SEA DUMPING ACT

PERMIT ASSESSMENT

Permit Assessment for Sea Dumping

SUMMARY APPLICATION DETAILS

Applicant name:	North Queensland Bulk Ports Corporation Limited
Application Date (Received)	25 October 2018
Assessment Type:	*Environment Protection (Sea Dumping) Act 1981*
Dumping Type:	Loading for the purpose of dumping and dumping of maintenance dredge material at sea.
Proposed Use:	Loading and dumping of up to 956,553m^3 of maintenance dredge material in the Great Barrier Reef Marine Park.
Period of Permit:	Application seeks permission for the period 2019 to 2029.
Locations:	Port of Hay Point.

SUMMARY ASSESSMENT DETAILS

Fees:	The required Sea Dumping application fee of $23,500 has been paid.
Sea Dumping Assessment:	The *Environment Protection (Sea Dumping) Act 1981* outlines the matters the GBRMPA, as the responsible agency, must have regard to in considering applications for permits. Under the *Environment Protection (Sea Dumping) Act 1981* a permit for dumping or loading for dumping: ○ may only be granted for controlled material that is within Annex 1 to the Protocol; and ○ may only be granted in accordance with Annex 2 of the Protocol. A copy of a draft Sea Dumping permit was provided to the proponent on 19 December 2018. No substantial comments were received. The proponent only requested clarification around minor administrative changes to the permit.

The London Protocol, Annex 2, Clause 15 states that each assessment should conclude with a statement supporting a decision to issue or refuse a permit for dumping. The assessment can conclude that the application for sea dumping is consistent with some matters of the London Protocol and not consistent with others.

The assessment recommends that a permit under the Sea Dumping Act be granted:

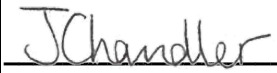
- Maintenance dredge material at the Port of Hay Point has been found to be uncontaminated and suitable for unconfined ocean disposal in accordance with the *National Assessment Guidelines for Dredging 2009*.
- The applicant explored methods to avoid or reduce the need for maintenance dredging at the Port of Hay Point. A comprehensive analysis of these efforts is provided in the Sustainable Sediment Management Assessment (the SSMA). Key technical documents supporting this assessment were independently peer reviewed and were found to be valid and reasonably accurate. The SSMA concluded that there are no alternatives available that would completely avoid the need for maintenance dredging. There is potential for options, other than at-sea disposal, after an initial campaign to dispose of 356,553m^3 of maintenance dredge material.

- The applicant has entered into an agreement under subsection 19(9) of the Sea Dumping Act with the Great Barrier Reef Marine Park Authority to investigate the possibility of avoiding or reducing the need for further dumping into the future to ensure the feasibility of beneficial re-use options are fully studied and, if superior disposal or re-use options are identified that the applicant will implement those options prior to dumping in the Marine Park.
- If all laws and permit conditions are complied with, the relevant impacts of the proposed conducts are considered to represent a low risk to environmental values.
- Various mitigation measures outlined in the risk (refer Attachment A) have been imposed through recommended permit conditions and/or are included in the required environmental management plans and Deed of Agreement. These mitigation measures, along with existing laws are considered adequate to address the risks of relevant maintenance dredge material dumping impacts to values of the Marine Park.
- The applicant has developed the Port of Hay Point Long-term Maintenance Dredging Management Plan (2018 – 2028) (the Long term Plan), which is a requirement for long term (10 years) sea dumping applications. The Long term Plan has been assessed against the Queensland *Guidelines for Long-term Maintenance Dredging Management Plans 2018* and the Australian Government *Long term Monitoring and management Plan Requirements for 10 year Permits to Dump Maintenance Dredge material at Sea*. The Long term Plan meets both of these sets of requirements, with minor amendments agreed to be implemented by the applicant before the first dredge campaign, if a permit is granted. The updated plan, incorporating GBRMPA comments to date and any further adjustments to reflect all permit conditions, if granted, must be approved by GBRMPA.
- Consistent with the London Protocol, the Long term Plan includes commitment to best practice port operations and continual improvement based on monitoring results, including:
    - Minimisation of sediment accumulation and dredging needs by employing the identified operational measures, including regular drag barring, to reduce sedimentation and increase the period between maintenance dredging (loading for purpose of dumping) and dumping activities.
    - Further feasibility investigations into beneficial re-use options
    - Maintenance Dredging Environmental Management Plan (MD-EMP) documents campaign specific management strategies and actions to minimise impacts from the loading and dumping of maintenance dredge material, which is reviewed and updated based on monitoring and auditing results (approved by GBRMPA) prior to each following campaign.
    - Monitoring framework, including ambient, impact and adaptive (real-time) components, and sets out the aims of the overall program and the process by which the results of the monitoring will be reviewed, analysed and reported. The Marine Environmental Monitoring Plan (Monitoring Plan) documents the specific monitoring program. The Long term Plan commits to a review after each campaign and the findings to incorporated in an updated Monitoring Plan prior to any future loading and dumping activities.
    - Long term Plan will be reviewed and updated every 5 years or when one of the following occurs: permit conditions change or new permits issued; when monitoring reports substantially different impacts than were predicted; or if an incident occurs that poses a significant risk to effective future management.
- The Long term Plan, Monitoring Plan and MD-EMP, approved by GBRMPA, must be available on the applicant's website.

- To ensure commitments made thorough the Long term Plan are adhered to and ongoing continual improvement of the management of dumping of maintenance dredge material, a permit condition is recommended to require a report to be published on the applicant's website addressing compliance with the requirements of the Environmental Thresholds Report, Maintenance Dredging Environmental Management Plan and the Marine Environmental Monitoring Plan, as verified by an independent audit. That audit report must include but not be limited to the following:
  (a) Deviations from the Environmental Thresholds Report;
  (b) Identification of any changes that would be required to the Maintenance Dredging Environmental Management Plan, the Marine Environmental Monitoring Plan or the Environmental Thresholds Report before the next dredge campaign.
- GBRMPA must approve the auditor in writing prior to commencement of each independent audit

Recommendation:
It is considered that the application is consistent with all matters of the London Protocol and granting the permit with the recommended permit conditions is in accordance with the Sea Dumping Act and the London Protocol.

ASSESSMENT OFFICER



Date: 23/01/2019

Julia Chandler, Assistant Director

Major Project and Tourism Assessments and Permissions

DELEGATE

Date: 23/01/2019

Simon Banks, General Manager (Reef Protection)

Application overview

North Queensland Bulk Ports Corporation (the applicant) applied for a 10 year permit for maintenance dredge material loading and dumping at sea. They have not undertaken dumping activities since 2010.

The Port of Hay Point is located about 40 kilometres south of Mackay. The Port includes two separate coal terminals, Hay Point Coal Terminal and Dalrymple Bay Coal Terminal. Port capability includes purpose-built rail in-loading facilities at both terminals, onshore stockpiling areas and offshore wharves serviced by conveyor systems and supported on jetties that run out to sea and allow loading in deep water.

The total volume proposed to be loaded for the purpose of dumping and dumped within the Approved Dredge Spoil Disposal Area (located in the Great Barrier Reef Marine Park) is 756,553 cubic metres, plus a further 200,000 cubic metres contingency volume for sediments deposited by extreme weather events such as cyclones. It is proposed that 756,553 cubic metres is disposed over approximately three campaigns with 356,553m^3 in the first 18 months (approximately 40 days), 200,000m^3 between years two to five (approximately 20 days) and 200,000m^3 between years five to ten (approximately 20 days). The total proposed dredging time is approximately 100 days in total over 10 years (2.7 per cent of the total permit term).

The application was publically advertised fortnightly in the Daily Mercury (Mackay) and Whitsunday Times to seek public comment from 23 June 2018 until 21 August 2018 (60 day period). The public advertising was undertaken in accordance with the *Great Barrier Reef Marine Park Regulations 1983* (Marine Park Regulations).

Permit Application Assessment Fee: $23,500 paid 26/11/2018

GBRMP Regulations: Assessment under the Marine Park Regulations recommends approval of the application (G19/40185.1) with the same permit conditions as recommended in this Sea Dumping Act assessment report where relevant.

Section 19 of the Sea Dumping Act states that a permit for dumping or loading for dumping, may only be granted for controlled material that is within Annex 1 of the Protocol and may only be granted in accordance with Annex 2 to the Protocol. Dredge material is listed as a controlled material in Annex 1. Annex 2, describes the considerations for assessing a sea dumping permit. The overarching considerations are that dredged sediment is a resource that should be used for beneficial purposes, management options should be guided by the comparison of both dumping and alternatives, and management actions for dredged material should ensure as far as practicable, that environmental disturbance and detriment are minimised and the benefits maximised. Annex 2 also covers the characterisation of material and contamination of waste.

Consideration of Assessment Criteria – In Accordance with Annex 2 London Protocol

Throughout this assessment, alignment has been made with Annex 2 of the London Protocol and the Revised Specific Guidelines for Assessment of Dredged Material. The assessment proceeds in order of those requirements and the numbers represent the items of Annex 2.

In the context of this application **'wastes'** are the maintenance dredge material proposed to be disposed of at sea dumped within the Approved Dredge Spoil Disposal Area (located in the Great Barrier Reef Marine Park). The Approved Dredge Spoil Disposal Area is defined by GPS coordinates in the recommended permit conditions.

GENERAL

Item 1. The acceptance of dumping under certain circumstances shall not remove the obligations under this Annex to make further attempts to reduce the necessity for dumping.

A Long-term Maintenance Dredging Management Plan (LMDMP) for the Port of Hay Point has been developed and is supported by the Port of Hay Point Sustainable Sediment Management Assessment (SSMA) and a 25-year technical analysis.

This LMDMP will be reviewed and updated every 5 years or when one of the following occurs:

- when permit conditions have been changed or amended or new permits issued;
- when monitoring results report substantially different impacts than were predicted; or
- if an incident occurs that poses a significant risk to effective future management.

Each review will include an analysis of the SSMA outcomes to ensure no new opportunities exist to reduce the necessity for dumping.

Additional work is also required to assess the feasibility of habitat restoration using dredged maintenance material. The applicant has established an advisory panel and has commenced a feasibility assessment. It is expected to take several years to undertake the necessary studies and, based on current knowledge, may only provide a solution for a single maintenance dredging program.

On 19 December 2018, the Authority wrote to the applicant advising that, before granting the permit it is considered appropriate to require the applicant to enter into an agreement, pursuant to paragraph I9(9)(b) of the Sea Dumping Act, to investigate the possibility of avoiding or reducing the need for further dumping in the Great Barrier Reef Marine Park. The letter indicated that any reduction in the volume of dredge material disposed in the Great Barrier Reef Marine Park is an important step in supporting the resilience of the Reef over the long term. The letter requested that the applicant enter into an agreement, pursuant to subsection 19(9) of the Sea Dumping Act, to explore the possibility of avoiding or reducing the need for further dumping in the Great Barrier Reef Marine Park by further investigating the feasibility of beneficial reuse options for the dredge spoil material.

The applicant has signed an Agreement under subsection 19(9) of the Sea Dumping Act to:

- take a long term strategic approach to avoiding or reducing maintenance dredge material dumping at sea associated with the Port of Hay Point;
- investigate the possibility of avoiding or reducing the need for further dumping of maintenance dredge material associated with the Port of Hay Point at sea by NQBP by:
  i. implementing a program that investigates the feasibility of beneficial re-use of dredge spoil material to contribute to avoiding or reducing the need for further dumping of maintenance dredging material associated with the Port of Hay Point at sea; and
  ii. identifying other opportunities to avoid or reduce the need for further dumping of maintenance dredge material associated with the Port of Hay Point at sea; and
  iii. outline a program that describes how NQBP will action any opportunities identified under subparagraphs (i) and (ii) that will avoid or reduce the need for further dumping of maintenance dredge material associated with the Port of Hay Point at sea.

- the Parties agree that if superior disposal or re-use options are identified by the applicant during its investigations pursuant to this Agreement, North Queensland Bulk ports Corporation Ltd will implement (where there are no undue risks to human health or the environment or disproportionate costs) those options prior to dumping in the Great Barrier Reef Marine Park.

The duration of the agreement is for 10 years. This proposal is consistent with Australia's obligations under the London Protocol to minimise the dumping of waste at sea.

WASTE PREVENTION AUDIT

Item 2. The initial stages in assessing alternatives to dumping should, as appropriate, include an evaluation of:

a. types, amounts and relative hazard of wastes generated;
b. details of the production process and the sources of wastes within that process; and
c. feasibility of the following waste reduction/prevention techniques:
i. product reformulation;
ii. clean production technologies;
iii. process modification;
iv. input substitution; and
v. on-site, closed-loop recycling.

Types, amounts and relative hazard of wastes generated

Bathymetric analysis and modelling undertaken as part of the Sustainable Sediment Management Assessment (SSMA Appendix D1 and D2) for the Port of Hay Point has provided estimates of current and future amounts of material that is likely to accumulate at the port over the next 10 year period.

Period	Volume (m^3)
Current	356,553
1-5 years	200,000
5-10 years	200,000
Cyclone contingency	200,000
Total 10 year permit requirement	**956,553**

The characteristics of the marine sediments consist predominantly of fine silts/clays (60%), mixed with sand (36%) and small amounts of gravel (4%). A sampling and analysis plan was developed in accordance with the National Assessment Guidelines for Dredging 2009 (NAGD). NAGD testing of the material requiring maintenance dredging has determined the material is suitable for at-sea disposal, meeting the criteria of the NAGD and, as such, is not considered hazardous to the environment from a contamination perspective.

Of the contaminants investigated Tributyltin (TBT), Diuron and Arsenic were noteworthy.

- TBT was detected at concentrations mostly below the screening criteria of the NAGD. Samples identified as being above the screening criteria was subject to elutriate testing to confirm that the TBT is not bioavailable and as such does not present a hazard at the Port of Hay Point. There have been international bans on the use of organotins in antifoul paints for many years. As such is expected that TBT will not be an ongoing hazard.
- Diuron is not specified as a contaminant of concern in the NAGD, although it is known to be a water quality contaminant in the local area, as a result of farming practices. Diuron concentrations in marine sediments at the port were determined not to be bioavailable through elutriate testing. There is no active use of Diuron associated with port activities, although the applicant will continue to include Diuron in future sediment quality investigations.
- Arsenic is known to occur naturally in concentrations above the NAGD screening criteria in Queensland waters and there are no sources derived from port activities or operations. No hazardous wastes or further waste management is identified.

All sediments are characterised to be extremely saline and high potential acid sulfate soil (PASS, concentrations greater than the QASSIT action criteria)) was detected in 16 samples from nine locations. These samples were mainly comprised of fine textured material (i.e. silts and silty clays) generally located in the apron and berth pocket areas. PASS concentrations less than the QASSIT guideline were also reported in coarser material (i.e. sand and silty sand) generally located in the departure channel.

Acid neutralising capacity was detected in all samples in concentrations considered sufficient to negate acidity. This buffering potential was expected to arise from the presence of carbonate grains within the sediments. These data indicate that the marine sediments, if brought ashore, are unlikely to require treatment via neutralisation with lime. They would however require treatment to manage risk of saline impacts if an alternative to at-sea disposal was to be considered. Low organic material was reported for all samples analysed. The highest organic material (i.e. 1-2%) reported occurred within the finer textured samples. Coarse material, primarily located in the departure channel, contained organic material less than the laboratory practical quantification limit.

Refer to items 12 and 13 and the risk assessment at Attachment A for an assessment of potential impacts of the proposed loading and dumping activities on environmental values and recommended mitigation measures.

Details of the production process and the sources of wastes within that process

A contamination audit was completed as part of the 2018 Sediment Sampling and Analysis Plan (Sediment Characterisation Report submitted with the application).

Agricultural land uses (primarily sugar cane production) are located several kilometres to the west of the terminals and minor residential land uses border the facilities to the north and south and are adjacent to the HTTH. The nearest major urban and industrial areas (apart from the coal terminals) with the potential to introduce contaminants into the Port of Hay Point are located in the city of Mackay located 15km to the north.

The Reef Catchments Water Quality Improvement Plan 2014-2021 states that Alligator Creek, which is adjacent to the dredge area, has pesticides and herbicides commonly used in sugar cane production (e.g. Diuron, Ametryn, Hexazinone) levels that are either just below or above the trigger values set out in The Water Quality Guidelines for the GBRMP (2010). The berths (both DBCT and HPCT), apron areas and departure path are located 1.8 to 3 km from shore in an open water environment where organic rich sediments, which have the potential to be contaminated, are unlikely to accumulate.

Stormwater from both terminals is collected, treated in sedimentation ponds to remove coal and sediment and then stored in large dams for reuse onsite such as for dust suppression.

Port activities have potential to introduce contaminants to the marine sediments in the Hay Point area. These activities include stockpiling, chemical and fuel storages, sewage treatment, abrasive blasting and metal coating processes that are required for operations and maintenance of the port facilities. Dust emissions from the coal terminals are continuously monitored. With respect HTTH and the boat ramp, the primary potential sources of contaminants are from chemical and fuel storage (and potential spills) associated with the operation of the Tug facilities and the use of the boat ramp.

Historically there has been individual sample exceedances of TBT which are a result of previously used anti-fouling paint on the bottom of vessels. The 2018 investigation concluded that, in accordance with the NAGD assessment framework, all sediments proposed for dredging under the 2019 maintenance program are suitable for unconfined placement at sea at the approved ADSDA. The 95% UCLs of all potential contaminants analysed, inclusive of TBT, metals and PAHs, are below respective NAGD or agreed local screening levels.

This finding has been consistent across testing completed since 2012; demonstrating the effectiveness of port operator's management strategies at avoid risk of contaminant release into the environment during port operations.

Contamination assessments have not determined areas of contamination requiring further audit and investigation.

When present in the marine environment in sufficient quantities, coal will have physical effects on organisms similar to that of suspended or deposited sediment, i.e. abrasion, smothering, reduced light availability and clogging of respiratory or feeding organs (Aherns *et al* 2005). Toxic effects of contaminants in coal, such as polycyclic aromatic hydrocarbons (PAHs) and trace metals/metalloids, are dependent on coal composition. In response to concerns about the presence of coal on some beaches north of the Port of Hay Point, the applicant commissioned a weight of evidence review to better understand the potential environmental impacts associated with unburnt coal in the marine environment with respect to the operations at Port of Hay Point. The review findings included:

- Coal is not currently a significant part of the sediment matrix in the maintenance material at Port of Hay Point. In accordance with agreed procedures for analysis of maintenance sediments in

accordance with the National Assessment Guidelines for Dredging 2009, sediments samples that contained visible coal particles are sieved through 400 µm screen to ensure sediment testing is not compromised. In the recent 2018 sediment assessment, coal fragments were only observed in 4 of 43 sampling locations.

- Studies in 2014 resulted in trace amounts of coal in sediments at Half Tide Tug Harbour (<0.6%) and the percentage of coal at an offshore control site ranged from 0.1% to 0.2%. An assessment in accordance with the National Assessment Guidelines for Dredging 2009 undertaken at the Port of Hay Point in 2018 concluded that all maintenance dredge areas samples were suitable for unconfined ocean disposal. Therefore, if finer coal particles are present in the maintenance material, it is unlikely that they are providing a source of contamination.
- Coal shipped through the Port of Hay Point originates from the Bowen Basin and can be characterised as being high rank bituminous and predominantly metallurgical coals, uniformly of low sulphur content and very low acid-generating potential, low capacity to release metal contaminants, and undefined PAHs properties.
- A recent investigation by the Queensland Department of Environment and Science of coal samples taken from the Mackay beaches concluded that “while is it not entirely possible to pinpoint the exact region this coal (came) from, it is possible to rule out that this coal originated from the Bowen Basin and Galilee Basin. If it is from Australia, it is most likely to come from the Southern Queensland coalfields or the NSW coalfields.”
- Stormwater outflows from the Port of Hay Point were within water quality guidelines for pH (acidity), most metals and PAHs. Metals that exceeded guideline values were determined to be within the background concentration for the Port area. During stormwater overflow from the coal terminals, coal content in immediate receiving waters at the Port of Hay Point did not exceed 2.8 mg/L at the Half Tide Tug Harbour monitoring location and were less than 0.01mg/L immediately outside the Half Tide Tug Harbour. Suspended coal particles were also determined to be of very small size (95% <10 µm).
- Preliminary examination of water and sediment PAHs indicates a higher carcinogenic/mutagenic potential in the immediate vicinity of port operational areas. This potential appears to diminish away from port operations. It is probable that this is primarily derived from combustion engine emissions.
- A study has been undertaken to examine the human health risks associated with potential bioaccumulation of contaminants in selected biota including mud crabs, fish and whelks at the Port of Hay Point (Koskela Group 2014a and 2014b). This study did not identify the accumulation of any metal above the accepted background concentration for these food types as listed in FSANZ guidelines and FSANZ (2003). Elutriate and pore water have been considered in previous sediment quality assessments at the Port of Hay Point, and there has been no forthcoming concerns regarding toxicity or bioavailability. It is acknowledged that the interactions of coal with sediment quality, pore water and surface waters have not been directly investigated to date.
- In 2012 composite coal samples from Hay Point Coal Terminal were tested in accordance with criteria under MARPOL Annex V. MARPOL is the International Convention for the Prevention of Pollution from Ships which was adopted by the International Maritime Organization in 1973. Based on the results of a freshwater and marine transformation/dissolution test, the composite coal sample did not meet the criteria for classification as an Environmentally Hazardous Substance considered harmful to the marine environment under MARPOL Annex V, or the criteria of a Class 9 dangerous good for the purpose of land (ADG, 2011) or marine (IMO, 2010) transport.
- It is noted that knowledge gaps exist with respect to:
    - Potential release of PAHs from coal, either as export product or as fugitive coal residing on the seabed or beaches;
    - Quality of pore water and the relationship between sediment, pore water and surface water, as this relates to metals and PAHs;
    - Source attribution of PAHs within the coastal environment; and
    - Bioaccumulation and the appraisal of either mutagenic or carcinogenic potential within selected biota.

Based on this weight of evidence report, there is expected to be a very low potential for unburnt coal to impact on the marine environment in any of the following ways:

- bioavailability of leachate from coal
- leaching from coal
- floating ashore or contaminating turtle nesting beaches
- causing human health issues in relation to people swimming at beaches adjacent to the approved dredge spoil disposal area
- contaminating fish or invertebrates caught by recreational or commercial fishers, or being toxic to any marine wildlife including crocodiles

Feasibility of the following waste reduction/prevention techniques:

vi. product reformulation;
vii. clean production technologies;
viii. process modification;
ix. **input substitution; and**
x. **on-site, closed-loop recycling**

Given the waste under consideration for this application is uncontaminated sediment accumulating in port navigational areas predominantly influenced by littoral drift, consideration of product reformulation, clean production technologies, process modification, input substitution on-site and closed-loop recycling are therefore not applicable to the sea dumping permit application.

Item 3. In general terms, if the required audit reveals that opportunities exist for waste prevention at source, an applicant is expected to formulate and implement a waste prevention strategy, in collaboration with relevant local and national agencies, which includes specific waste reduction targets and provision for further waste prevention audits to ensure that these targets are being met. Permit issuance or renewal decisions shall assure compliance with any resulting waste reduction and prevention requirements.

The applicant explored methods to avoid or reduce the accumulation of sediments in port navigational areas, and thus the need for maintenance dredging at the Port of Hay Point. A comprehensive analysis of these efforts is provided in the Sustainable Sediment Management Assessment (the SSMA). Appendix C of the SSMA Hay Point Sediment Dynamics reports on a conceptual understanding of the sediment dynamics in the region was used to investigate the effectiveness of remote upstream sediment control measures to eliminate or reduce the need for future maintenance dredging at the port of Hay Point. Key findings from the study include:

- Sediment is generally moving northwards, with three defined sediment transport processes in the area:
    - Littoral drift;
    - Nearshore turbidity zone; and
    - Inner-shelf bedload transport.
- The major source of sediments to the Port of Hay Point navigational areas are the large stores of available sediment from the inner continental shelf.
- Results from the sediment budget showed that the area is largely in balance, meaning there is little loss of sediment from the system.
- The model suggests that reducing fluvial sources of sediment through in-catchment sediment control measures would only result in a reduction of between 0.1 and 4% at the Port, thereby having very little impact on future maintenance dredging requirements.
- The effect of cyclones is unpredictable but can result in significant additional siltation, particularly in berth areas.

Bathymetric analysis and modelling predicts accumulation of between 200,000 – 250,000m^3 every 3-5 year period (See Appendices D1 and D2 and E of the SSMA). Regular bed levelling/drag barring would potentially reduce accumulation, but not completely avoid ongoing sediment build up (Appendix H of the SSMA – Assessment for navigational maintenance). It is predicted that regular bed levelling/drag barring would effectively reduce maintenance dredging needs to approximately 200,000m^3 over each 5-year

period (rather than every three years as current forecasts predict). Therefore, regular bed levelling has been included in the operational measures to be implemented under the Long term Maintenance Dredge Management Plan to reduce the frequency of maintenance dredging.

Tropical cyclones (TC) can significantly alter sediment dynamics within navigational infrastructure. Modelling associated with TC Debbie in March 2017 (See Appendices D1 Port of Hay Point bathymetric analysis and modelling; and D2 port of Hay Point bathymetric analysis – TC Debbie of the SSMA) supports that a contingency of approximately 200,000m^3 is prudent to account for similar events that result in significant additional siltation and accumulation in port berths and channels.

As no opportunities exist to prevent the natural processes that provide for the source of naturally accumulating marine sediments requiring maintenance dredging and dumping, a waste prevention strategy is not considered necessary and no waste reduction targets have been recommended. However, recommended permit conditions require the applicant to implement the following Management Plans (Plans) in the manner stated in the Plan:

(i) A Long Term Monitoring and Management Plan that addresses the management of dredging at the Port of Hay Point over a 25 year period;

(ii) Environmental Thresholds Report;

(iii) Maintenance Dredging Environmental Management Plan; and

(iv) Marine Environmental Monitoring Plan.

The Long term Plan as required under the first part of the above permit condition will be reviewed and updated every 5 years or when one of the following occurs: permit conditions change or new permits issued; when monitoring reports substantially different impacts than were predicted; or if an incident occurs that poses a significant risk to effective future management. This review will consider whether the sediment management strategies set in the Plan are being achieved over the long term, i.e. Use of operational measures to extend periods between maintenance dredging campaigns and minimise the overall maintenance dredging volume required over the first 10 years of the Plan to a maximum of 956,553 cubic metres, including contingency needs.

Item 4. For dredged material and sewage sludge, the goal of waste management should be to identify and control the sources of contamination. This should be achieved through implementation of waste prevention strategies and requires collaboration between the relevant local and national agencies involved with the control of point and non-point sources of pollution. Until this objective is met, the problems of contaminated dredged material may be addressed by using disposal management techniques at sea or on land.

As discussed in the address of *Annexure 2, Item 3* above, no opportunities exist to prevent the natural processes that provide for the source of naturally accumulating marine sediments requiring maintenance dredging and dumping.

As discussed in *Annexure 2, Item 2* above, a sampling and analysis plan was developed in accordance with the National Assessment Guidelines for Dredging 2009 (NAGD). A sediment quality assessment of the material requiring maintenance dredging has determined the material is suitable for at-sea disposal, meeting the criteria of the NAGD.

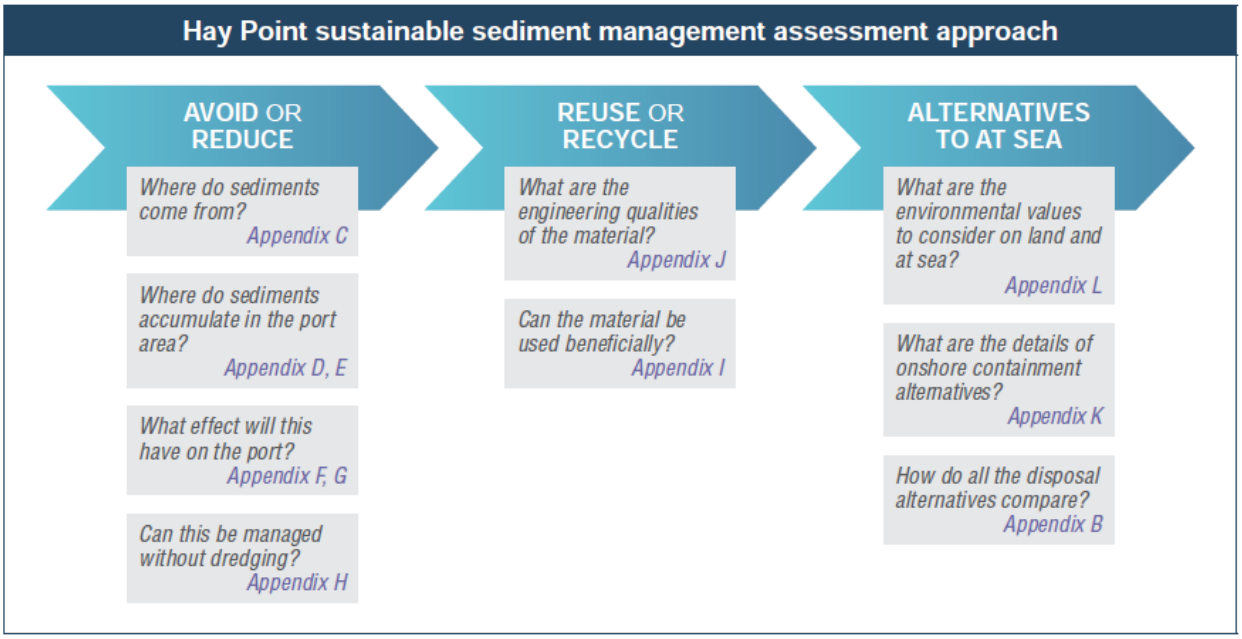
It is considered that no problem with contaminated dredged material exists under this application and development of waste prevention strategies additional to port operational strategies included in the Long term Plan are not warranted. Ongoing sediment characteristics assessments will be undertaken to ensure maintenance material meets the standards of the NAGD prior to each campaign and the Long term Plan will be reviewed at least 5 yearly to track whether the strategies set in the Plan are being achieved over the long term, i.e. Use of operational measures to extend periods between maintenance dredging campaigns and minimise the overall maintenance dredging volume required over the first 10 years of the Plan to a maximum of 956,553m^3, including contingency needs.

CONSIDERATION OF WASTE MANAGEMENT OPTIONS

Alternatives to at-sea disposal were considered by the applicant for the Port of Hay Point. A process of selection and evaluation of alternatives to at-sea disposal was undertaken over a number of years. The

findings are presented in Appendix B of the SSMA. The following technical reports underpinned the comparative analysis:

- **Appendix C** Sediment Dynamics Report
- **Appendix D1** Bathymetric Analysis and Modelling Report
- **Appendix D2** TC Debbie Bathymetric Analysis Report
- **Appendix E** Predictive Modelling Technical Report
- **Appendix F** Sedimentation Impacts on Port Operations
- **Appendix G** Economic Impacts on not Maintaining Sediment Accumulation
- **Appendix H** Assessment for Navigational Maintenance
- **Appendix I** Comprehensive Beneficial Reuse Assessment
- **Appendix J** Marine Sediment Properties Assessment
- **Appendix K** Onshore Pond and Reclamation Engineering Design
- **Appendix L** Environmental Values Assessment



Item 5. Applications to dump wastes or other matter shall demonstrate that appropriate consideration has been given to the following hierarchy of waste management options, which implies an order of increasing environmental impact:

.1 re-use;
.2 off-site recycling;
.3 destruction of hazardous constituents;
.4 treatment to reduce or remove the hazardous constituents; and
.5 disposal on land, into air and in water.

An assessment of the engineering properties of sediments in the navigational infrastructure at the Port of Hay Point (see Appendix J of the SSMA) was undertaken to inform a Comprehensive Beneficial Reuse Assessment (see Appendix I of the SSMA).

Feasible reuse options identified were limited given the characteristics of the marine sediments. Sediment characteristics include:

- consists predominantly of fine silts/clays (60%), mixed with sand (36%) and small amounts of gravel (4%).
- Clay-rich, finer materials were generally found inshore, near existing jetties and berths, which constitutes most of the maintenance dredging requirements at the Port by volume.

- The finer material has very high moisture content, which is likely to limit beneficial reuse options.
- Furthermore, it contains high plasticity clays and low to medium compressibility, increasing the potential to swell and shrink, making it unsuitable for heavy load bearing re-uses.
- The further offshore samples collected, such as the outer departure path, contained coarse sands, with some of the farthest offshore sites being above 90% sand.
- All samples were identified as extremely saline and if placed on land without treatment, would likely degrade soil quality, cause vegetation toxicity and impact surface and ground waters.
- High Potential Acid Sulphate Soil was detected in 9 of the 16 sampling locations generally in the apron and berth pocket areas.
- Analysis of the acid neutralising capacity indicated if bought ashore, the marine sediments are unlikely to require treatment via neutralisation with lime.

Twelve reuse options were identified for further analysis in Comprehensive Beneficial Reuse Assessment (see Appendix I of the SSMA). Analysis of each identified option and comparison between the options used a number of defined performance criteria including:

- Sediment Properties
- Material Suitability
- Opportunity
- Cost
- Process
- Duration
- GHG emissions
- Environmental Implications
- Social Implications
- Economic Implications
- Approvals and Permits
- Constraints
- Knowledge Gaps
- Future Considerations

No hazardous contaminants are present in the sediment that require destruction or the consideration of reduction or removal treatment (refer *Annexure 2, Item 2* above).

Disposal into land and water were considered in identifying the reuse options. Disposal to air is not considered relevant for dredged material.

A wide-ranging Environmental Values Assessment (Appendix L of SSMA) for the Port of Hay Point / Mackay area was used to inform an environmental constraints analysis and aid in site selection for both onshore and at-sea disposal options.

The main findings of the beneficial reuse assessment were:

- Although no on-land beneficial reuses were identified, many of these reuses would require the construction of an on-land containment facility to store and dry the material for reprocessing. On-land containment facilities or structures were assessed as disposal options in the comparative analysis.
- Land reclamation, although costly and not suitable for port related uses, has been assessed as a potential disposal option, as the land use plans of both the Port of Hay Point and Port of Mackay include potential future land reclamations.
- Direct habitat restoration has merit as a beneficial reuse, although it is acknowledged that considerable additional scientific research and a thorough feasibility assessment would be necessary before the option can be considered viable. No immediate opportunities for habitat restoration are available. Refer to 'Beneficial Reuse of Maintenance Dredged Material – Habitat Restoration Feasibility Assessment'.

Independent Peer Review- Comprehensive beneficial reuse assessment – Appendix I

The approach adopted to undertake the beneficial reuse investigations is detailed and robust, with a comprehensive list of performance criteria taken into consideration. The performance evaluation provides adequate and clear definition as to what constitutes high, medium and low performance for each of the criteria. Noting the nature of the dredged material, it is considered that the authors have evaluated all reasonable alternatives for beneficial reuse with the results justified. The cost estimates appear to be relatively thorough, with clearly stated and reasonable assumptions.

The reviewers also found that:

- the analysis method is robust and adequate to identify reuse options and analyse their opportunity, feasibility and achievability
- all reasonable alternative options for use of the dredge material have been identified
- all the relevant performance criteria have been considered and are sufficiently measurable
- the beneficial reuse analysis of each reuse option does accurately determine a level of performance for each performance criteria
- the level of performance is reasonably supported
- no alternative credible evidence can be identified that would support an alternative level of performance for each performance criteria
- the costs (financial and time) stated are reasonably accurate.

A comparison of all the disposal options, based on the following technical reports, was undertaken using the principles of structure decision making. The findings are presented in Comparative Analysis Technical Report (Appendix B of the SSMA).

The following technical reports underpinned the comparative analysis:

- **Appendix C** Sediment Dynamics Report
- **Appendix D1** Bathymetric Analysis and Modelling Report
- **Appendix D2** TC Debbie Bathymetric Analysis Report
- **Appendix E** Predictive Modelling Technical Report
- **Appendix F** Sedimentation Impacts on Port Operations
- **Appendix G** Economic Impacts on not Maintaining Sediment Accumulation
- **Appendix H** Assessment for Navigational Maintenance
- **Appendix I** Comprehensive Beneficial Reuse Assessment
- **Appendix J** Marine Sediment Properties Assessment
- **Appendix K** Onshore Pond and Reclamation Engineering Design
- **Appendix L** Environmental Values Assessment

Using a structured decision-making process, 11 decision objectives and 14 discrete measures were developed by a stakeholder advisory group. These spanned across a number of key categories or themes including:

- Environmental
- Cultural Heritage
- Port Economics and Operations
- Health and Safety
- Social
- Innovation
- World Heritage

An initial analysis of eight options indicated:

- At-sea disposal at the existing or potential new mid-shelf Dredge Material Placement Area (ADSDA) would be necessary to deal with the immediate maintenance needs at the Port.

- Habitat restoration, if feasible, may only be a 'one-off' solution and would require several years lead time. It is recommended that a Section 19 Agreement under the Sea Dumping Act would be the most appropriate management tool to require the applicant to demonstrate the feasibility (or not) of habitat restoration and creation options.
- Disposing of dredged material within a constructed reclamation at the Port of Mackay was found to be the worst performing single alternative across most themes (assessment criteria) and did not warrant further analysis.
- A combination of these alternatives may be required as part of a long-term solution (~25 years).

From this initial analysis, 11 long term strategies were developed, combining the various alternatives, over a 25-year timeframe. The structured decision making process showed how each of the eleven strategies compared when equally considering each of the key themes, as well as how the comparison would change if the outcomes were significantly weighted (75%) to any one particular theme. The results identified three higher performing options:

- continued and ongoing at-sea disposal at the existing inshore disposal location.
- a combination of continued at-sea disposal at the existing inshore disposal location and habitat restoration or creation at some time in the future (pending a range of additional studies and feasibility assessment), reverting to continue at-sea disposal thereafter.
- a combination of at-sea disposal at a new mid-shelf disposal location and habitat restoration or creation at some time in the future (pending a range of additional studies and feasibility assessment), reverting to continue at-sea disposal thereafter.

Independent peer review

An independent assessment of the following components of the applicant's information was commissioned by the Authority. The conclusions of that assessment are as follows:

Independent Peer Review – Comparative analysis technical report – Appendix B

"The approach used for the comparative analysis of dredge material disposal strategies provides a robust and transparent process for assessing disparate measures. Importantly, the "Principles of Structured Decision Making" process is an entirely appropriate and robust methodology for the comparative analysis of the various dredge material disposal options presented. This is of particular note from a sustainability/ Triple Bottom Line perspective, with consideration of the interplay between then social, economic and environmental aspects together. The non-linear, iterative approach is noted and commended.

Relatively strong evidence is provided in the document to substantiate conclusions. However, some evidence was derived from other reports, which have not been part of this review (see assumptions / qualifications). Notwithstanding the above comment, it is the review teams' opinion that the results are logical and findings sound.

The reviewers also found that:

- the structured decision making process was appropriate for the comparative analysis of various dredge material disposal strategies
- the decision making process was legitimate and transparent with the results for each material disposal strategy supported by accurate and factual evidence
- In Step 2, all the appropriate Themes have been identified and all appropriate Objectives and Measures have been developed to measure the performance of alternative options against
- In Step 4, the units of measure used to determine the performance score/measure for each objective are supported by evidence and are accurate relative to the evidence provided
- there is not any alternative credible evidence that could be reasonably used to derive a significantly different performance score/measure for each Objective
- In Step 5, the process of applying normalised scores and weighted scores is a credible process that can be used to compare the performance of each strategy without introducing bias
- In the development of the combined options, no reasonably viable long term combined options have been left out; and
- the conclusions are reasonably supported by evidence within the document.

Independent Peer Review- Assessment for navigational maintenance – Appendix H

"The approach adopted to evaluate prudent and feasible alternatives to dredging and disposal is based on both World Association for Waterbourne Transport Infrastructure (PIANC) and US Army Corps of Engineers guidance for minimising harbour and channel sedimentation. This guidance is considered best practice and subsequent methodology used for the comparative assessment sound.

With regard to the assessment criteria, the review team concluded that the rationale for rejecting siltation reduction solutions were valid; the costs estimates for the siltation reduction solutions were reasonably accurate; and the constraints analysis are reasonably accurate and justified. While there are some minor inconsistencies in the analysis, these do not affect the overall results and conclusions, which are reasoned and justified.

Independent Peer Review- Onshore Pond and Reclamation Engineering – Section 5.2 of Appendix K

The approach adopted is considered sound and the assumptions in terms of activities, operations, materials volumes etc. are reasonably well outlined. The resultant cost estimates are considered reasonable. The GHG [greenhouse gas] Protocol method used to calculate likely GHG emissions is considered one of the most robust "best practice" methodologies for these types of calculations. The calculations and resulting GHG emissions figures are therefore considered adequate to support the conclusions.

The reviewers also found that:

- the technical reasons for rejecting each onshore pond and reclamation option are valid;
- the rough order of magnitude cost estimates for each dredging campaign are reasonably accurate; and
- the greenhouse gas emissions are reasonably accurate.

Item 6. A permit to dump wastes or other matter shall be refused if the permitting authority determines that appropriate opportunities exist to re-use, recycle or treat the waste without undue risks to human health or the environment or disproportionate costs. The practical availability of other means of disposal should be considered in the light of a comparative risk assessment involving both dumping and the alternatives.

The independently peer reviewed in Comparative Analysis Technical Report (Appendix B of the SSMA) and supporting technical reports have provided sufficient evidence (refer Item 5 above) to support the conclusions that traditional maintenance dredging and at-sea disposal is, on balance of environmental, social and economic considerations, the most appropriate option for the Port of Hay Point. It is noted that habitat restoration options may be found feasible pending further investigation.

The applicant has committed via execution of a subsection 19(9) Agreement under the Sea Dumping Act to investigate the habitat restoration or creation beneficial reuse options further and has established a scientific advisory group to help scope a feasibility assessment. Under the Agreement the Parties agree that if superior disposal or re-use options are identified by the applicant during its investigations pursuant to this Agreement, North Queensland Bulk Ports Corporation Ltd will implement (where there are no undue risks to human health or the environment or disproportionate costs) those options prior to disposal in the Great Barrier Reef Marine Park.

In considering the practical availability of beneficial re-use options, it is noted that legislative approvals for undertaking habitat restoration or creation will be required and the scope for habitat restoration or creation is limited to individual dredge campaigns rather than an ongoing solution. In addition, considering the low risk of environmental impacts (refer Attachment A risk assessment) based on the proposed application, permit conditions and associated mitigation strategies, it is considered that the applicant has demonstrated that appropriate consideration has been given to the hierarchy of waste management options.

CHEMICAL, PHYSICAL AND BIOLOGICAL PROPERTIES

Item 7. A detailed description and characterisation of the waste is an essential precondition for the consideration of alternatives and the basis for a decision as to whether a waste may be dumped. If a waste is so poorly characterized that proper assessment cannot be made of its potential impacts on human health and the environment, that waste shall not be dumped.

Sediment quality and characterisation has been studied extensively at the Port of Hay Point and is well documented, as such is considered very well characterised.

The more recent characterisation reporting includes:

- Advisian (2018). Maintenance Dredging Sediment Characterisation Report Port of Hay Point, report 301001-02018-EN-RPT-0003, Advisian, Brisbane.
- Advisian (2017). North Queensland Bulk Ports Maintenance Dredging Sampling and Analysis Plan Port of Hay Point, report 301001-02018-EN-PLN-0001, Advisian, Brisbane.
- Advisian (2016). Comprehensive Beneficial Reuse Assessment – Port of Hay Point – Sustainable Sediment Management Assessment for Navigational Maintenance, report 301310-09537-002, Advisian, Brisbane.
- Advisian (2016). Port of Hay Point Sediment Characterisation Report DBCT Berths 3 & 4, report 301310-09537-0002, Advisian, Brisbane.
- BMT WBM (2011). Half Tide Boat Ramp Sediment Characterisation Report. June 2011. Report prepared for Queensland Department of Transport
- GBRMPA (2017). Port of Hay Point Maintenance Dredging Sampling and Analysis Plan approval letter dated 21 December 2017
- GHD (2005). Port of Hay Point – Capital Dredging Departure Path and Apron Areas. Sediment sampling and analysis report. Report prepared for the Ports Corporation of Queensland.
- GHD (2011). DRAFT Report for Berths 1 and 2 Maintenance Dredging Sediment Sampling and Analysis Plan, June 2011. Report prepared for Dalrymple Bay Coal Terminal.
- Ports and Coastal Environmental Pty Ltd (PaCE) (2013). Port of Hay Point, Sediment Characterisation Report - 2013. No. 2012001-001. Ormeau, Queensland.
- Ports and Coastal Environmental Pty Ltd (PaCE) (2014). Port of Hay Point, DBCT Berths 1 and 2 Sediment Characterisation Report. No. 2014002 – 002. PaCE, Brisbane.
- WorleyParsons (2013). Dudgeon Point Coal Terminals Project – Sediment Characterisation Report for Marine Support Facilities – Revision C, report – 301001-01385-00-PM-REP-0004-069. WorleyParsons 12 April 2013

As discussed in Annexure 2, Item 2 above, a sampling and analysis plan was developed in accordance with the National Assessment Guidelines for Dredging 2009 (NAGD). A sediment quality assessment (submitted with the application) of the material requiring maintenance dredging has determined the material is suitable for at-sea disposal, meeting the criteria of the NAGD.

Of the contaminants investigated Tributyltin (TBT), Diuron and Arsenic were noteworthy.

- TBT was detected at concentrations mostly below the screening criteria of the NAGD. Those above underwent elutriate testing to confirm TBT is not bioavailable and as such and do not present a hazard at the Port of Hay Point. There have been international bans on the use of organotins (including TBT) in antifoul paints for many years. As such is expected that TBT will not be an ongoing hazard.
- Diuron is not specifies as contaminant of concern in the NAGD, although it is known to be a water quality contaminant in the local area, as a result of farming practices. Diuron concentrations in marine sediments at the port were determined not to be bioavailable through elutriate testing. There is no active use of Diuron associated with port activities, although NQBP will continue to include diuron in future sediment quality investigations.
- Arsenic is known to occur naturally in concentrations above the NAGD screening criteria in Queensland waters and there are no sources derived from port activities or operations.

As per the NAGD assessment framework, it is recommended that the sediments to be dredged from the Port of Hay Point navigational areas outlined in this report are suitable for unconfined placement at sea at the approved ocean ADSDA on the basis that all 95% UCLs of the mean for chemical substances analysed are below respective NAGD or agreed local screening levels.

Item 8. Characterisation of the wastes and their constituents shall take into account:

.1 origin, total amount, form and average composition;
.2 properties: physical, chemical, biochemical and biological;
.3 toxicity;
.4 persistence: physical, chemical and biological; and
.5 accumulation and biotransformation in biological materials or sediments.

The National Assessment Guidelines for Dredging 2009 (NAGD) detail the required assessment of sediment quality of maintenance dredge material proposed for disposal at sea.

The origins of accumulated sediments at the port arise from natural coastal processes can are unlikely to be reduced or avoided (Refer Item 3 above).

Bathymetric analysis and modelling undertaken as part of the Sustainable Sediment Management Assessment (SSMA Appendix D1 and D2) for the Port of Hay Point has provided estimates of current and future amounts of material that is likely to accumulate at the port over the next 10 year period.

Period	Volume (m^3)
Current	356,553
1-5 years	200,000
5-10 years	200,000
Cyclone contingency	200,000
Total 10 year permit requirement	**956,553**

The sediments that accumulate within the areas targeted for maintenance dredging at Port of Hay Point have been subject to testing on numerous occasions. Sediment sampling to support characterisation of material to be targeted during the 2019 maintenance dredging program was completed in February 2018 in accordance with the approved Sampling and Analysis Plan (SAP). Consistent with previous testing results, this most recent testing has determined the material is suitable for at-sea disposal, meeting the criteria of the National Assessment Guidelines for Dredging 2009.

Generally, the sediment that accumulates in the navigational infrastructure and the Port of Hay Point is predominantly fine silts/clays (60%), mixed with sand (36%) and small amounts of gravel (4%). The sediment increases in the proportional presence of sands and gravel as distance from the shore increases.

All sediments are characterised to be extremely saline and high potential acid sulfate soil (PASS, concentrations greater than the QASSIT action criteria)) was detected in 16 samples from nine locations. These samples were mainly comprised of fine textured material (i.e. silts and silty clays) generally located in the apron and berth pocket areas. PASS concentrations less than the QASSIT guideline were also reported in coarser material (i.e. sand and silty sand) generally located in the departure channel.

Acid neutralising capacity was detected in all samples in concentrations considered sufficient to negate acidity. This buffering potential was expected to arise from the presence of carbonate grains within the sediments. These data indicate that the marine sediments, if brought ashore, are unlikely to require treatment via neutralisation with lime. They would however require treatment to manage risk of saline impacts if an alternative to sea disposal was to be considered.

Low organic material was reported for all samples analysed. The highest organic material (i.e. 1-2%) reported occurred within the finer textured samples. Coarse material, primarily located in the departure channel, contained organic material less than the laboratory practical quantification limit.

When present in the marine environment in sufficient quantities, coal will have physical effects on organisms similar to that of suspended or deposited sediment, i.e. abrasion, smothering, reduced light availability and clogging of respiratory or feeding organs (Aherns *et al* 2005). Toxic effects of contaminants in coal, such as polycyclic aromatic hydrocarbons (PAHs) and trace metals/metalloids, are dependent on coal composition. In response to concerns about the presence of coal on some beaches north of the Port of Hay Point, the applicant commissioned a weight of evidence review to better understand the potential environmental impacts associated with unburnt coal in the marine environment with respect to the operations at Port of Hay Point. The review findings included:

- Coal is not currently a significant part of the sediment matrix in the maintenance material at Port of Hay Point. In accordance with agreed procedures for analysis of maintenance sediments in accordance with the National Assessment Guidelines for Dredging 2009, sediments samples that contained visible coal particles are sieved through 400 µm screen to ensure sediment testing is not compromised. In the recent 2018 sediment assessment, coal fragments were only observed in 4 of 43 sampling locations. Studies in 2014 resulted in trace amounts of coal in sediments at Half Tide Tug Harbour (<0.6%) and the percentage of coal at an offshore control site ranged from 0.1% to 0.2%.

- Coal shipped through the Port of Hay Point originates from the Bowen Basin and can be characterised as being high rank bituminous and predominantly metallurgical coals, uniformly of low sulphur content and very low acid-generating potential, low capacity to release metal contaminants, and undefined PAHs properties.
- A recent investigation by the Queensland Department of Environment and Science of coal samples taken from the Mackay beaches concluded that "while is it not entirely possible to pinpoint the exact region this coal (came) from, it is possible to rule out that this coal originated from the Bowen Basin and Galilee Basin. If it is from Australia, it is most likely to come from the Southern Queensland coalfields or the NSW coalfields."
- An assessment in accordance with the National Assessment Guidelines for Dredging 2009 undertaken at the Port of Hay Point in 2018 concluded that all maintenance dredge areas samples were suitable for unconfined ocean disposal. Therefore, if finer coal particles are present in the maintenance material, it is unlikely that they are providing a source of contamination.
- Stormwater outflows from the Port of Hay Point were within water quality guidelines for pH (acidity), most metals and PAHs. Metals that exceeded guideline values were determined to be within the background concentration for the Port area. During stormwater overflow from the coal terminals, coal content in immediate receiving waters at the Port of Hay Point did not exceed 2.8 mg/L at the Half Tide Tug Harbour monitoring location and were less than 0.01mg/L immediately outside the Half Tide Tug Harbour. Suspended coal particles were also determined to be of very small size (95% <10 µm).
- Preliminary examination of water and sediment PAHs indicates a higher carcinogenic/mutagenic potential in the immediate vicinity of port operational areas. This potential appears to diminish away from port operations. It is probable that this is primarily derived from combustion engine emissions.
- A study has been undertaken to examine the human health risks associated with potential bioaccumulation of contaminants in selected biota including mud crabs, fish and whelks at the Port of Hay Point (Koskela Group 2014a and 2014b). This study did not identify the accumulation of any metal above the accepted background concentration for these food types as listed in FSANZ guidelines and FSANZ (2003). Elutriate and pore water have been considered in previous sediment quality assessments at the Port of Hay Point, and there has been no forthcoming concerns regarding toxicity or bioavailability. It is acknowledged that the interactions of coal with sediment quality, pore water and surface waters have not been directly investigated to date.
- In 2012 composite coal samples from Hay Point Coal Terminal were tested in accordance with criteria under MARPOL Annex V. MARPOL is the International Convention for the Prevention of Pollution from Ships which was adopted by the International Maritime Organization in 1973. Based on the results of a freshwater and marine transformation/dissolution test, the composite coal sample did not meet the criteria for classification as an Environmentally Hazardous Substance considered harmful to the marine environment under MARPOL Annex V, or the criteria of a Class 9 dangerous good for the purpose of land (ADG, 2011) or marine (IMO, 2010) transport.
- It is noted that knowledge gaps exist with respect to:
    - Potential release of PAHs from coal, either as export product or as fugitive coal residing on the seabed or beaches;
    - Quality of pore water and the relationship between sediment, pore water and surface water, as this relates to metals and PAHs;
    - Source attribution of PAHs within the coastal environment; and
    - Bioaccumulation and the appraisal of either mutagenic or carcinogenic potential within selected biota.

Based on this weight of evidence report, there is expected to be a very low potential for unburnt coal to impact on the marine environment in any of the following ways:

- bioavailability of leachate from coal
- leaching from coal
- floating ashore or contaminating turtle nesting beaches

- causing human health issues in relation to people swimming at beaches adjacent to the approved dredge spoil disposal area
- contaminating fish or invertebrates caught by recreational or commercial fishers, or being toxic to any marine wildlife including crocodiles

Item 9. Each Contracting Party shall develop a national Action List to provide a mechanism for screening candidate wastes and their constituents on the basis of their potential effects on human health and the marine environment. In selecting substances for consideration in an Action List, priority shall be given to toxic, persistent and bioaccumulative substances from anthropogenic sources (e.g., cadmium, mercury, organohalogens, petroleum hydrocarbons, and, whenever relevant, arsenic, lead, copper, zinc, beryllium, chromium, nickel and vanadium, organosilicon compounds, cyanides, fluorides and pesticides or their by-products other than organohalogens). An Action List can also be used as a trigger mechanism for further waste prevention considerations.

In Australia, the National Assessment Guidelines for Dredging 2009 (NAGD) provides the actions list and mechanism for screening constituents based on their potential effects on human health. As detailed in Item 7 & 8, the application meets all requirements under the Action List.

Item 10. An Action List shall specify an upper level and may also specify a lower level. The upper level should be set so as to avoid acute or chronic effects on human health or on sensitive marine organisms representative of the marine ecosystem. Application of an Action List will result in three possible categories of waste:

1. **wastes which contain specified substances, or which cause biological responses, exceeding the relevant upper level shall not be dumped, unless made acceptable for dumping through the use of management techniques or processes;**
2. **wastes which contain specified substances, or which cause biological responses, below the relevant lower levels should be considered to be of little environmental concern in relation to dumping; and**
3. **wastes which contain specified substances, or which cause biological responses, below the upper level but above the lower level require more detailed assessment before their suitability for dumping can be determined.**

The screening criteria of the National Assessment Guidelines for Dredging 2009 (NAGD) meet the obligations of Annexure 2, Item 10.

A sediment quality assessment (SAP report submitted with the application) of the material requiring maintenance dredging has determined the material is suitable for at-sea disposal, meeting the criteria of the NAGD.

The report recommends that the accumulated sediments to be dredged from the Port of Hay Point navigational areas outlined in this report are suitable for unconfined placement at sea on the basis that all 95% UCLs of the mean for chemical substances analysed are below respective NAGD or agreed local screening levels.

DUMP-SITE SELECTION

Item 11. Information required to select a dump-site shall include:

1. **physical, chemical and biological characteristics of the water-column and the seabed;**
2. **location of amenities, values and other uses of the sea in the area under consideration;**
3. **assessment of the constituent fluxes associated with dumping in relation to existing fluxes of substances in the marine environment; and**
4. **economic and operational feasibility.**

The Approved Dredge Spoil Disposal Area (ADSDA) has been used for this purpose by the Port since capital dredging in 2006.

Previous testing of the sediments within the ADSDA completed by Worley Parsons (2013) found these to be dominated by medium and coarse sands (~80-90%) with gravels (5-10%). Finer fraction sediments (silts and clays) represent <5% of the sediments. This finding is consistent with more recent testing that showed samples offshore had higher components of sands and coarse material compared to samples inshore (Advisian 2018).

Results from the long-term resuspension modelling are generally in agreement with the findings from a bathymetric analysis of the existing ADSDA at the Port of Hay Point (RHDHV, 2018). Section 7.6 (p228) of the Dredge Plume Modelling Assessment report describes that the ADSDA has retained 64% of the sediment from capital and maintenance dredging between 2006 and 2014. The modelling undertaken as part of this assessment has also predicted that approximately two thirds of the material placed at the existing ADSDA would be retained (over a 12-month period in this case).

The ADSDA is located in a low density seagrass meadow dominated by *Halophila* species. The area has been surveyed extensively with the most recent survey occurring in 2018. This survey confirmed presence of a light patchy *Halophila decipiens* community within the ADSDA (York and Rasheed, 2018). Inshore coral communities can be found in the vicinity of, but not within, the approved dredge spoil disposal area. Refer Item 12-14 below for more detail on the assessment of potential effects.

Each dredged material placement run will be logged using both satellite navigation and standard bridge equipment, and will be electronically fixed using a differentially corrected global positioning system (GPS). Electronic track plots will mark the start of each placement process (hopper open), and the end of the process (hopper closed). Placement tracks usually show an arc, which the dredge follows to ensure that all dredged material is placed within the designated ADSDA. Position will be determined with an accuracy of at least 10m.

Economic costs of various disposal options have been considered as part of the structured decision making process (SSMA), with detail cost analysis presented on all options. Cost when considered in isolation to other values is not considered prohibitive.

ASSESSMENT OF POTENTIAL EFFECTS

Item 12. Assessment of potential effects should lead to a concise statement of the expected consequences of the sea or land disposal options, ie, the "Impact Hypothesis". It provides a basis for deciding whether to approve or reject the proposed disposal option and for defining environmental monitoring requirements.

A wide-ranging Environmental Values Assessment (EVA) for the Port of Hay Point / Mackay area has been developed to identify the location of amenities, values and other important features in the area.

Based on the risk assessment at Attachment A, potential effects on human health, living resources, amenities and other legitimate uses of the sea are considered to be low risk.

Item 13. The assessment for dumping should integrate information on waste characteristics, conditions at the proposed dump-site(s), fluxes, and proposed disposal techniques and specify the potential effects on human health, living resources, amenities and other legitimate uses of the sea. It should define the nature, temporal and spatial scales and duration of expected impacts based on reasonably conservative assumptions.

The Port of Hay Point supports both inshore shallow water (five species of the genus *Halophila*) and mid-shelf deeper water (dominated by *Halophila decipiens*) seagrass meadows. *Halophila* species are colonising species that can tolerate frequent disturbances (McMahon *et al* 2017). The seagrass communities in the Hay Point area are naturally low density and ephemeral. The deepwater meadows in particular were found to occur annually, being present only between July and December each year. Studies have shown the meadows in the area to recover post-dredging (York *et al* 2015).

Fringing coral communities grow in waters surrounding Victor Island, Round Top Island, Flat Top Island, Slade Islet and Hay Reef. Sparse coral communities can also be found in the shallow waters of Dalrymple bay and southward from Dungeon Point. The hard coral species common to the area are those typical of turbid inshore environments of the Marine Park. A sparse, but diverse range of soft

corals, sponges, sea fans, ascidians and hydroids are also associated with these inshore coral communities.

Identified coral communities lie outside of the area predicted to be impacted by turbidity and sedimentation, and ecologically relevant turbidity thresholds will be used during dredging to further prevent impacts. Turbidity and sedimentation can reduce recruitment, survival and settlement of coral larvae (Erftemeijer *et al* 2012). It is recommended to include a permit condition to not allow the dredging and dumping works to be undertaken during the mass coral spawning periods each year.

Protected species are unlikely to be significantly impacted by maintenance dredging. There are a number of protected fauna species that are known to occur at the Port at times, including marine turtles, whales, dolphins, dugong, migratory shorebirds and the Water Mouse, but the area does not provide critical habitat resources for any marine species and disturbance to habitats will be low. There is evidence of very low levels of mortality of marine turtles during dredging excavations, which is reduced by the use of turtle deflection devices (McCook *et al* 2015). The Maintenance Dredge Management Strategy submitted with the application includes commitment to use dredge vessels fitted with turtle deflection devices. Open water fast moving species such as sharks, fin fish and dolphins are rarely impacted directly by dredging activities or dredge vessels due to the slow speeds at which vessels move. Any indirect impacts leading to habitat alienation from vessel presence, noise or turbidity will be temporary and short term in nature. Significant impacts are not expected.

Commercial fishing is already restricted within operational port limits, as such it is considered that use of the existing approved dredge spoil disposal area will not restrict fisheries access substantively above current restrictions. Disruption will be short-term and recreational fishers have sufficient alternate sites within the region to utilise. The risk to habitats is low, so indirect effects to fishers are also low and full access is expected to be restored after each campaign.

The Sustainable Sediment Management Assessment used information from the Environmental Values Assessment as the basis of an environmental constraints analysis and aided in site selection for both onshore and at-sea disposal options. As such, highly environmentally sensitive areas have been excluded in formulating the potential disposal options.

The primary ecosystem process that is likely to be relevant to the proposed conducts is resuspension of sediments. Maintenance dredging and dumping creates plumes that are shorter in duration, and more localised, than capital dredging (McCook et al 2015). Generally both disposed sediments and dispersed sediments from dredge plumes have the potential to be resuspended and transported by waves and ocean currents, and to contribute to the long-term, chronic increase in fine suspended sediment concentrations in the inshore Great Barrier Reef. The effects of any campaign will be context dependent and will differ between locations, types and extent of dredging and sediment dumping activities. (McCook et al 2015)

The applicant's numerical plume modelling, which the Authority had independently reviewed, shows that for the majority of the time suspended solids concentrations (SSC) resulting from dredging at Port of hay Point and relocation to the existing approved dredge spoil disposal area are less than 2mg/l, with isolated occurrences above 5mg/l. A study of natural resuspension of marine sediments in the Hay Point area demonstrated that maintenance dredging and relocation of up to 400,000m^3 results in low excess SSC, comparable to natural SSC during calm conditions (wind speeds of 15 knots and under). A further analysis investigated the Intensity, Duration, and Frequency of natural SSC using three years of continuous water quality data from the applicant's Port of Hay Point Ambient Marine Monitoring Program (provided by James Cook University's, TropWater). Modelling showed that the SSC would remain within the natural range of the Hay Point area, up until 800,000m^3 or more was dredged and disposed in a single campaign.

Approximately sixty percent of the spoil volume will be finer material, of which two-thirds is expected to remain directly within the approved placement area. Most of the remainder spoil will settle out adjacent to the placement area and quickly consolidate into seafloor sediment matrix. Dominant sediment transport processes are to the north, but 'direct' passage of fine silts to the Whitsundays is unlikely as sediment particles do not remain in suspension. Finer material will start to consolidate into the seafloor matrix within one week to one month after dumping, after which normal wave and wind energy will be insufficient to mobilise this material. Minor resuspension regularly occurs as a result of wave and tidal conditions, but resuspension will occur mostly during high energy events as would widespread resuspension of the surrounding seabed.

The Authority had the dredge plume modelling covered in Appendix A Part 1 and Part 2 of the applicant's Environmental Risk Assessment independently peer reviewed. The review concluded the following:

The overall report is well written and the approach to the dredging conceptualisation and sediment resuspension scenarios are well considered and sound. The models applied have the necessary physics and ability to model the behaviour of suspended sediment concentrations associated with dredging operations and resuspension weather and tide events.

The report does not provide a clear indication of vertical shear and the existence of any bottom boundary layer at the timescales presented so that the significance or not of these phenomena is accounted for. Tidal currents can have significant phase lags in the current profile and can at times have reversals from top to bottom. These are important considerations that will impact SSC behaviour.

Regardless of the adequacy of the 3D hydrodynamic modelling the sedimentary module applied only uses the depth averaged hydrodynamics not the full water column profile.

Assumptions of other aspects of the model setup are appropriate and reasonable however the boundary forcing for waves is less than optimal. The Mackay wave rider buoy to the north is used to force the deeper southern boundary.

The model in general does perform well in the validation exercises however there are some areas that should be improved in any future effort. The short period spiking in SSC at key resuspension events are not well replicated by the model.

The availability of data for validation and calibration of currents and SSC is limited and spread across a number of years rather than simultaneously made. It is recommended that a more comprehensive spatial and concurrent set of observations be made over periods long enough to capture all weather conditions that impact Hay Point are made to improve any future modelling and inform any dredging campaigns in the future.

The full suite of comments from the review were provided to the applicant as a formal further information request. Their responses were provided in the Applicant's Supplementary Information Package, including a Technical Note providing additional detail. A summary of responses included:

Baseline information

- In August 2018, NQBP installed two Acoustic Doppler Current Profilers (ADCPs) at the Port of Hay Point. One ADCP was installed at the northern end of DBCT berths and one ADCP was installed at the southern end of HPCT berths. NQBP will use data from these ADCPs, along with its continued ambient water quality monitoring program, to inform any future dredging programs.

2D vs 3D modelling

- The dredge plume model was setup with five sigma layers, with each representing 20% of the water column. The MIKE21/3 Flexible Mesh model has a dynamic timestep, meaning that the model will calculate the timestep required throughout the simulation (with the upper limit to this being specified by the user, in this case 60 seconds was set as the maximum timestep). The outer part of the Hay Point departure channel does not adhere to the GBRMPA recommendation that a minimum of two grid cells are included in the width of a dredged channel to ensure changes to the hydrodynamics are represented. This is because there is minimal difference between the dredged channel and the natural bathymetry in this area (less than 1 m, dredged channel is -14.7m LAT and surrounding bathymetry is less than -14m LAT) and so the channel would not be expected to result in a noticeable change to the hydrodynamics.
- All natural SSC modelling and the 12 month long simulations of resuspension from the ADSDA were undertaken using a 2D approach. This was considered appropriate given the understanding of the physical processes within the study area and uniformity of current speeds through the water column, as shown by the measured data.
- To ensure the modelling activities associated with excess SSC met the GBRMPA guidelines, all dredge plume sediment transport model simulations were undertaken using the 3D model. As noted above, the 3D model consisted of 5 sigma layers to include any vertical variability in the tidal currents through the water column.

Model calibration and validation

- The attached Technical Note Point 2 addresses the Wave Boundary. It makes the assumption that the wave conditions at the site are similar to that of the Mackay wave rider buoy. The graphs provided show a close correlation between the predicted and actual water movement.

Improvements to the model should occur through the actions outlined in Point 1 of the review for extended time frames and more significant weather events.

Sediment transport models

- Natural sediment simulations are not prescribed in the GBRMPA guideline requirements. The guidelines (paragraph 14.g) require modelling to be performed to establish the re-suspension that occurs after dumping and initial settling.

Vertical shear and bottom boundary layer

- The calibration graphs provided in the Technical Note do demonstrate a high level of calibration between the simulated and actual data.

Assumption that suspended sediment concentrations is uniform through the water column

- The presentation of the simulations as depth averaged plots of SSC does not assume that the SSC is uniform through the water column, it assumes that the variation in SSC through the water column can be adequately represented by averaging the SSC (i.e. the spatial and temporal patterns in SSC are similar through the water column, it is just the concentration which differs (higher near the bed, lower near the surface)). The dredge plume modelling results confirm this (see Section 4 of accompanying Technical Note). Additional water quality logging is being undertaken to further assess this (concurrent logging near bed and near surface).

Model does not perform well in simulating the observed short time-scale spiking during some weather events

- The short duration spikes are being further investigated as part of ongoing data collection works, as it is possible that they could be due to short duration localised near-bed resuspension and therefore not representative of the SSC throughout the water column. Based on the findings of the further work, future modelling will be refined to better represent the natural SSC.
- It is important to note that the underestimation of the wave conditions noted is only during the peak of the largest wave events over a 12 month period (TC Ului), which is not important for the dredge plume modelling as dredging would not occur during cyclonic weather events and the periods selected do not include any wave events of this size.
- The wave model validation shows that the 99th percentile significant wave height (Hs) is within 0.02 m of the measured data at the Hay Pt WRB (measured = 1.72m, modelled = 1.74m) which shows that the model provides a very good representation of the more typical larger wave events which occur at Hay Point.
- The guidelines (paragraph 14.f) only require “probable hydrodynamic conditions, weather events and dredge equipment scenarios”.

Influence of tidal currents on the wave conditions

- The influence of tidal currents on the wave conditions was not included in all SSC model runs, as it was only observed to result in a noticeable improvement in Hs at MK1, which was located directly to the east of Mackay Harbour in an area where very high tidal currents occur. Comparison between the measured and modelled wave conditions at the Hay Point WRB suggest that the influence of tidal currents on the waves are not required to accurately represent the wave conditions in this area. The hydrodynamic model does take into account the tides, wind and waves as specified in the GBRMPA guidelines.

Conclusion: The applicant has addressed the majority of the reviewer’s comments in an informative and comprehensive manner. The applicant has committed to and commenced additional long term monitoring to further improve the model for suspended solid concentration (SSC) and this action will address the majority of the reviewer’s comments.

Item 14. An analysis of each disposal option should be considered in the light of a comparative assessment of the following concerns: human health risks, environmental costs, hazards (including accidents), economics and exclusion of future uses. If this assessment reveals that adequate information is not available to determine the likely effects of the proposed disposal option then this option should not be considered further. In addition, if the interpretation of the comparative assessment shows the dumping option to be less preferable, a permit for dumping should not be given.

The independently peer reviewed in Comparative Analysis Technical Report (Appendix B of the SSMA) and supporting technical reports (refer Item 5 above) are considered to be adequate information to determine the likely effects of the proposed disposal option and have provided sufficient evidence to support the conclusions that the proposed dumping option is, on balance of environmental, social and economic considerations, the most appropriate option for the Port of Hay Point.

At-sea disposal at both the existing Dredge material Placement Area (ADSDA) and proposed new mid-shelf ADSDA performed equally well through the structured decision-making process. A preference for the existing ADSDA is based on a number of key benefits:

- The duration of a maintenance dredging is approximately half as long using the existing ADSDA when compared the duration using a mid-shelf ADSDA
- Interaction with other users and environmental values is therefore significantly less
- Operational impacts on the port are reduced
- GHG emissions and costs are reduced
- The existing ADSDA has been used since 2006 and as such the knowledge of the area is considerably better.
- The existing ADSDA has been shown to be retentive and modelling indicated that the deposition of the sediment resuspended from the placement site will be primarily in the areas directly adjacent to the placement site.

It is recommended to support the applicant's request to grant a permit for dumping within the existing ADSDA.

Item 15. Each assessment should conclude with a statement supporting a decision to issue or refuse a permit for dumping.

The independently peer reviewed plume modelling assessment, sediment analysis in accordance with NAGD, environmental values assessment, sediment resuspension assessment and additional technical reports supporting the sustainable sediment management plan and environmental risk assessment are considered to adequately inform the assessment of risks of maintenance dredge material dumping from the Port of Hay Point within the existing Approved dredge material Placement Area (refer Attachment A).

It is considered that the application is consistent with all matters of the London Protocol and granting the permit with the recommended permit conditions is in accordance with the Sea Dumping Act and the London Protocol.

MONITORING

Item 16. Monitoring is used to verify that permit conditions are met - compliance monitoring - and that the assumptions made during the permit review and site selection process were correct and sufficient to protect the environment and human health - field monitoring. It is essential that such monitoring programmes have clearly defined objectives.

The applicant will oversee the implementation of a three-tiered monitoring plan, with each component being undertaken by appropriately qualified marine scientists. The monitoring plan is made up of a combination of regular ambient monitoring (long-term monitoring) and individual dredging event related monitoring (short-term and real time monitoring). The environmental monitoring plan aims to:

- Assess the long-term baseline environmental condition of the Port and nearby sensitive receptors and allow for corresponding management of operations
- Detect any impacts from maintenance dredging, both immediately after dredging campaigns and over time
- Respond to real time environmental conditions during maintenance dredging to prevent unpredicted environmental conditions during dredging
- Collect data that will be used to drive continual improvement.

The scope of this monitoring plan consists of three tiers of monitoring program:

- Ambient monitoring – ongoing to assess long-term baseline environmental condition
- Impact monitoring – undertaken before, during and after each maintenance dredging to detect impacts

- Adaptive monitoring – real time monitoring during each maintenance dredging campaign to prevent incidents of serious environmental harm.

The parameters listed below will be monitored as part of the monitoring plan.

Parameter	Type of monitoring		
	Ambient	Impact	Adaptive
Marine water quality	X	X	X
Island fringing corals	X	X	
Seagrass and benthic habitat	X		
Invasive marine pests	X	X	
Sediment quality		Prior to each campaign as per NAGD	
Marine megafauna			X

Water quality parameters will be monitored during all tiers of the monitoring plan. Good water quality underpins the ecological success of key sensitive environmental receptors in the Hay Point region, including seagrass and corals. Water quality monitoring will be undertaken during all phases of this plan. Monitoring across both ambient and impact programs allows for an understanding of long-term trends, which may be analysed in conjunction with trends in ecological data. Key water quality parameters (NTU, SSC) can also be effectively monitored in real time during dredging campaigns. With the application of appropriate trigger levels, real time adaptive management actions can be undertaken, with the aim of ensuring predicted water quality targets are being tracked and met, and that water quality does not deteriorate to levels that may cause unacceptable environmental harm. Water quality monitoring data may also be used as part of the program of continual improvement, including to provide validation of hydrodynamic modelling.

Island fringing corals are one of the key sensitive environmental receptors in the Hay Point region. These communities are at risk from poor water quality, both due to decreased light levels and physical smothering. Effects post-dredging may take some time to become evident, particularly if stresses are sub lethal. Monitoring of island fringing corals will be undertaken across ambient and impact programs. This will allow for an understanding of annual trends, which can be reviewed in the broader context of GBR inshore reef health. Impact monitoring will specifically test for effects from maintenance dredging.

Seagrasses are a sensitive environmental receptor within the Hay Point region that, can be impacted from poor water quality, however their presence both temporal ephemeral and spatially patchy. Monitoring of seagrasses will be undertaken during the ambient program only. This will allow for an understanding of annual trends, which can be reviewed in the broader context of conditions and events in the region, including dredging and dumping. Impact monitoring of seagrasses is not proposed. The ephemeral and spatially patchy nature of the seagrass in the area is unlikely to allow meaningful data to be collected, particularly if dredging occurs during January – June when seagrasses are not present. If declines are detected during the ambient program in years post-dredging, further investigations will be scoped in collaboration with relevant marine scientists.

Invasive marine pests (IMP) have the capacity to enter into ports in ballast water, internal seawater systems and on the hulls of vessels (ships and yachts). The operation of the dredge vessel is a small contributing factor to the overall risk of IMPs. Monitoring via the deployment and quarterly checking of settlement plates will be undertaken as part of the baseline program.

Monitoring of **sediment characteristics** at the Port will be undertaken to ensure dredge material is suitable for ocean disposal as per the requirements of the NAGD. This guideline requires 5-year data currency and will therefore be undertaken as necessary to ensure currency of data.

Marine megafauna will only be monitored during the adaptive monitoring, whilst the dredge is operating. The primary aim of this is to prevent interactions between the vessel and any marine fauna.

The applicant proposed that the plan will be periodically reviewed to update (maintain, increase or decrease) monitoring effort and focus, based on the new and historical findings from the monitoring data.

Environmental thresholds

The applicant also has developed an Environmental Thresholds Report for the Port of Hay Point, which will guide trigger values for the monitoring program. A brief summary follows. The applicant commissioned an assessment which summarises key knowledge on relevant ecological thresholds and ambient water quality conditions at the Port of Hay Point. The intent of the assessment was to inform the management of dredging activities at the Port of Hay Point. The assessment included a review of published environmental thresholds, which were contextualised with the local environmental conditions at and around Hay Point, using actual measured water quality and deposition data.

The main subtidal habitats around Hay Point are open sandy bottoms, rocky reefs and seagrass beds, therefore maintenance dredging may impact upon the seagrass and coral communities. Statistical analysis of the data was undertaken using an intensity, duration and frequency (IDF) approach, to understand the natural variability of the natural environment (temporal and spatial) in terms of suspended sediment concentrations (SSC) / turbidity (NTU), benthic light availability (PAR) and sediment deposition.

Statistical analysis was undertaken on a three (3) year marine water quality dataset collected by James Cook University's (JCU) TropWATER unit. Using an intensity, duration, frequency (IDF) approach, the inshore marine environment in the Mackay / Hay Point area is naturally more turbid than many of the published guidelines, so they would offer little value for managing to natural conditions.

However, the analysis did identify that an intensity threshold of 15mg/L (11 NTU) would be appropriate at offshore locations and specifically at the inshore Round Top Island, which had considerably lower turbidity than other inshore areas. The report concludes that Round Top Island is considered a key location on which to develop intensity and duration triggers, given its proximity to the preferred, inshore spoil disposal area, and similarity between published intensity thresholds and the natural conditions measured.

Intensity thresholds have been based on an intensity value of 15mg/l (11 NTU) at Round Top Island, which reflects the:

- 92nd percentile of natural suspended solids concentration (SSC) in the wet season, and
- 95th percentile of natural suspended solids concentration (SSC) in the dry season

An example of how the trigger values is intended to work is contained in the Environmental Thresholds Report.

Management

Management of the proposed conducts will be by way of dredge and monitoring management plans which must be approved by the Authority. The proposed monitoring plan has key links to the Port of Hay Point Long-term Maintenance Dredging Management Plan (2018 – 2028), which sets out the process by which the results of the monitoring will be reviewed, analysed and reported.

Permit conditions ensuring compliance monitoring are recommended:

Within six months of completion of each dredge campaign permitted herein, the Permit Holder must publish a report on their website addressing compliance with the requirements of the Environmental Thresholds Report, Maintenance Dredging Environmental Management Plan and the Marine Environmental Monitoring Plan, as verified by an independent audit. That audit report must include but not be limited to the following:

a. *Deviations from the Environmental Thresholds Report;*
b. *Identification of any changes that would be required to the Maintenance Dredging Environmental Management Plan, the Marine Environmental Monitoring Plan or the Environmental Thresholds Report before the next dredge campaign.*

The Managing Agency must approve the auditor in writing prior to commencement of each independent audit referred to in condition 27

To facilitate annual reporting to the International Maritime Organization, North Queensland Bulk Ports Corporation Limited must report to the Department and the Managing Agency by 31 January each year,

including on the day of the expiry of the permit or completion of all dredging under this permit, information at Appendix 2 to this permit, or in a format as approved by the Department from time to time.

Item 17. A decision to issue a permit should only be made if all impact evaluations are completed and the monitoring requirements are determined. The provisions of the permit shall ensure, as far as practicable, that environmental disturbance and detriment are minimized and the benefits maximized. Any permit issued shall contain data and information specifying:
• the types and sources of materials to be dumped;
• the location of the dump-site(s);
• the method of dumping; and
• monitoring and reporting requirements.

The application assessment considers all impact evaluations and monitoring requirements. The following permit conditions are recommended:

The types and sources of materials to be dumped

2. North Queensland Bulk Ports Corporation Limited must ensure only up to 756,553m^3 in total of seabed material, derived from **maintenance dredging** of the Port of Hay Point is dumped at the approved dredge spoil disposal area, specified at Condition 7.
3. North Queensland Bulk Ports Corporation Limited must ensure only up to 200,000m^3 in total of seabed material, derived from **contingency maintenance dredging** of the Port of Hay Point is dumped at the approved dredge spoil disposal area, specified at Condition 7.
4. North Queensland Bulk Ports Corporation Limited must not dispose of more than 356,553m^3 of maintenance dredge spoil material to the approved dredge spoil disposal area, specified at Condition 7, within 18 months of the commencement date of the first **dredge campaign** authorised
5. under this permit.
6. Except in accordance with Conditions 4, North Queensland Bulk Ports Corporation Limited must not dispose of more than 200,000m^3 of maintenance dredge spoil material to the approved dredge spoil disposal area, specified at Condition 7 in any one calendar year.
7. North Queensland Bulk Ports Corporation Limited will only undertake **dumping activities** of sediments after the Managing Agency has advised the Permittee in writing that the relevant components of the Sampling and Analysis Plan and Sampling and Analysis Plan Report have been approved and the sediments are demonstrated to be suitable for unconfined ocean disposal in accordance with the **National Assessment Guidelines for Dredging**.

The location of the dump-site(s)

8. North Queensland Bulk Ports Corporation Limited must only dispose dredge material within the area bound by the following coordinates (GDA94 datum):

SITE ID	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MR1	-21.21982	149.30192
MR2	-21.20192	149.33486
MR3	-21.16552	149.3343
MR4	-21.19451	149.28061

9. North Queensland Bulk Ports Corporation Limited must ensure that dredged material is disposed so that the material is distributed evenly over an area located within the approved dredge spoil disposal area defined in Condition 7.

10. North Queensland Bulk Ports Corporation Limited must establish by **GPS** that, prior to dumping, the **vessel** is within the approved dredge spoil disposal area defined in Condition 7

The method of dumping

11. North Queensland Bulk Ports Corporation Limited must implement the following **Management Plans** (Plans) in the manner stated in the Plan:
    a. A Long Term Monitoring and Management Plan that addresses the management of dredging at the Port of Hay Point over a 25 year period;
    b. Environmental Thresholds Report;
    c. Maintenance Dredging Environmental Management Plan; and
    d. Marine Environmental Monitoring Plan.
12. North Queensland Bulk Ports Corporation Limited must review and update the Plans required under conditions 10(b-d) prior to each dredge campaign. Any modifications to the Plans must be approved in writing by the **Managing Agency** prior to implementation.
13. The approved Plans must be made available for the term of this permit (electronically) on North Queensland Bulk Ports Corporation Limited website within 30 days of being approved by the **Managing Agency**.
14. If **the Minster** believes that it is necessary or desirable for the better protection of the environment to do so, **the Minister** may request North Queensland Bulk Ports Corporation Limited to make specified revisions to any of the Plans as specified in Condition 10 and submit the revised Plan for **the Minister's** approval. If **the Minister** approves a revised Plan pursuant to this condition, North Queensland Bulk Ports Corporation Limited must implement that Plan in place of the original Plan specified at Condition 10.
15. North Queensland Bulk Ports Corporation Limited employees, officers, subcontractors and agents must ensure that all **dumping activities** are undertaken in accordance with this permit and the Plans as approved by the **Managing Agency** from time to time.

Monitoring and reporting requirements

20. North Queensland Bulk Ports Corporation Limited must keep records comprising either weekly plotting sheets or a certified extract of the ship's log which detail:
    a. the times and dates of when each dumping run is commenced and finished;
    b. the position (as determined by GPS) of the vessel at the beginning and end of each dumping run, with the inclusion of the path of each dumping run; and
    c. the volume of dredge material (in-situ cubic metres) dumped and quantity in dry tonnes for the specified operational period and a comparison of these quantities with the total amount permitted under the permit on a daily basis.

    These records are to be retained by North Queensland Bulk Ports Corporation Limited for verification and audit purposes.
21. Prior to the commencement of each **dredge campaign** and **dumping activities** under this permit, North Queensland Bulk Ports Corporation Limited must provide a bathymetric survey of the spoil ground, conducted immediately prior to the commencement of works, to the **Managing Agency**.
22. A bathymetric survey of the spoil ground must be undertaken by North Queensland Bulk Ports Corporation Limited within one (1) month of the completion of each dredge campaign dumping activities authorised under this permit.
23. Within two (2) months of a bathymetric survey being undertaken as specified in condition 22, North Queensland Bulk Ports Corporation Limited must provide a digital copy of each of the bathymetric surveys to the Australian Hydrographic Office, Locked Bag 8801, Woolongong, NSW 2500.
24. North Queensland Bulk Ports Corporation Limited must, within 30 days of receiving approval of each Plan from the **Managing Agency**, make available on the North Queensland Bulk Ports Corporation Limited's website, the approved Plans.

25. The North Queensland Bulk Ports Corporation Limited must, prior to 31 January each year, provide an annual report on the results of all field work, monitoring results and management requirements that form part of the Plans, as approved under condition 26.
26. North Queensland Bulk Ports Corporation Limited must, prior to 1 March each year make available on the Permit Holder's website all monitoring reports in accordance with the approved Marine Environmental Monitoring Plan.
27. Within six months of completion of each dredge campaign permitted herein, the Permit Holder must publish a report on their website addressing compliance with the requirements of the Environmental Thresholds Report, Maintenance Dredging Environmental Management Plan and the Marine Environmental Monitoring Plan, as verified by an independent audit. That audit report must include but not be limited to the following:
    a. Deviations from the Environmental Thresholds Report;
    b. Identification of any changes that would be required to the Maintenance Dredging Environmental Management Plan, the Marine Environmental Monitoring Plan or the Environmental Thresholds Report before the next dredge campaign.
28. The Managing Agency must approve the auditor in writing prior to commencement of each independent audit referred to in condition 27.
29. To facilitate annual reporting to the International Maritime Organization, North Queensland Bulk Ports Corporation Limited must report to the **Department** and the **Managing Agency** by 31 January each year, including on the day of the expiry of the permit or completion of all dredging under this permit, information at Appendix 2 to this permit, or in a format as approved by the Department from time to time.

Item 18. Permits should be reviewed at regular intervals, taking into account the results of monitoring and the objectives of monitoring programmes. Review of monitoring results will indicate whether field programmes need to be continued, revised or terminated and will contribute to informed decisions regarding the continuance, modification or revocation of permits. This provides an important feedback mechanism for the protection of human health and the marine environment.

The applicant has developed the Port of Hay Point Long-term Maintenance Dredging Management Plan (2018 – 2028) (the Long term Plan), which is a requirement for long term (10 years) sea dumping applications. The Long term Plan has been assessed against the Queensland *Guidelines for Long-term Maintenance Dredging Management Plans 2018* and the Australian Government *Long term Monitoring and management Plan Requirements for 10 year Permits to Dump Maintenance Dredge material at Sea*. The Long term Plan meets both of these sets of requirements, with minor amendments agreed to be implemented by the applicant before the first dredge campaign, if a permit is granted. The updated plan, incorporating GBRMPA comments to date and any further adjustments to reflect all permit conditions, if granted, must be approved by GBRMPA.

Consistent with the London Protocol, the Long term Plan includes commitment to best practice port operations and continual improvement based on monitoring results, including:

- Minimisation of sediment accumulation and dredging needs by employing the identified operational measures, including regular drag barring, to reduce sedimentation and increase the period between maintenance dredging (loading for purpose of dumping) and dumping activities.
- Further feasibility investigations into beneficial re-use options
- Maintenance Dredging Environmental Management Plan (MD-EMP) documents campaign specific management strategies and actions to minimise impacts from the loading and dumping of maintenance dredge spoil, which is reviewed and updated based on monitoring and auditing results (approved by GBRMPA) prior to each following campaign.
- Monitoring framework, including ambient, impact and adaptive (real-time) components, and sets out the aims of the overall program and the process by which the results of the monitoring will be reviewed, analysed and reported. The Marine Environmental Monitoring Plan (Monitoring Plan) documents the specific monitoring program. The Long term Plan commits to a review after each

campaign and the findings to incorporated in an updated Monitoring Plan prior to any future loading and dumping activities.

- Long term Plan will be reviewed and updated every 5 years or when one of the following occurs: permit conditions change or new permits issued; when monitoring reports substantially different impacts than were predicted; or if an incident occurs that poses a significant risk to effective future management.

The Long term Plan, Monitoring Plan and MD-EMP, approved by GBRMPA, must be available on the applicant's website.

To ensure commitments made thorough the Long term Plan and associated management plans are adhered to and ongoing continual improvement of the management of dumping of maintenance dredge material, a permit condition is recommended to require a report to be published on the applicant's website addressing compliance with the requirements of the Environmental Thresholds Report, Maintenance Dredging Environmental Management Plan and the Marine Environmental Monitoring Plan, as verified by an independent audit. That audit report must include but not be limited to the following:

- Deviations from the Environmental Thresholds Report;
- Identification of any changes that would be required to the Maintenance Dredging Environmental Management Plan, the Marine Environmental Monitoring Plan or the Environmental Thresholds Report before the next dredge campaign.

GBRMPA must approve the auditor in writing prior to commencement of each independent audit

ATTACHMENT A - RISK ASSESSMENT

Maintenance Dredge Disposal

A Risk Assessment has been prepared in accordance with the Risk Assessment Procedure and is provided below.

Assumptions:

- All Regulatory requirements will be followed by the permit holder.
- All permit conditions will be complied with.

Activity	Hazard(s)	Factors	Value(s)	Risk event		Impact	Pre management				Post management			
				Sensitivity	Exposure		Proposed mitigation (measures proposed by the applicant to be implemented)	Consequence	Likelihood	Initial Risk Rating	Additional avoidance, mitigation, offset measures or monitoring and management measures (Assessment *Considerations H and I*)	Consequence	Likelihood	Residual Risk Rating
Permission: loading for the purpose of dumping and dumping maintenance dredge spoil														
Movement of dredge vessel to/from the dredge material placement area	Direct death or removal of living things, including vessel strike Direct injury or disturbance of living things, including translocation Marine debris	• Departure path goes through General Use Zone where fishing and trawling are allowed. • Maximum 3-6 weeks of activity for an individual dredging and dumping campaign	Dolphins Dugongs Marine turtles Whales Reasonable use	L	L	• Potential for marine fauna strike • Potential for other users to be displaced for a period of time	The Maintenance Dredging Environmental Management Plan (MD-EMP) outlines proposed mitigation and management measures including for the following: • Dredger specifications (Table 5) • Dredge material placement requirements (page 5) • Cultural heritage (Table 6) • Waste management including general waste, sewage, hazardous waste, emissions (Table 7) • Ballast water and wash-down procedures (Table 8) • Adaptive management measures including thresholds and triggers (section 6.2) – Also refer to Environmental Thresholds Report and Marine Environmental Monitoring Program • Marine fauna (Table 17) • Incident management (section 6.3) • Reporting (section 7) Weight of evidence appraisal of impacts of unburnt coal at Port of Hay Point – no concern	N	P	L	• Only maintenance dredge spoil will be allowed to be dumped • Requirement to further explore non-sea disposal options before being allowed to dispose at sea for second and third campaigns • 10 year permit duration with limits on amount that can be disposed in any campaign. • Limit on the locations where dredge material can be disposed • Reporting of results of monitoring • Reporting of dumped amounts • Must implement mitigation, management and monitoring as outlined in the MD-EMP, Environmental Thresholds Report, Marine Environmental Monitoring Program • Requirement for a deed including insurance, indemnity and Environmental Site Supervisor provisions • Should maritime cultural heritage sites be located or found existing legislation requires that relevant stakeholders are notified. • Identification of a specific at-sea disposal area • Must notify of harm or potential harm to the Marine Park • Notice to Mariners to be provided by MSQ prior to the commencement of works.	N	P	L
Dumping dredge material	Change in natural light Change in hydrodynamics Change in noise Change in nutrients Change in sedimentation Contamination of water or sediment Direct damage, removal or destruction of non-living things Direct death or removal of living things, including vessel strike Direct injury or disturbance of living things, including translocation Exotic species or diseases Marine debris	• Sediment plumes • Smothering benthic fauna • Release of contaminants • Disposal area in General Use & Habitat Protection Zones where fishing is allowed. • Disposal area is in close proximity to ship anchorage areas. • Unburnt coal that has been collected in the dredger is mobilised.	Benthic infauna Coral Macro algae Mangroves Seagrass Water quality Reasonable use	H	H	• Temporary loss of benthic habitat • Changes to water quality leading to mortality or changes in coral and seagrass cover/diversity • Sediment deposition resulting in coral loss • Potential for lethal and sub-lethal effects on marine biota • Potential for marine fauna to be caught								