REPORT

2022-2032 Newcastle Port Maintenance Dredging Sea Disposal Permit

Long Term Monitoring and Management Plan

Client: Port of Newcastle

Reference: M&APA2776R001F0.1

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Royal HaskoningDHV

Enhancing Society Together

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Table of Contents

Table of Tables

Table of Figures

Appendices

1 Introduction

1.1 General

The Port of Newcastle ("the Port") is recognised as a major economic centre for both the Hunter Region and New South Wales (NSW) and has grown to become Australia's third-largest port by volume with trade worth about $26 billion to the national economy each year. It is the world's largest coal exporting port and also has facilities to handle general cargo, break-bulk goods and containers.

The Port operates twenty four hours a day, seven days a week, with twenty berths in use. Infrastructure within the Port includes coal terminals operated by Port Waratah Coal Services (PWCS) and Newcastle Coal Infrastructure Group (NCIG), a bulk liquid terminal for vegetable oils, agri-food storage and loading, local and national road and rail access and storage sheds adjacent to berths.

Much of the recent and current Port infrastructure has been constructed on reclaimed areas of Kooragang Island or is planned for construction on remediated land in Mayfield.

In addition to shipping, the Port includes berthing for cruise liners, an 80 berth marina and the Queens Wharf entertainment precinct. A ferry service operates within the Port between Newcastle and the northern suburb of Stockton.

Port of Newcastle (PON) is responsible for maintaining the declared depths of the navigation channels and berthing boxes and batters throughout the Port (refer **Figure 1**).

Dredging commenced in the Port in 1859 and has been virtually continuous since that time. Total dredging quantities up to 1993 were estimated to have been greater than 130 million m^3 (Patterson Britton, 1992) and are estimated to be greater than 145 million up until 2020.

The Department of Sustainability, Environment, Water, Population and Communities (SEWPaC), now Department of Agriculture, Water and the Environment (DAWE), granted Newcastle Port Corporation (now PON) a 10 year maintenance dredging Sea Dumping Permit for the period from March 2012 until March 2022. The permit was reissued in 2014 to PON following privatisation for the remaining 8 year period (permit number SD2014/2642). Details of all recent Sea Dumping Permits granted to PON are shown in **Table 1** below.

Table 1 Previous disposal permits

Date	*Volume*	*Granted / Refused*
June 2000	500,000 m^3 per yr (maintenance)	Granted (5 yr)
March 2001	290,000 m^3 (capital)	Granted
June 2006	500,000 m^3 per yr (maintenance)	Granted (5 yr)
June 2011	500,000 m^3 per yr (maintenance)	Granted (1 year extension)
March 2012	Issued to Newcastle Port Corporation (NPC) in 2012 with upper limit 6,450,000 m^3 for 10 year period Re-issued permit in 2014 to PON following privatisation with upper limit 4,721,000 m^3 in remaining 8 year period	Granted (10 yr)

Figure 1 Declared depths within PON channels and berthing boxes

PON is now submitting an application for a new 10 year maintenance dredging Sea Dumping Permit to DAWE for the period 2022-2032. A Long Term Monitoring and Management Plan (LTMMP) that covers the management of dredging at the Port over the life of the permit needs to be submitted along with the permit application and approved by the Minister for Environment before the new Sea Dumping Permit can be issued. Details of the LTMMP are presented in the following sections of this document.

1.2 Environmental Objectives

1.2.1 General

PON's environmental objectives relating to maintenance dredging activities include:

- Prevention, mitigation and management of any potential environmental impacts associated with maintenance dredging activities;
- Ensuring that environmental management is undertaken in accordance with relevant legislative and policy requirements, including the Sea Dumping Permit; and
- Ensuring that maintenance dredging is undertaken with due care to the environment, which includes the promotion of environmental awareness amongst PON employees, contractors, customers, port users, visitors and members of the public.

1.2.2 Objectives of the LTMMP

LTMMPs set out both the framework and specific measures for management, mitigation and monitoring of impacts with agreed performance criteria for specified acceptable levels of environmental harm. The LTMMP demonstrates how the environment at the Port and surrounds will be protected over the longer term and provides the Port with an opportunity to showcase their role as a steward for the marine environment. LTMMPs identify responsible parties, and also include mechanisms for the regular review of compliance with permit conditions, as well as a process for continuous improvement of environmental management and performance over the life of the permit.

Specifically, this LTMMP incorporates details of maintenance dredging for the Port and the associated disposal of the dredge material, and has been prepared in support of the application for a new 10 year Sea Dumping Permit. Management strategies that ensure minimal impact on the environment have been developed for the LTMMP and are described in **Sections 5** and **6**.

1.3 Structure and Use of the LTMMP

This LTMMP has been prepared in accordance with guidelines provided by DAWE in the National Assessment Guidelines for Dredging 2009 (NAGD) to enable its utilisation as a management tool for all personnel involved in the activities associated with the sea disposal of material derived from maintenance dredging of the Port. In particular, this Plan contains an outline of:

- background to the project;
- project proposal;
- statutory and regulatory requirements for the activities;
- identification of key environmental issues associated with the phases of the project;
- procedures for the implementation, monitoring and management of control provisions necessary to protect the environment during the project;
- responsibilities for the implementation, monitoring and management of control provisions necessary to protect the environment during operation; and
- procedures for reporting and corrective action as required.

Items addressed in this LTMMP as required by the NAGD are listed in **Table 2**, with a cross-reference to where each item is addressed in this LTMMP.

Table 2 Items Addressed in this LTMMP

Item	LTMMP Reference
Overall environmental management framework for the Port	1.4
Context of the regional and local environment, including a brief history of all dredging and disposal activities	1.1
Information on approvals and policy context	3
Description of the dredging and disposal activities, including materials to be dumped	2
Description of the existing environment	4
Description of potential impacts	5
Management strategies and actions	5 and 6
Contingency planning	6.14
Provisions for maintaining current sediment quality data over the life of the permit	6.9
Auditing requirements	6.15
Reporting	6.12
Continuous improvement	6.17
Stakeholder consultation, including the operation of a Technical Advisory and Consultative Committee (TACC)	6.16

1.4 Overall Environmental Management Framework

PON maintains an Environmental Management System (EMS) based on the principles of AS/NZS ISO 14001:2004 Environment Management Systems to assist in complying with all relevant environmental legislation, government policies and legal requirements. The scope of the EMS covers all operations controlled by PON in addition to operations that PON may influence. All PON facilities and activities that interact with the environment are encapsulated within the EMS. The EMS is documented, implemented, maintained and continually improved to ensure its ongoing effectiveness.

As part of this EMS, PON has devised an Environmental Policy, which is provided in **Appendix A**. The EMS also includes (but is not limited to) the following system procedures:

- EMS Management Review;
- Identification of Environmental Aspects and Impacts:
- Identification of Legal and Other Requirements;
- Environmental Objectives and Targets;
- Environmental Management Programs;
- Training;
- Environmental Incident Response and Reporting;
- Environmental Emergency Response;
- Waste Handling and Disposal;
- Monitoring and Evaluation;
- Control of Non-Conformances;
- Internal Auditing; and

- Identification of Heritage and Conservation Requirements.

Operational procedures contained in the EMS which are relevant to dredging activities include:

- Dredging;
- Bunkering;
- Environmental Inspections;
- Fuel Tank Leak and Spill Response; and
- Identifying Significant Environmental Aspects.

Forms and work instructions contained in the EMS which are relevant to dredging activities include:

- Marine Refuelling Instructions;
- Dredge Monthly Environmental Inspection; and
- Internal EMS Audit Schedule.

This LTMMP has been developed in accordance with the principles of PON's Environmental Management System and Environmental Policy.

2 PROJECT OVERVIEW

2.1 Dredging

PON undertakes maintenance dredging of the berthing boxes, navigation channels and associated batters throughout the Port entrance and along the South Arm of the Hunter River. This dredging is required to remove accumulated sediment and maintain safe, navigable depth in the Port.

The area in which maintenance dredging will be undertaken during the life of the new 2022-2032 Sea Dumping Permit is shown in **Figure 2**. For the purposes of the management of dredging activities, PON has subdivided the Port into seven areas (Areas A, B, C, D, E, F and G) based on the nature of the sedimentation in the Port and the layout of the port area. The area in which maintenance dredging has been undertaken to date comprises Areas A, B, C, D, E and F as represented by the green shaded area in **Figure 2**.

Additional berths in the Port may become operational during the life of the new 2022-2032 Sea Dumping Permit. PON will assume responsibility for the maintenance dredging of these berths and the adjacent shipping channel at the estimated timings outlined in **Table 3**. These berths and the adjacent shipping channel are represented by the magenta shaded area in **Figure 2**. A flowchart showing the indicative timing of activities for the overall life of the permit is provided in **Figure 3**[1].

Table 3 Additional berths to be introduced during life of Permit

Berth	Maintenance Dredge Area	Expected timing when PON will assume responsibility for maintenance-dredging[2]
Mayfield 5 & 6	A	2024
Mayfield 1 & 2	A	2028
Dyke Berth 3	B	2028
Channel upgrade (Horseshoe, Entrance and Steelworks Channel widening)	B, D, E	2024
Wet Lease for Thales (and a nominal access channel)	C	2022
Newcastle GasDock	G	2024
Hydrogen exports	G	2026

[1] *Sampling and Analysis Plans (SAP) referred to in Figure 2 are discussed in Section 6.*
[2] *These timings are based on the best available information at the current time, although it should be noted that these timings may change due to a range of factors. DAWE will be notified of any changes to the timings presented herein.*

Figure 2 PON Maintenance Dredge Areas

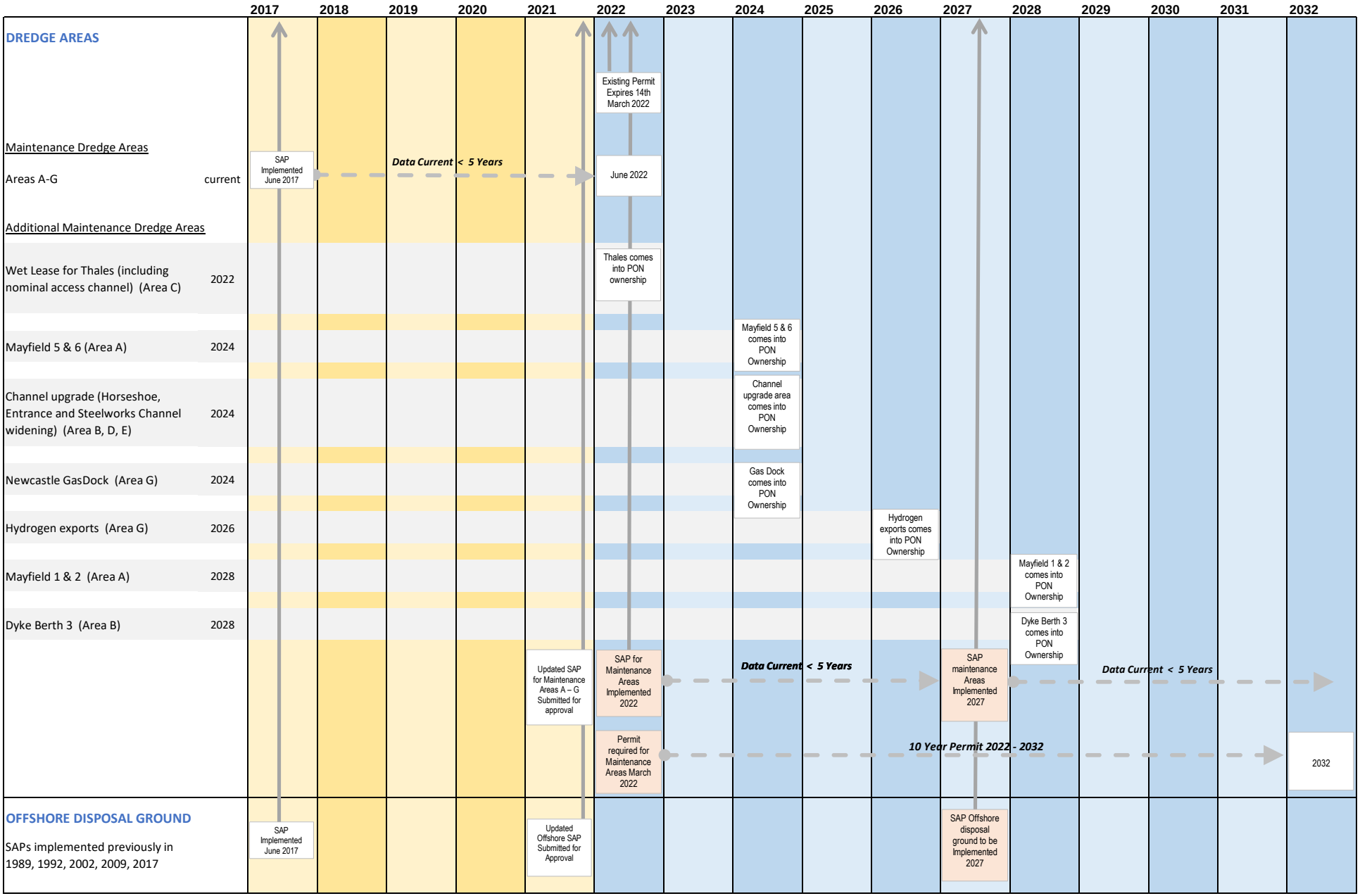

Figure 3 Flowchart with Indicative Timing of Overall Project

The maintenance dredging in Areas A, B, C, D, E, and F involves the removal of material to design dredge depths as indicated on **Figure 1**. The type of material removed for maintenance purposes comprises mostly silt and clay (mud, or fines) for Areas A to D, part of E and Area F with the proportion of sand being typically less than 30% by weight and often less than 10%. The material from Area E seaward of the line between the ends of the breakwalls typically comprises poorly sorted sand with less than 8% fines. Dredged material will be derived only from the maintenance dredging of the:

- berths, navigation channels and associated batters specified as areas A, B, C, D, E, and F throughout the life of the new sea dumping permit; and
- additional berths (and adjacent channels and batter slopes) as they fall under the responsibility of PON to maintain during the life of the new sea dumping permit (refer **Table 3**).

Table 4 shows the total annual volume of material removed from the maintenance dredging Areas A, B, C, D, E and F over the past 9 years.

Table 4 Total annual volume of material removed from the PON maintenance dredge areas

Year	Insitu volume placed at disposal ground as reported to DAWE (m^3)	Insitu volume placed at Stockton (material from part of Area E) as reported to DPIE (m^3)	TOTAL (m^3)
2012	669,968	9,233	679,201
2013	922,096	29,845	951,941
2014 (portion as Newcastle Port Corporation prior to privatisation)	136,936	0	136,936
2014 (portion as PON)	496,320[3]	6,309	502,629
2015	601,920[3]	58,280	660,200
2016	509,250	27,945	537,195
2017	437,500	25,839	463,339
2018	389,750	25,542	415,292
2019	364,541	28,458	392,999
2020	151,903	12,146	164,049
	TOTAL for sea disposal 4,680,000	TOTAL for beach nourishment 224,000	TOTAL Dredged 2012-2020 4,904,000
Annual Average (m^3)	**520,000**	25,000	**545,000**
Approximate Dredge Area (m^2)	**2,920,000**	1,475,000[4]	**4,394,000**
Approximate annual average sedimentation rate (mm/year)	**178**	17	

[3] Significant work was done in 2017 to determine the insitu density of the dredge material for each of the areas of the port to improve the accuracy of the reporting of dredging volumes. It was determined that 2014 and 2015 volumes had been overstated in annual reporting to DAWE. The revised volumes for 2014 and 2015, as presented in Table 4, were provided to DAWE.
[4] The part of Area E where maintenance dredged material is suitable for beach nourishment, being seaward of the line between the ends of the breakwalls

The maintenance quantities dredged from the Port vary from year to year due to the dynamic and variable processes of siltation throughout the Port. The total annual volume of material dredged varied from a minimum of 164,049 m^3 to a maximum of 951,941 m^3 between the years 2012 and 2020.

In 2012 the dredge vessel changed from a 38hr 5day/week operation to 12hr 365days/year operation as part of the eastern steelworks channel batter restoration project. This accounts for the higher dredge volumes recorded in 2012 and 2013. The low volume dredged in 2020 was due to a significant period of dredge vessel drydocking (12 weeks away and another 4 weeks alongside in Newcastle) combined with other vessel maintenance earlier in 2020. The COVID 19 pandemic also led to crew isolation and shortages. A year of significant dry weather i.e. lack of flooding events, also contributed to the lower volumes dredged in 2020.

As shown in **Table 4**, the annual average volume dredged from the maintenance areas over the life of the previous permit was in the order of 545,000 m^3. Despite the variation in annual dredge volumes observed during the last 10 year permit, it is anticipated that the annual average volume that may need to be dredged from the current maintenance dredge areas in any one year in the new 10 year permit will be in the order of previous annual average dredging volumes, i.e. equivalent to an annual average volume of 545,000 m^3.

However, as additional berths and associated channel areas fall under the responsibility of PON to maintain (refer **Table 3**), the annual dredge volumes from all areas of the port except Area F will generally increase over the life of the new Sea Dumping Permit. The additional berths and associated channel areas represent an increase in total maintenance dredge area from 439 ha to 527 ha. Anticipated dredge volumes for Areas A to G for purposes of the new 2022-2032 Sea Dumping Permit application have been estimated based on the total size of each area (following inclusion of the additional areas) and the simply determined estimated approximate annual average sedimentation rates for the Port. These volumes are summarised in **Table 5**.

Table 5 Anticipated Annual Dredge Volumes, 2022-2032

Maintenance Dredge Area	Total Area (ha)	Estimated Sedimentation Rate (mm/year)	Anticipated Volume (m^3) Normal Conditions
A	85	178	156,000
B	88	178	162,000
C	54	178	99,000
D	47	178	87,000
Portion of E with material suitable only for sea disposal	23	178	42,000
Portion of E with material suitable for beach nourishment	147	17	25,000
F	37	178	68,000
G	46	178	85,000
TOTAL	**527**		**702,000**

As outlined in **Table 5**, it is anticipated that the total average annual volume that may need to be dredged from the Port in any one year in the new 10 year permit could be in the order of 705,000 m^3 (rounded up), while in any one year depending upon the occurrence of flooding events in the Hunter River, an additional 300,000 m^3 may need to be dredged due to a flood event. Assuming similar quantities of Area E sands in the 2012-2022 period will be dredged and reused for beach nourishment of Stockton Beach over the life of the next 10 year permit, and allowing for up to 2 major flood events, PON's 2022 – 2032 sea dumping permit seeks approval for dredging and sea disposal of up to a total quantity of 7,400,000m^3 i.e. 705,000 m^3 per year for 10 years minus the estimated Area E material suitable for beach nourishment (25,000 m^3 per year) plus an additional 600,000 m^3 for up to 2 major flood events over the life of the 10 year permit.

Maintenance dredging in the Port is currently undertaken by PON's dredger the David Allan (refer **Figure 4** and **Figure 5**). This is a trailing suction hopper dredger which is also fitted with a grab. The vessel has a hopper capacity of 1000 m^3. Where necessary, depending on the rate of sedimentation in the Port, a contract dredger is employed to supplement the work of the David Allan. This vessel would also be a trailing suction hopper dredger. In the future, the David Allan may be replaced and another PON owned THSD may be used. Any dredge vessel in connection with the dumping activities and any associated vessels must comply with the relevant state, national or international standards with respect to seaworthiness, safety and environmental requirements, or any rules or conditions laid down by the certifying classification society, and be capable of dumping the dredged material at the spoil ground in accordance with the permit.

The majority of the maintenance dredging undertaken by the David Allan is carried out in trailing suction mode. This mode typically accounts for about 90% of all dredging. The trailing suction method is employed in both channel areas and berth areas, but channel dredging accounts for most of the trailer work. The typical cut depth in trailing suction mode is 0.3 to 0.4 m with a maximum of about 1 m and minimum of about 0.1 m. The width of the drag head is 1.7 m. The width of influence of the drag head is dependent on the material type but would be expected to be at least 3 to 4 m.

Figure 4 The David Allan trailing suction hopper dredger

Figure 5 TSHD David Allan splitting its hull

The grab fitted to the David Allan has a capacity of 3.5 m^3. The maximum depth of cut is about 1 m and the minimum about 0.1 m. The typical cut height is dependent on the type of material and operating location. Grab dredging is generally only undertaken where there is a constraint to operation in trailing suction mode such as safety.

As part of the channel maintenance, PON also utilises contracted sweep vessels to level the seabed when required. Currently some areas of the channel and most berths in the harbour are swept 1-2 times per year. Sweeping is undertaken to redistribute built up sediments on the harbour floor to deeper areas or areas more accessible for removal by the David Allan. In the future sweeping will become a PON operation, but may still require contractor engagement.

2.2 Disposal

2.2.1 Offshore Spoil Ground

The spoil ground off the Port for maintenance dredging material is situated approximately 3 km south-east of Nobbys Head in 25 to 30 m of water (refer **Figure 6**). This spoil ground is the same site as that used for the 2012- 2022 10 year permit. The area is approximately rectangular in shape as defined by the following coordinates in WGS84:

- 32○ 56.10’ S 151○48.94’ E
- 32○ 55.77’ S 151○49.40’ E
- 32○ 56.16’ S 151○49.79’ E
- 32○ 56.49’ S 151○49.32’ E

The David Allan will track its position over the spoil ground during the disposal activities to ensure disposal is within the defined co-ordinates, using a Global Positioning System (GPS). PON will ensure that maintenance dredge material will only be placed in the area specified by the above WGS84 co-ordinates.

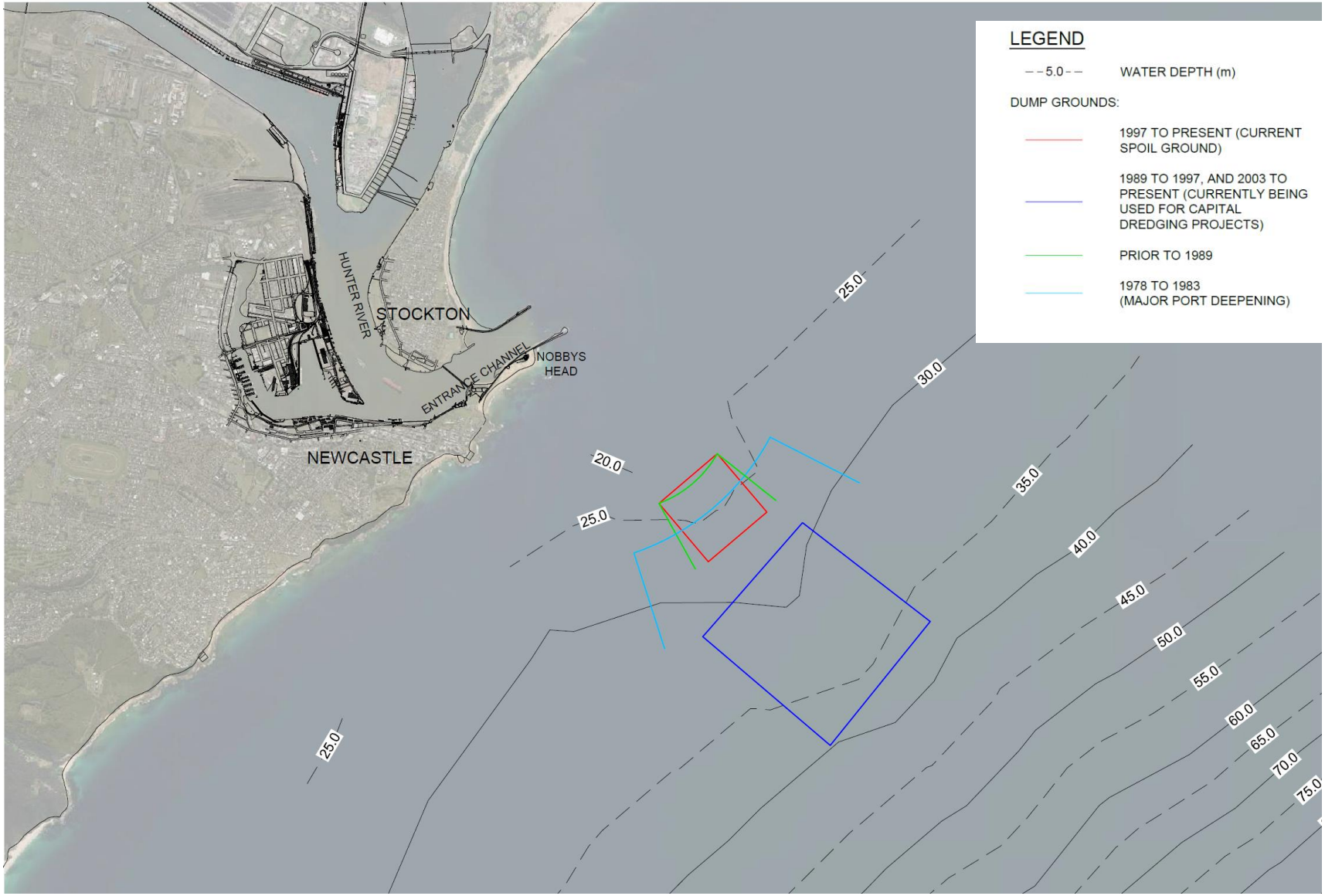

Figure 6 Proposed Spoil Ground Location Diagram

The David Allan generally operates one shift a day, approximately 12 hours per day. On average five loads per day are removed from the Port area which is equivalent to about 1600 m^3 in situ. Following high rainfall events causing significant increased sedimentation, the David Allan can sometimes operate 24 hours per day.

During the transport of the dredged material from the dredge area to the offshore spoil ground, and on the return journey, the vessel would observe all requirements of the Harbour Master in terms of vessel speed and other navigation requirements (refer further discussion in **Section 4.3.2**). Also, any appropriate maritime notices would be issued in relation to dredging and offshore disposal activities.

The dredger would navigate along the prescribed route and once at the spoil ground would open the hopper ('doors' on vessel's hull) to release the dredged material over the spoil ground.

In the longer term, the fine fraction of the sediment from the dredging (sediment in the silt and clay size fraction, i.e. mud, and some very fine sands) would be expected to disperse from the spoil ground in the manner described in previous sediment mobility studies (Patterson Britton; 1989, 1992, 2002, WorleyParsons 2002, RHDHV 2017). In these studies, the dispersion pathway of mud from the spoil ground was found to be relatively contained, bounded generally within a zone 5 km north and 6 to 7 km south of the spoil ground and out to a water depth of 60 to 100 m (refer further discussion in **Section 4.3.3**). The longer-term movement of dredge material is primarily offshore from the spoil ground into the adjacent Commonwealth Marine Area.

2.2.2 Nourishment of Stockton Beach

The sand material that has entered the PON navigation channel in Area E needs to be removed for safe navigation. The sand originated from the nearshore littoral transport zone as a consequence of the action of waves and currents. Due to the depth of the channel in Area E, the sand material does not re-enter the active coastal system under natural processes. From a coastal sediment budget/beach stability point of view, it is desirable for the material to be returned to the active coastal system by dredging and purpose placement.

In 2006, material from Area E was excluded from disposal at the designated spoil ground. The then Department of Natural Resources (DNR), now DPIE preferred that Area E material be placed off Stockton Beach for purposes of beach nourishment to address erosion issues along the beach. In 2009 PON sought the necessary approvals for the placement of suitable maintenance dredge material from Area E off Stockton Beach as this material had previously been shown to contain a relatively high proportion of sand in comparison to the other maintenance dredging areas.

Subsequently, maintenance dredging of an accumulation of around 100,000 m^3 of sand from Area E was carried out in June 2010 with material placed off Stockton Beach for beach nourishment. This large quantity was due to dredging having ceased in Area E in 2006 while approvals were sought for its reuse for beach nourishment. Since 2010, material from Area E suitable for beach nourishment purposes has been dredged annually by PON and placed off Stockton Beach. As noted in **Section 2.1**, PON's total average annual maintenance dredge volumes were 545,000 m^3 and over last 9 years typically 20,000-30,000 m^3 of material from Area E per year has been suitable for beach nourishment.

Stockton Beach is a highly dynamic coastal environment and has experienced numerous coastal erosion events requiring the construction of a range of temporary (e.g. sandbagging) and permanent protection measures (Bluecoast 2020). In recent years erosion has significantly impacted beach amenity and coastal assets.

In 2020, RHDHV prepared the Stockton Coastal Management Program (CMP) on behalf of City of Newcastle. The CMP includes actions to help manage, maintain, and preserve the coast between the northern breakwater of the Hunter River and Meredith Street. The program has mass sand nourishment as its primary coastal management action to improve beach amenity and protect coastal lands.

The CMP identifies three actions that relate to PON. Action CH13 requires PON to place suitable sand from maintenance dredging activities from the harbour entrance offshore of Stockton Beach. PON are supportive of this action and committed to work collaboratively with City of Newcastle on this matter.

PON holds the necessary approvals for the placement of suitable maintenance dredge material from Area E off Stockton Beach for the beneficial purpose of beach nourishment, as described in **Section 3.6**. It should be noted that this approvals process is separate to the Sea Dumping Permit application process. Maintenance dredging of Area E during the life of the new 10 year permit will involve placement of dredged material off Stockton Beach, provided that ongoing approvals are obtained. In general, approvals will be granted if it can be demonstrated that the material is suitable for the beneficial purpose of beach nourishment and will not result in any significant adverse environmental impacts.

3 STATUTORY AND LEGISLATIVE FRAMEWORK

3.1 Sea Dumping Act

The Environment Protection (Sea Dumping) Act 1981 provides for the environmental assessment of the dredging and disposal of dredged material in Australian waters. Commonwealth approval from DAWE is required under the Environment Protection (Sea Dumping) Act 1981 for the dredging and disposal at sea of maintenance dredged material from the Port.

In the past, DAWE generally limited the duration of sea dumping permits to five years. However, in 2009 the Australian Government established a policy of granting permits for maintenance dredging for up to 10 years under the Environment Protection (Sea Dumping) Act 1981. A LTMMP needs to be submitted along with the permit application and approved by DAWE prior to the issuing of the Sea Dumping Permit.

3.2 Crown Lands Management Act 2016

To undertake activities and work on Crown land, a licence is required from the Department of Planning, Industry and Environment (DPIE) – Lands (Crown Land). The license for maintenance dredging only pertains to that part of Area E beyond a line joining the position of mean high water mark at the outermost points of the northern and southern breakwaters, as this defines the boundary between Transport for NSW channel ownership (for which all maintenance dredging approvals are in place) and Crown land further offshore. A licence for the sea disposal of the maintenance dredge material is also required as the spoil ground is located on Crown land inshore from the three nautical mile limit of Coastal Waters in NSW.

PON was granted a licence under the Crown Lands Act 1989 (now repealed) from the Minister for the Environment for their maintenance dredging operations within Area E on 6 August 2009 (Licence Numbers RI 450958). Licence RI 450958 covers dredging (that part of Area E beyond a line joining the position of mean high water mark at the outermost points of the northern and southern breakwaters) and is valid until revoked. In May 2013 PON was issued a licence (RI 500434) for the disposal activities at the spoil ground. RI 500434 expires on 13 March 2022 in line with the PON sea dumping permit. PON will apply for ongoing licences from the Minister under the Crown Lands Management Act 2016 as required during the life of the new 10 year permit.

3.3 Coastal Management Act 2016 (Act) and State Environmental Planning Policy (Coastal Management) 2018

PON was granted concurrence under the Coastal Protection Act 1979 (now repealed) from the Minister for the Environment for their maintenance dredging and disposal operations on 7th July 2017, which is valid until 30 June 2022.

The Coastal Management Act 2016 (Act) and State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP) commenced on 3 April 2018. The Act has repealed the Coastal Protection Act 1979 (Former Act) and implemented a number of coastal reforms for NSW.

SEPP (Coastal Management) 2018 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The SEPP (Coastal Management) gives effect to the objectives of the Coastal Management Act 2016 from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

Coastal Management Areas and Objectives

The Coastal Management Act 2016 defines the coastal zone as comprising four coastal management areas. The four coastal management areas are:

- Coastal Wetlands and Littoral Rainforests Area — areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26
- Coastal Vulnerability Area — areas subject to coastal hazards such as coastal erosion and tidal inundation
- Coastal Environment Area — areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included
- Coastal Use Area — land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The maintenance dredge areas and spoil ground fall within the Coastal Environment Area as shown in **Figure 7**.

Figure 7: Coastal Management Designations for Study Area - Coastal Environment Area
https://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement

Development controls for the Coastal Environment Area aim to protect the processes and values of coastal waters, estuaries, coastal lakes and lagoons and the natural features on the adjoining land, including beaches, dunes, foreshores, headlands and rock platforms. Controls identify the need to minimise impacts on the environment, and PON must be satisfied that the proposed maintenance dredging and sea disposal avoids, minimises or manages impacts on:

- The integrity and resilience of the biophysical, hydrological and ecological environment;
- Coastal environmental values and natural coastal processes;
- The water quality of the marine estate, and has particular regard to cumulative impacts on sensitive coastal lakes;
- Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms;

- Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including people with a disability;
- Aboriginal cultural heritage, practices and places, and
- The use of the surf zone.

The objectives of the Coastal Environment Area are identified below in **Table 6**. The proposed maintenance dredging and sea disposal either meet these objectives or in no way is contrary to them.

Table 6: *Objectives of Coastal Environment Areas (Coastal Management SEPP)*

Objective No.	Objective Description	Works Compliance?
1	**To protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons.** *The maintenance dredging and sea disposal activities will not impact on the coastal environmental values or natural processes. Refer detailed impact assessment undertaken in the sea dumping permit application and summarised in **Section 5** of this LTMMP*	✓
2	**Enhance natural character, scenic value, biological diversity and ecosystem integrity** *The maintenance dredging and sea disposal activities are not contrary to the maritime and working port characteristics of the area. The maintenance dredging and sea disposal will not impact on biological diversity or ecosystem integrity.*	✓
3	**To reduce threats to, and improve the resilience of, coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change** *na*	✓
4	**To maintain and improve water quality and estuary health** *The maintenance dredging and sea disposal will not degrade the water quality and estuary health. Refer detailed impact assessment undertaken in the sea dumping permit application and summarised in **Section 5** of this LTMMP*	✓
5	**To support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons** *The maintenance dredging and sea disposal will not impact on or alter social and cultural values of the area.*	✓
6	**To maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system** *The maintenance dredging and sea disposal will maintain the presence of the shoreline in this area. In particular the beneficial reuse of sand from Area E for beach nourishment off Stockton Beach would assist with restoring the beach.*	✓
7	**To maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms** *The maintenance dredging and sea disposal will not alter public access in this area.*	✓

3.4 Protection of the Environment Operations Act

The Protection of the Environment Operations Act, 1997 (POEO Act) is the primary Act regulating pollution control and waste disposal in NSW. The Act gives the NSW Department of Planning, Industry and Environment (DPIE) the authority to issue licences and environment protection notices. Clause 19(1) of Schedule 1 of the POEO Act was amended in 2019 to clarify that an Environment Protection Licence

(EPL) under Section 43 is required for dredging when extraction of more than 30,000t of material is undertaken for sale. Schedule 1 defines extractive activities to be the extraction (by any method, including by excavation, dredging, blasting or tunnelling) or processing of extractive materials for the primary purpose of the sale of extracted material. The proposed maintenance dredging activities do not include sale of the extractive materials. Accordingly, an EPL for the maintenance dredging activities is not required.

3.5 Fisheries Management Act

Permits under Part 7 of the Fisheries Management Act 1994 (FM Act) are required for dredging and reclamation, temporarily or permanently obstructing fish passage, and harming marine vegetation. Section 199 of the Fisheries Management Act requires that a public authority must, before it carries out or authorises the carrying out of dredging work, give the relevant Minister written notice of the proposed work, and consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice. Following privatisation of the Port, PON is not considered a public authority. Section 201 of the Fisheries Management Act requires that a person (other than a public authority) must not carry out dredging except under the authority of a permit (unless the work is authorised by another relevant government authority). PON will therefore require a Section 201 permit under Part 7 of the Fisheries Management Act for the maintenance dredging activities. No temporary or permanent structures (such as a weir, causeway, dam, coffer dam etc.) or damage to marine vegetation will be undertaken as part of the maintenance dredging activities, hence negating the need for Section 219 or 205 permits.

3.6 Beach Nourishment Approvals

As noted in **Section 2.2.2**, the approvals process for the placement of maintenance dredge material from Area E off Stockton Beach for the beneficial purpose of beach nourishment is separate to the Sea Dumping Permit application. In a letter to PON dated 9 July 2009, the then Department of Environment, Heritage, Water and the Arts (DEWHA), now DAWE, confirmed that a permit under the Environment Protection (Sea Dumping) Act 1981 is not required for the placement of dredged sand off Stockton Beach for the purpose of beach nourishment as this activity is genuinely for a purpose other than the mere disposal of material. DAWE does however require notification of the activity occurring and that the material will not be disposed of at the disposal ground; and requires verification that the material from Area E is clean sand of similar nature to the material at Stockton Beach.

Dredging of uncontaminated material from Area E and its placement off Stockton Beach fall under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and requires preparation of a Review of Environmental Factors (REF).

The following is a summary of the approvals that were obtained before maintenance dredging in Area E and placement of dredged material off Stockton Beach commenced in June 2010:

- Crown Lands Act 1989 – Licenses for dredging and for placement of dredge material on Crown land (Licence Numbers RI 450958 and RI 500434 respectively). Licence RI 450958 covers dredging (that part of Area E beyond a line joining the position of mean high water mark at the outermost points of the northern and southern breakwaters) and is valid until revoked. In May 2013 PON was issued a licence (RI 500434) for the placement of dredged material off Stockton Beach and the spoil ground disposal activities. RI 500434 expires on 13 March 2022 in line with the PON sea dumping permit. PON will apply for ongoing licences from the Minister as required during the life of the new 10 year permit.

- Coastal Protection Act 1979 (now repealed) – Concurrence was most recently granted by the Minister for the Environment on 7 July 2017 for the maintenance dredging of up to 150,000 m^3 of material from Area E and the disposal of the material offshore of Stockton Beach. This concurrence is valid until 7 July 2022.
- Protection of the Environment Operations Act 1997 – Dredging and placement activities associated with the nourishment of Stockton Beach were bound by the conditions set out in EPL number 3373. However, as noted in **Section 3.4**, Clause 19(1) of Schedule 1 of POEO Act was amended in 2019 to clarify that an EPL under Section 43 is only required for dredging when extraction of more than 30,000t of material is undertaken for sale. As such EPL 3373 was surrendered on 11 August 2020.
- Fisheries Management Act 1994 – Notification to the Minister of Primary Industries was given and issues raised by the Minister were considered during formulation of the project proposal and preparation of the REF. As noted in **Section 3.5**, following privatisation of the Port, PON is not considered a public authority. Section 201 of the Fisheries Management Act requires that a person (other than a public authority) must not carry out dredging except under the authority of a permit (unless the work is authorised by another relevant government authority). PON will therefore require a Section 201 permit covering maintenance dredging activities in Area E under Part 7 of the Fisheries Management Act.

3.7 Sweeping Approvals

As noted in **Section 2.1**, PON also utilises contracted sweep vessels (SV) to level the seabed when required. Currently some areas of the channel and most berths in the harbour are swept 1-2 times per year. Sweeping is undertaken to redistribute built up sediments on the harbour floor to deeper areas or areas more accessible for removal by the David Allan. PON is proposing to procure a SV to increase the efficiency of dredging operations in the Port of Newcastle. Although sweeping would then become a PON operation, it may still require contractor engagement. A Review of Environmental Factors (REF) is being prepared for the proposed procurement of a multi-task sweep vessel (SV) to fulfil the requirements under Part 5 of the Environmental Planning & Assessment Act, 1979.

4 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Processes and Climate

4.1.1 Tidal Hydrodynamics

In general, in non-rainfall periods, astronomical tides are the major factor affecting the hydrodynamics of the Hunter River. As applies to the NSW coast in general, the tides acting at the entrance to the estuary are semidiurnal[5] (with significant diurnal inequality[6]), with a strong spring-neap[7] cycle (Patterson Britton & Partners, 2003). The tidal planes in Newcastle Harbour in the vicinity of the maintenance dredge areas are provided in **Table 7**.

Table 7 Tidal Level Variation In Newcastle Harbour from Australian National Tide Centre (2013)

Tidal Plane	Level (m NHTG)[8]
Highest Recorded Tide	2.37 m
Highest Astronomical Tide	2.10 m
Mean High Water Springs	1.62 m
Mean High Water	1.49 m
Mean High Water Neaps	1.37 m
Mean Sea Level	0.99 m
Mean Low Water Neaps	0.62 m
Mean Low Water	0.49 m
Mean Low Water Springs	0.37 m

Tides in the Hunter estuary vary from the ocean entrance to the tidal limits, generally with a gradual reduction in the mean tidal range proceeding upstream (excluding slight amplification within the Williams and Paterson Rivers). The tidal limit in the Hunter River is approximately at Oakhampton (64 kilometres upstream from the ocean). The general reduction in tidal range moving upstream can be understood in terms of tidal excursion, the distance a water particle travels over a tidal cycle. In the lower estuary, the tidal excursion is about 10 kilometres (MHL, 2002).

[5] Semi-diurnal tides have high and low water approximately equally spaced in time and occurring twice daily (that is, on average, there are two high tides and two low tides in any 24 hour period).

[6] Diurnal inequality is the difference in height of the two high waters or the two low waters of each tidal day.

[7] Spring tides occur twice per month (during new or full moons) and result in higher high tides and lower low tides (that is, a larger tidal range, compared to the average). Neap tides also occur twice per month (during quarter moons) and result in lower high tides and higher low tides (that is, a smaller tidal range, compared to the average).

[8] *The Newcastle Harbour Tide Gauge (NHTG) is operated by the Port of Newcastle. Zero on the Tide Gauge is approximately the level of Lowest Astronomical Tide (LAT) and is 1.01 m below Australian Height Datum (AHD).*

Based on the tidal gauging carried out in October 1995 (MHL, 1995), tidal velocities, discharges and tidal prisms[9] were recorded in the maintenance dredge area at Walsh Point for both the north and south arms of the Hunter River, as shown in **Table 8**. It can be seen that the North Arm of the Hunter River is characterised by higher velocities and discharges compared to the South Arm, and dominates the tidal prism carrying about 80% of the tidal flow at Walsh Point.

Table 8 Tidal Velocities, Discharges and Prisms In Maintenance Dredge Area

Location	Maximum Velocity (m/s)	Maximum Discharge (m^3/s)	Tidal Prism ($m^3 \times 10^6$)
Walsh Point (North Arm)	0.94 (flood)	1680 (flood)	23.7 (flood)
Walsh Point (North Arm)	0.99 (ebb)	1550 (ebb)	25.8 (ebb)
Walsh Point (South Arm)	0.43 (flood)	360 (flood)	5.4 (flood)
Walsh Point (South Arm)	0.26 (ebb)	490 (ebb)	7.9 (ebb)

4.1.2 Wind

Predominant winds in the Port area are from the north, with north-east winds prevailing in the warmer months of the year, while north-west winds prevail in the cooler months (Bluecoast 2020). Overall and seasonal wind roses for Nobbys BoM station are shown in **Figure 8**.

4.1.3 Flooding

Flooding behaviour in the Hunter estuary has been modified substantially since European settlement, due to construction of levees, spillways, canals, floodgates, and diversion banks. Much of these works were undertaken as part of the Lower Hunter Valley Flood Mitigation Scheme, in almost immediate response to the largest flood that has occurred since European settlement, which occurred in 1955. In total, 160 km of levees and spillways, 111 km of flood canals, 175 floodgates, 14 km of bank protection works and 40 km of control and diversion banks were built as part of this scheme (MHL, 2002).

As described by MHL (2002) and Patterson Britton & Partners (1996), floodwaters tend to spill over Kooragang Island during moderate to major floods (exceeding the 10% Annual Exceedence Probability (AEP) event). The southern part of Kooragang Island is protected from floodwaters by a large railway embankment, forcing far more floodwaters into the North Arm compared to the South Arm. At Walsh Point, about 75-80% of the flood flow is carried in the North Arm, with 20-25% conveyed by the South Arm.

Design peak flood levels at Newcastle Port determined for various AEP events are provided in **Table 9**. Note that the highest astronomical tide at Newcastle Port is around 1.0 m AHD, which would occur once every 18.6 years if there were no non-astronomical water level influences. Storm surge (barometric and wind setup), wave setup, coastal trapped waves and freshwater flow may all increase water levels above the predicted astronomical tide levels, with the maximum combination of these factors expected to be less than 0.4m[10].

[9] The tidal prism is the total volume of water exchanged at a particular cross section during a complete tidal cycle.

[10] This figure is dominated by storm surge. At the downstream end of the estuary, freshwater flow is considered to have little influence. The highest recorded water level at Newcastle Port was 1.37 m AHD, measured in May 1974, during a non-flood period. The peak water level at Newcastle Port in the highest recorded flood of February 1955 was 1.34 m AHD.

The flood levels within Newcastle Harbour range between 2.22m Newcastle Harbour Tide Gauge (NHTG) (1.21m AHD) and 2.35m NHTG (1.34m AHD) for the range of design events detailed in **Table 9**.

Table 9 Design Peak Flood Levels at Newcastle Port from PWD (1994) Flood Study

5 year ARI	2.22
10 year ARI	2.25
20 year ARI	2.28
50 year ARI	2.32
100 year ARI	2.35

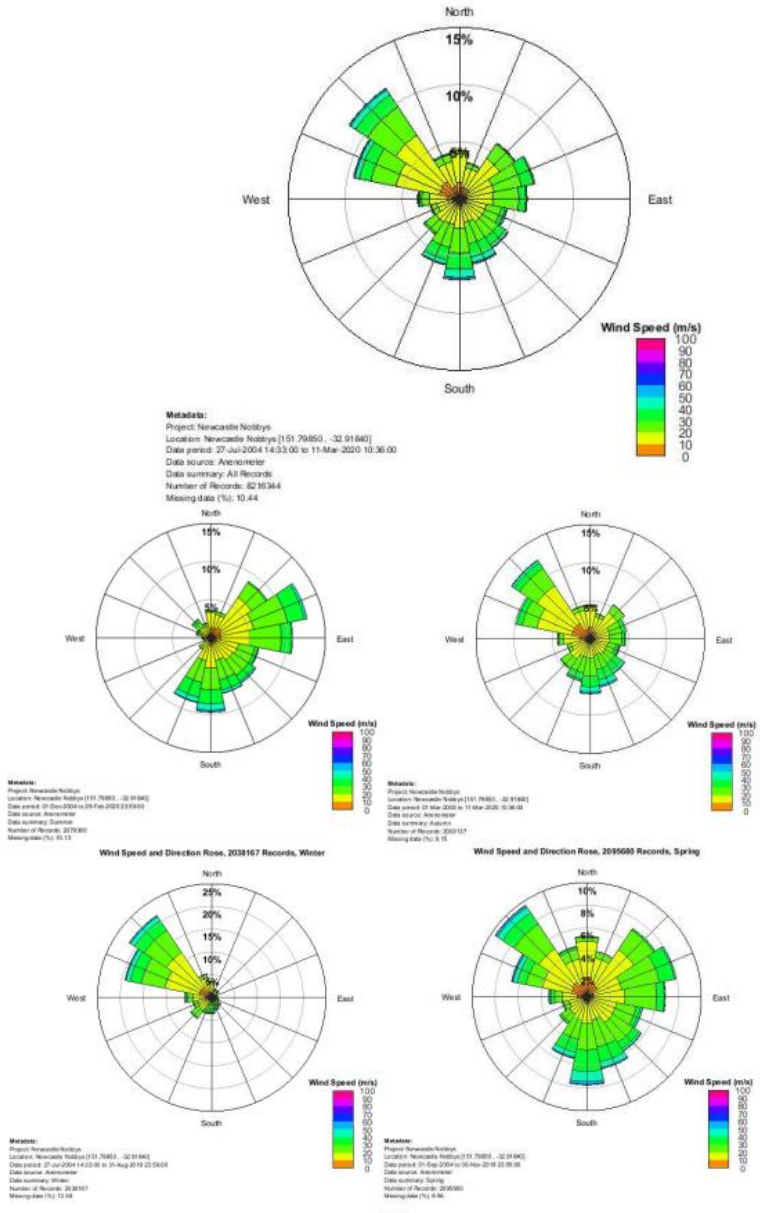

Figure 8 Windrose for Newcastle 2004-2020 (Source Bluecoast 2020)

4.1.4 Turbidity

Sanderson and Redden (2001) compiled and analysed 28 years of water quality measurements taken throughout the Hunter River estuary, including turbidity. Observations from this work included:
high turbidity values were common, with turbidity values highest during large freshwater flows; and,
the mean turbidity value was 15 NTU, with increasing values moving upstream.

Patterson Britton & Partners then undertook a substantial real-time water quality monitoring program at five background and nearfield station within the South Arm of the Hunter River as a component of the environmental obligations for the capital dredging works undertaken by Newcastle Coal Infrastructure Group (NCIG) (PBP, 2008). This program reported background turbidity levels in the Hunter River vary widely from close to 0 NTU to over 100 NTU, with a long term average of 14 NTU at Ironbark Creek. Episodes of elevated turbidity >100 NTU can last for hours or days.

Major factors affecting turbidity are tidal currents, river flow, local rainfall and vessel movements in the port (refer **Figure 9**).

The results of the baseline monitoring study indicated that the Hunter estuary is a highly dynamic and naturally turbid environment (refer **Figure 10**). Therefore, it is generally expected that any turbidity impacts related to maintenance dredging activities would be minimal.

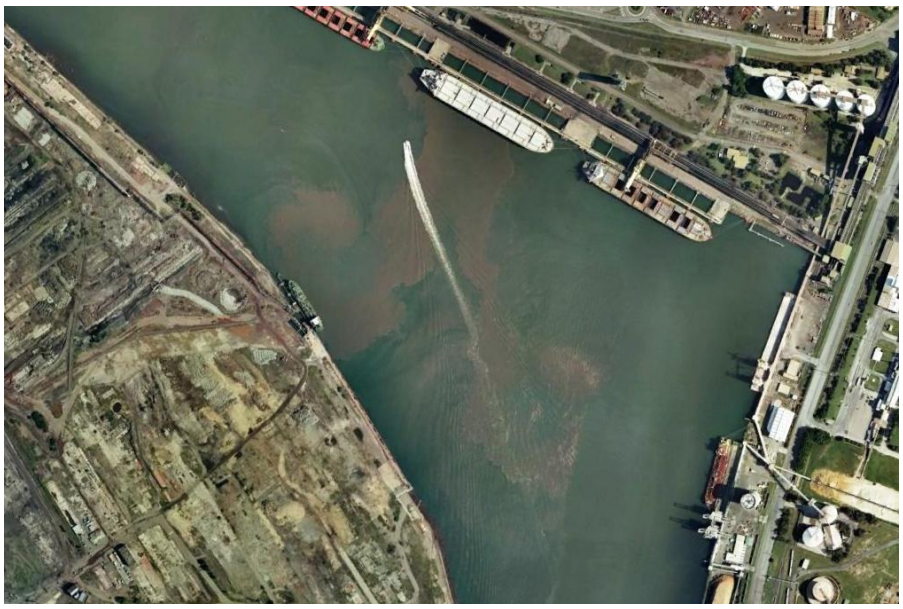

Figure 9 Turbidity Generated by Shipping Movements in the Swing Basin

Figure 10 Turbid flood waters from the Hunter River

4.1.5 Offshore Wave Climate and Currents

The spoil ground is located at around 33°S and receives waves generated in the southern Coral and Tasman Seas and the Southern Ocean. The annual wave climate is both energetic and highly variable with a distinct seasonality present. Based on an analysis of long- term records the months of March and June-July experience the largest average monthly wave heights (Harley et al, 2009). Although moderate waves dominate the climate, large waves (Hs11>4 m) and/or low swell may occur in any month (Short and Trenaman, 1992). Extreme events (Hs>6m) occur predominately in autumn and winter. Waves in the region are generated by five typical meteorological systems: east-coast lows, tropical cyclones, mid-latitude cyclones, zonal anticyclonic highs and local summer sea breezes (Short and Trenaman, 1992).

Newcastle Waverider buoy is located at the entrance to the Hunter River in approximately 22m water depth and is considered to be generally representative of the offshore conditions at the spoil ground. The Newcastle Waverider buoy has data from November 2009 to March 2020 (11 years) and is operated by Port Authority of NSW (Bluecoast 2020).

Wave roses for swell (swell waves, Tp>8s) and sea (local sea, Tp <8s) are provided in **Figure 11**. Wave roses show that the majority (approximately 65%) of offshore wave energy propagates from the S-SE sector (i.e. S, SSE and SE cardinal directions). S-SE waves originate from storms and swells in the Tasman Sea and Southern Ocean and can occur during any season. Easterly waves (i.e. ESE, E and ENE cardinal directions) make up approximately 35% of the total offshore wave energy.

Currents at the spoil ground are dominated by the East Australian Current. The southerly ocean current is located along the eastern seaboard of NSW offshore of Newcastle (Bluecoast 2020). The spoil ground experiences south-westerly currents over 60% of the time (predominantly in summer) with a current reversal in winter.

[11] H_s is the significant wave height, which is the average height of the highest one third of waves recorded in a given monitoring period.

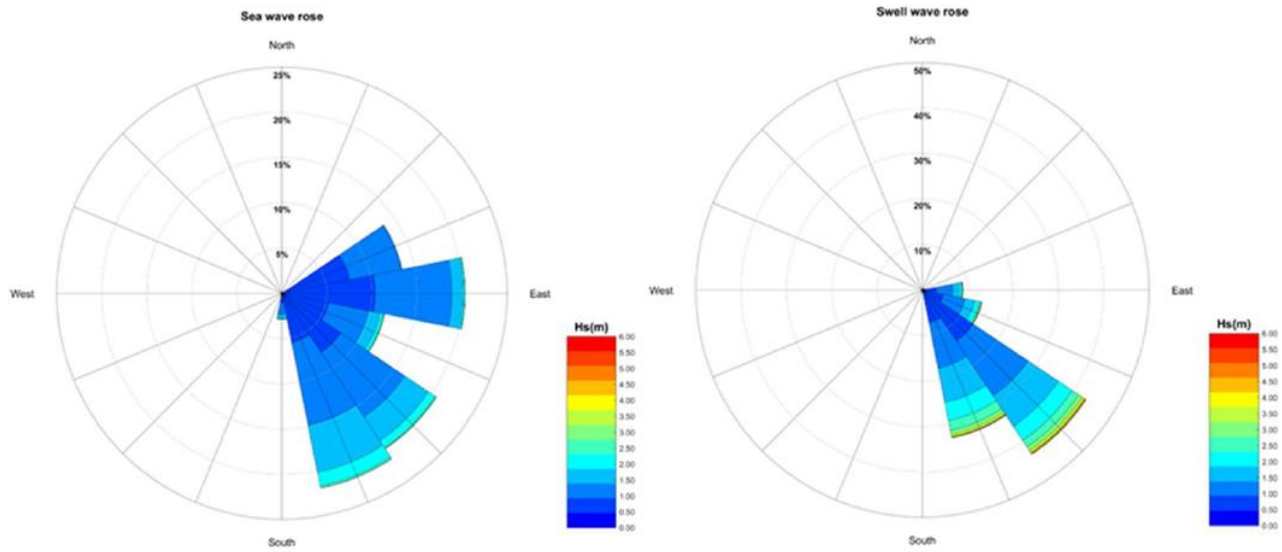

Figure 11 Long-term wave roses at Newcastle Waverider buoy November 2009 to March 2020 (Bluecoast 2020)

4.2 Maintenance Dredge Areas

4.2.1 Physical and Chemical Description of Material

A sediment sampling and testing program was undertaken in June 2017 to provide current sediment quality data for the maintenance dredge material in Areas A, B, C, D, E and F. The findings of the 2017 sediment quality investigations are documented in the Sampling and Analysis Plan (SAP) Implementation Report (RHDHV 2017a).

Sediment from within each dredge area was observed to be generally uniform. The results of five representative samples taken from each of the dredge areas indicate that:

- samples from Areas B, C and F consisted predominantly of dark grey mud (<63µm) with mud content ranging from 68% to 97%;
- muddy sands and sandy muds were observed in Areas A and D;
- sand content in samples increased closer to the port entrance with sediment in Area E comprising fine to medium grained yellow brown sand. Samples near the entrance comprised more than 85% sand; and
- gravel (>2 mm) was reported in samples from Areas A and E only.

The results of the chemical analysis of the sediments were compared to the guideline values provided in the NAGD. Results were also compared to the previous results from testing of the maintenance dredge areas in 2012. The results from 2017 showed that the 95% upper confidence limit (UCL) of the mean concentration of all the contaminants were below NAGD screening levels (SL) with the exception of nickel. In addition, the 95% UCL of the mean concentration of the majority of contaminants were lower than those reported in the 2012 investigation.

Nickel typically occurs in naturally high concentrations in Australian sediments. Nickel concentrations have historically been elevated within the maintenance dredge material although the concentrations have reduced since 2012.

In 2014, NPC (now PON) implemented a Port Wide Strategy (CSIRO, 2014) that sought to inform existing and future dredging programs of the risks posed by the sediments to marine ecology. Specific comments and conclusions regarding nickel concentrations from within the port comprised:

- Background concentrations of nickel frequently exceed the SL in many Australian estuaries.
- The SL for nickel is generally considered to be very conservative, potentially over protective, when the value is compared to that of other metals and considering the sensitivity of benthic marine organisms to nickel.
- The mean concentration of nickel has been reasonably constant for the past 10 years (30-40 mg/kg range), and while this exceeds the SL, CSIRO considered nickel at these concentrations to represent a low risk of adverse biological effects to organisms.
- In the case of nickel, although the exceedance of the SL may indicate it should be classed as a contaminant of potential concern (COPC), a series of correlations between concentration of aluminium and the metal contaminants, total PAHs and TOC was made which indicated the concentrations of nickel are largely naturally occurring. Higher concentrations of nickel, as with many metals and metalloids, occur naturally for sediments with higher portions of clays and silts. It was concluded that nickel should not be classified as a COPC (concentrations not deviating from background).

Overall, CSIRO concluded that assuming concentrations of contaminants observed in the Port's 5 yearly sampling program remain comparable to, or lower than, historical results, the maintenance dredge material is suitable for unconfined sea disposal.

The 2017 sediment quality investigations showed comparable or lower concentrations of all contaminants and the maintenance dredge material was considered suitable for unconfined sea disposal.

It is expected that the maintenance dredge material for Area G and the other areas that may come under the responsibility of PON for maintenance dredging will largely comprise sediments deposited by fluvial processes and should therefore be relatively similar to maintenance dredge material derived from the current maintenance dredge areas, i.e. suitable for unconfined sea disposal. This will be verified by sediment sampling and testing programs that will provide current sediment quality data for the maintenance dredge material. These programs will be implemented prior to the commencement of maintenance dredging operations in these areas.

4.2.2 Introduced Marine Organisms

A survey of introduced marine organisms was undertaken by the Centre for Research on Introduced Marine Pests (CRIMP) for the Newcastle Port Corporation between 23 August and 3 September, 1997, with results documented in CRIMP (1999). The survey was undertaken as part of the Australian Association of Port and Marine Authorities (AAPMA)/CRIMP national port survey initiative.

The national survey is designed to determine the distribution and abundance of a targeted group of introduced species in each port. These targeted species are made up of:

- those species listed on the Australian Ballast Water Management Advisory Council (ABWMAC) schedule of introduced pest species;
- a group of species which are major pests in overseas ports and which, on the basis of their invasive history and projected shipping movements, might be expected to colonise Australian ports; and
- those known exotic species in Australian waters that currently are not assigned pest status.

Two ABWMAC targeted pest species were recorded in the Port during the survey. The pest species included the toxic dinoflagellates Alexandrium catenella and A. minutum. These two species were distributed throughout the commercial areas of the Port. No other ABWMAC targeted pest species were recorded from the Port or adjacent areas.

Several other introduced and cryptogenic (i.e., of unknown origin) species were recorded in the region. These species are recognised as having been transferred to Australia in both historic and modern times, but do not pose significant economic or environmental threat (CRIMP, 1999).

The Newcastle Introduced Species Survey report (CRIMP, 1999) includes an assessment of the risk of translocation of introduced species found in the Port. The report notes that of the introduced species detected in the port, the majority of species are not restricted to estuarine environments and may be capable of extending their range beyond the Newcastle locale.

However, dredging practices are considered unlikely to influence the distribution of species in the Port with the exception of toxic dinoflagellate species. The potential for these organisms to be transported in the dredged material is evident as cysts of both species have been identified at the spoil grounds.

National Introduced Marine Pest Information System

The National Introduced Marine Pest Information System (NIMPIS) is a central repository of information on the biology, ecology and the Australian distribution of over 100 marine pest species. It includes known marine pests that have been introduced to Australian waters and exotic marine pests that could be introduced in the future.

A search of the DAWE interactive map facility provided at the National System's web page (http://www.marinepests.gov.au/pests/map) was accessed on 11/08/21 to provide recent information on marine pests recorded in Newcastle. No known pests were recorded for Newcastle. However, Newcastle is within the potential range of a number of pest species.

The NIMPIS aims to prevent new marine pests entering Australian waters, respond when a new pest does arrive and minimise the spread and impact of pests already established in Australia.

4.3 Offshore Spoil Ground

4.3.1 Previous Spoil Ground Use

Dredging commenced in the Port in 1859 and has been virtually continuous since that time. Total dredging quantities up to 2020 are estimated to exceed 145 million m3, almost all of which been deposited in the current spoil ground. Four different spoil grounds have been used at various times over the years (refer **Figure 12**).

The current spoil ground corresponds to the approximate position of the original spoil ground. It was used for more than a century prior to establishment of the spoil ground for major port deepening in 1978. The current spoil ground was re-introduced in February 1997. It is now well established and is the disposal area currently approved by DAWE. There is no evidence in the available data to indicate any significant adverse environmental impacts from use of this area for disposal of maintenance dredged material.

4.3.2 Disposal Route

The spoil ground is located within NSW Coastal Waters. Water depth at the spoil ground ranges from 25 to 30 m below Chart Datum. The route taken by the vessel transporting dredged material from the dredge area to the spoil ground is shown on **Figure 12**. The vessel takes the most direct route from the dredge area to the port entrance. Once out of the port entrance, the vessel turns southeast, travels to the spoil ground, swings around and when heading back to the entrance places material over the spoil ground.

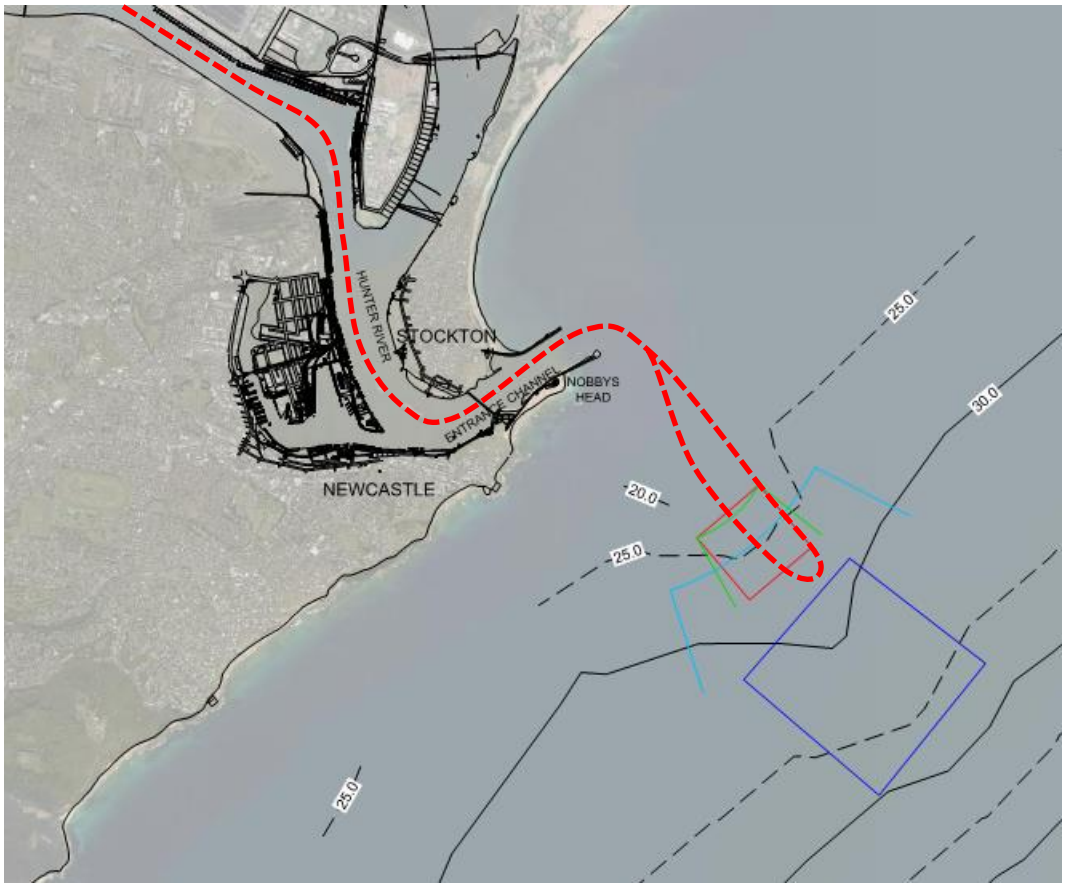

Figure 12 Indicative Route from Dredging Area to Spoil Ground

4.3.3 Description of Spoil Ground

A number of studies have been undertaken to characterise the offshore area and to ascertain the fate of material placed in the various spoil grounds over time. Studies have included chemical and physical sediment analyses, sidescan sonar, biological sampling and Remotely Operated Vehicle (ROV) video surveys. A more detailed description of the findings of the studies is presented in the maintenance dredging permit application. An overview of the key characteristics of the maintenance dredging spoil ground is provided below.

The most recent sediment sampling and testing program was undertaken in June 2017 to provide current sediment quality data for the spoil ground, in addition to broader sampling required to confirm the dispersion pathway of the sediment using the chemical and physical properties of the sediment as tracers. Details of the program are provided in RHDHV (2017b) which included the following findings:

- chemical testing of the sediments showed that the mean concentration and the 95% upper confidence limit of the mean concentration for all areas investigated were below the NAGD screening level (SL);
- beyond typically the 60m contour, elevated concentrations of contaminants (compared to the clean sands of the inner shelf) were found in the muddy sediment. These concentrations were compared to other sediment quality data for the NSW coast and overseas and were found to be in the typical range of background levels;
- the results of the chemical testing were compared to the results from the 2009 investigation and indicated no significant changes in contaminant concentrations within in each zone;
- the benthic invertebrate assemblages at the spoil ground were found to be different to the assemblages at the control locations. Differences detected to be significant were a decrease in both number of taxa and the total abundance of invertebrates within sediments collected from the spoil ground. This agrees with previous findings in 2001 (TEL 2001). The observed decreases in diversity are potentially due to loss of the more sensitive taxa, while the decrease in abundance is likely a direct impact of smothering by dredged material. Given sufficient time, benthic invertebrates will potentially migrate vertically through the overlying dredged material;
- sediments within the spoil ground contained low levels of heavy metals and PAHs, which were found to correlate weakly with some of the differences in the assemblage of benthic invertebrates. Hence some of these contaminants may be responsible for differences in the assemblage of benthic invertebrates in the spoil ground. However, the magnitude and duration of any impacts will be species specific, and dependent on the frequency and amount of dredged material dumped at any one point within the spoil ground;
- given the ongoing disposal of dredged material to meet maintenance dredging requirements, gradual long-term change in assemblages are expected to continue. This is consistent with previous findings in 2001 (TEL 2001);
- sampling at the four inshore locations confirmed the offshore movement of the dredged material from the spoil ground, i.e. the inshore samples had a very low mud content, contamination concentrations below SL and no “exotic” rock fragments typical of dumped material. However, in any future sampling, a greater sampling density could be adopted to provide more information on the mud content and contamination concentrations inshore of the current spoil ground;
- analysis of the chemical and physical properties of the sediment at the spoil ground and surrounding area provided a consistent picture for the dispersion pathway of the sediment identified in the 2002 and 2009 investigations.

A conceptual model of the far field dispersion of dumped dredge material is provided in **Figure 13.**

The Interactive Map Search facility on DAWE’s Environment Protection and Biodiversity Conservation Act (EPBC) web page was accessed 18/08/21 to provide an indication of flora and fauna potentially present within the spoil ground. The results of this search are provided in **Appendix B**. The search identified 75 Threatened species, 75 Migratory species and 97 Listed Marine species that are likely to exist (or their habitat may exist) within the defined search area. Of the threatened species identified, 24 are marine birds, three are whales (Blue, Southern Right and Humpback), four are sharks (Grey Nurse, Great White and Whale Shark, and Sawfish), and five are marine reptiles (various turtle species). These species are all reported as being covered by migratory provisions of the EPBC Act, 1999.

Of the 97 Listed Marine species, 21 comprise seahorses and pipefish, and the balance is made up of marine birds, mammals and reptiles, the majority of which are included above. The exceptions are the Yellow-bellied Seasnake and a number of bird species that are not classified as marine species, but that ‘overfly’ the marine area.

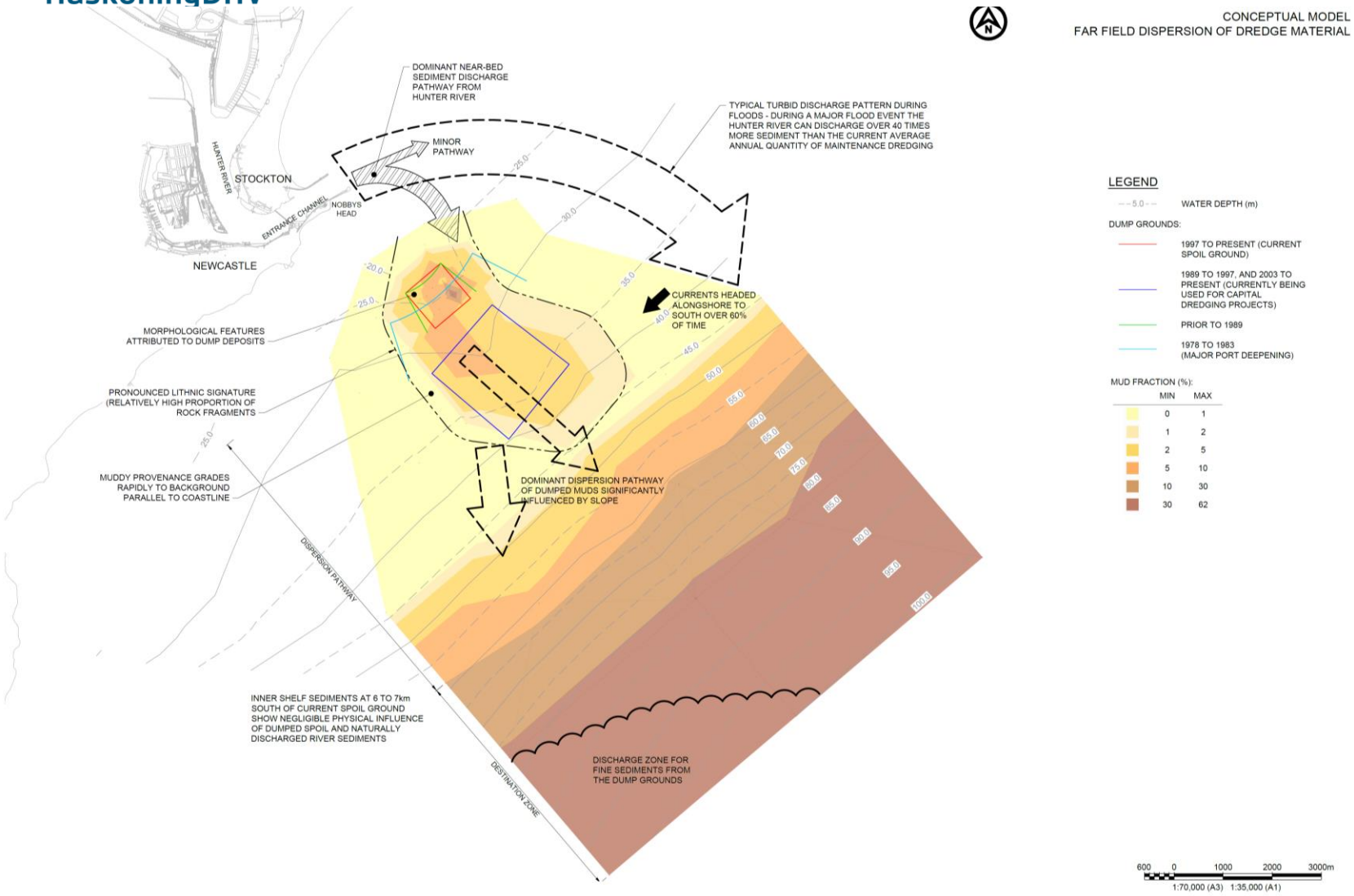

Figure 13 Conceptual Model Far Field Dispersion of Dredge Material

4.4 Fisheries

The proposed spoil ground is not subject to 'Marine Park' or other zoning having bearing on its intended use.

Sampling of the existing benthic communities within offshore disposal areas and two nearby control areas was undertaken by RHDHV (2017a) and by The Ecology Lab (2003). The investigations showed that there are no sensitive areas, such as seagrass meadows, coral communities or algae beds, present within the spoil ground.

Shallow, nearshore rocky reef habitat occurs along the coast of Newcastle. From the southern tip of the Hunter River mouth and further south small rocky reef habitats have been recorded (DPI 2010). The reefs in this area are shallow and continuous from the shore out to between 200 m and 1.8 km offshore (DPI 2010). These rocky reefs may support a variety of sponges, algae, sea urchins, ascidians and bryozoans. Rocky reefs are also often complex habitat with caves, rocky pinnacles and bommies or large boulders (DPI 2010). The spoil ground is located approximately 3.5 km to the east of the nearshore rocky reefs (refer **Figure 14**).

Along the Newcastle coastline there are several areas identified as fish breeding reefs and others regarded as angling reefs. These areas, such as Mudhole Reef and The Pinnacles, are several kilometres inshore from the proposed disposal area. North Reef (McEnally and McEnally 2008) is located approximately 3 km off the coastline and over 4.5 km to the north of the proposed offshore disposal area (see **Figure 14**).

No important fish, turtle, dolphin or whale habitat or breeding/calving areas have been identified within or near the spoil ground. Humpback whale migration pathways occur in this area between the months of June and September, however, humpbacks prefer the warmer waters of northern Queensland to calve and rest (DAWEa 2021). Southern right whales migrate to southern Australia in winter to give birth. While rare, they have been known to migrate as far as the north coast of NSW and have been observed to remain within several hundred metres of beaches up to several weeks (DAWEb 2021).

The Hunter River and coastal regions off Newcastle Port are utilised by recreational and commercial fishers. The commercial fisheries that operate within the area mainly use nets and include:

- Fisheries for ocean hauling;
- Ocean prawn trawling;
- Ocean Fish Trawling; and
- Ocean trap and line (Worley Parsons 2009b).

The spoil ground, nearby spoil grounds and adjacent Commonwealth waters are utilised by recreational and commercial fishers, and it has been noted that these fishing areas are productive and popular, particularly for recreational use (GHD. 2013). Commercial fishers are known to avoid the spoil ground, but operate directly offshore in Commonwealth waters.

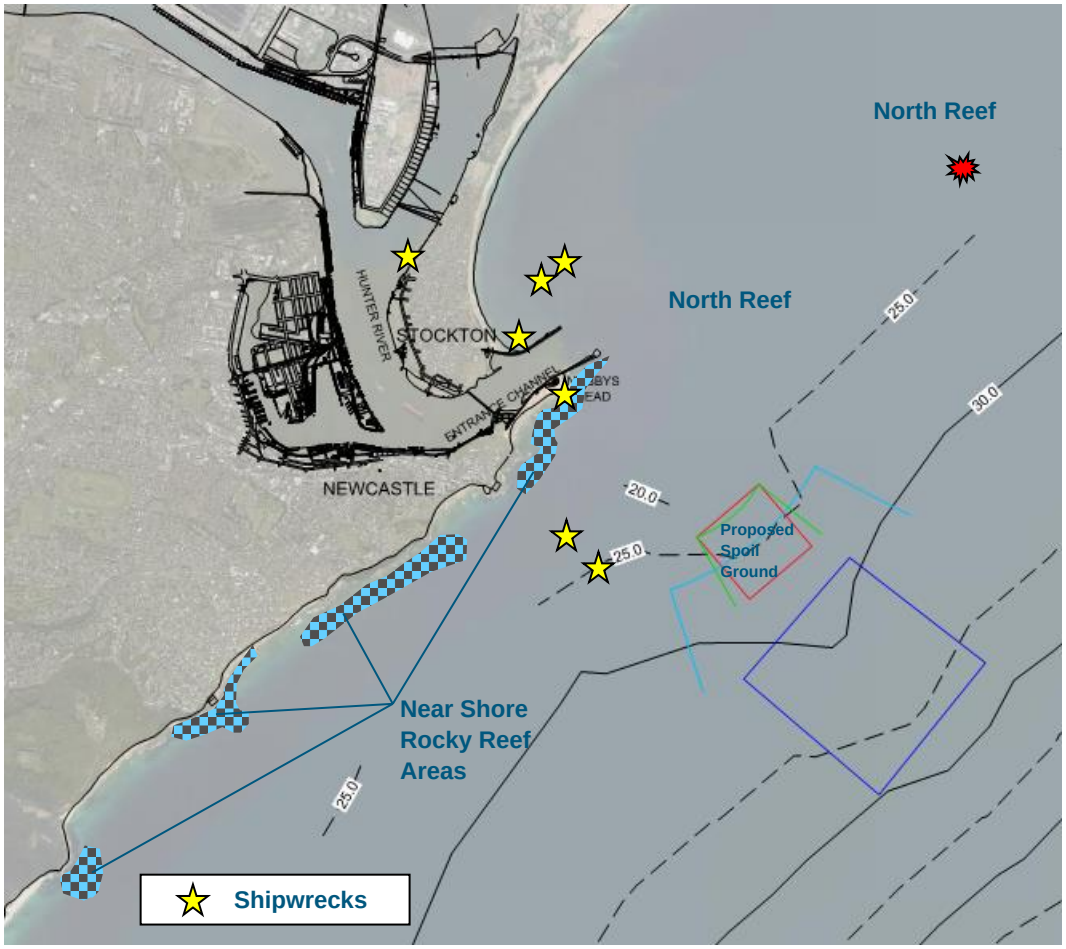

Figure 14 Location of Environmentally Sensitive Areas

An Environmental Assessment was completed on behalf of Industry & Investment NSW for deploying three Offshore Artificial Reefs (OARs) in the vicinity of Newcastle, Sydney and Wollongong to improve recreational fishing opportunities in NSW (Cardno Ecology Lab, 2010). The Newcastle OAR was deployed in 2019 approximately 3.6 km offshore from Blacksmiths Beach and the entrance to Swansea Channel at a depth of around 28 m, which allows for a depth of water over the OAR of around 16 m (refer **Figure 15**). Given that the proposed OAR site is approximately 30 km from the spoil ground, and with reference to the dispersion pathway shown in **Figure 13**, it is not expected that disposal activities will impact on ecological conditions at the OAR.

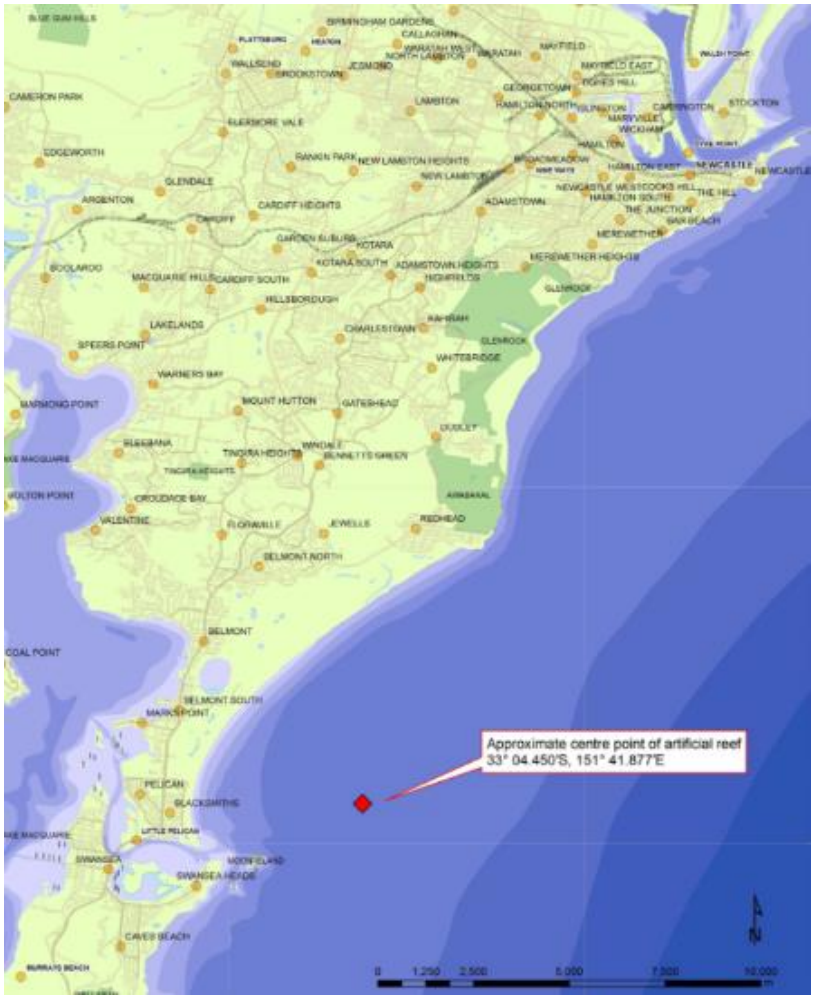

Figure 15 Newcastle Offshore Artificial reef approximately 30 km from the spoil ground (source: https://www.dpi.nsw.gov.au/fishing/recreational/resources/artificial-reef/newcastle-offshore-artificial-reef)

4.5 Indigenous Cultural Resources

The Newcastle Harbour area was the traditional country of the Awabakal and Worimi peoples. The area would have had abundant food resources in the sea, wetlands, forests and woodlands surrounding Newcastle and supported a large Aboriginal population.

Newcastle Harbour is now a highly disturbed and modified environment. A desktop assessment of potential cultural and heritage locations was undertaken. A search of the Aboriginal Heritage Information Management System (AHIMS) has shown there to be no known sites or places of Aboriginal significance within the Port declared under Section 84 of the NP&W Act.

4.6 Non-Indigenous Cultural Resources

The Interactive Map Search facility on DAWE's EPBC web page (refer **Appendix B** for search results) listed no world Heritage Properties, no National Heritage Places and one Commonwealth Heritage Place within 5 km of the spoil ground. This was Nobbys Lighthouse which is located on land and will be unaffected by the maintenance dredging and disposal activities.

Several shipwrecks exist just offshore of Newcastle several kilometres either north or inshore of the proposed spoil ground (refer **Figure 14**). One unnamed wreck, lying approximately 2 km south of the spoil ground, has been reported by *Kapola*. However, it is understood that this wreck and other areas offshore of the Newcastle Harbour entrance are not utilised frequently for diving. Discussions with local dive operators have indicated these wrecks and other areas offshore of the Newcastle Harbour entrance are not utilised frequently for diving, due to the consistently poor visibility encountered.

5 POTENTIAL IMPACTS AND MANAGEMENT STRATEGIES

5.1 General

A detailed assessment of the projected physical, chemical and biological impacts on the spoil ground and surrounding areas has been undertaken in support of PON's 10 year Sea Dumping Permit application. This information has not been repeated in full in this LTMMP. However, an overview of the potential impacts that may result as a consequence of the dredging and disposal activities is provided below. Relevant management strategies for the project are also described and will be adhered to at all times.

5.2 Potential Impacts and Management Strategies

5.2.1 Turbidity Levels and Dispersal of Sediment

Turbidity is considered to be visually unappealing, symptomatic of land degradation and probably impacting many benthic processes (Patterson Britton & Partners, 2003). However, high turbidity also limits light penetration into the water and therefore limits phytoplankton blooms and growth of undesirable plants and algae. Given the high nutrient loads into the Hunter estuary, high turbidity levels are therefore considered to have some desirable side effects as far as phytoplankton control is concerned.

Negative impacts of high turbidity can occur. One ecosystem that can be affected is seagrasses. In the case of Newcastle Port, there are no seagrasses present in the port area or the offshore spoil ground. However, it has been suggested that high turbidity is the reason for the small numbers of oysters present in the Hunter estuary. Increases in turbidity may also affect the foraging behaviour of fish, and suspended sediments may abrade the protective mucus coats on fish, thereby increasing their susceptibility to disease, clogging gill filaments, or suffocating the fish (MHL, 2002).

An environmental advantage of using a trailing suction hopper dredger such as the David Allan is that the suction-head draws most of the fine materials (silts and clays) into the suction pipe, with consequently a low percentage of fines escaping during dredging. Further, as the hopper fills, water is collected from the surface of the hopper and is discharged well below the water line below the keel of the vessel ('overflow dredging'). By ensuring that all discharges will occur well below the water line, the dispersal of material within the upper portion of the water column will be reduced.

Assessment of the spoil ground has indicated that for the 25 to 30 m water depths at the spoil ground, the dumped material would be largely intact as it plummets and impacts with the seabed with only 1% to 5% by weight of the material remaining in the water column. This process is referred to as 'convective descent'. As only a small amount of the dumped material is available in the water column to create turbidity, and this material disperses on the current and settles in deeper water (much like the suspended sediments at times of natural flood events), no specific management strategy is considered necessary for the mitigation of turbidity at the spoil ground.

5.2.2 Physical Impacts at the Spoil Ground

Due to the current use of the spoil ground for disposal of maintenance dredge material, it being established for that purpose, as well as the regular impacts of significant natural sediment output from the Hunter River, it is not expected that continued placement of maintenance dredged material would further significantly affect the environment at the spoil ground. As such, no management strategy is considered

necessary for the physical impacts (e.g. smothering of biota and change in substrate) associated with the disposal of the dredged material.

Nevertheless, PON will ensure that each load of dredged material is dumped at a different location within the spoil ground so that the dumped material is distributed evenly.

5.2.3 Sediment Quality

As discussed in **Section 4.2.1**, recent sediment quality investigations have shown that the maintenance dredge material from Areas A, B, C, D, E and F is suitable for unconfined sea disposal. Furthermore, chemical testing of sediment within the spoil ground showed that levels of contamination were below NAGD screening levels.

Sediment sampling of the maintenance dredge material within the Port and at the spoil ground is therefore only proposed to confirm contamination levels and support the next maintenance dredging permit application. Details of the proposed sampling are discussed in **Sections 6.9.1** and **6.9.2** for the dredge areas and the disposal areas respectively.

5.2.4 Effects on Marine Life

Large marine fauna, such as cetaceans and turtles, can be impacted by dredging activities. However, these mammals are mobile and can generally avoid dredging activities. The management strategy that will be implemented for the protection of cetaceans includes the following:

- during June to October inclusive, PON will check, using binoculars from a suitable high observation platform on the dredge vessel, for cetaceans within the monitoring zone, i.e. within 300m of an intended dumping run;
- dumping activities will only commence if no cetaceans have been observed in the monitoring zone for 10 minutes immediately preceding commencement; and
- if any cetaceans are sighted in the monitoring zone, dumping activities must not commence until 20 minutes after the last cetacean is observed to leave the monitoring zone.

The strategy is discussed in further detail in **Section 6.7**.

As discussed in **Section 4.3.3**, the benthic invertebrate assemblages at the spoil ground were found to be different to the assemblages at the control locations (RHDHV, 2017). Differences detected to be significant were a decrease in both number of taxa and the total abundance of invertebrates within sediments collected from the spoil ground. The observed decreases in diversity are potentially due to loss of the more sensitive taxa, while the decrease in abundance is likely a direct impact of smothering dredged material. Given sufficient time, benthic invertebrates will potentially migrate vertically through the overlying dredged material.

Details of the proposed biological monitoring as part of this LTMMP are discussed in **Section 6.9.2**.

5.2.5 Impacts on the Water Column

The potential for environmental impacts to occur within the water column due to dumping has been examined in several CSIRO studies involving dredge plume monitoring, elutriate testing, acid soluble metal analyses, acid volatile sulfide (AVS) and simultaneously extractable metals (SEM) analyses, and bioaccumulation monitoring of oysters deployed in the spoil ground above the seabed (Hunter Environmental Monitoring Program). The results from these studies are noted in three long-term sea

dumping strategy documents prepared on behalf of PON by Patterson Britton & Partners (1996, 2000) and WorleyParsons (2009b). These studies have concluded that there are unlikely to be significant environmental impacts within the water column during the sea disposal of maintenance dredging material from the Port.

5.2.6 Air Quality

Impact on the air quality is expected to be negligible, being sourced only from the vessel's exhaust.

5.2.7 Noise

Due to the location of the dredging works, noise impact on the local community is not expected to be an issue of concern. Noise generated from the dredging activities will be no greater than noise generated from the numerous commercial and recreational vessels using the Port.

There is no record of noise complaints from the operations of the David Allan, which have taken place over many years.

5.2.8 Threatened Species and Communities

As noted in Section 4.3.3, an EPBC Act Interactive Map Search has identified Threatened, Migratory and Marine protected species that may occur (or their habitat occurs) in the vicinity of the spoil ground.

The listed threatened species and marine protected species (seabirds, sharks, whales, sea snakes, seahorses/pipefish and sea turtles) should not be adversely affected by the disposal activities. A primary area of concern would be any nearshore reef / seagrass / marine algae beds on which the protected seahorses and pipefish would depend. However, these areas occur along the shoreline, well inshore from disposal activities and it is well established that the sediment deposited at the spoil ground disperses in the offshore direction into deeper water.

Other species, such as protected seabirds, marine reptiles and most marine mammals, range over a much larger area than the scale of the disposal operations and are therefore not expected to be significantly impacted by the process.

Some species do, however, need to be considered more carefully. For instance, Humpback Whales migrate annually past Newcastle during the winter (travelling north) and spring / early summer (returning south), while Southern Right Whales migrate to southern Australia in winter to give birth. A management strategy for the protection of cetaceans is outlined in **Section 5.2.4**, and is discussed in further detail in **Section 6.7**.

5.2.9 Changes in Bathymetry

Significant changes in bathymetry may result in navigation hazards, including grounding or damage to vessels, and altered wave conditions and currents.

However, as outlined in **Section 4.3.3**, the results of several rounds of sediment sampling and testing have confirmed the dispersive nature of the spoil ground, with offshore movement of the dredged material from the spoil ground in a south easterly direction before settling beyond the 60 m depth contour. As such, it is not expected that significant changes in bathymetry will be experienced at the spoil ground and the spoil ground is therefore expected to have capacity for the maintenance dredge material over the life of

the ten year permit. The management strategy that will be adopted to confirm this involves annual bathymetric surveys of the spoil ground, as described in **Section 6.10**.

Post-dredging surveys of the port area are also undertaken on a regular basis to ensure that declared depths are maintained.

6 IMPLEMENTATION OF THE LTMMP

6.1 Introduction

Environmental management of the maintenance dredging at the Port and sea disposal of the dredged material will ensure that PON achieves its commitment of undertaking the maintenance dredging in an environmentally responsible and safe manner in accordance with the requirements established during the permit application process. This includes the objective of continuous improvement in environmental management practices.

This section of the document outlines the requirements for the environmental management of the maintenance dredging in terms of the following:

- responsibilities;
- training;
- monitoring;
- reporting;
- contingency plans;
- auditing and monitoring of compliance with approval conditions;
- complaints management;
- review and revision of the LTMMP; and
- publication of the LTMMP.

6.2 Responsibilities for Environmental Management

Responsibility for environmental management of this project rest ultimately with PON. PON will have suitably experienced and qualified people engaged for the dredging and dumping activities.

PON will ensure that all persons engaged in the dumping activities authorised under the permit, including owners and persons in charge of the vessel/s are made aware of and comply with the LTMMP, the permit, and the requirements of the Environmental Protection (Sea Dumping) Act 1981.

6.3 Training

It is the responsibility of the Executive Manager Marine and Operations that any new personnel associated with the permit have an induction module specific to the operation of the permit. Ongoing staff will have periodic refresher courses on the permit requirements.

PON will ensure that all PON staff on board the dredger the David Allan and any other dredger that may be used in the project, are suitably trained for dredging and disposal activities. This includes record keeping and cetacean monitoring (refer **Sections 6.6** and **6.7**).

6.4 Materials to be Disposed of at Sea

Dredged material is to be derived only from the maintenance dredging of the:

- berths, navigation channels and associated batters specified as areas A, B, C, D, E, and F throughout the life of the new sea dumping permit; and
- additional berths (and adjacent channels and batter slopes) as they fall under the responsibility of PON to maintain during the life of the new Sea Dumping Permit (refer **Figure 2** and **Table 2**).

Adherence to the above is the responsibility of the Dredge Master. In addition, the Executive Manager Marine and Operations will ensure that no material derived from capital dredging projects is dumped at sea under the 10 year maintenance dredging permit.

6.5 Placement of Dredged Material

It is the responsibility of the Dredge Master that PON will only place the maintenance dredge material within the area defined by the following coordinates in WGS84:

32○ 56.10’ S 151○48.94’ E
32○ 55.77’ S 151○49.40’ E
32○ 56.16’ S 151○49.79’ E
32○ 56.49’ S 151○49.32’ E

The David Allan is equipped with an electronic chart that has a visual display of both the WGS84 co-ordinates and the vessel position, therefore ensuring that material will be dumped in the appropriate position.

The David Allan will track its position over the spoil ground during the disposal activities to ensure disposal is within the defined co-ordinates using a Global Positioning System (GPS). The Dredge Master will ensure that each load of dredged material is dumped at a different location within the spoil ground so that the dumped material is distributed evenly. It is part of the Dredge Master’s duties to maintain a record of individual spoil locations on the Material Relocation record sheet (refer **Appendix C**). Each record sheet identifies the position of approximately 50 loads.

6.6 Record Keeping

PON will ensure that the following record keeping is undertaken:

- PON will record the quantities of all material dredged and dumped (in cubic metres) on a daily basis to ensure that the quantities dumped are within the total amount approved under the permit. It is the responsibility of the Dredge Master to record these quantities on the David Allan Operating Log (refer **Appendix D**);
- PON will keep records comprising either weekly plotting sheets or a certified extract of the ship’s log which detail the following:

    a) the times and dates at which each dumping run is commenced and finished. This information will be maintained by the Dredge Master of the David Allan in an Operating Log;
    b) the position of the vessel at the beginning and end of each dredging run. This information will be maintained by the Dredge Master of the David Allan in an Operating Log;
    c) the position of the vessel at the beginning and end of each dumping run with the inclusion of the path of each disposal run. This information will be recorded by the Dredge Master on the Materials Relocation record sheet (refer **Section 6.5**);
    d) the volume of dredge material (in cubic metres) dumped for the specific operational period. This information will be maintained by the Dredge Master of the David Allan in an Operating Log; and,
    e) a means of estimating, from the reported amount, the quantity in both dry tonnes and cubic metres. Significant work was done in 2017 to determine the insitu density of the dredge material for each of the areas of the port to improve the accuracy of the reporting of dredging volumes. This is the responsibility of the Dredge Master.

6.7 Cetacean Monitoring

Monitoring and mitigation for the protection of cetaceans will be undertaken by PON during the disposal activities. Cetacean monitoring is the responsibility of the Dredge Master. During the months of June – October (inclusive), PON will check for cetaceans within the monitoring zone. Current watch keeping arrangements comprise a watch kept at all times from the bridge of the David Allan. A copy of Australian National Guidelines for Whale and Dolphin Watching 2017 is included in **Appendix E**.

Dumping activities will only commence if no cetaceans have been observed in the monitoring zone (i.e. within 300 m of an intended dumping run) for 10 minutes immediately preceding commencement of the dumping activity. Any sightings will be noted on a separate Materials Relocation records sheet noting date, time, cetacean location and disposal location.

If any cetaceans are sighted in the monitoring zone, dumping activities will not commence until 20 minutes after the last cetacean is observed to leave the monitoring zone. An alternative dumping location may be selected more than 300 m from any sightings of cetaceans and within the approved spoil ground. If the vessel relocates to an alternate dumping location, the mitigation measures for protection of cetaceans, as described above, will still be met.

6.8 Introduced Marine Species

Australian Quarantine and Inspection Service (AQIS) is the lead agency for the management of ballast water taken up overseas with the intention of discharge within an Australian port. AQIS is responsible for ensuring all international ballast water has been managed in accordance with the Australian ballast water management requirements before permitting its discharge inside Australia's territorial sea (12 nautical limit generally applies).

Any ballast water that has been exchanged at sea, by an approved method, is deemed to be acceptable for discharge in Australian ports / waters. Vessels must retain all ballast water records in the AQIS ballast water log and any relevant vessel logbooks, and make these available to quarantine officers on request. Australian ballast water management requirements are consistent with International Maritime Organisation (IMO) guidelines for minimising the risk of translocation of harmful aquatic species in ships' ballast water. AQIS officers in the Port are responsible for regulating the management of internationally sourced ballast water.

With respect to domestically sourced ballast water (ie. ballast water taken up within Australian waters) a new National System is being developed addressing the potential risks associated with marine pests and domestically sourced ballast water. PON will meet any obligations imposed on it through the new National System, including any monitoring requirements.

Any international dredger contracted to undertake maintenance dredging within the Port will be subject to an underwater inspection to determine the presence of any marine pests. DAWE will be advised by PON if an international dredger is to be used for maintenance dredging activities. Any further management requirements will be as agreed by PON and DAWE.

Management associated with introduced marine species is the responsibility of the Executive Manager Marine and Operations.

6.9 Sediment Sampling

6.9.1 Maintenance Dredge Areas

PON will undertake (or contract a third party to undertake) sediment sampling and analysis in accordance with the NAGD current at the time of sampling. This is the responsibility of the PON Environment Manager. The Sampling and Analysis Plan (SAP) for maintenance dredge areas that will be implemented during the life of the new 10 year permit is provided in **Appendix F**. Any amendments to an approved SAP will be submitted by PON for approval by DAWE prior to sampling.

It is proposed that sampling of the maintenance dredge material in the Port will be undertaken on two occasions during the life of the new 10 year permit, while the interval between these sampling events will be no longer than five years. The most recent sediment sampling exercise was undertaken in 2017, meaning that the next sediment sampling exercise for these areas will be undertaken no later than 2022, followed by another sampling exercise within a further five years. Sediment sampling exercises would adopt similar sampling locations and tests used for the 2017 investigations with the addition of dioxin testing as requested by DAWE and would be undertaken in accordance with the Maintenance Dredge Areas SAP (RHDHV, 2021) prepared for the 2022-2032 10 year permit application.

As described in **Section 2.1**, PON will assume responsibility for the maintenance dredging of the various additional berths and channel areas at different times throughout the life of the new 10 year permit (refer **Table 2**). As such, sediment sampling and testing programs will be implemented for these berths following capital dredging works and prior to the commencement of maintenance dredging operations. This will ensure that current sediment quality data is available before maintenance dredging commences in these areas. Subsequent sediment sampling and testing for these berths will be undertaken within 5 years of the initial maintenance dredge areas sediment investigations. Based on the current program PON propose to implement the SAP in 2022 and again in 2027 (refer **Figure 3**). Where possible, PON would ideally prefer to undertake sediment sampling and testing for the new additional berths and channel areas at the same time. However, the timing on this is dependant on the capital dredging being completed and the berths coming into PON's ownership. Accordingly, additional SAPs may need to be implemented for these additional berths. This will be confirmed throughout the life of the new 10 year permit.

DAWE will be informed in advance of the timings of all sediment sampling exercises that will be undertaken in the maintenance dredge areas during the life of the new 10 year permit.

It is expected that the material to be dredged from the maintenance areas will be suitable for unconfined sea disposal at the current spoil ground, as has been the case in the previous 10 year permit. However, if the sediment sampling and analysis shows that the material is not suitable for unconfined sea disposal, PON will ensure that an appropriate methodology for disposal of the material will be developed in accordance with the NAGD and in consultation with DAWE.

6.9.2 Spoil Ground

The behaviour of the dumped material offshore of Newcastle is well understood and the results of recent studies indicate that frequent ongoing monitoring of the spoil ground and adjacent areas is unnecessary. However, in accordance with the NAGD and best management practices in environmental monitoring, it is considered prudent that a SAP for the spoil ground is prepared and implemented midway through the 10 year permit to confirm the biological, chemical and physical properties of the sediment at the spoil ground and adjacent areas (see below). The SAP for the spoil ground that will be implemented during the life of the new 10 year permit is provided in **Appendix G**. Any amendments to an approved SAP will be submitted by PON for approval by the DAWE prior to sampling.

Benthic sampling and analysis of the sediment will be undertaken to determine whether dredged material disposal has had a measurable effect on benthic community structure (diversity and abundance) in the spoil ground.

Broader sampling will also be undertaken to confirm the dispersion pathway using the chemical and physical properties of the sediment as tracers. This approach has been successfully adopted for several previous investigations in the offshore area during 1989, 1992, 2002, 2009 and 2017.

It is recommended that the interval between sampling events should be no longer than 10 years. Given that the previous sampling exercise at the spoil ground was undertaken in 2017, the next exercise will be undertaken no later than 2027 (refer **Figure 3**). DAWE will be informed in advance of the timing of this sediment sampling exercise.

6.10 Bathymetric Surveys

PON will undertake an annual bathymetric survey of the spoil ground. This is the responsibility of the Port Surveyor. PON currently undertakes annual bathymetric surveys of the spoil ground. Within one month of completing the bathymetric survey, PON will provide a digital copy of the survey to the Australian Hydrographic Office at the following address:

Australian Hydrographic Office
Locked Bag 8801
Wollongong NSW 2500

Within two months of completing the final survey, PON will provide a report to DAWE. This report will include a chart showing change in sea floor bathymetry as a result of the dumping and include a written commentary on the volumes of material disposed that appear to have been retained within the spoil ground. This is the responsibility of the Port Surveyor.

PON will also undertake regular bathymetric surveys of the maintenance dredge areas. These surveys will generally be undertaken prior to and following maintenance dredging exercises.

6.11 Spill and Waste Management

PON will ensure that all vessels associated with maintenance dredging and sea dumping activities are maintained in a manner that minimises the potential for oil and grease leaks/spills. This includes making sure that all vessels have spill response kits on board. The locations of spill response kits will be clearly indicated on all vessels, and all crew will be familiar with spill response procedures.

In accordance with the Marine Pollution Act 2012, the vessel master shall, without delay, notify the Harbour Master, NSW Maritime, and PON. In turn, PON shall notify DAWE and DPIE. As described in PON's EMS, the incidence of any spills shall be investigated, including the collection and analysis of relevant information.

PON's Environmental Management System (EMS) includes waste handling and disposal procedures. These have been developed to:

- ensure the appropriate disposal of materials and waste produced through PON operations; and
- comply with the requirements of the Waste Reduction and Purchasing Policy (WRAPP) that forms part of the NSW Government Sustainability Policy.

PON's waste handling and disposal procedures cover Port areas, ships at anchor off the Port, vessels visiting commercial berths at the Port (including product transfer) and the David Allan dredge.

PON will ensure that all vessels associated with maintenance dredging and sea dumping activities comply with the waste handling and disposal procedures.

6.12 Reporting

As outlined in **Section 6.6**, PON will record quantities of material dredged and dumped, and will keep records of either weekly plotting sheets or the ship's log. These records are to be retained for auditing purposes.

As outlined in **Section 6.10**, a report on the final bathymetric survey will be completed and submitted to DAWE.

PON will submit annual compliance reports to DAWE (on 31 January each year) in order to facilitate reporting to the International Maritime Organisation. This requirement is noted in PON's business calendar and is the responsibility of the PON Safety and Environment Manager. The report will include the following:

- permit start date;
- permit expiry date;
- approved dumping site;
- nature of dumped material;
- permit quantity;
- quantity dumped the previous year; and
- dumping method used.

6.13 Environmental Inspections

The Executive Manager Marine and Operations is responsible for ensuring that regular environmental inspections are undertaken on all vessels and properties owned and operated by PON. This will include:

- Weekly Port Inspection - including details of any environmental incidents;
- Dredge Master's Monthly Report – undertaken by the Dredge Master, including details regarding waste storage and disposal, and incident management for the dredge vessel; and
- Survey Monthly Inspection – undertaken by PON's Senior Hydrographic Surveyor, including details regarding waste storage and disposal, and incident management for survey vessels.

6.14 Contingency Measures

The Executive Manager Marine and Operations is responsible for the contingency measures and their implementation. The PON contact for this project in the case of an incident occurring is the Executive Manager Marine and Operations, who can be contacted on 0407 040 719.

If, at any time during the course of dredging/dumping activities, an environmental incident occurs or environmental risk is identified, PON will implement measures to mitigate the risk or impact. PON will notify DAWE within 24 hours of any incident or identified risk, which will include:

- details of the incident or risk;
- measures taken;

- success of those measures in addressing the incident or risk; and
- any additional measures proposed to be undertaken.

It is the responsibility of the Dredge Master/Dredging Manager that the David Allan complies with the relevant state, national or international standards with respect to seaworthiness, safety and environmental requirements, or any rules or conditions laid down by the certifying classification society, and be capable of dumping the dredged material to the spoil site in accordance with this LTMMP. In particular, the David Allan is kept under "Class" in accordance with the classification requirements of Lloyd's Register. This ensures compliance with international regulations adopted by the International Maritime Organisation. The safety equipment onboard the David Allan is in accordance with requirements of the Australian Maritime Safety Authority (AMSA). Any other vessel undertaking maintenance dredging within the Port will be subject to these same or equivalent requirements through means of contract documentation.

6.14.1 Breakdown of the David Allan

In case of a breakdown of the David Allan causing dredging and disposal activities to cease temporarily, another suitable vessel may be used if possible or dredging activities may be ceased until the David Allan is repaired.

If another vessel is used to undertake the dredging, the vessel will comply with the relevant state, national or international standards with respect to sea worthiness, safety and environmental requirements. In addition, the Conditions of the Permit and this LTMMP would apply to that vessel.

6.14.2 Nearby Contaminated Sediments

Capital dredging will be undertaken in various new berths during the life of the new 10 year permit as listed in **Table 2** (refer **Section 2.1**). PON recognises that sediment designated for capital dredging from other berths may be potentially contaminated[12].

Capital dredging work is subject to its own separate approvals process. The conditions of approval and selected work methods would likely take into account the need to avoid any dispersal of contaminated material, should it exist, and the appropriate treatment of that material. Prior to the removal of any contaminated sediment, mitigation, monitoring and management measures such as the installation of a sheet pile wall and/or turbidity curtains would likely be implemented.

Accordingly, it is not expected that sediment from these activities will impact on any of the maintenance dredging activities. However, if sediment from these activities does become dispersed within any of the maintenance dredge areas, maintenance dredging will be temporarily halted until the contamination levels in the sediment within the maintenance dredge areas can be assessed and a course of action agreed with regulatory agencies.

Responsibility for removal of any dispersed contaminants will remain with the party undertaking the capital dredging and will need to be in accordance with the approvals applicable to the capital dredging.

6.14.3 Flood Related Dredging

The process of sedimentation within the Port is a complex process. It involves interaction between the longitudinal and vertical variations of salinity in the Port, which affect flocculation and settling of silt

[12] The nature and extent of any existing contamination would be determined from sediment sampling and testing programs implemented prior to capital dredging works. The preparation and implementation of these programs is outside the scope of this LTMMP and 10 year maintenance dredging permit application.

particles, and gravitational circulations (Patterson Britton & Partners, 2000). Since the silt load of the river and the salinity structure of the Port vary during any individual flood event and from one flood to another, the processes of siltation are dynamic and variable throughout the Port.

It is anticipated that the total annual volume that could need to be dredged from Areas A, B, C, D, E, F and G in any one year may be 800,000 m^3 depending upon the occurrence of flooding events in the Hunter River. PON's 10 year maintenance dredging permit application seeks approval for dredging and disposal of up to 7,400,000 m^3 over the life of the permit assuming in the order of 250,000 m^3 of material from Area E is beneficially reused for beach nourishment of Stockton Beach.

As noted in **Section 6.6**, PON will record the quantities of all material dredged and dumped (in cubic metres) on a daily basis to ensure that the quantities dumped are within the total amount permitted under the permit. If due to flood related events, PON is approaching the permitted volume of material to be disposed of offshore (i.e. 7,400,000 m^3), a submission will be made to DAWE to seek approval to dredge and dispose additional material. PON will seek this approval from DAWE when their records indicate that the progressive disposal volume is approaching the upper limit.

6.15 Auditing and Monitoring of Compliance with Approval Conditions

Activities relating to the dredging and disposal may be audited by DAWE to verify that the activities are meeting the specified and defined requirements.

Audit conditions that PON will adhere to include:

- all records will be retained for auditing purposes (refer Section 6.4); and
- PON will afford access to at least two Australian Government nominees to witness, inspect, examine or audit any part of the operations, including any dumping or monitoring activity, the vessel or any other equipment, or any documented records, and will be provided with any necessary assistance in carrying out their duties. This will be the responsibility of the Dredge Master. PON operating procedures for the David Allan state that a maximum of two persons may board the David Allan at any given time. The number of persons allowed is dictated by safety equipment and other requirements outlined in the relevant state, national or international standards. Additionally, any person boarding the David Allan will be subjected to the induction requirements of PON and operating procedures of the vessel.

PON also undertakes regular internal auditing to determine compliance to relevant legislation and standards with regard to Quality Assurance (QA), Work Health and Safety (WHS), and Electronic Information Security (EIS) Management Systems. **Table 10** summarises the scheduling of internal audits.

Table 10 Internal Auditing Scheduling and Responsibilities

Management System	Frequency	Responsibility
QA	QA procedures and work instructions - annual QA Policy – every two years	Executive Manager Marine and Operations
WHS	Every two years	Executive Manager Marine and Operations
EMS	Every two years	Executive Manager Marine and Operations
EIS	Annual	General Manager – Finance & Corporate

Unscheduled audits are also undertaken if deemed necessary. Any non-conformances identified during an internal audit are documented, while any corrective actions or suggested improvements are implemented within the respective branches of PON.

6.16 Consultation and Review of the LTMMP

This LTMMP has been prepared in consultation with the Newcastle Port Technical Advisory Consultative Committee (TACC). The TACC was established to address the long-term management of the Sea Dumping Permit by providing advice and oversight on research and monitoring, a forum for discussion and reconciliation of different viewpoints, a focus for long-term planning, and continuity of effort and direction.

Groups represented by the TACC include:

- PON;
- DPIE;
- City of Newcastle;
- Hunter Central Rivers Catchment Management Authority;
- Community Representative;
- DPI;
- Transport for NSW
- Port Authority of NSW
- OceanWatch Australia;
- Hunter Water Corporation; and
- DAWE.

PON will review the LTMMP if there are any changes to the dredging, disposal or monitoring activities. Notification and where necessary consultation with the TACC will be undertaken for any modifications to the LTMMP. Any modifications to the LTMMP will be submitted to DAWE for approval. The Executive Manager Marine and Operations will be responsible for this review and consultation.

6.17 Continuous Improvement

As part of PON's EMS procedures, programs are regularly reviewed and revised to reflect progress against environmental objectives and targets, ensuring continual improvement in environmental management. Improvement could refer to physical matters and processes, and include changes to specific actions, operations, responsibilities, resources and timeframes.

Specifically, PON will implement the following mechanisms in order to identify opportunities for continuous improvement to the maintenance dredging and disposal operations over the life of the new 10 year permit:

- Regular consultation and review of the LTMMP with the TACC, as described in **Section 6.16**; and
- Review the Dredging Operational Procedure (contained in the EMS) on an annual basis or more regularly as required.

6.18 Publication of the LTMMP

To ensure transparency and stakeholder understanding and acceptance of the environmental management of the Port, both the LTMMP and any monitoring or research results derived from it, should be published on the Port's website (https://www.portofnewcastle.com.au/).

6.19 Summary

A summary of the key monitoring and reporting tasks for the LTMMP is provided in **Table 11**. The anticipated timing for each task has also been identified. A summary of mitigation measures and the potential triggers for management response that may arise during the life of the new 10 year permit is provided in **Table 12** and **Table 13** respectively. Actions that would be implemented in response to these triggers have also been identified.

Table 11 Proposed Monitoring, Reporting and Management Practices, 2011-2021

Activity	Purpose	Timing/Frequency	Responsibility
Maintenance Dredging	Remove accumulated sediment and maintain safe, navigable depth in the Port	Continually, 7 days per week, 52 weeks per year	PON
Record Keeping	Ensure that the quantities dumped are within the total amount approved under the permit. Maintain thorough records of all dredging and disposal activities	Daily records of dredge quantities. Weekly plotting sheets or certified extract of ship's log which detail the following: a) the times and dates at which each dumping run is commenced and finished. This information will be maintained by the Dredge Master of the David Allan in an Operating Log; b) the position of the vessel at the beginning and end of each dredging run. This information will be maintained by the Dredge Master of the David Allan in an Operating Log; c) the position of the vessel at the beginning and end of each dumping run with the inclusion of the path of each disposal run. This information will be recorded by the Dredge Master on the Materials Relocation record sheet (refer **Section 6.5**); d) the volume of dredge material (in cubic metres) dumped for the specific operational period. This information will be maintained by the Dredge Master of the David Allan in an Operating Log; and, e) a means of estimating, from the reported amount, the quantity in both dry tonnes and cubic metres.	Dredge Master
Cetacean Monitoring	Protection of cetaceans	Annually during June to October inclusive	Dredge Master
Sediment Sampling and Testing (Areas A to F) refer Figure 2	Provide current sediment quality data for the maintenance dredge material in Areas A to F	Twice during 10 year permit at an interval no longer than five years. The next sediment sampling exercise will be undertaken no later than 2022 then 2027.	Environment Manager
Sediment Sampling and Testing (new berths) refer Figure 2	Provide current sediment quality data for the maintenance dredge material in Areas G and new berths	Following capital dredging works and prior to the commencement of maintenance dredging operations. Subsequent sediment sampling and testing to be undertaken within 5 years of the initial investigations.	Environment Manager
Sediment Sampling and Testing (spoil ground) refer Figure 2	Provide current sediment quality data for the spoil ground. Confirm the dispersion pathway of the sediment. Determine whether dredged material disposal has had a measurable effect on benthic community structure (diversity and abundance) in the spoil ground	Once during 10 year permit (currently set down for 2027).	Environment Manager
Bathymetric Survey (spoil ground)	Confirm there has not been significant change in sea floor bathymetry as a result of the dumping	Annual bathymetric survey submitted to Australian Hydrographic Office and report submitted to DAWE after final survey.	Port Surveyor
Bathymetric Survey (maintenance dredge areas)	Pre-dredging survey required to indicate required extent of dredging. Post- dredging survey required to confirm dredging was undertaken as planned	Regular surveys, generally pre and post maintenance dredging exercises	Port Surveyor
Training	Ensure that staff are suitably aware of the permit requirements	New staff to have an induction module specific to the operation of the permit. Ongoing staff to have periodic refresher courses on permit requirements	Executive Manager Marine and Operations
Compliance Reporting	Compliance with Permit	Annual compliance reports submitted to DAWE every 31 January, including: • permit start date; • permit expiry date; • approved dumping site; • nature of dumped material; • permit quantity; • quantity dumped the previous year; and • dumping method used.	Environment Manager
Environmental Inspections	Ensure that PON achieves its commitment of undertaking weekly and monthly environmental inspections on all properties and vessels owned and operated by PON	Weekly Port Inspection - including details of any environmental incidents. Dredge Master's Monthly Report – undertaken by the Dredge Master, including details regarding waste storage and disposal, and incident management for the dredge vessel. Survey Monthly Inspection – undertaken by PON's Senior Hydrographic Surveyor, including details regarding waste storage and disposal, and incident management for survey vessels.	Executive Manager Marine and Operations Dredge Master Senior Hydrographic Surveyor
Contingency Measures (Overall)	Mitigate environmental risks or impacts	If, at any time during the course of dredging/dumping activities, an environmental incident occurs or environmental risk is identified, PON will implement measures to mitigate the risk or impact. PON will notify DAWE within 24 hours of any incident or identified risk, which will include: • details of the incident or risk; • measures taken;	Executive Manager Marine and Operations

Activity	Purpose	Timing/Frequency	Responsibility
		• success of those measures in addressing the incident or risk; and • any additional measures proposed to be undertaken	
Contingency Measures (Breakdown of David Allan)	Ensure that dredging and disposal activities do not need to be delayed while the David Allan is unavailable	As required	Dredge Master
Contingency Measures (Nearby Contaminated Sediments)	Mitigate the potential dispersal of any contaminated sediments	As required	Party undertaking capital dredging
Contingency Measures (Flood Related Dredging)	Remove accumulated sediment and maintain safe, navigable depth in the Port following flood events	As required	Environment Manager
Auditing (at discretion of DAWE)	Verify that the activities are meeting the specified and defined requirements	As required	DAWE
Auditing (Internal)	Determine compliance to relevant legislation and standards with regard to QA, WHS and EIS Management Systems	Annual - QA procedures and work instructions, EIS audits Every two years – QA Policy, WHS audits	Executive Manager Marine and Operations (QA, WHS audits) General Manager – Finance & Corporate (EIS audits)

Table 12 Proposed Mitigation Measures, 2011-2021

Issue	Mitigation Measures	Performance Indicator	Responsibility
Dispersal of suspended sediment during dredging	Dredging will be undertaken by a trailing suction hopper dredger with a suction-head that draws most of the fine materials (silts and clays) into the suction pipe, with consequently a low percentage of fines escaping during dredging. As the hopper fills, water will be collected from the surface of the hopper and will be discharged well below the water line below the keel of the vessel ('overflow dredging'). By ensuring that all discharges will occur well below the water line, the dispersal of material within the upper portion of the water column will be reduced.	All discharges to occur well below the water line	Dredge Master
Transport of dredge material to spoil ground	The dredge vessel will take the most direct route from the dredge area to the port entrance. The dredge vessel will observe all relevant maritime notices, navigational requirements, and any requirements of the PON Harbour Master, including coordination of vessel movements with commercial shipping in the Port.	Zero incidents during transit	Dredge Master
Ensure that dredge material is derived from Areas A, B, C, D, E, F and G only	The dredge vessel will be fitted with GPS to ensure accurate positioning	No material derived from capital dredging projects to be dumped at the maintenance dredging spoil ground under the 10 year permit	Dredge Master Executive Manager Marine and Operations
Ensure that dredged material is dumped within designated spoil ground, i.e. the area defined by the following coordinates in WGS84: **32○ 56.10' S 151○48.94' E** **32○ 55.77' S 151○49.40' E** **32○ 56.16' S 151○49.79' E** **32○ 56.49' S 151○49.32' E**	The David Allan is equipped with an electronic chart that has a visual display of both the WGS84 co-ordinates and the vessel position, therefore ensuring that material will be dumped in the appropriate position. The David Allan will track its position over the spoil ground during the disposal activities to ensure disposal is within the defined co-ordinates using a GPS.	No disposal of dredge material outside boundary of spoil ground	Dredge Master
Significant changes in bathymetry at the spoil ground	The Dredge Master will ensure that each load of dredged material is dumped at a different location within the spoil ground so that the dumped material is distributed evenly. A record of individual spoil locations will be maintained on the Material Relocation record sheet (refer **Appendix C**) Annual bathymetric surveys will be undertaken at the spoil ground	No instances of repeated dumping of dredge material at one location	Dredge Master Port Surveyor
Protection of cetaceans	During the months of June – October (inclusive), PON will check for cetaceans within the monitoring zone (i.e. within 300 m of an intended dumping run). Current watch keeping arrangements comprise a watch kept at all times from the bridge of the David Allan. Dumping activities will only commence if no cetaceans have been observed in the monitoring zone for 10 minutes immediately preceding commencement of the dumping activity. Any sightings will be noted on a separate Materials Relocation records sheet noting date, time, cetacean location and disposal location. If any cetaceans are sighted in the monitoring zone, dumping activities will not commence until 20 minutes after the last cetacean is observed to leave the monitoring zone. An alternative dumping location may be selected more than 300 m from any sightings of cetaceans and within the approved spoil ground. If the vessel relocates to an alternate dumping location, the mitigation measures for protection of cetaceans, as described above, will still be met.	No injury or mortality incidents to marine mammals attributable to dredging	Dredge Master
Dispersal of contaminated sediments from elsewhere in the Port into maintenance dredge areas	Maintenance dredging will be temporarily halted until the contamination levels in the sediment within the maintenance dredge areas can be assessed and a course of action agreed with regulatory agencies.	No instances of cross contamination of maintenance dredge areas	
Introduced marine species	Vessels must retain all ballast water records in the AQIS ballast water log and any relevant vessel logbooks, and make these available to quarantine officers on request. Australian ballast water management requirements are consistent with IMO guidelines for minimising the risk of translocation of harmful aquatic species in ships' ballast water. AQIS officers in the Port of Newcastle are responsible for regulating the management of internationally sourced ballast water. With respect to domestically sourced ballast water (ie. ballast water taken up within Australian waters), PON will meet any obligations imposed on it through the National System, including any monitoring requirements to address the potential risks associated with marine pests and domestically sourced ballast water. Any international dredger contracted to undertake maintenance dredging within the Port of Newcastle will be subject to an underwater inspection to determine the presence of any marine pests. DAWE will be advised by PON if an international dredger is to be used for maintenance dredging activities. Any further management requirements will be as agreed by PON and DAWE.	Zero establishment of Introduced Marine Pests as a result of the dredging and spoil disposal activities	Environment Manager
Spill and Waste management	The locations of spill response kits will be clearly indicated on all vessels, and all crew will be familiar with spill response procedures. In accordance with the Marine Pollution Act 2012, the vessel master shall, without delay, notify the Harbour Master, NSW Maritime, and PON. In turn, PON shall notify DAWE and DPIE. The incidence of any spills shall be investigated, including the collection and analysis of relevant information.	Zero incidents involving the loss of oil, grease or any other waste into the marine environment	Dredge Master Environment Manager

Table 13 Triggers and Subsequent Actions, 2011-2021

Trigger	Action
Changes to timings when PON will assume responsibility for maintenance dredging of new berths (refer Section 2.1)	PON to notify DAWE. Revise timings for implementation of SAPs (if required)
PON is approaching the permitted total volume of material to be disposed of offshore (i.e. 7,400,000 m^3)	Submission will be made to DAWE to seek approval to dredge and dispose additional material.
Cetaceans sighted in monitoring zone	Dumping activities will not commence until 20 minutes after the last cetacean is observed to leave the monitoring zone. An alternative dumping location may be selected more than 300 m from any sightings of cetaceans and within the approved spoil ground
New staff begin work related to permit	All new staff to have an induction module specific to the operation of the permit
Breakdown of the David Allan	Dredge Master to notify Executive Manager Marine and Operations Another suitable vessel may be used if possible or dredging activities may be ceased until the David Allan is repaired. If another vessel is used to undertake the dredging, the vessel will comply with the relevant state, national or international standards with respect to sea worthiness, safety and environmental requirements.
International dredger contracted to undertake maintenance dredging	PON to notify DAWE. Dredger must be subjected to an underwater inspection to determine the presence of any marine pests.
Sediments unsuitable for unconfined sea disposal identified in maintenance dredge areas	PON to notify DAWE. PON will ensure that an appropriate methodology for disposal of the material will be developed in accordance with the NAGD and in consultation with DAWE. In addition, the chemical and physical testing of samples from the spoil ground and adjacent areas would be brought forward, and a biological testing program would be undertaken.
Flooding in Hunter River	Consider undertaking bathymetric survey of maintenance dredge areas. If required, undertake maintenance dredging to maintain navigable depths.
Any changes to dredging, disposal and monitoring activities	Review the LTMMP (if required). Any modifications to the LTMMP will be submitted to DAWE for approval.
Audit	PON will afford access to at least two Australian Government nominees to witness, inspect, examine or audit any part of the operations, including any dumping or monitoring activity, the vessel or any other equipment, or any documented records, and will be provided with any necessary assistance in carrying out their duties.
Oil Spill	Immediately implement spill response procedures. In accordance with the Marine Pollution Act 2012, the vessel master shall, without delay, notify the Harbour Master, NSW Maritime, and PON. In turn, PON shall notify DAWE and NSW EPA. The incidence of any spills shall be investigated, including the collection and analysis of data.
Environmental Incident occurs / Environmental Risk identified	PON will implement measures to mitigate the risk or impact. PON will notify DAWE within 24 hours of any incident or identified risk.

7 References

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8 GLOSSARY

Bathymetric survey - A map showing the measurement of the depth of bodies of water with depth contours. Bathymetry is the underwater equivalent to topography.

Benthic communities - Animals dwelling on the bottom of a water body. These organisms inhabit the sediment on lake, river, or ocean bottoms, as well as the sediment in marshes, tidal flats, and other wetlands.

Cetacean – A member of the sub-order Mysticeti or Odontoceti of the order Cetacea. Cetaceans are whales, dolphins and related marine mammals.

Conditions of the Permit – Conditions outlined in a permit by which the relevant party must abide.

Dredging – The practice of excavating or displacing the bottom or shoreline of a water body. Dredging can be accomplished with mechanical or hydraulic machines. Most is done to maintain channel depths or berths for navigational purposes.

Spoil ground – Designated area for dredged material placement. Designated areas must be co- ordinated with relevant government agencies for environmental compliance and acceptability.

Elutriate test - A test, which involves mixing sediment with 4 times its volume of seawater under specified conditions, to estimate the amounts of contaminants that will be released during sea disposal.

Long Term Monitoring and Management Plan - A site specific plan developed to ensure that the proposed activities associated with a project comply with all relevant environmental components and that all environmental risks are properly managed.

Heavy metals - are metals or metalloids found in the periodic table of elements from Group IIA through VIA. Metals exist in elemental form or as ions dissolved in water, or as vapours, or as salts or minerals in rock, sand, and dust, and form a variety of inorganic or organic compounds.

Maintenance dredging – The dredging to ensure that channels, berths or construction works are maintained at their designed dimensions.

Sediment - Any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water

Sedimentation - The accumulation of sediments on the bottom of waterways or bodies of water.

Toxicity testing - Procedures that evaluate the toxic effects of sediments on organisms.

Turbidity – A condition of a liquid due to fine visible material in suspension, which may not be of sufficient size to be seen as individual particles by the naked eye but which prevents the passage of light through the liquid. A measure of fine suspended matter in liquid.

Water column – Volume of water between the surface of the water and the ocean bottom.

Appendix A – PON ENVIRONMENTAL POLICY

Appendix B – EPBC ACT PROTECTED MATTERS REPORT

Appendix C – PON MATERIAL RELOCATION RECORD SHEET

Appendix D – PON OPERATING LOG SHEET

Appendix E – DAWE WHALE AND DOLPHIN IDENTIFICATION GUIDE

Appendix F – SAP FOR MAINTENANCE DREDGE AREAS, 2022 -2032

Appendix G – SAP FOR OFFSHORE SPOIL GROUND, 2022 - 2032