methods: cutter suction dredging	Hybrid mechanical and hydraulic	Land-based mechanical	Water-based mechanical (ploughing)
			
<ul style="list-style-type: none"> • Different sizes and capacities • Supported by auxiliary equipment, pipeline sets (up to 5 km) and boosters • Suits larger works in the waterways and harbours 	<ul style="list-style-type: none"> • Land based excavators • Hydraulic slurry pumps • Series of pipelines • Suits larger scale and repetitive sand trap management works 	<ul style="list-style-type: none"> • Land based earthmoving equipment and trucks • Suits sand bypassing works in coastal management areas and within harbor reserves 	<ul style="list-style-type: none"> • Small tug or barge equipped with a plough/leveller • Suits smaller works and high spots in entrance channels to harbours

1.2 Project team

DoT’s maintenance dredging program is facilitated by a project team that meets regularly to discuss ongoing maintenance dredging requirements. The project team may include the”

- Principal’s Representative and Superintendent (DoT)
- DoT’s engineering and project management consultant
- DoT’s environmental consultant
- DoT’s dredging contractor(s).

1.3 Purpose and development

This Environmental Management Framework (EMF) has been specifically developed to address DoT’s maintenance dredging operations. DoT acknowledges the *Ports Australia – Environmental Code of Practice for Dredging and Dredged Material Management* (Ports Australia 2016). However, it is considered the application of this Code of Practice is more appropriate to commercial industrial ports as opposed to small coastal facilities and waterways. This EMF is intended to ensure that DoT’s maintenance dredging activities are completed with appropriate consideration of environmental factors and all relevant environmental regulatory requirements. The EMF is based on the principles of:

- Protection of the environment and heritage
- Clear, relevant and practical identification of potential environmental impacts

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- Open engagement with stakeholders
- Effective environmental monitoring and management

Capital dredging within DoT sites and/or seabed lease areas may align with underlying environmental principles of the EMF; however, these projects should follow appropriate environmental regulatory processes, requirements, approvals and advice that may supersede this document. Capital dredging undertaken by third-party leaseholders within DoT sites, and the required environmental regulatory processes and approvals, is the responsibility of the lessees, unless otherwise agreed with the DoT.

This EMF revision incorporates lessons learnt from the previous document revision (BMT 2021) and includes minor changes based on the findings of the 2020/2021 and 2021/2022 EMF internal audits. This revision of the EMF now includes a risk assessment framework and relevant processes required for Aboriginal Heritage for projects that occur within an Indigenous Land Use Agreement (ILUA).

2 Environmental Management Framework

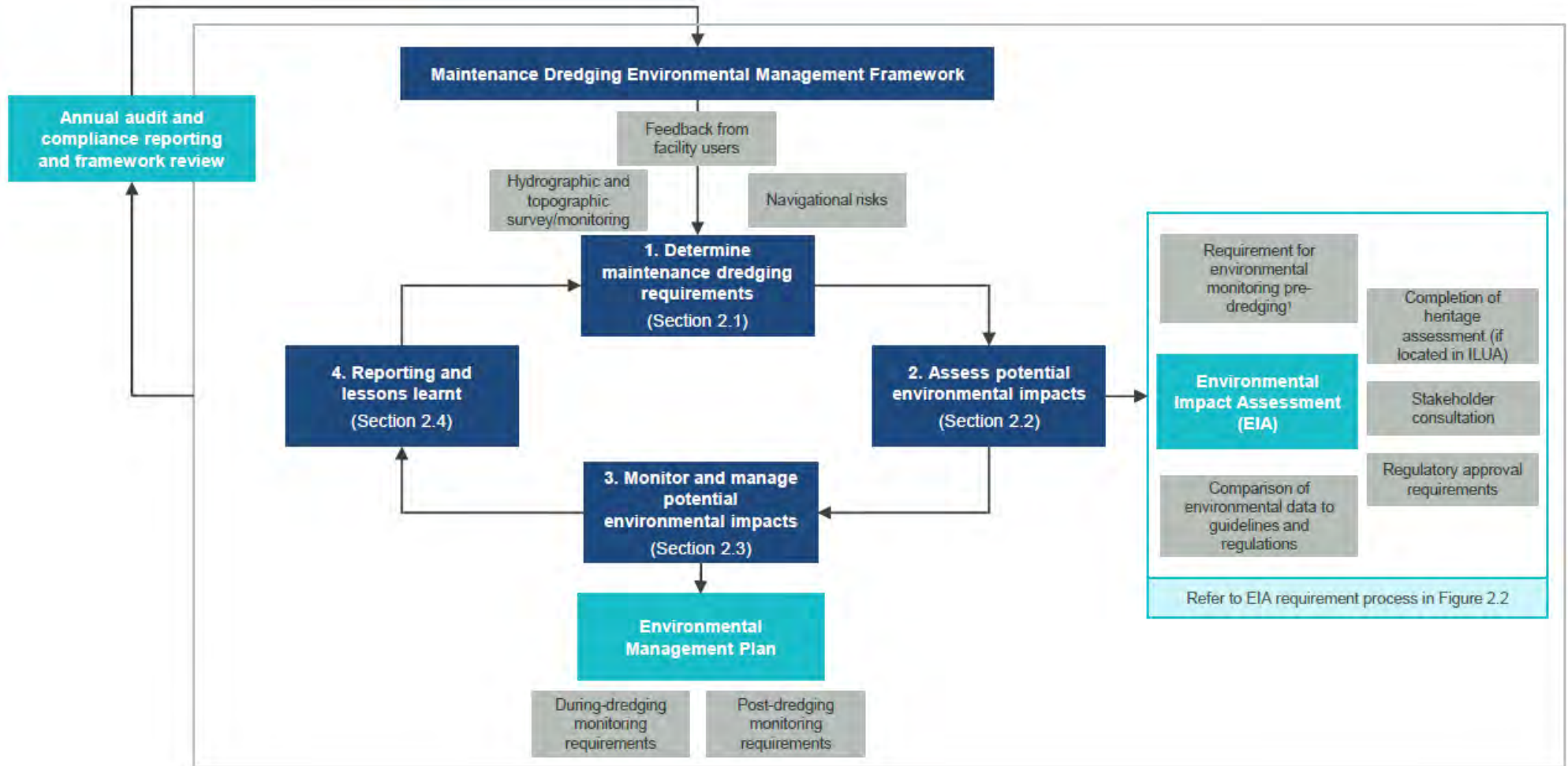
DoT's maintenance dredging typically involves the removal of relatively small volumes of clean marine sands from harbour basins, navigational channels and beach sand traps, and generally has a relatively low environmental impact. DoT's maintenance dredging projects have typically not been referred to the environmental regulators for formal assessment, and potential environmental impacts are managed through the EMF, which follows basic principles for referral of a proposal. There may be some situations where formal environmental approval(s) and advice are required, as determined during assessment of environmental impacts (Step 2 of the EMF process; Section 2.2; Figure 2.1).

The EMF outlines the following four steps to manage maintenance dredging and to ensure appropriate consideration of environmental factors and relevant environmental regulatory requirements (Figure 2.1):

1. Determine maintenance dredging requirements (Section 2.1)
2. Assess potential environmental impacts (Section 2.2)
3. Monitor and manage environmental impacts (Section 2.3)
4. Reporting and lessons learnt (Section 2.4).

The dedicated processes and reporting requirements of the EMF ensures maintenance dredging projects are managed in-line with recognised environmental criteria, and with consideration of potential environmental impacts. The EMF also undergoes an ~annual review to ensure best practice methods continue to be applied as knowledge, technology, dredging methods and regulatory requirements change (Section 3).

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Note:

1. Any required pre-dredging environmental monitoring will be documented in a Sampling and Analysis Plan; as appropriate

Figure 2.1 Maintenance Dredging Environmental Management Framework

BMT (OFFICIAL)**2.1 Determine maintenance dredging requirements (Step 1)**

DoT undertakes periodic hydrographic and/or topographic surveys to monitor the requirement for maintenance dredging in most sites in the maintenance dredging program, including entrance channels and harbour basins. In addition, DoT uses recent satellite and/or drone georeferenced images to monitor the requirement in coastal sites including sand traps, beach nourishment sites, coastal management areas and low-lying mudflats. The frequency of surveys and drone imagery at a site is determined on an as needed basis and may include consideration of the rate of sedimentation and erosion, historical trends, navigational risks, metocean events, feedback from users and local stakeholders, and environmental quality conditions (e.g., water quality). The typical dredging frequency at each site is provided in Table 1.1. The survey data assists in prioritising areas for maintenance dredging, provides information on the form and stability of any previous disposal area, and the presence of significant accretion or erosion. The requirement for maintenance dredging will be determined by DoT's engineering consultant using the assessment of survey data and other inputs (e.g., user feedback, navigation risks, aerial imagery, lessons learnt from previous dredging projects). This may be documented in a survey review which will assess the need to dredge. The review may recommend:

- Postpone the requirements to dredge and continue monitoring. This is typically when the reduction in navigational depth does not constitute an immediate or short-term safety hazard
- Maintenance dredging to restore safe navigation depths
- Other alternative actions to improve navigation such as the relocation of navigation aids. This is typically when it is possible to delay the requirement for maintenance dredging.

If maintenance dredging is required, the most recent survey will be used to define the areas and volumes to be dredged. The site characteristics such as the weather, geotechnical and environmental conditions will be used to determine a suitable dredge method. During the planning phase of maintenance dredging, the disposal and dredge design options will be assessed to ensure environmental impacts at both the dredging and disposal areas are minimised.

2.2 Assess potential environmental impacts (Step 2)

The significance of potential environmental impacts for maintenance dredging will be assessed in the context of the EPA's¹ environmental factors and associated environmental objectives that underpin the environmental impact assessment process in WA (EPA). This assessment is documented in an Environmental Impact Assessment (EIA), which will include information on the proposed dredging and disposal of material; relevant environmental monitoring results; potential environmental impacts; stakeholder consultation; potential heritage risk and potential environmental monitoring and/or management. If a maintenance dredging project is located within an Indigenous Land Use Agreement (ILUA), the Noongar Standard Heritage Agreement Framework (Annex A) must be used to assess the risk to heritage. This assessment is triggered by the Initial Desktop Environmental Review (IDER; Annex B), and documented in the EIA.

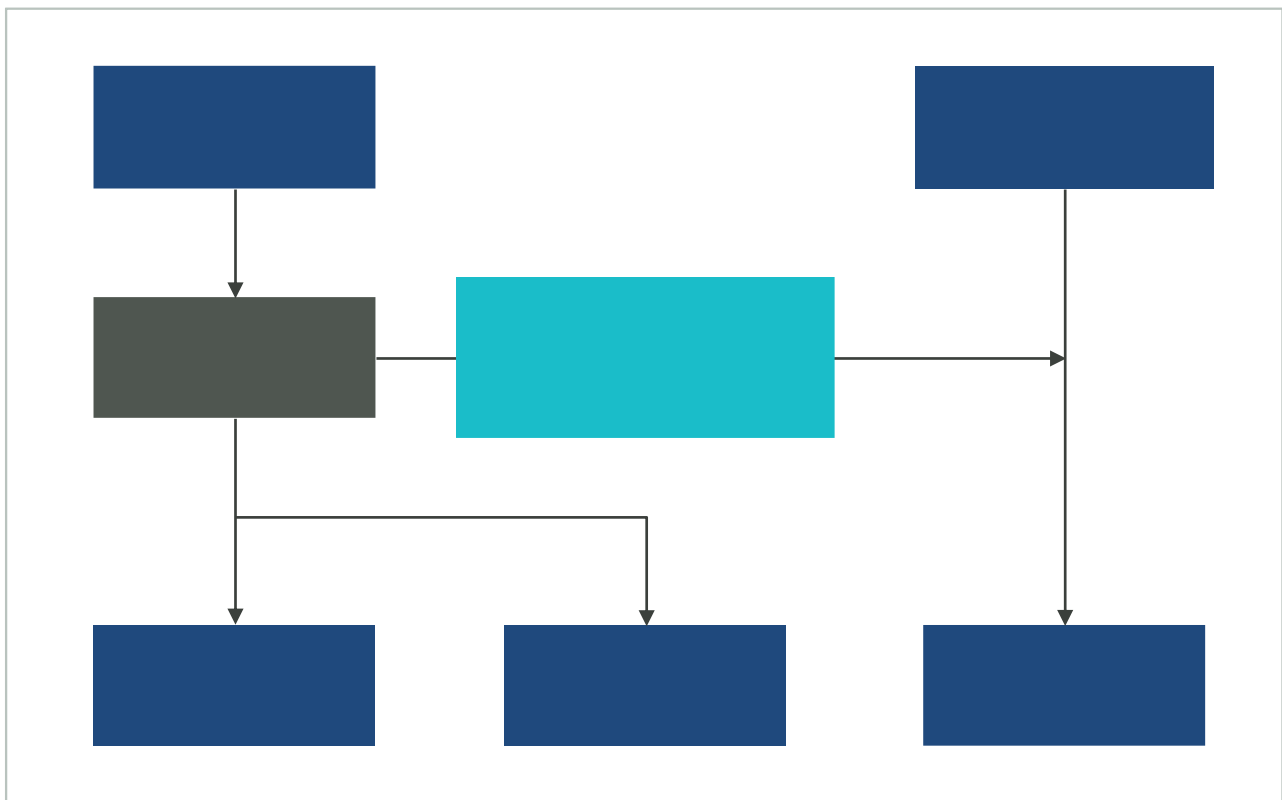
It is intended that an EIA remains current across multiple maintenance dredging projects for sites where the environmental risks, heritage risks, regulatory process and the proposed dredging (design and volume) and disposal is similar or unchanged. In situations where there is an existing EIA, an IDER (Annex B) will be completed to determine whether the existing EIA adequately addresses the potential environmental impacts of the proposed maintenance dredging project. The IDER will review the existing EIA together with other available information including closeout reports, data reports, heritage surveys,

¹ The EPA guidelines are updated from time to time. As part of the environmental impact assessment process, refer to most recent iteration for relevant factors and objectives.

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government records and site manager/client feedback. Completion of the IDER will identify one of three possible outcomes regarding the application of the existing EIA (Figure 2.2):

1. The existing EIA is adequate in addressing environmental, engineering and/or stakeholder aspects and will be applied to the upcoming maintenance dredging project
2. The existing EIA requires minor amendments before it can be applied to the upcoming maintenance dredging project
3. A new EIA² is required for the upcoming maintenance dredging project due to significant variations in environmental, engineering and/or stakeholder aspects of the proposed project when compared to the previous EIA



Note:

1. The existing Environmental Impact Assessment (EIA) may be updated to reflect the required amendments or documented in the Initial Desktop Environmental Review (IDER; Annex B).

Figure 2.2 Determining the requirement for an Environmental Impact Assessment

The IDER is completed by DoT’s environmental consultant and reviewed by DoT’s engineering consultant and project management consultant, in consultation with the project team and retained for auditing purposes.

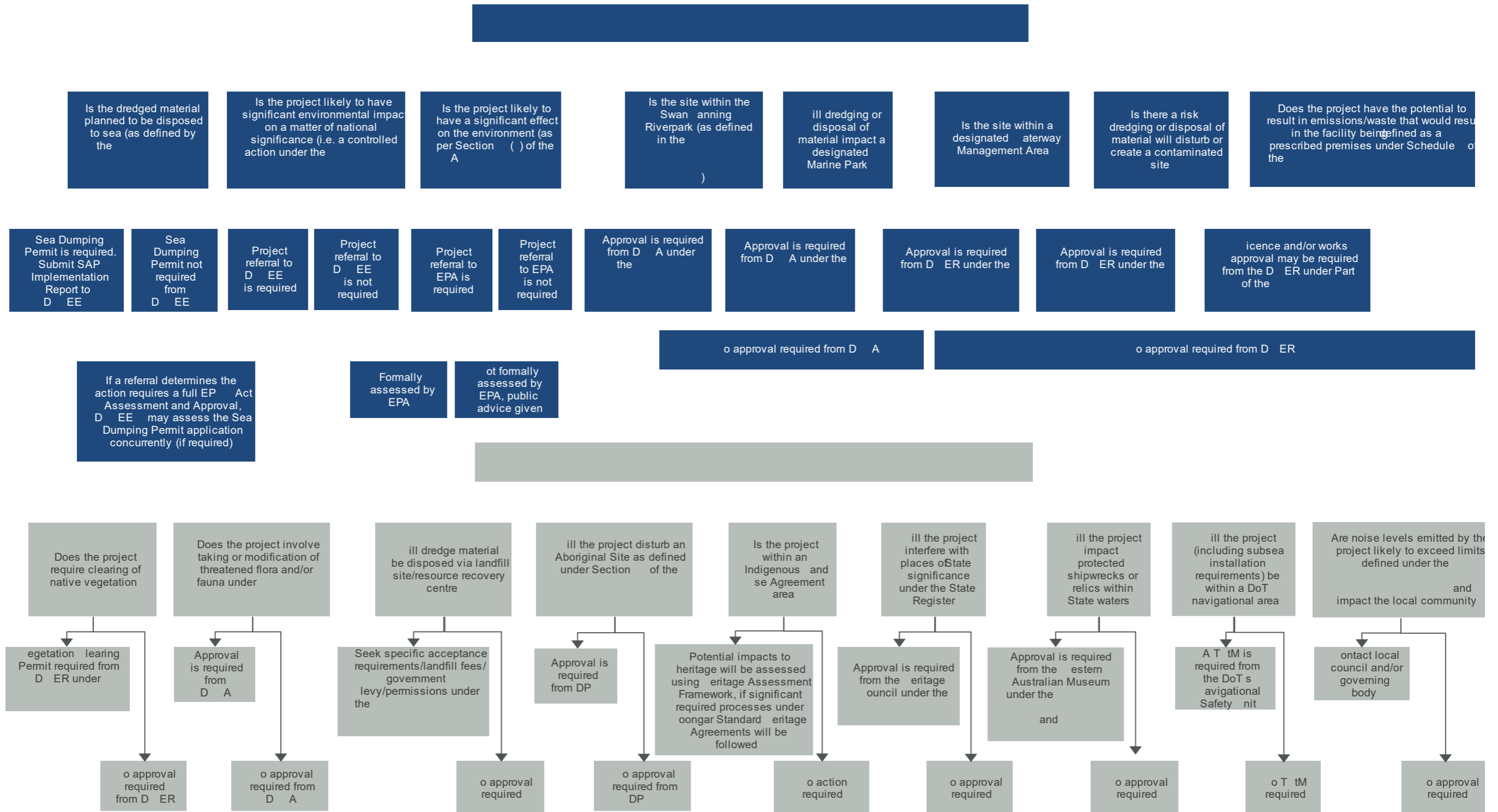
At locations where maintenance dredging occurs more frequently than annually, the IDER will be assessed prior to each campaign if DoT’s environmental consultant is aware of changes to environmental risks (e.g., oil spill or change of industries operating from the site); the regulatory process; the proposed dredging (design and volume); and/or the disposal (method and site).

² Sites with no existing EIA automatically require the preparation of a new EIA.

BMT (OFFICIAL)**2.2.2 Determine regulatory approval requirements**

Examples of primary and secondary approval pathways that will be considered for each maintenance dredging project are outlined in Figure 2.3. If the EIA identifies the potential for significant adverse environmental impacts or a high level of stakeholder concern, then it is appropriate to seek advice from the relevant regulatory authorities depending on the potential impacts associated with the maintenance dredging project (Figure 2.3). In these instances, further environmental approval may not be required if the works were considered within the original approval.

In the case of emergency dredging requirements, safety issues will take precedence over all other matters, including application of the EMF. In such instances the DoT Navigational Safety will be consulted.



Notes:

- The approvals, licences and permits detailed in this figure are those that most commonly apply to maintenance dredging projects. Some approvals, licences and permits, specifically those relevant to environmental sampling requirements, may not be included.
- DCCEEW = Australian Department of Climate Change, Energy, the Environment and Water; DPLH = Western Australian Department of Planning, Lands and Heritage; DWER = Western Australian Department of Water and Environmental Regulation, DBCA = Western Australian Department of Biodiversity, Conservation and Attractions, DoT = Western Australia Department of Transport, EPBC Act = Environmental Protection and Biodiversity Conservation Act 1999; EPA = Western Australian Environmental Protection Authority; ILUA = Indigenous Land Use Agreement; SAP = Sediment Sampling and Analysis Plan; NTM = Temporary Notice to Mariners.

Figure 2.3 Example of primary and secondary environmental approval pathways considered under the Environmental Management Framework

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2.2.3 Monitoring pre-dredging

Environmental monitoring may be completed before, during and after dredging (Sections 2.3.1 and 2.3.2) to quantify and minimise potential environmental impacts. Pre-dredging monitoring typically involves sediment sampling of the material to be dredged. Sediment sampling may also support characterisation of dredged material for engineering and geotechnical purposes. Sampling material from the proposed disposal areas may be required if ocean disposal and/or onshore disposal is being considered. Other pre-dredge monitoring (e.g., water quality, habitat mapping) may also be required, depending on the outcome of the IDER during preliminary project scoping and may be used to inform the preparation of the EIA (Section 2.1).

Pre-dredging environmental monitoring is required to be completed in accordance with a detailed sampling and analysis plan (SAP) that outlines sampling areas/sites, sampling design, sampling methods, rationale and justification for the proposed sampling approach, rationale for chemical and physical analyses, quality assurance and control procedures, and necessary transport and storage requirements. SAPs will be prepared with reference to relevant/current environmental guidelines and regulations (Section 2.2.4).

A SAP may not be required in instances where the sampling scope is small and there is confidence that field sampling can be completed in-line with relevant sampling requirements. Justification for this may be discretionary based on professional judgement and SAPs for simple, small sampling scopes may not be required.

2.2.4 Environmental guidelines

There are a number of environmental guidelines and regulations that apply to the assessment and management of environmental impacts of maintenance dredging, including the:

- *National Assessment Guidelines for Dredging* (NAGD; CA 2009) – provides a framework governing ocean disposal of dredged material. The NAGD approach to the assessment of marine sediments is applied to maintenance dredging projects regardless of whether the project involves ocean disposal.
- *Assessment and Management of Contaminated Sites* (DWER 2021) – provides guidance for the disposal of sediments with potential to create a contaminated site and/or contaminated leachate
- *Acid Sulfate Soils Guidelines* (DER 2015; Sullivan et al. 2018) – provide guidance for identifying acid sulfate soils and assessment methods when disturbing sediments within estuarine environment and/or in an acid sulfate soil risk area
- *Landfill Waste Classifications and Waste Definitions* (DWER 2019) – provides guidance for disposal of dredged material to a gazetted landfill site
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) – provides guidance for assessment of marine water quality (return water discharged to the marine/freshwater environment)

DoT's environmental consultant will apply relevant guidelines and regulations during the preparation of the SAP and EIA. This includes application of any new/updated guidelines and/or assessment of any new or emergent contaminants of concern.

2.2.5 Stakeholder consultation

Prior to each maintenance dredging project, the DoT Regional Coordinator, the Operations Manager and/or the Port/Harbour Manager will be notified, where applicable. DoT shall also notify the local Department of Biodiversity, Conservation and Attractions (DBCA), the local Department of Water and

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Environmental Regulation (DWER) and the relevant local government authority of dredging, as appropriate. If work is occurring within an ILUA, DoT shall notify the relevant prescribed body corporate. For sites with ongoing and regular maintenance dredging requirements, notification of works will be provided annually or if there are significant changes to the dredge works.

Depending on the location, duration and scope of work, DoT and/or DoT's engineering and project management consultant may also:

- consult with community groups such as surf clubs, schools, sea rescue, resident associations, commercial and recreational fishing associations
- install public information signage.

All relevant written stakeholder consultation will be documented. Verbal stakeholder consultation will be documented only if necessary, e.g. to document a complaint. A public complaints register will be maintained by DoT and is applicable to all phases of a dredging project. If requested and/or required, monitoring results of the project will be made available to stakeholders.

2.3 Monitor and manage potential environmental impacts (Step 3)

To direct appropriate management of the potential environmental impacts of each maintenance dredging project, as determined in the EIA (Section 2.1), an Environmental Management Plan (EMP) will be prepared by DoT's environmental consultant. It is intended that an EMP will be a live document, however, where the environmental risks, regulatory processes and the proposed dredging (design and volume) and disposal is similar or unchanged, it may only require minor edits from the previous iteration. The IDER (Section 2.1) will identify one of three possible outcomes regarding the application of the existing EMP:

1. Review and update EMP
2. Minor updates detailed in this IDER appended to the existing EMP
3. No updates to EMP required

The EMP will succinctly define the environmental monitoring and management, and contingency measures for dredging. The EMP will be informed by the EIA/IDER and include the consideration of the material to be dredged (volume and characteristics), dredging methods, location (of dredging and disposal areas), and the duration and timing of the dredging works. Comprehensive environmental monitoring is often not warranted for removal of small volumes of clean marine sands over a temporary duration. The EMP may provide scope for both during-dredging (Section 2.3.1) and post-dredging (Section 2.3.2) environmental monitoring. The EMP will also include details regarding the parties responsible for completing each of the management actions.

The dredging contractor will then prepare a Project Execution Plan, or similar documentation describing the scope of dredging works, and include reference to the contractor/s environmental monitoring and management responsibilities as detailed in the EMP.

Once the appropriate documentation has been completed as detailed above, the dredging project may commence. DoT is responsible for overall management of the dredging project, including the implementation of the EMP. Weekly progress reports that include updates on dredging operations, site inspections and environmental monitoring results are prepared by the project team in accordance with the EMP and submitted to DoT.

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2.3.1 Monitoring during dredging

A range of environmental monitoring is generally completed during dredging to ensure the environmental aspects of the maintenance dredging project are documented and understood. The type of environmental monitoring required is based on the risk of potential impacts of the maintenance dredging project, as determined in the EIA/IDER (Section 2.1). Environmental impacts associated with turbidity and the release of contaminants are generally the focus of environmental monitoring for DoT's maintenance dredging program. Turbidity monitoring requirements may include site photographs, plume sketches on site maps, remote imagery and aerial photography to inform plume extent. Other monitoring, such as water quality or benthic habitat surveys may also be required. All environmental monitoring data collected during dredging will be reviewed in accordance with the requirements of the EMP to assess potential environmental impacts from the dredging project.

DoT's dredging contractor may be required to undertake monitoring components during dredging. These monitoring procedures should be discussed during the preparation of the EMP to ensure that the monitoring commitments are feasible, well understood and required monitoring equipment is available.

2.3.2 Monitoring post-dredging

The post-dredging requirements will be determined within the EIA and documented in the EMP. Post-dredging monitoring is typically not required for DoT maintenance dredging projects.

2.4 Reporting and lessons learnt (Step 4)

On completion of the dredging project, a closeout report will be prepared. The closeout report provides a summary of the maintenance dredging, environmental monitoring undertaken and any operational and/or environmental issues or incidents. In addition, the closeout report will include details of any management measures implemented, and capture lessons learnt and recommendations for future dredging at the site. The closeout report provides an important reference for planning any future maintenance dredging projects and will be finalised within three months of completion of dredging. Closeout reporting should be completed for each maintenance dredging project, though for ongoing dredging projects reporting may be completed on an annual basis in a reduced format.

3 Review and Audit

This EMF is a controlled document that will be reviewed regularly to ensure best practice methods continue to be applied as knowledge, technology, dredging methods and regulatory requirements change. EMF reviews will identify and address any recommendations arising from the maintenance dredging program, as appropriate.

An annual internal audit of the maintenance dredging program will be carried out by DoT and DoT's environmental consultant to ensure that all environmental commitments within the EMF have been met during the 12-month audit period. To review the EMF commitments, at least two projects that occurred during the respective audit period – ranging in size, type and complexity – will be audited. An audit report will be prepared and include any non-conformances and recommendations for changes to the maintenance dredging program and/or EMF. The audit report will be submitted to DoT for review and comment prior to finalisation.

4 Third-party leaseholders

DoT is responsible for maintenance dredging of previously disturbed seabed areas and historic depths within DoT sites (Table 1.1, Figure 1.1), as per this EMF. There may be occasions where DoT is required to advise or assist third-party leaseholders in relation to monitoring and management of their maintenance dredging within DoT sites and/or seabed lease areas. In these instances, there is an expectation from DoT that any proposed maintenance dredging and disposal activities will be managed in accordance with the underlying principles of this EMF. However, the expectation is that third-party leaseholders undertaking maintenance dredging will obtain relevant environmental approvals, and projects with the potential to cause significant environmental impacts will follow the relevant regulatory environmental impact assessment process.

As this EMF is applicable to maintenance dredging, proposed capital dredging undertaken by third-party leaseholders within DoT sites and/or seabed lease areas, and the required environmental regulatory processes and approvals, is the responsibility of the lessees, unless otherwise agreed with DoT.

At a minimum, DoT expects third-party leaseholders dredging (capital or maintenance) within DoT assets and/or seabed lease areas, to assess that:

- Potential environmental impacts associated with proposed dredging and disposal have been considered
- Relevant regulatory requirements and/or approvals have been followed
- Appropriate monitoring and management measures for the project are in place.

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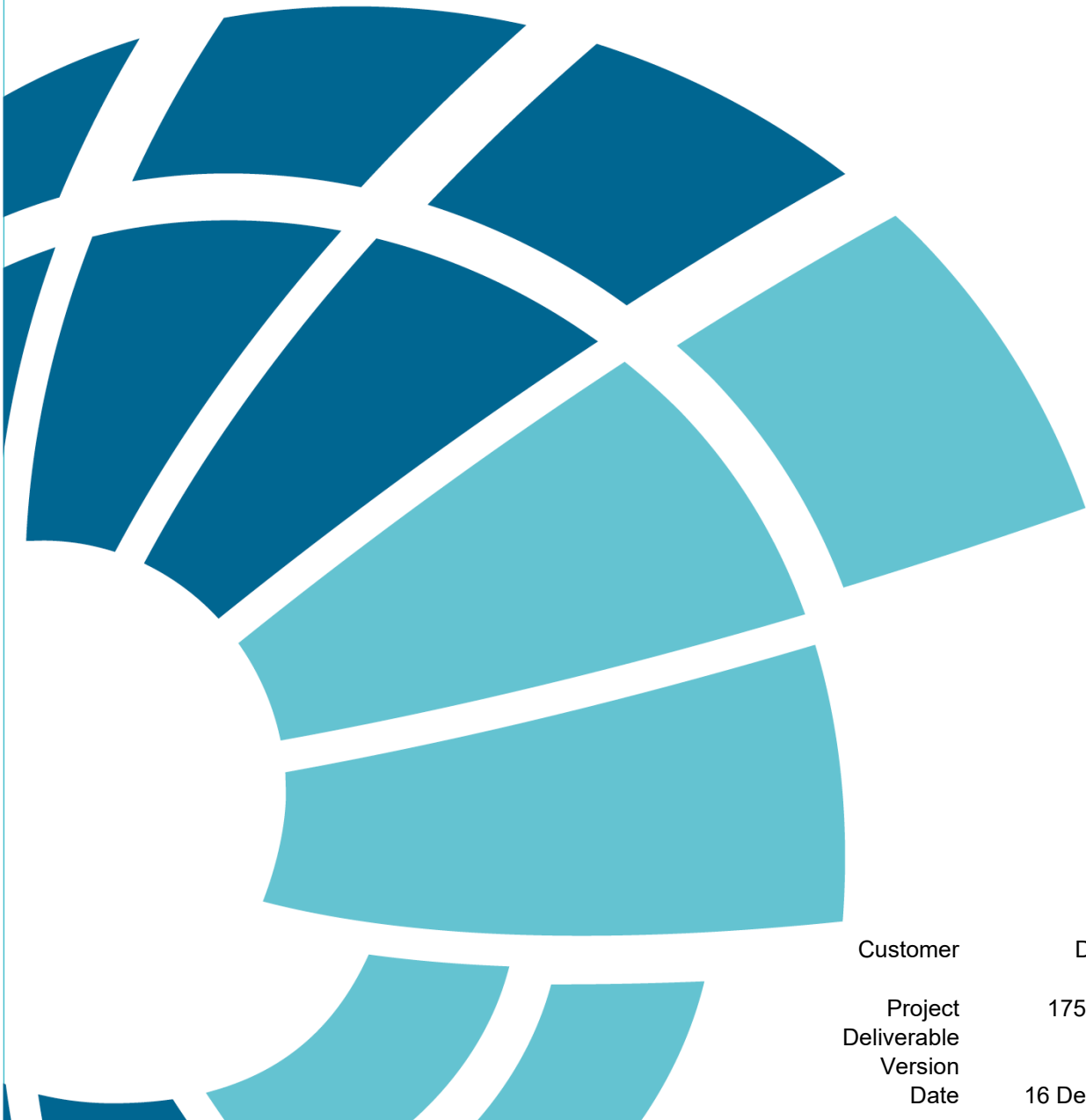
³ The EPA guidelines are updated from time to time. As part of the environmental impact assessment process, refer to most recent iteration for relevant factors and objectives.



Annex A Noongar Standard Heritage Assessment Framework

Noongar Standard Heritage Agreement Framework

Department of Transport



Customer	Department of Transport
Project Deliverable	175502.000_001
Version	0
Date	16 December 2022

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Amendment Record

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A	16 June 2022	F Hook (Archae-Aus)	Technical review
A	28 September 2022	S Mettam, A Patel (DoT)	Client review
0	03 February 2023	Click to enter text.	Click to enter text.

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Introduction

This framework is to identify project attributable risk to Aboriginal Heritage. The Framework draws on the risk assessment based in the Department of Planning, Lands and Heritage (DPLH¹) Cultural Due Diligence Guidelines.

The Framework is part of Department of Transport's Environmental Impact Assessment process. The Environmental Consultant will complete a risk assessment as part of the Environmental Impact Assessment process including assessment of the landscape, project details, scope of the project ground disturbance and search records etc.

Aboriginal Heritage due diligence for Projects should be completed at the early planning stages to avoid delays in Project timelines. Early consultation with Aboriginal people can help to identify how to minimise or avoid any disturbance of Aboriginal Heritage.

Land users should exercise caution in areas where no surveys have been completed, or where surveys have only been completed for parts of the area where a proposed activity may impact Aboriginal Heritage. Caution is required because heritage surveys over only part of the land may not have identified all possible Aboriginal Heritage values. Sole reliance on information contained in the Register may not be sufficient and consultation in the first instance with the Department of Planning, Lands and Heritage (DPLH) is recommended, depending on the DPLH's advice this consultation may extend to include the relevant Aboriginal people.

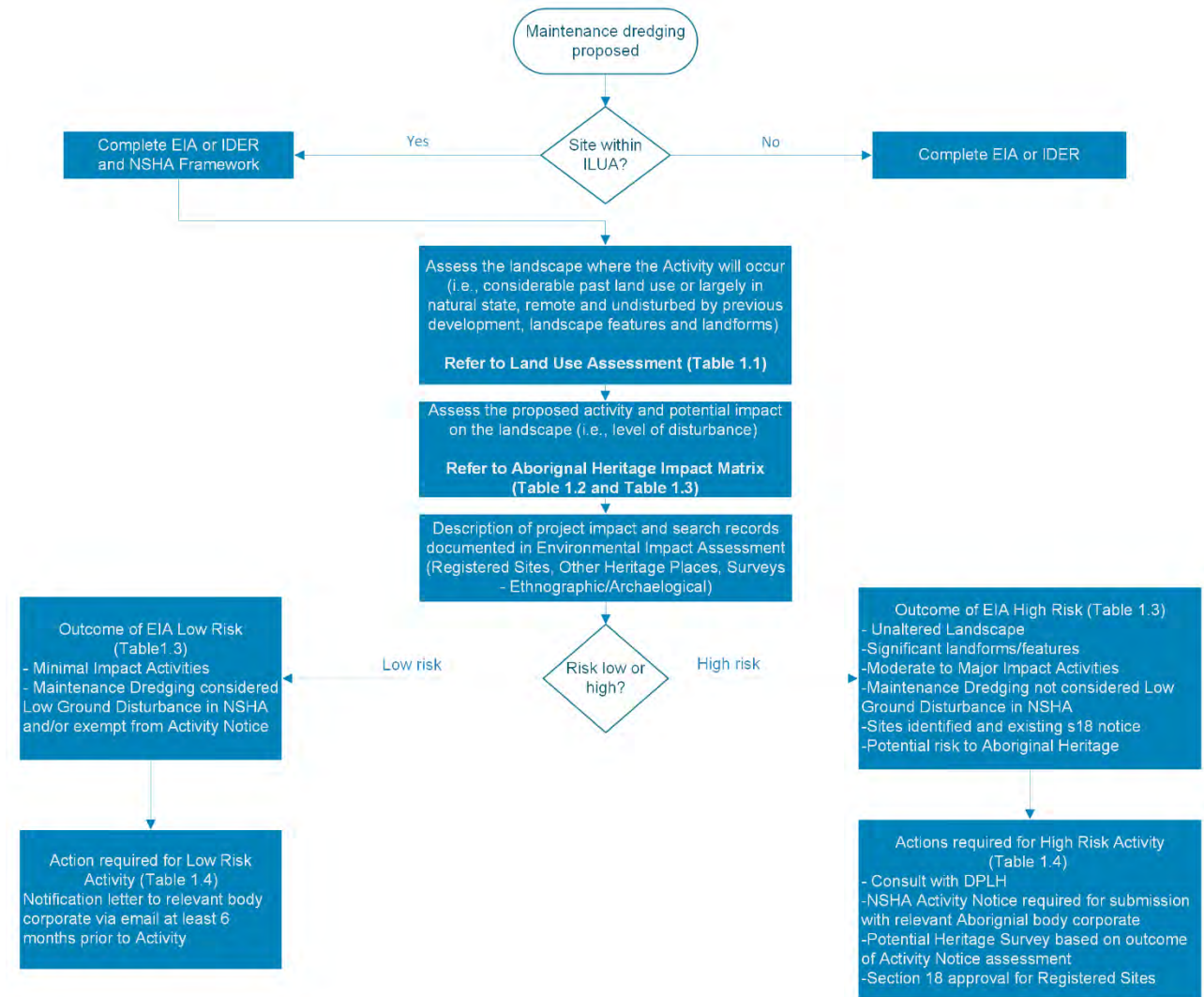
When a campaign is located within an Indigenous Land Use Agreement (ILUA) area the Noongar Standard Heritage Agreement Framework (0) should be utilised for the heritage assessment process. Figure 1.1 to Table 1.3 should be used for reference when completing the assessment. Table 1.3 details the actions required upon completion of heritage risk assessment.

¹ Formerly Department of Aboriginal Affairs

Noongar Standard Heritage Assessment

Project:	
Location:	
Completed By:	
Date:	

In accordance with Step 2 (Section 2.2) of the Department of Transport’s Environmental Management Framework (EMF; BMT 2023) when a campaign is located within an Indigenous Land Use Agreement (ILUA) area, the Noongar Standard Heritage Agreement Framework (0) should be utilised to complete the below Noongar Standard Heritage Agreement Assessment (NSHAA) outlined in Figure 1.1 to Table 1.3. The outcomes of the NSHAA are documented at the end of this document, and Table 1.3 details the actions required upon completion of heritage risk assessment.



Note: EIA = Environmental Impact Assessment, IDER = Initial Desktop Environmental Review, ILUA = Indigenous Land-use Agreement, NSHA = Noongar Standard Heritage Agreement.

Figure 1.1 Noongar Standard Heritage Agreement Framework

Table 1.1 Previous Land Use Assessment

Previous Land Use	Example	Indicate
Built Environment	Urban environment, towns, metropolitan region	<input type="checkbox"/>
Significantly altered	Cultivated and cleared land	<input type="checkbox"/>
Moderately altered	Partially cleared lands, re-vegetated landscape	<input type="checkbox"/>
Minimally altered	Urban bush land, regrowth areas	<input type="checkbox"/>
Unaltered	Protected areas or pristine environment	<input type="checkbox"/>

Aboriginal Heritage Impact Assessment

Categories	Description	Indicate
Negligible	<ul style="list-style-type: none"> walking, photography, filming; aerial surveying/magnetic surveys; use of existing tracks, water courses; environmental monitoring; water and soils sampling; fossicking using hand held instruments; spatial measurement; and scientific research, using hand held tools. 	<input type="checkbox"/>
Minimal	<ul style="list-style-type: none"> cultivation/grazing in areas previously cultivated/grazed; maintenance of existing paths, walls, roads, tracks, bridges, public infrastructure (e.g. electrical, water, sewage) and community utilities within the existing footprint and adjacent service areas; feral animal eradication, weed, vermin and pest control, vegetation control and fire control; and light vehicular access and camping. 	<input type="checkbox"/>
Moderate	<ul style="list-style-type: none"> work program clearance; sampling using hand held rig or rig mounted on a light vehicle; new fire breaks; re-vegetation; temporary power lines; temporary gravel or soil stockpile; and temporary camps. 	<input type="checkbox"/>
Significant	<ul style="list-style-type: none"> creation of new roads or tracks; new public access ways, bridges, culverts, flood remediation and erosion levies; land clearing over more than a small area; intensive soil/core sampling; new pipelines; significant reclamation works; and major landscaping/contouring 	<input type="checkbox"/>
Major	<ul style="list-style-type: none"> large-scale land clearing; exploration drilling; bulk sampling, soil excavation; 	<input type="checkbox"/>

Categories	Description	Indicate
	<ul style="list-style-type: none"> mechanical earthmoving, blasting; major construction works; open cut mining; large scale changes to waterways; and industrial development. 	

Table 1.2 Aboriginal Heritage Impact Risk Matrix

	Negligible	Minimal	Moderate	Significant	Major
Built Environment	Low	Low	Low	Low	Medium
Significantly Altered	Low	Low	Low	Medium	High
Moderately altered	Low	Low	Medium	Medium	High
Minimally altered	Low	Medium	Medium	High	High
Unaltered	Low	Medium	High	High	High

Table 1.3 Risk Matrix Actions

Risk Rating	Actions
Low (Review)	Consult with Heritage Consultant if uncertain how to proceed further actions may include: <ul style="list-style-type: none"> Consult with Heritage Consultant Desktop survey Aboriginal consultation
Medium (Review/ Exercise Caution)	Consult with Heritage Consultant and a range of actions may be required including: <ul style="list-style-type: none"> Consult with Heritage Consultant / Department of Planning, Lands and Heritage Desktop survey Aboriginal consultation Ethnographic survey Archaeological survey
High (Consult/ Survey/ Approvals)	Consult with Heritage Consultant and a range of actions may be required including: <ul style="list-style-type: none"> Desktop survey Aboriginal consultation Ethnographic survey Archaeological survey Application for a s18 Reg 10 under <i>Aboriginal Heritage Act 1972</i> Cultural Heritage Management Plan

Noongar Standard Heritage Agreement Assessment Outcome:

<i>Insert Risk Rating/ Colour</i>	<i>Insert Actions/ Justification</i>
-----------------------------------	--------------------------------------

References

BMT (2023) Department of Transport Maintenance Dredging Environmental Management Framework. Prepared for Department of Transport by BMT Commercial Australia Pty Ltd, Report No. R-1755_02-6, Perth, Western Australia, February 2023



Annex B Initial Desktop Environmental Review

Initial Desktop Environmental Review

Site			
Project no			
Document number			
Completed by		Date	
Reviewed by		Date	
		Date	
Last dredging campaign (year/volume)			

The Initial Desktop Environmental Review (IDER) is used to determine the appropriate sampling, analysis, monitoring, management and documentation requirements for each DoT maintenance dredging campaign. For sites that require maintenance dredging more frequently, the IDER is to be completed prior to each campaign. To assist in preparing the IDER, the project team will consider changes to contractors on site, environmental investigation(s) at the site that may provide contextual information, details of environmental incidents on site etc. Depending on the outcome of the IDER (**Error! Reference source not found.**) there may be a requirement to update/review the existing Dredging Environmental Impact Assessment (DEIA) and/or Dredging Environmental Management Plan (DEMP).

Table 1.1 Key project characteristics

Project element	Description	Construction works	Indicative timing
Berth pocket Turning basin Channel	Location, volume/depth (-CD) (volumes and depths must include over-dredge allowance)	Plant used for dredging	Time of year and period of operation
Dredging area total	Description, area estimate, total dredge volume (include over-dredge allowance)		
Disposal area (s)	Description, area estimate	Plant used for disposal	Time of year and period of operation
Applicability of existing DEIA to the key project characteristics	Do key project characteristics require a new DEIA? If yes/no, why?		

Table 1.2 Initial Desktop Environmental Review

Question	Detail/comment, as required	Updates to existing DEIA required?	Updates to existing DEMP required?
Is this maintenance dredging ? (if this is a capital dredging program the IDER process does not apply)	Yes/No	Detail after review	
Does the existing Dredging Environmental Impact Assessment (DEIA) cover this activity (Table 1.1)? <ul style="list-style-type: none"> similar dredging and disposal method with no new known risk correct impact/contaminant sources addressed adequate assessment of impact pathways and potential marine/terrestrial receptors in-line with current regulatory requirements prepared within a reasonable timeframe (nominally 5 years)? all site-specific conditions (i.e. climatic, oceanographic, biogeographic, social or environmental) considered 	Reference previous DEIA	Detail after review	
Does the DEIA consider whether the dredging and/or disposal areas occur within an Indigenous Land Use Agreement area (ILUA) ? If so, complete or update the Noongar Standard Heritage Agreement Assessment to determine risk as a part of the EIA. Are there any new Registered Aboriginal Heritage Sites or Other Heritage Places since preparation of the DEIA?	Run search of DPLH registered sites, determine if ILUA excludes maintenance dredging, if inside an ILUA determine if a Noongar Standard Heritage Agreement Assessment has been completed in the previous EIA or requires updating.	Detail after review	
Are there any historical site use(s) that require monitoring and management as part of the proposed maintenance dredging campaign such as contaminated sites?	Where relevant, include references used to determine historical site use	Detail after review	
Have there been any significant changes to operations/operators/land use(s) within the vicinity of the dredging site since previous maintenance dredging or not captured in the existing DEIA?	Detail whether changes to land use or operations could introduce new or different environmental risk as assessed in the existing DEIA (i.e., new slipway)	Detail after review	
Are there any significant environmental lessons learnt from the previous dredge project that should be addressed for the upcoming project?	Review the last closeout report and detail lessons learnt (as relevant to environmental impacts) and how they may be addressed during the upcoming project	Detail after review	
Is the site listed as a potentially contaminated or contaminated site ? Is there any available documentation on this contaminated status?	Check contaminated site status from DWER's online contaminated sites database search, and in consultation with DoT of new surrounding industry land uses	Detail after review	
Do historical sampling results indicate a higher risk of contamination at this site? If so, are the data: <ul style="list-style-type: none"> representative of the proposed dredge and disposal footprint and associated volumes? collected within a reasonable timeframe (nominally 5 years) to provide contemporary data? adequate to establish potential contaminants of concern and compare to guideline values? 	Any comments on currency, spatial coverage, parameters analysed, sampling methods and data quality. Provide reference to data use to make this assessment.	Detail after review	
Is there any previous regulatory approval, advice or consultation that should be considered as part of the DEIA, consider general Stakeholder consultation?	Does this maintenance dredging project require permit(s) or approval that is no longer current or not sought under the existing DEIA? (i.e., vegetation clearing, contaminated site status change, new stakeholder consultation)	Detail after review	
Are there any other site-specific environmental risks that may require consideration?	Any other noteworthy conditions of the site – such as future developments of marinas, town planning etc	Detail	

Table 1.3 Outcome of IDER (tick as appropriate)

Dredging Environmental Impact Assessment		
1	The existing DEIA is adequate in addressing environmental, engineering and/or stakeholder aspects and will be applied to the upcoming maintenance dredging project	<input type="checkbox"/>
2	The existing DEIA requires minor amendments before it can be applied to the upcoming maintenance dredging project	<input type="checkbox"/>
3	A new DEIA is required for the upcoming maintenance dredging project due to significant variations in environmental, engineering and/or stakeholder aspects of the proposed project when compared to the previous DEIA	<input type="checkbox"/>
Dredging Environmental Management Plan		
1	Review and update DEMP	<input type="checkbox"/>
2	Minor updates detailed in this IDER appended to the existing DEMP	<input type="checkbox"/>
3	No updates to DEMP required	<input type="checkbox"/>

Annex C Audit Table

Table 1.1 EMF Audit Table

Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
1	2.1	Determine maintenance dredging requirements	<p>DoT undertakes hydrographic and/or topographic surveys to monitor the requirement for maintenance dredging. The frequency of surveys at sites is determined on an as needs basis and may include:</p> <ul style="list-style-type: none"> • consideration of the rate of sedimentation • historical trends • navigational risks • metocean events • coastal aerial georeferenced imagery • feedback from users and • environmental quality conditions <p>The requirement for maintenance dredging will be determined by DoT's engineering consultant using the assessment of survey data and other inputs (e.g., user feedback, navigation risks, aerial imagery, lessons learnt from previous dredging projects). This may be documented in a survey review which may recommend further actions to improve navigation i.e., maintenance dredging or alternative methods to delay requirement for maintenance dredging (e.g. relocation of navigation aids).</p>	DoT's engineering consultant	Prior to dredging/ground disturbance		
2	2.1	Determine maintenance dredging requirements	If maintenance dredging is required, the most recent survey data is used to define the areas and volumes to be dredged.	DoT's engineering consultant	Prior to dredging/ground disturbance		
3	2.1	Determine maintenance dredging requirements	The disposal and dredge design options are assessed to ensure environmental impacts at both the dredging and disposal areas are minimised.	DoT's environmental consultant	Prior to dredging/ground disturbance		
4	2.2	Assess potential environmental impacts	The significance of potential environmental impacts for maintenance dredging will be assessed in the context of the EPA's environmental factors and associated environmental objectives as updated from time to time that underpin the EIA process in Western Australia.	DoT's environmental consultant	Prior to dredging/ground disturbance		
5	2.2	Assess potential environmental impacts	The environmental impact assessment will be documented in an EIA, which will include information on the proposed dredging and disposal of material; relevant environmental monitoring results; potential environmental impacts; stakeholder consultation; and potential environmental monitoring and/or management.	DoT's environmental consultant	Prior to dredging/ground disturbance		
6	2.2	Assess potential environmental impacts	<p>In situations where there is an existing EIA, an IDER will be completed to determine whether this existing EIA adequately addresses the potential environmental impacts of the upcoming maintenance dredging project. Completion of the IDER will identify one of three possible outcomes regarding the application of the existing EIA</p> <p>1 The existing EIA is adequate in addressing environmental, engineering and/or stakeholder aspects and will be applied to the upcoming maintenance dredging project.</p>	<p>DoT's engineering consultant</p> <p>DoT's environmental consultant</p>	Prior to dredging/ground disturbance		

Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
			<p>2 The existing EIA requires minor amendments before it can be applied to the upcoming maintenance dredging project.</p> <p>3 A new EIA is required for the upcoming maintenance dredging project if the IDER identifies significant variations in environmental, engineering and/or stakeholder aspects of the proposed project when compared to the previous EIA.</p> <p>4 Sites with no existing EIA automatically require the preparation of a new EIA.</p>				
7	2.2	Assess potential environmental impacts	The IDER is completed by the DoT's environmental consultant, in consultation with the project team, and reviewed by DoT's engineering consultant. The IDER will be retained for auditing purposes.	DoT's engineering consultant DoT's environmental consultant	Prior to dredging/ground disturbance		
8	2.2	Assess potential environmental impacts	At locations where maintenance dredging occurs frequently, the IDER will be assessed annually or more frequently if the DoT's environmental consultant is aware of changes to environmental risks (e.g., oil spill or change of industries operating from the site); the regulatory process; the proposed dredging (design and volume); and/or the disposal (method and site).	DoT's environmental consultant	Prior to dredging/ground disturbance		
9	2.2.1	Determine regulatory approval requirements	If the EIA identifies the potential significant adverse environmental impacts, or there is a high level of stakeholder concern, then it is appropriate to seek advice from the relevant regulatory authorities depending on the potential impacts associated with the maintenance dredging project.	DoT's environmental consultant	Prior to dredging/ground disturbance		
10	2.2.1	Determine regulatory approval requirements	In the case of emergency dredging works, safety issues may take precedence over all other matters, including application of the EMF, and the DoT Navigational Safety will be consulted.	DoT's environmental consultant	Prior to dredging/ground disturbance		
11	2.2.1	Determine regulatory approval requirements	A Sea Dumping Permit from the Australian DCCEEW will be obtained for the disposal of dredged material to sea (as defined by the <i>Environment Protection (Sea Dumping) Act 1981</i>).	DoT's environmental consultant	Prior to dredging/ground disturbance		
12	2.2.1	Determine regulatory approval requirements	The project will be referred to the DCCEEW if maintenance dredging is likely to have a significant impact on matters of national environmental significance under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
13	2.2.1	Determine regulatory approval requirements	The project will be referred to the EPA under Section 38(1) of the <i>Environmental Protection Act 1986</i> (EP Act) if maintenance dredging is anticipated to have a significant effect on the environment and previous approvals have not been obtained.	DoT's environmental consultant	Prior to dredging/ground disturbance		
14	2.2.1	Determine regulatory approval requirements	Projects that are within the Swan-Canning Riverpark will be referred to the DBCA under the <i>Swan and Canning Rivers Management Act 2006</i> . Projects that do not occur within the Swan-Canning Riverpark do not require referral and only approvals applicable to the Project will be documented in detail during the EIA process.	DoT's environmental consultant	Prior to dredging/ground disturbance		
15	2.2.1	Determine regulatory approval requirements	Projects that are likely to impact ecological and social values of a Marine Park will be referred to the DBCA under the <i>Conservation and Land Management Act 1984</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
16	2.2.1						

Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
		Determine regulatory approval requirements	A Licence to Dredge under the <i>Waterways Conservation Act 1976</i> will be obtained for dredging projects that occur within Waterway Management Areas. Projects that do not occur within a Waterway Management Area do not require referral and only approvals applicable to the Project will be documented in detail during the EIA process.	DoT's environmental consultant	Prior to dredging/ground disturbance		
17	2.2.1	Determine regulatory approval requirements	DWER shall be consulted if dredging or disposal activities disturb or have the potential to create a contaminated site as per the <i>Contaminated Sites Act 2003</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
18	2.2.1	Determine regulatory approval requirements	Correct licence or works approval will be sought from DWER under Part V of the EP Act if dredging or disposal activities have the potential to result in emissions/pollutants that would result in the site being defined as a prescribed premises under Schedule 1 of the Environmental Protection Regulations 1987	DoT's environmental consultant	Prior to dredging/ground disturbance		
19	2.2.1	Determine regulatory approval requirements	A Vegetation Clearing Permit will be obtained from DWER for Projects that require the disturbance or clearing of native vegetation. Projects that do not require a Vegetation Clearing Permit do not require referral and only approvals applicable to the Project will be documented in detail during the EIA process.	DoT's environmental consultant	Prior to dredging/ground disturbance		
20	2.2.1	Determine regulatory approval requirements	Projects that involve taking or modification of threatened flora and/or fauna will be referred to the DBCA under the <i>Biodiversity Conservation Act 2016</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
21	2.2.1	Determine regulatory approval requirements	Projects that require disposal of dredge material via a landfill site/resource recovery centre will seek specific acceptance requirements/fees/permissions under the <i>Waste Avoidance and Resource Recovery Act 2007</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
22	2.2.1	Determine regulatory approval requirements	The EIA will document if an application for consent for the disturbance of an Aboriginal site is required to be submitted via a notice under <i>Section 18 of the Aboriginal Heritage Act 1972</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
23	2.2.1	Determine regulatory approval requirements	If the Project is within an ILUA, potential impacts to heritage will be assessed via the Noongar Standard Heritage Agreement Framework and if significant, required processes under relevant Noongar Standard Heritage Agreements will be followed.	DoT's environmental consultant	Prior to dredging/ground disturbance		
24	2.2.1	Determine regulatory approval requirements	Projects that interfere with places of State significance under the State Register shall be referred to the Heritage Council under the <i>Heritage Act 2018</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
25	2.2.1	Determine regulatory approval requirements	Projects likely to impact protected shipwrecks or relics within State waters will seek advice/approval from the Western Australian Museum, under the <i>Underwater Cultural Heritage Act 2018</i> and <i>Maritime Archaeology Act 1973</i> .	DoT's environmental consultant	Prior to dredging/ground disturbance		
26	2.2.1	Determine regulatory approval requirements	Project works (including subsea installation requirements) planned in a navigational area governed by DoT will obtain a Temporary Notice to Mariners via DoT's Navigational Safety.	DoT's environmental consultant	Prior to dredging/ground disturbance		
27	2.2.1	Determine regulatory approval requirements	Projects likely to exceed noise limits defined under the <i>Environmental Protection (Noise) Regulations 1997</i> will seek approval from local council and/or governing body.	DoT's environmental consultant	Prior to dredging/ground disturbance		
28	2.2.2						

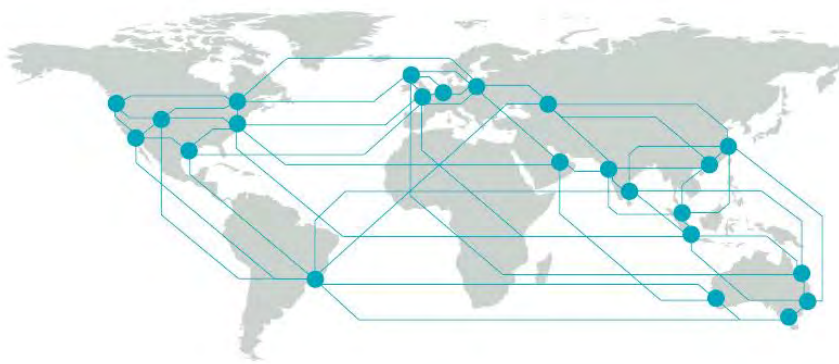
Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
		Monitoring pre-dredging	Pre-dredging environmental monitoring is required to be completed in accordance with a detailed SAP that outlines sampling areas/sites, sampling design, sampling methods, sampling rationale for chemical and physical analyses, quality assurance and control procedures, and necessary transport and storage requirements.	DoT's environmental consultant	Prior to dredging/ground disturbance		
29	2.2.2	Monitoring pre-dredging	SAPs will be prepared with reference to relevant/current environmental guidelines and regulations and should document the rationale and justification for the proposed sampling approach. An SAP may not be required in instances where the sampling scope is small and there is confidence that field sampling can be completed in-line with relevant sampling requirements. Justification will be discretionary based on professional judgement.	DoT's environmental consultant	Prior to dredging/ground disturbance		
30	2.2.3	Environmental guidelines	DoT's environmental consultant will apply relevant guidelines and regulations during the preparation of the SAP and EIA.	DoT's environmental consultant	Prior to dredging/ground disturbance		
31	2.2.4	Stakeholder consultation	Prior to each maintenance dredging project, the DoT Regional Coordinator, the Operations Manager and/or the Port/Harbour Manager/Master will be notified, where applicable.	DoT's engineering consultant	Prior to dredging/ground disturbance		
32	2.2.4	Stakeholder consultation	DoT will also notify the local DBCA, the local DWER, the relevant ILUA body corporate, and the relevant local government authority of dredging, as appropriate.	DoT's environmental consultant	Prior to dredging/ground disturbance		
33	2.2.4	Stakeholder consultation	For sites where there is ongoing and regular maintenance dredging requirements, notification of works will be provided annually or if there are significant changes to the dredge works.	DoT's environmental consultant	Annually or as required		
34	2.2.4	Stakeholder consultation	Depending on the location, duration and scope of work, DoT and/or DoT's engineering consultant may also: <ul style="list-style-type: none"> consult with community groups such as surf clubs, schools, sea rescue, resident associations commercial and recreational fishing associations install public information signage. 	Principal Representative or Superintendent DoT's engineering consultant	All phases of project		
35	2.2.4	Stakeholder consultation	All relevant written stakeholder consultation will be documented. Verbal stakeholder consultation will be documented only if necessary, e.g. to document a complaint.	Principal Representative or Superintendent DoT's engineering consultant DoT's environmental consultant DoT's dredging contractor(s)	All phases of project		
36	2.2.4	Stakeholder consultation	Stakeholders will be notified of relevant contact details for registering complaints e.g. via public information signs. Public complaints will be responded to as appropriate and documented in the project closeout report to inform the planning for following maintenance activities.	Principal Representative or Superintendent	All phases of project		

Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
				DoT's engineering consultant			
37	2.3	Monitor and manage potential environmental impacts	To direct appropriate management of the potential environmental impacts of each maintenance dredging project, as determined in the EIA, an EMP will be prepared by DoT's environmental consultant.	DoT's environmental consultant	Prior to dredging/ground disturbance		
38	2.3	Monitor and manage potential environmental impacts	The EMP will be a live document, however where the environmental risks, regulatory process and the proposed dredging (design and volume) and disposal is similar or unchanged, it may only require minor edits from the previous iteration. Therefore the IDER, will identify one of three possible outcomes regarding the application of the existing EMP: <ol style="list-style-type: none"> 1 Review and update EMP. 2 Minor updates detailed in this IDER appended to the existing EMP. 3 No updates to the EMP required. 	DoT's environmental consultant	Prior to dredging/ground disturbance		
39	2.3	Monitor and manage potential environmental impacts	The EMP will succinctly define the environmental monitoring and management, and contingency measures for dredging. The EMP will be informed by the EIA/IDER and include consideration of the material to be dredged (volume and characteristics), dredging methods, location (of dredging and disposal areas), and the duration and timing of the dredging works.	DoT's environmental consultant	Prior to dredging/ground disturbance		
40	2.3	Monitor and manage potential environmental impacts	The EMP will include details regarding the parties responsible for completing each of the management actions.	DoT's environmental consultant	Prior to dredging/ground disturbance		
41	2.3	Monitor and manage potential environmental impacts	The dredging contractor will prepare a Project Execution Plan, or similar documentation, that describes the scope of dredging works and includes reference to the contractor's environmental monitoring and management responsibilities as detailed in the EMP.	DoT's dredging contractor(s)	Prior to dredging/ground disturbance		
				Principal Representative or Superintendent			
42	2.3	Monitor and manage potential environmental impacts	Weekly progress reports that include updates on dredging operations, site inspections and environmental monitoring results are prepared by the project team for review in accordance with the EMP and submitted to DoT.	DoT's engineering consultant DoT's environmental consultant DoT's dredging contractor(s)	During dredging/ground disturbance		
43	2.3.1	Monitoring during dredging	The type of environmental monitoring required is based on the risk of potential impacts of the maintenance dredging project, as determined in the EIA/IDER.	DoT's environmental consultant	Prior to dredging/ground disturbance		
44	2.3.2	Monitoring during dredging	All environmental monitoring data collected during dredging will be reviewed in accordance with the requirements of the EMP to assess potential environmental impacts from the dredging project	DoT's environmental consultant	During dredging/ground disturbance and draft closeout within three months of completion of		

Audit item #	EMF Section No.	EMF Section Heading	Commitment	Responsibility	Timeframe	Evidence	Status
					dredging/ground disturbance		
45	2.3.3	Monitoring post-dredging	The post-dredging monitoring requirements will be determined within the EIA and documented in the EMP.	DoT's environmental consultant	Prior to dredging/ground disturbance		
46	2.4	Reporting and lessons learnt	<p>On completion of the dredging project, a closeout report will be prepared. Closeout reporting should be completed for each maintenance dredging project, though for ongoing dredging projects reporting may be completed on an annual basis in a reduced format. The closeout report will provide a summary of:</p> <ul style="list-style-type: none"> the maintenance dredging environmental monitoring undertaken any operational and/or environmental issues or incidents any management measures implemented lessons learnt and recommendations for future dredging at the site. 	<p>Principal Representative or Superintendent</p> <p>DoT's engineering consultant</p> <p>DoT's environmental consultant</p> <p>DoT's dredging contractor(s)</p>	Draft report within three months of completion of dredging/ground disturbance		
47	3	Review and Audit	This EMF is a controlled document that will be reviewed regularly to ensure best practice methods continue to be applied as knowledge, technology, dredging methods and regulatory requirements change. EMF reviews will identify and address any recommendations arising from the monthly maintenance dredging program meetings and closeout reports.	DoT's environmental consultant	As required		
48	3	Review and Audit	An annual internal audit of the maintenance dredging program will be carried out by DoT and DoT's environmental consultant.	DoT's environmental consultant	~Annually		
49	3	Review and Audit	A minimum of two projects that occurred during the respective audit period – ranging in size, type and complexity – will be audited.	DoT's environmental consultant	~Annually		
50	3	Review and Audit	An audit report will be prepared and include any non-conformances and recommendations for changes to the maintenance dredging program and/or EMF.	DoT's environmental consultant	~Annually		

Note:

1. DBCA = Western Australian Department of Biodiversity, Conservation and Attractions, DCCEEW = Department of Climate Change, Energy, the Environment and Water. DEMP = Dredging Environmental management Plan; DoT = Western Australia Department of Transport; DWER = Western Australian Department of Water and Environmental Regulation, EIA = Dredging Environmental Impact Assessment; EIAMP=Environmental Impact Assessment and Management Plan, EMF = Department of Transport Maintenance Dredging Environmental Management Framework (BMT 2021a); EMP = Dredging Environmental Management Plan; EPA = Environmental Protection Authority; EP Act = Environmental Protection Act 1987; IDER = Initial Desktop Environmental Review; ILUA = Indigenous Land Use Agreement; SAP = Sediment Sampling and Analysis Plan



BMT is a leading design, engineering, science and management consultancy with a reputation for engineering excellence. We are driven by a belief that things can always be better, safer, faster and more efficient. BMT is an independent organisation held in trust for its employees.

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Annex C Example plume sketch template

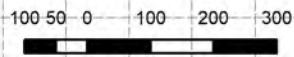
350000

351000

352000

Projection : UTM50 - Datum : GDA94
 Produced by BMT
 Production : 10 Sep 2021, KT, TB, PK
 Imagery : Nearmap 26 Mar 2015
 Project Ref : 179_01_002_01tempGeo5A4

This map is not to be used for navigational purposes. Positional accuracy should be considered as approximate.



Scale in metres
 Grid Scale - 100m

Legend

- Navigation Marker
- ▨ Discharge/Dredge Area
- ▭ Discharge Area
- ▭ Port Geographe Coastal Management Area

Environmental Monitoring Proforma
 Use Black Felt Tip Pen

Date:

Time:

Name:

Area in use:

Plume Sketched
 Site Photograph/s

Draw Wind Direction (From):



WIND SPEED (kn)	WAVE	
<1 - 2	Flat - Ripples with Crests	<input type="checkbox"/>
3 - 6	Small Wavelets	<input type="checkbox"/>
7 - 10	Large Wavelets	<input type="checkbox"/>
11 - 15	Small Waves	<input type="checkbox"/>
16 - 26	Moderate to Long Waves	<input type="checkbox"/>

TIDE High Mid Low
 Flood Slack Ebb

Notes & Comments:

OBSERVATIONS

Evidence of excessive algal growth?	<input type="checkbox"/>	Y	<input type="checkbox"/>	N
Evidence of foam on water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evidence of oily water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evidence of litter or other debris in water?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(Photos to be taken of any items reported)

Notes & Comments:

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.....

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6278500

6278500

6277500

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350000

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352000



Annex D Updates and Revisions to the EMMP

Updates and Revisions to the EMMP – Revision 7A

Table 1.1 Revisions register to the Port Geographe Coastal Structures Environmental Monitoring and Management Plan (Rev 6B as approved)

Document Section	Change	Reasoning
Throughout	Minor editorial changes, wording improvements, and reference updates where necessary	To improve clarity, consistency and relevance
Section 1	Removal of <i>Corporate endorsement</i>	Corporate endorsement was required when the first revision of the Environmental Monitoring and Management Plan (EMMP) was approved. The EMMP is an operational document, and there is no ongoing requirement for corporate endorsement as per Ministerial Statement 990
Section 1 Table 1.1	Management Targets #3 for Seagrass wrack management, 2 for Sediment movement, and 2 for Harbour entrance channel were revised. Text replaced and amended as follows: "Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)."	Historical data analyses from previous maintenance dredging campaigns shows the Management Target for seagrass health: the light attenuation coefficient (LAC) has not exceeded since 2018 when offshore disposal to Discharge Area 2 commenced. Furthermore, historical data from seagrass edge retreat monitoring demonstrated there were no significant changes to the position of seagrass meadow edges at impact sites relative to reference sites and the associated Management Target for seagrass meadow edge retreat was also met. Department of Transport have provided a revised Management Target to measure turbidity as opposed to LAC. Refer to technical notes (BMT 2022a,b) provided and response to Department of Water and Environmental Regulation comments enclosed for justification of LAC removal and revised approach.
Section 2.4.2	Added wording for justification and introduction for revised Management Target for routine LAC monitoring for management works involving disposal of material to the Offshore Disposal Area	
Section 3.1.3 Table 3.2	Management Target #3 was revised: "Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)."	
Section 3.1.4 Table 3.4	To all Tables in Sections mentioned: Monitoring method "Secchi depths" for monitoring Water column turbidity was removed.	
Section 3.2.4 Table 3.9	Parameter "Light attenuation" and the associated monitoring method "In situ data loggers or hand-held meter" and table note 2 were removed.	
Section 3.3.4 Table 3.14	Water quality monitoring (NTU) added at impact sites adjacent to offshore disposal area and reference sites at weekly intervals.	
Section 3.1.6 Table 3.5	Management Target #3 revised to: "Median NTU measured weekly at impact sites does not exceed 80 th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)." The reporting for the Management Target revised to NTU from LAC in Table 3.5.	Secchi Disk monitoring method has also been removed as it has proven to be an unreliable indicator of turbidity due to the subjective nature of the data collection and the sample collection reliability from the contractor. This monitoring method is superseded by regular UAV aerial imagery (i.e. drone) and seagrass edge mapping data.
Section 3.2.3	Management Target #2 was revised:	

Document Section	Change	Reasoning
Table 3.7 Section 3.3.3 Table 3.12	<i>"Median NTU measured weekly at impact sites does not exceed 80th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)."</i>	
Section 3.2.6 Table 3.10 Section 3.3.6 Table 3.15	Management Target #2 revised to: <i>"Median NTU measured weekly at impact sites does not exceed 80th percentile of the reference sites for two consecutive weeks (if completing offshore disposal during maintenance works)."</i> The reporting for the Management Target revised to NTU from LAC in Table 3.10 and Table 3.15.	
Section 2.1.1	Updated wrack pushing method to include land-based dozers and removed disposal via pipeline	Updated to better reflect the current methodology used.
Section 2.1.3	Added wording to allow for remedial dredging within the offshore disposal area should high spots be generated during disposal activities. <i>"Small-scale remedial dredging of low volumes may be required following disposal to the offshore disposal area if high spots are generated during disposal as observed from hydrographic survey data on campaign completion to maintain safe navigability".</i>	Small-scale (~<1000 m ³) remedial dredging required for navigational safety if high spots are generated within the offshore disposal area during disposal. The offshore area is already approved as a dredging area for beneficial reuse of disposed sand from maintenance dredging campaigns to nourish Wonnerup Beach (~10,000 ³)
Section 2.4.1	Text added under subheading 'Wrack and sediment quality': <i>"External sediment sources for nourishment (e.g. local sand pits) have previously been sampled and analysed for potential contaminants and physical suitability prior to use (BMT 2021b). The results were combined into a memorandum and show that concentrations of metals, organotins, and hydrocarbons were all below the relevant guidelines (BMT 2021). Prior to use, new external sediment sources will be sampled and analysed for contaminants and the memorandum updated."</i>	Text references an Internal Memorandum written in May 2021 which summarised that results of sediment sampling at external sand pits used for beach nourishment show no contaminants (BMT 2021). Previously no reference to the quality of this sediment in the EMMP.
Section 3.2.2 Table 3.6	Removal of reference to <i>"offshore disposal"</i>	Works related to sediment movement do not require offshore disposal of sediment, it is expected this may have been a copy and paste error.

References

- BMT (2021) Nourishment sources sand sampling and analysis, Port Geographe. Prepared for the Department of Transport by BMT Commercial Australia Pty Ltd, Internal Memorandum, Perth, Western Australia, May 2021
- BMT (2022a) Port Geographe Coastal Structures Environmental Monitoring and Management Plan Review of Light Logger Monitoring Technical Note, Prepared for the Department of Transport by BMT Commercial Australia Pty Ltd, Report No. Tn-1755_01-8, Perth, Western Australia, May 2022
- BMT (2022b) Technical Note – Further clarifications for removal of the light attenuation coefficient as a Management Target in the Port Geographe Environmental Monitoring and management Plan. Prepared for the Department of Transport by BMT Commercial Pty Ltd, Report No. Tn-1755_01-8, Perth, Western Australia, September 2022



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