REPORT

Onehunga Wharf: Specialist report to support an Occupation Permit application

Prepared for
Eke Panuku Development Auckland (EPDA)

Prepared by
Tonkin & Taylor Ltd

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Executive summary

Eke Panuku Development Auckland (EPDA) is preparing a new Occupation Permit for exclusive occupation of those parts of the water space currently occupied under Port of Auckland's s384A permit for Onehunga Wharf situated in the Manukau Harbour, Auckland.

Tonkin & Taylor Ltd (T+T) has undertaken an environmental assessment in relation to coastal processes, marine ecology and stormwater to inform the Assessment of Environmental Effects (AEE).

The existing Occupation Permit covers the wharf, breakwater and boat ramp. The primary users are the fishing industry and cement operators with some of the existing leases not expiring until 2047. The wharf consists of buildings, parking areas, storage areas and space for vessel docking (Figure 2.2).

The coastal environment is highly modified with areas of the seabed occupied by a variety of structures including wharves and reclamations, pontoons and piles. The current coastal processes in Manukau Harbour encompass two key dynamics. The dominant process is from the tide, in which the water is exchanged in and out of the harbour driving strong currents. The second is the generation of relatively small, wind-induced waves. These waves interact with the structures surrounding the harbour, resulting in complex and confused sea states. With the existing structures, occupation and activities remaining as they are currently there will be no change to the existing coastal processes.

The Port of Onehunga has been a location subject to industrial use throughout history and this has had impact on sediment and water quality through time. Overall, the sediment quality and water quality is 'poor' due to the high level of fine sediments and high nutrient levels and exceedances, (particularly of total and dissolved reactive phosphorus) respectively.

This report outlines a range of ecological values for ecological features within the Occupation Permit footprint, including values for marine mammals, fish, coastal birds and benthic fauna and flora. These values range from 'Low' to 'Very High' (refer to Table 1.1). Potential effects on ecological values have been assessed in the context of existing uses and management within the footprint of the Port of Onehunga Occupation Permit and the baseline for this assessment. A limited envelope of effects has been considered, given the Permitted Activity status of existing structures and activities, and an overarching 'Negligible' magnitude of effect applied. Overall, there is a 'Very Low' to 'Low' ecological effect associated with the proposed Occupation Permit and no further effects management is considered necessary.

Adherence to biosecurity management protocols, maintaining best practice approach to management of vessel antifouling, and upgrades to stormwater infrastructure in line with Best Practice are recommended to continue to limit effects to marine ecological values associated with existing structures and activities of the Port of Onehunga.

Table 1.1: Summary of marine ecological values for habitats and species of Port of Onehunga, the magnitude of effect and overall level of ecological effects.

Habitat / species	Ecological value	Magnitude of effect	Overall level of ecological effects
Marine mammals	'Low' to 'Very High' based on the species identified as potentially present at Port of Onehunga with threat statuses ranging from 'Not Threatened' to 'Threatened - Nationally Endangered'. Expected low frequency of marine	Negligible	Very Low to Low

Habitat / species	Ecological value	Magnitude of effect	Overall level of ecological effects
	mammal presence in close association with the Port of Onehunga.		
Fish	'Low' to 'Very High' based on the number of nationally and locally common indigenous species present, five vulnerable and one critically endangered species.	Negligible	Very Low to Low
Coastal birds	'Low to Very High' based on potential species assemblage at Port of Onehunga and surrounds, including three species classified as 'Threatened' and 12 species classified as 'At Risk'.	Negligible	Very Low to Low
Benthic infauna and fauna	'Low' based on the benthic community low species diversity at Port of Onehunga and degraded nearby habitats, 'poor' Auckland Council combined benthic health score, dominance of mud and contaminant tolerant species, the presence of secondary target biosecurity species (Asian date mussel), and 22 NIMS. Based on associated poor water quality and high fine silts and muds.	Negligible	Very Low

1 Introduction

1.1 Purpose

Eke Panuku Development Auckland (referred to as EPDA for the rest of the report) is preparing a new Occupation Permit for exclusive occupation of those parts of the water space currently occupied under Port of Auckland's s384A permit for Onehunga Wharf, situated in the Manukau Harbour (see Figure 1.1).

EPDA commissioned Tonkin & Taylor Ltd (T+T) to assess the effects of the existing structures and activities in relation to coastal processes, marine ecology and stormwater to inform the Assessment of Environmental Effects (AEE).

Figure 1.1: Extent of proposed coastal permits for Onehunga Wharf.

1.2 Scope of works

This assessment was undertaken as a desktop study based on existing reports and published information. The effects assessment was informed by prior knowledge and experience of our expert staff who have been involved in studies of this area.

1.3 Baseline for assessment

When preparing the assessment of effects from the proposed new Occupation Permit for the Onehunga Wharf, this report considers the following:

- Existing structures within the occupation space are a Permitted Activity, therefore potential effects from consented and authorised structures are not considered in this assessment.

- Existing activities (described in Section 2.5) within the occupation space are a Permitted Activity, therefore potential effects from existing and authorised activities are not considered in this assessment.
- Exclusive occupation is a Discretionary Activity, therefore potential effects that the occupation enables are included in this assessment.

2 Existing structures and activities

2.1 General setting

The Port of Onehunga sits on the eastern edge of the Manukau Harbour at the entrance to the Māngere Inlet.

The harbour is the second largest harbour within New Zealand, covering an area of approximately 365 km^2, and consists of more than 460 km of coastline (NIWA, 2007). The harbour is relatively shallow, with an approximate 62% of the harbour considered to be intertidal (Kelly, 2008b). The harbour consists of deeper channels, and intertidal sand and mud flats that are exposed at low tide. These intertidal flats are highly productive, and many are protected as Significant Ecological Areas (SEAs), mostly for the quality of the foraging habitat for birds. The coastline is fringed with recreational parks and reserves, coastal walkways, mangroves, rocky outcrops and sandy beaches, with both rural and urban coastal settlements, and a highly modified coastal area of the Port and industrial areas of Onehunga.

The majority of the buildings and structures of the wharf were built between mid-19th century and mid-20th century (Ecology Solutions, 2019). Part of the port is on reclaimed land extending from the tuff crater, Te Hōpua a Rangi (Ecology Solutions, 2019). The Port is currently utilised by commercial fishing vessels.

2018 saw the change of management from Ports of Auckland to EPDA. A planned redevelopment of Onehunga will be implemented over 25 years, to include high quality public spaces, mixed styles of housing close to the town centre, improved public transport and better connections with the Manukau Harbour (Eke Panuku Development Ltd, 2018).

2.2 Existing structures

2.2.1 Wharves and seawalls

Onehunga Wharf protrudes from the land along the edge of the channel to Māngere Inlet and has a perimeter of approximately 500 m. The site comprises a large wharf which consists of three separate structures constructed over a period between 1923 and 1962 and a reclamation edged with a combination of grouted rock walls and rock armour revetments. The wharf structures generally comprise reinforced concrete piles and headstocks with beams in two directions and diagonal bracing providing lateral constraints. A timber fender system extends around the perimeter of the wharf face. The wharf structures are in moderate to poor condition. The deck of the wharf is around 3.0 to 3.4 m AVD so is likely to be subject to increased inundation with sea level rise. Inland of the wharf the reclamation is likely formed from at least 4 metres of gravel fill overlying around 3 m of marine sediments that overly stiff volcanic tuff at greater depths. The reclamation and shoreline are protected with a rock armoured edge and grouted rock seawalls. The surrounding area has a mixture of different coastal protections in place ranging from rock armouring to grouted rock wall as well as unmodified sections undergoing erosion.

Photograph 2.1: View along southern and northern edge of the wharf.

Photograph 2.2: Rock armoured edge of inner berthing area.

2.3 Stormwater and services

Information on stormwater and services was accessed from the Auckland Council Geomaps in June 2024. Information around the use and condition of these assets is unknown. The port area is largely separate from the adjacent catchment by Onehunga Harbour Road, so no additional rainwater enters the site. The majority of services are also situated within the road corridor. Onsite there is no significant stormwater network, with rainwater directly discharging to the CMA from the wharf decks and reclaimed areas. There is a stormwater outlet that drains the adjacent Gloucester Park to the north.

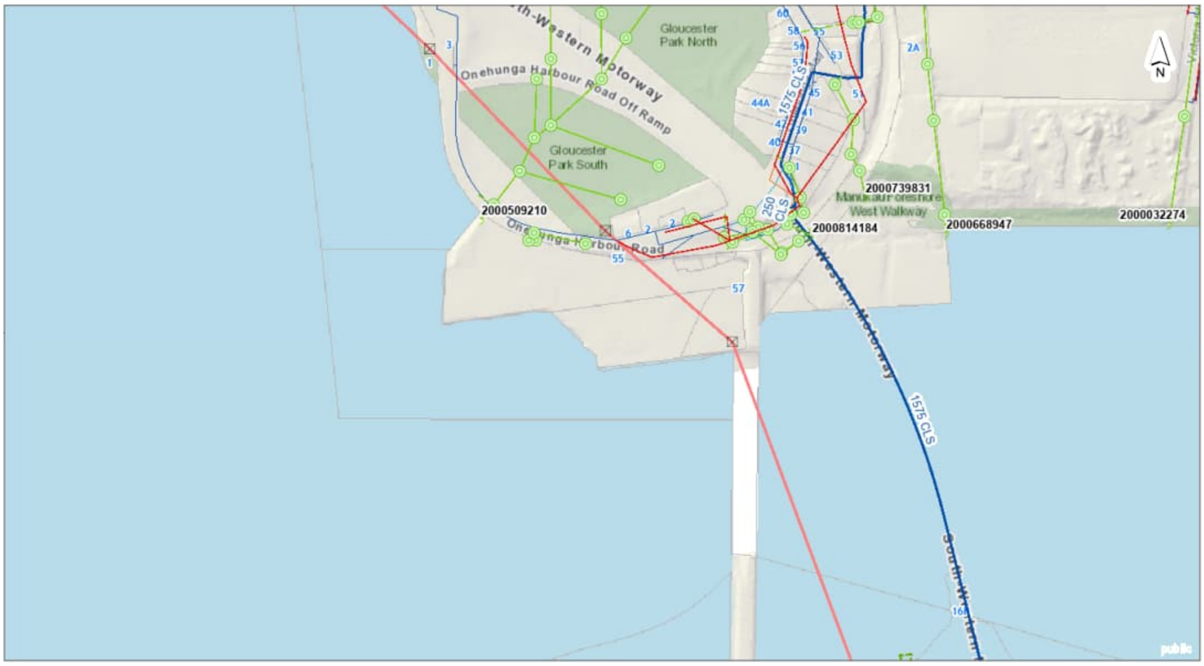

Figure 2.1: Stormwater and wastewater infrastructure (Source: AC Geomaps).

2.4 Maintenance activities

There are currently no maintenance activities, such as dredging, undertaken in the coastal area of Port of Onehunga Wharf.

2.5 Existing uses, buildings and public access

The existing Occupation Permit covers the wharf, breakwater and boat ramp. The primary users are the fishing industry and cement operators with some of the existing leases not expiring until 2047. The wharf consists of buildings, parking areas, storage areas and space for vessel docking (Figure 2.2).

Figure 2.2 Existing uses and companies that occupy Port of Onehunga.

2.6 Existing management

The existing consented structures and discharges from stormwater outlets are maintained and managed through their individual consent condition requirements held by EPDA. Existing biosecurity management with which vessels need to comply includes:

- Craft Risk Management Programme, which is in place to manage biosecurity risk associated with vessels entering New Zealand territorial waters.
- Auckland Council Regional Pest Management Plan, which outlines rules to assist in reducing the human mediated spread of pests between regions, as well as within Auckland. Rules are outlined specifically for nine high risk species.
- Auckland Unitary Plan – Sections F2.13, F2.19.7 and F2.21.8 which have rules to prevent cleaning hulls in place and in ways that stop pests getting into the sea, limiting fouling on your hull to stop pests 'hitch hiking' into uncontaminated areas or transferring from your vessel to others (passive discharges).
- For commercial vessels, a biosecurity management plan is often required under operating consent conditions.

3 Coastal setting

3.1 Bathymetry

Typical bathymetry along Onehunga wharf is shown in Figure 3.1 from published hydrographic charts (NZ4315). This information shows that depth offshore of the wharf is 5 to 7 m below Chart Datum (CD) with the shoal area adjacent to the wharf having a depth of 2 to 3 m. Within the inner berthing area the depths are between 1 to 2 m below Chart Datum (CD). CD is around 2.2 m below AVD-46.

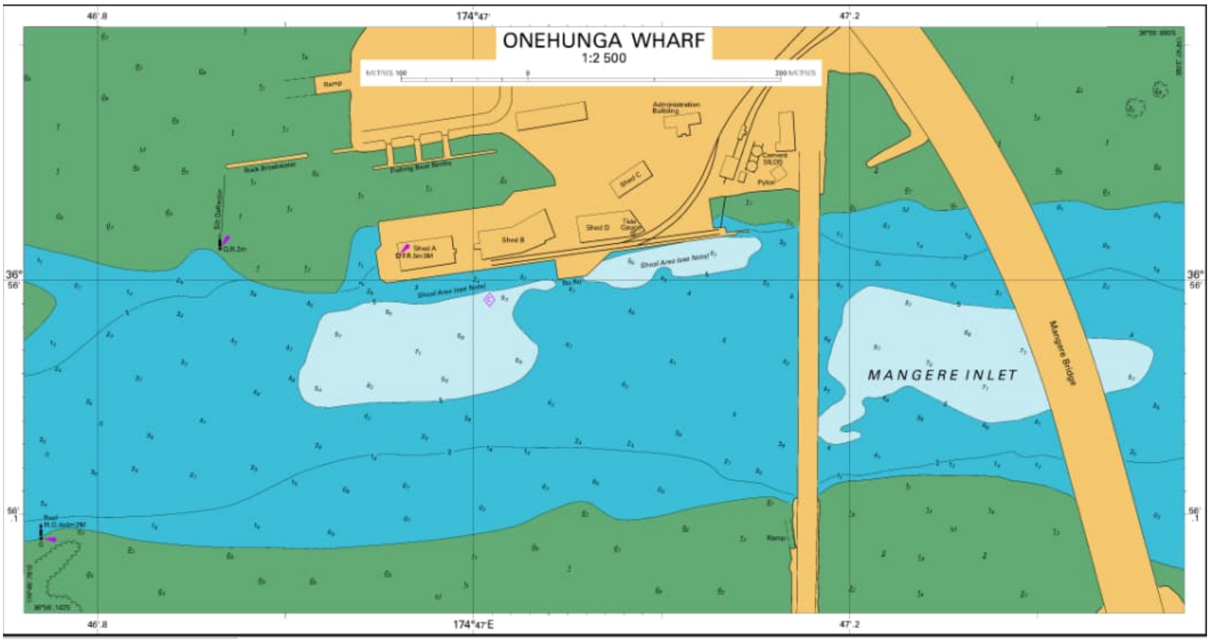

Figure 3.1: Bathymetry Onehunga wharf (Source: LINZ Hydrographic Chart NZ4315).

3.2 Sediments

Analysis by Davis Coastal Consultants (2019) finds the waters of the Manukau have a high fine sediment load and the upper harbour location is subject to silt deposition making it "muddy" where silt can settle. This also leads to infilling and shallowing of the upper harbour over time.

A T+T sediment sampling report was undertaken in 2020. Samples were analysed for the presence of asbestos, heavy metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Elutriation testing and for particle size analysis was also conducted on selected samples.

Overall, the results show that with few exceptions the concentrations of contaminants within the sediment fall within expected background ranges for non-volcanic soils in the Auckland region. Slightly elevated concentrations of arsenic and nickel were identified in a small number of samples and asbestos was detected (at <0.001% w/w) in a single sample. Comparison to relevant evaluation criteria shows that:

- Contamination specific health and safety control measures <u>will not need to be implemented</u> during the future dredging works.
- Users of the harbour are not expected to be affected by contact with either sediment or water discharges generated during dredging works.
- Environmental receptors are not expected to be adversely affected by contact with either sediment or water discharges generated during dredging works.

- The following factors are likely to prevent disposal of sediment as cleanfill:
  - The presence of asbestos, albeit low concentrations (<0.001% w/w) in a single sample, means that materials are unlikely to be able to be considered acceptable as cleanfill.
  - The physical characteristics of the material (wetness, potential odour, etc) are likely to limit disposal options for the dredged sediment.

3.3 Water levels

3.3.1 Tidal levels

The following table sets out commonly used definitions for high tide as measured at the Onehunga port. These levels are to Auckland Vertical Datum (AVD).

Table 3.1: Tide and storm surge levels at Onehunga Port (Source: LINZ and Stephens, 2013)

Tide level		Level (m CD)
Highest recorded level (31/07/1965) adjusted for sea level rise		2.8
Highest Astronomic Tide	HAT	2.4
Mean High Water Spring (Nautical)	MHWS	2.0
Mean High Water Neaps	MHWN	1.18
Mean Sea Level	MSL	0.22
Mean Low Water Neaps	MLWN	-0.83
Mean Low Water Springs	MLWS	-1.71

3.3.2 Extreme water levels

Storm surge results from the combination of barometric set-up due to low atmospheric pressure, and wind stress from winds blowing along or onshore which elevates the water level above the predicted tide. The combined elevation of the predicted tide and storm surge is known as the storm-tide. The levels for a range of return periods are shown in Table 3.2, although it should be noted that they do not include any allowance for wave effects.

Table 3.2: Extreme water levels at the Onehunga wharf (Source: Auckland Council, 2020)

AEP	39%	18%	10%	5%	2%	1%	0.5%
ARI	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr
Level (m AVD-46)	2.48	2.56	2.64	2.73	2.87	3.01	3.16

3.3.3 Sea level rise

Historic sea level rise in New Zealand has averaged 1.7 ± 0.1 mm/year (Hannah and Bell, 2012). Climate change is predicted to accelerate this rate into the future. Sea level rise is likely to exacerbate the coastal erosion and inundation hazard.

The Intergovernmental Panel on Climate Change (IPCC) assessment report (AR6) report was published in August 2021. The AR6 report includes five emission scenarios with the 2.6, 4.5 and 8.5 scenarios that are similar, but not the same, as the AR5 report. The modelling projects slightly more warming for a given pathway than AR5 scenarios. Local downscaling of the global outcomes reported by the IPCC to New Zealand setting has been done and included in the Maps — NZ SeaRise Programme website including projections of vertical land movement (VLM) and this information is the basis of sea level rise estimates in the MfE (2024) guidance.

The predicted vertical land movement for Onehunga Harbour is -2.9 mm/year. Table 3.3 shows the resulting sea level rise projections, with and without VLM for SSP 2.6, 4.5 and 8.5, to 2150. Note that these levels do not take into account wave set up or run-up that will add to inundation.

Table 3.3: Sea level rise projections from the 1986-2005 baseline for the four emission scenarios

Year	SSP2.6 Median (+VLM)	SSP 4.5 Median (+VLM)	SSP 8.5 Median (+VLM)	SSP 83rd % (+VLM)
2060	0.24 (0.4)	0.28 (0.44)	0.34 (0.5)	0.44 (0.67)
2090	0.38 (0.63)	0.48 (0.73)	0.68 (0.93)	0.9 (1.24)
2130	0.61 (0.98)	0.81 (1.18)	1.25 (1.62)	1.7 (2.18)
2150	0.73 (1.15)	1.00 (1.42)	1.56 (1.99)	2.15 (2.71)

3.4 Winds

Wind data is available from the Auckland Airport wind gauge, which is considered to be representative of winds occurring in the Manukau Harbour. The wind data used was collected on an hourly basis from May 1962 to May 2014, a duration of 52 years. The data collected from a high mast, situated at a site 7 m above MSL, has been converted to meters per second and transformed to wind speeds as they would occur 10 m above MSL. The wind rose comprising wind speeds (m/s) and probability of occurrence per direction have been presented in Figure 3.2. This shows the prevailing winds that affect Onehunga Harbour, occur from south-southwest to western directions (approximately 40% of the time).

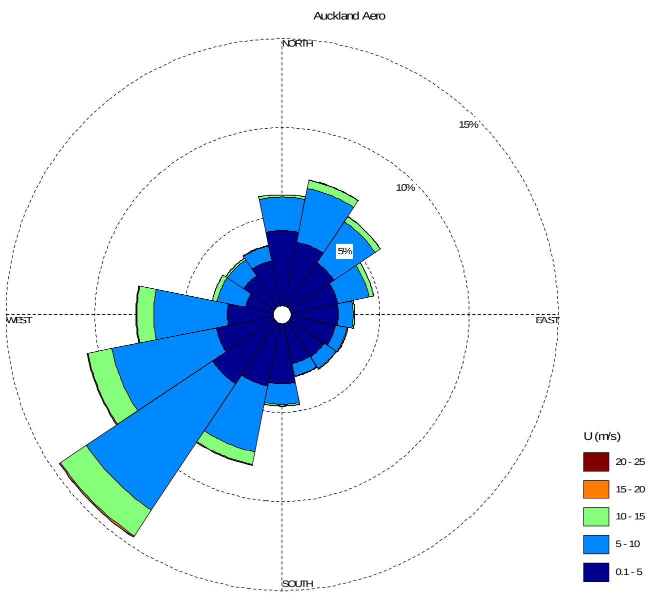

Figure 3.2: Wind rose at Auckland Airport 1962-2014 (source: cliflo).

3.5 Waves

This area is exposed to direct wave energy from the longer fetches to the south and southwest during high tides. Based on an inspection of satellite images from Google Earth the offshore piled structure provides some limited protection for certain conditions while the rock armour groyne provides shelter to the seabed to the north of the structure during southerly and south-westerly wind conditions.

Onehunga is exposed to wind generated waves from the southerly and south-westerly direction, with the greatest wave heights generated from the southerly and south-westerly at high tides due to the fetch extending into Manukau Harbour of around 12 km. The remaining fetches are short (less than 1.5 km). Therefore, wind generated wave heights can be in the order of 0.8 m, with periods ranging from 2 to 3 seconds.

3.6 Vessel wakes

Waves generated by vessel wake from fishing vessels such as small fishing vessels and recreational boats. Due to the size of these vessels there is no significant wake at this location.

3.7 Currents

T+T has reviewed the 2016 NIWA assessment of Māngere inlet to understand the effect of tidal currents along the Onehunga. This assessment used a Delft3d hydrodynamic model to model the flows within the Māngere inlet. Peak flood and ebb flows were found to occur 2 hours before and after high and low tides respectively, with flow speeds larger for the flood tide (see outputs for this in Figure 3.3). A peak current speed of approximately 1 $m.s.^{-1}$ was identified adjacent to the wharf

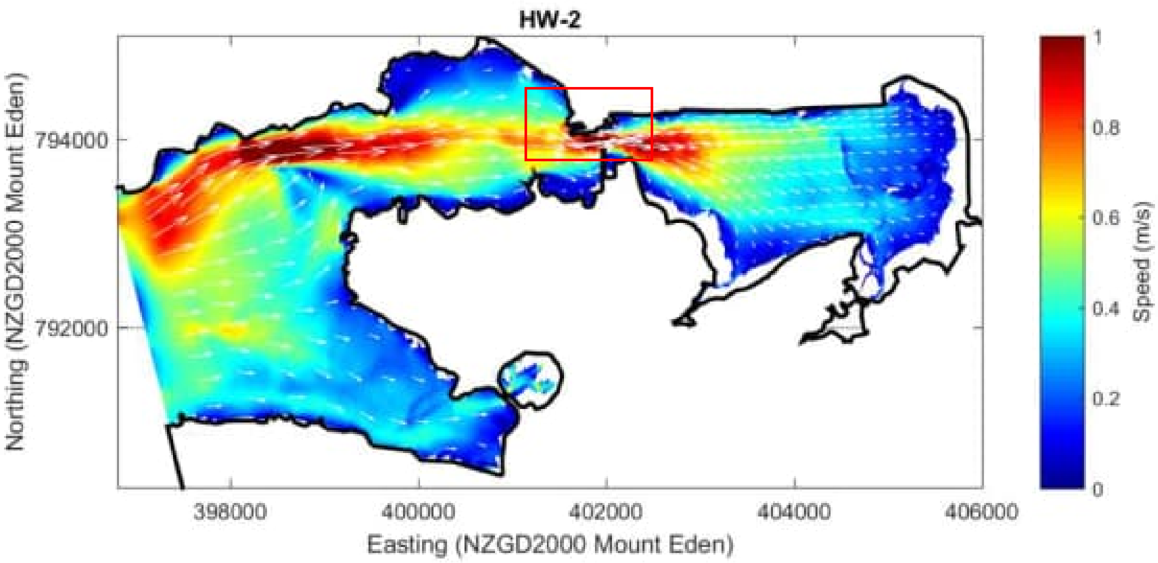

Figure 3.3: Māngere Inlet flood current speed and direction for a spring tidal cycle, 2 hours before high tide (source: Pritchard et al. 2016).

4 Ecological values

4.1 Methods

The ecological impact assessment involved a desktop assessment of existing available information for the site. Specific methods included:

- A desktop review of available information, including Significant Ecological Areas (SEAs), iNaturalist database, eBird database, National Aquatic Biodiversity Information System (NABIS) portal, Marine Biosecurity Porthole, Auckland Council State of the Environment (SoE) reporting and previous ecological assessments.
- Preparation of an Ecological Impact Assessment (EcIA) that broadly follows the Ecological Impact Assessment Guidelines 2018 (EcIAG) published by the Environment Institute of Australia and New Zealand (EIANZ). Refer to Appendix B for the criteria and tables used in this assessment. Whilst the EcIAG are designed for freshwater and terrestrial systems, we have applied a modified version of the guidelines for marine systems developed by Boffa Miskell and adapted it to the current application in the four tables set out in Appendix B. The guidelines were used to establish the following:
  - The ecological values within the Occupation Permit footprint and immediate surrounds (ref to Appendix B Table 1, Appendix B Table 2, Appendix B Table 3 and Appendix B Table 4).
  - The magnitude of effect (Appendix B Table 4) and overall level of effect (Appendix B Table 5) on ecological values from the proposed Occupation Permit, taking into consideration the additional measures to avoid, remedy or mitigate effects and whether there are residual adverse effects that should be offset or compensated.

4.2 Ecological setting / context

The Manukau Harbour is vast, with intertidal mudflats and subtidal channels. The harbour is relatively shallow, and has four main channels and three major inlets, including Māngere Inlet to the east of the Port of Onehunga. These upper reaches form an interface between fresh and saltwater and tend to be muddy, due to the accumulation of fine sediment entering the area via surrounding catchment runoff (Auckland Council, 2021).

The Port of Onehunga is situated in the upper reaches of the Manukau harbour. It is positioned along the Onehunga-Māngere Inlet foreshore which has historically been formed by extensive volcanic activity. Much of the coastal area has been modified through time, with very few of the volcanic features remaining. The existing wharf structures occupy an area of reclaimed land ().

The harbour and its catchments have undergone significant changes in landcover and modifications to the coastline since the arrival of humans. This has resulted in large-scale loss of native habitats, leaving fragmented pockets of habitat which are impacted by their isolation, presence of non-indigenous species and from disease (Auckland Council, 2021).

The wharf is situated within a shallow intertidal part of the Manukau Harbour on an area with limited space which is confined by the roading network of SH20 and Onehunga Harbour Road (Ecology Solutions, 2019).

Figure 4.1: Aerial image of Port of Onehunga, SH20 and the mouth of Māngere Inlet (Source, Auckland Council GeoMaps, 2024).

4.3 Receiving environment sediment and water quality

4.3.1 Sediment quality

Marine sediment contaminant monitoring began in the Manukau Harbour in 1998, with a focus on key heavy metals associated with urban stormwater (copper, lead and zinc). Sediment quality guidelines are used to assess the risk of adverse effects on marine habitats and biota due to elevated contaminant concentrations. These values are not considered a pass or fail, rather are a trigger for further investigation (Mills and Allen, 2021).

There are currently 27 sites within the Manukau Harbour, with two of these approximately 800 m from Onehunga Wharf: 'Māngere Cemetery' and 'Māngere at Kiwi Esplanade'. The Māngere Cemetery site is adjacent to the Ports of Onehunga, is known to be the receiving endpoint for industrial and commercial contaminants and has shown elevated levels of metals since Auckland Council monitoring began in 1998 (Mills and Allen, 2021).

Quality of samples collected at Māngere Cemetery has improved over time, with metals levels dropping from an 'amber' Environmental Response Criteria (ERC)[1] status in 1998 ('red' in 2001) with

[1] 1 The ERC guidelines are used to assess whether the measured contaminant concentrations are likely to be causing adverse environmental effects. The ERC guidelines were derived from the ANZECC (2000) Sediment Quality Guidelines ISQG-Low values (now the ANZWQG 2018 Default Guideline Values) and other internationally recognised guidelines (ARC, 2004).

- Green: presents a low risk to the biology so the site is unlikely to be impacted.
- Amber: indicate contaminant levels are elevated and the biology of the site is possibly impacted.

Red: Indicate that contaminant levels are high and the biology of the site is probably impacted.

elevated levels of copper, lead and zinc (with the exception of 'red' status in 2001) to 'green' from 2013 to the most recent analysis in 2019 (Mills and Allen, 2021).

Mud content in Manukau Harbour tends to be higher in the lower energy, upper reaches of the estuary, as fine sediments settle following run off from the land. Sediments at Onehunga Wharf vary in depth and have built up around the main structure of the wharf over time (Ecology Solutions, 2019). The Māngere Inlet in general has historically been dominated by fine sediment and a high proportion of mud (Mills and Allen, 2021). More recent results from an investigation for Pikes Point Closed Landfill Consent application, supported these statements, and found that sites along the Northern Shoreline of Māngere Inlet showed a dominance of silt and mud, and proportions of mud higher than 90% (T+T, 2024). The dominance of silt and mud could be expected due to lower hydrodynamic energy within the inlet (Drylie, 2021).

Other project specific surveys have been carried out in the Māngere Inlet and adjacent to the Māngere Wastewater Treatment Plant (WWTP) (approximately 4 km to the southwest of the Port of Onehunga) including:

- Investigations carried out as part of the East West Link roading (EWL) application. These identified that within Māngere Inlet, sediment grain size was characterised as almost exclusively soft muds dominated by very fine particles i.e. < 32µm (Kelly, 2008a).
- Watercare runs the Pond Recovery Monitoring Programme (PRMP), which was established in the early 2000s following the return of the WWTP oxidation ponds to tidal influences[2]. The most recent monitoring results (2020 – 2021) identified that in all 'ponds' (previously bunded areas), the distribution of soft residual sludge-rich sediments has continued to decrease. In addition, when the average concentrations of metals in sediment samples were compared to ANZECC DGV guidelines or Auckland Council modified guidelines, no metals exceeded the 'green', DGV-Low or DGV-High trigger values in 2020 (Bioresearches, 2021).

4.3.2 Water quality

Auckland Council run a State of the Environment monitoring programme for coastal water quality. The Manukau Harbour consists of eight monitoring sites, six of which have been monitored since 1987. The most recent water quality index (WQI) for Māngere Bridge was calculated as 'poor' and has had this score since 2008, based on a monthly median value for a five-year rolling period (Kelly and Kamke, 2023). These scores are attributed to a high frequency of exceedances (> 10 times the guidance values[3]) of all nutrient parameters and chlorophyll a. Nutrient concentrations that were particularly elevated at the site were total and dissolved reactive phosphorus (Kelly and Kamke, 2023).

Water quality monitoring undertaken as part of the most recent Harbour Ecological Monitoring Programme (HEMP) (2020-2021) state that the Māngere WWTP has a substantial influence on water quality in the north-eastern Manukau Harbour. While trends suggest that water quality has improved over the past 10 years, an increasing trend in water temperature is concerning and could have unpredictable ecological consequences (Kelly, 2021).

Safeswim is a fully integrated monitoring and modelling programme supported by a web-based communications platform to provide beach goers 'real time' status of water quality. The programme

[2] The PRMP was designed to monitor the physical, chemical and biological changes that occur in the marine sediments of the breached oxidation ponds as the distribution of residual sludge rich sediments alters as a result of scouring, redistribution and export from the pond areas. The PRMP complements long term monitoring undertaken as part of the Harbour Ecological Monitoring Programme (HEMP) and provides additional detail for habitat quality indicators.

[3] Guidelines are derived from three main sources: the 80th percentile of 10 years of data (2007-2016) at references within the Auckland region; Australia and New Zealand default guidelines (ANZECC 2000); and Northland Regional Council tidal creek guidelines. Separate guidelines are used for open coasta, estuarine sites and tidal creek sites (Foley, 2018; Ingley, 2020).

both models and carries out real time monitoring of the levels of enterococci within the water to improve the accuracy and timeliness of information provided to the public to make informed decisions about where to swim (Auckland Council, 2020). There is one Safeswim site approximately 700 m from Port of Onehunga at 'Māngere Bridge'. At the time of writing the swimming status was 'Good water quality', however, it has been noted that this score may shift following periods of heavy rainfall (Auckland Council, 2024).

4.3.3 Summary

The Port of Onehunga has been a location subject to industrial uses over time, which has had an impact on sediment and water quality. Overall, within the location of Port of Onehunga, high fine silts and muds are present and are consistent with many sites nearby in Māngere Inlet. No contaminant data was available directly within the Port of Onehunga Wharf footprint, however nearby sites have contaminant ERC levels that have improved in recent years and have current 'Green' ERC statuses. The water quality in Māngere Inlet sites is classified as 'poor', due to high frequency of exceedances (>10 times the guideline values) of all nutrient parameters and chlorophyll *a*, and particularly elevated total and dissolved reactive phosphorus (Kelly and Kamke, 2023).

On the basis of the existing environment, historical land use and the information outlined above, the sediment and water quality is expected to be 'poor' overall.

The effects from sediment and water quality is discussed further in Sections 4.5, 4.6, and 4.7 as they relate to ecological values of fish, coastal birds and benthic fauna.

4.4 Marine mammals

Marine mammals encompass cetaceans (whales and dolphins) and pinnipeds (seals and sea lions), with half of the world's cetaceans having at some point been sighted within New Zealand (Mulcahy and Peart, 2012). Six species of marine mammals are known to be present and frequent the Manukau Harbour, with the majority of these sightings concentrated around the entrance to the harbour. The species observed, as indicated on the National Aquatic Biodiversity Information Service (NABIS) database, include the NZ fur seal (*Arctocephalus forsteri*; Not threatened), common dolphin (*Delphinus delphis*; Not threatened), bottlenose dolphin (*Tursiops truncatus*; Threatened – Nationally endangered), māui dolphin (*Cephalorhynchus hectori maui*; Threatened – Nationally critical), orca (*Orcinus orca*; Threatened – Nationally critical) and southern right whale (*Lissodelphis peronii*; Nationally vulnerable).

Within close proximity to Onehunga Wharf, NABIS indicates that four species may be present, Bottlenose dolphin, common dolphin, orca and New Zealand fur seal (NABIS, 2024). iNaturalist records identify sightings of NZ fur seal at Māngere Bridge (approximately 250 m from Onehunga Wharf). While the NZ Fur Seal distribution historically covered the entire New Zealand coastline, sealing in the 1700s and 1800s pushed the species to the brink of extinction. In 1978 NZ fur seals were fully protected by the Marine Mammals Protection Act; since that time, populations have increased, and NZ fur seals are beginning to re-appear more frequently on shorelines around the North Island (Fisheries New Zealand, 2022).

4.5 Fish

Manukau Harbour has many fish species which are important for cultural, recreational and commercial harvest (Kelly, 2008a). They range in size, abundance, habitat preferences, life history, behaviour and physiology. Many of the species found in the Manukau Harbour area are commercially and recreationally targeted species (Davis, 2018). The Ngā Hau Māngere (the revamped old Māngere Bridge) next to Onehunga Wharf is one of the most popular land-based fishing locations within the harbour, regularly attracting large numbers of fishermen/woman (Kelly, 2008a).

Observations of small bait fish such as yellow eyed mullet (Aldrichetta foresteri), Pilchards (*Sardinia neopilchardus*) and eleotrids (*Grahamichthys radiatus*) have been noted around the Port of Onehunga Wharf (Ecology Solutions, 2019).

The nearby Māngere Inlet has historically been reported to have a diverse abundance of fish species. Surveys carried out by NIWA in 2001 identified species of yellow eyed mullet (*Aldrichetta forsteri*), anchovy (*Engraulis australis*), exquisite goby (*Favonigobius exquisitus*), smelt (*Retropinnidae family*), speckled sole (*Peltorhamphus latus*), yellow belly flounder (*Rhombosolea leporine*) (Kelly, 2008a).

NABIS indicates that 44 fish species could potentially be present within the location of Onehunga Wharf. Of these, five species are listed as 'Vulnerable' (Bronze whaler shark - *Carcharhinus brachyurus*; hammerhead shark - *Sphyrna zygaena*, spiny dogfish -*Mustelus lenticulatus*, thresher shark -*Alopias vulpinus*, white pointer shark - *Carcharodon carcharias*), and one is listed as 'Critically endangered', (school shark - *Galeorhinus galeus*). The data identifies the area as a 'Hot spot' for ten species; the species list is provided in Appendix C.

There are three common ray species found in New Zealand coastal waters, Short tail stingray (*Bathytoshia brevicaudata*) (Least concern); Long tail stingray (*Dasyatis longa*) (Data deficient); and New Zealand eagle ray (*Myliobatis tenuicaudatus*) (Least concern). All three species are known to be present within the Manukau Harbour (iNaturalist, 2024), and may therefore be within the vicinity of the Onehunga Wharf.

4.6 Coastal birds

The Manukau Harbour plays a significant role for endemic and migratory shorebirds. Throughout the harbour upwards of 30,000 birds use the exposed mud and sand flats daily to feed, while open green spaces near the coast and actively managed shell banks provide important roosting areas (Auckland Council, 2021). Much of the Manukau Harbour is afforded protection under Significant Ecological Areas (SEAs) to protect areas of importance for coastal bird species; SEA-M1-23w3 is located ~400 m to the south of the Onehunga Wharf and provides protection for extensive areas of feeding habitat for waders along the coastline (Auckland Council, 2016) (refer 8).

Long term monitoring of waders carried out by the Ornithological Society of New Zealand / Birds New Zealand has found that the harbour supports a wide variety of species. The birds of the Manukau are known to utilise the proximity to the East coast and move between the Manukau Harbour and the highly productive Firth of Thames, following the low tides. At an international level, the harbour has significance in that it is part of the East Asia – Australasian Flyway, where migrant birds fly from as far as Alaska or Russia to the Manukau Harbour to replenish, before returning to breed in the Northern Hemisphere (Auckland Council, 2021).

Onehunga wharf is used by a wide variety of coastal birds. The majority of these are native, with a survey carried out in 2019 identifying Pied stilt (*Himantopus himantopus leucocephalus*) as the most numerous species recorded, followed by the white fronted tern (*Sterna striata*). Other species identified included Pied shag (*Phalacrocorax varius varius*), Black shag (*Phalacrocorax carbo novaehollandiae*), Little black shag (*Phalacrocorax sulcirostris*) and little shag (*Phalacrocorax melanoleucos brevirostris*) (Ecology Solutions, 2019).

Despite heavy industrial activity on the wharf (wooden piers, piles, railings and shed roofs are utilised for roosting) the site is identified as foraging habitat as part of the natural distribution of a range of resident and migratory birds (Ecology Solutions, 2019) (Figure 4.3).

Monitoring of sites nearby in Māngere Inlet for Pikes Point Closed Landfill reconsenting, identified several wading and foraging coastal bird species in the intertidal area. These included white-faced heron (*Egretta novaehollandiae*), Variable oyster (*Haematopus unicolor*), Black backed gulls (*Larus dominicanus)* and Red billed gulls (*Chroicocephalus novaehollandiae*) (T+T, 2024).

Additional surveys undertaken for the East West Link proposed roading corridor found 16 species of coastal birds present, many of which have already been observed in the above references. See Appendix D for a full list of species observed (De Luca, 2016).

iNaturalist records for species seen around Port of Onehunga and EBird records for Māngere – Kiwi Esplanade Trail (~2 km from the Port of Onehunga) are consistent with other records and surveys mentioned above (Appendix D).

Figure 4.2: White fronted tern roosting on Port of Onehunga (Ecology Solutions, 2019).

4.7 Benthic fauna and flora

Marine invertebrates include those that are found living in and on the seafloor and within the water column. The Manukau Harbour benthic ecology has been monitored since 1987, consisting of six sandflat sites in the main body of the harbour, and 27 sites in more sheltered/depositional locations, such as Māngere Inlet (refer to Figure 4.3). The overall health of the harbour ranges from 'excellent' to 'poor', with sites in sheltered tidal creeks generally less healthy than the open sandflats (Auckland Council, 2021). All of the sites within the Māngere Inlet (Māngere Cemetery, Ann's Creek, Tarata, Harania) are calculated as having a 'Poor' combined health score in 2019 (the most recent report result available at the time of writing). The lower health at Ann's Creek and Māngere Cemetery relates to higher concentration of metals than is present at the harbours sandflat sites and have shown no significant change over time (Drylie, 2021).

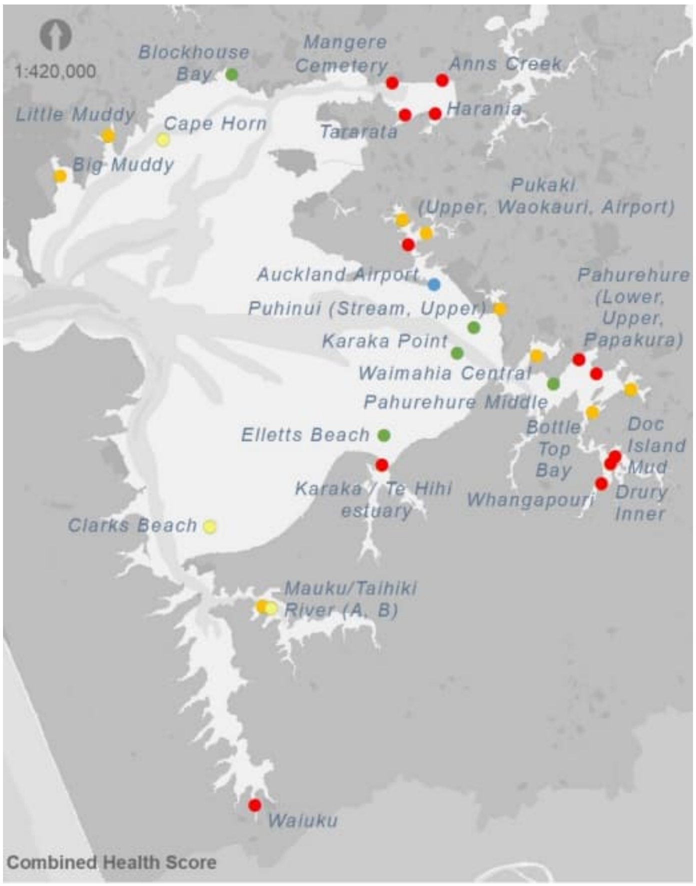

Figure 4.3: Combined health score for Manukau benthic ecology sites in 2019 (Drylie, 2021).

A baseline survey which was focused on the detection of marine pest species was undertaken in 2006 for the Port of Onehunga, marina and surrounding areas at 44 sites. A mixture of soft and hard substrates and pelagic communities were surveyed. From the 2,690 samples collected, 342 taxa were noted, of which 317 were considered to be native species. The native species covered 19 taxa groups, with seven taxa groups accounting for 90% of the native fauna, including, Polychaeta, Mollusca, Arthropoda, Bacillariophyta, Chordata, Bryozoa and Rhodophyta (Campbell et al., 2009).

Further to this survey, a marine pest survey was undertaken for the Manukau Harbour which included the Port of Onehunga Wharf piles. Species found to be present from diver surveys of the wharf piles and structures included a conspicuous shallow water ascidian, *Polandrocarpa zorritensis,* the colonial ascidian *Botrylloides leachii* and *Didemnum lambitum*, the solitary ascidian *Styela plicata* and barnacle species *Notomegabalanus decorus* (Tupe et al., 2020). It is likely that Pacific oysters are also found on the wharf piles.

A survey of stormwater outfalls within the Māngere Inlet approximately 1,5 km from the Port of Onehunga was undertaken in February 2024, as part of a resource consent application for Pikes Point Closed Landfills. The survey identified minimal epifauna living in silty muddy sediment, and the invertebrate communities were noted as degraded, with low species diversity. Pneumatophores and mangrove seedlings were present in several quadrats, as well as the presence of crab holes which were abundance across all sites. A small number of bivalve species including *Macomona Liliana*, *Cyclomactra ovata* and *Arthritica ovata* were noted to be present, along with high numbers of the sediment tolerable polychaete worm *Heteromastus filiformis* (T+T, 2024).

Surveys undertaken for the EWL project within the Māngere Inlet identified benthic invertebrate species abundance to be variable among locations, with the northern shoreline exhibiting the lowest abundance of species (De Luca, 2016). Historically the inlet has been reported to have diverse and abundant shellfish populations, including species such as pipi (*Paphies australis*), scallops (*Pecten novaesealandiae*) and mussels (*Perna canacliculus*) (Waitangi Tribunal, 1985).

4.7.1 Biosecurity

The spread of non-indigenous marine species (NIMS) outside their natural range can negatively impact ecological, socio-cultural and economic marine values. The pressure from NIMS that are established, and those that are known overseas to be a threat, has been identified by the Ministry for the Environment as one of the most important pressures on coastal marine habitats and ecosystems (*Our Marine Environment 2022* – jointly produced by the Ministry for the Environment and Stats NZ).

A targeted marine pest survey was carried out in the Manukau harbour in 2019 and identified no primary target species, one secondary target species (Asian date mussel - *Arcuatula senhousia*) and eight non target NIMS at the Port of Onehunga (Appendix E) (Tupe et al., 2020). No further species were identified from the Marine Biosecurity Porthole records. Results for the wider Manukau harbour detected no primary target species, one secondary target species (Asian date mussel) and 14 non target NIMS (Figure 4.4; Tupe et al., 2020).

An earlier baseline survey was undertaken in 2006, which surveyed 44 sites around Port Onehunga. This identified no primary or secondary species and 16 NIMS (Campbell et al., 2009) (Appendix E).

Figure 4.4: Bed mat of Asian date mussel (Arcuatula senhousia) and Amathia verticillata in the Manukau Harbour (Tupe et al., 2020).

4.8 Summary of values

Ecological habitat and species values are described in Section 4.4 to 4.7 above. These are summarised and have been assigned an ecological value based on the EIANZ EcIAG tables as provided in Appendix B.

Table 4.1 provides a summary of the values for marine ecology within the Port of Onehunga; the ecological values range from ‘Low’ to ‘Very High’.

Table 4.1: Summary of marine ecological values for habitats and species of Port of Onehunga

Habitat / species	Ecological value
Marine mammals	'Low' to 'Very High' based on the species identified as potentially present at Port of Onehunga with threat statuses ranging from 'Not Threatened' to 'Threatened - Nationally Endangered'. Expected low frequency of marine mammal presence in close association with the Port of Onehunga.
Fish	'Low' to 'Very High' based on the number of nationally and locally common indigenous species present, five vulnerable and one critically endangered species.
Coastal birds	'Low to Very High' based on potential species assemblage at Port of Onehunga and surrounds, including three species classified as 'Threatened' and 12 species classified as 'At Risk'.
Benthic infauna and fauna	'Low' based on the benthic community low species diversity at Port of Onehunga and degraded nearby habitats, 'poor' Auckland Council combined benthic health score, dominance of mud and contaminant tolerant species, the presence of secondary target biosecurity species (Asian date mussel), and 22 NIMS and associated poor water quality and high fine silts and muds. Nearby sites indicate that sediment contaminant levels are improving, however, no data was available for the Port of Onehunga.

5 Assessment of effects

This section addresses the effects of the existing development on coastal processes, water quality and ecology. This assessment considers:

- Existing uses, maintenance and management within the footprint of Port of Onehunga Wharf Occupation Permit (Sections 2.4 - 2.6).
- The baseline for assessment, as outlined in Section 1.3, which outlines the Permitted Activity status for existing structures and activities, while giving consideration to potential effects associated with exclusive occupation (a Discretionary Activity).

5.1 Coastal processes

At Port of Onehunga Wharf, the coastal environment is highly modified with areas of the seabed occupied by a variety of structures including wharves, outfalls and piles. The present coastal processes include tidal process of changing water levels and flows exchanging water to and from the harbour to the wider Manukau Harbour as well as generally small wind generated waves that interact with the structures around the perimeter of the harbour to create complex and confused sea states.

As the tidal forces and wave driven processes are generally low, the seabed area is considered to be an accretionary area and prone to low rates of sedimentation, with sediment from other locales settling into the harbour area.

With the existing structures, occupation and activities remaining as they currently are there will be no change to the existing coastal processes. Any change to the existing structures, occupation and activities will require a specific assessment of effects.

5.2 Water quality

The harbour and its catchments have undergone significant changes in landcover and modifications to the coastline since the arrival of humans. The wharf is situated within a shallow intertidal part of the Manukau Harbour with limited land area and constricted by the roading network of SH20 and Onehunga Harbour Road (Ecology Solutions, 2019).

The Port of Onehunga has been a location subject to industrial uses and contaminants throughout history which have had impact on the sediment and water quality. Overall, within the location of Port of Onehunga high fine silts and muds are present and are consistent with many sites nearby in Māngere Inlet. No contaminant data was available directly under the wharves, however, nearby sites have contaminant ERC levels that have improved in recent years, and have 'Green' ERC status. The water quality in Māngere Inlet sites is calculated as 'poor', due to high frequency of exceedances (>10 times the guideline values) of all nutrient parameters and chlorophyll *a*, and particularly elevated total and dissolved reactive phosphorus (Kelly, and Kamke, 2023).

There is no significant rainwater flow from the adjacent catchments that enter the Port site and all rainfall that lands on the site discharges directly to the CMA without treatment.

With the existing structures, occupation and activities within Port of Onehunga remaining as they currently area there will be no change to the existing water quality. Any change to the existing structures, occupation and activities will require a specific assessment of effects.

5.3 Ecology

This section outlines the potential ecological effects associated with the Occupation Permit, based on the ecological features and values discussed in Section 4. Section 4 outlines a range of ecological values for ecological features within the Occupation Permit footprint, including values for marine mammals, fish, coastal birds and benthic fauna and flora. These values range from 'Low' to 'Very High'.

Given the established baseline, the potential effects associated with exclusive occupation are limited to shading from existing structures on the seabed and the associated modification to natural habitats for marine fauna. These effects apply to fish and benthic fauna and flora. While mobile species, such as fish, can self-relocate away from unsuitable habitat, it is expected that benthic fauna and flora communities will continue to be impacted to the same extent as the current situation by the occupation of existing structures in of Port of Onehunga wharf. As outlined in Section 4.7, the benthic fauna and flora values are currently 'Low' due to a range of impacts on benthic communities in this urban receiving environment.

The potential effects from existing activities, such as vessel movement and wharf activities are not considered in this assessment. However, we note that adherence to current standards and guidelines will continue to limit the potential effects on ecology. For example, adherence to biosecurity management protocols outlined in Sections 2.6 (e.g. the Craft Risk Management Programme, AC RPMP) and maintaining a best practice approach to management of vessel antifouling.

Potential effects from antifouling paints leaching from vessels can cause toxic effects to benthic invertebrates and impact reproductive success (Gadd and Cameron, 2012; Campana et al. 2012; Zitoun, 2018). Specifications in the AUP coastal section (rule F2.19.7 and standard F2.21.8.2) require vessels to adhere to these to manage discharges into the marine environment, and impacts to benthic health, sediment and water quality.

Potential effects to ecology associated with the discharge of stormwater include impacts to fish and benthic fauna and flora from contaminants and sediments associated with these discharges, entering the water column from runoff from hard surfaces. This can have flow on effects to coastal birds, associated with impacted food sources and a potential reduced ability to forage in the water column (Lukies et al, 2021). While stormwater discharges are an existing activity and therefore 'Permitted', it is noted that where existing structures or activities do not currently adhere to Best Practice standards (including appropriate levels of stormwater treatment), and with the development of new structures, EPDA should seek to upgrade stormwater infrastructure in line with Best Practice to limit effects to marine ecological values.

Based on the discussion above, an overarching 'Negligible' magnitude of effect has been applied, whereby "a negligible magnitude of effect equates to a change that is barely distinguishable or approximating to the 'no change' situation." (Roper et al., 2018). A negligible magnitude of effect is considered to be appropriate based on the very limited potential envelope of effects that are otherwise not Permitted Activities.

Based on a 'Negligible' magnitude of effect, and a range of 'Low' to 'Very High' ecological value, this equates to an overall 'Very Low' to 'Low' ecological effect. No further effects management is considered necessary for the proposed Occupation Permit.

6 Summary and conclusions

The Onehunga Wharf is a man-made environment, dominated intertidally by concrete walls and piles with soft muds as the benthic substrate.

Section 3 outlines the coastal process setting for the Onehunga Wharf. The coastal environment is highly modified with areas of the seabed occupied by a variety of structures including wharves, reclamations and piles. The current coastal processes in Manukau Harbour encompass two key dynamics. The dominant process is from the tide, in which the water is exchanged in and out of the harbour driving strong currents. The second is the generation of relatively small, wind-induced waves. These waves interact with the structures surrounding the harbour, resulting in complex and confused sea states. With the existing structures, occupation and activities remaining as they are currently there will be no change to the existing coastal processes.

Section 4.3 outlines the existing water quality and sediment quality. Onehunga Wharf is located at the bottom of an urban catchment, with historic and current industrial and commercial use (fishing vessels, recreational vessels, cement operators). Overall, the sediment and water quality is considered to be 'poor'. This is based on the presence of high-fine silts and muds and the high frequency of water quality guideline exceedances (>10 times the guideline values). These exceedances are of all nutrient parameters, chlorophyll *a*, and particularly elevated total and dissolved reactive phosphorus. With the existing structures, occupation and activities at Onehunga remaining as they currently are, there will be no change to the existing water quality.

Section 4 outlines a range of values for the ecological features within the Occupation Permit footprint, including values for marine mammals, fish, coastal birds and benthic fauna and flora. These values range from 'Low' to 'Very High' (refer to Table 6.1). Potential effects on ecological values have been assessed in the context of existing uses, maintenance and management within the footprint of the Port of Onehunga Occupation Permit, and the baseline for assessment as outlined in Section 1.3. A limited envelope of effects has been considered, given the Permitted Activity status of existing structures and activities, and an overarching 'Negligible' magnitude of effect applied. Overall, there is a 'Very Low' to 'Low' ecological effect associated with the proposed Occupation Permit and no further effects management is considered necessary.

Notwithstanding the overall level of ecological effect, adherence to biosecurity management protocols, maintaining best practice approach to management of vessel antifouling, and upgrades to stormwater infrastructure in line with Best Practice are recommended to continue to limit effects to marine ecological values associated with existing structures and activities of Port of Onehunga.

Table 6.1: Summary of marine ecological values for habitats and species of Port of Onehunga, the magnitude of effect and overall level of ecological effects.

Habitat / species	Ecological value	Magnitude of effect	Overall level of ecological effects
Marine mammals	'Low' to 'Very High' based on the species identified as potentially present at Port of Onehunga with threat statuses ranging from 'Not Threatened' to 'Threatened - Nationally Endangered'. Expected low frequency of marine mammal presence in close association with the Port of Onehunga.	Negligible	Very Low to Low
Fish	'Low' to 'Very High' based on the number of nationally and locally common indigenous species present, five vulnerable and one critically endangered species.	Negligible	Very Low to Low

Habitat / species	Ecological value	Magnitude of effect	Overall level of ecological effects
Coastal birds	‘Low to Very High’ based on potential species assemblage at Port of Onehunga and surrounds, including three species classified as ‘Threatened’ and 12 species classified as ‘At Risk’.	Negligible	Very Low to Low
Benthic infauna and fauna	‘Low’ based on the benthic community low species diversity at Port of Onehunga and degraded nearby habitats, ‘poor’ Auckland Council combined benthic health score, dominance of mud and contaminant tolerant species, the presence of secondary target biosecurity species (Asian date mussel), and 22 NIMS. Based on associated poor water quality and high fine silts and muds.	Negligible	Very Low

7 Applicability

This report has been prepared for the exclusive use of our client Eke Panuku Development Auckland (EPDA), with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Auckland Council as the consenting authority will use this report for the purpose of assessing that application.

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Appendix A Onehunga Wharf Location Map

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NOTES:
NZ Topographic - Basemap Only: Eagle, LINZ, StatsNZ, OSM. Google Satellite: Google. NZ Topographic - Reference Labels: Eagle, OSM

REVISIONS	NO.	BY
First version (20/05/24)	0	JORB

PROJECT No.	1094624	
DESIGNED	JORB	MAY.24
DRAWN	JORB	MAY.24
CHECKED	DSMI	MAY.24
APPROVED		DATE

CLIENT **EKE PANUKU DEVELOPMENT LTD**
PROJECT **OCCUPATION PERMIT AREAS**
TITLE ONEHUNGA PORT

SCALE (A4) 1:15,000 FIG No. FIGURE 2. REV 0

Appendix B EIANZ EcIAG (2018) modified guidelines summary tables

Appendix B Table 1: Criteria for assigning ecological value to marine, avifauna and terrestrial species.

Ecological Value	Species
Very High	• Internationally or 'Nationally Threatened' species (Nationally Critical, Nationally Endangered, Nationally Vulnerable) found in the ZOI* either permanently or seasonally.
High	• Species listed as Internationally or Nationally At Risk – Declining, found in the ZOI either permanently or seasonally.
Moderate	• Locally uncommon or distinctive species; or • Species listed as any other category of At Risk, found in the ZOI either permanently or seasonally.
Low	• Nationally and locally common indigenous species.
Negligible	• Exotic species, including pests, species having recreational value.

*In this case the Zone of Influence (ZOI) refers to all estuarine and marine water bodies and environments that could be potentially impacted by the Project. It includes the Project Site and any environments beyond the Project Area where 'indirect effects' such as discharges may extend (sometimes called the Study Area).

Appendix B Table 2: Characteristics of estuarine and marine areas/habitats and associated ecological values[4].

Ecological Value	Characteristics
Very High	• Benthic invertebrate community typically has very high diversity, species richness and abundance for the habitat type. • Benthic invertebrate community is dominated by taxa that are sensitive to organic enrichment, contaminants and mud e.g. rated as 'Excellent' using the Auckland Council (AC) Benthic Health Model (BHM)[5] or similar index. • Marine sediments typically comprise < 20% silt and clay grain sizes (mud) or rated as 'Excellent' using the AC BHMmud or similar index. • Surface sediment oxygenated to > 5 cm depth[6] with no anoxic sediment present. • Annual average sedimentation rates typically less than 1 mm above background levels[7]. • Contaminant concentrations in surface sediment significantly below DGV and AC ERC-Orange effects threshold concentrations[8]. • Water quality high, with no toxicants above effects threshold concentrations. • Water column contaminant values typically at or better than ANZG 99% species protection level and/or scored as 'Excellent' on a recognised Water Quality Index (WQI)[9]. • Fish community typically has very high diversity, species richness and abundance[10]. • Invasive opportunistic and disturbance tolerant species absent[11]. • Threatened or At Risk marine species present. • Threatened ecosystems present. • Vegetation likely to be nationally important and recognised as such. • Native estuarine vegetation or Macroalgae sequences community intact and provides significant habitat for native fauna. • No evidence of nuisance phytoplankton or macroalgal blooms[10]. • Physical habitat unmodified.
High	• Benthic invertebrate community typically has high diversity, species richness and abundance. • Benthic invertebrate community contains many taxa that are sensitive to organic enrichment, contaminants and mud. E.g. rated as 'Good' using the AC BHM or similar index.

[4] The characteristics of marine and estuarine sites with 'Negligible' to Very High ecological values were originally developed by Dr Sharon De Luca, Boffa Miskell Ltd, then modified further here, to guide valuing estuarine environments, and to provide a transparent approach that can be replicated. The characteristics have been accepted by decision-makers in Environment Court and Board of Inquiry hearings, including a number of NZTA projects (Transmission Gully, MacKays to Peka Peka, Ara Tūhono Project Puhoi to Warkworth and Warkworth to Wellsford Sections). Table 2 is based on the approach taken in these projects, and has been further developed with additional available indices to improve its use for the current consent applications.

[5] Hewitt, J E., Lohrer, A M and Townsend, M (2012). Health of estuarine soft-sediment habitats: continued testing and refinement of state of the environment indicators. Prepared by NIWA for Auckland Council. Auckland Council technical report, TR2012/012.

[6] Robertson, B.M, Stevens, L., Robertson, B., Zeldis, J., Green, M., Madarasz-Smith, A., Plew, D., Storey, R., Oliver, M. 2016. NZ Estuary Trophic Index Screening Tool 2. Determining Monitoring Indicators and Assessing Estuary Trophic State. Prepared for Envirolink Tools Project: Estuarine Trophic Index, MBIE/NIWA Contract No: C01X1420. 68p.

[7] Townsend and Lohrer (2015). ANZECC Guidance for Estuary Sedimentation. Prepared for Ministry for the Environment by NIWA.

[8] ANZG (2018) Default Guideline Value concentrations, or Auckland Council's Environmental Response Criteria contaminant threshold concentrations (Auckland Regional Council TP168, 2004).

[9] E.g., Ingley, R (2021). Coastal and estuarine water quality state and trends in Tāmaki Makaurau / Auckland 2010-2019. State of the environment reporting. Auckland Council technical report, TR2021/02.

[10] https://www.mpi.govt.nz/legal/legislation-standards-and-reviews/fisheries-legislation/maps-of-nz-fisheries/

[11] https://www.marinebiosecurity.org.nz/

Ecological Value	Characteristics
	• Marine sediments typically comprise < 40% silt and clay grain sizes or rated as 'Good' using the AC BHMmud or a similar index. • Surface sediment oxygenated up to 5 cm depth. • Annual average sedimentation rates typically less than 2 mm above background levels. • Contaminant concentrations in surface sediment rarely exceed DGV and AC ERC-Orange effects threshold concentrations. • Water quality does not have any toxicants above effects thresholds. • Water column contaminant values typically between ANZG 95% and 99% species protection levels and/or scored as 'Good' on a recognised WQI. • Fish community typically has high diversity, species richness and abundance. • Invasive opportunistic and disturbance tolerant species largely absent. • Vegetation likely to be regionally important and recognised as such. • Native estuarine vegetation or Macroalgae community dominated by native species and provides high quality habitat for native fauna. • Nuisance phytoplankton or macroalgal blooms may occur infrequently at a limited spatial scale. • Physical habitat largely unmodified.
Moderate	• Benthic invertebrate community typically has moderate species richness, diversity and abundance. • Benthic invertebrate community has both tolerant and sensitive taxa to organic enrichment, contaminants and mud present. E.g. rated as 'Fair' using the AC BHM or similar index. • Marine sediments typically comprise < 60% silt and clay grain sizes or rated as 'Fair' using the AC BHMmud or similar index. • Shallow depth of oxygenated surface sediment to 1 - 2 cm depth. • Annual average sedimentation rates typically less than 5 mm above background levels. • Contaminant concentrations in surface sediment generally below DGV-high or AC ERC-Red effects threshold concentrations. • Water quality has concentrations of toxicants below effects thresholds. • Water column contaminant values typically between ANZG 90% and 95% species protection levels and/or scored as 'Fair' on a recognised WQI. • Fish community typically has moderate species richness, diversity and abundance. • Few invasive opportunistic and disturbance tolerant species present. • Vegetation likely to be important at the level of the ecological district. • Native estuarine vegetation and macroalgae community dominated by native species and provides moderate habitat for native fauna. • Nuisance phytoplankton or macroalgal blooms may occur sporadically over a moderate spatial scale. • Physical habitat modification limited.
Low	• Benthic invertebrate community degraded with low species richness, diversity and abundance. • Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant, and mud tolerant organisms with few/no sensitive taxa present. E.g. rated as 'Marginal' using the AC BHM or similar index. • Marine sediments dominated by silt and clay grain sizes (> 60%) or rated as 'Marginal' using the AC BHM or similar index.

Ecological Value	Characteristics
	• Surface sediment predominantly anoxic (lacking oxygen). • Annual average sedimentation rates typically less than 10 mm above background levels. • Elevated contaminant concentrations in surface sediment, above DGV-high or AC ERC-Red effects threshold concentrations. • Water quality compromised by some toxicants above effects thresholds. • Water column contaminant values typically between ANZG 80% and 90% species protection levels and/or scored as 'Marginal' on a recognised WQI. • Fish community depleted with low species richness, diversity and abundance. • Invasive, opportunistic and disturbance tolerant species dominant. • Vegetation has limited ecological value other than as local habitat for tolerant native species. • Native estuarine vegetation and/or macroalgae community provides minimal/limited habitat for native fauna. • Nuisance phytoplankton or macroalgal blooms may occur commonly over a moderate scale. • Physical habitat highly modified.
Negligible	• Benthic invertebrate community degraded with very low species richness, diversity and abundance for the habitat type. • Benthic invertebrate community dominated by organic enrichment tolerant, contaminant tolerant, and mud tolerant organisms with no sensitive taxa present. E.g. rated as 'Poor' using the AC BHM or a similar index. • Marine sediments dominated by silt and clay grain sizes (> 80%) or rated as 'Poor' using the AC BHM or similar index. • Surface sediment anoxic (lacking oxygen). • Annual average sedimentation rates typically greater than 10 mm above background levels. • Elevated contaminant concentrations in surface sediment, above ANZG DGV-high effects threshold concentrations. • Water quality degraded, with the concentration of many toxicants above effects thresholds. • Water column contaminant values typically at or worse than ANZG 80% species protection levels and/or scored as 'Poor' on a recognised WQI. • Where shellfish are present, flesh has moderate-high contaminant concentrations as compared to reference site data. • Fish community depleted with very low species richness, diversity and abundance. • Invasive, opportunistic and disturbance tolerant species highly dominant. • Native estuarine vegetation and/or Macroalgae absent or so sparse as to provide very limited ecological value. • Nuisance phytoplankton or macroalgal blooms may occur frequently over a large spatial scale. • Physical habitat extremely modified.

Appendix B Table 3: Criteria for assigning ecological values for rocky/hardshore benthic habitats

Ecological value	Characteristics
Very High	• Rocky substrate abundant, providing very high topographic complexity • Very low sediment cover on rocky substrate • Very high diversity and abundance of sessile benthic organisms for the habitat type • Very high diversity and abundance of mobile macroinvertebrates for the habitat type • Sessile and mobile benthic organisms comprise many sensitive taxa. Invasive, opportunistic and/or disturbance tolerant species absent • Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have very large spatial extent and very low patchiness • Very high diversity and abundance of fish for the habitat type • Threatened or At Risk marine species present • Threatened ecosystem type present • Habitat unmodified • Water quality has concentrations of toxicants below effects thresholds
High	• Rocky substrate abundant, providing high topographic complexity • Low sediment cover on rocky substrate • High diversity and abundance of sessile benthic organisms for the habitat type • High diversity and abundance of mobile macroinvertebrates for the habitat type • Sessile and mobile benthic organisms comprise many sensitive taxa. Invasive, opportunistic and/or disturbance tolerant species largely absent • Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have large spatial extent and low patchiness • High diversity and abundance of fish for the habitat type • Threatened or At Risk marine species present • Threatened ecosystem type present • Limited habitat modification • Water quality has concentrations of toxicants below effects thresholds
Moderate	• Rocky substrate provides moderate topographic complexity • Moderate sediment cover on rocky substrate • Moderate diversity and abundance of sessile benthic organisms for the habitat type • Moderate diversity and abundance of mobile macroinvertebrates for the habitat type • Sessile and mobile benthic organisms comprise both tolerant and sensitive taxa • Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) have moderate spatial extent and moderate patchiness • Moderate diversity and abundance of fish for the habitat type • Few Threatened or At Risk marine species present • Few Threatened ecosystems present • Moderate habitat modification • Water quality has concentrations of toxicants below effects thresholds

Ecological value	Characteristics
Low	• Rocky substrate provides limited topographic complexity • High sediment cover on rocky substrate • Low diversity and abundance of sessile benthic organisms for the habitat type, but high cover of opportunistic macroalgae possible • Low diversity and abundance of mobile macroinvertebrates for the habitat type • Sessile and mobile benthic organisms comprise mostly invasive, opportunistic and disturbance-tolerant taxa, with very few sensitive taxa present • Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) absent, but biogenic habitat formers may be present in low abundance • Low diversity and abundance of fish for the habitat type • No Threatened or At Risk marine species present • No Threatened ecosystem type present • High habitat modification • Low water quality, with the concentration of some toxicants above effects thresholds
Negligible	• Rocky substrate sparse, providing limited topographic complexity • Rocky substrate smothered by sediment • Very low diversity and abundance of sessile benthic organisms for the habitat type • Very low diversity and abundance of mobile macroinvertebrates for the habitat type • Sessile and mobile benthic organisms comprise only invasive, opportunistic and disturbance-tolerant taxa, with no sensitive taxa present • Biogenic habitat formations (e.g., perennial algal canopies, shellfish aggregations) absent • Very low diversity and abundance of fish for the habitat type • No Threatened or At Risk marine species present • No Threatened ecosystem type present • High habitat modification • Very low water quality, with the concentration of many toxicants above effects thresholds

Appendix B Table 4: Summary of the criteria for describing the magnitude of effect.

Magnitude	Description
Very High	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature

Magnitude	Description
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

Appendix B Table 5: Criteria for describing overall level of ecological effects.

Magnitude of effect	Ecological Value				
	Very High	High	Moderate	Low	Negligible
Very High	Very High	Very High	High	Moderate	Low
High	Very High	Very High	Moderate	Low	Very Low
Moderate	High	High	Moderate	Low	Very Low
Low	Moderate	Low	Low	Very low	Very Low
Negligible	Low	Very low	Very low	Very low	Very Low
Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Overall level-of-effect categories are used to determine if residual effects management is required over and above measures to reduce the severity of effects through efforts to avoid, remedy or mitigate adverse effects. Usually, if the level of residual effect is assessed as being "Moderate" or greater this warrants efforts to offset or compensate for these effects.

Appendix C Fish species found around Onehunga Wharf

Appendix C Table 1: Fish species potentially present within the surrounding waters of Port of Onehunga Wharf and their IUCN Red List Status.

Common name	Species name	Source	IUCN Red List Status
Australian anchovy	*Engraulis australis*	NABIS; Kelly (2008a)	Least concern
Barracouta	*Thyrsites atun*	NABIS	Not listed
Blue cod	*Parapercis colias*	NABIS	Least concern
Blue mackerel	*Scomber australasicus*	NABIS	Least concern
Brill	*Colistium guntheri*	NABIS	Not listed
Bronze whaler shark	*Carcharhinus brachyurus*	NABIS	Vulnerable
Butterfish	*Odax pullus*	NABIS	Least concern
Eleotrids	*Grahamichthys radiatus*	Ecology Solutions (2019)	
Exquisite goby	*Favonigobius exquisitus*	Kelly, 2008a	Least concern
Frostfish	*Lepidipus caudatus*	NABIS	Data deficient
Garfish	*Hyporhamphus ihi*	NABIS	Not listed
Golden mackerel	*Trachurus novaezelandiae*	NABIS	Least concern
Grey mullet	*Mugil cephalus*	NABIS	Least concern
Hammerhead shark	*Sphyrna zygaena*	NABIS	Vulnerable
Hapuku	*Polyprion oxygeneios*	NABIS	Not listed
Horse mackerel	*Trachurus declivis*	NABIS	Least concern
John dory	*Zeus faber*	NABIS	Data deficient
Kahawai	*Arripus trutta*	NABIS	Not listed
Kingfish	*Seriola lalandi*	NABIS	Least concern
Koheru	*Decapterus koheru*	NABIS	Least concern
Leatherjacket	*Meuschenia scaber*	NABIS	Least concern
Lemon sole	*Pelotretis flavilatus*	NABIS	Least concern
Murphey's mackerel	*Trachurus murphyi*	NABIS	Data deficient
New Zealand sole	*Peltorphamphus novaezeelandiae*	NABIS	Not listed
Parore	*Girella tricuspidate*	NABIS	Not listed
Pilchard	*Sardinops sagax*	NABIS; Ecology Solutions (2019)	Least concern
Red gurnard	*Chelidonichthys kumu*	NABIS	Least concern
Red snapper	*Centroberyx affinis*	NABIS	Not listed
Rig	*Mustelus lenticulatus*	NABIS	Least concern
Rough skate	*Dipturus nasutus*	NABIS	Least concern
Sand flounder	*Rhombosolea plebeia*	NABIS	Not listed
School shark	*Galeorhinus galeus*	NABIS	Critically endangered
Sea perch	*Helicolenus percoides*	NABIS	Not listed
Silver warehou	*Seriolella punctata*	NABIS	Not listed

Common name	Species name	Source	IUCN Red List Status
Smelt	Retropinnidae family	Kelly, (2008a)	Species unknown
Snapper	*Pagrus auratus*	NABIS	Least concern
Speckled sole	*Peltorhamphus latus*	Kelly, (2008a)	Least concern
Spiny dogfish	*Mustelus lenticulatus*	NABIS	Vulnerable
Spotted stargazer	*Genyagnus monopterygius*	NABIS	Least concern
Spratts	*Sprattus meulleri*	NABIS	Least concern
Thresher shark	*Alopias vulpinus*	NABIS	Vulnerable
Turbot	*Colistium nudipinnis*	NABIS	Not listed
White pointer (Great white shark)	*Carcharodon carcharias*	NABIS	Vulnerable
Yellow belly flounder	*Rhombosolea leporina*	NABIS; Kelly (2008a)	Not listed
Yellow-eyed mullet	*Aldrichetta forsteri*	NABIS; Ecology Solutions (2019); Kelly (2008)	Least concern

Appendix D Coastal bird species recorded at Port of Onehunga and surrounds

Appendix D Table 1: Coastal bird species recorded at Port of Onehunga Wharf and nearby Māngere Inlet and their associated Robertson et al, 2021 threat status

Common name	Species name	Location observed	Threat status	Source
Black backed gull	*Larus dominicanus*	Onehunga Wharf; Māngere Inlet; Māngere – Kiwi Esplanade Trail	Not threatened	De Luca (2016); T+T (2024); EBird (2024); iNaturalist (2024)
Black billed gull	*Chroicecphalus bulleri*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	At Risk - Declining	De Luca (2016); EBird (2024)
Black shag	*Phalacrocorax carbo novaehollandiae*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	At Risk – Relict	De Luca (2016); Ecology Solutions (2019); EBird (2024)
Caspian tern	*Hydroprogne caspia*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	Threatened – Nationally vulnerable	De Luca (2016); EBird (2024)
Eastern bar-tailed godwit	*Limosa lapponica baueri*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	At Risk – declining	De Luca (2016); EBird (2024)
Lesser knot	*Calidris canutus rogersi*	Māngere Inlet	At Risk – declining	De Luca (2016)
Little black shag	*Phalacrocorax sulcirostris*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	At Risk - Naturally uncommon	De Luca (2016); Ecology Solutions (2019); EBird (2024)
Little shag	*Microcarbo melanoleucos (previously known as Phalacrocorax melanoleucos)*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	At Risk – Relict	De Luca (2016); Ecology Solutions (2019); EBird (2024)
New Zealand dotterel	*Charadrius obscurus aquilonius*	Māngere Inlet	Threatened – Nationally increasing	De Luca (2016)
New Zealand kingfisher	*Todiramphus sanctus vagans*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	Not threatened	De Luca (2016); EBird (2024)
Pied shag	*Phalacrocorax varius*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	At Risk - Recovering	De Luca (2016); Ecology Solutions (2019); EBird (2024); iNaturalist (2024)
Pied stilt	*Himantopus himantopus leucocephalus*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	Not threatened	De Luca (2016); Ecology Solutions

Common name	Species name	Location observed	Threat status	Source
				(2019); EBird (2024)
Pukeko	*Porphyrio melanotus*	Māngere Inlet	Not threatened	De Luca (2016)
Red billed gull	*Chroicocephalus novaehollandiae*	Māngere Inlet	At Risk – Declining	De Luca (2016); T+T (2024)
Reef heron	*Egretta sacra sacra*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	Threatened - Nationally endangered	De Luca (2016); EBird (2024)
Royal spoonbill	*Platalea regia*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	At Risk – Naturally uncommon	De Luca (2016); EBird (2024)
South Island pied oystercatcher	*Haematopus finschi*	Onehunga wharf; Māngere Inlet; Māngere – Kiwi Esplanade Trail	At Risk – declining	De Luca (2016); Ebird (2024); EBird (2024); iNaturalist (2024)
Spur winged plover	*Vanellus miles novaehollandiae*	Māngere Inlet	Not threatened	De Luca (2016)
Variable oystercatcher	*Haematopus unicolor*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	At Risk - Recovering	De Luca (2016); EBird (2024); T+T (2024);
White faced heron	*Egretta novaehollandiae*	Māngere Inlet; Māngere – Kiwi Esplanade Trail	Not threatened	EBird (2024); T+T (2024);
White fronted tern	*Sterna striata*	Onehunga Wharf; Māngere – Kiwi Esplanade Trail	At Risk – Declining	Ecology Solutions (2019); EBird (2024); iNaturalist (2024)

Appendix E Biosecurity species found in Manukau Harbour and around Port of Onehunga

Table Appendix E.1 : Biosecurity risk species found in the Manukau Harbour targeted marine pest survey (Tupe et al., 2020) and Port of Onehunga baseline survey (Campbell et al., 2009)

Species name	Biosecurity status	Location
Arcuatula senhousia	Secondary target	Tupe et al., 2020
Amathia distans	Non target, non-indigenous species	Campbell et al., 2009
Amathia verticillata	Non target, non-indigenous species	Tupe et al., 2020
Barantolla lepte	Non target, non-indigenous species	Campbell et al., 2009
Botrylloides diegensis	Non target, non-indigenous species	Tupe et al., 2020
Bugula neritina	Non target, non-indigenous species	Campbell et al., 2009
Charybdis japonica	Non target, non-indigenous species	Tupe et al., 2020
Conopeum seurati	Non target, non-indigenous species	Campbell et al., 2009
Cryptosula pallasiana	Non target, non-indigenous species	Campbell et al., 2009
Dipslosoma listerianum	Non target, non-indigenous species	Campbell et al., 2009
Ectopleura crocea	Non target, non-indigenous species	Tupe et al., 2020
Jassa slatteryi	Non target, non-indigenous species	Campbell et al., 2009
Magallana gigas	Non target, non-indigenous species	Tupe et al., 2020
Molgula manhattensis	Non target, non-indigenous species	Campbell et al., 2009
Monocorophium acherusicumi	Non target, non-indigenous species	Campbell et al., 2009
Neanthes aff. *succinea*	Non target, non-indigenous species	Campbell et al., 2009
Polyandrocarpa zorritensis	Non target, non-indigenous species	Tupe et al., 2020
Polydora cornuta	Non target, non-indigenous species	Campbell et al., 2009
Polydora hoplura	Non target, non-indigenous species	Campbell et al., 2009
Pyromaia tuberculata	Non target, non-indigenous species	Campbell et al., 2009
Soleria sp.	Non target, non-indigenous species	Campbell et al., 2009
Theroa lubrica	Non target, non-indigenous species	Tupe et al., 2020
Tritia burchardi	Non target, non-indigenous species	Tupe et al., 2020

Note: The Marine Biosecurity Porthole was also checked for records, but no further records were available aside from those detailed in Tupe et al., 2020.