9.15.1 Existing Environment

Historical Context

A literature review of historical sources indicates that the land in the vicinity of the site was occupied by Indigenous Australians prior to European settlement of the region from the 1820s.

Twofold Bay and its safe harbour, Snug Cove ("Weecoon" to the Thaua), was named and mapped by George Bass early in 1798 during his initial voyage of discovery (Eden Community Site, 2012). The first recorded contact between Indigenous Australians and Europeans at Snug Cove was when Matthew Flinders landed at this location in September 1798. It was recorded that Flinders had "*an amiable exchange of snacks with a middle aged Aboriginal man*" (Heritage Branch, 1996, 148). This encounter is memorialised with a rock plaque at Snug Cove (Figure 9-71).

Figure 9-71 Interpretative sign about whaling history with the larger plaque about explorers George Bass and Matthew Flinders

Source: Advisian, 2016

After this first contact, many ships, sealers and whalers sought shelter in Twofold Bay from adverse wind conditions. In the 1820s, pastoralism commenced which slowly increased through to the 1840's. The settlement of the region became regularised with the proclamation of the County of Auckland in 1846. The Imlay Brothers (Alexander, Peter and George), all military surgeons from Scotland arrived in Australia in 1829, 1830 and 1833 respectively, ran once such large pastoral enterprise from Bega down to Cape Howe.

By 1828, the mainland whaling industry had firmly begun in Twofold Bay which became a significant industry until 1930s. It is noted that the sign in Figure 9-71 describes that Europeans began whaling earlier in 1791 with Captain Thomas Raine establishing the first shore based station at Snug Cove in 1828. The local Aboriginal people had a key role in providing their skills and labour to this industry. A number of whaling stations were developed in what became a competitive industry including by the Peter and George Imlay, Ben Boyd and Alexander Davidson. Peter and George Imlay erected Eden's first building at the location in 1833.

An initial attempt was made in 1834 to survey a township on Twofold Bay but it was not finalised until 1843 by Government Surveyor Thomas Townsend, who named the new township after the family name of Baron Auckland, George Eden, Governor-General of India and First Lord of the Admiralty (Eden Community Site, 2012).

Coastal shipping remained for over a Century as the main line of communication for the South Coast of NSW as no railway was ever constructed and road access was difficult (Heritage Branch, 1996). Twofold Bay contains many shipwrecks of mostly 19th Century vessels.

The Port of Eden developed with the construction of a timber jetty in Snug Cove in 1860. The earliest Port uses were for coastal trading for timber and livestock commodities. With the end of Eden's whaling industry in the 1930's, the disruption of shipping trade during the Second World War and the upgrading of the Princes Highway for transportation of goods, the port's main industry became fishing including fish handling and the servicing of fishing vessels (Department of Lands, 2004). The Town of Eden was proclaimed on 14 May 1948 (Figure 9-72).

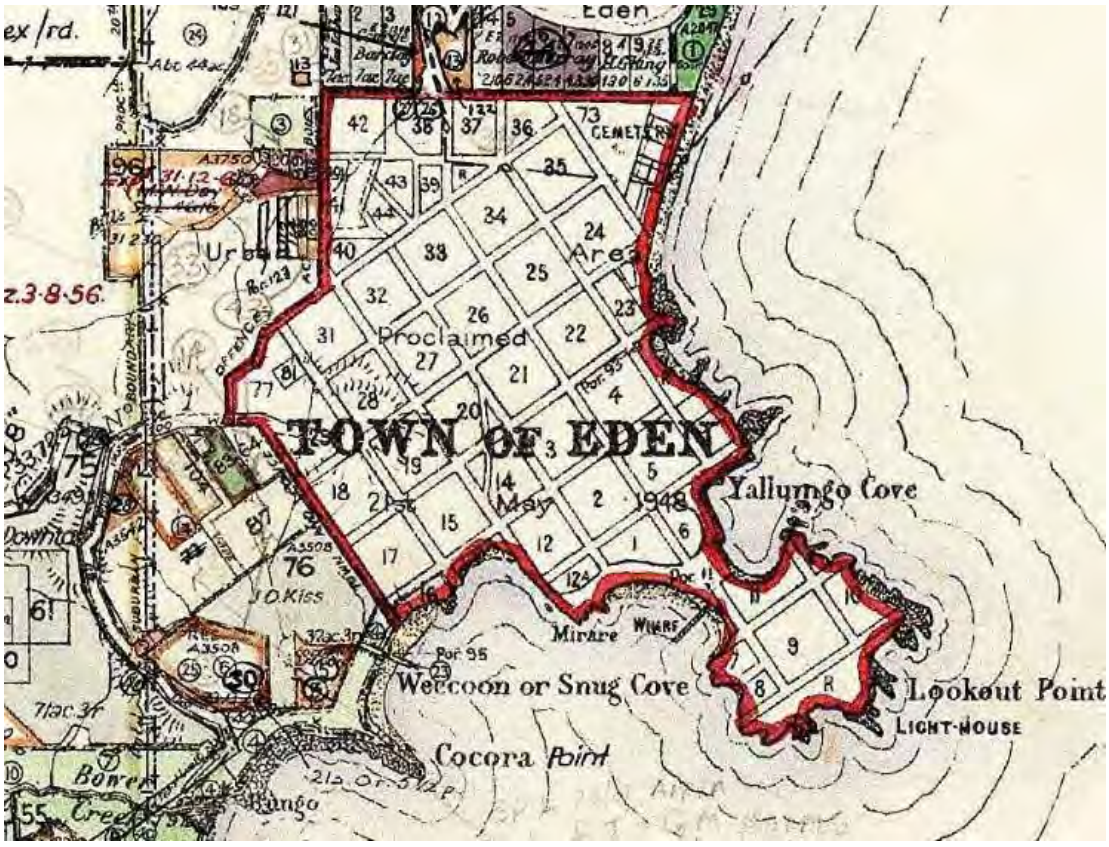

Figure 9-72 Extract of Parish of Eden Map, circa 1950s

(Source: NSW Land and Property Information, 2016)

George Bass had noted in 1798 the potential for Twofold Bay for its seine net fishing but it was not until 1936 that trawling by Danish seine nets was introduced (Heritage Branch, 1996). Fish canning did not begin until the 20th Century with the former Heinz Cannery in operation at nearby Cattle Bay from the 1949 until 1999. In 1945 the Eden Fishermen's Co-operative was established as one of NSW's earliest co-operative ventures (Department of Lands, 2004).

Since 1958, Eden Slipway Services (formerly the Broadwater Engineering Slipway) has operated in Snug Cove and for most of that time has been able to service almost any vessel in the Eden home fishing fleet as well as government vessels.

In 1975 the Unloading Wharf (Breakwater Wharf) in the lee of the breakwater was built at Snug Cove. Some land was reclaimed at Snug Cove for this construction. The breakwater was extended in 1984. During 1980's further land was reclaimed along the shoreline of Snug Cove. Further maritime facilities were developed including the Mooring Jetty (1981) and the Multipurpose Jetty (1984), the latter which replaced the demolished 1860 timber jetty.

Figure 9-73 to Figure 9-77 present a series of historical photographs to show the phases of development at Snug Cove.

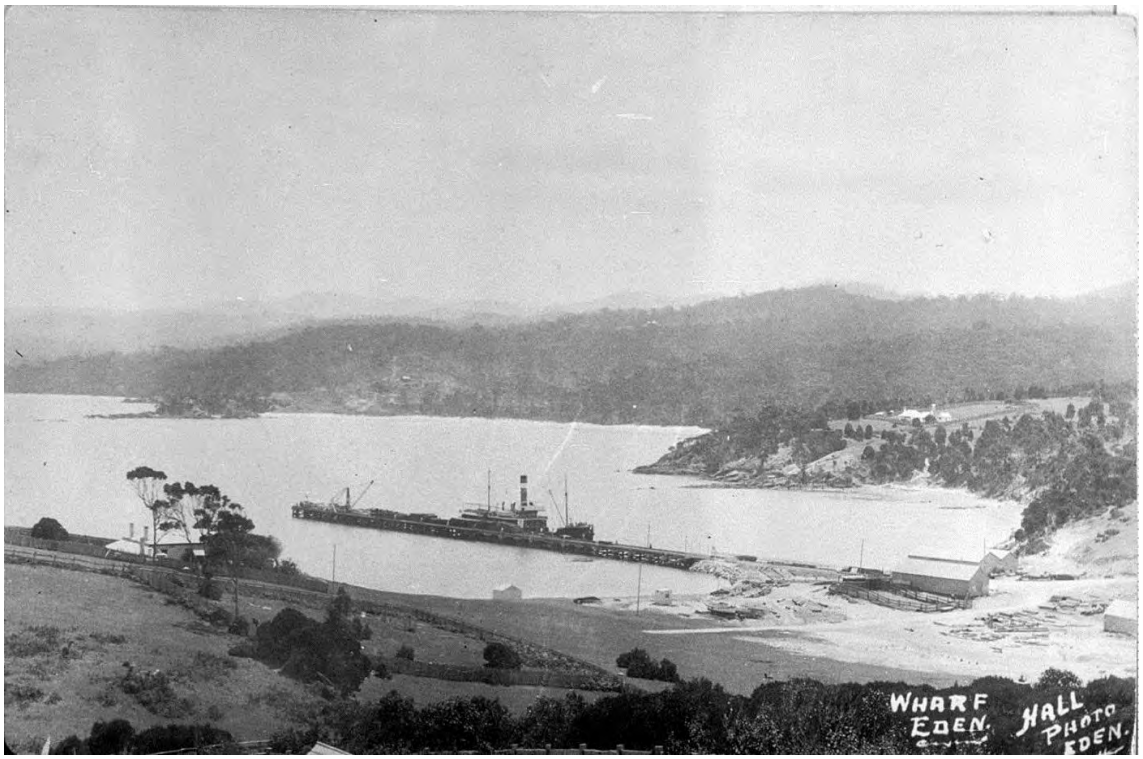

Figure 9-73 View of Snug Cove in 1912

Source: State Library of NSW

Figure 9-74 View of Snug Cove in 1926

Source: State Library of NSW

Figure 9-75 View of Imlay Street circa 1950s

Source: State Library of NSW

Figure 9-76 View of Snug Cove in 1979

Source: State Library of NSW

Figure 9-77 View of the Breakwater Wharf in 1984

Source: State Library of NSW

Review of Heritage Registers

Australian Heritage Database

A search of the Australian Heritage Database on 19 August 2016 indicated that there are no World Heritage Sites or items on the National Heritage List or the Commonwealth Heritage List located within the site or near the site.

State Heritage Inventory

A search of the NSW State Heritage Inventory and Schedule 5 of the LEP was completed on 19 August 2016. There was no State Heritage Register (SHR) listed items, local heritage items or heritage conservation areas listed within the site.

It is noted that the Sydney Ports Corporation Section 170 Heritage and Conservation Register (S170), dated April 2013 identifies an item "Eden Harbour Master's Telescope and Barometer", however this item is not recorded in the SHI and no further details of this item are publically available.

13 items heritage items are located within a vicinity of the site (at a radius of 800m measured from the Breakwater Wharf). The details of these items are provided in Table 9-52. An extract of the LEP Heritage Map is provided in Figure 9-78.

Table 9-52 Heritage Items in the vicinity of the site

Item Name	Address	Register Listed	Approximate distance from Wharf
The Crown and Anchor Inn	238 Imlay Street	LEP (No. I047)	445m
Building	237 Imlay Street	LEP (No. I046)	465m
House	233 Imlay Street	LEP (No. I045)	490m
House (former courthouse)	2 Cocora Street	LEP (No. I043)	500m
Eden Courthouse	231 Imlay Street	S170 (Attorney General's Department) & LEP (No. I044)	510m
Eden Killer Whale Museum	182 Imlay Street	LEP (No. I762)*	515m
Eden Police Station building	229 Imlay Street	LEP (No. I042)	570m
Matt Howard's store	178 Imlay Street	LEP (No. I041)	625m
Anchor	Imlay Street	LEP (No. I212)	680m
St. Georges Uniting Church	217 Imlay Street	LEP (No. I215)	715m
St. John's Anglican Church	98 Calle Calle Street	LEP (No. I217)	720m
Former Bank of NSW	Imlay Street	LEP (No. I213)	740m
Cottage	10 Chandos Street	LEP (No. I758)	770m

* Not mapped on LEP Heritage Map

Figure 9-78 Extract of the LEP Heritage Map

Source: BVSC, 2013

Historic Shipwrecks

Part 3C of the *Heritage Act 1977* sets out the provisions of the protection of historic shipwrecks. A 'historic shipwreck' is defined as:

> *"historic shipwreck means the remains of any ship (including any articles associated with the ship):*
>
> *(a) that have been situated in State waters, or otherwise within the limits of the State, for 75 years or more, or*
>
> *(b) that are the subject of a historic shipwrecks protection order."*

A search of the NSW Maritime Heritage Database on 20 August 2016 indicated that there are 16 historic shipwrecks located within Twofold Bay (refer to Table 9-53).

Table 9-53 Shipwrecks known to be within Twofold Bay

Ship Name	Where Lost	When
George	Twofold Bay	1806
Mary	Twofold Bay	1821
Olivia	Twofold Bay, south of	1827
Amelia	Twofold Bay	1828
Teazer	Twofold Bay, off	1854
Lawrence Frost	Twofold Bay, on sand bank near Davidson Whaling Station site	1856
Oliver Frost	Twofold Bay, 9 mls SE of, ashore (Goodburz Pt)	1856
William Bowness	Twofold Bay, ashore	1856
Charles Webb	Twofold Bay, near Nine Mile Beach	1859
Unidentified	Twofold Bay	1861
Mimmie Dyke	Twofold Bay, south of	1866
Dunkeld	Twofold Bay, off	1870
Ellen	Twofold Bay, ashore	1872
Lanercost	Twofold Bay, Mowarry Point	1872
Jane Spiers	Twofold Bay, Jane Spiers Beach	1878
Tea Tephi	Twofold Bay	1894

In Snug Cove, there are no known historic shipwrecks. This is confirmed by the Side-Scan Sonar & Magnetometer Survey (2015) by Marine GeoSolutions where 62 targets were within the surveyed area, of which 40 which were inside the proposed dredge pocket area. A salvage diving operation was completed to recover the debris identified by the survey which resulted in 120t of steel being recovered from within the proposed dredge footprint.

Given the location of these historic shipwrecks, none of these shipwrecks would be impacted by the Project.

Archaeological Potential

There are no known archaeological sites. The site has limited archaeological potential due to previous disturbance for the construction of maritime facilities and the reclamation of the parts of the Snug Cove foreshore.

Heritage Significance

None of the existing land-based or maritime facilities have been identified as statutory listed heritage items. However, it is recognised that Snug Cove has a high level of heritage significance for its Aboriginal history of occupation, very early contact with Flinders (1798), then European settlement initially for the whaling industry and then as an active port facility in continuous use since 1860.

9.15.2 Potential Construction Impacts

There are no identified heritage items, heritage conservation areas, known archaeological sites or historic shipwrecks in the Project area.

The construction of the Project would not physically impact upon any identified heritage items located in the vicinity of the Project given the distances. Therefore it is not considered to impact upon the heritage significance of any of these heritage items.

9.15.3 Potential Operational Impacts

Similarly, there will be no operational impacts on historic heritage.

The new wharf extension, its location, dimensions and materials are considered appropriate within the existing waterside context. Further, the Project will make a positive contribution to the continuation of the historic values and use of Snug Cove for port facilities.

9.15.4 Proposed Mitigation Measures

Proposed mitigation measures are outlined in Table 9-54.

Table 9-54 Proposed Mitigation Measures

Mitigation Measure	Phase
All relevant staff and contractors are to be trained regarding their statutory obligations and responsibilities under the *Heritage Act 1977* and best practice outlined in *The Burra Charter 2013*, through the site induction and toolbox talks in the event suspected historical cultural material is uncovered.	Construction
In the event that any potential archaeological 'relics' or 'historic shipwrecks' are disturbed and identified within the site during construction works, all work in the area shall cease forthwith and the Heritage Division and a qualified archaeologist be consulted to determine an appropriate course of action prior to the recommencement of work in the area of the 'relic' or 'historic shipwrecks'. This protocol to be included the CEMP.	Construction

9.16 Soils and Geotechnical

An assessment of the potential impact on geology, soils and contamination has been undertaken below which draws on desktop information and geotechnical fieldwork and sediment sampling and analysis that has been carried out to date for the Project.

9.16.1 Existing Environment

Geotechnical Fieldwork

A geotechnical investigation for the Project has been undertaken by Tectonic Geotechnical Pty Ltd. The investigation was conducted to provide geotechnical information for the design of the wharf extension and breasting/mooring piles.

The geotechnical investigation has enabled the development of an engineering geological model for the site and design soil parameters for construction in various strata in the seabed.

The geotechnical investigation has been reported in three separate documents. The Interpretive Report is presented in Appendix L. The investigation was also conducted to provide geotechnical information on a wave attenuator that is proposed on the seaward side of Cattle Bay and results for this development are included in the reports. However, development approval for the wave attenuator is being sought as part of a separate application and has not been assessed here.

A total of 13 boreholes were excavated for the wharf extension and dredging. The fieldwork methodology is presented in the Geotechnical Investigation Fieldwork Report.

Five boreholes were initially excavated as part of the geotechnical investigation, (BHT1, BHT3-BHT6) in February and March 2015. The five boreholes were excavated for the purpose of dredging, slope stability, piling and breasting dolphin piling and were extended to depths ranging from -20mCD to -40mCD.

Following a review of a geophysical survey a further two boreholes were excavated (BHT9, BHT10); one in the dredge area, and one at the proposed mooring buoy. These additional boreholes were excavated in March 2015 to depths -12m CD and -35m CD.

An additional six boreholes (BHT12-BHT17) were excavated in July 2015 within the dredge area to assess the depth to and type of rock. Boreholes BHT12-BHT17 were extended to 11.5m CD.

Soil and rock samples were recovered from each of the boreholes and analysed at a National Association of Testing Authorities (NATA) accredited laboratory for classification and strength testing. Laboratory testing was undertaken in accordance with relevant Australian and international standards.

Regional and Local Geology

The site of the proposed wharf extension and the southern side of Lookout Point is underlain by the Cambrian to Early Silurian (Ordovician) age Adaminaby Group which is comprised of undifferentiated sediments, turbidites, sandstone, mudstone and shale. The northern part of Lookout Point is underlain by Late Devonian age Boyd Volcanic Complex which comprises undifferentiated acid volcanics, basalts, quartz porphyries and minor sediments. The mainland to the north is Late Devonian age twofold formation (of the Merimbula Group) comprising fluvial sandstone with mudrock and conglomerate.

In Snug Cove the local geology is comprised of sedimentary rocks of low to high strength that appear to have been altered by volcanic activity.

Borehole profiles

Full soil and rock descriptions, explanatory notes and rock core photos are provided in Appendix L. Soil tests comprised Standard Penetration Tests (SPTs), pocket penetrometer (PP) and sheer vane testing.

Four subsurface profiles have been defined from analysis of the seven boreholes that were initially excavated for the wharf extension and dredging and these are described in Table 9-55 below.

Table 9-55 Subsurface profiles

Profile ID	Description
Profile 1	Boreholes BHT1 and BHT6 encountered shallow soil profiles over rock at depths of 1m to 2m below seabed (BSB)
Profile 2	Boreholes BHT4 and BHT9 encountered alluvial sands over a residual soil layer up to 3m thick, with rock at depths of 6m to 7m BSB
Profile 3	Borehole BHT3 encountered deeper alluvial soils overlying rock at 15.5m BSB
Profile 4	Boreholes BHT5 and BHT10 encountered deep alluvial soils extending to 31m to 35m BSB. Rock was encountered at borehole BHT10 at 31m BSB. No rock was intersected for borehole BHT5.

Acid Sulfate Soils

The adjoining foreshore land at Snug Cove has not been mapped as containing acid sulfate soils on the Acid Sulfate Soils Map of the LEP.

Sediment sampling within the dredge location was completed by AMA across two separate sampling campaigns. All of the sediment results returned a net acidity of <0.02 %S, confirming that the acid production potential of the sediments targeted for dredging to facilitate the Breakwater Wharf Extension is low.

Soil Contamination

Sediment sampling undertaken by AMA (2015a) confirms that the sediments proposed for the capital works dredging were considered suitable for unconfined offshore disposal. All of the samples tested had concentrations within the NEPM Health-based Investigation Levels for Residential Landuse (HIL-A).

Hazardous Materials

A Hazardous Substances Survey was undertaken by Safe Work and Environments in September 2016 to identify potentially hazardous substances that would be disturbed or removed during the construction phase of the Project that may impact upon worker health and safety.

The survey comprised visual observation and limited sampling but did not include access to confined spaces, demolition of structures or excavation.

The survey revealed that natural occurring asbestos was discovered at the south-western and south-eastern ends of the breakwall. There is potential for the health and safety of construction workers to be compromised when this material is disturbed. In addition it is likely that subsurface water mains

located throughout the site and an electrical mounting board in the carpark is also likely to contain asbestos. In addition the tall lights located on the wharf are likely to contain PCBs in the capacitors.

There are no buildings or other structures to be demolished and no other land areas that require remediation.

Soil Salinity

Based on the location and elevation of the Project site, groundwater would be expected to be saline, with groundwater levels directly influenced by tidal fluctuations.

Routine water quality monitoring of temperature, salinity, faecal coliforms and phytoplankton is undertaken by Eden Sea Farms, including within Snug Cove (Site 2), to monitor the status of waters nearby these aquaculture facilities. Results of the data collected at Snug Cove between February 2010 and January 2015 indicate that salinity ranges between 33.5 ppt (recorded in September 2012) to 39.3 ppt (a seemingly abnormally high result recorded in March 2013). Average salinity across months within the dataset was 34.8 ppt (which is at the lower end of the normal range for marine waters).

9.16.2 Potential Construction Impacts

Geohazards

Potential geohazards associated with the construction of the proposed structures and dredging operations for Project are outlined below.

Landslip potential for adjacent soil profile – vibration levels on adjacent hillsides could potentially reach 2 to 3mm/s during piling to refusal.

Lateral variability in subsurface conditions – soil and rock profiles in the vicinity of the piles for the wharf would need to have a suitable level of lateral resistance to withstand physical impacts from berthing ships and the wave and tidal actions. The soil profile at boreholes BHT3, BHT5 and BHT10 is comprised of deep very loose to loose sand and very soft to soft sandy silt which is expected to have low lateral resistance and therefore a reduced lateral capacity. Additional piles or piles spaced closer together may be required and piling methods would need to be carefully considered to ensure the piles remain vertical on the sloping rock layers.

Drillability of rock – rock such as metasandstone and slate that will be encountered during the pile driving activities should be within the capacity of pile drilling equipment. However there is also the presence of very high strength quartz layers that may require rock cutting attachments. Driven piles may not be able to penetrate sufficiently deep into the rock layer and will therefore need to comprise a combination of driven casing and bored cast-in-place piles.

Uncontrolled pile penetration – driving piles through soft to firm and very loose to loose soils, such as those encountered in BHT5 and BHT10, may result in piles dropping uncontrollably.

Dredging impacts – the dredged material is expected to comprise sandy soils as well as rock. Dredging sandy soils would be undertaken using soil suction or excavator type methods while rock dredging would require rock cutting methods. Depending on the fracturing of the rock dredge there may be excessive wear on dredge cutting bits. The angular nature of the rhyolitic rock and presence of knobs of metasandstone may also result in excessive wear and blockage of flexible pipes and soil cutting and suction equipment.

Dredge batters (breakwater wharf) – dredging is expected to extend to within 6m from the existing wharf structure. The existing structure is supported by a series of sheet pile walled caissons. Dredging depths are likely to vary from 4m at the eastern end to 1.5m at the western end (and 2.5m at BHT3). At the eastern end of the wharf it is likely that the dredging would be in rock and that batter slopes would be about 1V:1H. The level of rock at the western end of the wharf is deeper and dredging would mostly be within loose silty sand and sand. Dredging at the western end in silty sand would require batter slopes of 1V:3H. Accordingly, dredging to 2.5m depth could result in the works being very close to and undermining the existing wharf.

Dredge batters (multi-purpose jetty) – dredging is expected to extend to within 10m of the western end of the multi-purpose jetty and to depths of about 2.5m below sea bed. The subsurface profile for the batter edge is expected to be similar to either BHT6 or BHT9. Borehole BHT6 encountered shallow rhyolitic tuff rock at about 1m below sea bed that is expected to be stable at slopes of 1V:1H. The profile at BHT9 comprised approximately 5m of sand over rock and batters would need to be 1V:3H to be stable. If the subsurface profile is similar to BHT9 the crest of the batter would be within a few metres of the multi-purpose jetty and there is potential for the dredging excavations to destabilise the jetty structure.

Seabed debris– debris lying on the seabed, such as that discarded from boats, has the potential to cause obstruction to piling activities.

Liquefaction– there is potential for liquefaction in sand and sand-like soils that have a low plasticity index (less than 7%) as a result of seismic activity. Clay and silt soils that have a plasticity index of greater than or equal to 7% may also be prone to cyclic softening. A plasticity index of 9% was measured under laboratory conditions for some of the borehole samples.

Acid Sulfate Soils

The exposure (through excavation or dredging activities) and oxidation of acid sulfate soils (which can occur if exposed to air) can lead to water quality and aquatic ecology impacts. As previously discussed however, tested sediments returned a net acidity of <0.02 %S, confirming that the acid production potential of the sediments targeted for dredging to facilitate the Breakwater Wharf Extension is low. Therefore the risk of acid sulfate soils being oxidised is considered negligible. While the sediments proposed to be dredged do not contain contaminants at levels that are likely put the local marine environment (e.g. water quality) or local marine ecology at risk, settlement of resuspended sediments does have the potential to cause adverse effects to marine flora and fauna.

Soil Contamination

Sediments have been assessed as not containing concerning concentrations of contaminants that would be impacted by construction activities. The sediments have been assessed as appropriate for unconfined ocean disposal under the NAGD).

The construction activities will not disturb any other landside areas and no remediation of contaminated soils is required.

Hazardous Materials

The naturally occurring asbestos material in the rock on the breakwall is to be relocated to areas along the existing breakwater that require repair/strengthening.

The subsurface water mains pipes and electrical box in the carpark that are presumed to contain asbestos are to be left insitu, labelled with warning signage, and maintained in their current condition. The asbestos from the sections water main is to be safely removed prior to any demolition or other intrusive work that may disturb the asbestos.

The PCB containing capacitors on the wharf are to be left insitu and removed prior to any demolition.

The subsurface fill material was not sampled during the hazardous substances survey but further investigation is recommended prior to intrusive ground works. The soil will need to be classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014) prior to offsite disposal.

Soil Salinity

The construction phase of the Project will not involve disturbance of landside subsurface materials and therefore, would not result in any groundwater or soil salinity in the wharf area being intercepted.

9.16.3 Potential Operational Impacts

Once the Project has been completed potential geohazards, soil contamination and soil salinity would be negligible and would be limited to those associated with ongoing maintenance of the new structure and any maintenance dredging.

9.16.4 Proposed Mitigation Measures

Proposed mitigation measures are outlined in Table 9-56.

Table 9-56 Proposed Mitigation Measures

Mitigation Measure	Phase
A list of geotechnical design parameters based on the results of the boreholes and laboratory testing has been developed and presented in Table C1 in Appendix C of the Geotechnical Investigation Interpretive Report (Appendix L). The parameters have been considered during design development to ensure geotechnical hazards during construction are reduced as much as possible. This includes a reduced extent for the dredging footprint in the vicinity of the Multipurpose Jetty to ensure it is not compromised during the dredging activities.	Detailed Design
The naturally occurring asbestos material in the rock on the breakwall is to be safely relocated to areas along the existing breakwater that require repair/strengthening. The subsurface water mains pipes and electrical box in the carpark that are presumed to contain asbestos should be left insitu, labelled with warning signage, and maintained in their current condition. Asbestos is to be removed prior to any demolition or other intrusive work that may	Construction

Mitigation Measure	Phase
disturb the asbestos. The PCB containing capacitors on the wharf are to be left insitu and removed prior to demolition. The subsurface fill material was not sampled during the hazardous substances survey but further investigation is recommended prior to intrusive ground works. The soil will need to be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) prior to offsite disposal.	
All friable and non-friable asbestos-containing waste on-site shall be handled and disposed off-site at an EPA licensed waste facility by an EPA licensed contractor in accordance with the requirements of the *Waste Classification Guidelines* (NSW EPA, 2014) and any other regulatory instrument as amended.	Construction

9.17 Utilities and Services

A desktop review of impacts to utilities and services has been undertaken. This section provides a description of the existing utilities and services and how the Project would interact with these services. An Outline Servicing Strategy has been prepared for electrical and water services. Where required, appropriate management measures for these works would be developed to minimise impacts to existing service providers.

9.17.1 Existing Environment

Subsurface utilities located at Snug Cove include connections to power, potable water, emergency water (fire), stormwater and telecommunications. Based on information compiled from a number of sources including Dial Before You Dig (2015) enquiries and the Snug Cove Eden Port Management Plan, services provided at the Breakwater Wharf which is subject to this Project are understood to be as follows:

- Electrical services (Essential Energy): Cubicle at Weecoon Street, LV underground cables from cubicle to Wharf and 11 240/415 volt outlets.
- Lighting: 6 light poles at 22 metre centres at rear of wharf apron.
- Potable water (BVSC): Main along Weecoon Street, 6 water outlets at Wharf.
- Emergency water (BVSC): 3 fire hydrants.
- Telecommunications (Telstra): Telecommunications connections at buildings at Snug Cove Wharf.

Part of the local stormwater network owned by BVSC is also present in the vicinity of the Project area. This network includes a stormwater drainage line and associated inlet pits along Weecoon Street and at the wharf car park. Stormwater from this network drains directly to Snug Cove. BVSC also own a brick public amenities building at the wharf containing male, female and disabled toilets and showers.

There are no known existing utilities within the waterside area of the works).

Navigation aid requirements are dealt with separately in Section 9.5.

9.17.2 Potential Construction Impacts

Interaction with Existing and Proposed Services and Utilities

The introduction of large cruise ships to an extended Breakwater Wharf will require the provision of additional utilities and services. These requirements include:

- Increased power demand requiring upgrade of transmission lines and/or supply lines and outlets.
- Increased potable water demand requiring extension of water mains and provision of additional water main connections along the extended wharf
- Increased emergency water demand, requiring the installation of additional fire hydrants along the extended wharf.

Outline Servicing Strategy

The aim of the Outline Servicing Strategy is to identify the extent of upgrade/augmentation required to existing site electrical and water services subject to a demand based assessment and detailed design process to be undertaken. The preliminary concept services design proposes the decommissioning of and/or relocation of some existing and the installation of new services to the existing wharf and for the wharf extension.

The following new services will extend the existing services as described below.

- Wharf Lighting and Power Outlets:
    - New electrical cables, conduits, pulling pits, junction boxes and distribution boards.
    - 8 x LED flood lighting poles (9m high) and fittings to southern side of wharf extension.
    - 12 x LED fender line lights to northern side of wharf extension.
    - 5 x single phase General Power Outlets (GPO) along the wharf extension.
- Dolphin Lighting:
    - 2 x 5m high light pole for each dolphin.
    - Each light to contain solar powered LED light fittings.
- Potable Water:
    - 100mm diameter water main along the existing wharf and Wharf extension (replacing decommissioned 100mm diameter AC water main).
    - 4 x 65mm and 4 x 25mm water connections along the Wharf extension.

- 1 x 65mm and 14 x 25mm water connections along the existing wharf.

- Emergency Water (fire-fighting):
  - 2 x fire hydrants along the Wharf extension.
  - 3 x connections to existing fire hydrants.

Construction Impacts

The Project includes lighting upgrades which may result in some disruption to lighting and electrical services during construction. Upgrades to potable water (including emergency water) and power necessitated by the development may result in temporary disruptions to the provision of services to nearby allotments.

Construction activities, such as the operation of the compound site, dredging or use of machinery, are not expected to place a large demand on existing utilities within the Project area. Therefore, impacts on public utilities during the construction phase are expected to be minimal.

9.17.3 Potential Operational Impacts

The operation of the Project would require the ongoing provision of all existing services, including power, potable water and emergency water to the wharf.

As outlined above in Section 9.17.2, new services will be installed to support the operation of the wharf extension including electrical, potable water and emergency water (fire-fighting).

Existing public amenities (male, female and disabled toilets and showers) are located in a brick building at Snug Cove. It is not proposed to provide any additional public amenities.

There are no requirements for sewer connections or fuel provision. Each cruise ship has the capacity to manage without these requirements with careful management and scheduling.

Potable water will be required for cleaning and maintenance at the wharf as well as for the supply of potable water to cruise ships. This is expected to have a minimal impact on available water supply to the area, as the demand will not be sufficiently large to stress existing water supply resources and infrastructure.

Telecommunications connections would also be provided at the wharf, with no anticipated operational impacts on those networks.

9.17.4 Proposed Mitigation Measures

In order to mitigate potential impacts on utilities and services, the following proposed measures in Table 9-57 will be implemented.

Table 9-57 Proposed Mitigation Measures

Mitigation Measure	Phase
Investigations will be carried out by the Contractor(s) to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works.	Construction
Relevant service utility providers or owners will be consulted to verify the location of all services and to determine any potential impacts of the works. This includes requirements for protection, relocation or decommissioning of services.	Construction
The Contractor(s) will be required to verify the location of all existing utilities in the vicinity of the project area and protect the utilities as necessary. This will include a Dial Before You Dig (DBYD) enquiry and survey of underground utilities as required.	Construction
Any utility upgrades, such as the installation of additional fire hydrants and fire-fighting equipment, potable water supply upgrades or upgrades to power supply to the wharf, will be conducted such that service impacts on utility customers are minimised. This may involve completing works at night or at specific times.	Construction

9.18 Waste Management

The POEO Act is the principal piece of legislation that addresses waste management and licencing in NSW. It defines 'waste' and outlines offences and penalties relating to waste management. Schedule 1 of the POEO Act contains a list of waste definitions and classifications.

The *Protection of the Environment Operations (Waste) Regulation 2014* sets out provisions covering the transportation of waste, reporting and tracking of certain waste.

The *Waste Avoidance and Resource Recovery Act 2001* promotes the efficient use of resources to reduce environmental harm. It aims to ensure that resource management options are considered against a hierarchy of avoidance, resource recovery (including reuse, reprocessing, recycling and energy recovery) and disposal, and provides for a continual reduction in waste generation in line with the principles of ecologically sustainable development.

These key pieces of waste legislation have been considered in the development of mitigation measures to reduce the potential impacts associated with waste from the Project.

This section has been prepared to assess the potential impacts associated with waste generated as a result of the construction and operational phases of the Project and to address the Secretary's Environmental Assessment Requirements on this item which are as follows:

- *The proponent must assess the potential construction and operational impacts of both liquid and non-liquid waste generated, and how it would be handled, processed or disposed of on or off-site.*

9.18.1 Existing Environment

Cruise ships that visit Eden currently anchor offshore and passengers are brought to shore via tender. Waste generated as a result of the existing operation is minimal as all wastes generated by the ship while offshore are held on the ship and discharged at another port.

9.18.2 Potential Construction Impacts

Activities associated with the Project have the potential to generate liquid and non-liquid waste materials during both the construction and operational phases. No gaseous wastes are anticipated to be generated during either the construction or operational phases of the Project.

The key waste streams likely to be generated during the construction phase of the proposed extension and the estimated quantities are provided in Table 9-58.

Table 9-58 Key waste streams

Construction waste	Estimated quantity of waste for disposal (for total construction period)
Removal of part of existing wharf	Asphalt - 150m^2 Excavated sand/soil - 300m^3 Steel - less than 10t AC pipe 100mm diameter - 20m PVC pipe - 100m
Excess construction materials that cannot be returned to supplier	Pile offcuts - 400-500t (recyclable as scrap steel. Tonnage will be dependent on subsurface bed conditions and final drive depth.
Dredged material including rock and sand	231,500m^3
Domestic waste (food, packaging, paper and office waste)	20 tonnes
Human waste and wastewater – collected in portable toilets	300 kilolitres
Oils and lubricants for site plant and equipment maintenance	8 kilolitres

Waste streams generated during the construction phase have the potential to adversely impact the surrounding environment if not managed appropriately, including the following:

- Contamination of soil, surface water and groundwater (including the water quality and aquatic habitat of Snug Cove) resulting from inappropriate storage and transport of waste.
- Excessive amounts of materials being ordered resulting in an inefficient use of resources.
- Health and safety of port workers, local residents and visitors to the port area.

- Visual amenity and aesthetic quality of the port area which would remain an active port throughout the construction phase.

- Waste that is incorrectly classified and disposed to landfill that otherwise could have been reused or recycled.

9.18.3 Potential Operational Impacts

While the ships are berthed at the Breakwater Wharf extension, activities would continue on board and various wastes would be generated, including human waste, paper and office waste and domestic waste such as food and packaging.

Ship to shore sewerage will not be installed as part of the Project. All waste (including human, domestic and office) generated by the ships when they are berthed at Snug Cove would be held on the ships and taken to the next port for discharge, likely to be Sydney or Melbourne. As such the berthing of cruise ships would result in no additional demand on Eden landfill site, other local landfills, or Eden Sewage Treatment Plant from domestic or human waste. There would be no quarantine waste transported from the cruise ships when they are berthed at Eden.

Potential operational impacts are likely to be minimal and limited to the following:

- Inappropriate handling of maintenance materials while the cruise ships are berthed.

- Waste receptacles on the cruise ships or the wharf are not appropriately contained and compromised, spilling waste material into Snug Cove and onto the wharf.

Inappropriate handling of waste materials during operation could result in impacts to Snug Cove water quality and aquatic habitat, and health and safety of users of and visitors to the wharf.

9.18.4 Proposed Mitigation Measures

Mitigation measures to address the generation of waste during both construction and operation phases of the Project have been developed (Table 9-59) to satisfy the waste management hierarchy of waste avoidance (highest priority), reuse and recycling/reprocessing with disposal as a last resort.

Table 9-59 Proposed Mitigation Measures

Mitigation Measure	Phase
The Contractor(s) is to prepare and implement Construction Waste Management Plan (CWMP). The CWMP specifies the management of each waste stream (non-liquid, liquid, and gaseous).	Construction
During the construction phase the following mitigation measures would be implemented: • All waste would be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014). • Construction materials would be procured to ensure minimal cut-off and wastage. • Excess construction material suitable for reuse would be returned to	Construction

Mitigation Measure	Phase
the supplier, or recycled. • Waste streams would be kept separate on site to reduce cross-contamination and ensure the wastes are handled appropriately. • Barges for dredged material would not be overloaded to prevent spillage of dredged material while being transported to the offshore disposal site. • Vehicles used for the transportation of waste would be covered to prevent loss of waste. • Waste to be disposed offsite would be disposed to a waste facility that is licenced to receive that type of waste stream. • Waste to be transported offsite would be recorded including type, quantity and destination. • Hazardous waste such as waste oil and lubricating oil would be recycled at an appropriately licenced recycling waste depot. • Portable toilets would be emptied on a regular basis and human waste disposed of to a local sewage treatment plant. • Recycling facilities (garbage bins or other suitable receptacles) would be provided to maximise recycling of waste materials such as plastic, glass, aluminium cans, and paper/cardboard.	
Once the wharf extension is complete ongoing waste management for the wharf would be the responsibility of the Department. The following measures are suggested initiatives that should be included in an Operational Waste Management Plan for the port. • Waste receptacles on the wharf should be designed to deter birds and vermin, and should be routinely checked (at least quarterly) to ensure they are fit for purpose, appropriately sized, and securely contain waste. • Recycling facilities should be provided on the wharf to maximise recycling of waste materials such as plastic, glass, aluminium cans and paper. • Maintenance materials, including waste oil and lubricants, would be disposed at an appropriately licenced facility.	Operation

9.19 Greenhouse Gas and Energy

This section provides an assessment of greenhouse gas emissions and energy consumption that would result from the construction and operation of the new extended wharf.

There are no specific requirements relating to greenhouse gas and energy in the SEARs for the Project. A qualitative desktop assessment has been adopted to assess the potential impacts from greenhouse gas emissions and energy consumption associated with the construction and operation of the Project. The assessment has comprised the following:

- An outline of greenhouse gas generating activities and likely greenhouse gas emissions for both the construction and operation phases.
- Greenhouse gas emissions classified as Scope 1, Scope 2 or Scope 3 in accordance with *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* (World Resources Institute and World Business Council for Sustainable Development, 2004).
- Potential impact of greenhouse gas emissions from the Project on the environment.
- Measures to avoid and/or minimise greenhouse gas emissions.

Opportunities to reduce greenhouse gas emissions and energy consumption during both the construction and operational phases of the Project have been investigated and incorporated into the design where possible. The Green Port Guidelines (Sydney Ports Corporation, 2006) has been referenced as a best practice guide for greenhouse gas emission and energy reduction initiatives in the port environment.

9.19.1 Existing Environment

Greenhouse gas emissions would be the primary impact of the Project on climate change and can be divided into direct and indirect emissions. As defined within the GHG Protocol direct greenhouse gas emissions are emissions from sources that are owned or controlled by the contractor, while indirect emissions are those that are a consequence of the activities of the contractor but occurs at sources owned or controlled by another contractor/company. To help delineate between direct and indirect emissions sources they have been defined as Scope 1, Scope 2 or Scope 3 and probable sources of emissions have been listed against each one (Table 9-60).

Table 9-60 Emission types and probable sources of emissions

Scope Type[1]	Type of emission	Source of emission during construction or operation phase
Scope 1	Direct emissions that occur from sources that are owned or controlled by the construction contractor or cruise operator and that occur within the site boundary	*Construction phase:* Fuel combustion during the operation of construction plant and equipment *Operational phase*: Fuel combustion when the cruise ships are at the port; fuel combustion from maintenance activities
Scope 2	Indirect emissions – are from the consumption of purchased electricity and which occur at the facility where the electricity is generated	*Construction* phase: Purchase of electricity to power plant and equipment, including small plant and hand power tools; use of electricity in site office *Operational phase*: Electricity use on wharf (if photovoltaic lighting is not used)
Scope 3	Indirect emissions from other sources - are a consequence of the activities of the construction contractor but occur from sources not	*Construction phase*: Embodied energy of construction materials; transportation of materials to the site; waste disposal and decomposition of waste

	owned or operated by the contractor	*Operational phase*: Embodied energy of maintenance materials, including spare parts, oil, and lubricants

1. Defined in The Greenhouse Gas Protocol (WRI and WBCSD, 2004)

9.19.2 Energy Legislation and Policy

The *National Greenhouse and Energy Reporting Act 2007* provides the legislative framework for the national reporting of information regarding greenhouse gas emissions and energy consumption in Australia.

The Australian Government has committed to reducing emissions to 26-28% on 2005 levels by 2030. This target was set following the Climate Summit in Paris in 2015 and represents a 50-52% reduction in emissions per capita between 2005 and 2030. The Australian Government's Direct Action Plan sets out how this will be achieved in combination with the Emissions Reduction Fund which will offer incentives to businesses and the community to adopt new technologies to improve energy efficiency.

On a State level, in August 2013 a NSW Energy Efficiency Action Plan was released with a key objective of containing electricity costs through the promotion of efficient energy use. The plan aims to realise annual energy savings of 16,000 gigawatt-hours by 2020.

9.19.3 Potential Construction Impacts

The main greenhouse gas that would be emitted during the construction phase would be carbon dioxide from the combustion of diesel by operating plant and equipment. Other greenhouse gases such as carbon monoxide and nitrous oxides may also be emitted if there is incomplete combustion of the diesel fuel.

Greenhouse gas emissions would also result from the following activities:

- The use of electricity at the construction site.
- Indirect emissions associated with the manufacturing and transport of construction materials.
- Decomposition of waste.

The volume of greenhouse gas emissions that would be generated during the construction phase of the Project would depend on the operating hours, type and numbers of plant and equipment, amount of purchased electricity for site diesel, type and quantity of construction materials, and distance that the materials are transported.

Due to the small number of plant and equipment that are likely to be operating at any one time, the temporary and relatively small scale of the construction work, greenhouse gas emissions are not expected to be significant. The emissions would be minimised by implementing appropriate mitigation measures.

9.19.4 Potential Operational Impacts

Once the wharf extension is operational greenhouse gas emissions associated with the Project would comprise combustion of fuel from the cruise ships and during maintenance activities.

According to the current shipping schedule for the Port of Eden at least 14 different cruise ships are scheduled to stop at Eden between 2016 and 2019. The fuel consumption of a ship is dependent on the ship's size, speed, number of passengers on board, and other ship-specific features. When at peak power a cruise ship is likely to use 200 to 300 tonnes of fuel per day. Less fuel would be used as the ships enter and leave the Eden Port and when cruising speed is slow. While the ships are at berth the engines would remain on to provide power for lighting, pumps, ventilation and communication facilities ('hotelling' mode), and greenhouse gases would continue to be emitted. The emissions from hotelling would depend on the type of vessel engines that are used to generate power while the ship is berthed.

At present cruise ship visits to Eden are day stops where the ships arrive in the morning and depart by the afternoon or evening. When the wharf extension is operational cruise ships would continue to berth in the morning (arrive between the hours of 7:00am and 10:00am) and depart by the afternoon or evening (between 3:00pm and 6:00pm), and there would be no overnight stays.

9.19.5 Proposed Mitigation Measures

Mitigation measures to reduce greenhouse gas emissions and energy consumption during the construction and operation phases of the Project are proposed in Table 9-61.

Table 9-61 Proposed Mitigation Measures

Mitigation Measure	Phase
The layout design has been optimised to allow use of the existing wharf and breakwater, using the embodied energy from the historic capital construction of these thus removing the additional greenhouse gas emissions which would have been caused by demolishing and reconstructing these items The design has included offsetting and angling the berth to reduce the impact on the existing structure and the breakwater. The stern of the larger ships would be unprotected by the breakwater which removes the requirement for additional construction and associated construction materials for the breakwater. The dredging design of the berth pocket has been optimised, including the use of ship simulation, to reduce dredging towards the east and west where ships will not travel. This reduces the volume of dredging, disposal and associated greenhouse gas emissions. Geotechnical and geophysical investigations have been undertaken to remove the requirement for drilling and blasting of rock material. Investigations showed material could be removed by backhoe, which would have been on site to remove blasted material anyway. The structural design has been optimised to reduce the amount of steel and concrete used. Steel would be used for the dolphins to allow offsite fabrication and minimise requirement for barges, workboats and associated equipment on site, which would otherwise have produced more greenhouse gas if structures were fully constructed over water.	Detailed Design

Mitigation Measure	Phase
Concrete would be used for the main deck, which should be locally sourced sand and aggregate, reducing transport associated greenhouse emissions. Use of concrete in these areas is a more durable solution than steel or timber, and an underside coating specified to further improve durability. The specification of coating and cathodic protection (CP) system to increase durability of steel structures will reduce the requirement for painting steel below water, and associated in water maintenance of coating system.	
Sustainable procurement practices would be adopted where feasible. This would include selecting recycled construction materials (including recycled concrete, steel and timber) where available and giving preference to recycled over virgin materials. In addition the following measures would be considered: • Construction materials would be sourced locally where possible • Construction materials that have minimal embodied energy should be selected. • Use of PVC plastic would be minimised • Construction materials that are low maintenance and durable should be considered • Plant and equipment would be switched off when not in constant use and not left idling • Plant and equipment brought onsite would be regularly serviced and energy efficient vehicles or equipment would be selected where available • Any plant and equipment that is not working efficiently (i.e. emitting excessive smoke) would be removed from site and replaced as soon as possible • Demolition, construction, and dredging works would be planned to ensure minimal movement of plant and equipment, including barges • At least 10% of site based electricity needed during construction should be sourced from renewable or green sources.	Construction
• The potential to generate energy on-site (such as the use of photo-voltaic lighting) should be considered. • The operators of cruise ships entering the port should consider using low sulphur fuel.	Operation

9.20 Hazards and Risks

A desktop risk assessment has been undertaken for the broader construction and operational hazards and risks. The assessment has evaluated the potential safety issues and impacts during construction and operation of the Project including emergency matters. The assessment has considered the operational safety requirements at the Port of Eden, Twofold Bay and in the Tasman Sea. Management and mitigation measures are proposed, where appropriate.

Section 9.10 Health and Safety has been prepared to specifically assess the impacts of the Project to community health and safety.

9.20.1 Existing Environment

Snug Cove is an active working waterfront/port area with a mix of light industrial, commercial, and retail, and government administration, car parking uses, an oil recycling depot and various maritime facilities. The land is owned and managed by the Department.

PANSW operates the Port of Eden and has responsibility for:

- Maintenance of safe navigation for shipping.
- Preservation of the marine environment through the execution of its PSOL.
- Administration of the Dangerous Goods Regulation.
- Emergency response for marine-based incidents.
- Clean up of any environmental spills within the Port and coastal waters.

9.20.2 Potential Construction Impacts

Potential hazards and risks associated with construction of the Project would be associated with the following two categories:

- Environmental hazards and risks – including potential spills of fuel, oil and other harmful substances and generation of pollution and wastes from construction vessels and equipment that may affect the environment.
- Construction hazards and risks – including operation and maintenance of plant and machinery, transport and use of materials required for construction that may affect the health and/or safety of construction personnel and/or the community.

Environmental hazards and risks

Potential construction environmental hazards and risks include:

- Spills of fuel, oil and other harmful substances from construction vessels leading to changes to the chemical signature of marine waters in Snug Cove (i.e. increased nutrients, heavy metals, increased pH) (eg. via rupture of a fuel tank from a collision, or during refuelling).

- Spills of fuel, oil and other harmful substances from construction vessels leading to changes to the chemical signature of marine coastal and offshore waters within and adjacent to Twofold Bay (i.e. increased nutrients, heavy metals, increased pH) (eg. via rupture of a fuel tank from collision).
- Ingestion of fuels, oils or other harmful substances by birds may occur inadvertently as a result of slicks on the waterway attracting schools of fish, to which birds are attracted to and feed on.
- Pollution of waterway with construction waste, general waste or 'foreign materials' from stormwater runoff.
- Entanglement in or ingestion of marine debris has the potential to adversely impact on birds.
- Noise emissions associated with dredging and piling activities (below and above water) have the potential to adversely impact marine fauna and shorebirds.
- Impacts to fauna from the use of artificial lighting during night-time dredging.
- Vessel strike during construction is most likely to occur if birds are attracted to lights on vessels during evening or night time dredging.
- Construction materials, wastes or objects falling from the Breakwater Wharf into Snug Cove causing water pollution and risk to human health.
- Construction materials, wastes or objects falling from construction barges or other construction vessels into Snug Cove causing water pollution and risk to human health.
- Impacts on mussels in nearby aquaculture facilities associated with elevated levels of turbidity from dredging activities, and spills of fuel, oil and other harmful substances from construction vessels.
- Impacts on commercial and recreational fishing stocks associated with elevated levels of turbidity from dredging activities, and spills of fuel, oil and other harmful substances from construction vessels.

Construction hazards and risks

Potential construction hazards and risks include:

- Undertaking works close to sensitive receivers, such as nearby residences with construction noise and vibration impacts.
- Undertaking works within highly pedestrianised areas that are used by the public and existing businesses.
- Navigation and safety including vessel strikes between construction vessels, floating plant and other vessels in Snug Cove, Twofold Bay and the Tasman Sea (for transport to the offshore disposal site).
- Slips, trips and falls at the wharf, floating plant or on dredging vessels from wet or oily floors, uneven surfaces and cluttered areas for construction workers and the public.

- Construction workers working over water, diving, or near water with possibility of falling from the wharf or vessels during works or crew transfers potentially resulting in physical injury or drowning and risk of electrocution when using electrical equipment near water.
- Workers at the land-based construction site may encounter wind-blown particles (e.g. from operating machinery, exposure of surfaces), with risk of eye injury or respiratory irritation.
- Workers may encounter noisy plant and equipment, particularly from piling or dredging activities. Excessive noise may result in short or long term hearing loss.
- The use and storage of hazardous materials which are not properly handled, stored or disposed of including any asbestos materials.
- Working on the dredge vessels or land-based construction site may require entry to confined spaces. The risks associated with working in confined spaces include lack of oxygen resulting in suffocation or loss of consciousness due to airborne contaminants.
- There is a risk that the public or on-site workers may be adversely impacted by construction vehicles, vessels and/or moving equipment including heavy machinery and utilities and services decommissioning, relocation and installation during construction with potential risks of injury.
- Fire risk include ship lines and line of fire, welding works, grinding or heat generating machinery and which may be exacerbated in the presence of flammable substances such as fuels and oils that are likely to be used in small quantities during construction.
- Security incidents that may arise during construction include protests, terrorism, vandalism or unauthorised access to construction sites. These incidents may result in property damage and direct or indirect harm to workers or the public within the affected area.
- Natural hazards including storm events could cause direct or indirect harm to workers on the dredge vessels and the wharf.
- Weather conditions during outdoor construction work can pose a hazard to worker safety such as sun exposure, dehydration, heatstroke or heat stress.

9.20.3 Potential Operational Impacts

Potential hazards and risks associated with operation of the Project would be associated with the following two categories:

- Environmental hazards and risks – including potential spills of fuel, oil and other harmful substances and generation of pollution and wastes from cruise ships that may affect the environment.
- Operational safety hazards and risks – including operation of the wharf extension, safety of the passengers, crew, the public and other port users and maintenance safety/access.

Environmental hazards and risks

Potential operational environmental hazards and risks include:

- Objects falling from the cruise ships and other vessels at the Breakwater Wharf, causing water pollution.
- Pollution of waterway and impacts to fauna with contaminants, general waste or 'foreign materials' from stormwater runoff or from cruise ship passengers and employees.
- Spills of fuel, oil and other harmful substances leading to changes to the chemical signature of Snug Cove (i.e. increased nutrients, heavy metals, increased pH).
- Runoff from cleaning activities on the passenger wharf leading to contamination of the water column with pollutants.
- Compounds (i.e. copper) entering the water column from anti-fouling biocidal coatings on ship hulls.
- Illegal discharge of vessel holding tanks.
- Accidental discharge or spills of bilge water, sewage and grey water.
- Noxious emissions from cruise ships settling in the area and impacting on air and water quality.
- Impacts to birds from vessel strikes from moving cruise ships with highest risk at night when lighting on ships attract birds.

Operational safety hazards and risks

Potential operational safety hazards and risks include:

- Navigation and safety including vessel strikes between cruise ships and other vessels in Snug Cove and Twofold Bay and damage to infrastructure.
- Passengers or staff falling from vessels potentially resulting in physical injury or drowning.
- Slips, trips or falls at the wharf whilst passengers/ crew embarking and disembarking the cruise ship and travelling around Snug Cove including the bus pick up and drop off area and taxi stands.
- Fires associated with cruise ships and to nearby buildings.
- Natural hazards including storm events which could cause direct or indirect damage to vessels and infrastructure.
- Vehicle accident or contact by moving vehicle or equipment.
- Introduction of disease, including human, other animal and plant disease.

9.20.4 Proposed Mitigation Measures

All identified potential construction and operation hazards and risks are considered to be manageable through the implementation of the proposed mitigation measures outlined in Table 9-62 below.

Table 9-62 Proposed Mitigation Measures

Mitigation Measure	Phase
Application of safety in design principles to ensure safe access to all new facilities.	Detailed Design
Preparation and implementation of a CEMP to manage the potential environmental and constructions hazards impacts. This is to include the relevant mitigation measures identified throughout the EIS.	Construction
Preparation and implementation of Construction Noise and Vibration Management Plan to manage the impacts to sensitive receives (refer to Section 9.6).	Construction
Preparation and implementation of a Construction Waste Management Plan that specifies the management of each waste stream (non-liquid, liquid, and gaseous) would be prepared by the contractor and incorporated into the CEMP for the Project (refer to Section.	Construction
Site safety protocols, tool box talks, risk assessments, Safe Work Method Statements, and incident management and emergency procedures would be prepared prior to the commencement of construction works and implemented as required throughout construction.	Construction
Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction
Preparation and implementation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation
Implementation of existing PANSW management policies and procedures including navigation and passage plans, security management and the Emergency Response Plan for port-related emergencies such as oil and chemical spills.	Construction and Operation
Preparation of an Operational Waste Management Plan to manage ongoing waste with provision for updating on stated periodic basis.	Operation
Provision and maintenance of fire-fight equipment and hydrants.	Operation

9.21 Cumulative Impacts

This section of the EIS has assessed the interaction of the Project with other known developments in the area. Potential cumulative impacts and benefits arising from the interaction of the Project with those developments have been identified below and are assessed in a detailed qualitative manner and documented in this section. Management and mitigation measures are proposed, where considered appropriate.

9.21.1 Existing Environment

There have been no major developments that have either commenced construction or have been completed in the past five years in the Port of Eden.

There are currently four other known major developments approved or proposed in the vicinity of the Snug Cove:

1. Cattle Bay Marina (Eden Marina)
2. Eden Safe Harbour Project
3. Port of Eden Marina
4. Redevelopment of former Mobil Eden site

Cattle Bay Marina (Eden Marina)

The development of the former Heinz Cannery factory site and surrounding lands at Cattle Bay has been subject to a Major Project Concept Approval (05_0032) issued by the Minister for Planning on 22 August 2008 for a mixed tourist and residential development (BVSC, 2015). The approval has been subsequently modified on two separate occasions and is still active. The approved Concept Plan includes:

- A tourist facility comprising building zones for a 60 room hotel (4 storeys); 74 serviced apartments (4 storeys) and a conference building (including restaurant and function room) (2 storeys);
- 8 x 3 storey townhouses;
- 11 x 2 storey dwelling houses;
- 15 x 3 storey residential flat buildings comprising 41 units;
- Total residential floor space of 13,400m^2;
- Total tourist floor space of 18,400m^2;
- A total floor space ratio of 0.39:1 for the site;
- 297 car parking spaces;
- Access via extension to existing roads and new private, internal roads;
- A landscape and open space concept comprising a total of 58,576m^2 of private and public open space;
- Foreshore access; and
- A stormwater management concept and utilities services strategy.

A marina development (land/water based components) did not form part of the Major Project Concept Approval issued by the Minister.

In February 2013 the proponent sought Director General's Requirements (DGRs) for the construction of the Cattle Bay Marina. The DGRs were issued on 23 March 2013. A Development Application (DA2014.430) was then lodged with BVSC on 29 October 2014. The DA was supported by a number of technical reports. The DA sought consent for the staged construction of a 154 berth marina comprising three floating pontoon arms, fixed wave attenuator, refurbishment of the existing wharf, land based car parking and temporary buildings to house marina administration and toilet facilities (BVSC, 2015).

DA2014.430 was assessed by BVSC and approved by the Southern Region Joint Regional Planning Panel on 1 December 2015. The approved development (land and water) comprises the foreshore land which the former Heinz Cannery factory occupied, the old cannery wharf and encompasses parts of the Cattle Bay and Twofold Bay marine environs (BVSC, 2015). Figure 9-79 shows the approved marina layout.

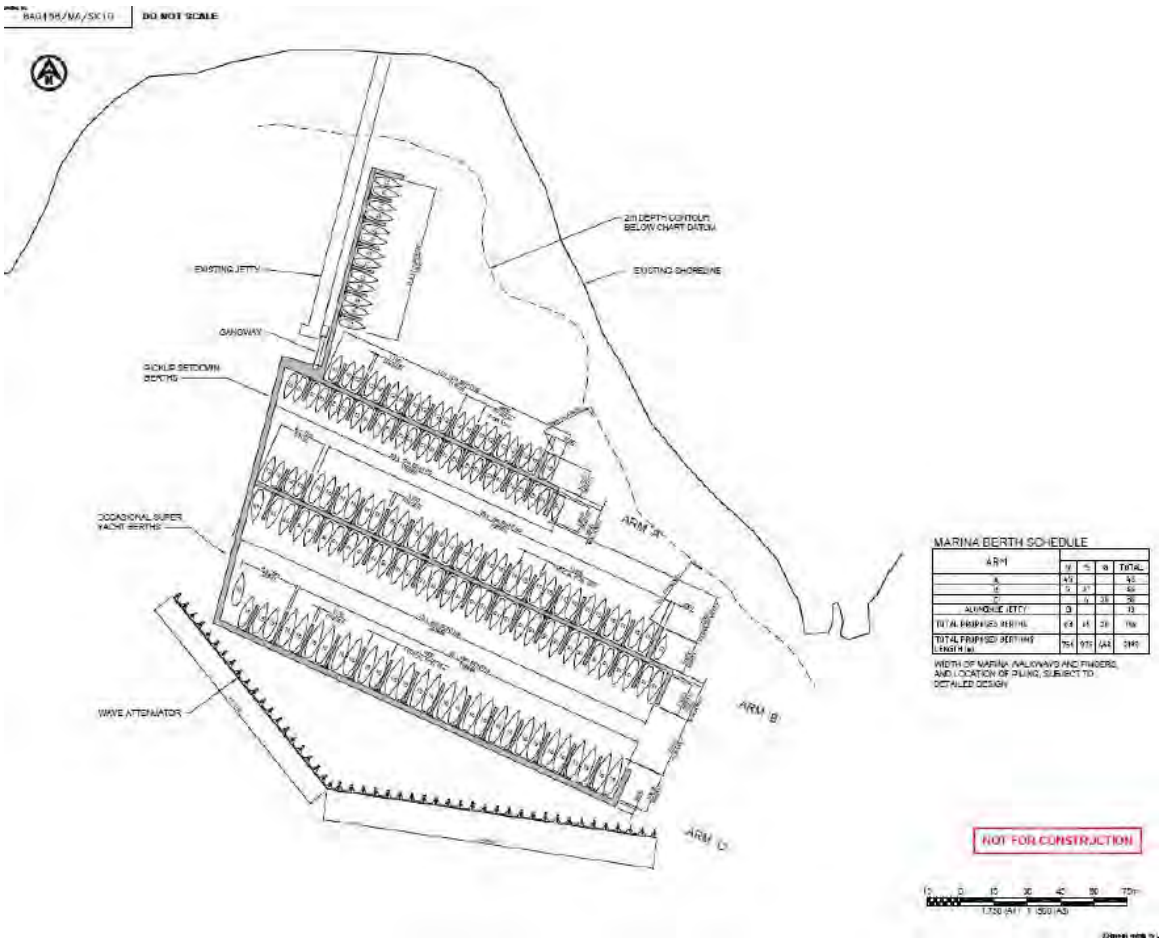

Figure 9-79 Proposed Cattle Bat Marina Development and Wave Attenuator Stages 1 and 2

Source: Royal Haskoning DHV, 7 August 2015

The Department and AMA (2015a) met with Eden Resorts Hotels on 18 June 2015 to discuss potential cumulative impacts during construction and operation. Areas of particular cumulative impact focus that were identified included:

- Shipping and vessel movement
- Marine water quality and hydrodynamics
- Terrestrial noise
- Under water noise
- Visual amenity
- Lighting spill
- Coastal Processes and Hydrodynamics
- Air Quality
- Fisheries
- Species and Habitats.

From the above, the key issues that were identified (AMA 2015a) as requiring further attention were: shipping and vessel movement and impacts to aquatic ecology and underwater noise from construction (ie. piling activities).

On 5 May 2016, a Section 96 Modification Application to modify Development Consent No. DA2014.430, was lodged by Heinrich Ruiz de Roxas. It remains undetermined by BVSC. There are no further public details of this modification.

According to the information contained on Eden Marina's website, the overall status of their site development as reported on their website is that "*with an extensive list of approvals in place and all of the essential specialist reports commissioned and lodged, the Eden Marina project is ready to commence final design and then construction, once public sector funding is assured*". Further, Eden Marina indicates in relation to their project timeframes:

- September 2016 – construction certificate
- December 2016 – tender in place
- January 2018 – Marina Stage 1 complete
- December 2017/January 2018 – Let contract for resort hotel Stage 1.

Eden Safe Harbour Project

The Eden Safe Harbour Project is a Transport for NSW (TfNSW) project that has the objective to provide a safe harbour for local and visiting vessels and improve the protection of existing infrastructure. The project scope involves the installation of a wave attenuator in Snug Cove either as a fixed or floating wave attenuator. Figure 9-80 shows the proposed location of the attenuator.

The proposed attenuator has been developed to concept design level stage and the delivery strategy is currently under consideration by TfNSW. RMS has confirmed (refer letter in Appendix B) that it will

be responsible for all aspects of the relocation of swing moorings in Snug Cove affected by the Project and the Eden Safe Harbour Project.

Figure 9-80 Proposed Attenuator and the dredge basin

Source: Royal Haskoning DHV, 2016

Port of Eden Marina

The Port of Eden Marina (POEM) is proposed to be located immediately to the south east of the Cattle Bay Marina site. The consortium called Port of Eden Marina Inc. was created in 2010 as a not for profit community association for the purpose of securing government funding for additional marina development in Eden.

POEM Inc (2016) has described the existing issues with Snug Cove relating to exposure to southern gales resulting in damage to vessels which have restricted economic development and investment opportunities as a small boat hub.

The POEM proposed development comprises a marina of up to 191 berths, developed over two stages with wave attenuator, floating structures, piling and services, marina amenities/administration building, pump out facility and car parking spaces (Figure 9-81).

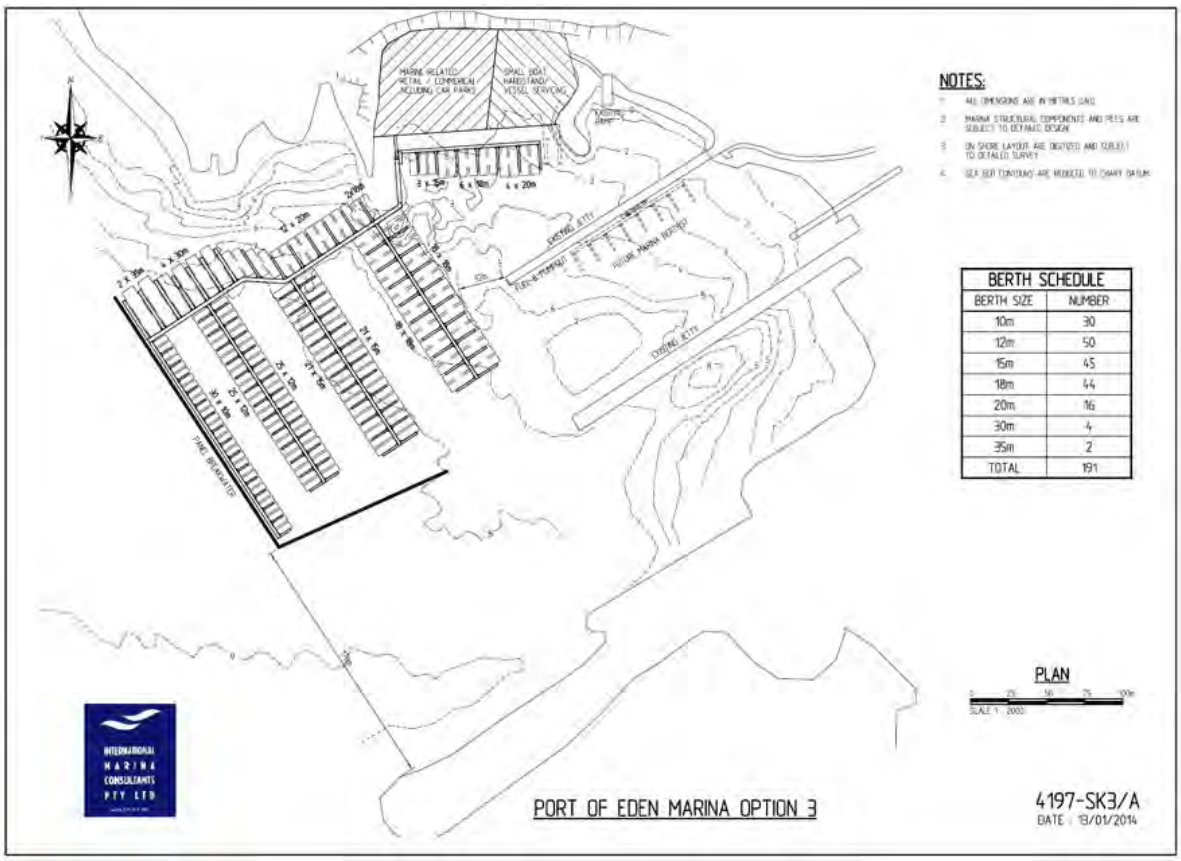

Figure 9-81 Port of Eden Marina Option 3

Source: POEM Inc, 2014

The construction of the wave attenuator as part of the Eden Safe Harbour Project is required for this development to proceed. There is no DA currently lodged for the proposed development.

Redevelopment of former Mobil Eden site

In 2002, the former Mobil Eden distribution facility on By Street was closed. This site which has an area of approximately 0.8ha is located adjacent to the Port on a sloping site with views over Snug Cove (Figure 9-82). The facility's structures including six fuel storage tanks were demolished and the site remediated in 2007. The land is currently vacant.

Figure 9-82 View looing north-west of the former Mobil Eden site in By Street

Source: Advisian, 2016

In June 2016, Snug Cove Developments, a consortium of four local families purchased the site. Their plans for the site entail the development of a new commercial and residential hub that is take advantage of the Project and Safe Harbour Project.

There is no DA currently lodged for the proposed development.

9.21.2 Potential Construction Impacts

The overall construction works to be undertaken within Snug Cove and Cattle Bay involve four specific activities as described by AMA (2015a) in their cumulative impact assessment, namely (1) dredging of the berth pocket out from the Breakwater Wharf, (2) extension of the Breakwater Wharf (3) installation of wave attenuators on the western end of Snug Cove and offshore of Cattle Bay; and (4) installation of piles and floating berths in Cattle Bay.

The potential cumulative construction impacts to the four other known major developments are discussed below.

Cattle Bay Marina (Eden Marina)

There is the potential for the construction of the Cattle Bay Marina to be undertaken in the same timeframe as that proposed in the Project's construction works program. Potential impacts could include the following:

- Reduction in water and sediment quality from disturbance to the sea bed from dredging and marine structures works.
- Impacts to marine ecology including aquatic habitats and marine fauna.
- Increase in terrestrial noise and underwater noise.
- Increase in vessel movements in Snug Cove and Twofold Bay.

- Impacts to visual amenity including light spill.

BVSC (2015) in its assessment of DA2014.430 considered the potential cumulative impacts of the Cattle Bay Marina development concluded that:

> *"The potential cumulative impact on the environment has been assessed through the EIS evaluation process and mitigation measures recommended to address identified potential impact which are supported."*

A "Marine Construction Zone" and "Construction Vessel Mooring Zone" are proposed on Figure 5-4 to ensure protection of construction vessels and existing and future port users.

Considering the likely significance of potential impacts and the findings in the EIS for Cattle Bay (Royal Haskoning, 2013) and Ocean Environmental Consulting (2015) findings, the impacts from the proposed construction works were assessed by AMA (2015a) as being minor. Therefore, with the appropriate mitigation measures, the construction activities were considered unlikely to significantly affect the environment.

Eden Safe Harbour Project

The wave attenuator proposed for the Eden Safe Harbour Project offshore from Snug Cove and the adjacent Cattle Bay are likely to be positioned in approximately -7m to -9m water depth, beyond the existing moorings. The timeframe for the construction for the wave attenuator has not been finalised by the Department and TfNSW.

There will be localised interaction with the seabed during the installation of piles and wave attenuator. The dredging for the Project and pile driving associated with both Projects are not likely to generate significant levels of turbidity.

The wave attenuator is within the vicinity of the mapped seagrass and the Breakwater Wharf extension is located in the vicinity of the mapped macroalgal beds (ie. *Ecklonia spp*.). The proposed pile driving locations should avoid any of the mapped seagrass meadows, where possible.

The Project and wave attenuators do not contain any suitable foraging or nesting habitat for species listed under the TSC Act. These species are unlikely to be adversely impacted by the proposed construction activities, given the location of the works and no interaction with intertidal or inshore areas are expected.

There will be short term visual impacts from the construction of the wave attenuator from the movement of construction vessels and use of construction equipment on the water.

It is considered that the interaction of the Project and the Eden Safe Harbour Project would not have any adverse environmental impacts with the implementation of appropriate management measures such as the implementation of a CEMP.

Port of Eden Marina

It is unlikely that the timing of construction for this project, if approved, would coincide with the construction of the Project and as such would not be anticipated to have any significant cumulative construction impacts.

Redevelopment of former Mobil Eden site

The timeframe for any redevelopment of that site has not been determined. Given it is a land based site located adjacent to Snug Cove in By Street, the main potential cumulative impacts could include increased construction traffic on the road network, visual impacts from construction works and noise impacts from construction works. It is not anticipated that there would be any significant cumulative construction impacts.

9.21.3 Potential Operational Impacts

The main potential cumulative operational impacts identified by AMA (2015a) include vessel strikes to both marine fauna and to other vessels from increased vessel movements (in frequency and size of vessels) in Snug Cove and the increase demand on local infrastructure. These impacts would be as a result of the cumulative operation of the Project, Cattle Bay Marina and Port of Eden Marina (if approved). Ocean Environmental Consulting (2015) has suggested that the risk of vessel strike can be managed with low speeds, potential variable or zoned (time and place) speeds limits especially during Southern Right Whales and Humpback Whale feeding aggregations and visitation periods as well as a mix of education and active management tools.

The potential cumulative impacts in relation to traffic, transport, access and local infrastructure demand and services has been considered in the EIS. It is considered that these impacts can be appropriately managed by the recommended mitigation measures..

The Eden Safe Harbour Project is intended to have a positive operational impact for water based users of Snug Cove by providing a safe harbour for local and visiting vessels and improve the protection of existing infrastructure.

The redevelopment of the former Mobil Eden site may comprise a new commercial and residential hub which could be developed to take advantage of the growth of the cruise ship industry in Eden. This would have positive socioeconomic impacts for the community. It would be expected that any future development at the site would have a minor impact on the local road network from increased traffic generation. There are no significant cumulative impacts from the interaction between the Project and redevelopment of this site.

9.21.4 Proposed Mitigation Measures

Proposed mitigation measures are outlined in Table 9-63.

Table 9-63 Proposed Mitigation Measures

Mitigation Measure	Phase
Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction
Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels, aquatic habitats, marine fauna and existing and future port users.	Construction
Preparation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation

9.22 Principles of Ecologically Sustainable Development

Schedule 2 of the EPA Regulation 2000 requires that an EIS have regard to the principles of ESD.

By its very nature, the objective of the Project is to create a sustainable economy based on tourism, particularly associated with attracting greater numbers of cruise ships to Eden. A range of ESD initiatives have been considered in the design and assessment process to date. These include managing potential impacts to water quality from increased turbidity, ensuring that marine plant used in construction is clean (no biofouling) and will not pose a risk to any sensitive marine receptors and ensuring that the waterway is maintained and does not impact on key beneficial uses.

Consideration of the principles of ecologically sustainable development in regard to the Project is shown in Table 9-64.

Table 9-64 Consideration of the principles of ESD for the Project

ESD principle	Comment
Precautionary principle The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (ii) an assessment of the risk-weighted consequences of various options	Specialists were engaged to carry out environmental assessments and evaluate key impacts for the Project. This helped to ensure a thorough understanding of the existing environment within the Project site, identify the potential impacts associated with the Project and develop measures to avoid or mitigate identified impacts. An Environmental Risk Analysis was carried out for the Project to identify key potential environmental impacts associated with construction and operation of the Project. The Environmental Risk Analysis also considered the proposed mitigation and management measures for the Project and residual risks following their implementation. An assessment of 'worst case' impacts was carried out. It is anticipated that through the implementation of mitigation measures and through continuation of detailed design, the identified impacts will be further reduced. The precautionary principle has been implemented in determining the impact of the Project on aquatic and terrestrial ecology.
Inter-generational equity Inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations	The Project will contribute to inter-generational equity by making Eden an attractive and accessible stop over for an increasing number of cruise ships, resulting in a sustainable growth in tourism and the local and regional economy in Eden and surrounding areas. Mitigation measures are proposed to avoid or minimise identified impacts.

ESD principle	Comment
	The environmental impact assessment carried out for the Project has shown that the identified impacts will not result in a significant impact on the environment.
Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration	The Project has been designed to minimise impacts to areas of biodiversity significance to conserve biological diversity and ecology integrity. The mitigation measures proposed aim to minimise impacts to biodiversity throughout implementation of the Project.
Improved valuation, pricing and incentive mechanisms Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as: (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	The Project has been in development for many years and environmental issues have been investigated and considered throughout this development period. Mitigation measures have been incorporated into the development of the Project to minimise impacts during construction and operation. The preferred option has been selected to be the most cost effective supply option for the extension of the Breakwater Wharf. Three dredging methodologies have been considered in the EIS which have different environmental and cost implications.

10 Summary of Environmental Impact Assessment and Proposed Mitigation Measures

This chapter provides a concise synthesis of the EIS for the Project which includes:

- Description of the Project
- Description of any Project uncertainties
- Compilation of any impacts not avoided
- Summary of the proposed mitigation measures
- Summary of the proposed management plans
- Compilation of Project outcomes
- Justification for the Project

10.1 Description of the Project

10.1.1 Key Features

The key features of the Project comprise extension of the existing Breakwater Wharf, deepening of the adjacent berth pocket and approach channel and disposal of the dredge material at an offshore disposal site. This will enable cruise ships up to 325m in length to berth alongside the upgraded Breakwater Wharf so that passengers can embark/disembark via a gangway onto the wharf.

The Project design includes:

- Extension of the existing wharf by approximately 95m.
- Installation of three mooring dolphins and two berthing dolphins.
- Installation of new landside bollards to restrain the ship's bow.
- Dredging of approximately 231,500m^3 of in-situ material including overdredging allowance.
- Transport and placement of the dredge material at an offshore disposal site.
- Installation of minor services (lighting, potable water and emergency water).
- Installation of navigation aids.

10.1.2 Location

The Breakwater Wharf extension and dredging works footprint in Snug Cove and Twofold Bay are partly located within Lot 111 DP 839683 and vacant Crown Land. The wharf is part of Crown Reserve 180072 and the bed of Twofold Bay is Crown Land. The Crown is the landowner for the works at the wharf and for the dredging footprint. The Department manages the estate on behalf of the Crown.

The offshore disposal site is rectangular with dimensions 500m by 1000m. It is located within a previously used disposal ground by the Department of Defence Twofold Bay project which had a total approved area of 500,000m^2. The disposal site is situated approximately 6nm east of Twofold Bay, in approximately 60m depth in the Tasman Sea within Commonwealth Waters, owned by the Australian Government.

10.2 Description of any Project Uncertainties and Impacts not Avoided

There are no Project uncertainties that have been identified for the construction or operation phases.

The Project impacts that are not avoided include the following which were identified with a severity before treatment rating of 'High' (pre-mitigation risk) in the Environmental Risk Analysis:

- Increased turbidity, reduced DO and mobilisation of sediments caused by pile driving, anchoring/mooring of construction vessels, material placement or soil erosion from land works leading to detrimental effects on marine biota.
- Accidental spills or leaks leading to contamination of water column with chemicals or other pollutants.
- Toxic impacts on mussels in nearby aquaculture facilities associated with spills of fuel, oil and other harmful substances from construction vessels.
- Potential human health risks associated with consumption of contaminated animals.
- Impacts on commercial and recreational fishing stocks associated with elevated levels of turbidity from dredging activities, and spills of fuel, oil and other harmful substances from construction vessels.
- Sediment plumes within and adjacent to Snug Cove caused by dredging.
- Sediment plumes within and adjacent to Snug Cove caused by dredging, overflow of the TSHD, pile driving activities, propeller wash or by anchoring or movement of construction vessels.
- Sediment plumes caused by offshore disposal of dredged material.
- Pollution of waterway with contaminants, general waste or 'foreign materials' from stormwater runoff or from cruise ship passengers and employees (i.e. oils, detergents, lubricants, synthetic rubber, litter, heavy metals, etc.).
- Direct impacts on subtidal soft sediment habitats and associated benthic infauna in the dredge area and at the offshore disposal site through dredging and disposal of marine sediments.

- Water and sediment quality impacts on marine habitats and associated marine fauna in the study area caused by construction or operational activities at the site.
- Impacts of marine debris (e.g. entanglement / ingestion) to marine fauna in the study area caused by construction and/or operational activities at the site.
- Underwater noise impacts of construction and operation on marine fauna, particularly marine mammals (e.g. behavioural and physiological).
- Impacts on native fauna and ecosystems caused by the introduction of invasive marine species to areas in which they do not yet occur.
- Entanglement in, or ingestion of, marine debris (i.e. causing injury or death).
- Impacts of water pollution (e.g. fuel / oil spills, sewage).
- Management of the main sources of noise and vibration emissions during construction.
- Relocation of impacted swing moorings.

The Environmental Risk Analysis indicates that the severity after treatment rating (residual risk for the above impacts can be reduced to at least 'Moderate' with the implementation of the proposed mitigation measures.

10.3 Summary of the Proposed Mitigation Measures

The proposed mitigation measures to be implemented for the Project are summarised in Table 10-1.

Table 10-1 Summary of Proposed Mitigation Measures

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
1.01	Water Quality	Inspection of all construction equipment and vessels by qualified personnel prior to commencement of work, to reduce the risk of hydrocarbon spills or leaks.	Construction	9.1.3
1.02	Water Quality	Timing of works should be planned to avoid, where possible, periods of high rainfall or during storm/wind warnings. Where this is not possible, preparation and tidying should occur around the worksite to reduce the potential for contamination of the waterway from stormwater runoff.	Construction	9.1.3
1.03	Water Quality	Hopper barges for dredged material will not be overloaded to prevent spillage of dredged material while being transported offshore.	Construction	9.1.3
1.04	Water Quality	Containment of the work area to prevent contamination of water by materials associated with pile replacement or repair, grouting, and concreting.	Construction	9.1.3
1.05	Water	Waste management as per measures described in Section	Construction	9.1.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
	Quality	9.18 to reduce the likelihood of rubbish and construction materials entering the waterway.		
1.06	Water Quality	The Department shall notify the aquaculture permit holder(s) at least one week prior to commencement of any dredging related activities that may result in the disturbance of any sediment.	Construction	9.1.3
1.07	Water Quality	DPI-Fisheries (1800 043 536) shall be immediately notified of any fish kills in the vicinity of the construction works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by DPI-Fisheries.	Construction	9.1.3
1.08	Water Quality	To avoid the disruption to the operations at the Cattle Bay mussel farm from the risk of the dredging and construction works that may impact on water quality in Twofold Bay, the Department and Eden Sea Farms in accordance with the Deed of Settlement and Release agrees for the temporary relocation of the Cattle Bay Mussel Farm (lease No. AL07/098 and AL08/098) to a predetermined location pursuant to Lease No. AL06/001 in Twofold Bay.	Construction	9.1.3
1.09	Water Quality	Water quality monitoring to be conducted in accordance with the CEMP, which includes appropriate trigger levels and a tiered management response depending on the trigger levels reached (Appendix D).	Construction	9.1.3
1.10	Water Quality	Portable toilets to be emptied on a regular basis and human waste disposed of to a local sewage treatment plant.	Construction	9.1.3
1.11	Water Quality	Establish comprehensive vessel/ship refuelling procedures to avoid or reduce the possibility of release. Include as a minimum requirements for: • Adhering to all PANSW and pollution regulations • Refuelling during daylight hours where possible, depending on sea conditions • Training personnel involved with refuelling or fuel transfer in their roles, functions and responsibility, including emergency response • Maintaining open communication channels • Deploying spill prevention systems in accordance with established procedures and regulatory requirements • Maintaining emergency response equipment to ensure that it is readily available	Construction	9.1.3
1.12	Water Quality	Spill response kits located around the construction site, on the passenger wharf and on-board construction and dredging vessels.	Construction	9.1.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
1.13	Water Quality	The existing dedicated oil spill recovery area at the landward end of the Breakwater Wharf, containing spill containment booms, chemical absorbent materials and dispersants shall be maintained and operated by PANSW.	Construction	9.1.3
1.14	Water Quality	Environmentally Friendly/water based drilling muds to be used for pile drilling activities.	Construction	9.1.3
1.15	Water Quality	Industry standards, PANSW and pollution prevention regulations shall be adhered to during refuelling, transfer, storage and handling of hazardous materials.	Construction	9.1.3
1.16	Water Quality	The lowest level of hydrocarbons (oil, grease, petrol, diesel) practicable will be stored on site.	Construction	9.1.3
1.17	Water Quality	Bunding of chemical storage areas on board construction and dredging vessels, and land-based construction areas.	Construction	9.1.3
1.18	Water Quality	Vessels shall have adequate on-board communication, containment, drainage and monitoring systems to prevent discharges of unauthorised effluents.	Construction	9.1.3
1.19	Water Quality	Containment of spills and leaks in accordance with the technical guidelines section Bunding and Spill Management of the Authorised Officers Manual (EPA 2012) and the most recent version of the Australian Standards in the guidelines. Containment should be designed for no discharge.	Construction	9.1.3
1.20	Water Quality	Appropriate site and project inductions/training detailing the potential water quality impacts and relevant construction measures and spill and emergency response procedures.	Construction	9.1.3
1.21	Water Quality	Spill response strategy and procedures should include the contact details of the relevant authorities to be notified in the event of a spill, including the PANSW: Harbour Master/Pilot, PANSW Port of Eden Main Jetty, Eden NSW 2551 T: +61 2 6496 1719 E: edenpilots@portauthoritynsw.com.au W: http://edenport.com.au/contact_us	Construction	9.1.3
1.22	Water Quality	Appropriate waste facilities should be readily accessible on the passenger wharf to encourage passengers to dispose of waste correctly.	Operation	9.1.4
1.23	Water Quality	Regular inspection and clearing of marine debris from waters, land-side, adjacent to the cruise ship berth and along the foreshore should be undertaken by management	Operation	9.1.4

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		and / or subcontractors. The regular inspection should also include a periodic inspection of the seabed to remove any accumulated rubbish.		
1.24	Water Quality	Use of water sensitive urban design measures.	Operation	9.1.4
1.25	Water Quality	Educate employees of the cruise ship terminal on best practice for washing of wharf / land based facilities. Where possible, rinse with water only or use detergents with low-phosphate content;	Operation	9.1.4
1.26	Water Quality	In-water cleaning to occur only on anti-fouling coatings suitable for in-water cleaning (obtainable from coating manufacturer);	Operation	9.1.4
1.27	Water Quality	Best practice hull cleaning procedures (where required) to be followed (e.g. Department of Agriculture, Fisheries and Forestry (DAFF) Anti-fouling and In-water Cleaning Guidelines, 2013, and the ANZECC Code of Practice for Antifouling and In-Water Hull Cleaning and Maintenance 1997).	Operation	9.1.4
1.28	Water Quality	Prevent/minimise sewage pump-out by docked passenger ships.	Operation	9.1.4
1.29	Water Quality	Oils and hazardous chemicals should be stored in bunded and covered storage areas.	Operation	9.1.4
1.30	Water Quality	To limit the resuspension of seabed sediments, appropriate speed zones should be enforced.	Operation	9.1.4
1.31	Water Quality	Ongoing periodic monitoring of water quality and surface sediments;	Operation	9.1.4
1.32	Water Quality	Establish comprehensive vessel/ship refuelling procedures to avoid or reduce the possibility of release. Include as a minimum requirements for: • Adhering to all PANSW and pollution regulations • Refuelling during daylight hours where possible, depending on sea conditions • Training personnel involved with refuelling or fuel transfer in their roles, functions and responsibility, including emergency response, • Maintaining open communication channels • Deploying spill prevention systems in accordance with established procedures and regulatory requirements • Maintaining emergency response equipment to ensure that it is readily available.	Operation	9.1.4
1.33	Water	Low EHS-risk cleaning products will be preferentially	Operation	9.1.4

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
	Quality	selected (i.e. biodegradable detergents and dispersants).		
1.34	Water Quality	Vessels shall have adequate on-board communication, containment, drainage and monitoring systems to prevent discharges of unauthorised effluents.	Operation	9.1.4
1.35	Water Quality	The use of any surfactants, dispersants and detergents will be restricted to the minimum amount required to complete tasks.	Operation	9.1.4
1.36	Water Quality	Prohibit discharge of contaminated bilge water into the waterway.	Operation	9.1.4
1.37	Water Quality	In NSW State waters, Transport for NSW is responsible for ensuring that maritime incidents (including oil and chemical spills) are responded to quickly and effectively. At the Port of Eden, the PANSW (Sydney resources) is the lead response agency. Containment of spills and leaks in accordance with the technical guidelines section Bunding and Spill Management of the Authorised Officers Manual (EPA 2012) and the most recent version of the AS in the guidelines.	Operation	9.1.4
1.38	Water Quality	Containment should be designed for no discharge.	Operation	9.1.4
1.39	Water Quality	Spill response strategy and procedures should include the contact details of the relevant authorities to be notified in the event of a spill, including the PANSW: Harbour Master/Pilot, PANSW Port of Eden Main Jetty, Eden NSW 2551 T: +61 2 6496 1719 E: edenpilots@portauthoritynsw.com.au W: http://edenport.com.au/contact_us	Operation	9.1.4
2.01	Sediment Quality	Ensure fuel handling, bunkering and emergency procedures and equipment are appropriate, available and considered standard in the Port's and contractors procedures. Adequate equipment and facilities will be available on board and at the wharf during construction. Ensure relevant staff and contractors are trained in emergency response.	Construction and Operation	9.2.2 & 9.2.3
2.02	Sediment Quality	Best practice hull cleaning procedures (where required) to be followed (e.g. Department of Agriculture, Fisheries and Forestry Anti-fouling and In-water Cleaning Guidelines, 2013).	Construction	9.2.2
2.03	Sediment	Appropriate general waste handling and disposal processes	Construction	9.2.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
	Quality	in contractor's policies and procedures.		
3.01	Aquatic Ecology	To minimise damage to sensitive marine habitats (seagrass and subtidal rocky reef) in the immediate construction area, Snug Cove and Cattle Bay, all construction vessels must avoid anchoring over areas of sensitive habitat including mapped seagrass beds and areas of subtidal rocky reef. Vessels must only anchor (except in the case of emergencies) in areas marked as a dedicated mooring zone for construction vessels on the Figure 5-4 of the EIS.	Construction	9.3.3
3.02	Aquatic Ecology	To minimise unnecessary damage to marine habitats Contractor(s) must limit any unnecessary / temporary construction (i.e. through selection of the most appropriate construction methods) and limit any anchoring which is required by vessels. Any temporary barge / platform structures along the breakwater must be positioned so as to minimise physical disturbance of macroalgae.	Construction	9.3.3
3.03	Aquatic Ecology	All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage.	Construction	9.3.3
3.04	Aquatic Ecology	To reduce the potential impacts of water quality on marine habitats during construction and operation, all mitigation measures outlined in Section 9.1 (Water Quality) of the main EIS must be adopted.	Construction / Operation	9.3.3
3.05	Aquatic Ecology	To reduce the potential impacts of sediment quality on marine habitats during construction and operation, all mitigation measures outlined in Section 9.2 (Sediment Quality) of the main EIS must be adopted.	Construction / Operation	9.3.3 & 9.3.4
3.06	Aquatic Ecology	To enhance the potential for contractors to be able to assist in the protection of marine habitats (especially seagrass, macroalgae and rocky reef areas) in the study area, all contractors, in particular skippers, must be made aware of the areas of sensitive habitat within the study area and of the potential impacts that construction works may have on these areas.	Construction	9.3.3
3.07	Aquatic Ecology	A turbidity curtain with a minimum drop of 4m must be used locally around the perimeter of pile drilling works to limit the spread of plumes generated by drilling activities. Drilling spoil and cuttings must be deposited at seabed level within the footprint of the new wharf and contained within the turbidity curtain.	Construction	9.3.3
3.08	Aquatic Ecology	Monitoring of water quality (particularly turbidity) during construction should be undertaken and dredging operations ceased if levels of suspended sediment become higher than trigger values developed for the Project.	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
3.09	Aquatic Ecology	Due to the nature of the Project there is no way to mitigate the direct impact of dredging on soft sediment habitats within the dredge area.	Construction	9.3.3
3.10	Aquatic Ecology	Post construction surveys of marine vegetation (i.e. seagrass and macroalgae) should be undertaken to determine the degree of damage and recovery of benthic habitats in the study area.	Post-Construction	9.3.3
3.11	Aquatic Ecology	To minimise damage to marine habitats in the study area which may be utilised by marine fauna, all measures listed under 'Marine Habitats and Flora' above to protect marine habitats must be adopted.	Construction / Operation	9.3.3 & 9.3.4
3.12	Aquatic Ecology	To reduce potential water quality impacts on marine fauna during construction and operation all measures listed in Section 9.1 of the main EIS (Water Quality) must be adopted.	Construction / Operation	9.3.3 & 9.3.4
3.13	Aquatic Ecology	To reduce potential sediment quality impacts on marine fauna during construction and operation all measures listed in Section 9.2 of the main EIS (Sediment Quality) must be adopted.	Construction / Operation	9.3.3 & 9.3.4
3.14	Aquatic Ecology	To reduce the potential impacts of marine debris on marine fauna, waste associated with construction and operation must be managed as per Section 9.18 of the main EIS (Waste Management). In addition, all ships at sea must adhere with the amendments to the International Maritime Organisation's (IMO's) International Convention for the Prevention of Pollution from Ships (Marine Pollution: MARPOL) Annex V which came into force on 1 January 2013. The amendments prohibit the discharge of all garbage from ships into the sea (except under very specific circumstances). This reverses the presumption that garbage may be discharged into the sea based on defined distances from shore and the nature of the garbage. The amendments also list requirements for garbage management plans on ships and port reception facilities for receiving waste. MARPOL is implemented in Australia through the Protection of the Sea (Prevention of Pollution from Ships) Act 1983.	Construction / Operation	9.3.3 & 9.3.4
3.15	Aquatic Ecology	To reduce the potential for lighting related impacts on marine fauna the following measures should be adopted: • Limit the need for construction activities to be undertaken during the evening and night time to reduce the overall need for construction related artificial lighting (on vessels and on the land portion of	Construction / Operation	9.3.3 & 9.3.4

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		the site) and associated impacts. • The use of sensor lighting or dimmers on the wharf to reduce brightness during times of night when the facility is less likely to be in use.		
3.16	Aquatic Ecology	If possible, the risk of overnight cable strike can be minimised by placing floating plant on a swing mooring, where space permits and it is deemed safe to do so by the vessel Master, rather than leaving plant in a fixed mooring configuration as the reliance on a single swing mooring line will minimise cable oscillation.	Construction	9.3.3
3.17	Aquatic Ecology	The risk of vessel strike during construction and operation may be reduced through the adoption of: • All vessels associated with dredging and construction will travel at speeds no higher than 10 knots within the port limits, en-route to, or at the disposal ground. • Vessels must maintain a 300 m exclusion zone with all whales en-route to and from the disposal ground and within the disposal ground. • Education of all personnel. • Active management such as daily information exchange on known marine mammal activity (e.g. via local residents, commercial fishers, mussel farmers, NPWS whale watch and Cat Balou Cruises). • Awareness of the presence of marine fauna in the local waterway by vessel operators so that they can adopt appropriate speeds and clearance when cetaceans are nearby. • Variable or zoned (time and place) speed limits during the operation phase, particularly in relation to Southern right whales and humpback whale feeding aggregations and during peak marine mammal visitation periods within Twofold Bay.	Construction / Operation	9.3.3 & 9.3.4
3.18	Aquatic Ecology	To reduce the potential for noise impacts on marine fauna (specifically marine mammals) the Piling Operation Procedures outlined in the EPBC Act Referral must be followed: Piling Operation Procedures: a) Pre-start Observation: Marine mammal observers must visually monitor observation and shut-down zones for whales for a minimum of 30 minutes before the commencement of piling. b) Soft-Start Procedure: If after the 30 minute pre-start observation no whale/s have been spotted within the	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		observation or shutdown zone a soft start procedure may commence with a gradual increase in piling impact energy of no more than 50% of full impact energy for 10 minutes. The soft start procedure must be implemented after breaks in piling driving of 30 minutes or more. c) Stand by procedure: If a whale is spotted within the observation zone during the soft start procedure the operator of the piling equipment must be placed on standby to shut-down the piling rig and a trained crew member should continuously monitor the whale/s in sight at all times. d) Normal Piling Procedure: If no whale/s has been sighted during the soft-start procedure full impact piling may commence. Contractor(s) must make reference to EPBC Act Referral for specific details.		
3.19	Aquatic Ecology	To reduce the potential for noise impacts on marine fauna (specifically marine mammals) the following Shut-Down requirements outlined in the EPBC Act Referral must be followed: Shut-Down requirements: a) If visibility is poor and the marine mammal observer is unable to clearly identify objects to the full observation zone distance, a vessel or aircraft search must be conducted or the action postponed until visibility has improved. b) Piling is not permitted between 6.00 pm and 7.00 am. c) If any whales are spotted within the shut-down zone, piling must cease immediately or as soon as safe to do so until the whale/s has moved outside of the shut-down zone. d) All piling must cease for a minimum of 1 hour after the last sighting of a whale within the observation zone. Piling must recommence at the pre-start observation after the 1 hour shutdown has elapsed. Contractor(s) must make reference to EPBC Act Referral for specific details.	Construction	9.3.3
3.20	Aquatic Ecology	Methods on how to deter seals and sea lions from damaging property have been published by the National Oceanic and Atmospheric Administration (NOAA 2015). These methods include: • Barriers and exclusion devices (e.g. fencing, posts, bull rails, electric fencing, netting, swim step protectors).	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		• Visual repellents (e.g. flags, flashing lights / strobes, balloons, human attendants). • Noise makers (e.g. horns, whistles or bells, electronic acoustic devices, clapping, banging). • Physical contact (e.g. water hoses, poles, sprinklers or sprayers). The potential impacts and possible deterrents to stop Fur Seals from utilising the end of the breakwater during construction were discussed with experts in the field of marine mammals from the Merimbula NPWS (Craig Dickman), DPI-Fisheries, Eden (Matthew Proctor), Macquarie University (Rob Harcourt) and ORRCA (Organisation for the Rescue and Research of Cetaceans in Australia). All experts advised that seals will move away from the area during construction and remain at distance from any activities occurring at the end of the breakwater whilst construction is occurring. Any attempt to deter seals using barriers, visual and noise deterrents and physical are more likely to cause impacts to the seals than the development itself. Based on this advice no removal or deterrence of fur seals from the breakwater or construction area should be undertaken as a mitigation measure.		
3.21	Aquatic Ecology	All injured marine mammals should be immediately reported to the ORRCA 24 hour hotline on 02 9415 3333 or NPWS on 1300 361 967. The ORRCA telephone hotline is staffed by volunteers and keeps ORRCA members, Government Authorities and interested members of the public informed of marine mammal emergencies, incidents and sightings. ORRCA representatives will quickly mobilise to site and attempt to capture and treat the stricken animal. Depending upon the location of the animal and the circumstances that surround the injury, breakwater construction activities may need to cease or be altered to enable the rescue of the animal.	Construction / Operation	9.3.3 & 9.3.4
3.22	Aquatic Ecology	There is no way to mitigate the direct impacts of dredging on benthic marine infauna within the dredge footprint as these organisms will be directly removed via dredging activities.	Construction	9.3.3
3.23	Aquatic Ecology	There is no way to mitigate the impacts on smothering of benthic infauna at the disposal site from dredge material disposal. However, given that the sediment which will be disposed of consists mainly of sand, recolonisation of the disposal area following disposal is expected to occur over time.	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
3.24	Aquatic Ecology	The four goals of the NSW *Invasive Species Plan 2008 – 2015* (NSW DPI 2008) must be adopted for the Project: 1. Exclude – i.e. prevent the establishment of new invasive species. The challenge is to identify species, thoroughly assess potential invasiveness and implement effective barriers to prevent their establishment. 2. Eradicate or Contain – i.e. eliminate or prevent the spread of new invasive species. The challenge is to develop and deploy effective and efficient ways to eradicate or contain an introduced species before it becomes widespread. 3. Effectively Manage – i.e. reduce the impacts of widespread invasive species. The challenge is to manage or control of species to reduce their impact where benefits are greatest. 4. Capacity – i.e. ensure NSW has the ability and commitment to manage invasive species. The challenge is for NSW to have the knowledge, skills, resources and systems to address the impacts of invasive species.	Construction / Operation	9.3.3 & 9.3.4
3.25	Aquatic Ecology	All Contractor(s) must undertake a Vessel Risk Assessment (VRA) for each vessel prior to mobilisation of the vessel to site. The VRA may be undertaken by the vessel owner/operator. All vessels, floating plant and dredge equipment mobilised to site from any place inside or outside of Australia shall be subject to a VRA. The VRA will determine if an Invasive Marine Species inspection (IMS) is required. The Contractor(s) must provide the completed VRA to the Principal at least four weeks prior to the vessel leaving the departure port.	Construction	9.3.3
3.26	Aquatic Ecology	The Contractor(s) must undertake an Invasive Marine Species (IMS) inspection of all vessels assessed in the VRA as uncertain or high risk for introduction of invasive marine species. Any construction vessels mobilised from outside of Australia shall be considered high risk and an IMS inspection must be carried out.	Construction	9.3.3
3.27	Aquatic Ecology	The IMS inspection must be undertaken by an appropriately qualified practitioner with experience in biosecurity of marine vessels. The Contractor(s) is responsible for arranging the IMS inspection and attendance of DPI-Fisheries.	Construction	9.3.3
3.28	Aquatic Ecology	The Contractor(s) must provide the completed IMS report to the Principal at least seven days prior to the vessel	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		leaving the departure port.		
3.29	Aquatic Ecology	Where IMS inspections identify significant amounts of sediment and/or the presence of an invasive marine species (as deemed by the IMS inspector) the vessel must be dry docked and cleaned prior to entering the site. The Contractor(s) must then resubmit the VRA and if the vessel is classified as low risk it shall be permitted to sail to site and begin operations.	Construction	
3.30	Aquatic Ecology	Construction vessel antifouling must be maintained to avoid the attachment and potential translocation of invasive species into and out of Twofold Bay.	Construction	9.3.3
3.31	Aquatic Ecology	Spillage of dredged sediments during transit to the disposal location must be avoided so as not to increase the distribution of invasive species which may occur within the Snug Cove area but not yet in other areas of Twofold Bay. This should be done via proper containment of marine sediments on the barges.	Construction	9.3.3
3.32	Aquatic Ecology	Ballast water management: • Ballast water exchange by domestic vessels must be avoided. • Domestic vessels should manage ballast water in accordance with the *Australian Ballast Water Management Requirements* (Department of Agriculture and Water Resources 2016). • Any ballast water exchange from international vessels must be undertaken in accordance with the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* (BWM) (IMO 2016) – i.e. "whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 m in depth, taking into account Guidelines developed by IMO" and "in cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 m in depth".	Construction / Operation	9.3.3 & 9.3.4
3.33	Aquatic Ecology	For all commercial vessels and/or barges, dredge or other equipment coming from overseas the Australian Government Department of Agriculture and Water Resources processes for pre-arrival, arrival and inspection and post-arrival must be followed. These can be found at: http://www.agriculture.gov.au/biosecurity/avm/vessels/commercial-vessels/barges-and-towed-vessels	Construction	9.3.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		http://www.agriculture.gov.au/biosecurity/avm/vessels/commercial-vessels/process_for_commercial_vessels		
3.34	Aquatic Ecology	For cruise ships coming from outside of Australian waters the procedures outlined in Australia's National System for the Prevention of Marine Pest Incursions shall be adopted. Cruise ships must also adopt the Australian Government Department of Agriculture and Water Resources processes of reporting and pre-arrival which can be found at: http://www.agriculture.gov.au/biosecurity/avm/vessels/commercial-vessels/cruise-vessels	Operation	9.3.4
3.35	Aquatic Ecology	Monitoring and inspection / surveillance of the dredge vessel and barges must be undertaken in accordance with the *Biosecurity Act 2015*.	Construction	9.3.3
3.36	Aquatic Ecology	Monitoring of potential pest species establishment at the disposal ground post disposal must be undertaken.	Post-Construction	9.3.3
3.37	Aquatic Ecology	Temporary relocation of the nearby mussel aquaculture facility from their current Cattle Bay lease area to lease AL06/001 at Boydtown for the duration of construction will help to ensure that construction related impacts on mussel aquaculture are avoided.	Construction	9.3.3
3.38	Aquatic Ecology	To reduce the potential impacts of water quality on the mussel aquaculture lease area located near the study area during operation all mitigation measures outlined in Section 9.1 (Water Quality) of the EIS must be adopted.	Operation	9.3.4
3.39	Aquatic Ecology	DPI-Fisheries (1800 043 536) must be immediately notified of any fish kills in the vicinity of the construction works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by DPI-Fisheries.	Construction / Operation	9.3.3 & 9.3.4
4.01	Terrestrial Ecology	Potential impacts of lighting on birds can be reduced by limiting the need for construction activities to be undertaken during the evening and night time – this will reduce the overall need for construction related artificial lighting (on vessels and on the land portion of the site) and associated impacts.	Construction	9.4.2
4.02	Terrestrial Ecology	Below water construction noise (from activities such as piling or dredging) is expected to have little impact on shorebirds and marine birds that will generally be above water. Nevertheless, the mitigation measures proposed to reduce underwater noise impacts in the Aquatic Ecology section of this EIS will also negate any potential for underwater noise impacts to occur on birds if they happen to be feeding / diving underwater at the time of these	Construction	9.4.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		works (refer to Section 9.3 Aquatic Ecology).		
4.03	Terrestrial Ecology	Above water construction noise impacts, which have the potential to impact on the behaviour of shorebirds and marine birds, are to be managed in accordance with the Construction Noise Management Measures outlined in Section 6.6 of PEL (2016) and the Noise and Vibration Mitigation Measures outlined in Section 9.6.4 of this document. These measures generally aim to reduce the severity and/or duration of noise emissions from construction plant and activities.	Construction	9.4.2
4.04	Terrestrial Ecology	To reduce the potential impacts of marine debris on shorebirds and marine birds, waste associated with the construction and operation of the Project are to be managed as per Section 9.16.4 of this document (Waste Management Mitigation Measures).	Construction and Operation	9.4.2 & 9.4.3
4.05	Terrestrial Ecology	To reduce the potential impacts of water quality / water pollution on shorebirds and marine birds, water quality impacts are to be mitigated as per Section 9.1.6 (Water Quality Mitigation Measures). There are numerous ways to mitigate water quality impacts and with adoption of these no significant impacts on birds are expected.	Construction and Operation	9.4.2 & 9.4.3
4.06	Terrestrial Ecology	Mitigation measures to reduce the potential for vessel strike have been discussed in the Section 9.3.4 (Aquatic Ecology Mitigation Measures). While it is highly unlikely that birds will be impacted by vessel strike to begin with, the adoption of these measures will also reduce the potential risks of vessel strike on birds.	Construction and Operation	9.4.2 & 9.4.3
4.07	Terrestrial Ecology	Potential impacts of lighting on birds can be reduced through installation of downward directed lighting – this may be adopted for any lighting along the wharf structures. Downward directed lighting will reduce light emissions into the sky and therefore potential impacts such as disorientation of and/or attraction of migratory birds passing by at night.	Operation	9.4.3
4.08	Terrestrial Ecology	Potential impacts of lighting on birds can be reduced by the use of green or blue lighting (rather than white or red) where possible, noting sector light is red) these colours have been proven to have little or no effect on the behaviour / orientation / attraction of avian species whereas white or red lighting are known to have much more of an impact.	Operation	9.4.3
4.09	Terrestrial Ecology	Many noise impacts associated with the operation of the Project will be similar to impacts already present at the site, and other will be unavoidable, however, some ship noise	Operation	9.4.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		related impacts are likely to be improved over time with technological advances in industrial standards. In the meantime, operational related impacts will only be short term and occasional and are unlikely to significantly affect birds in the study area.		
4.10	Terrestrial Ecology	All ships at sea must adhere with the amendments to the International Maritime Organisation's (IMO's) International Convention for the Prevention of Pollution from Ships (MARPOL) Annex V which came into force on 1 January 2013. The amendments prohibit the discharge of all garbage from ships into the sea (except under very specific circumstances). This reverses the presumption that garbage may be discharged into the sea based on defined distances from shore and the nature of the garbage. The amendments also list requirements for garbage management plans on ships and port reception facilities for receiving waste. MARPOL is implemented in Australia through the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*.	Operation	9.4.3
4.11	Terrestrial Ecology	Human interference with birds, such as inappropriate feeding, can largely be managed through the education of passengers about the potential risks to shorebirds and marine birds from such practices. Educational measures could include signage on the wharf and/or information provided to passengers on board vessels regarding local native wildlife and threats to wildlife on entry to the Port.	Operation	9.4.3
5.01	Traffic, Transport and Access	The final location of the navigation aid is to ensure that the existing footpath on the Snug Cove foreshore remains unimpeded to allow access to/from the wharf.	Detailed Design	9.5.2
5.02	Traffic, Transport and Access	Relocation of impacted swing moorings is to be assessed and undertaken by RMS by 30 June 2017.	Pre-Construction	9.5.2
5.03	Traffic, Transport and Access	Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction	9.5.2
5.04	Traffic, Transport and Access	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction	9.5.2
5.05	Traffic, Transport and Access	Consultation with PANSW during construction and operation to ensure maintenance of safe navigation for shipping.	Construction and Operation	9.5.2 & 9.5.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
5.06	Traffic, Transport and Access	Implement the recommendations of the Smartship Australia report.	Operation	9.5.3
5.07	Traffic, Transport and Access	Preparation of an OEMP prior to operation commencement to manage the use of land and waterway areas from cruise ship operations.	Operation	9.5.3
5.08	Traffic, Transport and Access	Preparation of an Operational TMP prior to operation commencement which should address but be not limited to the following: • Bus layover area if required. • Proposed new location for the Marquee. • Temporary signage locations and speed limits. • Bus and taxi loading procedures for passengers, including disabled access. • Bus route to locations and drop-off / pick-up method. • Detailed number of shuttle bus required. • Travel access guide. • Any proposed additional bus drop-off locations.	Operation	9.5.3
6.01	Noise and Vibration	Where possible, plant and equipment is to be selected that can be fitted with options to minimise noise such as covers, mufflers, shrouds and other noise suppression equipment.	Construction	9.6.2
6.02	Noise and Vibration	Plant and equipment is to be turned off and not left idling when not in use. Anchorages and moorings should be used for boats or other water craft if necessary.	Construction	9.6.2
6.03	Noise and Vibration	Plant and equipment is to operate in accordance with industry standards and have been serviced as per manufacturer specifications.	Construction	9.6.2
6.04	Noise and Vibration	Noisy plant and equipment is to be oriented away from sensitive receivers where possible.	Construction	9.6.2
6.05	Noise and Vibration	Temporary screens or other items that provide a noise buffer (including plant and equipment) are to be used proximate to noise sources.	Construction	9.6.2
6.06	Noise and Vibration	Low noise emission plant and equipment is to be selected where available.	Construction	9.6.2
6.07	Noise and Vibration	Broadband reversing alarms or similar is to be used as an alternative to a traditional beeper reversing alarm for vehicles permanently on site.	Construction	9.6.2
6.08	Noise and Vibration	Plant and equipment is to be well maintained and serviced regularly to ensure it is not generating excessive noise.	Construction	9.6.2
6.09	Noise and	Tools are not to be dropped from a height onto hard	Construction	9.6.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
	Vibration	surfaces.		
6.10	Noise and Vibration	Above water noise levels are to be monitored continuously.	Construction	9.6.2
6.11	Noise and Vibration	Consider respite periods for activities that continue for extended periods of time, particularly those works to be undertaken outside normal working hours such as dredging.	Construction	9.6.2
6.12	Noise and Vibration	The use of horns and alarms are to be minimised, most particularly during works undertaken in the evening and night time periods.	Construction	9.6.2
6.13	Noise and Vibration	The staff and visitor induction protocols are to include awareness of noise generating activities and mitigation measures and techniques that should be implemented.	Construction	9.6.2
6.14	Noise and Vibration	The community is to be notified prior to noise intensive activities commencing, such as piling.	Construction	9.6.2
6.15	Noise and Vibration	The community is to be informed prior to any out of hours work commencing.	Construction	9.6.2
6.16	Noise and Vibration	A complaints procedure is to be implemented by the Contractor and contact details provided to potentially affected residents and businesses in the area.	Construction	9.6.2
6.17	Noise and Vibration	The Contractor's complaints procedure is to include a record of complaints indicating cause and measures taken to resolve/minimise cause.	Construction	9.6.2
6.18	Noise and Vibration	Where noise levels are above the highly noise affected levels the contractor is to consult with the community to identify work practices or alternative mitigation measures that aim to minimise the intrusiveness of the noise generating activities as much as possible. These may include letterbox drops, attended noise monitoring, individual briefings, project specific respite and phone calls to affected stakeholders.	Construction	9.6.2
6.19	Noise and Vibration	Works are to be scheduled to minimise the number of noisy plant and equipment operating at any one time.	Construction	9.6.2
6.20	Noise and Vibration	Construction activities are to be planned to minimise vehicular movements around the site.	Construction	9.6.2
6.21	Noise and Vibration	High vibration methods are to be substituted with lower vibration methods where possible.	Construction	9.6.2
6.22	Noise and Vibration	Trial measurements are to be conducted at the furthest point from sensitive receivers to test predicted values and ensure vibration compliance is achieved.	Construction	9.6.2
6.23	Noise and	Alternatives to high vibration plant and equipment are to	Construction	9.6.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
	Vibration	be used where possible.		
7.01	Air Quality	Mitigation measures for air quality have been included in the CEMP. The mitigation measures would be developed to satisfy an air quality performance objective to minimise polluting air emissions produced during construction works. Air quality management actions during construction would be the responsibility of the construction contractor and would be implemented throughout the duration of the construction period.	Construction	9.7.2
7.02	Air Quality	All plant and equipment used during the construction works would be regularly maintained to comply with the relevant exhaust guidelines. Prior to the commencement of work all construction equipment would be inspected by a qualified person to ensure emissions are minimised.	Construction	9.7.2
7.03	Air Quality	Any visible dark emissions from vessel exhausts would be reported and the equipment repaired or replaced as soon as practicable.	Construction	9.7.2
7.04	Air Quality	Refuelling activities would be undertaken during daylight hours and undertaken by trained personnel only.	Construction	9.7.2
7.05	Air Quality	To minimise potential air quality impacts during the operational phase it is recommended that cruise ships entering the port adopt low sulphur fuels.	Operation	9.7.3
8.01	Property and Land Use	Relocation of impacted swing moorings is to be assessed and undertaken by RMS by 30 June 2017.	Pre-Construction	9.8.2
8.02	Property and Land Use	Eden Sea Farms is to be temporarily relocated prior to dredging.	Pre-Construction	9.8.2
8.03	Property and Land Use	Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction	9.8.2
8.04	Property and Land Use	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction	9.8.2
8.05	Property and Land Use	Preparation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation	9.8.3
9.01	Visual Amenity	The final location of the navigation aid is to ensure that the existing footpath on the Snug Cove foreshore remains unimpeded to allow access to/from the wharf.	Detailed Design	9.9.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
9.02	Visual Amenity	Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction	9.9.2
9.03	Visual Amenity	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction	9.9.2
9.04	Visual Amenity	Preparation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation	9.9.3
10.01	Health and Safety	To manage potential impact of decrease in water quality: • Water Quality Monitoring Program • CEMP and Contractor(s) EMP	Construction	9.10.2
10.02	Health and Safety	To manage potential impact of algal blooms: • CEMP and Contractor(s) EMP • Water Quality Monitoring Program	Construction	9.10.2
10.03	Health and Safety	To manage potential impact of increase noise: • CEMP • Contractor(s) EMP including CNVMP	Construction	9.10.2
10.04	Health and Safety	To manage potential impact of increased air emissions: • CEMP • Contractor(s) EMP • OEMP	Construction and Operation	9.10.2
10.05	Health and Safety	To manage potential impact of odour and unsanitary conditions: • CEMP • Contractor(s) EMP including Construction Waste Management Plan • OEMP	Construction and Operation	9.10.2 & 9.10.3
10.06	Health and Safety	To manage potential impact of decreased visual amenity, the large cruise ships at berth will be transient in nature with no overnight berthing.	Operation	9.10.3
10.07	Health and Safety	To manage potential impact of pests: • OEMP (Waste Management Plan)	Operation	9.10.3
10.08	Health and Safety	To manage potential impact of safety: • Maritime Safety procedures • Occupational Health and Safety procedures	Construction and Operation	9.10.2 & 9.10.3
10.09	Health and Safety	To manage potential food safety risks: • NSW Food Safety Program	Construction and Operation	9.10.2 & 9.10.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		• Testing is required on the mussels to be undertaken by Eden Sea Farms ensure they meet the food safety standards and are fit for consumption		
10.10	Health and Safety	To manage potential impacts of traffic generation: • Operational TMP	Operation	9.10.3
10.11	Health and Safety	To manage the potential impact of communicable disease: • Follow relevant NSW Public Health Unit Control Guideline for the particular infectious disease	Construction and Operation	9.10.2 & 9.10.3
11.01	Socio-Economic	Relocation of impacted swing moorings is to be assessed and undertaken by RMS by 30 June 2017.	Pre-Construction	9.11.2
11.02	Socio-Economic	Eden Sea Farms is to be temporarily relocated prior to dredging.	Pre-Construction	9.11.2
11.03	Socio-Economic	Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction	9.11.2
11.04	Socio-Economic	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction	9.11.2
11.05	Socio-Economic	Consultation with PANSW during construction and operation to ensure maintenance of safe navigation for shipping.	Construction and Operation	9.11.2 & 9.11.3
11.06	Socio-Economic	Maximise opportunities for local and Aboriginal workforce participation during construction and operation.	Construction and Operation	9.11.2 & 9.11.3
11.07	Socio-Economic	Preparation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation	9.11.3
11.08	Socio-Economic	Implementation of the Benefit Realisation Strategy in consultation with relevant stakeholders.	Operation	9.11.3
12.01	Coastal Processes	A water quality monitoring program will be implemented before and during dredging to manage any potential water quality impacts surrounding the dredge footprint and within the vicinity of the mussel leases and other sensitive environmental receptors (i.e., seagrass meadows). This program will be documented within the CEMP).	Construction	9.12.2
13.01	Hydrology	The CEMP is to include appropriate sediment and erosion management controls to minimise water quality impacts from surface runoff in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004). All erosion and sediment controls to be in place prior to the commencement of any landside works, maintained throughout construction, and removed only once all	Construction	9.13.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		disturbed areas have been reinstated.		
13.02	Hydrology	Weather and tide forecasts will be checked regularly during construction. Where flooding is forecast to the work area, all equipment and materials would be removed from the landside construction zone or appropriately secured above expected flood levels in the area.	Construction	9.13.2
13.03	Hydrology	Any car park alterations completed as part of the upgrade are to incorporate Water Sensitive Urban Design elements such as tree pits and bioretention swales. This would provide water quality improvements to the site by slowing runoff. The approach aligns with initiative C.19 "Incorporate Water Sensitive Design (WSUD)" from the *NSW Sustainable Design Guidelines Version 3.0* (TfNSW, 2013).	Detailed Design / Construction	9.13.2
14.01	Aboriginal Heritage	Maximise opportunities for local and Aboriginal workforce participation during construction.	Construction	9.14.2
14.02	Aboriginal Heritage	Project staff and Contractor(s) would be made aware of their statutory obligations for heritage under the National Parks and Wildlife Act 1974 through the site induction and toolbox talks. The Contractor(s) are to include an Aboriginal Culture Awareness module in its induction training in which the local Aboriginal community will be invited to present.	Construction	9.14.2
14.03	Aboriginal Heritage	In the event that any Aboriginal sites are disturbed and identified within the area of works, works within the immediate vicinity of the Aboriginal object will cease forthwith and the Office of Environment and Heritage (OEH) contacted so that appropriate management strategies can be identified and followed.	Construction	9.14.2
14.04	Aboriginal Heritage	In the event that skeletal remains are uncovered, works in the immediate area will cease, the area would be cordoned off and the NSW Police Coroner and Transport for NSW (TfNSW) environment team would be contacted to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the OEH Enviroline 131 555 and relevant Aboriginal stakeholders would be contacted to determine an action plan for the management of the skeletal remains prior to works re-commencing.	Construction	9.14.2
15.01	Historic Heritage	All relevant staff and contractors are to be trained regarding their statutory obligations and responsibilities under the *Heritage Act 1977* and best practice outlined in *The Burra Charter 2013*, through the site induction and toolbox talks in the event suspected historical cultural material is uncovered.	Construction	9.15.2
15.02	Historic Heritage	In the event that any potential archaeological 'relics' or 'historic shipwrecks' are disturbed and identified within the	Construction	9.15.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		site during construction works, all work in the area shall cease forthwith and the Heritage Division and a qualified archaeologist be consulted to determine an appropriate course of action prior to the recommencement of work in the area of the 'relic' or 'historic shipwrecks'. This protocol to be included the CEMP.		
16.01	Soils and Geotechnical	A list of geotechnical design parameters based on the results of the boreholes and laboratory testing has been developed and presented in Table C1 in Appendix C of the Geotechnical Investigation Interpretive Report (Appendix L). The parameters have been considered during design development to ensure geotechnical hazards during construction are reduced as much as possible. This includes a reduced extent for the dredging footprint in the vicinity of the Multipurpose Jetty to ensure it is not compromised during the dredging activities.	Detailed Design	9.16.2
16.02	Soils and Geotechnical	The naturally occurring asbestos material in the rock on the breakwall is to be safely relocated to areas along the existing breakwater that require repair/strengthening. The subsurface water mains pipes and electrical box in the carpark that are presumed to contain asbestos should be left insitu, labelled with warning signage, and maintained in their current condition. Asbestos is to be removed prior to any demolition or other intrusive work that may disturb the asbestos. The PCB containing capacitors on the wharf are to be left insitu and removed prior to demolition. The subsurface fill material was not sampled during the hazardous substances survey but further investigation is recommended prior to intrusive ground works. The soil will need to be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) prior to offsite disposal.	Construction	9.16.2
17.04	Soils and Geotechnical	All friable and non-friable asbestos-containing waste on-site shall be handled and disposed off-site at an EPA licensed waste facility by an EPA licensed contractor in accordance with the requirements of the *Waste Classification Guidelines* (NSW EPA, 2014) and any other regulatory instrument as amended.	Construction	9.16.2
17.01	Utilities and Services	Investigations will be carried out by the Contractor(s) to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works.	Detailed Design and Construction	9.17.2
17.0	Utilities and	Relevant service utility providers or owners will be consulted to verify the location of all services and to	Construction	9.17.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
2	Services	determine any potential impacts of the works. This includes requirements for protection, relocation or decommissioning of services.		
17.03	Utilities and Services	The Contractor(s) will be required to verify the location of all existing utilities in the vicinity of the project area and protect the utilities as necessary. This will include a Dial Before You Dig (DBYD) enquiry and survey of underground utilities as required.	Construction	9.17.2
17.04	Utilities and Services	Any utility upgrades, such as the installation of additional fire hydrants and fire-fighting equipment, potable water supply upgrades or upgrades to power supply to the wharf, will be conducted such that service impacts on utility customers are minimised. This may involve completing works at night or at specific times.	Construction	9.17.2
18.01	Waste Management	The Contractor(s) is to prepare and implement Construction Waste Management Plan (CWMP). The CWMP specifies the management of each waste stream (non-liquid, liquid, and gaseous).	Construction	9.18.2
18.02	Waste Management	During the construction phase the following mitigation measures would be implemented: • All waste would be classified in accordance with the Waste Classification Guidelines (NSW EPA, 2014). • Construction materials would be procured to ensure minimal cut-off and wastage. • Excess construction material suitable for reuse would be returned to the supplier, or recycled. • Waste streams would be kept separate on site to reduce cross-contamination and ensure the wastes are handled appropriately. • Barges for dredged material would not be overloaded to prevent spillage of dredged material while being transported to the offshore disposal site. • Vehicles used for the transportation of waste would be covered to prevent loss of waste. • Waste to be disposed offsite would be disposed to a waste facility that is licenced to receive that type of waste stream. • Waste to be transported offsite would be recorded including type, quantity and destination. • Hazardous waste such as waste oil and lubricating oil would be recycled at an appropriately licenced recycling waste depot. • Portable toilets would be emptied on a regular basis	Construction	9.18.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		and human waste disposed of to a local sewage treatment plant. • Recycling facilities (garbage bins or other suitable receptacles) would be provided to maximise recycling of waste materials such as plastic, glass, aluminium cans, and paper/cardboard.		
18.02	Waste Management	Once the wharf extension is complete ongoing waste management for the wharf would be the responsibility of the Department. The following measures are suggested initiatives that should be included in an Operational Waste Management Plan for the port. • Waste receptacles on the wharf should be designed to deter birds and vermin, and should be routinely checked (at least quarterly) to ensure they are fit for purpose, appropriately sized, and securely contain waste. • Recycling facilities should be provided on the wharf to maximise recycling of waste materials such as plastic, glass, aluminium cans and paper. • Maintenance materials, including waste oil and lubricants, would be disposed at an appropriately licenced facility.	Operation	9.18.3
19.01	Greenhouse Gas and Energy	The layout design has been optimised to allow use of the existing wharf and breakwater, using the embodied energy from the historic capital construction of these thus removing the additional greenhouse gas emissions which would have been caused by demolishing and reconstructing these items The design has included offsetting and angling the berth to reduce the impact on the existing structure and the breakwater. The stern of the larger ships would be unprotected by the breakwater which removes the requirement for additional construction and associated construction materials for the breakwater. The dredging design of the berth pocket has been optimised, including the use of ship simulation, to reduce dredging towards the east and west where ships will not travel. This reduces the volume of dredging, disposal and associated greenhouse gas emissions. Geotechnical and geophysical investigations have been undertaken to remove the requirement for drilling and blasting of rock material. Investigations showed material could be removed by backhoe, which would have been on site to remove blasted material anyway. The structural design has been optimised to reduce the	Detailed Design	9.19.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
		amount of steel and concrete used. Steel would be used for the dolphins to allow offsite fabrication and minimise requirement for barges, workboats and associated equipment on site, which would otherwise have produced more greenhouse gas if structures were fully constructed over water. Concrete would be used for the main deck, which should be locally sourced sand and aggregate, reducing transport associated greenhouse emissions. Use of concrete in these areas is a more durable solution than steel or timber, and an underside coating specified to further improve durability. The specification of coating and cathodic protection (CP) system to increase durability of steel structures will reduce the requirement for painting steel below water, and associated in water maintenance of coating system.		
19.02	Greenhouse Gas and Energy	Sustainable procurement practices would be adopted where feasible. This would include selecting recycled construction materials (including recycled concrete, steel and timber) where available and giving preference to recycled over virgin materials. In addition the following measures would be considered: • Construction materials would be sourced locally where possible. • Construction materials that have minimal embodied energy should be selected. • Use of PVC plastic would be minimised. • Construction materials that are low maintenance and durable should be considered. • Plant and equipment would be switched off when not in constant use and not left idling. • Plant and equipment brought onsite would be regularly serviced and energy efficient vehicles or equipment would be selected where available. • Any plant and equipment that is not working efficiently (i.e. emitting excessive smoke) would be removed from site and replaced as soon as possible. • Demolition, construction, and dredging works would be planned to ensure minimal movement of plant and equipment, including barges. • At least 10% of site based electricity needed during construction should be sourced from renewable or green sources.	Construction	9.19.2
19.0	Greenhouse	• The potential to generate energy on-site (such as the	Operation	9.19.3

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
3	Gas and Energy	use of photo-voltaic lighting) should be considered. • The operators of cruise ships entering the port should consider using low sulphur fuel.		
20.01	Hazards and Risks	Application of safety in design principles to ensure safe access to all new facilities.	Detailed Design	9.20.2
20.02	Hazards and Risks	Preparation and implementation of a CEMP to manage the potential environmental and constructions hazards impacts. This is to include the relevant mitigation measures identified throughout the EIS.	Construction	9.20.2
20.03	Hazards and Risks	Preparation and implementation of Construction Noise and Vibration Management Plan to manage the impacts to sensitive receives (refer to Section 9.6).	Construction	9.20.2
20.04	Hazards and Risks	Preparation and implementation of a Construction Waste Management Plan that specifies the management of each waste stream (non-liquid, liquid, and gaseous) would be prepared by the contractor and incorporated into the CEMP for the Project (refer to Section.	Construction	9.20.2
20.05	Hazards and Risks	Site safety protocols, tool box talks, risk assessments, Safe Work Method Statements, and incident management and emergency procedures would be prepared prior to the commencement of construction works and implemented as required throughout construction.	Construction	9.20.2
20.06	Hazards and Risks	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels and existing and future port users.	Construction	9.20.2
20.07	Hazards and Risks	Preparation and implementation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation	9.20.3
20.08	Hazards and Risks	Implementation of existing PANSW management policies and procedures including navigation and passage plans, security management and the Emergency Response Plan for port-related emergencies such as oil and chemical spills.	Construction and Operation	9.20.2 & 9.20.3
20.09	Hazards and Risks	Preparation of an Operational Waste Management Plan to manage ongoing waste with provision for updating on stated periodic basis.	Operation	9.20.3
20.10	Hazards and Risks	Provision and maintenance of fire-fight equipment and hydrants.	Operation	9.20.3
21.01	Cumulative Impacts	Preparation and implementation of CEMP to manage the impacts of construction works.	Pre-Construction / Construction	9.21.2

Ref	Issue	Mitigation Measure	Phase	Relevant EIS Section
21.02	Cumulative Impacts	Implementation and adherence to the defined "Marine Construction Zone" and "Construction Vessel Mooring Zone" to ensure protection of construction vessels, aquatic habitats, marine fauna and existing and future port users.	Construction	9.21.2
21.03	Cumulative Impacts	Preparation of OEMP and Operational TMP to manage the use of land and waterway areas from cruise ship operations.	Operation	9.22.2

10.4 Summary of the Proposed Management Plans

A number of environmental management plans (EMPs) and sub-plans will be developed and implemented for the Project. The management plans will detail objectives and mitigation measures (including those identified in this EIS), to be implemented during construction and / or operation of the Project, as relevant. The management plans will include corrective actions and relevant thresholds for implementation of such actions. Monitoring will also be detailed to ensure mitigation and corrective actions are being implemented as required and are achieving the intended environmental outcomes.

All management plans are required to be prepared by experienced and appropriately qualified personnel. All management plans and strategies are required to be reviewed and approved by the Department prior to commencement of the relevant components of work. The Department has overall responsibility for ensuring these management plans are effectively implemented.

Measures prescribed in each management plan are not to be contradictory to measures prescribed in other managements plans for the Project. That is, the suite of management plans is to complement each other and provide overarching environmental outcomes.

The management plans to be developed and implemented for the Project is discussed below.

10.4.1 Construction Environmental Management Plan

The CEMP provides the basis for environmental management for all construction activities associated with the Project including dredging and marine structures. The CEMP has been based on the relevant information, requirements and potential impacts of construction as identified in the Project EIS prepared by Advisian. A copy of the CEMP is in Appendix D.

Each Contractor will develop their own Project specific EMP to manage the environmental risks specifically related to their scope of work on the Project. These Contractor documents must be developed to align with the CEMP as a minimum and are required to be submitted to the Principal prior to mobilisation to site. Compliance with the CEMP is mandatory for all personnel and Contractors carrying out construction activities for the Project.

The flowchart in Figure 10-1 provides an outline of the process for the approval, distribution and revision process of the CEMP.

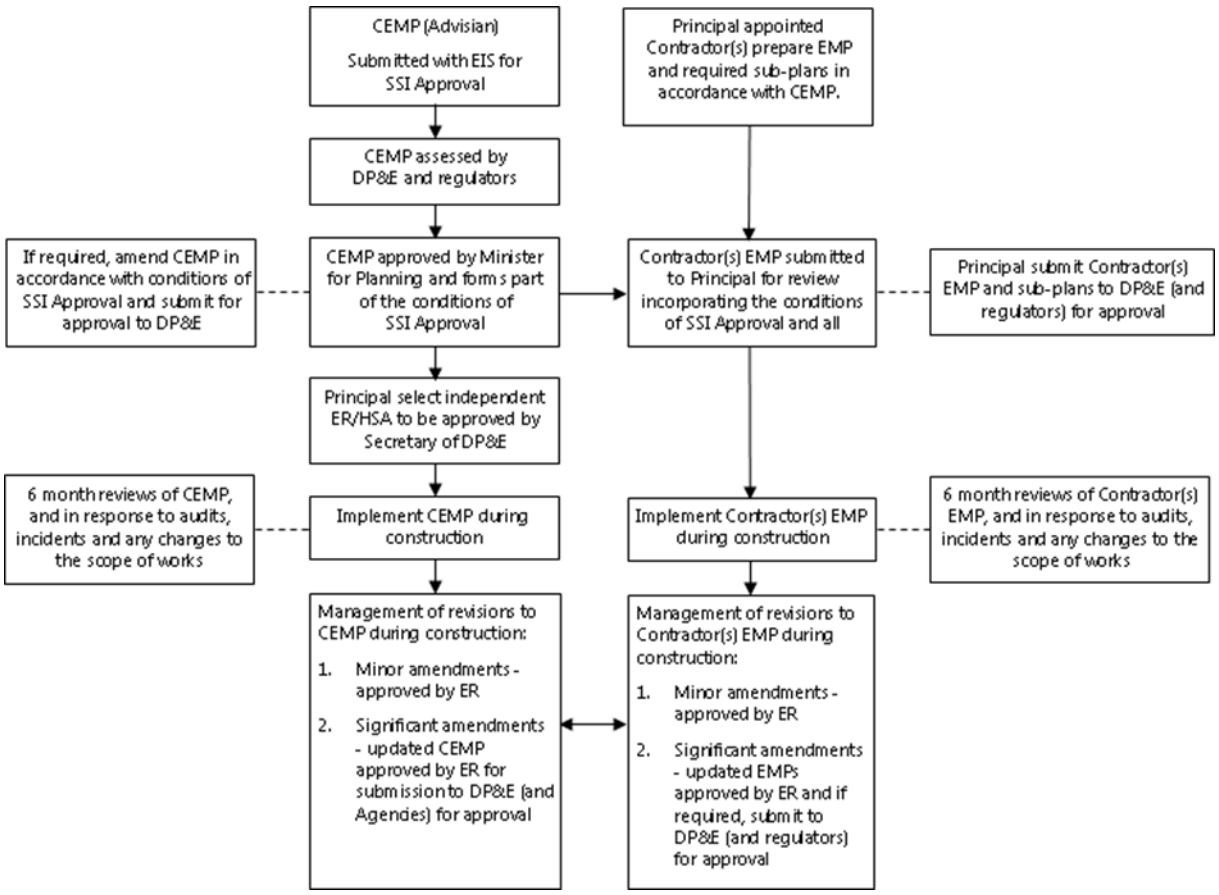

Figure 10-1 CEMP Approval, Distribution and Revision Process Flowchart

Environmental management sub-plans will be required to be prepared by the Contractor(s) and included in their EMP. These include:

- Construction Noise and Vibration Management Plan.
- Construction Traffic and Access Management Plan.
- Construction Waste Management Plan.

Additional sub-plans may be required in the conditions of the SSI Instrument of Approval.

10.4.2 Operational Environmental Management Plan

A framework for the preparation of an OEMP has been developed and is outlined below.

The OEMP will be prepared to outline the environmental management framework and practices and procedures to be implemented during the operational phase of the Project for cruise ships only. The OEMP relates to operations at the Breakwater Wharf Extension only and would not cover dredging (including maintenance dredging) or other activities undertaken by tenanted areas of the Port.

The OEMP will be submitted for approval by the Secretary of DP&E prior to the commencement of the operation of the Project (berthing of cruise ships).

The OEMP will address all relevant conditions included in the Instrument of Approval. The OEMP will be prepared in consultation with relevant government agencies and with reference to the Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004). It would be developed from and be consistent with the EIS for the Project.

The purpose of the OEMP will be to identify environmental risks associated with the berthing of cruise ships at the Breakwater Wharf and to detail measures to manage the risks and avoid or reduce environmental harm during the life of the Project.

The OEMP will include, but not necessarily be limited to:

- Identification of all statutory and other obligations that the proponent is required to fulfil in relation to the operation of the Project, including all approvals, licences and consultations.
- A description of the roles and responsibilities for all relevant employees (including contractors) involved in the operation of the Project.
- Environmental policies and principles to be applied to the operation of the Project.
- Standards and performance measures to be applied the Project and a means by which environmental performance can be periodically reviewed and improved, where appropriate.
- Management policies to ensure that the environmental performance goals are met and to comply with the conditions in the Instrument of Approval.
- The additional plans listed in the OEMP Structure.
- The environmental monitoring requirements outlines outlined in the Instrument of approval.

It is expected that the OEMP will be a standalone document that would be a part of a suite of environmental management documents for the Port. The OEMP will be developed in consultation with PANSW and integration with their OEMP's and standard operating procedures (SOPs) as well as RMS, TfNSW, EPA, BVSC and Emergency Services.

OEMP Structure

The OEMP will include a comprehensive list of environmental issues that are likely to be encountered and require management once cruise ships are berthing at the Breakwater Wharf Extension. Environmental objectives will be developed for each environmental issue and the intended management approach will be detailed.

Environmental risks associated with the operational phase of the Project have been identified during the preparation of the EIS. These risks would form the basis of the environmental issues that are to be included in an OEMP. The full list of environmental issues will be reviewed when the OEMP is being prepared to ensure they are still current and that no other issues are relevant.

The principal activity that would be undertaken at the Breakwater Wharf once it has been extended is the berthing of cruise ships.

Environmental elements that may be impacted during the operational phase include the environment (land, air and water) of the Port, neighbouring residents, Port users, and marine fauna and flora.

The OEMP is to be prepared to include following chapters, as a minimum:

- Glossary of terms and acronyms
- Introduction and background of the Project
- OEMP objectives
- Description of relevant activities that would be undertaken during the operation of the Project
- Legislative framework and statutory obligations
- Environmental policies, standards and procedures
- Environmental management
    - Risk assessment
    - Stormwater and Water Quality Management
    - Operational Noise Management Plan
    - Air Quality Management Plan
    - Waste Management Plan
    - Traffic, Transport and Access management
    - Hazards and risks and emergency response
- Roles and responsibilities for all relevant employees
- Complaints procedure
- Reporting and auditing
- Induction and training
- OEMP review
- Non-conformance and incident response
- Emergency contacts

For each of the environmental issues the following would be detailed:

1. Performance objectives
2. Key performance indicators
3. Management actions, including timing
4. Monitoring

5. Responsibility
6. Reporting
7. Corrective actions
8. Relevant references / standards

10.4.3 Operational Traffic Management Plan

A framework for the preparation of the Operational Traffic Management Plan (Operational TMP) has been prepared by McLaren Traffic Engineering. The TMP is to be prepared a traffic specialist prior to operation. The TMP is to address but be not limited to the following:

- Bus layover area if required.
- Proposed new location for the Marquee.
- Temporary signage locations and speed limits.
- Bus and taxi loading procedures for passengers, including disabled access.
- Bus route to locations and drop-off / pick-up method.
- Detailed number of shuttle bus required.
- Travel access guide.
- Any proposed additional bus drop-off locations.

10.5 Compilation of Project Outcomes

The Project will enable cruise ships to berth alongside the upgraded Breakwater Wharf so that passengers can embark/disembark directly and safely via the ships gangway. It will also make the Port an attractive and accessible stop over for an increasing number of cruise ships, resulting in a growth in tourism in Eden and surrounding areas and providing a boost to the local and regional economy.

10.6 Justification for the Project

Eden and the Sapphire Coast region experienced a deteriorating economy, especially in the retail and agricultural sectors, between the Census periods of 2001 and 2011. It is noted that the next Census was carried out August-September 2016. This economic weakness contributes to the region having a high level of socio-economic disadvantage when compared to the rest of Australia (only 13% of suburbs in Australia are more disadvantaged). Conversely, strong growth is continuing in the Australian ocean cruise industry (domestic and international).

A report by the AEC Group indicates that only three cruise ships visited Eden in 2014-15 whilst nine cruise ships visited Eden during the 2015-16 season. Forward bookings with PANSW (as of August 2016) indicate that 14 ships are scheduled to visit in 2016-17 season and 18 in 2017-18. At this early stage of planning, 5 ships are currently booked for season 2018-19. The significant increase in visitation between 2014-15 and 2017-18 cruise seasons (representing a 600% increase) is a direct

result of the growth of the Australian cruise industry and the understanding by existing cruise ship operators that new cruise ship infrastructure will be installed at Eden.

The port does not have the required infrastructure to take advantage of cruise ship industry growth. As already stated, restricted by draft and length, cruise ships are unable to berth alongside land-based infrastructure in Snug Cove. Cruise ships are required to anchor offshore, with passengers utilising a tender boat to get ashore. This has the potential for access and safety issues to arise. Only one of the two major cruise operators, Carnival, currently visits the port. Investment in port infrastructure is therefore required to address these deficiencies.

Consultation with the cruise industry and PANSW indicates that while ships in the 220-260m LOA size range (and smaller) will continue to be used for over 30 years, there will likely be an increasing number of longer vessels (greater than 300m) within 5-10 years. Carnival Australia and RCCL are supportive of the wharf extension to improve berthing arrangements at Eden and both have commissioned/ delivered the construction of new ships that have a greater than 300m LOA.

Given its location between Sydney and Melbourne, Eden is ideally placed to take advantage of this growth in the cruise industry by attracting cruise vessels in transit between the two state capitals. Extending the Breakwater Wharf would develop the destination as an attractive port of call by meeting the needs of the growing cruise sector. This will in turn lead to increased tourist activity that would bring a number of long term socio-economic benefits for the local and regional economies and the Eden and Sapphire Coast communities.

The delivery of the Project is considered a high priority for the NSW Government driven by the following factors:

- Implementation of the preferred option will result in estimated total economic benefits of $48.4 million (as of March 2016) in present value terms, and the operation will result in 86 new full-time equivalent jobs.
- The Project is directly aligned with a number of Commonwealth and State Government initiatives, strategies and priorities.
- The NSW Government and BVSC have made significant commitments via regular media statements regarding the imminent delivery of this Project. The Project is subject to ongoing and considerable media attention. This is especially following the joint on-site announcement by the Prime Minister of Australia and NSW State Premier on 23 May 2016 for the $50 million in funding to upgrade the Port and Merimbula Airport.
- Failure of the Project to be delivered or be delivered to a standard that will not guarantee long term viability, will result in significant community disappointment, significant negative reputational impact for all levels of government and contribute to continued degradation of the town and local economy.
- The Project currently has a total of $44 million in funding commitments, including $10 million being provided by Commonwealth Government, a requirement of which is that the project must be completed on or before 30 June 2018.

11 Conclusion

This EIS has been prepared in accordance with Part 5.1 of the EP&A Act and other relevant legislation. In particular, it addresses the SEAR issued by DP&E for the proposal. The EIS also includes consideration of issues raised by the community and stakeholders during development of the proposal and preparation of the EIS for the Project.

There is strong justification for the Project, as summarised in Section 10.7 and supported by the objectives of the EP&A Act.

The approach for mitigation and management of the potential adverse impacts of the proposal is outlined in Section 10 of the EIS. These measures would be incorporated into the CEMP and OEMP and any relevant environmental management plans to be developed prior to the construction of the proposal and subsequently (as required), into the future operator's environmental management system.

Provided the measures and commitments specified in this EIS are applied and effectively implemented during the design, construction and operational phases of the proposal, the identified potential environmental impacts are considered to be acceptable or able to be controlled to acceptable levels by appropriate management of construction works and cruise ship operations.

The Project is an appropriate response to the current and forecast cruise ship industry growth and will enable cruise ships to berth alongside the upgraded Breakwater Wharf so that passengers can embark/disembark directly and safely via the ships gangway. It will make the Port an attractive and accessible stop over for an increasing number of cruise ships, resulting in a growth in tourism in Eden and surrounding areas and providing a boost to the local and regional economy.

It is recommended that the SSIA be approved.

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