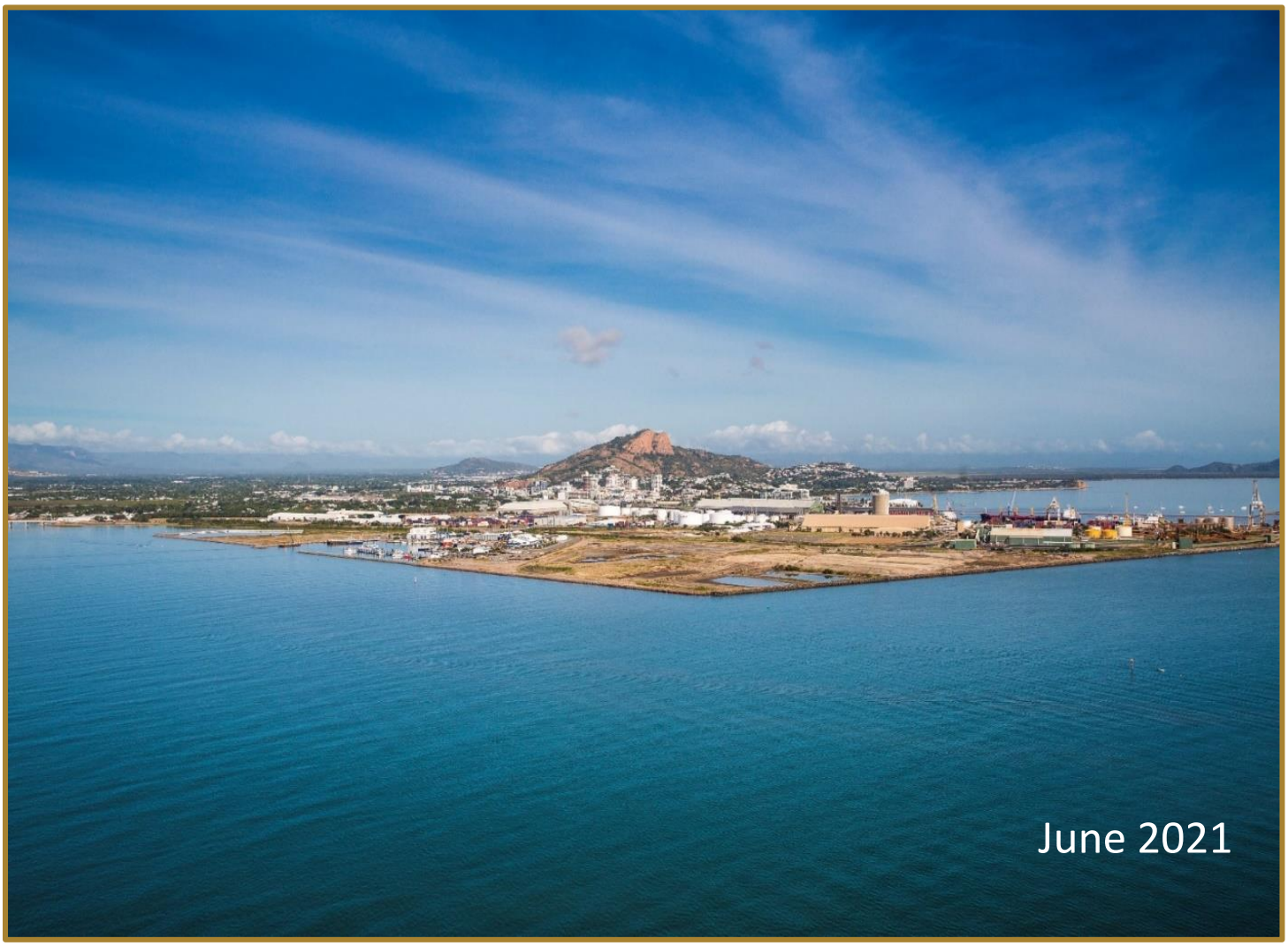
Townsville Port Expansion Channel Upgrade Project

Environmental Procedure for Pile Driving



Document Control Sheet

Revision history

Revision No.	Date	Changed by	Nature of amendment
0	14/02/2020	T Smith	Submitted Version
1	29/06/2021	T Smith	Updated with detailed approach and scientifically determined exclusion and observation zones

Document approval

Approval of the Environmental Procedure for Pile Driving (R1) was issued by DAWE on 12 July 2021.

The Environmental Procedure for Pile Driving (R1) was published on the CU Project's website on 14 July 2021.

This document has been prepared to meet the Commonwealth Government's EPBC Approval No. 2011/5979 Conditions and the Queensland's Coordinator General's Conditions for the Port of Townsville Limited's Port Expansion Project.

DECLARATION OF ACCURACY

EPBC Number	2011/5979
Project Name	Port of Townsville Port Expansion Project
Approval Holder	Port of Townsville Limited
ACN / ABN	130 077 673 / 44 411 774 236
Approved Action	To expand the Port of Townsville, in Townsville Queensland. The action is for dredging, land reclamation and construction of infrastructure.
Location of the Action	Townsville, Queensland

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

Full name (please print)

Marissa Wise

Organisation (please print)

Port of Townsville Limited

Date 29 / 06 /2021

GLOSSARY

AEIS	Townsville Port Expansion Project: Additional Information to the Environmental Impact Statement - Final (June 2017).
CU Project	Channel Upgrade Project
CEMP	Construction Environmental Management Plan
Department / DAWE	The Australian Government Department of Agriculture, Water and the Environment, or any other agency administering the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) from time to time
EIS	Port Expansion Project (PEP) Environmental Impact Statement (March 2013)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
Exclusion Zone	A radius, from the centre of the pile to be driven, around pile driving operations to minimise the risks of physiological impacts to marine fauna, based on current scientific evidence. The zone must be visually observed at all times during piling driving operations, and where pile driving operations must cease if marine fauna are observed within the relevant radius.
High frequency cetaceans	The functional cetacean hearing group that represents those odontocetes (toothed whales, snub-fin dolphin, Australian humpback dolphin, Indo-pacific bottlenose dolphin) specialised for hearing high frequencies.
Listed Dolphin Species	Australian snubfin dolphin (*Orcaella heinsohni*) and Australian humpback dolphin (*Sousa sahulensis*). Note: definition amended to replace Indo-Pacific humpback dolphin (*Sousa chinensis*) with *Sousa sahulensis* based on revised speciation and listing - https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=87942
Listed Turtle Species	Green Turtle (*Chelonia mydas*), Hawksbill Turtle (*Eretmochelys imbricate*); Flatback Turtle (*Natator depressus*); Loggerhead Turtle (*Caretta caretta*); Olive Ridley Turtle (*Lepidochelys olivecea*); and Leatherback Turtle (*Dermochelys coriacea*)
Low frequency cetaceans	The functional cetacean hearing group that represents mysticetes (baleen whales e.g., humpback whales) specialised for hearing low frequencies.
Marine Fauna	Listed turtle species, Dugong (*Dugong dugon*), listed dolphin species, and all other Cetaceans – referred to in this document as marine megafauna
MEMP	Marine Environmental Management Plan
Minister	The Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and includes a delegate of the Minister
MNES	Matter of National Environmental Significance: In the context of this approval: Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage place, listed turtle species, listed dolphin species and all other Cetaceans, Dugong (*Dugong dugon*), Commonwealth marine area and the Great Barrier Reef Marine Park
Observation Zone	The zone whereby the movement of marine fauna should be monitored to determine whether they are approaching or entering the exclusion zone. For

	whales, dolphins or dugongs, this includes a 2 kilometre horizontal radius from the piling equipment, and for listed turtle species, this includes a 300 metre horizontal radius from the piling equipment. An alternate distance for the observation zone may be considered, if it provides equivalent or better protection to marine fauna, in accordance with Condition 23.
PEP	Port Expansion Project
Port	Port of Townsville Limited
Re-strike testing activities	Testing of an installed pile to confirm that the pile has been installed to the appropriate engineering standards
Site	The new reclamation area (Lot 794 on SP308904) and the northern extent of the East Port Area at the Port of Townsville (Lot 791 on EP2348)
Suitably qualified independent expert(s)	A person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using the relevant current protocols, standards, methods and/or literature
Suitably qualified marine observer(s)	As defined in EPBC Act Approval 2011-5979, a dedicated and suitably trained person, with demonstrated experience in marine fauna observation, identification and monitoring of marine fauna, distance estimation and reporting. The marine observer must only be tasked with undertaking visual observations for marine fauna whilst they are engaged to do so, and must not have any other duties while engaging in visual observations.

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1 INTRODUCTION

Port of Townsville Limited (Port) is a Government Owned Corporation established under the *Government Owned Corporations Act 1993*, which manages the Port of Townsville. The Port is located on Cleveland Bay, approximately three kilometres east of the city centre in Townsville, North Queensland (Figure 1). It is a multi-purpose port that handles predominantly bulk and general cargo with a land and sea jurisdiction in excess of 450 km^2. The Port is situated in the Great Barrier Reef World Heritage Area, outside of the Great Barrier Reef Marine Park. Surrounding the Port of Townsville is Cleveland Bay and the community of Townsville. Townsville is a long-established township with a history of urbanisation and industrial activities in the Ross River and Ross Creek drainage system.

The Townsville Port Expansion Channel Upgrade Project (CU Project) is Stage 1 of the Port's long-term Port Expansion Project (PEP). The PEP (Figure 1) aims to create a series of strategic assets which will address current capacity constraints and accommodate future growth in trade over a planning horizon to 2040. It includes development of port infrastructure and work to "top of wharf" facilities, namely, capital dredging; reclamation; breakwaters and revetments; berths; access roads; rail loop; and trunk services and utilities. It does not include the development of "above wharf" infrastructure such as terminal pavements; ship-loaders and unloaders; product conveyors; storage buildings for products; rail loaders and unloaders; stacking and reclaiming equipment; storage tanks; and pipelines, which will be subject to separate statutory assessment and approval requirements prior to the start of their operations.

The CU Project involves:

- the supply and haulage of marine-grade armour rock;
- the construction of a reclamation area;
- construction of the Diagonal Breakwater (realignment of the Western Breakwater);
- the construction of a temporary offloading facility;
- capital dredging and placement of capital dredge material in the reclamation area; and
- movement and installation of navigation aids:

The construction, reclamation and dredging will occur inside the existing port limits, the designated water areas in which navigation falls under the control of the Regional Harbour Master (RHM). The reclamation area forms part of Lot 794 on SP308904 adjacent to the northern extent of the East Port area (Lot 791 on EP2348, which is Strategic Port Land), while the temporary offloading facility and activities will occur adjacent to Lot 794.
The capital dredge campaign will last approximately 2 to 3 years and dredge approximately 3.9 million cubic metres using a mechanical dredge. All the capital dredge material will be placed within the new revetment bunds as part of land reclamation activities. Dewatering and ground improvement of emplaced sediments will also be undertaken.

Piling activities are limited during the CU Project given the focus is on development of a reclamation area and channel widening dredging only. Piling activities will be for the construction of a temporary unloading facility and associated mooring infrastructure for the discharge of dredge material from barges to the reclamation area and the repositioning of channel navigation beacons in the areas of the channels to be widened.

Figure 1: Locality Plan of the Port of Townsville & CU Project

2 SCOPE AND OBJECTIVES

This procedure has been developed for pile driving operations that may be undertaken as part of the Channel Upgrade Project to ensure that pile driving operations:

- Are undertaken adopting a managed approach that includes adequate preparation and controlled start up procedures;
- minimises and mitigates adverse impacts on marine megafauna, particularly inshore dolphins, dugongs, and marine turtles;
- meets the conditions of the Commonwealth and State approvals; and
- complies with any other relevant legislation (i.e. *Environmental Protection (Noise) Policy 2019)*, standards/guidelines (i.e. South Australian Department of Planning, Transport and Infrastructure: Underwater Piling Noise Guidelines First published: November 2012) and industry practice.

This Environmental Procedure for Pile Driving is Appendix I of the CU Project *Marine Environmental Management Plan (MEMP POT 2135).* This Procedure is stand alone, however should also be read in conjunction with the MEMP to ensure all management and mitigation measures are captured in undertaking the proposed works.

The PEP was the subject of an Environmental Impact Statement (EIS) and a further Additional Information to the Environmental Impact Statement (AEIS), submitted in support of Commonwealth and State project approval applications.

Commonwealth approval (EBPC 2011/5979) under the Environment Protection and Biodiversity Conservation Act 1999 for the PEP was granted on 5 February 2018. The Queensland Coordinator-General's Evaluation Report on the Environmental Impact Statement for the Townsville Port Expansion Project was issued in September 2017.

Appendix A lists the conditions from the EPBC Act approval relevant to this Environmental Procedure for Pile Driving, there were no piling specific conditions in the Queensland Coordinator-General's Evaluation Report.

2.1 Pile Driving activities

Pile driving activities for the CU Project are limited to the development of the temporary unloading facility, mooring infrastructure for the discharge of dredge material from barges to the reclamation area and for the re-alignment of the channel navigational beacons.

Temporary unloading facility (TUF)
The temporary unloading facility (TUF) consists of an offloading platform constructed perpendicular to the CU reclamation area and an access channel and swing basin to allow for all-tide safe access by tugs and barges. The TUF will consist of a sheet piled wall backed by a rock breakwater on the ocean side (constructed in a similar manner to the 2.2KM reclamation rock wall). Cylindrical anchor, mooring and breasting piles will also be installed for tieback and mooring purposes as part of this structure. These facilities are temporary and will be decommissioned once dredging and placement activities are completed.

The offloading facility will be constructed from the land side using articulated vehicles and excavators for the breakwater, with marine-based plant to install piling. Sheet piles and cylinder piles (for tieback and mooring arrangements) will be installed, with all piling works to be undertaken as per this procedure.

Underwater noise modelling of the TUF piling work has been undertaken and is detailed in section 3.

Channel navigation beacons

The channel navigation beacons are in place for the access channels to the Port of Townsville. As a consequence of the capital dredging to widen both channels, the lateral beacons and lead lights that support ship movement through the channels will need to be re-positioned to support safe navigation. Approximately half of the channel lateral beacons will need to be removed and reinstalled outside of the toe of the widened channel. Some rationalisation of the number of beacons requiring re-positioning will occur as part of this process. Lead lights at the land end and sea end of the channels will also need to be re-positioned to identify the centreline of the new channels.

The beacons are owned by Maritime Safety Queensland (MSQ), the Port will work in collaboration with MSQ to facilitate this work. Navigational beacon piles are between 600mm (lateral beacons) and 1200mm (lead lights) in diameter and will be installed with up to 25m embedment. The standard approach is to drive piles into the seabed and attach the beacons on top of the driven piles at the appropriate location.

As the re-positioning works will require piling, the following procedure will be implemented for this piling work.

The work to relocate the navigation beacons has not yet been finalised, as such the underwater noise modelling for the Channel navigation beacons piling work has not yet undertaken. This procedure will be updated to incorporated this at a later stage.

3 MARINE MEGAFAUNA OBSERVATION AND EXCLUSION ZONES

As per condition 15 of EPBC 2011/5979, Port has utilised the services of an underwater acoustic consulting company (Jasco) to review and/or establish relevant Exclusion Zones to minimise the risk of physiological impacts to marine megafauna from pile driving. These Exclusion Zones are for the piling works to construct the Temporary Unloading Facility, involving the following:

- Installation of sheet piles, by vibratory piling and impact piling;
- Installation of cylinder piles (700 and 950mm diameter), by vibratory piling and impact piling; and
- Potentially, simultaneous piling of sheet or cylinder piles by tandem piling rigs, by vibratory piling and impact piling.

Table 1 provides details if each pile to be driven for the TUF, including intended penetration depth and number of piles to be driven per day. The Exclusion Zones established are based on these pile specifications.

Table 1: TUF piling spread, including type of pile, intended penetration and proposed number to be installed per day.

Pile shape	Description	Dimension		Final penetration depth (m)	Maximum # of piles per day*
		Length (m)	Diameter or width (m)		
Sheet	Unloading facility walls	18	AZ 36-700N	9	10
Cylindrical	Anchor	12	0.70	5.5	8
	Breasting	16 - 18	0.95	7 - 9	4

* Maximum number of piles the contractor has advised will be piled in a single day.

The following Exclusion Zones were developed using a modelling study of underwater sound levels associated with the specific pile driving activities planned to occur as part of the TUF construction. This study assessed distances from pile driving activities, including the cumulative exposure from driving multiple piles per day, from a single barge to where underwater sound levels reached thresholds corresponding to various levels of impact to marine megafauna in the area. To provide flexibility during works, the study also identified distances to thresholds from various aggregate (simultaneous) scenarios, in which two piling barges would operate simultaneously.

Given the Exclusion Zones are based on the cumulative exposure from a defined number of multiple piles driven per day (Table 1), the number of piles to be driven on any day will establish the relative Exclusion Zone. Once the program and Exclusion Zone is established, the number of piles driven per day can not be exceeded.

Several different thresholds for evaluating effects on marine megafauna were assessed, including physical injury, auditory injury (permanent threshold shift (PTS) and temporary threshold shift (TTS) – a permanent or temporary reduction, respectively, in hearing sensitivity), and behavioural disturbance. In general, TTS was the threshold utilised to establish the nominated exclusion zones. As different megafauna species have different susceptibility to underwater noise impact, these are grouped based on their hearing sensitivity.

For most of the Exclusion Zones established, the applied Exclusion Zone is based on a cumulative underwater noise level from the installation of the total number of piles expected to be completed in a day, not any single pile. The exception to this is the Exclusion Zones for low frequency cetaceans, where both single pile and multiple pile Exclusion Zones are presented given their transient nature and reduced potential to be in the impact area across multiple pile driving events.

The established Exclusion Zones for each pile type, by hammer type and for each species group are as per the following sections. It is to be noted that consistent with non-piling construction activities, a minimum Exclusion Zone of 100m (for whales) and 50 m (for dolphins, dugongs and turtles) have been applied to the project pile driving activity. Where the calculated Exclusion Zone is smaller than this minimum distance, the minimum distance will apply and the calculated distance is noted for reference in the tables.

Further to determining exclusion zones, Jasco has also provided input on revised Observation Zones associated with each Exclusion Zone. These Observation Zones are not entirely determined using ranges derived from acoustic assessments. Rather, their extent incorporates consideration of factors such as fauna visibility, source mobility, water depth, and fauna surfacing intervals. The Observation Zones have been scaled in association with the predicted Exclusion Zones, with a minimum relationship of a factor of the Observation Zone doubling the established Exclusion Zone. The established Observation Zones are presented with the Exclusion Zones in the following section.

3.1 Single Pile driving operation:

Vibratory Piling – single piling operation:

The determined Exclusion and Observation Zones for vibratory piling, single piling operation are as follows:

Table 2: Recommended ***vibratory*** piling Exclusion Zones for each hearing group.

Where the calculated Exclusion Zone was less than the Exclusion Zone for non-piling works, the calculated distance noted in parenthesis.

Hearing Group	Exclusion Zone Distance (m)		
	Sheet Pile (AZ36-700N)	Anchor Pile (0.70m diameter)	Mooring/breasting Pile (0.95m diameter)
Low frequency cetaceans	410	100 (10)	100 (20)
High frequency cetaceans	110	50	50
Sirenians (Dugong)	50	50 (-)	50 (-)
Sea turtles	50 (<10)	50 (-)	50 (-)

A dash indicates the threshold was not reached within the limits of the modelling resolution (10 m).

Table 3: Recommended ***vibratory*** piling Observation Zones for each hearing group.
Minimum Observation Zones apply.

Hearing Group	Observation Zone Distance (m)		
	Sheet Pile (AZ36-700N)	Anchor Pile (0.70m diameter)	Mooring/breasting Pile (0.95m diameter)
Low frequency cetaceans	2,000	2,000	2,000
High frequency cetaceans	500	500	500
Sirenians (Dugong)	500	500	500
Sea turtles	300	300	300

Impact Piling – single piling operation:

The determined Exclusion and Observation Zones for Impact piling, single piling operation are as follows:

Table 4: Recommended ***impact*** piling Exclusion Zones for each hearing group.
Where the calculated Exclusion Zone was less than the Exclusion Zone for non-piling works, the calculated distance noted in parenthesis.

Hearing Group	Exclusion Zone Distance (m)		
	Sheet Pile^ (AZ36-700N)	Anchor Pile (0.70m diameter)	Mooring/breasting Pile (0.95m diameter)
Low frequency cetaceans	Single Pile: 1840* Ten piles: 5200	Single Pile: 180 Eight Piles: 400	Single Pile: 430 Four Piles: 900
High frequency cetaceans	780	50	110
Sirenians (Dugong)	970	60	110
Sea turtles	60	50 (30)	60

* Distance calculated for a single pile is also predicted to prevent TTS for the driving of two sheet piles, assuming 6.67 minutes of driving each at a rate of 40 strikes per minute.

^ Exclusion zone distances for alternative numbers (between 1 and 10) of Impact driven sheet piles are provided in Jasco Report, based on the distances to TTS. These alternative Exclusion Zones may be applied where it is determined to drive less piles per day.

Table 5: Recommended ***impact*** piling Observation Zones for each hearing group.

Where the calculated exclusion zone was less than the exclusion zone for non-piling works, the calculated distance noted in parenthesis.

Hearing Group	Exclusion Zone Distance (m)		
	Sheet Pile (AZ36-700N)	Anchor Pile (0.70m diameter)	Mooring/breasting Pile (0.95m diameter)
Low frequency cetaceans	Single Pile: 2,840 Ten piles: 6,200	Single Pile: 2,000 Eight Piles: 2,000	Single Pile: 2,000 Four Piles: 2,000
High frequency cetaceans	1,080	500	500
Sirenians (Dugong)	1,270	500	500
Sea turtles	300	300	300

3.2 Simultaneous Piling:

As the exact arrangement for any simultaneous piling has not been determined, several simultaneous piling operations scenarios were assessed and provides the contractor with a range of options for simultaneous piling. The following Exclusion Zone tables provide the range of scenarios and the determined Exclusion Zones for each.

As for single piling Exclusion Zones, a minimum Exclusion Zone of 100m (for whales) and 50 m (for dolphins, dugongs and turtles) have been applied to the project pile driving activity consistent with non-piling construction activities. Where the simultaneous piling calculated Exclusion Zone is lower than this minimum distance, the calculated distance is noted in additional to this minimum distance.

It is important to note that no simultaneous piling operations are considered where one barge is impact driving while the other barge is vibratory driving. For these scenarios, the exclusion zones in Section 3.1 for the single barge operations for each type of driving would apply to that particular operation.

Further, the approach for the revised Observation Zones associated with each Exclusion Zone have also been applied to the simultaneous piling scenarios. As per single piling operations, the Observation Zones have been scaled in association with the predicted Exclusion Zones, with a minimum relationship of a factor of the Observation Zone doubling the established Exclusion Zone. The established Observation Zones are also presented in the following section.

Table 6. *Aggregate scenarios (**vibratory piling**, SEL criteria)*: Piling Exclusion Zones for each hearing group for simultaneous vibratory piling operations

Hearing group	Exclusion Zone Distance (m)									
	Aggregate 1 (10 sheet piles and 8 anchor piles)	Aggregate 2 (10 sheet piles and 10 sheet piles)	Aggregate 3 (8 sheet piles and 8 anchor piles)	Aggregate 4 (8 sheet piles and 8 sheet piles)	Aggregate 5 (6 sheet piles and 8 anchor piles)	Aggregate 6 (6 sheet piles and 6 sheet piles)	Aggregate 7 (4 sheet piles and 8 anchor piles)	Aggregate 8 (4 sheet piles and 4 sheet piles)	Aggregate 9 (2 sheet piles and 8 anchor piles)	Aggregate 10 (2 sheet piles and 2 sheet piles)
LF cetaceans	430	650	360	560	290	470	220	360	140	220
HF cetaceans	110	190	90	160	70	130	50	90	50 (30)	60
Sirenians (Dugong)	50	100	50 (40)	80	50 (40)	70	50 (30)	60	50 (20)	50 (40)
Sea turtles	50 (10)	50 (30)	50 (10)	50 (30)	50 (10)	50 (30)	50 (10)	50 (30)	50 (-)	50 (30)

A dash indicates the threshold was not reached within the limits of the modelling resolution (10 m).

Table 7. *Aggregate scenarios (**vibratory piling**, SEL criteria)*: Piling Observation Zones for each hearing group for simultaneous vibratory piling operations

Hearing group	Observation Zone Distance (m)									
	Aggregate 1 (10 sheet piles and 8 anchor piles)	Aggregate 2 (10 sheet piles and 10 sheet piles)	Aggregate 3 (8 sheet piles and 8 anchor piles)	Aggregate 4 (8 sheet piles and 8 sheet piles)	Aggregate 5 (6 sheet piles and 8 anchor piles)	Aggregate 6 (6 sheet piles and sheet piles)	Aggregate 7 (4 sheet piles and 8 anchor piles)	Aggregate 8 (4 sheet piles and 4 sheet piles)	Aggregate 9 (2 sheet piles and 8 anchor piles)	Aggregate 10 (2 sheet piles and 2 sheet piles)
LF cetaceans	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
HF cetaceans	500	500	500	500	500	500	500	500	500	500
Sirenians (Dugong)	500	500	500	500	500	500	500	500	500	500
Sea turtles	150	150	150	150	150	150	150	150	150	150

Table 8. *Aggregate scenarios (**impact piling**, SEL criteria)*: Piling Exclusion Zones for each hearing group for simultaneous impact piling operations

.Hearing group	Exclusion Zone Distance (m)									
	Aggregate 1 (10 sheet piles and 8 anchor piles)	Aggregate 2 (10 sheet piles and 10 sheet piles)	Aggregate 3 (8 sheet piles and 8 anchor piles)	Aggregate 4 (8 sheet piles and 8 sheet piles)	Aggregate 5 (6 sheet piles and 8 anchor piles)	Aggregate 6 (6 sheet piles and sheet piles)	Aggregate 7 (4 sheet piles and 8 anchor piles)	Aggregate 8 (4 sheet piles and 4 sheet piles)	Aggregate 9 (2 sheet piles and 8 anchor piles)	Aggregate 10 (2 sheet piles and 2 sheet piles)
LF cetaceans	5,200	6,920	4,750	6,320	4,190	5,600	3,520	4,750	2,600	3,520
HF cetaceans	790	1,240	630	1,010	510	900	400	620	230	400
Sirenians (Dugong)	980	1,440	900	1,330	650	1,070	490	900	300	490
Sea turtles	70	110	60	90	60	90	50	80	50 (40)	60

Table 9: *Aggregate scenarios (**impact piling**, SEL criteria)*: Piling Observation Zones for each hearing group for simultaneous impact piling operations

Hearing group	Observation Zone Distance (m)									
	Aggregate 1 (10 sheet piles and 8 anchor piles)	Aggregate 2 (10 sheet piles and 10 sheet piles)	Aggregate 3 (8 sheet piles and 8 anchor piles)	Aggregate 4 (8 sheet piles and 8 sheet piles)	Aggregate 5 (6 sheet piles and 8 anchor piles)	Aggregate 6 (6 sheet piles and sheet piles)	Aggregate 7 (4 sheet piles and 8 anchor piles)	Aggregate 8 (4 sheet piles and 4 sheet piles)	Aggregate 9 (2 sheet piles and 8 anchor piles)	Aggregate 10 (2 sheet piles and 2 sheet piles)
LF cetaceans	6,200	7,920	5,750	7,320	5,190	6,600	4,520	5,750	3,600	4,520
HF cetaceans	1,090	1,540	930	1,310	810	1,200	800	920	800	800
Sirenians (Dugong)	1,280	1,740	1,200	1,630	950	1,370	800	1,200	800	800
Sea turtles	150	150	150	150	150	150	150	150	150	150

4 PROCEDURE AND ACTIONS

The following section outlines the procedure and actions to be implemented in preparing for and undertaking piling activities. A number of these elements have been achieved for the Temporary unloading facility (especially section 4.1) however all actions need to be undertaken for the Channel Beacon works.

4.1 Prior to Undertaking Piling

Prior to commencing pile driving activities, the Port must establish the effective exclusion zone to minimise risk to marine megafauna from the pile driving operations. The Port has engaged the services of a suitably qualified person to determine the exclusion zone based on relevant noise modelling and scientific evidence regarding the impact of noise on key marine megafauna species and the noise and vibration impacts associated with piling. This work was also peer reviewed to demonstrate the exclusion zones are appropriate.

Actions

Details	Responsibility	Status
Establish an **exclusion zone** to minimise the risk of physiological impacts to marine megafauna from pile driving operations. The **exclusion zone** must be based on noise modelling and relevant scientific evidence and peer reviewed by a suitably qualified independent expert. Determined exclusion zones are detailed in section 3.	Environmental Advisor CU	TUF – Completed Channel beacons – pending
Update this Environmental Procedure for Pile Driving and the associated Marine Environment Management Plan with the specific exclusion zone	Environmental Advisor CU	This document TUF – Completed Channel beacons – pending
Submit the updated MEMP and Environmental Procedure for Pile Driving to the Minister for Approval.	Environmental Advisor CU	TUF – Underway
Engagement of Suitably qualified marine observers in the sighting, recording and reporting of marine megafauna within or around the piling observation and exclusion zones.	Contractors	TUF – underway

4.2 Piling Operations

The following requirements are to be implemented when undertaking Piling Operations for the CU Project:

Details	Responsibility
Determine the Pile installation program for each day and determine the relevant Exclusion Zone/s and Observation Zone/s. These zones are to be communicated to all parties, especially the Suitably qualified marine observers and recorded on the observation sheet	Contractors
Ensure that pre-start visual observations for marine megafauna are undertaken across the Observation Zone/s. The Observation Zones are as detailed in Section 3, being the horizontal radius from the piling equipment. The visual observations must be undertaken by a suitably qualified marine observer for at least 30 minutes immediately preceding the commencement of pile driving operations.	Contractors
Only commence pile driving operations if marine megafauna have not been sighted within the Exclusion Zones as detailed in Section **3** at the completion of the 30 minute pre-start visual observations.	Contractors
Initiate soft-start procedures at the commencement of pile driving operations, with a gradual increase in piling impact energy of no more than 50% of full impact energy for 10 minutes. The soft-start procedure must be implemented after breaks in piling of 30 minutes or more.	Contractors
Apply piling noise mitigation measures, where practicable, to attenuate underwater noise if determined to pose a significant risk.	Contractors
Undertake underwater noise monitoring of initial piling activities to validate the noise modelling and exclusion zones established for this Project.	Environmental Advisor CU
Ensure that visual observations are undertaken by a suitably qualified and dedicated marine observer during pile driving operations.	Contractors
Implement stand-by procedures if marine megafauna are sighted within the Observation Zone during the soft-start or normal operation procedures.	Contractors

Details	Responsibility
The stand-by procedures are to include placing the operator of the piling equipment on stand-by to shutdown the piling equipment.	
Cease pile driving operations if marine megafauna are observed in, or about to enter the Exclusion Zones, as detailed in section 3. Pile driving operations must not commence again until all marine megafauna are observed to move outside the Exclusion Zone and 30 minutes have passed since the last sighting of the marine megafauna within the Exclusion Zone.	Contractors
Do not commence pile driving operations between the hours of sunset and sunrise. Pile driving operations commenced before sunset or before a period of low visibility may continue between the hours of sunset and sunrise, unless pile driving operations have been suspended for more than 15 minutes.	Contractors
With the exception of soft-start procedures and noise modelling, apply the same procedure for piling activities for all re-strike testing activities. A maximum of 15 full force blows of the pile hammer may be applied to each test pile on a maximum of two re-strike test events per test pile.	Contractors
Ensure records of Suitably qualified marine observers engaged for visual observations are kept along with all recording of marine megafauna observations. Ensure a log of all triggering of stand-by procedures and/or cessation of piling due to marine megafauna within the observation and/or exclusion zone is maintained, include date and times of ceasing and re-commencing piling.	Contractors Environmental Advisor CU

4.3 Corrective Actions

If impacts on marine megafauna are identified, either via piling operation impacts or relevant marine megafauna monitoring (e.g. underwater noise monitoring of initial piling activities), corrective actions to address piling impacts will be implemented. The following actions will be taken where an impact on marine megafauna from piling activities is identified or suspected:

Details	Responsibility
Investigate all incidents in relation to potential impacts from piling on marine megafauna promptly and undertake appropriate actions, as required. This may include underwater noise monitoring and modelling where appropriate.	Contractors Environment Manager CU / Environmental Advisor CU
Review the findings of the underwater noise monitoring of initial piling activities and undertake any modification to the exclusion zones or mitigation controls where monitoring shows variance from the predicted noise levels.	Environment Manager CU / Environmental Advisor CU
Where impacts are identified or suspected, implement additional control measures, including reviewing and modifying plant, equipment and construction practices or modifying the relevant exclusion zone, before continuing with the piling operations.	Contractors Principal's Site Representative
Implement corrective actions to meet required outcomes of regulators.	Contractors Principal's Site Representative
Update relevant Management Plans (CEMP and MEMP) and procedures with revised management controls, as necessary.	Environmental Advisor CU

4.4 Training and Communication

Training and communication are fundamental components of this Procedure given the unique nature of monitoring for marine megafauna around piling activities. The following will apply to CU Project piling activities:

Details	Responsibility
Training	
Ensure appropriate induction of suitably qualified marine observers to the area and works is implemented to support marine megafauna observation, identification and monitoring, distance estimation and reporting.	Contractors Manager Environment CU
Ensure all site personnel or contractors carrying out piling activities are familiar with the requirements of this procedure (e.g. during pre-start site inductions) and marine megafauna requirements.	Contractors Manager Environment CU
Ensure managers and supervisors or contractors with responsibility for the items in this Environmental Procedure for Pile Driving fully understand the responsibilities and requirements associated with marine fauna.	Contractors Principal's Site Representative
Communication	
Communicate the high priority areas to all site personnel.	Contractors Principal's Site Representative
Communicate to all parties the Pile installation program for each day and the relevant Exclusion Zone/s and Observation Zone/s to apply to that day's piling activities. The Suitably qualified marine observers and recorded on the observation sheet	Contractors Suitably qualified marine observers
Notify the Principal's Site Representative and/or Manager Environment CU/ Environmental Advisor CU. of any cessation of piling due to marine fauna.	Contractors
In the event of marine megafauna entering the observation zone, notify the Piling Crew/Master (for implementation of Stand by Procedures) In the event of marine megafauna entering the exclusion zone and the cessation of piling, notify the Principal's Site Representative and/or Manager Environment CU/ Environmental Advisor CU.	Suitably qualified marine observers Contractors
Records will be kept of all observations of marine megafauna in association with the pile driving activities.	Contractors Environmental Advisor CU

5 REPORTING AND RESPONSIBILITY

The Port will take responsibility for coordinating the implementation of this procedure, with the assistance of suitably qualified contractors/consultants.

Reporting associated with this Environmental Procedure for Pile Driving, including the noise monitoring associated with initial piling activities, will be via the MEMP reporting. This will primarily be via the annual reporting and review of the MEMP and for compliance reporting again the EPBC Act Approval conditions.

Any impacts identified via the marine megafauna or inshore dolphin monitoring plans as a result of piling activities will be reported via the specific monitoring plans and inform reviews of the MEMP and this procedure.

In the event of a breach of an approval condition, relevant regulators will be notified within statutory timeframes as per conditional requirements and of the control measures being implemented to address the incident.

Where management controls are to be amended during the CU Project in response to recommendations, the relevant Management Plans (CEMP and MEMP) will be updated to incorporate updated management arrangements into the on ground practices. The updating of the plans will occur immediately, or as part of the regular review of the plan depending on the significance of the management action modification. A record of changes made will be kept.

In the event that the procedure needs to be revised during implementation, then the Port will consult with the regulators on the need for amendments and submit a revised procedure for approval. Changes of a minor administrative nature will not require approval, in accordance with the Department's policy on management plans.

6 CONTINUOUS IMPROVEMENT

This Environmental Procedure for Pile Driving will be subject to regular review.

This Procedure is a "living document" which will undergo formal review at the start of each piling campaign. During delivery, review and amendment will occur as necessary to ensure it remains fit for purpose and achieves the required program objectives inclusive of identification and implementation of any new or changing environmental risks and mitigation actions. Recommendations on improvements or amendments are to be reported as part of the annual reporting process. This will align with the regular review of the performance of the CEMP as required under the approval conditions.

This procedure will be subject to annual review as part of the MEMP annual reporting process. This will align with the regular review of the performance of the MEMP as required under the EPBC Act approval conditions.

Changes to the Procedure may be developed and implemented in consultation with relevant regulators and other stakeholders over time. All changes are to ensure mitigation of key risks to marine megafauna and be approved by Project Management before implementation.

Information from this Procedure will be used to assist with improving control measures in the MEMP and CEMP.

Continuous improvement will also be achieved via the MEMP, to which this Procedure is a part of (Appendix I of MEMP). Consideration and review of improvements to the MEMP will be reflected within this Environmental Procedure.

7 RELATED DOCUMENTS

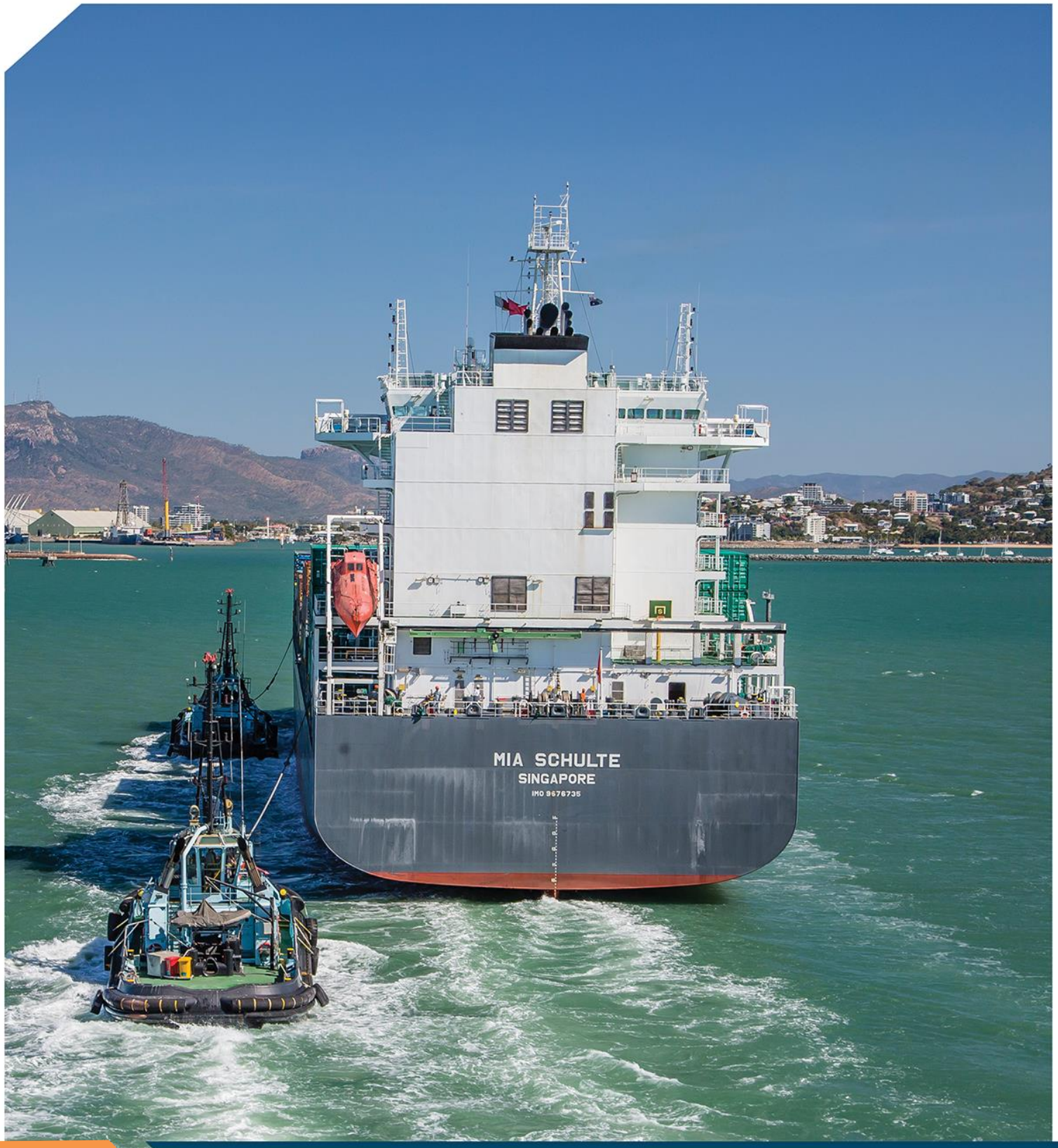
Document Number	Title	Document Type	Purpose
2011/5979	EPBC Approval issued 5 February 2018	Approval	Sets conditions from Commonwealth Department of Environment & Energy.
POT2135	CU Marine Environmental Management Plan	Plan	Outlines the environmental management requirements for Matter of National Environmental Significance (MNES) from activities in the marine environment.
POT2154	CU Inshore Dolphin Monitoring Plan	Plan	Details the monitoring program to be implemented to monitor the inshore dolphin populations in and adjacent to the CU Project area, including to identify any project related impacts.
POT2155	CU Marine Megafauna Monitoring Plan	Plan	Details the monitoring program to be implemented to monitor marine megafauna populations in and adjacent to the CU Project area, including to identify any project related impacts.
POT2099	CU Construction Environmental Management Plan	Plan	Outlines the overview of the construction and reclamation activities and associated environmental management requirements and contingency plans for severe weather events.

APPENDIX A

EPBC Approval Conditions Reference Table

Ref	Cond. No.	Condition Requirement	Plan Reference	Demonstration of how the plan addresses the condition requirement
1	15	The person taking the action must establish an exclusion zone to minimise the risk of physiological impacts to marine fauna from pile driving operations. The exclusion zone must be based on noise modelling and relevant scientific evidence. The exclusion zone must be peer reviewed by a suitably qualified independent expert and included in the MEMP required by Condition 12 and submitted for the Minister's approval. The person taking the action must not commence pile driving operations unless the Minister has approved the MEMP.	4.1	Section 4.1 details the actions to be taken prior to piling, including the establishment of the required exclusion zone to be applied during piling. This also includes the requirement to use a suitably qualified independent expert.
2	16	The person taking the action must ensure that pre-start visual observations for marine fauna are undertaken across the entire observation zone. The visual observations must be undertaken by a suitably qualified marine observer for at least 30 minutes immediately preceding the commencement of pile driving operations, and during pile driving operations. Records must be kept of marine observers engaged for visual observations.	4.2	Section 4.2 details the pre-start visual observations to be taken, including the period of time to undertake the observation.
3	17	The person taking the action can only commence pile driving operations if marine fauna have not been sighted within the exclusion zone at the completion of the 30 minute pre-start visual observations in Condition 16.	4.2	Section 4.2 details the requirement to not commence piling until the pre start visual observation has been completed.
4	18	The person taking the action must initiate soft-start procedures at the commencement of pile driving operations, with a gradual increase in piling impact energy of no more than 50% of full impact energy for 10 minutes. The soft-start procedure must be implemented after breaks in piling of 30 minutes or more.	4.2	Section 4.2 details the requirement to implement soft start procedures.
5	19	The person taking the action must implement stand-by procedures if marine fauna are sighted within the observation zone during the soft-start or normal operation procedures. The operator of the piling equipment must be placed on stand-by to shutdown the piling equipment.	4.2	Section 4.2 details that stand by procedures are to be implemented where marine fauna are sighted within the observation zone.
6	20	The person taking the action must cease pile driving operations if marine fauna are observed in, or about to enter the exclusion zone. Pile driving operations must not commence again until all marine fauna are observed to move outside the exclusion zone and 30 minutes have passed since the last sighting of the marine fauna within the exclusion zone.	4.2	Section 4.2 details that piling must cease where marine fauna are sighted in, or about to enter, the exclusion zone.

Ref	Cond. No.	Condition Requirement	Plan Reference	Demonstration of how the plan addresses the condition requirement
				It also details that piling can not re-commence until all fauna have moved out of the exclusion zone and not sighted for 30 mins.
7	21	The person taking the action must not commence pile driving operations between the hours of sunset and sunrise. Pile driving operations commenced before sunset or before a period of low visibility may continue between the hours of sunset and sunrise, unless pile driving operations have been suspended for more than 15 minutes.	4.2	Section 4.2 details the hours of operation for piling, being daylight hours only.
8	22	The person taking the action must also apply Conditions 16, 17, 19, 20 and 21 to re-strike testing activities. A maximum of 15 full force blows of the pile hammer may be applied to each test pile on a maximum of two re-strike test events per test pile.	4.2	Section 4.2 details the requirement of applying the specified conditions for re-strike testing activities.
9	23	The person taking the action may undertake an alternate procedure to Conditions 15 - 22, if the alternate procedure provides equivalent or better protection to marine fauna from pile driving operations. The alternate procedure must be outlined in the MEMP, peer reviewed by a suitably qualified independent expert, and submitted for the Minister's approval. The person taking the action must not commence pile driving operations unless the Minister has approved the MEMP, outlining the alternate procedures in accordance with this Condition.	4	Section 4 details the current Environmental Procedure for piling. Any changes to the intended procedure will lead to a revision of Section4, as per the processes detailed in Section 5.



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