Native Vegetation Clearance Proposal Outer Harbor Channel Widening Project

Data Report

Clearance under the *Native Vegetation Regulations 2017*

26 July 2018

Outer Harbor, South Australia

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1. Application information

Applicant:	Flinders Ports Pty Ltd		
Key contact:	Lee Kolokas		
Landowner: *(if the applicant is not the landowner, you must attach written permission)*	Crown (refer attached Sponsor Letter confirming Minister for Transport and Infrastructure support for Crown)		
Site Address:	Outer Harbor Channel, Gulf St Vincent		
Local Government Area:	Out of council land, adjacent City of Port Adelaide	Hundred:	Out of Hundreds, adjacent Port Adelaide
Certificate of Title:	The nearest CT to the project site is Volume 6126 Folio 8691	Section/Allotment:	
Proposed clearance area:	The clearance area occurs within the northern Port River and extends approximately 7 kilometers into the Gulf St Vincent.		
Applicable regulation and purpose of the clearance	Regulation 12(34) Infrastructure To widen the existing channel and swing basin to accommodate change in vessel size with a maximum width of 49m.		
Level of risk	4		
Proposed SEB offset:	SEB of $944,304.74 to be met via payment into the Native Vegetation Fund		

2. Background to proposal and description of vegetation

2.1 Location of the clearance

Port Adelaide is the primary maritime gateway for South Australia and includes 19 berths of varying capacity, including seven within Outer Harbor (OH1, OH2, OH3, OH4, OH6, OH7 and OH8), located on Lefevre Peninsula. The Outer Harbor berths include South Australia's only container terminal facility (OH6 and OH7), a dedicated grain wharf (OH8) and a dedicated fuel berth (OH4). The majority of the land within the Outer Harbor (above the low water mark) is zoned as Industry under the Port Adelaide Enfield Council Development Plan and heavily utilised for industrial purposes.

The Outer Harbor channel and swing basin are not zoned under any Development Plan as they are below low water and constitute crown land. In addition, Bird Island (also known as Section Banks), located on the northern side of the Outer Harbor Channel, is not zoned under a Development Plan and is vacant land. This is an artificial island that has developed by a combination of anthropogenic (human-induced) and natural processes acting upon the Outer Harbor breakwater.

There is no seagrass located at the proposed Dredge Material Placement Area (DMPA), situated in the Gulf St Vincent.

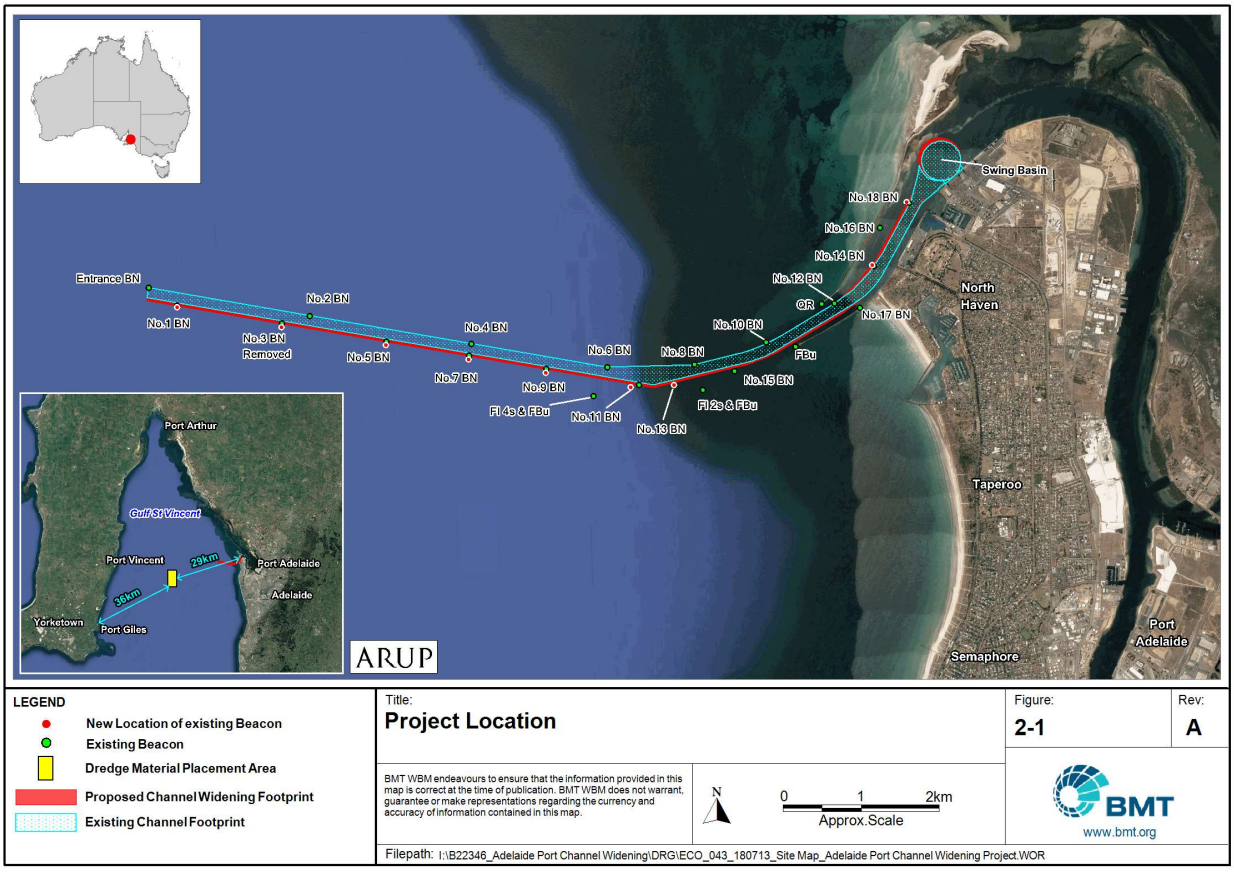


Figure 1 Project Location Plan

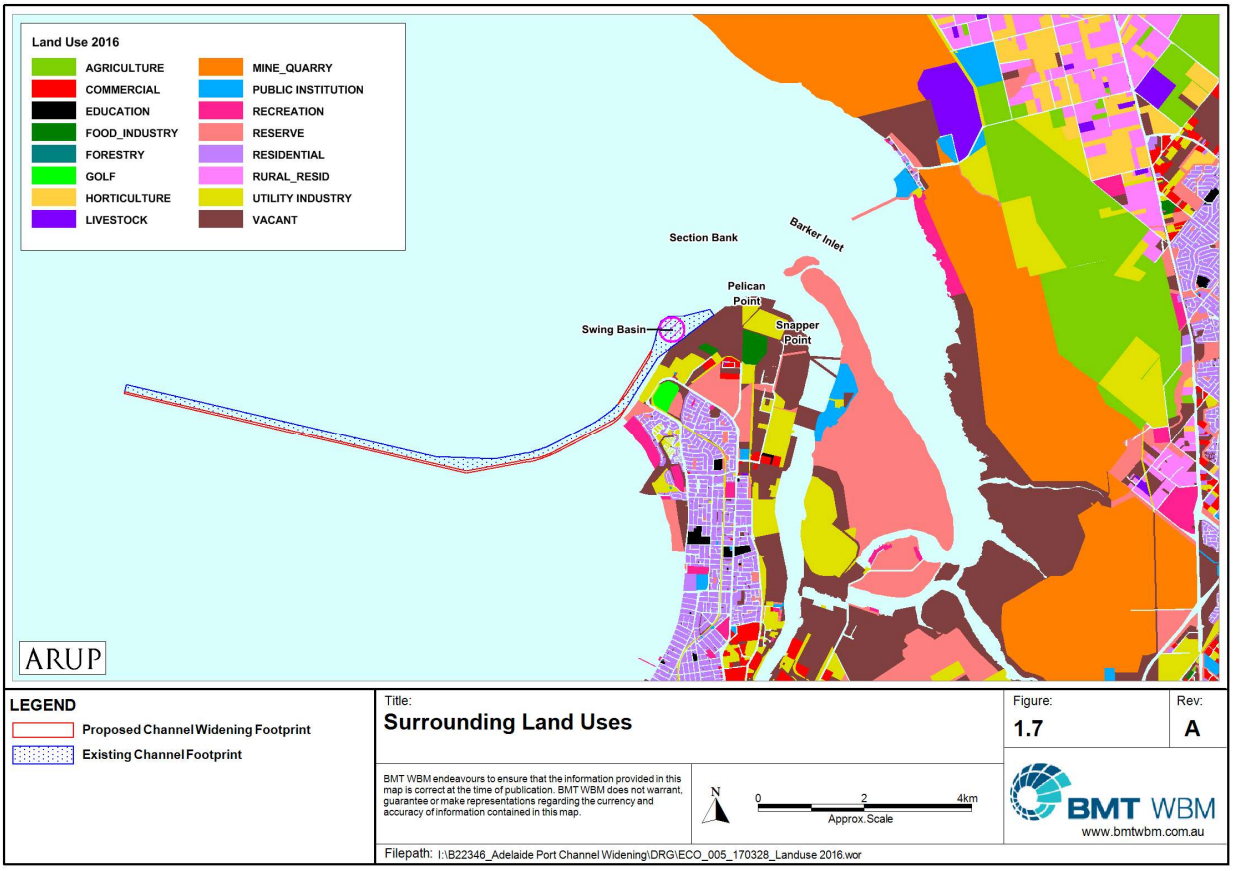


Figure 2 Surrounding Land Use

2.1.1 Purpose of the proposal

As the global shipping owners convert more and more ships to the Post Panamax class, Flinders Ports is compelled to provide suitable infrastructure to support this activity (Outer Harbor experienced a four-fold increase in 2016 and forecast this doubling again in 2017). There is the need to remain competitive with other Australian Ports, with Melbourne planning to open a new dock to accommodate wider vessels and all other major ports already operationally capable for these vessel types. Flinders Ports is already experiencing capacity constraints with some shipping declined or compelled to operate with restrictions impacting efficiency due to existing constraints

The OHCW Project is responding to this change in vessel size (broader) as the key driver to ensure economic operations are maintained to support South Australian trade and avoid any decrease through use of alternative Australian ports and land routes for import and export trade. Also contributing to the demand and urgency for the OHCW Project to proceed, it is noted that from 2018 there will be similar increases (change in shipping class) for visiting Cruise Liners, with a general trend towards broader ships seeking to visit South Australian waters.

The channel will be dredged to achieve the design width, with the dredged material proposed to be placed approximately 30km off-shore in Gulf St Vincent (the same location utilised in 2005, a zone approximately 7km by 5km in size located in deep water (>30m) and avoiding major shipping routes). Flinders Ports conducted an optimisation study to assess the appropriate channel width to safely operate the channel and swing basin for increased vessel sizes. This study resulted in the recommendation to increase from the existing 130m wide channel to the proposed 170m wide channel.

As the channel is being widened, there is also a need to relocate existing navigational aids to reflect the new alignment of the channel. There are potentially 16 in total that may require works of some nature prior to any dredging.

2.1.2 Description of the vegetation to be cleared

Vegetation Assessment

A vegetation assessment was undertaken in April 2017 (BMT WBM Appendix A) through geo-spatial analysis and verified via field survey. The field survey consisted of video transects. Where water quality was poor or species were cryptic a Van Veen grab sampler was used to collect samples.

The purpose of the vegetation assessment was to identify the extent and composition of seagrass that could be impacted by dredging activity (either directly, or indirectly from dredging plumes). The assessment did not undertake a detailed investigation into seagrass health.

The survey identified three main categories of seagrass meadows within the study area, as described within Table 1 and Figure 3, which included a mix of seagrass species including small patches of *Halophila australis*, *Amphibolis antartica* and *Posidonia sinuosa*, with *Heterozostera sp.* being the dominant species recorded. EPA information (2011) was used to determine likely occurrence of seagrasses outside of the field survey area. The DMPA has not been included in this assessment because seagrasses are not found in that locality, due its depth.

Classification categories in Table 1 were broadly based on previous classifications produced by EPA (2013a) and a visual estimate of seagrass cover in-line with EPA (2013b):

- Sparse –35% seagrass coverage
- Moderate 35–70% seagrass coverage
- Dense 70–100% seagrass coverage.

Classification of substrate without seagrass was based on a fine-scale interpretation of the CATAMI Classification scheme for Scoring Marine Biota and Substrate in Underwater Imagery (Althaus et al 2014).

The seagrass within the study area were classified in to three different seagrass associations:

- Association 1: Moderate to dense seagrass *Amphibolis* +/- *Posidonia*
- Association 2: Sparse *Halophila australis* +/- very sparse *Posidonia sp*.
- Association 3: Seagrass dominated by *Heterozostera sp*.

Association 1 Moderate to dense seagrass *Amphibolis* +/- *Posidonia*

This association was composed of moderate to dense mixed seagrass communities of *Amphibolis* and/or *Posidonia* species. The association was recorded in deeper offshore waters, with the closest meadows found 3 km off the coast. It occurred in aggregated and/or patchy meadows stretching over 7 km wide. It was mapped within close (~100 m) proximity to the outer channel in some places. There were no introduced species observed within this association. Furthermore, epiphyte growth within this association was very sparse to none.

The species within this association are persistent/perennial species that have long turn-over (months–years) of growth units (i.e. rhizome, shoot and root) and clonal vegetative growth. These species also exhibit high physiological resistance to disturbance, but are slow to recover from disturbances (Kilminster et al. 2015). Therefore, it is likely that this association is reflective of a relatively undisturbed seagrass meadow and is considered to be in healthy, good condition.

Association 2 Sparse *Halophila australis* +/- very sparse *Posidonia sp*.

This association was composed of sparse *Halophila australis* and/or very sparse *Posidonia sp*. It was a widespread, patchy association within the study area (but not within the area predicted to be subject to turbidity plumes during dredging), particularly in water depths between -6 and -13 m Lowest Astronomical Tide (LAT). The meadows occurred from approximately 700 m offshore and stretched to the western most extent to the study area to the north of the outer channel. There were also small patches of the association within the shipping channel. There were no introduced species observed within this association. There was sparse epiphytic algae growth recorded on the seagrass within this association (i.e. less than 10%).

The most common species in the association was *Halophila sp*., a colonising/ephemeral species characterised by short turnover times (<months) and low physiological resistance to disturbances. However, ephemeral species recover rapidly, in part due to high investment in sexual reproduction and the resultant ability to build up a seed bank (Erftemeijer & Robin Lewis 2006, Kilminster et al. 2015). Due to the proximity of this association within and adjacent to the existing channel, it is therefore likely to have experienced some disturbance from channel operation and is in variable condition from poor to good.

Association 3 Seagrass dominated by *Heterozostera sp*.

This association was composed of moderate to dense *Heterozostera sp*. It mostly occurred in a nearshore band, up to 4 km offshore. However, *Heterozostera sp*. are likely more abundant in the muddy intertidal areas north-east of the Port, and outside of the area ground truthed as part of this study. Note that this association was not ground-truthed during the survey but was based on unsupervised classification and past distribution (EPA, 2011) and satellite imagery, thus epiphyte growth, co-occurrence with

introduced species and condition status is unknown, however we would expect it is similar to other mapped areas and is low. This species is typically fast-recovering after disturbance, as exhibited following the previous dredge campaign in 2005 (SARDI, 2005, 2006 and 2016).

Vegetation Impact Summary

Currently, dredging is scheduled to commence in 2019 and continue for 4-6 months. It is estimated that a total area of 4ha of seagrass would be removed directly from the channel, and an indirect disturbance from dredge plumes of between 158 and 230ha, depending on the season within which dredging will occur, see Table 1 below. Additional geotechnical investigations have been completed in late 2017, with greater clarity on sediment profiles across the Project. The modelling will be updated with the revised data and is anticipated to further reduce the anticipated turbidity impacts through better dredge management planning.

The proponent is seeking to minimize impacts to seagrass, by undertaking dredging in winter months should approvals be gained in sufficient time. With the application of further dredging controls that will be agreed with the EPA, such as real-time water quality monitoring and implementation of a reactive management plan (implement actions if pre-agreed turbidity levels are identified to reduce, it is considered likely that seagrasses indirectly disturbed will be lower than predicted below, and will recover quickly from dredging. As a condition of the Development Approval, an Environmental Monitoring Program will be prepared and approved prior to dredging which outlines in detail seagrass and water quality monitoring to be undertaken.

Studies have shown that seagrasses are sparsely distributed within the dredge area, with 4ha of seagrasses expected to be directly impacted through dredging activities.

Table 1: Estimate of seagrass impacts from direct and indirect dredge plumes, Summer and Winter periods (without application of dredging controls, such as a reactive monitoring program)

Classification category	Coverage	Direct Impact	Total Area (ha) within the High to Medium Impact Area (Summer)	Total Area (ha) within the High to Medium Impact Area (Winter)	Notes
Moderate to dense seagrass	Moderate to dense (35-100%)	-	*0.02*	*0.02*	*Amphibolis* and/or *Posidonia*. Relatively undisturbed seagrass meadow in good condition.
Sparse seagrass	Sparse (1-35%)	*4*	*0.2*	*0.2*	*Halophila australis* and/or very sparse *Posidonia*. Likely to have experienced some disturbance from existing channel operation. Variable condition- poor to good.
Seagrass dominated by *Heterozostera*	Moderate to dense (35-100%)	-	230	158	Based on unsupervised classification and past distribution (EPA, 2011) and satellite imagery; not ground-truthed during this survey. Condition is not known.
Total		**4**	**230**	**158**	

For the purposes of assessment, it has been identified that seagrass meadows within the High and Medium impact areas would experience temporary reduction of coverage as a result of indirect impacts from sediment plumes and higher turbidity levels. No impacts are expected within the 'Zone of influence'. These figures do not take into account control measures that will be in place during the dredge campaign, including the use of turbidity triggers and a reactive management program. Should a trigger level be reached during dredging (set in consultation with the EPA) management measures to control turbidity will be undertaken which may include switching dredging to another location or ceasing works temporarily until conditions improve.

It is difficult to identify the level of temporary impact as it may vary depending on a number of factors, including weather conditions, dredging timing and duration, dredging methodology and many other external factors such as storm water runoff from the wider catchment. These indirect impacts are predicted to be temporary in nature, with recovery and re-growth anticipated to occur upon completion of the Project and within 1-3 years following.

2005 Dredging Campaign

The 2005 dredging campaign to deepen the outer harbor channel did result in the temporary loss of seagrass meadows to the north and south of the channel, however surveys conducted by SARDI in 2004, 2006, 2007 and 2016 (*Tanner 2004, Tanner and*

Rowling 2008 and Wiltshire and Tanner 2016) have demonstrated that seagrass has recovered following this campaign within the vicinity of the outer harbor channel, and largely did so within 12 months of dredging (based on leaf density surveys undertaken by SARDI in 2007 (Wiltshire & Tanner 2016).
A dredging methodology has been identified that will have a significantly reduced impact in comparison to the 2005 dredge campaign; seagrass loss will be less extensive and is expected to recover over time. We are therefore seeking to make an SEB payment for direct losses only as detailed in this Report and supporting documentation.

Proposed Monitoring Program
We are therefore proposing a pre, immediate post, and subsequent post (i.e. 2-5 years) monitoring program to be able to accurately quantify the amount of permanent seagrass loss that may be attributable to the dredging program and confirm the accuracy of modelling undertaken. A detailed monitoring program will be prepared and submitted to the satisfaction of the EPA.

2.1.3 Fauna Assessment

Given the high mobility of marine fauna, it is not feasible to accurately identify fauna usage of each seagrass category (refer Section 2.1.2).

A search of data records from BDBSA, Atlas of Living Australia, and EPBC Sprat database within 10km of the likely area of impact has identified the fauna in Table 2 could occasionally utilise the seagrass meadows within the modelled area of impact for foraging purposes. No habitat or breeding areas which support significant populations of threatened species have been identified within the impact area during previous surveys within the project area (KBR 2005, Kemper et al. 2008, Bamford et al. 2008, TSSC 2013, EAC 2014, Bossley et al. 2017, Steiner 2012). Whilst these species may be present, they are not recorded at significant numbers and are not reliant on the seagrass meadows likely to be affected by the project.

A reduction in seagrass coverage can indirectly affect marine fauna that feed on fish species supported by seagrass and result in reduced species diversity and abundance. In general, direct and indirect impacts to seagrass is restricted to areas within and adjacent to the approach channel and Section Bank, and there is abundant alternative feeding habitat immediately adjacent. As a result, the temporary reduction in seagrass coverage is not expected to cause impact to the availability of feeding habitat and hence the species listed in Table 2.

Table 2: Fauna species which are likely to occur within the area of impact

Common Name	**Species Name**	**NPW Act Status**	**EPBC Status**
Indo-pacific bottlenose dolphin	*Tursiops aduncus*	-	-
Short-beaked common dolphin	*Delphinus delphis*	-	-
Common bottlenose dolphin	*Tursiops truncatus*	-	-
Australian sea lion	*Neophoca cinerea*	Vulnerable	Vulnerable
New Zealand fur seal	*Arctocephalus forster*	-	Marine
Bronze whaler	*Caracharhinus brachyurus*	-	-
Dusky whaler	*Caracharhinus obscurus*	-	-
Port Jackson shark	*Heterodontus potusjacksoni*	-	
Smooth stringray	*Dasyatis brevicaudata*	-	
Black stingray	*Dasyatis thetidis*	-	
Southern eagle ray	*Myliobatis australis*	-	
Magpie fiddler ray	*Trygnorrhina melaleuca*	-	

Banded stingaree	*Urolophus cruciatus*	-	
Silver Gull	*Chroicocephalus novaehollandiae*	-	Marine
White Ibis	*Threskiornis molucca*	-	Marine
Australian pelican	*Pelacanus conspicillatus*	-	Marine
Little egret	*Egretta garzetta*	Rare	Marine
Caspian tern	*Hydroprogne caspia*	-	Migratory, Marine
Crested tern	*Thalasseus bergii*	-	Migratory, Marine
Fairy tern	*Sternula nereis nereis*	Endangered	Vulnerable

2.1.4 Approvals required *or* obtained under other legislation (including past clearance approvals)

An approval under Section 49 of the *Development Act 1993* has been granted in May 2018. An application for a Dredge License under the *Environment Protection Act 1993* will also be sought from the EPA.

A referral was also submitted to the Commonwealth Department of Environment and Energy (DoEE) under the *Environment Protection and Biodiversity Conservation Act 1999* for potential impacts to migratory species. Notification was received in January 2018 that the Project is "not a controlled action if undertaken in a particular manner" with management actions required to mitigate potential impacts to whales during the period of 1 May to 30 November if Piling works are underway.

Table 3: Legislative Approval Summary

Legislation	Approval sought and date	Outcome
Development Act 1993	Development Number 010/V048/17	Approved with conditions – project was referred for comment to the Coastal Protection Board, Environment Protection Agency, Adelaide Dolphin Sanctuary and Heritage Council.
Environment Protection Act 1993	Dredging license under Schedule 1 of the Act, and EPA also consulted as part of the development assessment referral process	Submitted in parallel to this application, awaiting determination from EPA
Natural Resources Management Act 2004	Not required / Consulted	No action required
National Parks and Wildlife Services Act 1972	Not required / Consulted	No action required
Fisheries Management Act 1991	DEWNR consulted as part of the development assessment referral process	No action required
Adelaide Dolphin Sanctuary 2005	Dolphin Sanctuary consulted as part of the development assessment referral process	No action required
Environmental Protection and Biodiversity Conservation Act 1999	Referred in July 2017	Determination, the project is not a controlled action.

Past clearance approvals

In 2005 Flinders Ports sought approval from the Native Vegetation Council for the direct removal of re-growth seagrasses in the existing channel. A native vegetation license agreement was negotiated, with the outcome that a $10,000 Significant Environmental Benefit was paid to the South Australian Research and Development Institute (SARDI) for research into seagrass health; this satisfied the SEB provisions of the *Native Vegetation Act 1991.*

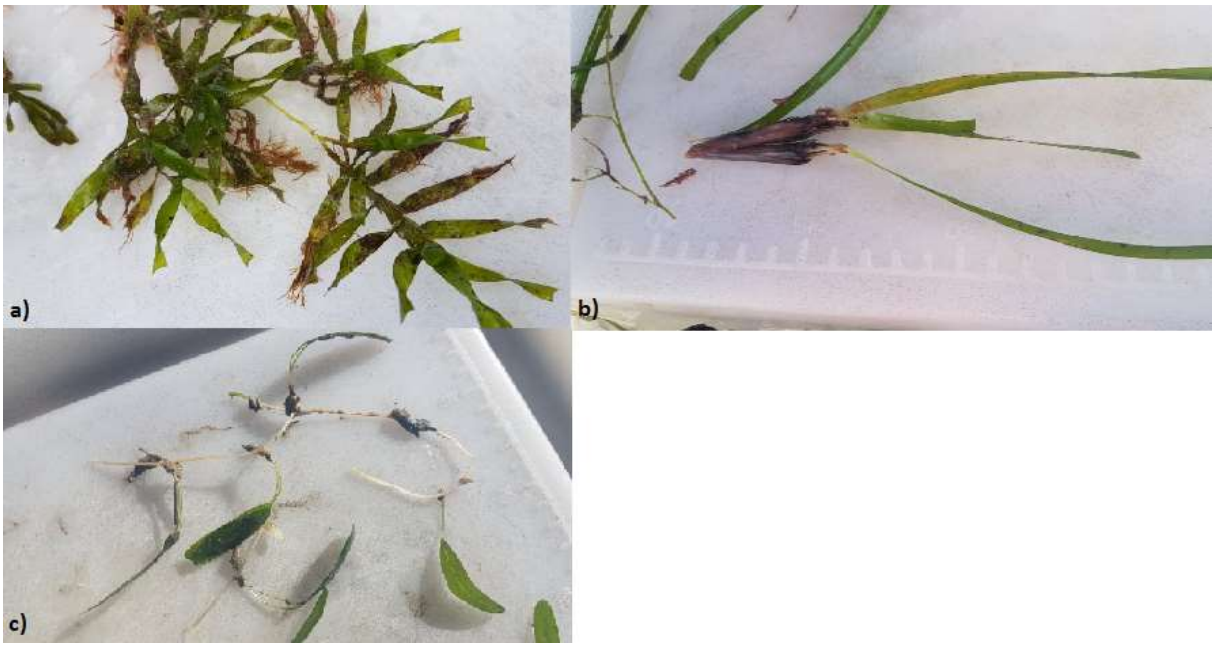
Future clearance approvals

As detailed in the Development Application (Appendix B), there is no foreseeable need to undertake future seagrass clearance for general port management. There is minimal sediment input into the channel, and it has not required maintenance dredging since the previous campaign in 2005. The widening is expected to cater for likely future vessel visitation and class sizes for the foreseeable future.

2.1.5 Photographs and GPS points of impact area

Examples of perennial seagrasses *a) Amphibolis antarctica and b) Posidonia sinuosa and c) Halophila australis* seagrass collected adjacent to Adelaide Port.

Figure 3



2.1.6 Spatial information

The plans provided (Figures 4 and 5) show expected zone of impact over laid on seagrass habitat mapping / vegetation associations.

Direct impacts (marked in pink within the channel) will occur to small patches of sparse seagrass recorded within the area to be widened.

Indirect impacts as a result elevated turbidity during dredging in summer and winter are identified in blue.

These plans reflect a revised dredge methodology developed following further engagement with the EPA to mitigate further the predicted impacts as assessed in the original DA Report. The revised dredge methodology involves no side-casting of material and thus reduces significantly (predicted > 40%) the volume of fines mobilized into the water column and hence results in a significant reduction on the predicted extent of the dredge plume. (refer to Appendix C for full details).

Figure 4: Zones of Impact – Turbidity – Summer.

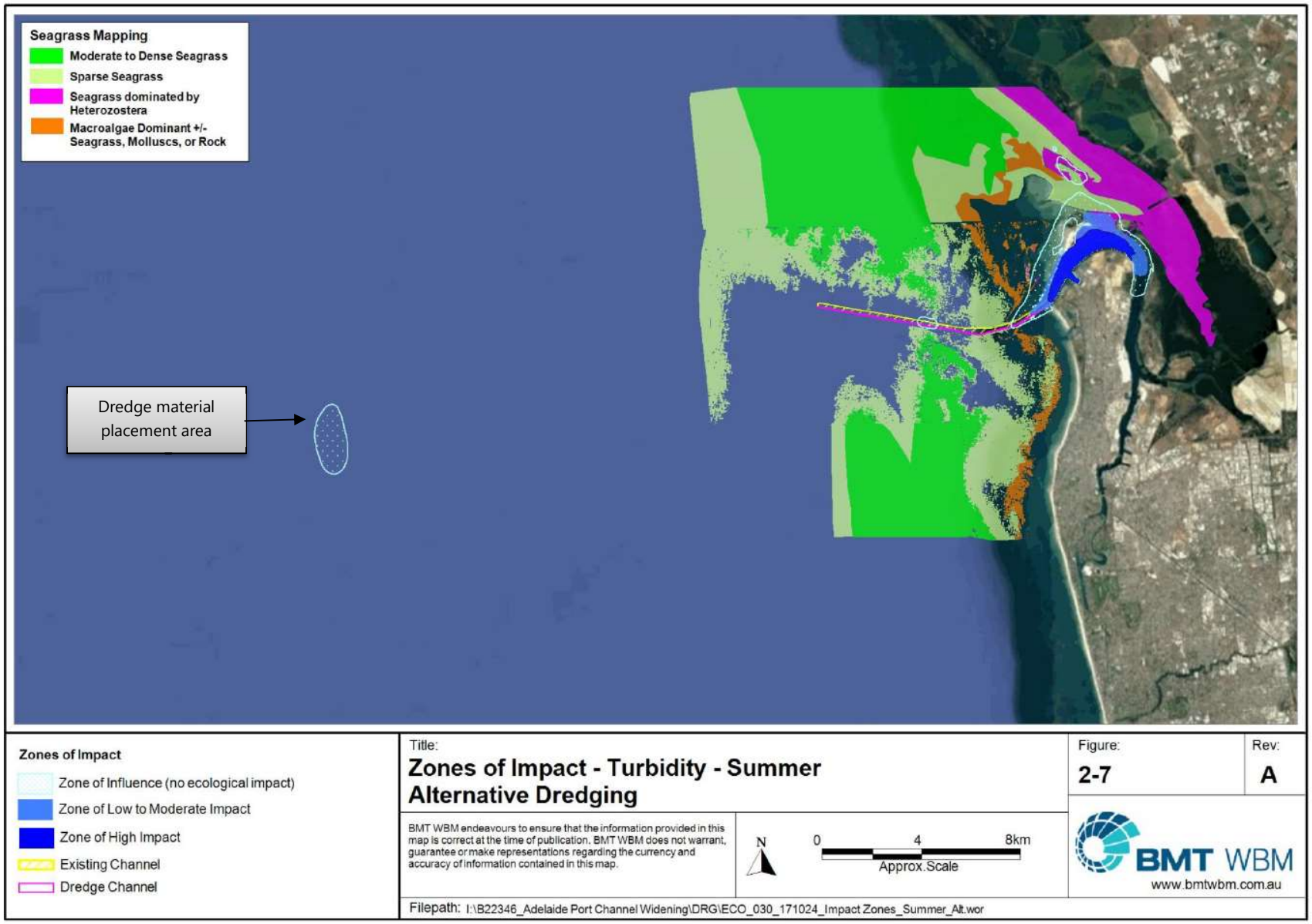
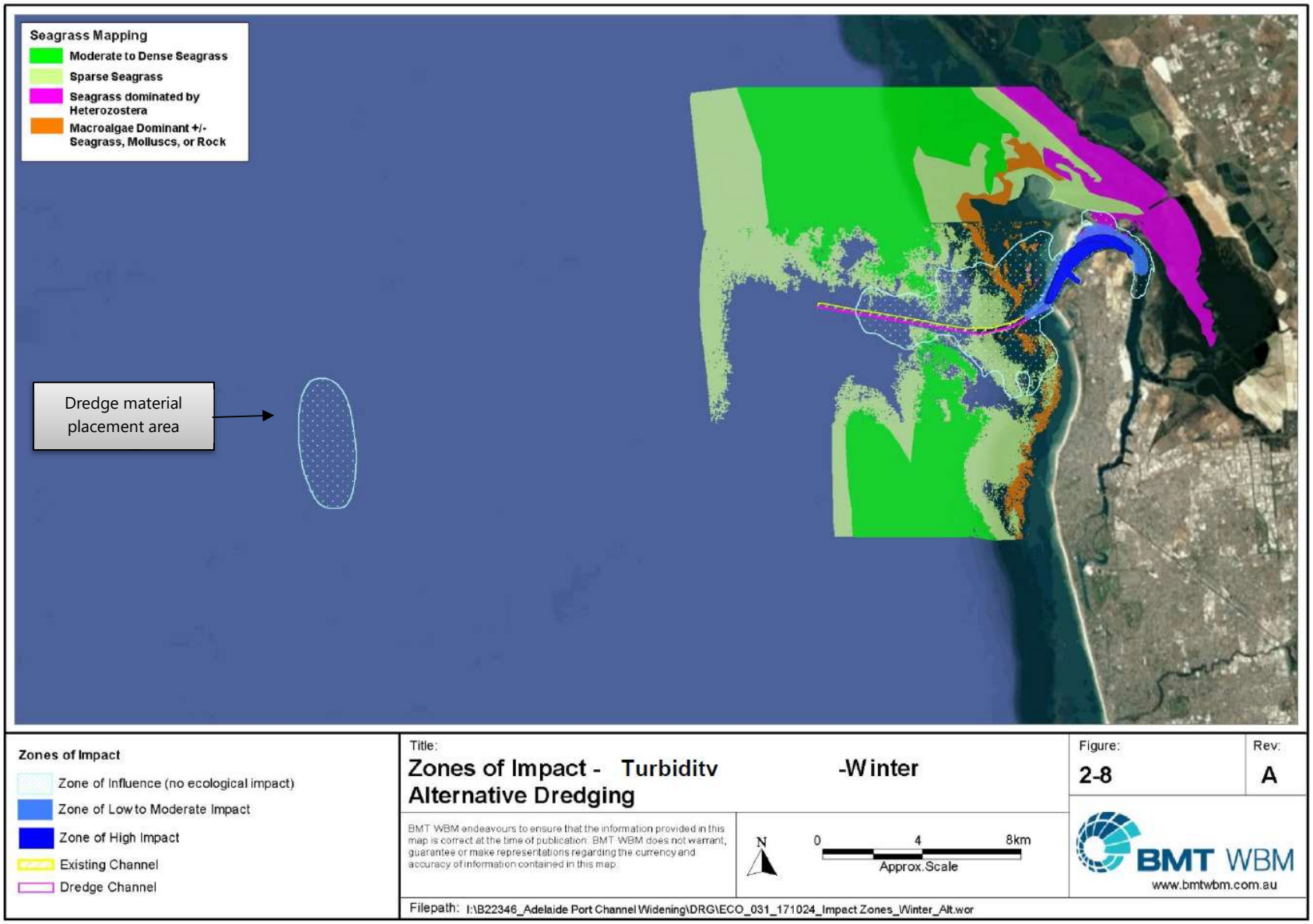


Figure 5: Zones of Impact – Turbidity – Winter



3. Assessment criteria and recommendations

3.1 Requirements of the Regulation

The Outer Harbor Channel Widening Project is seeking approval in accordance with Regulation 12(34) Infrastructure to clear vegetation to allow for the expansion of the Outer Harbor Channel. In 2017 the project received sponsorship from the Minister of Transport and Infrastructure for South Australia as a s49 development as defined in the *Development Act 1993* (*public infrastructure*).

A development application was lodged and decision notification (including conditions) received in May 2018.

3.2 Risk Assessment

3.2.1 Patch Assessment

The vegetation assessment reviewed the area surrounding the Outer Harbor Channel and extended north, south and within the Port River to capture vegetation that may be directly and indirectly impacted by the project (Assessment area; refer to Figure 4). The assessment revealed the presence of seagrasses in varying condition throughout the Assessment area (refer to Section 2.1.2).

For the purpose of this project, the following patch sizes have been applied:

- 4ha for direct impacts
- 158ha for indirect impacts, winter only.

Table 4. Impact Summary and Biodiversity Scores for expected winter dredging campaign

Impact	Vegetation Classification Category	Size of Patch Impacted (ha)	Total Biodiversity Score
Direct	Association 2: Sparse *Halophila australis* and/or very sparse *Posidonia* seagrass	4	52.50
Indirect	Association 1: Moderate to dense *Amphibolis* and/or *Posidonia* seagrass	0.02	0.67
Indirect	Association 2: Sparse *Halophila australis* and/or very sparse *Posidonia* seagrass	0.2	5.78
Indirect	Association 3: Moderate to dense *Heterozostera* dominated seagrass	158	5266.14
Total		**162.22**	5325.09

These impacts have been determined through modeling conducted by BMT and based on the dredge methodology discussed in Addenda 2 of the Development Application, Appendix B.

Direct Impact

Only a small amount of seagrass will be directly disturbed by dredge equipment to widen the channel (4ha in total).

Indirect Impact

Turbidity to be released during dredging activity has been modelled to identify the potential area of seagrass that may be impacted during the length of the campaign. The modelling shows that the expected dredge plume will mostly affect an area of

moderate to dense *Heterozostera sp* within the inner harbor area, which whilst sensitive to light availability has a quick rate of recovery from disturbance. It is anticipated that there will be some temporary disturbance to these beds, but they are expected to rapidly recover following the cessation of dredging (particularly should dredging occur over the winter months as planned). The area of indirect impact is much less than the 2005 campaign due to a reduced volume of material to be disturbed (50% less), and an improved dredge methodology and implementation of a reactive monitoring program to further reduce potential impacts throughout dredging activity.

3.2.2. Principles of Clearance

Principle b) It has significance as a habitat for wildlife;

The fauna assessment (refer Section 2.1.3) identified the fauna in Table 2 could occasionally utilise the seagrass meadows within the assessment area for foraging purposes. This includes three species listed as Rare, Vulnerable or Endangered in the *National Parks and Wildlife Act 1972* (NPW Act) and nine species are listed in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). However, no habitat or breeding areas which support significant populations of threatened species have been identified within the impact area (KBR 2005, Kemper et al. 2008, Bamford et al. 2008, TSSC 2013, EAC 2014, Bossley et al. 2017, Steiner 2012).

The direct and indirect loss of seagrass is restricted to areas within and adjacent to the approach channel and Section Bank, and abundant alternative feeding habitat occurs immediately adjacent. As a result, the project is not expected to impact to the availability of feeding habitat and hence Rare, Vulnerable or Endangered species.

Therefore, vegetation clearance within the assessment area is not considered seriously at variance with Principle b.

Principle c) It includes plants of a rare, vulnerable or endangered species;

The assessment area consists of native seagrass species, however no species within the assessment area are listed as rare, vulnerable or endangered in the NPW Act or EPBC Act.

Therefore, vegetation clearance within the assessment area is not considered seriously at variance with Principle c.

Principle d) The vegetation comprises the whole, or a part, of a plant community that is rare, vulnerable or endangered;

The assessment area consisted of native seagrass meadows. Seagrass meadows are not listed as rare, vulnerable or endangered within the NPW Act or the EPBC Act.

Therefore, vegetation clearance within the assessment area is not considered seriously at variance with Principle d.

3.2.3 Clearance complies with any relevant NVC guidelines related to the activity.

There are no current NVC guidelines that relate to dredging or seagrass impacts. However the project is working with the EPA to develop water quality and turbidity targets to ensure minimal impact and best practice methods are applied during construction.

3.2.4 Risk Summary and Risk Level

The direct and indirect impacts for the Outer Harbor Channel Widening Project meet the **risk level 4** criteria due to:

- the extent of impacts (direct and indirect) is greater than 0.5ha,
- the total biodiversity score is greater than 250,

In accordance with the *Regulations 2017* approval through the Native Vegetation Assessment Panel (NVAP) is sought.

3.3 Address the Mitigation Hierarchy

The project has endeavored to avoid or reduce impact to native vegetation where possible, see methods applied to address the mitigation hierarchy below:

a) Avoidance

It is acknowledged the project will impact seagrass (both direct and indirect). Flinders Ports is planning on investing significant capital to undertake this Project and has reviewed in detail the requirements to undertake these works. The risk of Adelaide being removed as a port of call for containerised cargo visits is real as detailed in the Development Application report (Arup. 2017). In addition, Flinders Ports has an obligation to maintain and operate the port in a safe and efficient manner, and the increasing volume of Post Panamax vessels visiting Adelaide is driving this capital project.

Flinders Ports commissioned an optimisation study to ensure that the proposed channel widening and alignment was appropriate to maintain safe operations as intended whilst minimising the amount of material required to be removed (ie: as part of due diligence investigations, Flinders Ports sought to achieve the maximum benefit with the minimum amount of construction works as well as reducing the extent of direct and indirect impacts upon the seagrasses through decreased volumes of material to be removed).

Flinders Ports also considered the 'do nothing approach'. If the OHCW Project was not to proceed, and Flinders Ports maintained the existing infrastructure through the channel and swing basin at Outer Harbor, then there is a real risk that Post Panamax vessels will look to avoid the necessary operational constraints in place at the Port of Adelaide and utilise other Australian ports to load and unload their cargoes more efficiently.

The "do nothing" option is not considered viable as detailed below.

There are increasing volumes of Post Panamax vessels visiting Outer Harbor, and these are forecast to almost double again in 2017 following a four-fold increase in 2016. Operational restrictions require the use of tides to safely navigate these vessels into Outer Harbor including speed restrictions. Reliance upon tidal conditions restricts the opportunities for vessels to operate 24/7 and hence if they are delayed or miss the available tide, are forced to anchor in deeper water off-shore until the next opportunity presents to enter Outer Harbor (up to 12 hours potentially). Currently, any vessel wider than 43m cannot utilise Outer Harbor due to the channel width. The project will enable vessels up to 49m wide to operate safely and these are forecast to occur into the future as shipping operators update their vessels.

As the volumes increase, it can be assumed that delays will increase as the number of arriving and departing vessels will create bottle-necks at the available tidal windows and potentially lead to longer delays if the number of vessels waiting cannot be safely piloted through the channel on a single tide. This may result in some vessels being delayed for up to 24 hours at any one time.

Such delays to these international shipping companies that operate the Post Panamax vessels impact their schedules and hence commercial return. A stationary container vessel is not generating income for the asset owner and is to be avoided at all times. This is another reason why ports, operating in a global market, invest in significant infrastructure to ensure turn-around times (load and unload cargoes) is delivered in the most efficient, safe and reliable manner to minimise the time at port and maximise usage of the wharf and associated infrastructure.

Delays at the Port of Adelaide may cause shipping companies to consider alternative destinations, such as Melbourne, requiring South Australian trade to be conveyed across land via road and rail if this were to eventuate, adding time and cost to all imports and exports impacted, as well as increased impacts and usage on the existing road and rail networks.

b) Minimization

Flinders Ports have proposed a range of mitigation measures working with the EPA, DEWNR and others to minimize the extent of disturbance, duration and intensity of indirect impacts to seagrass from dredge plumes:

A commitment to a dredge methodology that significantly reduces the amount of sediment that is released into the environment. Flinders Ports has committed (at significant forecast capital cost) to adopt a dredging methodology that significantly reduces the volume of sediment predicted to be mobilized in the water column as opposed to the base case dredge methodology as presented in the DA Report originally. This approach (refer to Appendix C Addenda 2, from the DA Report for complete details), as detailed in the subsequent Addenda 2 to the original DA Report and following detailed analysis and collaboration with the EPA involves a significant forecast capital cost increase in the range of $10-20 million and adds up to 2 months to the program, with a predicted >40% reduction in the volume of fines mobilized into the water column and subsequent reductions in predicted turbidity levels and potential impacts.

Acknowledge that summer works are the least preferred time for dredging and so Flinders Ports is progressing with utmost urgency to seek commencement of works in Autumn 2019 and hence avoid potential summer period works given the project is estimated to take between 4 to 6 months overall.

Implement a robust water quality monitoring program in accordance with EPA requirements and best practice principles to enable pro-active management of dredging activity at all times. This will enable the adoption of reactive management practices during construction that actively mitigates the levels of turbidity generated against a set of threshold levels agreed with the EPA in an approved Dredge Management Plan. Should agreed threshold levels be exceeded, the dredge contractor shall be required to undertake additional management measures to reduce turbidity which may include changing the timing or location of dredging until conditions improve. Stringent monitoring of dredging activity is likely to result in a further reduction to the predicted impacts on seagrass.

c) Rehabilitation or restoration.

Rehabilitation or restoration of seagrass meadows has had very limited success both internationally and within Australia. Because of the often varied success of transplant operations, it is preferred to allow seagrass to regenerate naturally in the first instance. It is also noted that the impacts occur on crown land further complicating Flinders Ports ability to directly control long term programs of rehabilitation or restoration.

A monitoring program is proposed and will collect information on seagrass extent and composition within the predicted area of impact (i.e. low to high impact area) at regular interval (currently proposed to undertake surveys immediately prior to dredging, immediately post-dredging, 2 and 5 years (if required) post-dredging). These surveys will be undertaken in accordance with the methodology utilised for the 2017 seagrass survey and in agreeance with the EPA, which used a combination of satellite imagery and video survey transects (refer to Appendix A for further detail of the survey methodology). In particular, transects will also ensure to align with water quality monitoring sites.

A detailed monitoring plan will be provided for agency review as the project progresses.

d) Offset

The project is proposing to offset the direct and indirect impacts to native vegetation through payment into the Native Vegetation Fund. The offset has been determined through population of the marine assessment scoresheets provided by the Native Vegetation Management Unit, see Section 4 SEB and scoresheets attached (Appendix D) for details.

4. Significant Environmental Benefit

4.1 DETERMINATION OF THE SEB OBLIGATION

The vegetation assessment revealed three vegetation association within the survey area. The associations varied in condition from poor to good (refer to Section 2.1.2). A map of the assessment area, vegetation associations and predicted impacts is provided in Figure 4.

An SEB has been calculated using the marine assessment scoresheets provided by the Native Vegetation Management Unit (Appendix D). The scoresheets include a number of factors to determine the SEB, these include:

- species diversity
- past disturbance
- presence of bare ground
- weeds.

The location, condition and level of impact varies across the associations and therefore justification for scores assigned in the assessment scoresheets is provided below.

Direct Impact

Association 2

The area of direct impact occurs within 40m of the Outer Harbor Channel and has been previously disturbed by channel dredging and operations, therefore species diversity is likely highly diminished and seagrass beds heavily impacted. Vegetation within this association consists of highly scattered individuals that have regenerated since the previous dredging campaign in 2005 (Wiltshire and Tanner 2016).

No loss factors have been applied and all vegetation in this area will be removed.

Indirect Impact

Association 1

Vegetation in the survey area is moderate to highly dense, with 35-100% cover. However the area that may be impacted by dredge plumes is in proximity to the existing channel, where species diversity is likely to be reduced and seagrass beds partly impacted. The re-assessment of sites potentially impacted by the 2005 dredge campaign states regeneration for seagrasses has occurred within the study area (Wiltshire and Tanner 2016).

A loss factor of 0.4 for the scale of impacts has been applied as vegetation may experience temporary leaf loss, however the project will not physically remove plants or root mass in this area. A rehabilitation rate of 0.7 has been applied due to the expected recovery of the association within 1-3 years.

Association 2

Vegetation is sparse, between 1-35% cover. The area that may be impacted by dredge plumes occurs in proximity to the existing channel, therefore species diversity is likely to be reduced and seagrass bed impacted. Vegetation in the impact area has regenerated since the 2005 dredge campaign (Wiltshire and Tanner 2016).

A loss factor of 0.4 for the scale of impacts has been applied as vegetation may experience temporary leaf loss, however the project will not physically remove plants or root mass in this area. A rehabilitation rate of 0.7 has been applied due to the expected recovery of the association within 1-3 years.

Association 3

Vegetation across the survey area occurs in moderate to highly dense, with 35-100% cover. However the area that may be impacted by dredge plumes occurs in proximity to the existing channel, therefore species diversity is likely to be reduced and seagrass bed partly impacted. The area is likely to have scattered regeneration

A loss factor of 0.4 for the scale of impacts has been applied as vegetation may experience temporary leaf loss, however the project will not physically remove plants or root mass in this area. A rehabilitation rate of 0.7 has been applied due to the expected recovery of the association within 1-3 years.

4.1.1 Summary of SEB Calculations

The project is proposing to commence dredging in Autumn 2019 to maximise dredging within winter, in an effort to reduce impacts. The project will also adopt the use of the alternative dredge methods, as discussed in Addendum 2 of the DA (Appendix B) to further minimise impacts. Refer to Table 5 for breakdown of impacts and SEB figures for direct impacts.

Table 5 Summary of Impacts and SEB's

Vegetation Classification Category	Direct Impact (ha)	Unit Biodiversity Score	Total Biodiversity Score	SEB Direct Impacts Fee($)	SEB Admin Fee
Association 2 Sparse *Halophila australis* and/or very sparse *Posidonia* seagrass	4	13.13	52.50	$68,906.25	$3,4445.31
Area Direct Impacts	**4ha**	**SEB Payment (including Admin fee)**			**$72,351.56**
Vegetation Classification Category	**Total Area (ha) within the High to Medium Impact Area (Winter)**	**Unit Biodiversity Score**	**Total Biodiversity Score**	**SEB Indirect Impacts Fee ($)**	**Admin Fee ($)**
Association 1 Moderate to dense *Amphibolis* and/or *Posidonia* seagrass	*0.02*	33.33	0.67	$104.99	$5.25
Association 2 Sparse *Halophila australis* and/or very sparse *Posidonia* seagrass	*0.2*	28.88	5.78	$909.56	$45.48
Association 3 Moderate to dense *Heterozostera* dominated seagrass	158	33.33	5266.14	$829,417.05	$41,470.85
Total Area Indirect Impact	**158.22ha**	**SEB Payment (including Admin fee)**			**$871,953.18**
TOTAL PROJECT IMPACT	**162.22ha**	**TOTAL PROJECT SEB (including Admin fee)**			**$944,304.74**

4.2 SEB PAYMENT

The project has considered rehabilitation works, however previous rehabilitation projects have had limited success. Additionally, Flinders Ports do not own any part of the seabed (crown land), therefore have no suitable location in their care and control for rehabilitation activities. Any restoration near the channel may be subject to future disturbance related to port operations or other environmental events.

Therefore, the project will meet SEB requirements via payment into the Native Vegetation Fund.

Flinders Ports will work with the Native Vegetation Management Unit to determine an appropriate payment plan.

5. References

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6. Appendices

Appendix A: Seagrass Habitat Mapping (2017 BMT WBM)

Appendix B: OHCW DA Addendum 2

Appendix C: Decision Notification DA 010/V048/17.

Appendix D. Marine Assessment Scoresheets (Direct Impact Association A2, Indirect Impact Association A1, Indirect Impact Association A1, Indirect Impact Association A3)