



Bermagui Harbour Dredging

Addendum review of Environmental Factors

Transport for NSW

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Transport for NSW | November 2021

Prepared by NGH Pty Ltd and Transport for NSW

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Executive summary

The proposed modification

Transport for NSW (TfNSW) propose to modify the Review of Environmental Factors (REF) for the *Bermagui Boat Harbour and Entrance Channel Sediment Investigation* prepared by Advisian (2016), and subsequent modifications. by reassessing the final destination of dredged marine sediments of the Bermagui Harbour and Entrance Dredging Project (the Project).

Key features of the proposed modification (the Proposal) would include:

- Leaving the stockpile of 12,000m² of Virgin Excavated Natural Materials (VENM) material removed from Horseshoe Bay Beach in-situ, rather than relocating to Moorhead Beach as suggested in the Project REF.
- Material dredged from inner harbour areas of the Bermagui Boat Harbour (Area 3, 4 and 5) and placed at the stockpile site to be tested and classified for reuse or waste.
- Managing the stockpile for long-term storage of the dredge material according to the *Stockpile Site Management Guidelines 2015*.
- Material dredged from Areas 2 and 6 would be placed offshore of Moorhead Beach in/behind the surf zone.

The proposed modifications detailed in this Addendum REF would be undertaken concurrent with dredging works in Areas 6 and 2. The construction of the Proposal would be undertaken over 3 months.

Background

The Bermagui Boat Harbour provides berthing for a number of commercial fishing vessels, many recreational motor and sailing boats, Marine Rescue NSW and also provides marine servicing and slipway facilities for the local area. The Entrance Channel provides the only access into the Bermagui River and out into the ocean.

The most recent prior dredging campaign was undertaken in 2003.

In 2016, the then Department of Primary Industries – Lands commissioned an REF for new proposed dredging works for part of Bermagui Boat Harbour and the Entrance Channel, with the aim to assess the likely potential environment impacts of the proposed dredging and associated spoil disposal activities, and to consider the appropriate level of environmental assessment of the Project (Advisian, 2016).

Subsequent to this, but prior to dredging activities commencing, an Addendum REF to this work was prepared following consultation with Bega Valley Shire Council regarding the dredging strategy and disposal options. These works were approved in April, 2020.

The material dredged from Areas 1 and 6 were initially placed on Horseshoe Bay Beach as proposed and assessed in the Project REF Addendum 1 (Blue-sky Planning, 2020). However, this disposal option generated concerns from the community. In response, approximately 12,000m³ of dredged marine sands placed on the beach have been relocated by truck to the designated stockpile area west of the harbour.

Transport for NSW now propose leave the relocated material from Horseshoe Bay Beach at this stockpile site. This differs from the Project REF, which noted that the material would be hydraulically placed on Moorhead Beach (Advisian, 2016). Considering the change to the original scope of works, an additional Addendum REF is required to re-assess the environment impacts of the Dredging Project proposal and fulfil the requirements outlined in the *Environmental Planning & Assessment Act 1979*.

Need for the proposed modification

The proposed modification described and assessed in this Addendum REF is consistent with the strategic need for the broader dredging project to ensure the maintenance of safe navigation for commercial and recreational vessels travelling through the Bermagui Entrance Channel into the Bermagui River and Boat Harbour.

The proposed modification is required to address community concerns regarding the disposal and stockpiling of marine sands from the Bermagui Harbour Entrance Channel on sand dunes within Horseshoe Bay Beach.

Proposal objectives and development criteria

In addition to the objectives outlined in the Project REF, additional objectives specific to the proposed modification are to:

1. Remove the need to transport VENM from the project stockpile site to Horseshoe Bay Beach to address community concerns with the methodology.
2. Manage the existing stockpile site to ensure its suitability for long-term storage of marine sediment. This would encompass managing both:
 - a. The use of dredged materials, and
 - b. Potential contamination issues.

Options considered

In developing options for the proposed modification, TfNSW sought to meet the project objectives and where possible avoid or minimise technical, economic, social and environmental constraints. The selected option was based on the NSW Environmental Protection Agency's (EPA) *Waste Management Hierarchy*, where adaptive re-use on site is the second most preferable option, with avoiding and reducing waste production being the first.

Detailed options analysis for the dredging works as a whole were assessed in the Project REF. Regarding the proposed modification discussed in this Addendum REF, the options analysis considered the following:

- Option 1 – Do nothing, and not dredging the remaining areas of Bermagui Boat Harbour and Entrance Channel
- Option 2 - Continue placing stockpiled sediments on Horseshoe Bay Beach as described in the Project REF Addendum 1
- Option 3 – Offsite disposal of VENM material from Horseshoe Bay Beach at the nearest licenced facility.
- Option 4 – Long-term stockpiling at the existing stockpile site.

The preferred option is Option 4 - Long-term stockpiling at the existing stockpile site. This option allows TfNSW to address community concerns regarding VENM disposal on Horseshoe Bay Beach, and its long-term storage in an established stockpile site. The stockpile site is in close proximity to Horseshoe Bay Beach, and Bermagui Harbour, therefore it would not impose prohibitive transport costs.

Statutory and planning framework

Under the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP), the proposed modification is categorised as development for the purpose of:

- "waterway or foreshore management activities", i.e.:

- instream management or dredging to rehabilitate aquatic habitat or to maintain or restore environmental flows or tidal flows for ecological purposes
- coastal management and beach nourishment; and/ or
- “port, wharf or boating facilities”, i.e.:
 - routine maintenance works (including dredging, or bed profile levelling, of existing navigation channels if it is for safety reasons or in connection with existing facilities).

The proposed modification is not State significant infrastructure or State significant development. Under the Infrastructure SEPP a public authority may undertake a range of public activities without development consent provided that there has been appropriate consultation with all relevant government authorities and that an environmental impact assessment under Part 5 of the *Environmental Planning & Assessment Act* (EP&A Act) 1979 has been undertaken.

Community and stakeholder consultation

Community concerns regarding the placement of dredged material on Horseshoe Bay Beach motivated the relocation of that material to the existing stockpile site, and have been considered in this Addendum REF.

The works will be subject to ongoing community consultation, including public display of this REF and preparation of a submissions report.

Comments were provided by DPIE’s Biodiversity Conservation Division (BCD) on 1 September 2021 and BVSC on 4 November 2021 and have been addressed in this Addendum REF. Consultation with DPIE-Crown Lands may be required if any new permits or changes to existing permits are required for the works.

Environment impacts

The main environmental impacts of the proposed modification are:

Soils and sediment quality

The proposed modification involves the long-term and co-located storage of 12000m³ VENM relocated from Horseshoe Bay Beach in addition to the dredged sediments to be taken from the inner Harbour Areas 3,4 and 5. The VENM materials are Entrance Channel sediments, originally dredged from Areas 1 and 6. This material has already been deposited on the stockpile site, dewatered and levelled.

The deposition of this material would be in addition to the approximately 6,800m³ of material to be dredged from the inner Harbour Areas 3,4 and 5 and stored on-site as detailed and assessed in the Project REF. This equates to a revised total stored material volume of approximately 19,800m³ (compared to the 6,800m³ assessed in the Project REF and Stockpile SAP). The overall increase in height of the stockpile would be less than 2.5m. The overall surface area of the stockpile site is not anticipated to increase. All sediment deposited on the site would be restricted to the stockpile pad footprint illustrated in Figure 3-1.

Conscious of these changes to the planned stockpile site, key additional potential impacts may include:

- Landform instability and erosion
 - The stockpile site would not be fully isolated from the environment. It would involve bare and unstable porous areas of sand susceptible to

wind and water erosion. It's not proposed at this stage to cover the stockpile site. This can lead to erosion and the deposition of sediment into the nearby environment, including the Bermagui River and nearby coastal wetlands.

- Potential oxidation of PASS
 - PASS may be present in the sediment dredged from Areas 3,4 and 5. The exposed design of the stockpile site may incur oxidation of PASS, the production of sulphuric acid in the soil, and the leaching of that into the nearby environment. Leaching can incur the following indirect impacts
 - Acidification of waterways, fish kills, habitat destruction, geotechnical instability (soil erosion/subsidence, aquifer clogging) and aggressivity to structures/structural damage to steel and concrete infrastructure.
 - Unnecessary disturbance of ASS areas causing acid generation, lowering pH levels and elevated dissolved metals.
 - Consequential community and social perceptions of the Project.
 - Long term consequences if ASS or acidic leachate travels downstream through sensitive estuarine wetlands.
 - Acid drainage may also exacerbate the mobilisation and concentration of any other toxic metals present in the dredged sediment or surrounding soil strata.
- Downward migration of TBT into and cross-contamination of the VENM at the base of the stockpile site.
 - Once contaminated, the VENM would no longer be suitable for future beach renourishment and would need to be eventually disposed of at a licenced waste landfill facility.
 - Downward migration may also extend into the lower soil strata, and TBT contamination may expand to the surrounding environment.
- Further compaction of soils
 - Traffic and additional material laydown can compact soils and limit their ability to support vegetation. Maximising the use of existing areas of disturbance for the stockpile sites would be achieved. Traffic movements in and out of the site, as well as construction traffic movements along the proposal site would require management to rationalise and reduce impacts.

There is presently little detailed understanding of the dynamics of longshore and cross-shore sediment transport at Moorhead Beach. Sand does enter and become deposited in the Bermagui River Mouth and Entrance Channel under prevailing tidal processes. Dredged sediment placed off Moorhead Beach may over time transfer back to Entrance Channel.

The management of these additional risks would centre on appropriate pad design (including clear vertical partitioning between the VENM sediments and those to be

deposited from Areas 3,4 and 5), installation and maintenance of erosion and sediment controls, as well as testing and management of specific contaminants as outlined in the Project REF, Project REF Addendum 1 and the Stockpile SAP.

PASS would be managed in accordance with the Acid Sulfate Soils Management Plan.

Hydrology and water quality

The long-term storage of sediment at the stockpile site has the potential to degrade water quality within the nearby Bermagui estuary. Field visits conducted in preparation of the Project REF identified sediment run-off from the stockpile site towards the estuary.

A water quality management and monitoring plan for the Bermagui dredging project has been previously prepared (Hydrosphere Consulting, 2020). It describes key risks to hydrology and water quality as a result of the project, including the storage of sediment from Areas 3,4 and 5 at the stockpile site.

However, the increased volume of sediment to be deposited and stored long term at the stockpile site as a result of the proposed modification may increase the risk of run-off, especially given the site's vulnerability to erosive processes as discussed previously. If uncontrolled, this would be detrimental to water quality in the estuary area, in particular through increased turbidity, leaching of contaminants and processes of sedimentation. While the additional risk imposed by the proposed modification is low, the use of appropriate sediment and erosion controls at the stockpile site in accordance with the *Stockpile Site Management Guidelines* (TfNSW, 2015), and as described in the Stockpile Site Management Plan would be required.

The stockpile site is not currently at risk of inundation during storm tide events in the Bermagui River estuary. In accordance with *Stockpile Site Management Guidelines* (TfNSW, 2015), the dredged material would be permanently stored at the site. Therefore, storm tide inundation predicted for the site in the future would not impact the storage of materials at the site.

No additional safeguards and management measures are required for potential hydrology and water quality impacts beyond those outlined in the Project REF, the Project REF Addendum 1, the Bermagui Water Quality Management and Monitoring Plan

Biodiversity

Additional minor vegetation clearing at the edge of the site may be required to facilitate the use of machinery to level the VENM sediments present there in preparation for deposition of sediment dredged from Areas 3, 4 and 5. This clearing would be minor and localised.

No additional impacts to listed threatened entities are anticipated, given the pre-existing and disturbed status of the stockpile site.

No additional impacts to estuarine macrophytes (e.g. seagrass) are anticipated by the amendments to the Stockpile Site. The safeguards and management measures outlined in the Project REF, the Project REF Addendum 1, this Addendum REF and its accompanying environmental management plans are sufficient to minimise and manage impacts (e.g. from sediment run-off and impacts to water quality).

The planned timing for dredging and deposition on Moorhead Beach may coincide with the shorebird nesting season. While sediment is likely to be placed offshore of the beach itself, as suggested by DPIE and BVSC, consultation should be undertaken with DPIE shorebird officers.

Justification and conclusion

The proposed modification is required for the concurrent storage and management of:

- 1) VENM dredged from Areas 2 and 6 from the Bermagui Entrance Channel; and,
- 2) material extracted from Areas 3,4 and 5 of the Inner Harbour on the permanent and existing stockpile site to the west of the Bermagui Harbour.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the project objectives but would still result in some additional impacts on sediment and water quality. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would also enable the permanent removal of dredged materials from Horseshoe Bay Beach in response to community feedback. On balance the proposed modification is considered justified and the following conclusions are made.

Contents

1	Introduction.....	1
1.1	Proposed modification overview.....	1
1.2	Purpose of the report.....	3
1.3	Background.....	4
2	Need and options considered	9
2.1	Strategic need for the proposed modification	9
2.2	Proposal objectives and development criteria	9
2.3	Alternatives and options considered.....	9
2.4	Preferred option	10
3	Description of the proposed modification	11
3.1	Design.....	11
3.2	Main features of the modification.....	14
3.3	Construction activities	14
3.4	Ancillary facilities.....	16
3.5	Public utility adjustment.....	16
3.6	Property acquisition.....	16
4	Statutory planning framework	17
4.1	Environmental Planning and Assessment Act 1979	17
4.2	Other relevant NSW legislation	19
4.3	Commonwealth legislation	20
4.4	Confirmation of statutory position	21
5	Consultation	22
5.1	Stakeholder consultation	22
5.2	Community outcomes.....	22
6	Environmental assessment.....	24
6.1	Soils and sediment quality.....	24
6.2	Hydrology and water quality	30
6.3	Other impacts.....	33
6.4	Cumulative impacts.....	38
7	Environmental management.....	39
7.1	Environmental management plans	39
7.2	Summary of safeguards and management measures	40
7.3	Licensing and approvals.....	54
8	Justification and conclusion	55
8.1	Justification	55
8.2	Objects of the EP&A Act	55
8.3	Conclusion	58

9 Certification	60
10 References	61
Appendix A Site Photos	62
Appendix B Consideration of clause 228(2) factors & Consideration of matters of National Environmental Significance and Commonwealth land	64
Appendix C Statutory consultation checklists	69
Appendix D Background Searches	74
Appendix E Stockpile Management Plan	82
Appendix F Acid Sulfate Soils Management Plan	83
Appendix G BCD comment	84

List of Figures

Figure 1-1: Location of the proposed modification	2
Figure 1-2: The proposed modification	3
Figure 3-1 Stockpile pad design and fill	12
Figure 3-2 Stockpile design and pad preparation	13
Figure 10-1 Coastal Management Areas under the CM (SEPP) in the Bermagui Harbour and Entrance Channel area (DPIE, 2021)	78
Figure 10-2P Priority Oyster Aquaculture Areas (POAA) in the Bermagui River and Estuary Area (DPI, 2021)	79
Figure 10-3 Estuarine macrophytes in the Bermagui River and Estuary Area (DPIE, 2021)	80

List of Tables

Table 1-1 Summary of issues raised by key stakeholders (Advisian, 2016)	5
Table 1-2 Justification for revised scope of works	7
Table 6-1 Sediment quality investigation results (WorleyParsons, 2015)	24
Table 7-1: Summary of site specific safeguards	40
Table 7-2: Summary of licensing and approvals required	54
Table 8-1 Objects of the EP&A Act	55

Terms and acronyms used in this REF

Term/Acronym	Description
AHD	Australian Height Datum
AS	Australian Standard
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW).
BCA	Building Code of Australia
CEMP	Construction environmental management plan
CM SEPP	State Environmental Planning Policy (Coastal Management) 2018
EIA	Environmental impact assessment
EPA	NSW Environmental Protection Agency
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
MNES	Matters of national environmental significance under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
NPW Act	<i>National Parks and Wildlife Act 1974</i> (NSW)
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
TfNSW	Transport for New South Wales

1 Introduction

1.1 Proposed modification overview

Transport for NSW (TfNSW) propose to modify the Review of Environmental Factors (REF) for the *Bermagui Boat Harbour and Entrance Channel Sediment Investigation* prepared by Advisian (2016), and subsequent modifications. by reassessing the final destination of dredged marine sediments of the Bermagui Harbour and Entrance Dredging Project (the Project).

Key features of the proposed modification (the Proposal) would include:

- Leaving the stockpile of 12,000m² of Virgin Excavated Natural Materials (VENM) material removed from Horseshoe Bay Beach in-situ, rather than relocating to Moorhead Beach as suggested in the Project REF.
- Material dredged from inner harbour areas of the Bermagui Boat Harbour (Area 3, 4 and 5) and placed at the stockpile site to be tested and classified for reuse or waste.
- Managing the stockpile for long-term storage of the dredge material according to the *Stockpile Site Management Guidelines 2015*.
- Material dredged from Areas 2 and 6 would be placed offshore of Moorhead Beach in/behind the surf zone.

The location of the stockpile site is shown in Figure 1-1. No change to the location is proposed. The works area, including dredging areas, is provided as Figure 1-2. Chapter 3 describes the proposed modification and its key features in more detail. Photos of the site are provided in Appendix A.

The original *Bermagui Boat Harbour and Entrance Channel Sediment Investigation REF* (Advisian, 2016), henceforth the 'Project REF' in this addendum REF, was not placed on public exhibition.

In addition, the following Addendum REF for the Project was also prepared in 2020:

- *Bermagui Boat Harbour, Bermagui River and Entrance Channel Dredging addendum REF* (Blue-sky Planning , 2020) (henceforth the 'Project REF Addendum 1').

The proposed modifications detailed in this Addendum REF would be undertaken concurrent with dredging works in Areas 6 and 2 (refer to Figure 1-2). These areas will be dredged in accordance with the provisions of the project REF and project REF addendum. Clean dredge spoil from these areas will be hydraulically placed in the surf zone off Moorhead Beach.



Figure 1-1: Location of the proposed modification

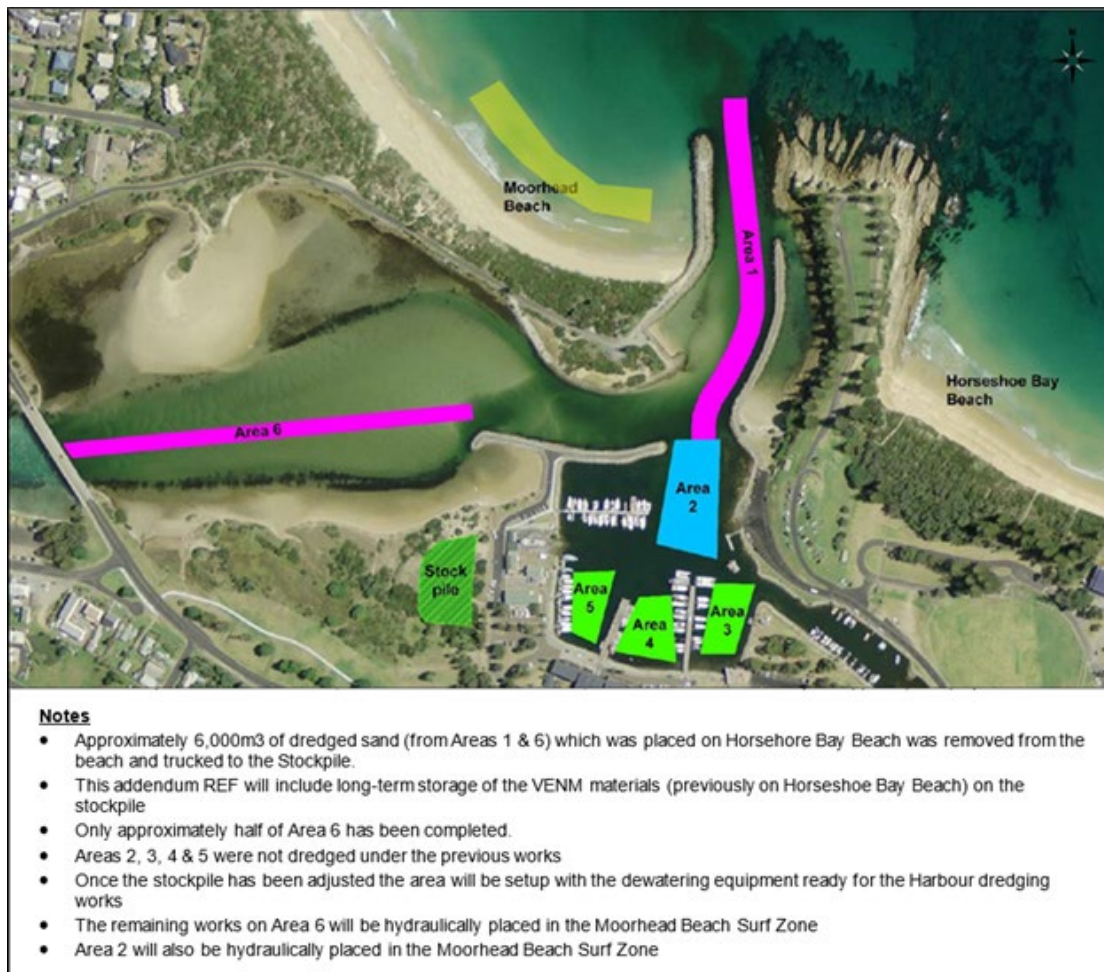


Figure 1-2: The proposed modification

1.2 Purpose of the report

This addendum review of environmental factors (REF) has been prepared by NGH Pty Ltd on behalf of TfNSW Maritime Infrastructure Delivery Office. For the purposes of these works, TfNSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This addendum REF is to be read in conjunction with the Project REF (Advisian, 2016), and the 'Project REF Addendum 1' (Blue-sky Planning, 2020). The purpose of this addendum REF is to: describe the proposed modification; document and assess the likely impacts of the proposed modification on the environment; and, detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in context of clause 228 of the Environmental Planning and Assessment Regulation 2000, *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS required? guidelines) (DUAP, 1995/1996), the Marinas and Related Facilities EIS Guideline (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the addendum REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, including that TfNSW examine and take into account to the fullest extent

possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the addendum REF would be considered when assessing:

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Urban Spaces under Division 5.2 of the EP&A Act.
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report.
- The potential for the proposed modification to significantly impact any matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Australian Government Minister for the Environment on whether assessment and approval is required under the EPBC Act.

1.3 Background

The Bermagui Boat Harbour provides berthing for a number of commercial fishing vessels supplying the Bermagui Fisherman's Co-operative, many recreational motor and sailing boats, Marine Rescue NSW and also provides marine servicing and slipway facilities for the local area. The Entrance Channel provides the only access into the Bermagui River and out into the ocean.

The most recent prior dredging campaign had been undertaken in 2003. This historical work was performed using a small cutter section dredge and two locations within the Boat Harbour plus the Entrance Channel were dredged to - 4.5m AHD. Materials from within the harbour were pumped to a bunded disposal site immediately west of the slipway. Clean sands from the Entrance Channel were used for renourishment of Moorhead Beach.

In 2016, DPI-Lands commissioned the original REF investigation works for the Project, with the aim to assess the likely potential environment impacts of the proposed dredging and associated spoil disposal activities, and to consider the appropriate level of environmental assessment of the Project (Advisian, 2016). Subsequent to this, but prior to dredging activities commencing, the Project REF Addendum 1 was prepared in response to further consultation with Bega Valley Shire Council regarding the dredging strategy and disposal options.

1.3.1 Bermagui Boat Harbour and Entrance Channel Sediment Investigation: Review of Environmental Factors and Sediment Options Report (Advisian, 2016)

The scope of works at the time considered by Advisian in their assessment included dredging parts of the Bermagui Boat Harbour and Entrance Channel to - 4.5 m AHD as required to maintain safe navigation of vessels. This included assessment of the following activities:

- Dredging and relocation of clean marine sands from the Entrance Channel to be disposed of at one of two identified beach disposal sites (Moorhead Beach or River Beach) in close proximity to the dredge location.

- Dredging and relocation of marine sediments from the Boat Harbour to a land-based disposal site west of the Bermagui Slipway, which is also in close proximity to the dredge location.
- Installation/removal of dredge pipelines, dewatering bunds and temporary works.

The original objective of the proposed dredging at the time was to ensure the maintenance of safe navigation for commercial and recreational vessels travelling through the Bermagui Entrance Channel into the Bermagui River and Boat Harbour. This was informed by targeted consultation with key stakeholders conducted in the first half of 2016. Key issues raised at the time are summarised in Table 1-1.

In order to re-establish safe Entrance Channel access and navigation, an estimated 12,000m³ of marine sands was required to be removed. An additional 5,000m³ of material would need to be extracted from the Boat Harbour. This equates to removing a total of 17,000m³ of marine material through dredging activities.

This volume was under the scheduled activity threshold for Extractive activities (water based) as prescribed in Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act). Therefore, an Environment Protection Authority (EPA) licence was not required for the activity at the time.

Table 1-1 Summary of issues raised by key stakeholders (**Advisian, 2016**)

Issue	Stakeholders
Shallow areas in the harbour impose safety hazards for recreational craft and restriction mobility boating/berthing.	Marine Rescue Bermagui Fishing Co-op
Shallow areas in the Entrance Channel inhibit access for large commercial fishing vehicles, which were only able to enter at high tide.	Bermagui Fishing Co-op
The Entrance Channel needs to be widened to allow for safe marine navigation.	Marine Rescue
The depth of the rocky reef which lies across the entrance to the channel limits the depth to which dredging will be beneficial	Marine Rescue
The shallow sandy beach area on the northern side of the Entrance Channel is not really an issue for vessels entering the harbour	Bermagui Fishing Co-op
The Bermagui Slipway operator requires a 1.6 m high tide to slip the largest vessel in the harbour.	Bermagui Marine Services
Dredging around the sides / underneath the slipway should be avoided as it has undermined its stability in the past	Bermagui Slipway

A number of dredging options were considered at the time. These included:

1. Doing nothing (i.e., not dredging);
2. Considering alternative dredging options based on the location of seagrass meadows, the specific dredging needs identified through consultation and the practicality and impact of difference dredging equipment; and,
3. Considering alternative disposal options, including
 - a. Moorhead beach
 - b. River beach
 - c. Vacant land immediately west of the Bermagui slipway
 - d. Eastern end of Horseshoe Bay (requested for consideration by Bega Valley Shire Council), and
 - e. Offshore disposal (at sea).

The Project REF focused on disposal options a. b. and c.

Option d. was not considered practical due to distance and topography. Option e. was not considered practical or sustainable due to financial costs, potential environment impacts and the proximity of Bateman's Bay Marine Park.

Advisian (2016) recommended in the Project REF that the majority of dredged material from the Entrance Channel should be placed on the eastern end of Moorhead Beach (option a) by pipeline. Some material could also be used to:

- Renourish River Beach (avoiding seagrass areas) or;
- Remediate any existing borrow pits from the vacant land immediately west of the harbour, or;
- Temporarily stockpile on adjacent land for use by Council to renourish other nearby beaches (e.g. Horseshoe Bay Beach).

Furthermore, it was recommended that the material removed from the Boat Harbour should be delivered to vacant Crown land on the western side of the Harbour subject to further material testing and consultation with the NSW Environmental Protection Authority (Advisian, 2016).

1.3.2 Bermagui Boat Harbour, Bermagui River and Entrance Channel Dredging Addendum REF (Blue-sky Planning , 2020)

Following consultation with BVSC and further sediment sampling, DPIE – Crown Lands revised the scope of dredging works and hence commissioned the first addendum to the Project REF.

Prepared by Blue-sky Planning (2020), the scope of works assessed for the amendment were:

- Expanding the dredge footprint to include approximately 6,000m³ of clean marine sand from the Wallaga Lake Road Bridge to the Entrance Channel to address stakeholder consultation issues.
- Disposal of clean marine sand to Horseshoe Bay Beach via a pipeline through Dickinson Park (Lot 7063 DP 1118744), which is a Council managed Crown Reserve, and to Moorhead Beach via submerged pipeline.
- Dredging and relocation of marine sediments from the Boat Harbour to a land-based disposal site west of the Bermagui Slipway via an overland pipeline and testing of marine sediments from the boat harbour using a compartmentalised testing regime to minimise the amount of marine sediment being disposed of to landfill.

- The preparation of a sediment sampling and analysis plan for waste classification for areas not previously sampled and for boat harbour sediments in relation to disposal options.

The justification for this revised scope of works is summarised in Table 1-2.

The new total dredge volume is expected to be a maximum of 27,000m³. Approximately 12,300m³ would be placed on Horseshoe Bay Beach, 8,000m³ on Moorhead Beach and the remainder dredged from the harbour and placed on the Crown land stockpile site west of the boat harbour (consistent with the Project REF).

Table 1-2 Justification for revised scope of works

Activity	Justification
Expanding dredging footprint.	Stakeholders expressed a need for the dredging footprint to extend further west to address infilling in the Bermagui Harbour as far as the Wallaga Lake Road bridge, to access the boat ramp on the southern side of the bridge.
Disposal of clean marine sand to Horseshoe Bay and Moorhead beaches.	Bega Valley Shire Council also identified that Horseshoe Bay Beach is in need of sand replenishment.
Dredging, relocation and onsite testing of Harbour sediments.	The cost of transporting and depositing the sediment at a licensed land fill facility is prohibitive, and it has been determined that an on-site testing regime at the land-based placement site west of the harbour will form part of the proposed scope of works to minimise the amount of sediment being sent to landfill.
The preparation of sediment sampling and analysis plan for areas not previously sampled	A Sediment Sampling and Analysis Plan for testing of the sediments will be required to be prepared and approved by Crown Lands prior to the commencement of the works in the boat harbour.

1.3.3 Approval and implementation of works

These assessments were conducted in accordance with s5.5 of the *Environmental Planning & Assessment Act (1979)* and Part 14 Division 1 Clause 228 of the *Environmental Planning & Assessment Regulation (2000)*. Under Division 13, Clause 68, of *State Environmental Planning Policy (SEPP) Infrastructure 2007*, development carried out by or on behalf of a public authority for the purpose of port, wharf or boating facilities is permissible without consent.

It was determined that the proposed scope of works as outlined in the Project REF and the Project REF Addendum 1 would not have a significant impact on the environment and, therefore, that no Environment Impact Statement (EIS) was required.

The Project was approved in April 2020.

During the actual execution of the proposed works (May to December 2020) the dredging contractor completed excavation of Area 1 and approximately half of Area 6. However, Areas 2, 3, 4 and 5 were not completed. Refer Figure 1-2.

The material dredged from Areas 1 and 6 were initially placed on Horseshoe Bay Beach as proposed and assessed in the Project REF Addendum 1. However, this disposal option generated concerns from the community. In response, approximately 12,000m³ of dredged marine sands placed on the beach have been relocated by truck to the designated stockpile area west of the harbour.

1.3.4 Bermagui Harbour Dredging Addendum REF (this addendum REF)

TfNSW, who now coordinate and manage the maritime functions of DPIE-Crown Land through the Maritime Infrastructure Delivery Office, propose to now leave the relocated 12,000m² of Virgin Excavated Natural Materials (VENM) within the stockpile area *in situ*.

This differs from the Project REF, which noted that the material would be hydraulically placed on Moorhead Beach (Advisian, 2016). Rather, the material will remain on the stockpile for an indefinite amount of time. As such, a stockpile management plan will need to be produced to manage issues that arise from the long-term storage of the material. An acid sulfate soils management plan would also need to be prepared.

The remaining dredging works in Area 6 (refer Figure 1-2) will continue as stated in the original REF, meaning the dredge spoil will be hydraulically placed on Moorhead Beach. It was noted that the harbour was dredged in 2003, and the sand was placed on Moorhead Beach.

Considering the change to the original scope of works, an additional Addendum REF is required to re-assess the environment impacts of the Dredging Project proposal and fulfil the requirements outlined in Division 5.1 of the EP&A Act and Section 5.5 of the EP&A Act. It pertains in particular to the following amended scope of works:

- Leaving the stockpile of 12,000m³ of Virgin Excavated Natural Materials (VENM) material removed from Horseshoe Bay Beach in-situ, instead of the relocation to Moorhead Beach as suggested in the project REF.
- Placement of Area 3, 4 and 5 at the stockpile site to be tested and classified for reuse or waste.
- Managing the stockpile for long-term storage of the dredge material according to the *Stockpile Site Management Guidelines* (TfNSW, 2015).
- Material dredged from Areas 2 and 6 would be placed offshore of Moorhead Beach in/behind the surf zone.

2 Need and options considered

2.1 Strategic need for the proposed modification

Chapter 2 of the Project REF and chapter 3 of the Project REF Addendum 1 addressed the strategic need for the project, the project objectives and the options that were considered. These were summarised in section 1.3.1 of this report. The proposed modification described and assessed in this Addendum REF is consistent with the strategic need for the project.

The proposed modification is required to address community concerns regarding the disposal and stockpiling of marine sands from the Bermagui Harbour Entrance Channel on sand dunes within Horseshoe Bay Beach.

2.2 Proposal objectives and development criteria

Chapter 2 of the Project REF identifies the proposal objectives and development criteria that apply to the proposed modification.

In addition to the objectives outlined in the Project REF, additional objectives specific to the proposed modification are to:

3. Remove the need to transport VENM from the project stockpile site to Horseshoe Bay Beach to address community concerns with the methodology.
4. Manage the existing stockpile site to ensure its suitability for long-term storage of marine sediment. This would encompass managing both:
 - a. The use of dredged materials, and
 - b. Potential contamination issues.

2.3 Alternatives and options considered

2.3.1 Methodology for selection of the preferred option

In developing options for the proposed modification, TfNSW sought to meet the project objectives and where possible avoid or minimise technical, economic, social and environmental constraints. The selected option was based on the NSW Environmental Protection Agency's (EPA) *Waste Management Hierarchy*, where adaptive re-use on site is the second most preferable option, with avoiding and reducing waste production being the first.

Detailed options analysis for the dredging works as a whole were assessed in the Project REF.

2.3.2 Analysis of options

Option 1 – Do Nothing

The option to 'do nothing' should always be considered when identifying and assessing project alternatives. In regard to the proposed modifications to the Project REF, doing nothing would entail not dredging the remaining areas of Bermagui Boat Harbour and Entrance Channel. This option was not considered acceptable or feasible, as it would not mitigate the current safety and navigation hazards for commercial and recreational

users of the waterway as identified by stakeholders during consultation (described in the Project REF, and summarised in this report, section 1.3.1).

Option 2 – Continue placing stockpiled sediments on Horseshoe Bay Beach as described in the Project REF Addendum 1

The option to continue stockpiling sediment on Horseshoe Bay Beach was not considered acceptable. It would disregard community feedback, which would be detrimental to TfNSW's relationship with the community and key stakeholders.

This option would align with the project objectives of the project REF and Project Addendum REF 1, but is not considered feasible as a result of the above.

Option 3 – Offsite disposal

The Project REF advised that Council's Central Waste Facility is the nearest licensed facility capable of dredged accepting marine material. That facility is located approximately 80km to the south of Bermagui.

Offsite disposal at the landfill facility would enable TfNSW to relocate and permanently dispose of VENM originally placed on Horseshoe Bay Beach and new dredged material to be collected. However, the cost of transporting and depositing the material to the licensed land fill facility is prohibitive and not cost efficient.

Option 4 – Long-term stockpiling at the existing stockpile site

This option would involve preparing the existing stockpile site to the west of Bermagui Harbour as a long-term storage site for all VENM removed from Horseshoe Bay Beach as well as the placement of dredged materials from Area 3, 4 and 5. Sediments would be tested and classified for re-use or waste.

In addition, under this option, the remaining VENM sediment to be dredged from Areas 2 and 6 would be placed offshore of Moorhead Beach in/behind the surf zone for beneficial re-use. The material will then be reworked along the shoreline over time. As the works are likely to be undertaken during the busier summer period, offshore placement would involve less disruption to the community.

This option would address community concerns regarding the placement of dredged VENM on Horseshoe Bay Beach. The placement of VENM sediment off Moorhead Beach aligns with the suggestions of DPIE and Council. This option would appropriately address the revised addendum REF objectives identified in Section 2.2.

2.4 Preferred option

The preferred option is Option 4 - Long-term stockpiling at the existing stockpile site. This option allows TfNSW to address community concerns regarding VENM disposal on Horseshoe Bay Beach, and its long-term storage in an established stockpile site. The stockpile site is in close proximity to Horseshoe Bay Beach, and Bermagui Harbour, therefore it would not impose prohibitive transport costs.

3 Description of the proposed modification

3.1 Design

The existing stockpile pad footprint will be retained as outlined in Appendix B of the Project Addendum REF 1. With reference to Figure 3-1 and Figure 3-2 below, the specific design elements of the stockpile, and assessed for this modification, are summarised as follows:

- Total stockpile area: 6,200m²
- Fill crest: 3.40m Australian Height Datum (AHD) (with a total stockpile depth of 1.25m)
- Total fill capacity: 29,000m³, encompassing:
 - Spoil from Area 3: 3,000m³
 - Spoil from Area 4: 2,300m³
 - Spoil from Area 5: 1,500m³
 - Spoil relocated from Horseshoe Bay Beach: 12,000m³
- The existing batter slope is 1 in 2
- VENM is partitioned according to the designs in Figure 3-1

The partitioned design plan outlined in Figure 3-1 will be applied onto the existing stockpile site, which was originally not constructed to a plan.

The establishment, operation, maintenance and decommissioning of the stockpile site would be guided by TfNSW's *Stockpile Site Management Guidelines* (TfNSW, 2015).

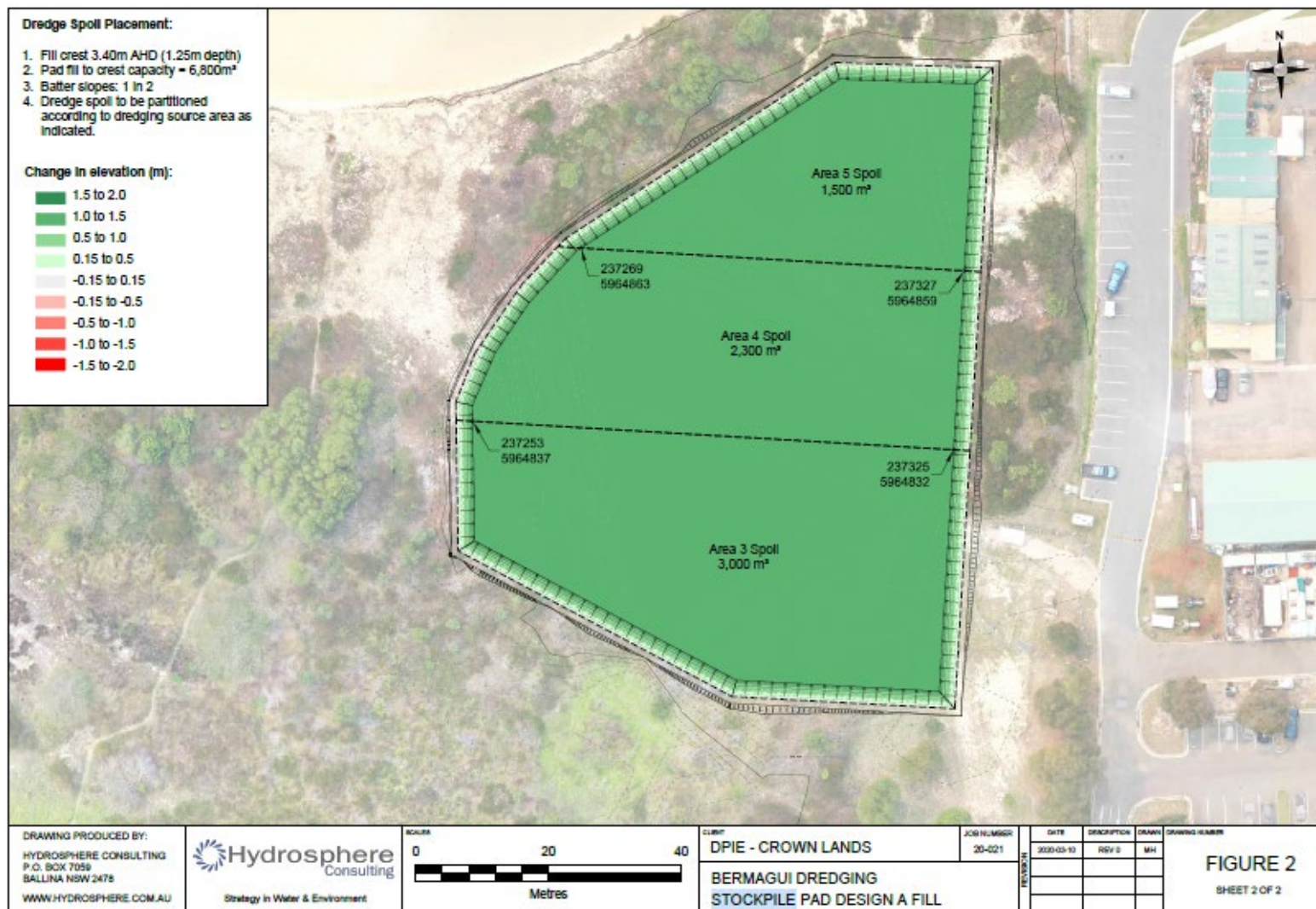


Figure 3-1 Stockpile pad design and fill

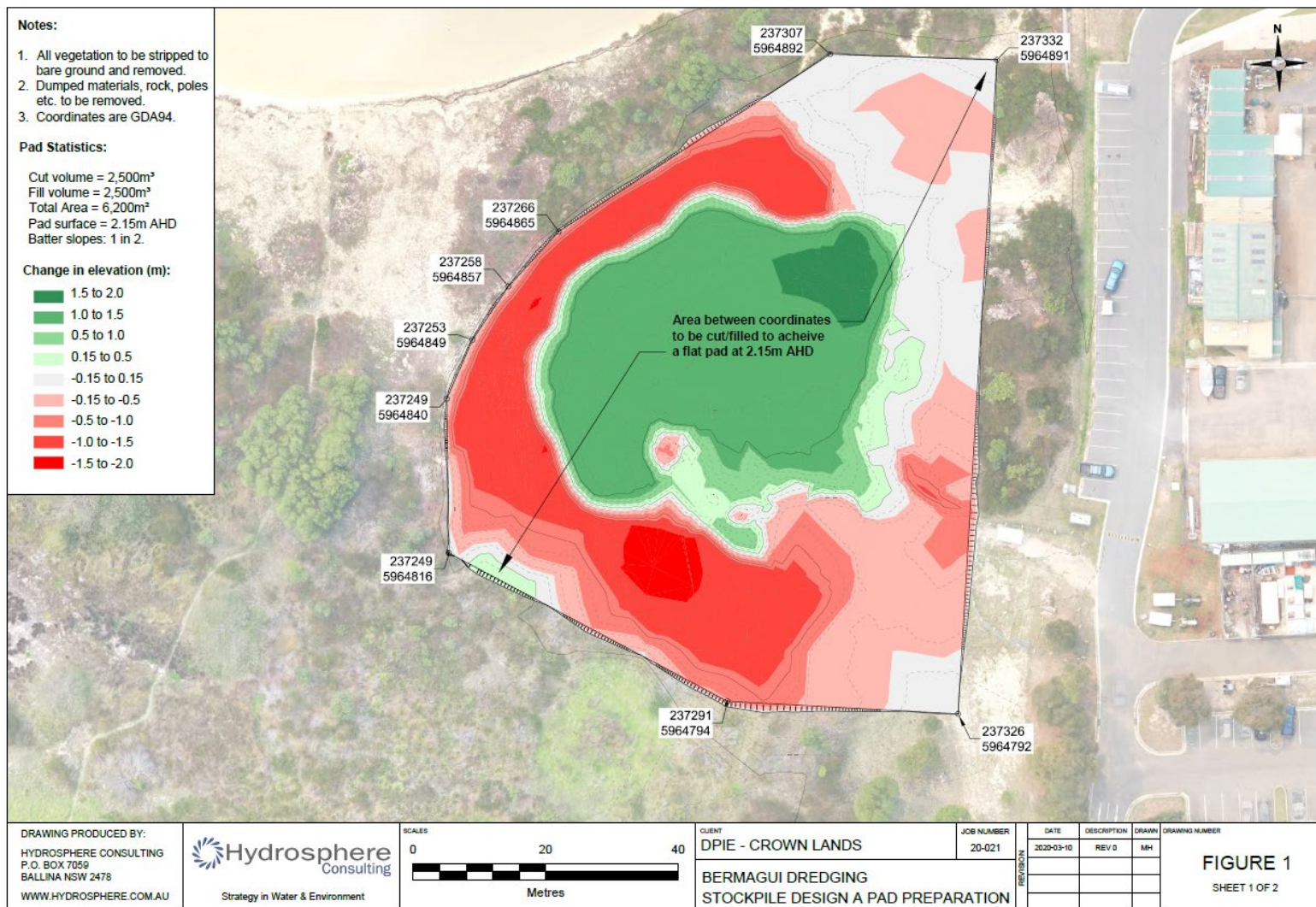


Figure 3-2 Stockpile design and pad preparation

3.2 Main features of the modification

TfNSW proposes to modify the Project REF to level and formalise the existing stockpile indicated in Figure 1-2 to ensure its suitability for the co-located and long term storage of both VENM relocated from Horseshoe Bay Beach, and sediments to be dredged from Areas 3,4 and 5. The specific configuration and extent of the permanent stockpile is shown in Figure 3-1.

Key features of the proposed modification would:

- Be confined to the area assessed in this addendum REF
- Include appropriate erosion and sediment controls during establishment of the engineered permanent stockpile
- Generally be consistent with the existing topography
- Involve adding material to the existing stockpile site, but overall rise of the surface level will be restricted to 2.5 metres
- Be in accordance with the Stockpile Site Management Plan prepared by NGH. Refer Appendix E.
- Be in accordance with the Acid Sulfate Management Plan prepared by NGH. Refer Appendix F.
- Include batter slopes no steeper than 3:1.

Furthermore, the remaining VENM sediment to be dredged from Areas 2 and 6 would be placed offshore of Moorhead Beach in/behind the surf zone for beneficial re-use in response to consultation with DPIE (BCD) and Council.

3.3 Construction activities

3.3.1 Work methodology

Site preparation

- No go zone flagging is to be installed around the boundary of the permanent stockpile site.
- Erosion and sediment controls are to be installed, including maintenance and addition of controls at the existing stockpile site.
- Adjustment of the existing stockpile according to specifications within the Stockpile Management Plan, including preparation of additional segregated areas if necessary to avoid material cross-contamination.

Dredging works to be carried out

- Excavation of remaining material from Area 6 and Area 2 (as per the determined project REF and relevant subsequent addendum).
- Hydraulic placement of dredged VENM from Areas 6 and 2 in the surf zone off Moorhead Beach as originally planned in the project REF via an overland pipeline.
- Dredging of inner harbour areas 3, 4 and 5 to be placed on stockpile area.
- In-situ waste classification of material to be carried out prior to transportation (to confirm classification as General Solid Waste).

- Acid Sulfate Soils ASS and Potential Acid Sulfate Soils (PASS), which will be encountered during dredging will be managed according to the Acid Sulfate Soils Management Plan (ASSMP) in Appendix F.

3.3.2 Construction hours and duration

Hours for construction work are as follows:

- Monday to Friday 7 am – 6 pm
- Saturday 8 am – 1 pm
- No work on Sunday or public holidays

As these are recommended, not mandatory, TfNSW may wish to alter hours of operation to suit other requirements (e.g. dredging operations may cease over the weekends or in other holiday periods to limit disruption to recreational and commercial users of the Boat Harbour and Entrance Channel).

The construction of the Proposal would be undertaken over 3 months, with anticipated commencement Q1 2022.

3.3.3 Plant and equipment

Equipment/machinery that may be used include:

- | | |
|----------------------------------|------------------------------|
| • Excavator 20-30 tonne | • Dredge Equipment |
| • Security flagging & fencing | • Booster pumps |
| • Bulldozer 13-20 tonne | • Support boats for dredging |
| • Dewatering Equipment TBC | • Heavy road transporters |
| • Generator (s) | • Sand sieving equipment |
| • Site Storage and accommodation | • Heavy off-road dumpers |

3.3.4 Source and quantity of materials

The dredging works to be undertaken in Areas 6 and 2 would have an estimated volume of 10600m³. This would be placed in the surf zone off Moorhead Beach.

The dredging works to be undertaken in Area 3, 4 and 5 would have an estimated volume of 6800m³ which would be placed at the stockpile site. The approximate 12,000m³ removed from Horseshoe Bay Beach has already been deposited at the stockpile site.

An estimated total of 17,000m³ of sediment would be placed and stored at the stockpile site.

3.3.5 Traffic management and access

Additional plant movements would occur within the proposal site during construction for the proposed modification as the remaining Areas 6 and 2 are dredged onto Moorhead Beach and the permanent stockpile is adjusted.

An estimated 5 trucks would be required to access the proposal area to deliver equipment and machinery required to carry out the works.

3.4 Ancillary facilities

The proposed modification would be carried out using the existing site compounds; no additional ancillary facilities to those outlined in the Project REF and the Project REF Addendum 1 would be required.

3.5 Public utility adjustment

Additional public utility adjustments are not required for the proposed modification.

3.6 Property acquisition

The proposed modification is confined to the existing established stockpile site, which is located on Crown Land. No additional property acquisition is required.

4 Statutory planning framework

This section provides the statutory and planning framework for the amended activity and considers the provisions of environmental planning instruments, NSW legislation and Commonwealth legislation as relevant to the amended scope of works. The planning framework in this addendum REF is consistent with the framework outlined in Chapter 3 of the Project REF (Advisian, 2016) and Chapter 4 of the Project REF Addendum 1 (Blue-sky Planning, 2020).

4.1 Environmental Planning and Assessment Act 1979

This addendum REF has been prepared in accordance with Part 5 of the Environmental Planning and Assessment (EP&A) Act and Clause 228 of the Environmental Planning & Assessment (EP&A) Regulation 2000 and considers whether the amended project would have a significant impact on the environment.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Under the Infrastructure SEPP a public authority may undertake a range of public activities without development consent provided that there has been appropriate consultation with all relevant government authorities and that an environmental impact assessment under Part 5 of the *Environmental Planning & Assessment Act* (EP&A Act) 1979 has been undertaken.

Dredging of the Boat Harbour, Bermagui Harbour and Entrance Channel would be undertaken on behalf of TfNSW Maritime, and hence it would be defined as:

- “waterway or foreshore management activities”, i.e.:
 - instream management or dredging to rehabilitate aquatic habitat or to maintain or restore environmental flows or tidal flows for ecological purposes
- coastal management and beach nourishment; and/ or
- “port, wharf or boating facilities”, i.e.:
 - routine maintenance works (including dredging, or bed profile levelling, of existing navigation channels if it is for safety reasons or in connection with existing facilities).

Consultation with key stakeholders was undertaken in the first half of 2016 for the original scope of works (Advisian, 2016). The dredging works and disposal works have been subject to environmental assessment (Advisian, 2016).

Additional consultation will be undertaken with Bega Valley Shire Council and Crown Lands once the pipeline routes and final scope of works are determined.

4.1.2 State Environmental Planning Policy (Coastal Management) 2018

The proposed works are consistent with the aims of the Policy as they protect the assets of the coast.

The proposed modifications to the stockpile site are located in the following areas mapped under the CM SEPP:

- Proximity area for Coastal Wetlands (Clause 11)
- Coastal Environment (Clause 13)
- Coastal Use Area (Clause 14).

Refer Appendix D.

As per clause 11 of the CM SEPP, development on land identified as proximity area to coastal wetlands cannot be granted unless the consent authority is satisfied that the proposed development will not significantly impact on either:

(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetlands; or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetlands.

TfNSW is the consent authority for the proposed modifications. The potential impacts of the modification on the biophysical, hydrological or ecological integrity of the adjacent coastal wetlands are addressed in section 6. Potential impacts on surface and groundwater flows are addressed in section 6.2.

In regard to Clause 13 and Clause 14 of the CM SEPP, development consent is not required for the proposed works as the works are permissible without consent under the ISEPP. Therefore, the provisions of Clauses 13 and 14 do not apply.

4.1.3 State Environmental Planning Policy (Primary Production and Rural Development) 2019

This REF has taken into consideration Division 4 of *State Environmental Planning Policy (Primary Production and Rural Development)* due to the proximity of the proposed amended works to Priority Oyster Aquaculture Areas (POAA) within the Bermagui River. The nearest POAA is located approximately 310m upstream of the Wallaga Lake Road bridge. Refer to Appendix D.

Development consent is not required for the proposed works, however potential water quality impacts and management measures have been addressed in Section 6.2 of this addendum REF to ensure that there is no adverse impact on water quality, and thereby indirect impacts on oyster aquaculture. The Department of Primary Industries (DPI) was consulted as part of the Project REF.

Bega Valley Local Environmental Plan 2013

The dredging footprint is contained entirely within the W3 Working Waterways zone. The Stockpile site is completely contained within the SP3 Tourist zone. The W3 and SP3 zones were considered during the project REF and no further consideration is required for this addendum.

The disposal site at Moorhead Beach is zoned E2 Environmental Conservation. The proposed works are consistent with the objectives of the E2 zone as they contribute to the protection and management of the beach environment.

In accordance with Division 13 Clause 68(2) of the ISEPP, the proposed works can proceed without development consent.

4.2 Other relevant NSW legislation

4.2.1 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) is administered by DPI - Fisheries and applies to all State waters. In its Schedules, the FM Act lists threatened species of fish and marine vegetation, endangered populations and ecological communities, critical habitats and key threatening processes. All aquatic vegetation (mangroves, seagrass and seaweeds) is protected under the FM Act.

The FM Act requires that an assessment of significance (7-part test) be applied to species of fish and marine vegetation (i.e. seagrasses, mangroves and seaweeds) and populations or ecological communities listed under its Schedules that may be affected by a proposed action, development or activity. If a significant impact on a threatened species is likely, a Species Impact Statement (SIS) must be completed, and the concurrence of NSW Fisheries is required.

In relation to the proposed amended works, when a proposal is likely to harm aquatic vegetation a Permit to Harm Marine Vegetation must be obtained under s.205 of the FM Act. As shown in Appendix C of the Project REF Addendum 1, the additional works are not expected to impact any areas of marine vegetation.

A search of the FM Act 1994 for listed marine species with the potential to occur in the proposed dredge location was undertaken for the Project REF, and is detailed by Advisian (2016) in section 6.4, 6.5 7 of that REF.

4.2.2 Crown Land Management Act 2016

The stockpile site is located on Crown Land.

Under Section 5.3 of the *Crown Land Management Act 2016* the Minister can do anything with Crown Land that a registered proprietor of land can do. Under section 12.6 (2)(a) of the same Act, the Department can enter into a contract for the undertaking of works on Crown Land.

4.2.3 Biodiversity Conservation Act 2016

DPIE is responsible for administering the *Biodiversity Conservation Act 2016* (BC Act). The BC Act requires that an assessment of significance be applied to species and communities listed under its Schedules that may be affected by a proposed action, development or activity. If a significant impact on a threatened species is likely, a Species Impact Statement (SIS) must be completed and the concurrence of DPIE is required.

An updated search of the NSW BioNet Database for species with the potential to occur in the proposed dredge and stockpile locations was undertaken for this addendum REF (refer Appendix D). The project REF and project REF addendum assessed the impacts of the proposed works and provided a series of mitigation measures to manage potential biodiversity impacts. The proposed modification would not incur additional biodiversity impacts beyond those identified and assessed in the Project REF and Project REF Addendum 1, including impacts to biodiversity over the long-term. No new threatened entities impacted by the Proposal were identified during the updated searches.

4.2.4 Heritage Act 1977

The *Heritage Act* 1977 provides for the conservation of natural and cultural heritage of State or local significance. Heritage items listed in a statutory register or identified under an interim heritage order cannot be demolished, redeveloped or altered without the approval of the State. The Act also has provision (delegation under the Commonwealth *Historic Shipwrecks Act* 1976) for the protection of marine relics (e.g. shipwrecks) and a permit is required to disturb them. The impacts of the proposed dredging on any historic shipwrecks were considered in the Project REF. The NSW Office of Environment and Heritage does not identify any shipwrecks in the Bermagui River.

4.2.5 Coastal Management Act 2016

The proposed amended works are located in the coastal zone, as defined by the *Coastal Management Act 2016* (CM Act). The proposed amended works are consistent with the objects of the CM Act as they contribute to maintaining the coastal zone as a vital economic zone and to supporting a sustainable coastal economy by mitigating the impacts and risks of coastal hazards.

Part 2 of the CM Act describes the coastal zone and objectives for coastal management areas which are identified by State Environmental Planning Policy (Coastal Management) 2018. The proposed works are located in the Coastal Environment Area and Coastal Use Area.

Part 3 of the CM Act applies to any public authority that exercises functions in connection with the coastal zone. Division 4 Clause 23 states:

23 Other public authorities to have regard to coastal management program and coastal management manual:

1. Public authorities (other than local councils) are to have regard to coastal management programs to the extent that those programs are relevant to the exercise of their functions.
2. In particular, those public authorities are to have regard to relevant coastal management programs and the coastal management manual in the preparation, development and review of, and the contents of, any plans of management that those public authorities are required to produce and, in doing so, are to have regard to the objects of this Act.

There is not yet a coastal management program in place that covers the works areas.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Commonwealth Department of Agriculture, Water and Environment (DAWE) for proposed '*actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land*'. These are considered in Appendix B and section 6 of the REF.

The assessment of the impact of the proposed modification on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental

significance or on Commonwealth land. Accordingly, the proposal has not been referred to DAWE under the EPBC Act.

4.4 Confirmation of statutory position

The proposed modification is categorised as development for the purpose of '*waterway or foreshore management activities*' and '*port, wharf or boating facilities*'; and, is being carried out by or on behalf of a public authority (TfNSW). Under clause 68 of ISEPP the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Division 5.1 of the EP&A Act. Consent from Council is not required.

5 Consultation

5.1 Stakeholder consultation

No changes to the consultation strategy outlined in Chapter 4 of the project REF are required or proposed (refer Appendix C). In accordance with the SEPP (Infrastructure), consultation with key stakeholders was undertaken in preparation of the Project REF (Advisian, 2016).

Comments were provided by DPIE's Biodiversity Conservation Division (BCD) on 1 September 2021 in response to the Project REF and Project REF Addendum 1. Refer Appendix G. These comments have been addressed in this Addendum REF.

Based on the changes, it is considered unlikely further permit updates or consultation is required with the NSW Department of Primary Industries (Fisheries).

Consultation with DPIE-Crown Lands may be required if any new permits or changes to existing permits are required for the works. TfNSW have consulted with BVSC regarding the proposed modifications, including seeking Council comment on this draft Addendum REF. BVSC provided minor comments on the potential for re-using any existing VENM at the stockpile site. These are addressed in the Stockpile Management Plan.

If the planned timing for dredging and deposition off Moorhead beach may coincide with the shorebird nesting season, consultation should be undertaken with DPIE shorebird officers.

5.2 Community outcomes

Community concerns regarding the placement of dredged material on Horseshoe Bay Beach motivated the relocation of that material to the existing stockpile site, and have been considered in this Addendum REF.

The works will be subject to ongoing community consultation, including public display of this REF and preparation of a submissions report as described below.

5.2.1 Ongoing Consultation

This addendum REF will be placed on public display. Community and other stakeholders will have the opportunity to make submissions to TfNSW for their consideration.

The display period will take place from [XX day/month/year] and will end on the [XX day/month/year].

Following the display period, a Submissions Report would be prepared as outlined below in Section 5.2.2

5.2.2 Submissions Report

Subsequent to public display of this Addendum REF and receipt of submissions, a Submissions report will be prepared to:

1. identify and respond to issues raised during the public display and submissions period; and,

2. assess and justify any changes to the proposal, including any refinements to safeguards and environmental management measures.

The Submissions Report will be prepared in collaboration with TfNSW and in accordance with their reporting guidelines.

The Submissions Report will list the respondents, identify and categorise raised issues, summarise the issues and respond to the issues. It may be necessary for additional studies to be undertaken to further address particular issues. This may involve further specialist assessments, design investigations or stakeholder consultation. The need for any such work will be discussed with TfNSW once key issues have been identified and characterised.

Any changes to the proposed modification resulting from further investigations or submissions will be documented, assessed and justified in the Submissions Report. Should changes to the proposed modification require revision or addition of safeguards and management measures in this Addendum REF, these changes will be outlined in the Submissions Report.

6 Environmental assessment

This section of this Addendum REF identifies and characterises the potential environmental impacts associated with the construction and operation of the proposed modification to the Bermagui Boat Harbour and Entrance Channel dredging program as outlined in section 3.

All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the factors specified in the *Is an EIS required?* (DUAP, 1995/1996) guideline as required under clause 228(1) of the Environmental Planning and Assessment Regulation 2000 and the *Marinas and Related Facilities Guideline* (DUAP, 1996). The factors specified in clause 228(2) of the Environmental Planning and Assessment Regulation 2000 are also considered in Appendix B.

Detailed investigation into the environment impacts of the dredging program and previous modifications are provided in the Project REF (Advisian, 2016) and Project REF Amendment 1 (Blue-sky Planning, 2020). The potential impacts, and mitigation and management measures addressed below are only relevant to the proposed modification.

6.1 Soils and sediment quality

6.1.1 Existing environment

The stockpile site is existing. The existing environment of the stockpile site is described in the Project REF.

Detailed testing of marine sediments was conducted prior to the dredging program to determine the quality of those sediments. The testing was used to inform the dredging and disposal strategy outlined in the Project REF (Advisian, 2016) and accompanying Sediment Sampling and Analysis Plan (SSAP) (WorleyParsons, 2015).

Testing outcomes pertaining to Areas 1 and 6 (Entrance Channel sediments) and Areas 3, 4 and 5 (inner Boat Harbour sediments) are summarised in Table 6-1 below for reference. Potential contaminants of concern are highlighted. The testing indicated that potential contaminants are not detectable in sediment from Area 1 and 6, and hence could be classified as VENM.

However, possible acid-sulfate soils (PASS) and Tributyltin (TBT) occur in the Harbour sediments in Areas 3, 4 and 5. These sediments are considered contaminated.

Table 6-1 Sediment quality investigation results (WorleyParsons, 2015)

Contaminant/Physio-chemical property	Entrance Channel (Area 1 and 6)	Boat Harbour (Area 3,4 and 5)
Particle size	+75 µm to +19.0 mm	+75 µm to +19.0 mm.
Foreign material	No foreign materials as listed by the NSW EPA were detected	Wood; absolute maximum concentrations were exceeded at three test locations within the harbour.
Acid sulfate soils (ASS)	No physical indicators of AASS were observed.	No physical evidence of AASS were observed.

Contaminant/Physio-chemical property	Entrance Channel (Area 1 and 6)	Boat Harbour (Area 3,4 and 5)
	<p>Net acidity results were either below the laboratories limit of reporting or below adopted assessment criteria.</p> <p>Risk of sediments being ASS is considered negligible.</p>	<p>Dark grey / black fine organic sediments were observed in the top 300 mm of the majority of cores indicating the potential presence of PASS.</p> <p>Net acidity, including the acid neutralising capacity (ANC) of the sediment, exceeded the adopted assessment criteria only one test location in the inner harbour (in the eastern arm of the harbour).</p> <p>Net acidity, excluding the ANC of the sediment, exceeded the adopted assessment criteria at seven other test locations.</p> <p>Net acidity concentrations for all remaining test samples were either below the laboratories limit of reporting or below the adopted assessment criteria.</p>
Metals/Metalloids	Individual concentrations, means and 95% UCLs of all metals and metalloids in the Entrance Channel and Boat Harbour were below the respective NAGD screening levels and NSW EPA ENM levels.	
Tributyltin (TBT)	Individual concentrations, means and 95% UCLs of normalised values for organotin compounds were below the respective NAGD screening level.	<p>TBT concentrations exceeded, particularly in upper sediment layer.</p> <p>The mean and 95% UCL of (normalised) TBT was 17.6 µgSn/kg (and 8.4 µgSn/kg for non-normalised) compared to the NAGD screening level of 9 µgSn/kg on the 0 to 0.5 horizon.</p> <p>The ANZECC (2000) sediment quality guidelines ISQG-Low trigger value for non-normalised TBT (5 µgSn/kg) was exceeded at a number of sites</p>
Elutriates testing for TBT	N/A	Elutriates testing for TBT was undertaken on BH8 (0 - 0.35 m), BH13 (0 - 0.5 m) and BH14 (0 - 0.5 m). The average TBT result for elutriates testing was 2.8 ngSn/L which is below the ANZECC 95% protection trigger value of 6 ngSn/L.
Organochloride Pesticides	Individual concentrations, means and 95% UCLs of OCs in the Entrance Channel and Boat Harbour were below the respective NAGD screening levels.	
PCBs	Individual concentrations, means and 95% UCLs of OCs in the Entrance Channel and Boat Harbour were below the respective NAGD screening levels.	

Contaminant/Physio-chemical property	Entrance Channel (Area 1 and 6)	Boat Harbour (Area 3,4 and 5)
Hydrocarbons	Individual concentrations, means and 95% UCLs of hydrocarbons in the Entrance Channel and Boat Harbour were below the respective NAGD screening levels and NSW EPA ENM levels for all recorded hydrocarbons.	
Conclusions	Sandy sediments can be classified as Virgin Excavated Natural Material (VENM). Suitable for onshore disposal.	Cannot be classified as Excavated Natural Material due to the presence of PASS at some of the sites. Not suitable for onshore disposal without a Specific Resource Recovery Exemption. If no exemption pursued or accepted, then sediments may be disposed of at a licensed General Solid Waste landfill facility.

Subsequent to sediment testing, a stockpile Sampling and Analysis Plan (SAP) has also been prepared to detail the sampling and analysis strategy to be implemented at the stockpile site in accordance with the EPA's *Waste Classification Guidelines* (Hydrosphere Consulting, 2020). It outlines the appropriate stockpile design, and sediment treatment and stockpiling measures necessary to manage and mitigate contamination risks associated with the testing, dewatering and storage of material dredged from Areas 3,4 and 5 in the inner Boat Harbour.

The stockpile SAP does not address Entrance Channel sediments dredged from Areas (1 and 6), as this material was not original intended to be placed at the stockpile site. These materials were also considered VENM, so further management was required.

Broadly, sediment transport across the Bega Valley coast is influenced by the combined actions of waves, wind and currents (BMT WBM, 2015). However, there is presently little detailed understanding of the dynamics of longshore and cross-shore sediment transport at Moorhead Beach. In general, across NSW, net longshore drift tends to the north, and in the Bega Valley is strongly influenced by bounding cliffs and headlands. The Bermagui River training walls are present at the southern end of Moorhead Beach, with a recent Coastal Hazard Assessment for the area indicating that no sediment bypassing currently occurs around the training walls under the influence of longshore transport processes (BMT WBM, 2015). Nevertheless, sand does enter and become deposited in the Bermagui River Mouth and Entrance Channel under prevailing tidal processes.

6.1.2 Additional potential impacts

The proposed modification involves the long-term and co-located storage of 12000m³ VENM relocated from Horseshoe Bay Beach in addition to the dredged sediments to be taken from the inner Harbour Areas 3,4 and 5. The VENM materials are Entrance Channel sediments, originally dredged from Areas 1 and 6. This material has already been deposited on the stockpile site, dewatered and levelled.

The deposition of this material would be in addition to the approximately 6,800m³ of material to be dredged from the inner Harbour Areas 3,4 and 5 and stored on-site as

detailed and assessed in the Project REF. This equates to a revised total stored material volume of approximately 19,800m³ (compared to the 6,800m³ assessed in the Project REF and Stockpile SAP). The overall increase in height of the stockpile would be less than 2.5m. The overall surface area of the stockpile site is not anticipated to increase. All sediment deposited on the site would be restricted to the stockpile pad footprint illustrated in Figure 3-1.

Conscious of these changes to the planned stockpile site, key additional potential impacts may include:

- Landform instability and erosion
 - The stockpile site would not be fully isolated from the environment. It would involve bare and unstable porous areas of sand susceptible to wind and water erosion. It's not proposed at this stage to cover the stockpile site. This can lead to erosion and the deposition of sediment into the nearby environment, including the Bermagui River and nearby coastal wetlands.
- Potential oxidation of PASS
 - PASS may be present in the sediment dredged from Areas 3,4 and 5. The exposed design of the stockpile site may incur oxidation of PASS, the production of sulphuric acid in the soil, and the leaching of that into the nearby environment. Leaching can incur the following indirect impacts
 - Acidification of waterways, fish kills, habitat destruction, geotechnical instability (soil erosion/subsidence, aquifer clogging) and aggressivity to structures/structural damage to steel and concrete infrastructure.
 - Unnecessary disturbance of ASS areas causing acid generation, lowering pH levels and elevated dissolved metals.
 - Consequential community and social perceptions of the Project.
 - Long term consequences if ASS or acidic leachate travels downstream through sensitive estuarine wetlands.
 - Acid drainage may also exacerbate the mobilisation and concentration of any other toxic metals present in the dredged sediment or surrounding soil strata.
- Downward migration of TBT into and cross-contamination of the VENM at the base of the stockpile site.
 - Once contaminated, the VENM would no longer be suitable for future beach renourishment, and would need to be eventually disposed of at a licenced waste landfill facility.
 - Downward migration may also extend into the lower soil strata, and TBT contamination may expand to the surrounding environment.
- Further compaction of soils
 - Traffic and additional material laydown can compact soils and limit their ability to support vegetation. Maximising the use of existing areas of disturbance for the stockpile sites would be achieved. Traffic movements in and out of the site, as well as construction traffic movements along the proposal site would require management to rationalise and reduce impacts.

No soil disturbance works additional to those assessed in the Project REF and Project Addendum REF 1 are required for the existing stockpile site. All works would be confined to the stockpile site and access track.

The management of these additional risks would centre on appropriate pad design (including clear vertical partitioning between the VENM sediments and those to be deposited from Areas 3,4 and 5), installation and maintenance of erosion and sediment controls, as well as testing and management of specific contaminants as outlined in the Project REF, Project REF Addendum 1 and the Stockpile SAP.

PASS would be managed in accordance with the Acid Sulfate Soils Management Plan. Refer Appendix F.

Clean VENM sediments would be placed in the surf zone off Moorhead Beach. While studies indicate that the influence on longshore drift on the movement sediment from Moorhead Beach to the Entrance Channel is moderated by the Bermagui River mouth training walls (BMT WBM, 2015), sediment does still deposit and accumulate in the Entrance Channel under prevailing tidal conditions. Further detailed understanding of the processes of sediment transport and accumulation is required to:

- Predict likely movement of any deposited material;
- Identify if it will remain in the beach compartment;
- Determine the potential for the material to circulate back into the Entrance Channel; and,
- Inform preferred deposition locations to maximised beneficial re-use.

As such, TfNSW have commissioned Manly Hydraulics Laboratory to prepare a detailed sand placement monitoring program to identify and address potential sediment pathways from the placement site at Moorhead Beach.

6.1.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Run-off, erosion and sedimentation	Erosion and sediment control measures are to be implemented and maintained to: <ul style="list-style-type: none"> • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site. (in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)).	Construction Contractor	Construction
	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including	Construction Contractor	Operation

Impact	Environmental safeguards	Responsibility	Timing
	clearing of sediment from behind barriers) and records kept and provided on request.		
	Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.	Construction Contractor	Operation
General	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline.	Construction Contractor	Operation
Potential Acid Sulfate Soils	Potential or actual acid sulphate soils are to be managed in accordance with the Roads and Maritime Services Guidelines for the <i>Management of Acid Sulphate Materials 2005</i> .	Construction Contractor	Operation
Soil disturbance	No new access tracks to be created for the works.	Construction Contractor	Construction/Operation
Cross-contamination	VENM sediments will be clearly partitioned from materials dredged from Areas 3,4 and 5.	Construction Contractor	Operation
Sediment pathways	Implement further assessment to understand sediment transport between the beach and the Entrance Channel to: <ul style="list-style-type: none"> • Predict likely movement of any deposited material • Identify if it will remain in the beach compartment • Determine the potential for the material to circulate back into the Entrance Channel • Inform preferred deposition locations to maximised beneficial re-use 	Construction Contractor	Pre-construction
Sediment pathways	Implement a detailed sediment transport monitoring program to address potential sedimental pathways from Moorhead beach to the Bermagui River Entrance Channel. This monitoring plan shall consist of: <ul style="list-style-type: none"> • Pre and post beach renourishment hydrosurveys in conjunction with aerial 	Construction Contractor	Construction/Operation

Impact	Environmental safeguards	Responsibility	Timing
	photogrammetry surveys of the beach. <ul style="list-style-type: none"> Preparation of a sand testing, evaluation and monitoring program for the proposed dredge material. 		
Offshore placement (Moorhead beach) and sediment sampling	Sediment shall be piped to the surf zone north of the break wall (at least 50-100m north) to minimise potential for migrating back into the channel. Sediment sampling: <ul style="list-style-type: none"> Sedimental sampling shall be conducted on Moorhead beach to determine grain size, and therefore the appropriateness of the VENM sediments for beach re-nourishment (sand used for nourishment shall be similar grain size or slightly coarser). Samples shall be tested from the swash zone to foredune, with the swash zone to berm generally having coarser sand grading finer at foredune 	Construction Contractor	Construction/Operation

6.2 Hydrology and water quality

6.2.1 Existing environment

6.2.1.1 Surface water

The stockpile site is located in proximity to the Bermagui River, which is classified as a barrier river and is permanently open to the ocean. The Bermagui estuary covers an area of 2.2km². The river has a catchment area of 8,350ha.

The Bermagui River catchment had a pressure index of 3.1, which is considered moderate according to OEH's 2010 classification of pressures on catchments.

Very little existing water quality data could be sourced for the Bermagui River or Boat Harbour. In The State of the Catchments Report OEH (2010) indicates that the Bermagui River is a wave dominated estuary which results in naturally low turbidity.

As identified in the Project REF, water quality in the Bermagui Entrance and Harbour area is generally good and is regularly subject to tidal flushing. A summary of physio-chemical water quality data collected at the time of the Project REF is provided on page 51 of the REF document (Advisian, 2016).

6.2.1.2 Groundwater

Preliminary desktop review of the Bureau of Meteorology's Australian Groundwater Explorer (BOM, 2021a) for groundwater bores indicated two within 1km of the stockpile site:

- GW056008.1.1. (water supply)
 - Bore depth: 35m
- GW056866.1.1. (water supply)
 - Bore depth: 24m

Localised upper aquifer systems comprised of alluvial sediments as well as sedimentary rock are present to the south and east of the existing stockpile site. Bermagui river is likely to act as a primary discharge point for these aquifer systems.

The Bermagui River estuary is considered as a high potential Aquatic Groundwater Dependent Ecosystem (GDE) (BOM, 2021b). The coastal wetland immediately west of the stockpile site is considered a groundwater dependent wetland.

There are no terrestrial GDEs within close proximity of the stockpile site. The nearest is a patch of Estuarine Creek flat Scrub 350m to the south on the site of the Bermagui Golf Club (BOM, 2021b).

6.2.1.3 Coastal hazards

Coastal hazards mapped completed by BMT WBM on behalf of the BVSC indicated that the Bermagui River estuary is currently subject to inundation during storm tide events (BMT WBM, 2015). The northern section of the stockpile site is adjacent to land mapped as 'unlikely' to be inundated during storm tide events. In the 2050 planning horizon, the stockpile site is mapped as 'almost certain' to be inundated during storm tide events (BMT WBM, 2015). Refer appendix D.

The stockpile site is not subject to coastal erosion hazards.

6.2.2 Additional potential impacts

The long-term storage of sediment at the stockpile site has the potential to degrade water quality within the nearby Bermagui estuary. Field visits conducted in preparation of the Project REF identified sediment run-off from the stockpile site towards the estuary.

A water quality management and monitoring plan for the Bermagui dredging project has been previously prepared (Hydrosphere Consulting, 2020). It describes key risks to hydrology and water quality as a result of the project, including the storage of sediment from Areas 3,4 and 5 at the stockpile site.

However, the increased volume of sediment to be deposited and stored long term at the stockpile site as a result of the proposed modification may increase the risk of run-off, especially given the site's vulnerability to erosive processes as discussed previously. If uncontrolled, this would be detrimental to water quality in the estuary area, in particular through increased turbidity, leaching of contaminants and processes of sedimentation. While the additional risk imposed by the proposed modification is low, the use of appropriate sediment and erosion controls at the stockpile site in accordance with the *Stockpile Site Management Guidelines* (TfNSW, 2015), and as described in the Stockpile Site Management Plan (refer Appendix E) would be required.

Groundwater is not anticipated to be affected by the operation of the stockpile site. The coastal wetland aquatic GDE to the east of the stockpile is not anticipated to be affected.

The stockpile site is not currently at risk of inundation during storm tide events in the Bermagui River estuary. In accordance with *Stockpile Site Management Guidelines* (TfNSW, 2015), the dredged material would be permanently stored at the site. Therefore, storm tide inundation predicted for the site in the future would not impact the storage of materials at the site.

6.2.3 Safeguards and management measures

No additional safeguards and management measures are required for potential hydrology and water quality impacts beyond those outlined in the Project REF, the Project REF Addendum 1, the Bermagui Water Quality Management and Monitoring Plan and in section 6.1 of this report are required.

6.3 Other impacts

6.3.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Biodiversity	<p>The stockpile site and its access track are existing and already disturbed.</p> <p>Comprehensive description of the existing terrestrial and marine environment, and assessment of the dredging projects' potential impacts on biodiversity values is provided in the Project REF and Project REF Addendum 1.</p> <p>An updated Bionet search is provided in Appendix D, to identify listed threatened entities under the BC Act in the locality (i.e., within 10km) of the stockpile site.</p> <p>Moorhead Beach may provide habitat for shorebirds.</p> <p>Similarly, updated mapping of estuarine macrophytes in the Bermagui River and Estuary is provided in Appendix D. It indicates that seagrass extent (in particular, <i>Zostera</i>) within the estuary to the north of the stockpile site is more extensive than previous desktop mapping of marine flora conducted for the Project REF.</p> <p>The Macrophyte mapping also indicates extents of seagrass (<i>Zostera</i>) near Area 6. The Project REF only conducted limited biodiversity surveys for Area 6.</p>	<p>Additional minor vegetation clearing at the edge of the site may be required to facilitate the use of machinery to level the VENM sediments present there in preparation for deposition of sediment dredged from Areas 3, 4 and 5. This clearing would be minor and localised. The field visit to the site conducted for the Project REF identified much of the vegetation along the verge of the stockpile site and access track as disturbed and weed-infested.</p> <p>The stockpile site is located in a coastal wetlands proximity area (refer appendix D). The proposed modification to the stockpile site is unlikely to incur additional impacts to the biophysical, hydrological and ecological integrity of the nearby coastal wetland.</p> <p>No additional impacts to listed threatened entities are anticipated, given the pre-existing and disturbed status of the stockpile site.</p> <p>No additional impacts to estuarine macrophytes (e.g. seagrass) are anticipated by the amendments to the Stockpile Site. The safeguards and management measures outlined in the Project REF, the Project REF Addendum 1, this Addendum REF and its accompanying environmental management plans (Appendix E and F)</p>

Environmental factor	Existing environment	Potential impacts
		<p>are sufficient to minimise and manage impacts (e.g. from sediment run-off and impacts to water quality).</p> <p>Macrophyte mapping has been updated in this REF. The deposit into the washzone is unlikely to impact macrophytes due to the ocean environment. No further action would be required.</p> <p>The planned timing for dredging and deposition on Moorhead Beach may coincide with the shorebird nesting season. While sediment is likely to be placed offshore of the beach itself, as suggested by DPIE and BVSC, consultation should be undertaken with DPIE shorebird officers.</p> <p>Consolidated safeguards and mitigation measures for biodiversity impacts are outlined in section 7.2.</p>
Traffic and transport.	<p>Additional plant movements would occur within the proposal site during construction for the proposed modification as the permanent stockpile site is adjusted.</p> <p>An estimated 5 trucks would be required to access the stockpile site to deliver equipment and machinery required to carry out the works.</p>	<p>Trucks will access the stockpile site via the existing track located off Lamont Street.</p> <p>The small number of trucks represent a minor increase in vehicle movements.</p> <p>Access to the Bermagui Fisherman's' wharf, the Bermagui Yacht club and marina would not be impeded during the modification or operation of the stockpile site.</p> <p>Public access to the stockpile site would be restricted.</p> <p>Consolidated safeguards and mitigation measures are outlined in section 7.2.</p>
Aboriginal heritage.	<p>Refer to section 8.1 of the Project REF and section 6.3 of the Project REF Amendment 1</p> <p>Bermagui waterhole is the only Aboriginal Heritage Information Management System (AHIMS) registered</p>	<p>The stockpile site was determined during the Project REF and Project REF Addendum 1 to have low archaeological potential as a result of extensive existing disturbance.</p>

Environmental factor	Existing environment	Potential impacts
	<p>item or place with the 1km of the Stockpile site. The proposed modifications would not disturb this site.</p> <p>The stockpile site is located on Crown Land (Lot 1/DP717711), and is subject to the following Land claims by the NSW Aboriginal Land Council:</p> <ul style="list-style-type: none"> • ALC 42495 lodged by New South Wales Aboriginal Land Council on 19 December 2016 (status: Incomplete). • ALC 42623 lodged by New South Wales Aboriginal Land Council on 23 December 2016 (status: Incomplete). <p>Additionally, an application for determination Native Title by NTSCORP Ltd on behalf of the South Coast Peoples (Trib. No NC2017/003) is currently active over the stockpile site.</p>	<p>The proposed modification would not incur additional impacts to those described in section 8.1 of the project REF and section 6.3 of the Project REF Amendment 1. Consolidated safeguards and mitigation measures are outlined in section 7.2.</p>
Socio-economic.	<p>Refer to section 9 of the Project REF and 6.4 of the Project REF Addendum 1.</p> <p>The nearest POAA is located approximately 310m upstream of the Wallaga Road Bridge (Refer appendix D).</p> <p>The deposition of material on Horseshoe Beach raised community concerns. The deposition of dredged material off Moorhead Beach may incur a similar community response.</p>	<p>Impacts of the proposed modification would be consistent with those described in section 9 of the Project REF and 6.4 of the Project REF Addendum 1. Priority oyster lease and areas in the Bermagui may experience indirect effects from additional impacts on water quality from the proposed modification.</p> <p>However, the implementation of stringent sediment and water quality safeguards and management measures are determined sufficient to avoid or minimise impacts on water quality, and hence on oyster leases. Measures are outlined in the Project REF, the Project REF Addendum 1, the Bermagui Dredging Water Quality Management</p>

Environmental factor	Existing environment	Potential impacts
		<p>and Monitoring Plan, the Stockpile Management Plan and the measures outlined in section 7.2 of this report.</p> <p>The dredging process and deposition off Moorhead Beach should be clearly communicated with community stakeholders, in addition to clearly outlining the benefits of those activities (offshore, beach re-nourishment, the quality of VENM sediments etc...).</p> <p>This Amendment REF will be placed on public display by TfNSW, and public comment invited. Following the display period, a Submissions Report would be prepared to:</p> <ul style="list-style-type: none"> • Identify and respond to issues raised during the public display and submissions period. • Assess and justify any changes to the proposal, including any refinements to safeguards and environmental management measures.
Historic heritage.	Refer to section 8.2 of the Project REF and section 6.3 of the Project REF Addendum REF.	<p>There are no historic or maritime heritage items within or in proximity to the stockpile site. No impacts are anticipated.</p> <p>Consolidated safeguards and mitigation measures are outlined in section 7.2.</p>
Landscape and visual amenity.	Refer section 9.2 of the Project REF. The Bermagui River estuary near the stockpile site has visual amenity and aesthetic values for Bermagui community and visitors.	<p>The proposed modification would raise the height of the stockpile site by approximately 1.15m higher than what was assessed in the Project REF. This would make the site more visible to nearby users and may slightly reduce the visual amenity of the immediate area.</p> <p>However, existing vegetation cover and local sand dune morphology in the surrounding environment as well as</p>

Environmental factor	Existing environment	Potential impacts
		<p>the low overall height increase would mean only very minor additional impacts to visual amenity are anticipated.</p> <p>The mitigation measures outlined the Project REF and in section 7.2 of this report are considered adequate.</p>
Noise and vibration.	<p>Refer section 10 of the Project REF and section 6.5 of the Project REF Addendum 1.</p> <p>The stockpile site is in close proximity to the Bermagui wharf and yacht club. The existing noise environment is dominated by boating and vehicular traffic, minor construction noise and minor residential noise.</p>	<p>Some machinery would be required to level the stockpile site in preparation for the deposition of material from Areas 3,4 and 5. Overall additional noise impacts from the machinery as a result of the proposed modification would be low.</p> <p>There would be additional noise impacts during the operation of the stockpile site.</p> <p>The mitigation measures outlined the Project REF and in section 7.2 of this report are considered adequate.</p>
Air quality.	Refer to section 5.3 of the Project REF.	<p>The stockpile site would not be isolated from the environment and may be susceptible to generating dust. Management of windblow sediment at the stockpile site would be conducted in accordance with the Stockpile Management Plan and the Stockpile Site Management Guidelines.</p> <p>The mitigation measures outlined the Project REF and in section 7.2 are considered adequate.</p>
Waste and resource management.	Refer to the Project REF and Project REF Addendum 1 for classification and management of dredging material, in particular from the inner boat harbour.	Impacts of the proposed medication would be consistent with those described in the Project REF and Project REF Addendum 1.

6.4 Cumulative impacts

The proposed modification would incur minor additional impacts on water quality in the Bermagui River Estuary and nearby coastal wetlands. These would be managed and mitigated against through the implementation of best practice stockpile management processes, including erosion and sediment controls, and testing and removal of contaminated material.

No additional negative cumulative impacts are anticipated as a result of the modification.

6.4.1 Safeguards and management measures

Environmental safeguards, as detailed in the consolidated project safeguards list (refer to section 7.2), would apply to the proposed modification as relevant and are considered adequate to address cumulative impacts. No additional measures are proposed.

7 Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposed modification. Should the proposed modification proceed, these management measures would be addressed if required during detailed design and incorporated into the Stockpile Management Plan and Acid Sulfate Soil Management Plan and applied during the construction and operation of the proposed modification.

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures for the Bermagui Boat Harbour and Entrance Channel Dredging program are summarised in Table 7-1. Additional safeguards and management measures identified in this addendum REF are included in ***bold and italicised font***. The safeguards and management measures will be incorporated into the detailed design phase of the proposed modification, the CEMP, the Stockpile Management Plan and Acid Sulfate Soil Management Plan, and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of site specific safeguards

No.	Impact	Environmental safeguards	Responsibility	Timing
S - 1	Soils and erosion	<ul style="list-style-type: none"> No dredging around areas where high concentrations of TBT were recorded should occur (i.e. around the slipway area). No dredging should occur in areas where the ANC of PASS is low (i.e. up the eastern channel). If this area requires dredging at a later date then material from here which is disposed to land should be treated in accordance with an ASS Management Plan (ASSMP) which will include the application of lime for acid neutralisation. A Sediment Sampling and Analysis Plan (SSAP) would be prepared prior to commencement of the additional works. The SSAP would be approved by Transport for NSW and would define the testing regime for dredged sediments from the boat harbour and areas not sampled for the original REF. The SSAP would be implemented prior to commencement of works within any of the additional areas. Dredged material would be managed dependent on its classification. Disposal of contaminated material would be undertaken at an appropriately licenced landfill in accordance with the relevant guidelines. 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Any permanent disposal of Boat Harbour sediment to the land site west of the harbour will require further testing for PASS and TBT. If not then determined to be ENM then transfer to a licences waste facility will be required. <i>Erosion and sediment control measures are to be implemented and maintained to:</i> <ul style="list-style-type: none"> <i>Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets</i> <i>Reduce water velocity and capture sediment on site</i> <i>Minimise the amount of material transported from site to surrounding pavement surfaces</i> <i>Divert clean water around the site.</i> <p><i>(in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book)).</i></p> <ul style="list-style-type: none"> <i>Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.</i> <i>Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.</i> <i>The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline.</i> <i>Potential or actual acid sulphate soils are to be managed in accordance with the Roads and Maritime Services</i> 		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p><i>Guidelines for the Management of Acid Sulphate Materials 2005.</i></p> <ul style="list-style-type: none"> <i>No new access tracks to be created for the works.</i> <i>VENM sediments will be clearly partitioned from materials dredged from Areas 3,4 and 5.</i> <i>Implement further assessment to understand sediment transport between the beach and the Entrance Channel to:</i> <ul style="list-style-type: none"> <i>Predict likely movement of any deposited material</i> <i>Identify if it will remain in the beach compartment</i> <i>Determine the potential for the material to circulate back into the Entrance Channel</i> <i>Inform preferred deposition locations to maximised beneficial re-use</i> <i>Implement a detailed sediment transport monitoring program to address potential sedimental pathways from Moorhead beach to the Bermagui River Entrance Channel. This monitoring plan shall consist of:</i> <ul style="list-style-type: none"> <i>Pre and post beach renourishment hydrosurveys in conjunction with aerial photogrammetry surveys of the beach</i> <i>Sediment shall be piped to the surf zone north of the break wall (at least 50-100m north) to minimise potential for migrating back into the channel.</i> <i>Sediment sampling:</i> <ul style="list-style-type: none"> <i>Sedimental sampling shall be conducted on Moorhead beach to determine grain size, and therefore the appropriateness of the VENM sediments for beach re-nourishment (sand used for</i> 		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p><i>nourishment shall be similar grain size or slightly coarser).</i></p> <ul style="list-style-type: none"> ○ <i>Samples shall be tested from the swash zone to foredune, with the swash zone to berm generally having coarser sand grading finer at foredune</i> 		
AQ -1	Air quality	<ul style="list-style-type: none"> • Ensure that exhaust emissions from all diesel powered plant and equipment remain within EPA emission standards by fitting appropriate exhaust control measures. • Implement regular maintenance of all diesel powered plant and machinery used in the project in line with manufacturer's requirements. • Wind fences, or other measures, to minimise the generation of windblow sediment from the stockpile site. 	Contractor	Construction/Operation
W-1	Water quality	<ul style="list-style-type: none"> • To reduce the potential impact of suspended sediments on the marine environment (increased turbidity and re-suspension of potential contaminants) a floating boom and silt curtain should be installed around the immediate dredge area (with consideration to boating traffic and safe navigation) to prevent the spread of finer sediments disturbed during dredging. • silt curtain should be used when dredging areas of the Boat Harbour which are close to seagrass beds. • At any onshore disposal site(s), sediment bunding should be placed around the area identified for sediment disposal (prior to placement) to prevent intermediate sediment run-off into the waters. 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Works should be postponed in the event of heavy or prolonged rainfall to reduce any cumulative effects of increased turbidity on marine habitats including seagrasses • All dredge plant and associated equipment should be maintained and inspected regularly to minimise the risk of oil and fuel leaks. • No refuelling of dredge plant or equipment should be undertaken onsite. • An oil spill response kit should be kept on all boats and barge, and be on land at site. In the event of a spill, NSW Maritime and any relevant marine authorities should be notified. • All other solid waste / litter generated (e.g. food scraps and packaging) during the works should be contained to prevent them entering the waterways. This waste should be disposed of appropriately onshore. • A surface water monitoring plan should be developed to measure water quality performance prior to and during the dredging. An understanding of ambient water quality prior to dredging will be required. Some basic data is presented in this Section but additional monitoring is recommended. Parameters may include TSS / turbidity, DO, pH and metals. Surface monitoring may include periodic monitoring of water quality near dredging locations or targeted monitoring during high risk operations to detect issues. May include visual and in-situ (e.g. turbidity) monitoring • Dewatering strategies should be designed for each for each disposal site to prevent remobilisation of potential contaminants and suspended sediment from re-entering the 		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>dredged waterway. ANZECC (2000) water quality triggers should be adopted for all discharges (TSS, DO, pH and metals).</p> <ul style="list-style-type: none"> For the Entrance Channel a resultant discharge of <50mg/L TSS from dewatering areas should be acceptable Measures to avoid water quality impacts should be outlined in an environmental management plan developed for the activity. 		
B-1	Marine habitat and fauna	<ul style="list-style-type: none"> Mitigation measures outlined for minimising impacts on sediment quality and water quality will also minimise impacts on marine flora and fauna and should be adopted. The River Beach site should not be used as a disposal area due to the presence of important and sensitive marine habitats here (e.g. dense seagrass beds and extensive mudflats used by juvenile fish, marine invertebrates and shorebirds for feeding). The dredge contractor should be made aware of the location of seagrass beds and other sensitive habitats including areas of rocky intertidal / subtidal near the entrance to the Boat Harbour. The dredge operator should take all necessary precautions to avoid damage to these habitats. Any movement of barges / vessels should be undertaken to limit their impact on seagrass beds. Vessels should limit travel at low tide over seagrass beds to minimise the potential for propeller damage. Anchoring of the dredge barge and any other associated vessels should be kept to a minimum and no anchoring in 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> Seagrass beds should occur unless absolutely necessary. Silt curtains should be placed between the immediate dredge area and seagrass beds / rocky habitats. To reduce the spread of suspended sediments and their potential impact on all marine habitats and fauna present in the study area a silt curtain should be erected around the area of operations where it is safe and possible to do so. Dredging during the late winter / early spring months rather than summer months will help to reduce the impact on seagrass from increased turbidity effects (i.e. light attenuation and smothering). Seagrasses are more vulnerable to light deprivation in summer and start to regenerate following senescence in late spring as waters start to warm. Dredging should be limited to periods of calm weather and low rainfall where possible to decrease the potential impact on water quality and the possible cumulative impacts of increased turbidity on seagrass beds. The dredge operator shall take all necessary actions to avoid any adverse interactions with marine mammals, turtles and rays including ceasing dredge operations if required. Before commencement of dredging the area should be scanned for the presence of marine fauna. Work should not commence until they have left the dredge area. Silt curtains should be monitored / checked regularly to avoid entanglement of marine fauna. Silencers on engines and machinery could be used to minimise noise impacts on marine fauna. 		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> All equipment used should be serviced and well maintained to ensure that they are in proper working condition and reduce the potential for spills of fuels / oils. All general waste generated during the activity should be contained appropriately before removal and disposal offsite to prevent it entering the waterway and being ingested by / entangling marine fauna. Due to the presence of marine vegetation in the study area and the potential for harm to this through dredging / disposal of sediments a NSW DPI Part 7 Permit to Harm Marine Vegetation is required for the proposed activity. No dredging equipment is to encroach within 20m of any marine vegetation. Seagrass mapping is to be used as a guide to the required buffer area. 		
B-2	Terrestrial vegetation, habitat and fauna	<ul style="list-style-type: none"> All pipeline routes for disposal of sediment should be planned so they do not pass through areas of native vegetation or coastal dunes. There are suitable pipeline routes along either roadways or adjacent grassed areas from both the Entrance Channel and Boat Harbour sites to proposed disposal sites. Mitigation measures outlined previously for minimising impacts on sediment quality and water quality will also minimise impacts on coastal shorebirds, their habitats and food sources. ASS risks should be managed through the implementation of an ASSMP. Bunding should be erected at the disposal sites prior to disposal so that runoff of fine sediment does not occur 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>through coastal vegetation or marine habitats used by shorebirds during the dewatering phase.</p> <ul style="list-style-type: none"> • Works should be postponed in the event of heavy or prolonged rainfall. • All plant and machinery required for the land based works should be well maintained and in good working order to prevent spills of fuels and oils into terrestrial areas. • No land based machinery should operate within areas of coastal vegetation or dunes. No disturbance of dune landforms should occur. • All rubbish associated with the activity should be contained of and disposed of appropriately to prevent pollution of the terrestrial environment and impacts on terrestrial species. • No terrestrial or marine vegetation is to be removed for the pipeline systems used for sediment deposition. • Ensure that machinery used for the works is free of weed material before entering and exiting the works area to avoid the introduction or spread of weed species. • If unexpected threatened species are discovered, works must cease immediately and the Project Manager contacted for further instruction. • No deposition of sand on any beach is to occur during shorebird nesting season. • If the planned timing for dredging and deposition off Moorhead Beach coincides with the shorebird nesting season (September to March), Consultation should be undertaken with DPIE shorebird officers. 		

No.	Impact	Environmental safeguards	Responsibility	Timing
H – 1	Aboriginal heritage	<ul style="list-style-type: none"> No disturbance of subsurface deposits at the disposal sites should be undertaken by land based machinery. In the unlikely event that a potential archaeological object is identified whilst carrying out works, all activities in the immediate vicinity of the object should cease and a suitably qualified archaeologist should be contacted to confirm the validity of the object. The Contractor must notify the appropriate agency and will need to apply for the appropriate approvals prior to the recommencement of further ground disturbance works. All persons working on site that are involved in ground disturbing works should be made aware that it is an offence under Section 86 of the National Parks and Wildlife Act 1975 to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an approved Aboriginal Heritage Impact Permit (AHIP). 	Contractor	Construction/Operation
H – 2	Historic heritage	<ul style="list-style-type: none"> In the unlikely event that a potential archaeological object is identified whilst carrying out works, all activities in the immediate vicinity of the object should cease and a suitably qualified archaeologist should be contacted to confirm the validity of the object. The Contractor must notify the appropriate agency (Heritage NSW) and will need to apply for the appropriate approvals prior to the recommencement of further ground disturbance works. 	Contractor	Construction/Operation
SE – 1	Socio-economic	<ul style="list-style-type: none"> The duration of dredging should be undertaken in as short a time frame as necessary to reduce the impact on scenic and visual amenity in Bermagui Boat Harbour. Timing of the works, and therefore any restrictions on boating movements and public access along the foreshore, 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<p>should take into account the peak use periods (including holiday periods and weekends) and aim to minimise interruptions to recreational users.</p> <ul style="list-style-type: none"> • The community and commercial operators in the area should be made aware of the timing of the proposed works so that they can plan accordingly. This may be done through direct consultation with commercial operators and local businesses, notices in the local newspaper, local shops, community noticeboards and through council. • There are a number of official requirements of NSW Maritime which will help mitigate impacts on recreational and commercial boating arising from the proposed works: <ul style="list-style-type: none"> ○ <i>Speed Restrictions</i> – Short term speed restrictions (4 knot limit) are to be put in place around the dredge area and any equipment during dredging and pumping operations. ○ <i>No Anchoring Zones</i> – No anchoring will be allowable anywhere where a pipeline has been sunk for temporary sand pumping activities. ○ Under the <i>Marine Safety Act</i> all marine obstructions (e.g. pipelines) must be clearly marked and channel markers erected during dredging operations. Channel markers would then be relocated to their new positions following dredging. • To reduce the potential issues associated with access NSW Maritime requires that Lands provide a Marine Notice in the local papers in advance of the works to notify users of changes to navigation and access during the dredging operations. 		

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> The use of silencers on engines and machinery will help to minimise any potential noise impacts. Dredging and disposal should also be undertaken within the hours nominated in the Interim Construction Noise Guidelines Prior to the commencement of works Bega Valley Shire Council will be consulted in relation to potential disruption to public areas and roads. All works areas will be restored to their original condition at the completion of works, and all signage, fencing and rubbish removed from the site. The process and potential benefits of VENM sediment deposition off Moorhead Beach should be clearly communicated to community stakeholders. This should include outlining the ongoing management and monitoring activities that the TfNSW will be undertaking. 		
N-1	Noise	<ul style="list-style-type: none"> Undertake all dredging works within the specified Hours of Operation. Optional noise mitigating strategies include enclosing engines with sound absorption material and ensuring properly maintained / functioning mufflers are fitted to plant and equipment. Guidelines for noise levels which should be referred to by the contractor include: <ul style="list-style-type: none"> <i>DEC 2006 – Assessing Vibration: A Technical Guideline. Department of Environment and Conservation. February 2006.</i> 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> ○ <i>DECC 2009 – Interim Construction Noise Guidelines. Department of Environment and Climate Change. July 2009.</i> ○ <i>DECCW 2001 – NSW Road Noise Policy. Department of Environment, Climate Change and Water. March 2011.</i> ○ <i>EPA 2000 – NSW Industrial Noise Policy. Environment Protection Authority. January 2000.</i> • Plant will not be left running when not in use. • All plant must be regularly maintained and repaired or replaced if equipment becomes noisy due to age or condition. • The work site must be arranged to minimise the use of movement alarms on vehicles and mobile plant. • All employees and contractors should receive an environmental induction prior to commencement of works. The induction should include but not be limited to: <ul style="list-style-type: none"> ○ relevant project specific and standard noise mitigation measures; ○ permissible hours of work; and ○ location of nearest sensitive receivers. 		
T -1	Traffic and transport	<ul style="list-style-type: none"> • Vessel traffic management and consultation plans will be developed in consultation with TfNSW. • Specific vehicle traffic management measures will be included in a traffic management plan, particularly in relation to the proposed pipeline routes, and Council will be informed at least 21 days prior to works commencing. 	Contractor	Construction/Operation

No.	Impact	Environmental safeguards	Responsibility	Timing
		<ul style="list-style-type: none"> • Works would be coordinated around the busy holiday period to minimise the traffic disruption to local tourism. • Any works impacting on waterway navigation must seek TfNSW support, 21 days prior to works commencing. A full scope of works including dates is to be provided to NavigationAdviceNorth@rms.nsw.gov.au. • Any work vessels or equipment involved in the project must comply with the relevant NSW Marine Legislation (i.e., day shapes, lights, etc.) including the Marine Safety (Domestic Commercial Vessels) National Law Act 2012. • All navigation beacons and lights are to remain operational. Any decommissioning or damage is to be reported to TfNSW. 		

7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the Bermagui Harbour and Entrance Channel Dredging project and when they need to be obtained are listed in Table 7-2. No new licences or permits are required.

Table 7-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>FM Act 1994</i>	Part 7 Fisheries Management Act 1994 permit application to dredge and / or reclaim from NSW Department Primary Industries (Fisheries).	
<i>FM Act 1994</i>	Part 7 Fisheries Management Act 1994 permit application to harm marine vegetation (seagrasses) from the NSW Department Primary Industries (Fisheries).	
<i>POEO Act 2014</i>	Special Exemption from EPA under Part 9 of the POEO Regulation 2014 if disposal of Boat Harbour sediment to the area west of the harbour is to occur (to be determined by Lands and Exemption to be prepared by Lands if this option is selected).	

The following permits were determined not be necessary for the project:

- Environment Protection Licence from EPA under the POEO Act (1997).

8 Justification and conclusion

8.1 Justification

The proposed modification is required for the concurrent storage and management of:

- 1) VENM dredged from Areas 2 and 6 from the Bermagui Entrance Channel; and,
- 2) material extracted from Areas 3,4 and 5 of the Inner Harbour on the permanent and existing stockpile site to the west of the Bermagui Harbour.

VENM from Areas 1 and 6 was originally deposited on Horseshoe Bay Beach, but has been relocated to the stockpile site in response to community feedback. Areas 3, 4 and 5 in the inner harbour are yet to be dredged. They are to be extracted, placed on the stockpile site and managed alongside VENM in accordance with the Stockpile Site Management Plan.

The proposed modification may impose additional impacts to sediment and water quality, both at the stockpile site and in the receiving environment around it, as described in section 6 of this report. The severity and likelihood of these impacts occurring are considered to be low, and can be effectively managed through the safeguards and management measures outlined in section 7.2, and the actions identified in the Stockpile Management Plan and Acid Sulfate Soils Management Plan that accompany this Addendum REF.

While there are environmental risks associated with the proposed modification, the risks are minor and can be effectively managed and mitigated through the safeguards outlined in Table 7-1 and with respect to the Stockpile Site Management Plan and ASS management plan that accompany this addendum REF.

Utilising the existing stockpile site to store and manage the VENM from Areas 2 and 6, with minimal environment impacts, would provide a positive outcome to the ongoing Bermagui Harbour and Entrance Channel dredging project, and demonstrates responsiveness and consideration of community feedback. The benefits of the proposed modification are considered to outweigh its potential adverse impacts and risks.

8.2 Objects of the EP&A Act

The objects of the EP&A Act have been reviewed and updated where required to reflect changes in impacts due to the proposed modification. Table 8-1 explains how the proposed modification performs against the objects of the Act and references earlier sections of this addendum REF and the project REF where greater detail is provided.

Table 8-1 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposed modification demonstrates due consideration of the States natural resources by the adoption of the option to permanently stockpile fill within the project area. The proposed permanent stockpile will successfully enable the relocation of 12,000 cubic metres of VENM from Horseshoe Bay Beach, and adheres to the principles of the

Object	Comment
	NSW EPA's Waste Management Hierarchy.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecologically sustainable development (ESD) are considered in section 2 of the project REF, which also applies to the proposed modification.
1.3(c) To promote the orderly and economic use and development of land.	The proposal area is contained within an existing stockpile site and is consistent with the land use zoning provisions of the local environmental plan. Proposed modification avoids using land that could otherwise be used.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the project.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The potential environmental impacts of the proposed modification have been assessed and additional environmental safeguards have been proposed where required. The proposed modification would have a negligible impact on native animals and plants, ecological communities and their habitats.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposed modification would not affect non-Aboriginal heritage or Aboriginal cultural heritage.
1.3(g) To promote good design and amenity of the built environment.	The proposed modification would not affect the amenity of the built environment.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not directly relevant to the proposed modification.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.

Object	Comment
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	<p>This Addendum REF has been prepared in response to community feedback on the placement of dredged material on Horseshoe Bay Beach. It will go on public display, and public comment will be invited.</p> <p>Subsequently, a submissions report summarising and addressing key issues raised during the public display period will be prepared.</p>

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle states that “if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental damage”.

The Project REF assessed the existing environment and potential impacts on the environment in relation to the proposal. While some impacts were determined to be likely, the REF found that the proposed dredging does not pose any threat of serious or irreversible damage to the environment. Additional safeguards have been proposed in this addendum REF to further minimise the potential adverse impacts identified during the assessment.

Intergenerational equity

The inter-generational and intra-generational equity principle states *“the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”*.

As the proposed modification would have no serious or irreversible impact on the environment, there will be no effect on intergenerational equity.

The proposed dredging program also aims to maintain and enhance the value of the waterway in terms of recreational and commercial uses, and in turn, economic value. Maintenance of safe access through the Entrance Channel and in the Boat Harbour will support local and regional tourism and commercial operators, providing flow on effects to the broader community.

Conservation of biological diversity and ecological integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of ESD.

This principle states that the *“diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival”*.

No significant impacts on biodiversity (including marine or terrestrial fauna and their habitats) or ecological processes are expected to occur as a result of the proposed modification. Dredging will avoid any sensitive areas of seagrass. Mitigation measures can be adopted to ensure that any potential impacts on fauna and habitats are minimised and are described throughout this document.

Improved valuation, pricing and incentive mechanisms

This principle states that *“costs to the environment should be factored into the economic costs of a project”*.

Namely those environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement;
- The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The dredging program and proposed medication outlined in this addendum REF would have social and economic benefits. Maintenance of the recreational amenity of the Bermagui River and harbour through provision of safe navigation access is extremely important to visitors and locals alike. In turn, the economy of the local area is boosted (e.g. local businesses, accommodation facilities).

8.3 Conclusion

This addendum REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. This has included consideration, where relevant, of conservation agreements and plans of management under the NPW Act, stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced during the design development and options assessment. The proposed modification as described in the addendum REF best meets the project objectives but would still result in some additional impacts on sediment and water quality. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification would also enable the permanent removal of dredged materials from Horseshoe Bay Beach in response to community feedback. On balance the proposed modification is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposed modification would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be

prepared and approval to be sought from the Minister for Planning and Urban Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposed modification is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Australian legislation

The proposed modification is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Agriculture, Water and Environment is not required.

9 Certification

This addendum review of environmental factors provides a true and fair review of the proposed modification in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed modification.



Jane Love
Senior Environmental Manager
NGH Pty Ltd
Date: 2/12/2021

I have examined this addendum review of environmental factors and accept it on behalf of Transport for NSW.

Insert name

[Position title, e.g. Project Manager]

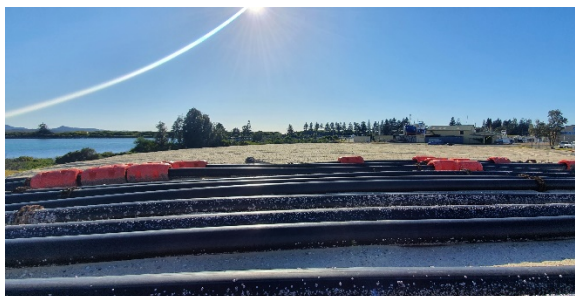
[Insert relevant Transport for NSW region/program]

Date:

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Appendix A Site Photos





Appendix B Consideration of clause 228(2) factors & Consideration of matters of National Environmental Significance and Commonwealth land

Clause 228(2) Checklist

In addition to the requirements of the *Is an EIS required?* (DUAP 1995/1996) guideline and the *Marinas and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the addendum REF, the following factors, listed in clause 228(2) of the Environmental Planning and Assessment Regulation 2000, have also been considered to assess the likely impacts of the proposed modification on the natural and built environment.

Factor	Impact
a) Any environmental impact on a community? The impact of the proposed modification on the adjacent businesses would be short term, while the permanent stockpile is adjusted to accommodate the modification. Of positive benefit, the modification would enable the permanent relocation of VENM originally deposited on Horseshoe Bay Beach.	Short-term minor negative impact, Long -term, minor positive benefit.,
b) Any transformation of a locality? The stockpile site is existing. The proposed modification would not transform the locality.	Nil
c) Any environmental impact on the ecosystems of the locality? The proposed modification would not significantly affect terrestrial or marine plants or animals of national or state conservation significance. Similarly, the stockpile area is existing, disturbed and is not considered suitable for any threatened species known to occur within the broader region. Mitigation and safeguard measures will be put in place to avoid impacts on water quality within the Bermagui River and estuary.	Negligible negative impact (if all safeguards are effectively implemented).
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposed modification would not affect aesthetic, recreational, scientific or other environmental qualities or values.	Nil
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposed modification would not affect a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value.	Nil

Factor	Impact
<p>f) Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?</p> <p>No important habitat for native species is present at the stockpile site. Impacts on native species would not be significant.</p>	Negligible negative.
<p>g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?</p> <p>The area is disturbed and no evidence of mammal habitation or nesting birds is present. The site comprises of predominantly invasive flora species. Due to the disturbed nature of the site, the small size of the proposed modification area and the poor-quality native vegetation present, the proposed modification would not endanger any species of animal, plant or other form.</p>	Negligible negative
<p>h) Any long-term effects on the environment?</p> <p>The proposed modification would involve the upgrade of an existing permanent stockpile, increasing the elevation of the land. The site would be revegetated and the invasive flora currently present would be removed, therefore, providing a positive impact on the site.</p>	Minor long-term negative
<p>i) Any degradation of the quality of the environment?</p> <p>The vegetation of the site is currently degraded due to previous disturbance and the presence of invasive flora species.</p>	Long-term minor negative.
<p>j) Any risk to the safety of the environment?</p> <p>The proposed modification does not pose any risk to the safety of the environment.</p>	Nil
<p>k) Any reduction in the range of beneficial uses of the environment?</p> <p>The proposed modification is situated within crown land reserve and would not reduce the range of beneficial uses of the environment. The stockpile site is existing.</p>	Nil
<p>l) Any pollution of the environment?</p> <p>During preparation of the stockpile site the main sources of pollution are expected to be from plant and equipment, in particular from hydrocarbon spills. During operation, there is a risk of pollution caused by sediment laden water from erosion and sedimentation, acid sulphate soils, as well as TBT. This risk can be effectively managed and mitigated through the mitigation measures and safeguards outlined in the Project REF and subsequent Addendums. An acid sulfate management plan has been prepared. Potential TBT contaminated materials will be tested and classified on site following the stockpile site sediment sampling and analysis plan. Any TBT contaminated material found to be present would be sent to a licenced landfill facility for disposal.</p>	Short and Long-term minor negative.
<p>m) Any environmental problems associated with the disposal of waste?</p>	Long term minor impacts.

Factor	Impact
The proposed modification would involve the removal and disposal of waste sediments generated by the dredging program. Material would be tested and classified on site in accordance with the NSW EPA's guidelines. Any found to be contaminated would be sent to a licenced landfill facility for disposal.	
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposed changes would not increase demand for resources, which are, or are likely to become, in short supply.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? The cumulative impacts of the proposed modification are discussed in Section 56.4. Temporary potential cumulative impacts may occur as a result of stockpile preparation activities occurring simultaneously with other projects in the local area, however, no significant other nearby projects are known or expected to occur simultaneously.	Nil
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposed modification would not impact on, or be impacted by, coastal processes and coastal hazards in the immediate term. Long-term (by 2050), the stockpile site is likely to be subject to increased risk of inundation during storm surges and estuary flooding events. The stockpiling of material at the stockpile site would not be permanent as per TfNSW's stockpile management guidelines. Dredging material would be removed by 2050.	Immediate -nil Long term (2050) – likely impacts.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on the Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of Agriculture, Water and the Environment. The Protected Matters Search result is provided overleaf.

Factor	Impact
a) Any impact on a World Heritage property? The proposed modification would not have any impact on a World Heritage property.	Nil
b) Any impact on a National Heritage place? There are no National Heritage Places near to the proposed modification. Direct or indirect impacts are not expected.	Nil
c) Any impact on a wetland of international importance? The proposed modification would not affect a wetland of international importance.	Nil
d) Any impact on a listed threatened species or communities? A number of Commonwealth listed threatened species have the potential to occur in the local area. However, no plants or animals of national or state conservation significance would be affected. Similarly, the area to be disturbed is not considered suitable for any threatened species known to occur within the broader region. The nature, scale and location of the proposed changes are such that direct impacts on these species or their habitats are not expected. Indirect impacts are also not expected	Nil
e) Any impacts on listed migratory species? A number of Commonwealth listed migratory species have the potential to occur in the local area. The nature, scale and location of the proposed changes is such that impacts on these species or their habitats are not expected. Indirect impacts are also not expected	Nil
f) Any impact on a Commonwealth marine area? The proposed modification would not have any impact on a Commonwealth marine area.	Nil
g) Does the proposed modification involve a nuclear action (including uranium mining)? The proposed modification does not involve a nuclear action.	
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposed modification would not impact on Commonwealth land.	Nil

Appendix C Statutory consultation checklists

Infrastructure SEPP

Certain development types

Development type	Description	Yes/No	If 'yes' consult with	ISEPP clause
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No	N/A	ISEPP cl. 95A
Bus Depots	Does the project propose a bus depot?	No	N/A	ISEPP cl. 95A
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	N/A	ISEPP cl. 95A

Development within the Coastal Zone

Issue	Description	Yes/No/NA	If 'yes' consult with	ISEPP clause
Development with impacts on certain land within the coastal zone	Is the proposed modification within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	N/A. No coastal vulnerability areas have yet to be mapped.	N/A	ISEPP cl. 15A

Note: See interactive map here: <https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management>. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

Council related infrastructure or services

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Stormwater	Is the work likely to have a <i>substantial</i> impact on the stormwater management services which are provided by council?	No	N/A	ISEPP cl.13(1)(a)
Traffic	Is the work likely to generate traffic to an extent that will <i>strain</i> the capacity of the existing road system in a local government area?	No	N/A	ISEPP cl.13(1)(b)
Sewerage system	Will the work involve connection to a council owned sewerage system? If so, will this connection have a <i>substantial</i> impact on the capacity of any part of the system?	No	N/A	ISEPP cl.13(1)(c)
Water usage	Would the work involve connection to a council owned water supply system? If so, would this require the use of a <i>substantial</i> volume of water?	No	N/A	ISEPP cl.13(1)(d)
Temporary structures	Would the work involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, would this cause more than a <i>minor</i> or <i>inconsequential</i> disruption to pedestrian or vehicular flow?	No	N/A	ISEPP cl.13(1)(e)
Road & footpath excavation	Would the work involve more than <i>minor</i> or <i>inconsequential</i> excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No	N/A	ISEPP cl.13(1)(f)

Local heritage items

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than <i>minor</i> or <i>inconsequential</i> ?	No	N/A	ISEPP cl.14

Flood liable land

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
Flood liable land	Is the work located on flood liable land? If so, would the work change flood patterns to more than a <i>minor</i> extent?	No	N/A	ISEPP cl.15
Flood liable land	Is the work located on flood liable land? (to any extent). If so, does the work comprise more than minor alterations or additions to, or the demolition of, a building, emergency work or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	ISEPP cl.15AA

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable land* published by the New South Wales Government.

Public authorities other than councils

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
National parks and reserves	Is the work adjacent to a national park or nature reserve, or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act?	No		ISEPP cl.16(2)(a)
National parks and reserves	Is the work on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	Environment, Energy and Science, DPIE	ISEPP cl. 16(2)(b)
Aquatic reserves	Is the work adjacent to an aquatic reserve or a marine park declared under the <i>Marine Estate Management Act 2014</i> ?	No	Department of Planning, Industry and Environment	ISEPP cl.16(2)(c)
Sydney Harbour foreshore	Is the work in the Sydney Harbour Foreshore Area as defined by the <i>Place Management NSW Act 1998</i> ?	No	Property NSW	ISEPP cl.16(2)(d)
Bush fire prone land	Is the work for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	ISEPP cl.16(2)(f)
Artificial light	Would the work increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky	No	Director of the Siding Spring Observatory	ISEPP cl.16(2)(g)

Issue	Potential impact	Yes/No	If 'yes' consult with	ISEPP clause
	region is within 200 kilometres of the Siding Spring Observatory)			
Defence communications buffer land	Is the work on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No	Secretary of the Commonwealth Department of Defence	ISEPP cl. 16(2)(h)
Mine subsidence land	Is the work on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	No	Mine Subsidence Board	ISEPP cl. 16(2)(i)

Appendix D Background Searches

D.1. Updated NSW Bionet searches (threatened entities under the BC Act)

D.1.1 Threatened species

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -36.38 West: 150.02 East: 150.12 South: -36.48] returned a total of 409 records of 63 species.

CE – Critically Endangered

E – Endangered

V - Vulnerable

Scientific Name	Common Name	NSW status	Comm. status
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	P	V
<i>Apus pacificus</i>	Fork-tailed Swift	P	C,J,K
<i>Hirundapus caudacutus</i>	White-throated Needletail	P	V,C,J,K
<i>Diomedea exulans</i>	Wandering Albatross	E	E
<i>Diomedea gibsoni</i>	Gibson's Albatross	V	V
<i>Thalassarche cauta</i>	Shy Albatross	V	V
<i>Ardenna pacifica</i>	Wedge-tailed Shearwater	P	J
<i>Ardenna tenuirostris</i>	Short-tailed Shearwater	P	C,J,K
<i>Macronectes halli</i>	Northern Giant-Petrel	V	V
<i>Circus assimilis</i>	Spotted Harrier	V	
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V	
<i>Hieraaetus morphnoides</i>	Little Eagle	V	
<i>Lophoictinia isura</i>	Square-tailed Kite	V	
<i>Pandion cristatus</i>	Eastern Osprey	V	
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	
<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V	
<i>Haematopus longirostris</i>	Pied Oystercatcher	E	
<i>Pluvialis fulva</i>	Pacific Golden Plover	P	C,J,K

Scientific Name	Common Name	NSW status	Comm. status
<i>Thinornis cucullatus cucullatus</i>	Eastern Hooded Dotterel	E	V
<i>Irediparra gallinacea</i>	Comb-crested Jacana		
<i>Arenaria interpres</i>	Ruddy Turnstone	P	C,J,K
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	P	C,J,K
<i>Calidris canutus</i>	Red Knot	P	E,C,J,K
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE,C,J,K
<i>Calidris ruficollis</i>	Red-necked Stint	P	C,J,K
<i>Limosa lapponica</i>	Bar-tailed Godwit	P	C,J,K
<i>Limosa limosa</i>	Black-tailed Godwit	V	C,J,K
<i>Numenius madagascariensis</i>	Eastern Curlew	P	CE,C,J,K
<i>Numenius minutus</i>	Little Curlew	P	C,J,K
<i>Numenius phaeopus</i>	Whimbrel	P	C,J,K
<i>Hydroprogne caspia</i>	Caspian Tern	P	J
<i>Sterna hirundo</i>	Common Tern	P	C,J,K
<i>Sternula albifrons</i>	Little Tern	E	C,J,K
<i>Thalasseus bergii</i>	Crested Tern	P	J
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	
<i>Calyptrorhynchus lathamii</i>	Glossy Black-Cockatoo	V	
<i>Glossopsitta pusilla</i>	Little Lorikeet	V	
<i>Lathamus discolor</i>	Swift Parrot	E	CE
<i>Ninox connivens</i>	Barking Owl	V	
<i>Ninox strenua</i>	Powerful Owl	V	
<i>Tyto novaehollandiae</i>	Masked Owl	V	
<i>Tyto tenebricosa</i>	Sooty Owl	V	
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V	
<i>Anthochaera phrygia</i>	Regent Honeyeater	E	CE
<i>Epthianura albifrons</i>	White-fronted Chat	V	
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V	
<i>Petroica phoenicea</i>	Flame Robin	V	
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (eastern)	E	E
<i>Phascolarctos cinereus</i>	Koala	V	V
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	

Scientific Name	Common Name	NSW status	Comm. status
<i>Petaurus australis</i>	Yellow-bellied Glider	V	
<i>Petauroides volans</i>	Greater Glider	P	V
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V
<i>Eubalaena australis</i>	Southern Right Whale	E	E
<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V	
<i>Pultenaea pedunculata</i>	Matted Bush-pea	E	
<i>Haloragis exalata</i> subsp. <i>exalata</i>	Square Raspwort	V	V
<i>Distichlis distichophylla</i>	Australian Saltgrass	E	

D.1.2 Threatened Ecological Communities

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Licensed Report of all Valid Records of Threatened (listed on BC Act 2016) , Commonwealth listed , CAMBA listed , JAMBA listed or ROKAMBA listed Communities in selected area [North: -36.38 West: 150.02 East: 150.12 South: -36.48] returned 0 records for 15 entities.

CE - critically endangered

E – endangered.

Scientific Name	NSW status	Comm. status
<i>Araluen Scarp Grassy Forest in the South East Corner Bioregion</i>	E	
<i>Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions</i>	E	
<i>Brogo Wet Vine Forest in the South East Corner Bioregion</i>	E	
<i>Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	V
<i>Dry Rainforest of the South East Forests in the South East Corner Bioregion</i>	E	
<i>Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	
<i>Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	CE
<i>Lowland Grassy Woodland in the South East Corner Bioregion</i>	E	CE
<i>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions</i>	E	E
<i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	CE
<i>Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	E

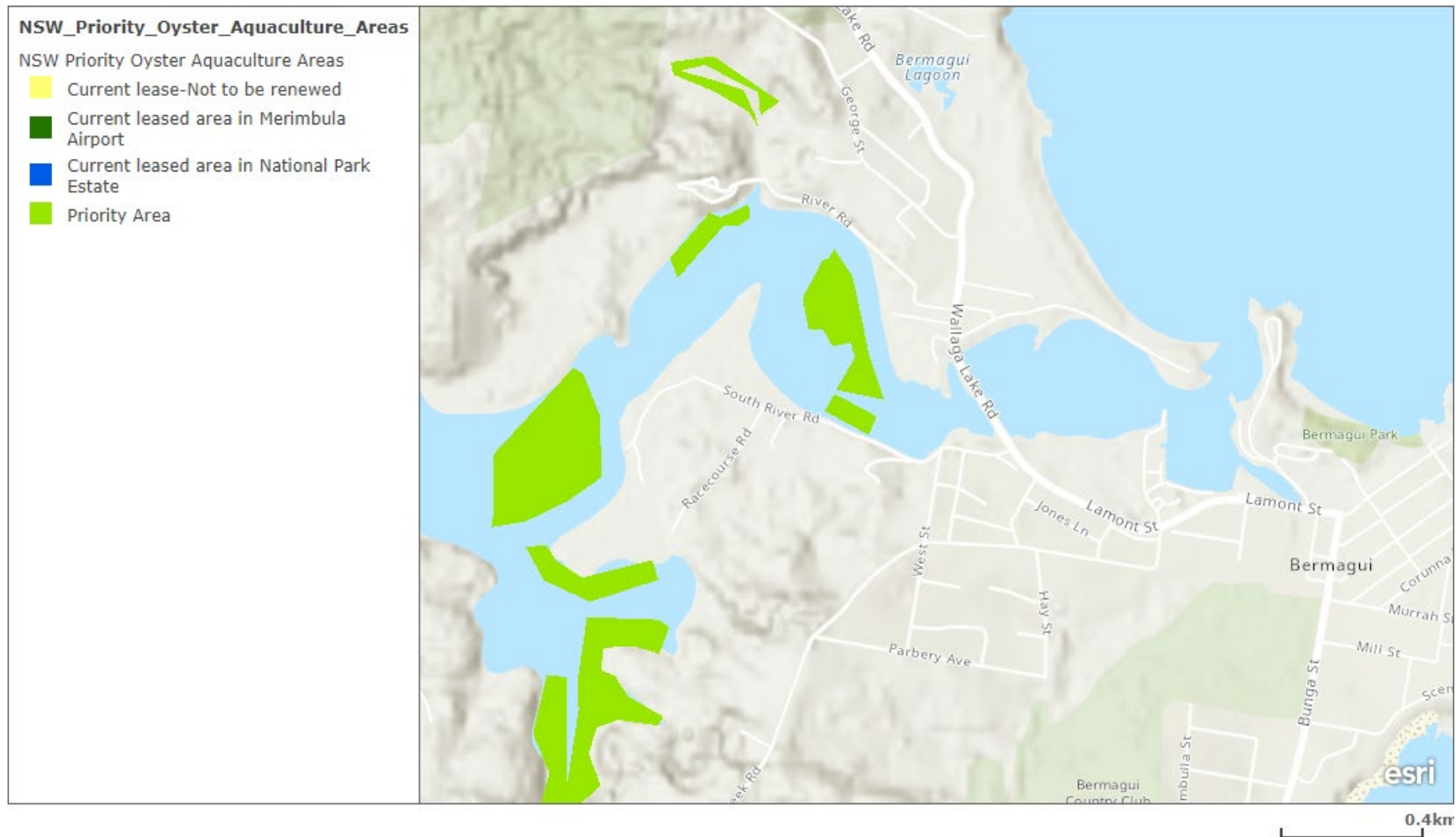
Scientific Name	NSW status	Comm. status
<i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i>	E	
<i>Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions</i>	E	
<i>Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions</i>	E	
<i>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and</i>	E	CE

D.2. Coastal Management Areas (CM SEPP)



Figure 10-1 Coastal Management Areas under the CM (SEPP) in the Bermagui Harbour and Entrance Channel area (DPIE, 2021)

D.3. Priority Oyster Aquaculture Areas



Esri, Geoscience Australia, NASA, NGA, USGS | Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS | Fisheries NSW

Figure 10-2P Priority Oyster Aquaculture Areas (POAA) in the Bermagui River and Estuary Area (DPI, 2021)

D.4. Updated Estuarine Macrophyte Mapping

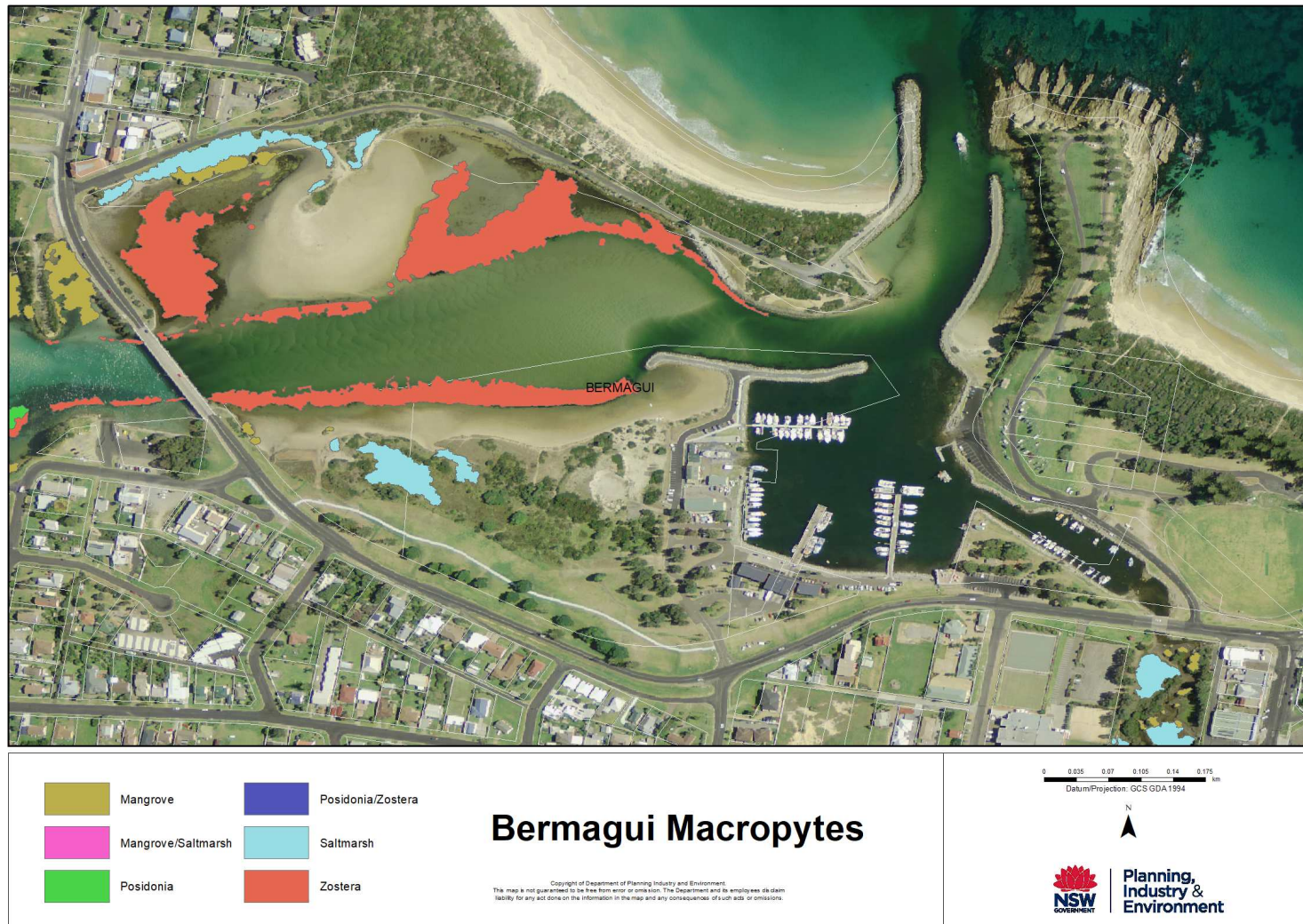


Figure 10-3 Estuarine macrophytes in the Bermagui River and Estuary Area (DPIE, 2021)

D.5. Coastal hazards mapping – Bermagui Harbour and Entrance Channel (BMT WBM, 2015)

Appendix E Stockpile Management Plan

Appendix F Acid Sulfate Soils Management Plan

Appendix G BCD comments