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EPA Reference: 34148

29 November 2017

Mr Reece Svetec
Planning Officer
Development Assessment Commission
GPO Box 1815
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Dear Mr Svetec

Referral Response - Section 49 Development Act (Crown Development by State Agencies)

Development Application No.	010/V048/17
Applicant	Flinders Ports Pty Ltd
Location	In St Vincent Gulf, 29km S/E of Outer Harbor.
Activity of Environmental Significance	Schedule 8 Item 11 - Schedule 22, Dredging; Section 49 - Crown Development
Proposal	Capital dredging to widen the existing channel and swing basin located at Outer Harbor by approximately 40m for a distance of approximately 7km requiring the removal of nom. 1.55 million m ³ of material to be placed off-shore at a designated placement (7kmx5km) area within the Gulf St Vincent.
Decision Notification	A copy of the decision notification must be forwarded to: Client Services Officer Environment Protection Authority GPO Box 2607 ADELAIDE SA 5001

The above development proposal was referred to the Environment Protection Authority (EPA) by the State Commission Assessment Panel (SCAP) for environmental advice to assist the SCAP in its report to the Minister for Planning in accordance with the requirements of Section 49(7a) of the *Development Act 1993*.

The following response is provided in accordance with Section 49(7a) of the *Development Act 1993*, and Schedule 8 of the *Development Regulations 2008*.

In determining this response the EPA had regard to and sought to further the objects of the *Environment Protection Act 1993*, and also had regard to:

- the General Environmental Duty, as defined in Part 4, Section 25 (1) of the Act; and
- relevant Environment Protection Policies made under Part 5 of the Act.

Please direct all queries relating to the contents of this correspondence to Phil Hazell on telephone (08) 8204 2136 or facsimile (08) 8124 4673 or email Phil.Hazell@sa.gov.au.

THE PROPOSAL

The proposed development involves widening the existing Outer Harbor channel and swing basin by approximately 40 metres, resulting in the need to dredge approximately 1.55 million m³ of material along seven kilometres of the channel. The proposed development would result in widening the existing channel from 130 metres to 170 metres.

The dredged material is proposed to be placed approximately 30 kilometres off-shore in Gulf St Vincent (the same location utilised in 2005, an area approximately 7km by 5km in size located in deep water (>30m) and avoiding major shipping routes).

As Outer Harbor can only currently accommodate vessels up to a maximum width of 42.2 metres, the proposed development would enable the port to accommodate vessels with a maximum width of 49 metres once complete.

The proposed development also includes relocating existing navigational aids to reflect the new alignment of the channel. There are potentially 16 navigational aids in total that may require works of some nature, with a total of nine currently identified as requiring physical relocation prior to any dredging.

SITE DESCRIPTION

The proposed development involves the following two sites:

- dredging works within the Outer Harbor Channel and swing basin; and
- the dredge material placement area (DMPA) located 30km south-west of Outer Harbor in Gulf St Vincent.

Outer Harbor Channel

Seven kilometres of the Outer Harbor Channel is proposed to be widened by approximately 40m. The material to be dredged from the Outer Harbor Channel consists primarily of shelly sand and silt, with some clays and limestone also likely to be encountered. Levels of contaminants within these sediments were identified as being below the guideline values in the *National Assessment Guidelines for Dredging (Commonwealth of Australia, 2009)*. They are, therefore, suitable for placement at sea. In addition, the Outer Harbor area includes the Adelaide Dolphin Sanctuary and resident and migratory shorebird habitation on Bird Island.

The nearshore environment has extensive *Posidonia* sp. seagrass meadows which are the dominant sub-tidal marine habitat in South Australian gulfs.

Gulf St Vincent

The DMPA is proposed to be located approximately 30km south west of the Outer Harbor and would consist of a rectangular shape approximately 7km by 5km. Seagrass meadows exist within both the Gulf St Vincent and in areas within or adjoining the Outer Harbor Channel. Commercial fishing activities also occur within the Gulf St Vincent (in proximity to the DMPA).

The EPA acknowledges that the DMPA is the same location that was utilised during a capital dredging works campaign that was undertaken in 2005.

CONSIDERATION

Advice in this letter includes consideration of the location with respect to existing land uses and is aimed at protecting the environment and avoiding potential adverse impacts upon the locality.

In assessing the proposed development, the EPA considered the following plans, specifications and reports submitted with the application:

- *Flinders Ports Outer Harbor Channel Widening Project Development Application Report* prepared by Arup and BMT WBM, dated July 2017 (the DA report)
- *Project Location Plan* prepared by BMT WBM, dated 22 June 2017
- *Dredge Material Placement Area* prepared by BMT WBM, dated 28 April 2017
- *Minutes from Meeting between EPA, Flinders Ports, Arup, BMT WBM and DPTI on 30 August 2017: Flinders Ports Capital Dredging Works DA*
- *Memorandum* prepared by Arup and dated 22 August
- *Flinders Ports Outer Harbor Channel Widening Project DA Report - Addendum #1* prepared by ARUP and dated 13 September 2017
- *GIS data* prepared by BMT WBM which enabled the EPA to superimpose mapped seagrass areas and the modelled Zones of Impact.
- *All referenced material* (as contained in the DA Report), provided to the EPA on 13 September 2017
- *Flinders Ports Outer Harbor Channel Widening Project DA Report - Addendum #2* prepared by ARUP and dated 30 October 2017; and
- *Flinders Ports Outer Harbor Channel Widening Project DA Report - Addendum #2 Revision A*, prepared by ARUP and dated 6 November 2017.

The EPA also had the following inter-agency and stakeholder consultation regarding this development application:

- Pre-lodgement meeting with Flinders Ports Pty Ltd on 16 September 2016
- Meeting with DEWNR on 20 September 2017
- Meeting with DPTI on 28 September 2017 (DPTI Infrastructure as project sponsor and DPTI Planning as the Planning Authority)
- Meeting with Flinders Ports Pty Ltd and their consultants (Arup and BMT WBM) and DPTI on 30 August and 9 October 2017.

ENVIRONMENTAL ISSUES

Water Quality

State of the Outer Harbor Channel Post 2005 Capital Dredging Works Campaign

An Environmental Monitoring Plan (EMP) undertaken following the 2005 dredge dredging works identified that seagrass impacts occurred as a result of increased turbidity from the dredge campaign. Seagrass recovered within two years at the four sites that were monitored greater than one kilometre from the Channel. However, there were extensive areas that were not monitored and aerial photography obtained by the EPA suggests that there was widespread seagrass loss near the shipping channel during 2002-2007. Such aerial photography was undertaken in 2007 and indicated there was approximately 1600 hectares of seagrass loss in the vicinity of the shipping channel as a direct result of the dredging campaign undertaken in 2005/06.

Original proposed dredging methodology

The original dredging methodology (identified in the application as the 'baseline dredge method') was proposed as being the same methodology that was utilised during the last major Outer Harbour dredging event in 2005/06. The baseline dredge proposal would use a combination of a medium sized Cutter Suction Dredger (CSD) and a Trailing Suction Hopper Dredge (TSHD) of about 10,000m³ hopper capacity. The CSD was proposed to be used for breaking up a proportion of the sea bed material that was not suitable for direct TSHD dredging. The CSD would side-cast this material (placing material on the sea bed), which would then be re-dredged by the TSHD for disposal to the Dredge Material Placement Area (DMPA) 30 km offshore.

When dredging, the TSHD would move forward at a speed of approximately 1-2 knots. Dredging using the TSHD would take place at the drag head attached to suction pipe trailing arms. There would be two trailing arms, one each side of the TSHD. For a TSHD with a 10,000m³ hopper capacity and an effective dredge output of 5,000m³ per hour (as proposed in the DA Report) the dredged material would be loaded into the hopper in the form of a slurry (approximately 10% solids and 90% water). As the hopper is filled up, excess water would be separated and discharged back into surrounding marine waters through an overflow process utilising a 'green valve'. Such an overflow system would be designed to provide the means of separating the solids from the water by reducing the turbulence of the slurry mixture and allowing sufficient time for solids to settle in the hopper. The 'green valve' is an adjustable valve that chokes the flow to reduce the air taken down in the overflow mixture leaving the hopper. This is designed to create a denser particle stream, causing less turbulence and allowing sediments to travel more quickly to the seabed.

Once loaded, the TSHD would sail under its own power to the DMPA where the doors of the hull would be opened to allow the dredged material to drop to the sea bed.

In summary, the base scenario presented in the DA report made the following assumptions:

- CSD side-casting of stiff clays and limestones, representing 66% of the estimated 1.55M m³ in-situ material
- 10,000m³ hopper TSHD to dredge loose material without pre-treatment by a CSD

- (approximately 34% of the 1.55M m³ in situ) in addition to the CSD side-cast material
- TSHD hopper overflow allowed without restrictions.

This scenario was chosen by Flinders Ports following a detailed assessment of a number of alternative dredging scenarios as well environmental, timing, economic and commercial considerations.

Preliminary modelling undertaken by the proponent suggested the (baseline) dredging would discharge in the order of 433,000 tonnes of fine sediments into nearshore waters from the dredge works (not including at the DMPA). This figure, as identified by the EPA, would represent more than 13 times the cumulative stormwater sediment discharge for the entire metropolitan coast since 2005 (estimated to be 31,500 tonnes between 2005 and 2014 by Water Data Services Pty Ltd in their 'Adelaide Coastal Waters Study: Stormwater Data Audit Report' for the EPA in 2015). Fine sediments generate the most turbidity and are resuspended by wind and wave action in nearshore waters for extended periods of time, further impacting water clarity.

As identified in the application, there are times when this overflow would occur adjacent to well established seagrass areas where, depending on the season that dredging would be undertaken, extensive seagrass loss is estimated to be between approximately 1000 hectares during winter or approximately 1500 hectares during a summer dredge campaign. The seagrass predicted to be lost is a mixture of *Posidonia* and *Amphibolis* spp. These are very long lived species which, once lost, have limited ability to recolonise. In many locations, seagrass removal or loss is still evident more than 100 years after the stress has been removed (e.g. Port Broughton seagrass mining in 1908-1914 - Irving, 2013). The EPA identified that such potential seagrass loss would equate to an economic loss to the State of between \$17-29 million a year (accounting for fisheries production, the cost of sand cartage on the beach, which is exacerbated by seagrass loss etc.).

The EPA therefore considered that the original baseline dredge methodology was likely to result in significant seagrass loss and a very high probability of causing serious environmental harm. Effective mitigation of significant seagrass loss therefore required changes to the proposed dredge method.

As a result, the proposed dredging methodology (which only predicted turbidity plumes generated under the worst case scenario with no controls in place) was discussed at length between the EPA and Flinders Ports (the applicant). The EPA requested further information to investigate alternative dredge methodologies that would mitigate turbidity impacts at the dredge site and reduce the spill of fine sediment into the water column but still remain technically feasible and economically viable.

In response to several meetings with Flinders Ports and the EPA's further information request letter dated 28 September 2017, the applicant provided additional information titled *DA Report Addendum #2* which included Alternative Dredging Scenario Considerations prepared by Arup and dated 6 November 2017. This information investigated the feasibility, cost and duration of various alternative dredging methods including:

- no overflow from TSHD,

- no side casting of the CSD
- filtration or addition of flocculants
- reducing the rate of dredging
- use of different dredge plant and equipment (e.g. backhoe dredge), or
- the use of a cutter suction dredge only.

Each of these alternatives resulted in a different mix of impacts, including prolonged duration, technical inefficiencies, and subsequent flow-on cost effects, when compared to the original proposed dredging methodology. Of all the options reviewed, the 'no side casting of the CSD' option was identified as providing the most significant reduction in the predicted turbidity and sediment impacts on seagrass but extended the duration of the overall works.

The *DA Report Addendum #2* included an appendix which was titled 'Alternative Dredge Methodology' (the 'no side casting of the CSD' option referenced above). This appendix modelled an alternative dredging scenario that removed the requirement for double-handling of material that was dredged by the CSD. This scenario was referred to by the applicant's consultants as the 'best case' methodology. The methodology modelled involved a combination of a small-medium Trailing Suction Hopper Dredger (TSHD) of about 3,000m³ hopper capacity and a medium size Cutter Suction Dredger (CSD) supported by 2,000m³ hopper capacity Split Hull Barges (SHB). The TSHD would be used to dredge the sandy/soft material and the CSD would be used for breaking up seabed material and discharging directly into SHB's for transport to the DMPA, thus avoiding side casting. The modelling performed for this scenario assumed that:

- a 3,000m³ hopper TSHD would be used to dredge loose material (34% of 1.55M m³ in situ) without prior CSD treatment
- a CSD would be used to dredge stiff clays and limestone
- a CSD would pump directly 2,000m³ SHBs for transport to the DMPA
- overflow would be allowed from the SHB hopper (60% of the fine sediment entering the SHB hopper would exit via the overflow)
- dredging would occur without using mitigation measures during the dredging campaign (this was unlikely in practice).

Hydrodynamic modelling of this scenario showed that the total quantity of fine sediment spill from the proposed channel dredging works was 265,000 tonnes, which is a 39% reduction compared to the original proposed dredging methodology presented in the DA report. Such a reduction would be achieved by avoiding the double handling of dredge material and by replacing TSHD overflow dredging with CSD discharge into the SHB.

Modelled turbidity concentration (in NTU) contours and sediment deposition rate (in mg/cm²) contours for the alternative dredge methodology conducted during both winter and summer dredging scenarios were presented in Figures 2.1-2.6 contained in the technical memorandum attached to the *DA Report Addendum #2*. The alternative dredge methodology turbidity and sediment deposition maps for both winter and summer dredging scenarios showed a smaller and less intense footprint of elevated turbidity and sediment deposition extending from the dredging area compared to the original proposed dredging methodology. On the other hand, slightly higher turbidity and sediment deposition impacts at the offshore DMPA site were predicted due to slightly higher fine sediment content of material placed from the SHB operations.

Figures 2.7-2.10 in the same technical memorandum attached to the *DA Report Addendum #2* also that showed the predicted seagrass zones of impact (i.e. no ecological impact, low to moderate impact, and high impact) associated with turbidity and sediment impacts from the alternative dredging methodology during both a potential winter or summer dredging campaign. The size of the low to moderate and high impact zones for both potential winter and summer dredging campaigns were considerably smaller than the size of such zones predicted for the original proposed dredging methodology.

On 7 November 2017 Flinders Ports' consultants (Arup) confirmed via an email to DPTI and the EPA that the 'Alternative Dredge Methodology' as contained in *DA Report Addendum #2* was the methodology to be assessed for this development application. On 24 November 2017, Lee Kolokas (of Flinders Ports) reconfirmed (via a phone call with Phil Hazell of the EPA) the applicant's commitment to adopt this dredging methodology in practice.

The EPA considers that the hydrodynamic modelling undertaken for the alternative dredge methodology (i.e. no side casting of CSD) option predicts a substantial reduction in:

- the turbidity and sediment deposition; and
- size of the zones of predicted seagrass impact

when compared to the original proposed dredging methodology.

The EPA, therefore, considers that this methodology represents a reasonable and practicable approach to minimising environmental harm. The EPA has advised a condition below to ensure that the proposed alternative dredging methodology (or similar methodology that can achieve an equivalent (or better) environmental outcome) is implemented.

The timing of the proposed dredging works is also a critical factor affecting the degree of marine impact associated with this development application as the turbidity generated from the proposed dredging works would have a different impact on seagrass depending on the season the dredging works were undertaken in. Seagrass builds up energy stores during summer, so a summer dredge would be more detrimental than a winter dredge. Such differences in the degree of predicted impacts on seagrass are evident in Figures 2.7-2.10 contained in the *DA Report Addendum #2* that showed the predicted seagrass zones of impact (i.e. no ecological impact, low to moderate impact, and high impact) associated with turbidity and sediment impacts from the alternative dredging methodology during both a potential winter or summer dredging campaign. The EPA has therefore advised a condition below that seeks to avoid dredging works during the summer months.

In addition, the EPA has also advised a condition below to require the preparation and implementation of an environmental monitoring program (EMP) that is designed to demonstrate and validate the zones of seagrass impact predicted in the hydrodynamic modelling documented in the technical memorandum attached to the *DA Report Addendum #2*.

Dredge Management Plan (DMP)

Section 8 of the DA report presented a framework Dredge Management Plan (DMP) for the proposed dredging works. This framework outlines that the DMP would include monitoring and response requirements in order to reduce plume and sedimentation impacts.

In order to adaptively manage the dredging works, the EPA considers that an extensive monitoring program would need to be developed so that seagrass conditions can be monitored in a 'before after control impact' (BACI) design. The monitoring program should include turbidity and light logging capabilities to ensure that the zones of impact are accurate (i.e. to understand if those areas impacted are limited to just the zone of high impact and whether or not seagrass recovery would occur). A condition ensuring that a detailed DMP is prepared and submitted to the reasonable satisfaction of the EPA prior to works commencing has been advised below.

Caulerpa taxifolia

The Outer Harbor shipping channel is extensively infested with *Caulerpa taxifolia*, a listed invasive species. Dredging through this section is likely to spread fragments of *Caulerpa* throughout the nearshore environment, causing further dispersion of this invasive species. The EPA considers that spreading of this non-native species via discharge and/or deposition would cause environmental harm as per Part 1, clause 5(c) of the *Environment Protection (Water Quality) Policy 2015*.

The environmental impacts of *Caulerpa taxifolia* invasion include altered sediment chemistry, prevention of seagrass growth and rehabilitation, altered faunal communities and increased costs associated with clearing marine infrastructure such as intake pipes. *Caulerpa taxifolia* can grow from small fragments generated by the dredging process. As such, the active management of fragmentation and release of *Caulerpa taxifolia* fragments from dredging is required to decrease the risk of establishment outside the current containment area. The EPA has advised a condition to ensure that appropriate measures to manage *Caulerpa taxifolia* should be contained in a detailed Dredge Management Plan (DMP).

Interface Between Land Uses

The EPA publication *Evaluation distances for effective air quality and noise management (2016)* recommends a minimum separation distance of 300 metres (for noise and air quality purposes) between the activity of dredging works and a sensitive receptor. In this instance the closest residential receivers to the proposed dredging works are those located on South Australia One Drive, North Haven, approximately 300m from the centreline of the shipping channel, as shown in Figure 42 of the DA report.

As the closest sensitive receivers are located 300 metres from the proposed development, the EPA has considered potential air quality and noise impacts in more detail below.

Air Quality

As identified in the Memorandum prepared by Arup and dated 22 August 2017, it is confirmed that dredged material would not be stored on land. Given the dredging activities are marine based, the dredged material would have a high moisture content at all times and would remain mixed with marine water as it is transported to the dredge disposal placement area approximately 30km off-shore in the Gulf St Vincent. Therefore, it is not anticipated that the dredged spoil would dry out and become odorous during the proposed works. This is satisfactory to the EPA.

The EPA considers that there is a low risk of dust and/or odour nuisance occurring from the

proposed development.

Noise

Dredging Works

Airborne noise impacts on human receptors, as identified in the DA report are predicted to meet the relevant noise criteria contained in the *Environment Protection (Noise) Policy 2007* provided that proposed dredging works undertaken within 650 metres of human noise sensitive receivers is conducted during the day-time. Further information provided to the EPA confirmed that dredging works would be scheduled in the vicinity of the port entrance/passenger terminal during the day-time, and/or at times of favourable weather conditions (receivers upwind of works). This is satisfactory to the EPA and a condition to this effect has been advised below.

Pile Driving

Airborne noise impacts on human receptors are also predicted to meet the night-time criteria of Leq 45dB(A)/Lmax 60dB(A) for distances greater than 1600 metres from human noise sensitive receivers under weather conditions conducive to noise propagation. As such, piling within this distance (the EPA understands this would comprise one pile) should be undertaken during the day-time period only. Further information provided to the EPA also confirmed that piling within 1600 metres of noise sensitive receivers would only occur between 7am to 7pm Monday to Saturday and piling works would not be undertaken on a Sunday. This is satisfactory to the EPA and conditions to these effects have been advised below.

Under Water Noise

The EPA considers that section 6.4.1.3 Underwater Noise (pg. 127) of the DA Report was inadequate in terms of fully addressing the potential underwater noise impacts from the proposed piling driving activities. In relation to the Adelaide Dolphin Sanctuary and breeding season for cetaceans, the EPA considered that further mitigation measures would be required as per the mitigation methods described in Section 5.4.2 of the *DPTI underwater Piling Noise Guidelines (2012)* including marine mammal observers with appropriate stop works procedures, use of vibratory hammer, press-in-piling or suction piling and/or a coffer dam (noting bubble curtains are not effective in open marine environments). Further information in the form of a memorandum prepared by Arup and dated 22 August 2017 confirmed that underwater piling works would be conducted in accordance with the *DPTI underwater Piling Noise Guidelines (2012)* through the implementation of:

- appropriate stop works procedures
- use of vibratory hammer, and
- press-in-piling or suction piling and/or a coffer dam (noting bubble curtains are not effective in open marine environments).

This is satisfactory to the EPA.

As explained in an inter agency meeting with Flinders Ports, Arup and BMT WBM on 30 August 2017 and within the EPA's further information request letter (dated 17 August 2017), the EPA considered that use of the Flinders Ports Control Tower (operating 24/7) as the sole

marine mammal observer was not appropriate. The marine mammal observer should be appropriately qualified in the identification and behaviour of marine mammals, be positioned at a location to observe marine mammals within the one kilometre zone of the works and have direct and immediate communication with the piling operator/site supervisor. Further information provided to the EPA on 22 August 2017 identified that an appropriately trained mammal observer(s) would be contracted and implemented at all times during the proposed works so that appropriate stop works procedures from the use of vibratory hammer and a press-in-piling or suction piling can be implemented when mammals are located within a one kilometer radius of the piling works. This is satisfactory to the EPA and a condition to this effect has been advised below.

Wastewater Management

Refuelling

The DA report stated that no refuelling would occur while the dredging vessels are operational out at sea. It is acknowledged that the dredging contractor would utilise the existing port facilities to refuel in accordance with standard port operating procedures. In terms of preventing contamination from spills and discharges and complying with the *Environment Protection (Water Quality) Policy 2015*, this is considered satisfactory to the EPA.

CONCLUSION

The proposed development includes capital dredging works that would involve 1.55M m³ of material being hydraulically dredged and removed from the Outer Harbor Channel. The dredged material would then be placed 30km off-shore (in a designated placement area 7 x 5km) within the Gulf St Vincent. The proposal would enable larger (deeper draft) Panamax vessels to utilise the port at all times independent of tide and hence maintain Adelaide on the global freight routes.

The EPA notes that similar capital dredging works occurred within the Outer Harbor channel in 2005. An Environmental Monitoring Plan (EMP) undertaken following the 2005 dredging works identified that seagrass impacts occurred as a result of increased turbidity from the dredge campaign. Seagrass recovered within two years at the four sites that were monitored greater than 1km from the Outer Harbor channel. However, there were extensive areas that were not monitored (due to poor design of the monitoring program) and aerial photography obtained by the EPA suggests that extensive areas of seagrass were lost near the shipping channel during the 2002-2007 period. As the current dredging proposal originally intended to use the same technology and methodologies that were previously utilised during the previous 2005 dredge campaign, the EPA worked with Flinders Ports and their consultants (Arup and BMT WBM) to consider the use of alternative dredging methods to ensure that environmental harm could be minimised and that serious environmental harm could be prevented during the proposed dredging works.

Flinders Ports ultimately proposed an alternative dredging methodology, involving use of the 'no side casting Cutter Suction Dredger (CSD)' option. Hydrodynamic modelling undertaken for this dredging option estimated that it would result in a 39% reduction in fine sediment spill into the marine environment compared to the original proposed dredging methodology. Hydrodynamic modelling of the predicted impacts of turbidity and sediment

deposition on seagrass associated with the alternative dredging methodology in both winter and summer also showed that the size of the 'low to moderate' and 'high' seagrass impact zones were considerably reduced when compared to the original proposed dredging methodology. The EPA considers this to be a substantial reduction in the degree of predicted environmental harm caused by the proposed dredging works and this methodology represents a reasonable and practicable way of minimising environmental harm.

Despite Flinders Ports commitment to adopt the alternative dredging methodology, the EPA considers that the timing of the proposed dredging works is also a critical factor affecting the degree of marine impact associated with this development application. This is because the turbidity generated from the proposed dredging works would have a different impact on seagrass depending on the season the dredging works were undertaken in. Seagrass builds up energy stores during summer, so a summer dredge would be more detrimental than a winter dredge. The EPA therefore strongly recommends a winter dredge campaign (i.e. outside the summer months).

Even with the use of the alternative dredging methodology and winter timing of the dredging works, approval of this proposal may still result in the generation of widespread turbidity and a high likelihood of extensive seagrass loss.

In order to minimise potential environmental impacts to an acceptable level having regard to the general environmental duty (as defined in section 25 of the EP Act), the EPA recommends that the proposed capital dredging should only be allowed to proceed subject to conditions relating to:

- timing of the dredging works
- the proposed alternative dredging methodology being implemented
- an environmental monitoring program be prepared and implemented
- the preparation of a dredge management plan
- restrictions on the timing and methods employed for pile driving.

The EPA will continue to work closely with Flinders Ports through the EPA licence process, implementation of the Dredge Management Plan and proposed scope of works to ensure that the extent of turbidity impacts (as anticipated) are minimised thereby reducing the amount of seagrass loss in areas near the Outer Harbor Channel.

ADVICE

The following advice is provided for the purposes of Section 49 of the *Development Act 1993*:

Recommended conditions:

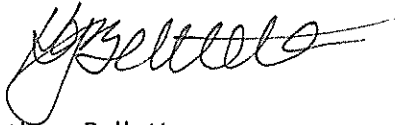
1. Dredging work must be avoided during the December to February period.
2. The dredging methodology to be used must implement the 'no side casting of the Cutter Suction Dredger (CSD)' option presented in the Flinders Ports Pty Ltd Outer Harbor Channel Widening DA Report - Addendum #2 as prepared by Arup Pty Ltd on 6 November 2017 or similar method that can achieve an equivalent (or better) environmental outcome.
3. Prior to the commencement of dredging works, an Environmental

- Monitoring Program (EMP) must be prepared to the reasonable satisfaction of the EPA. The EMP must be designed to demonstrate and validate the zones of seagrass impact predicted in the hydrodynamic modelling documented in the Technical Memorandum prepared by BMT WBM on 23 October 2017 and incorporate, as a minimum, the monitoring of seagrass conditions using a 'before after control impact' (BACI) design measuring appropriate seagrass health metrics via seagrass diver surveys at an appropriate spatial and temporal frequency. The EMP must then be implemented.
4. Prior to the commencement of dredging works, a Dredge Management Plan (DMP) must be prepared and submitted to the reasonable satisfaction of the EPA which is designed to provide real time adaptive management of dredge plumes (incorporating 'alarm' and 'hold' triggers and management actions if triggers are exceeded) and incorporates, as a minimum, details about the following:
 - a. the use of continuous (10 minute interval or similar) turbidity and light logging (using calibrated remote and telemetered instruments with self-cleaning capability);
 - b. water sampling (at an appropriate spatial and temporal frequency) to monitor total suspended solids (TSS) and chlorophyll to enable comprehensive seasonal calibration of relationships between other parameters;
 - c. the use of probes or similar to monitor dissolved oxygen, pH, salinity, temperature (at an appropriate spatial and temporal frequency);
 - d. real time access to telemetered stations so that raw data can be obtained in an appropriate electronic format;
 - e. appropriate management of *Caulerpa taxifolia* within the Outer Harbor shipping channel to ensure that dredging near the Outer Harbor breakwater and swing basin (where *Caulerpa taxifolia* infestations are known to occur) would not spread fragments of *Caulerpa taxifolia* throughout the nearshore marine environment.
 5. Dredging works conducted in the vicinity of the Outer Harbor port entrance/passenger terminal must be undertaken during the day-time and/or at times of favourable weather conditions with respect to human noise sensitive receivers (i.e. receivers upwind of dredging works).
 6. Piling works within 1600 metres of noise sensitive receivers must only occur between 7am to 7pm Monday to Saturday.
 7. Piling works must not be undertaken on a Sunday.
 8. Appropriately trained marine mammal observers must be used to ensure that appropriate stop work procedures are adopted in relation to the use of vibratory hammer and press-in-piling or suction piling is implemented as an alternative when marine mammals are located within a one kilometre radius of any piling works.

The following notes provide important information for the benefit of the applicant and are requested to be included in any approval:

- The applicant is reminded of its general environmental duty, as required by Section 25 of the *Environment Protection Act 1993*, to take all reasonable and practicable measures to ensure that the activities on the whole site, including during construction, do not pollute the environment in a way which causes or may cause environmental harm.
- An environmental authorisation in the form of a licence is required for the operation of this development. The applicant is required to contact the Environment Protection Authority before acting on this approval to ascertain licensing requirements. Information on applying for a licence (including licence application forms) can be accessed here:
http://www.epa.sa.gov.au/business_and_industry/applying_for_a_licence
- EPA information sheets, guidelines documents, codes of practice, technical bulletins etc. can be accessed on the following web site: <http://www.epa.sa.gov.au>

Yours faithfully



Kathryn Bellette
Delegate

ENVIRONMENT PROTECTION AUTHORITY

