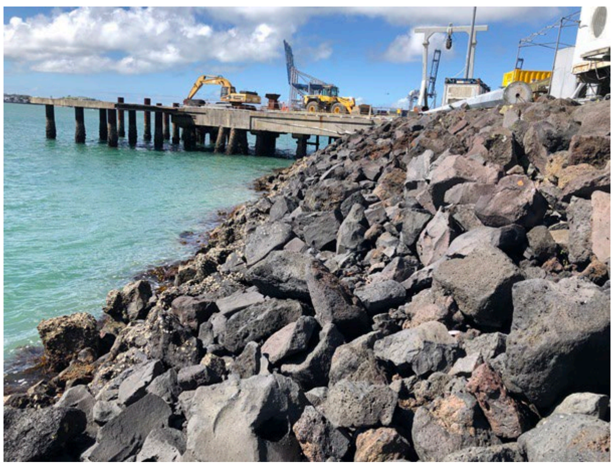
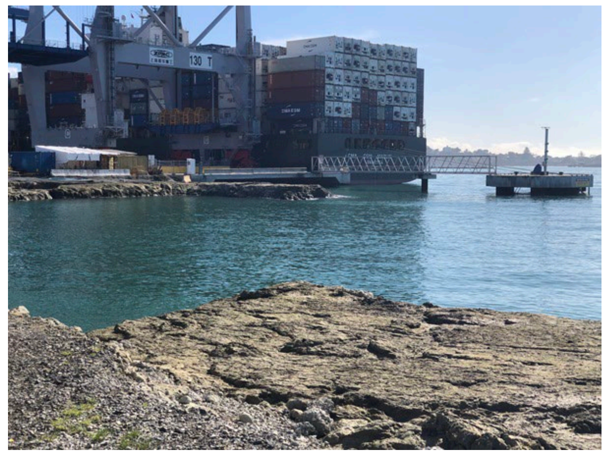
Attachment 31

Assessment of effects on the ecological environment prepared by Kennedy Environmental Limited

KENNEDY ENVIRONMENTAL LIMITED

BLEDISLOE NORTH WHARF & FERGUSSON NORTH WHARF EXTENSION CONSTRUCTION – EFFECTS ON THE ECOLOGICAL ENVIRONMENT





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List of Abbreviations & Units

ANZG	Australia New Zealand Guidelines
ASP	Approved Sampling Plan
AUP	Auckland Unitary Plan
BN	Bledisloe North
CDS	Cuvier Dumping Site
dB	Decibel
DDT	Dichlorodiphenyltrichloroethane
DGV	Default Guideline Value (ANZG 2018)
DoC	Department of Conservation
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Authority
FN	Fergusson North
GM	Geometric mean
GV-high	Guideline Value - high (ANZG 2018)
mg/L	milligrams per litre (water)
mg/kg	milligrams per kilogram (sediment)
MHRSS	Marine High Risk Site Surveillance
MDC	Marine Dumping Consent
N	Number of samples.
NDS	Northern Disposal Site
NIS	Non indigenous species
NOAA	National Oceanic and Atmospheric Administration
NZCPS	New Zealand Coastal policy Statement
OCP	Organochlorine pesticide
PAH	Polyaromatic hydrocarbon
PCB	Polychlorinated biphenyl
POAL	Port of Auckland Limited
PTS	Permanent threshold shift
RORO	Roll on Roll off

TBT	Tributyl tin
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TTS	Temporary threshold shift
USEPA	United States Environmental Protection Agency
WNC	Waitematā Navigation Channel

1 INTRODUCTION

1.1 Background

Port of Auckland Limited (POAL) operates the Port of Auckland (the Port). The Port has a Masterplan that sets out the potential development of the Port for the next 30 years. The Plan identified a number of projects that would improve operations within the Port. The Port has progressively passed ownership of a number of waterfront assets to Auckland Council (the Council).

As part of Auckland Council's 2024-2034 Long-Term Plan, Mayor Brown has proposed to transfer the Central wharves (Captain Cook and Marsden Wharf) to public use within the next 2-3 years. To achieve the Mayor's vision, POAL must reconfigure its operational footprint to enable the construction of a replacement mixed-use wharf to accommodate the Roll on Roll off (RORO) vessels that will no longer be able to berth at Captain Cook Wharf and Marsden Wharf. POAL is seeking resource consent for the following:

- The construction of an additional wharf/berth at the seaward side of Bledisloe Terminal. This is referred to as the Bledisloe North (BN) wharf to provide for large cruise ships (>300 m in length) and existing RORO displaced from Captain Cook Wharf. This will also improve cruise ship management within the harbour and reduce the size of cruise ships that currently berth at Princes/Queens wharves.
- The construction of an extension to the existing Fergusson North (FN) berth at the Fergusson container terminal, which will improve efficiency of vessel container management at the berth (i.e., loading / unloading time).

Figure 1: Existing Fergusson Container Terminal FN Wharf (left) with Bledisloe Terminal (right) with RORO car/vehicle carrier berthed at B3 wharf.

1.2 Assessment Report

1.2.1 Unitary Plan requirements

The areas of work associated with the new BN wharf and FN extension sit within the Port precinct as defined in the Auckland Unitary Plan. The land is zoned 'Business – City Centre' and the coastal marine area is zoned 'Coastal – General Coastal Marine'.

The reasons for resource consent are set out in the Application prepared by Bentley & Co. In relation to the consent matters that are directly relevant to the consideration of the ecological effects of the project:

- Impact and vibratory piling activities require resource consent as a restricted discretionary activity (F2.19.8(A114)).
- The discharge of stormwater to the coastal marine area from the BN wharf structure exceeds 5,000 m^2 and requires resource consent as a discretionary activity (F2.8.4.1(A10)).
- The discharge of contaminants from a new industrial or trade activity areas listed as "high risk" in Table E33.4.3 at the BN wharf and FN wharf structures requires resource consent as a discretionary activity (E33.4.2(A24)).

1.2.2 Report contents

This report examines the effects of the proposed BN wharf construction and the effects of the construction of an easterly extension to the FN berth on ecological resources and environmental quality within the adjacent Waitematā Harbour. The report also considers post construction matters relating to stormwater management. The report is structured as follows:

- Section 2 provides information on the proposed works.
- Section 3 describes the assessment framework used in this report.
- Sections 4 and 5 set out environmental and ecological information relevant to the assessment.
- Section 6 sets out the effects associated with proposed construction works:
  - Effects of demolition (pile removal) at BN.
  - Effects of piling at BN and FN.
  - Effects of revetment construction at both locations.
  - Effects of toe trench excavation at BN.
  - Effects of general construction at both locations.
  - Effects of other construction related effects.
- Section 7 examines operational stormwater management.
- Section 8 examines cumulative effects associated with the proposed wharf construction and wharf extension and provides a summary of effects discussed within this report.
- Section 9 identifies proposed monitoring, management and environmental/ecological enhancement proposed as part of the projects.
- Section 10 presents a summary and conclusions.

1.2.3 Information sources

This report was prepared using information within reports prepared in support of this application:

- A construction methodology prepared by Beca Ltd (Beca 2024a).
- An assessment of the effects of the works on the physical coastal environment (Beca 2024b).
- A report on hydrodynamic modelling in relation to proposed works (Beca 2024c) (Appendix A in Beca 2025b).
- A contaminated soils management plan the proposed works (Beca 2024d).
- A report on the effects on proposed construction on air and underwater acoustics prepared by Marshall Day Ltd (Marshall Day 2025a) and an underwater construction noise management plan (Marshall Day 2025b).
- An assessment of the sediment quality within the BN revetment toe trench (KEL 2025).

In preparing this report, I have also reviewed the Cultural Values Assessment prepared by Ngaati Te Ata Waiohua; and Te Akitai

There have been a number of reports prepared previously that provide information on the environment adjacent to both the BN and FN locations. These are referenced throughout this report. The reports include the assessment of environmental effects for the Fergusson Container terminal expansion (POAL 1996); the assessment of effects report for proposed deepening of the approaches to the FN berth and the commercial shipping lane (POAL 2001) and associated appendices to that document (e.g., Beca 2001a,b; KM 2001) and a recent report on the assessment of sediment quality at the FN berth (KEL 2022). Copies of these reports and assessments can be provided on request.

2 PROPOSED BLEDISLOE NORTH WHARF & FERGUSSON NORTH BERTH EXTENSION CONSTRUCTION WORKS

2.1 Bledisloe North Wharf

A summary of the proposed construction works and methods is provided below (as presented in Beca 2024a). Initial works include the removal of a small area of previous wharf construction at the eastern end of the reclamation at the Bledisloe Terminal. This comprises cutting concrete filled steel cased piles at seabed level and demolition and removal of the reinforced concrete deck. The key elements of construction works at BN include:

- Revetment reshaping, excavation of a toe trench in seabed at base of revetment and upgrading of the revetment rock quality (removal of undersized rock and replacement with larger rock). Management of excavated material for approved disposal.
- Installation of steel cased reinforced concrete piles in a sequence of pile rows (bents).

- Installation of under wharf erosion protection at both ends of wharf.
- Installation of reinforced concrete decking and wharf infrastructure (including stormwater management).

Table 1 provides a comparative summary of the works at both BN and FN.

Table 1. Construction elements (from Beca 2024a).

	Bledisloe North wharf	**Fergusson North extension**
Wharf construction	330 m (long) x 27.5 m (wide) precast concrete beams and in-situ reinforced concrete deck supported by steel cased reinforced concrete piles.	45 m (long) x 33.5 m (wide) structures as per BN.
Piles	Steel encased reinforced concrete.	Steel encased reinforced concrete.
	Drilled through rock revetment and underlying marine sediments and socketed into Waitematā sandstone.	Drilled through mudcrete reclamation and underlying marine sediments and socketed into underlying Waitematā sandstone.
	51 rows of piles, most 5 deep. Pile separation 6 m N-S and 6.5 m W-E. Inner 1,200 mm all others 900 mm diameter. Total of 241 piles.	Eight rows of piles six deep for main deck extension. SE extension six piles. Total of 48 piles. Pile dimensions as per BN.
Revetment	Existing revetment to be largely retained. Surface rock to be removed - upper section to be reshaped (1990's addition) and heavier rock to be placed on entire seaward face.	Outer layer of mudcrete trimmed for rock placement. Extended rock revetment, wraps around to end of existing reclamation bund.
Erosion mattress	Concrete erosion mattress required at both ends of wharf in front of revetment.	None required.
Dredging	None for vessel access. Excavation for toe trench for new revetment.	None required.

2.2 FN Works

A summary of proposed construction works and methods is provided below (as presented in Beca 2024a). The new wharf deck will cover an area of 45 m by 34 m from the eastern end of the existing wharf deck out to the existing dolphin. The key elements of construction works at FN include:

- Installation of steel cased reinforced concrete piles in a sequence of pile rows (bents).
- Installation of reinforced concrete decking and wharf infrastructure.

2.3 Site Setting

2.3.1 Bledisloe terminal

Bledisloe Terminal has been developed from two pre-existing wharfs. Kings Wharf started operation in 1908 and formed what is now the western side of the existing reclamation. The harbour wall at Kings Low located adjacent to Marsden Wharf is the remnant of the original Kings Wharf. This can be seen in the 1933 photograph provided in the sequence of Bledisloe Terminal development images in Appendix A.

Bledisloe Wharf was constructed for the meat export trade in the 1940s being commissioned in 1948. Reclamation between the two wharfs was underway by late 1973 (refer Appendix A), with reclamation progressing through to 1976 along with the construction of the western Bledisloe wharf (B2) which was operational in late 1976.

The original BN revetment was completed during 1976 (refer Appendix A) and the western section completed in 1984 when the final works for the B3 wharf were being completed (refer Appendix A). The piles at the eastern end of B2 were in place by 1976 and it is assumed those at the western end in 1985. It is understood that additional rock was placed along the top of the revetment in the 1990's.

2.3.2 Fergusson container terminal

Fergusson container terminal has its origins in work that commenced in 1967 with reclamation inside the 1919 eastern tide deflector. By 1971 a wharf was in use for roll-on roll-off vessels and Fergusson wharf was constructed and the first container vessel berthed in June 1971. Reclamation continued through the late 1970s to complete the container terminal in 1978.

In 1998 POAL were granted resource consents to extend the container terminal and add a new wharf (Fergusson North) on the north side of the reclamation. Reclamation work commenced on the eastern side of the then terminal prior to May 2004 and progressively extended north such that by August 2013 was close to its current extent. In 2014 works commenced on the development of the FN wharf and the first piles were being put in place in November 2015. Piling works continued through 2016, with work on the deck starting towards the end of that year. By January 2019 the wharf deck was substantially complete, and the eastern dolphin constructed. Appendix A provides a sequence of aerial images to illustrate the development of the current container terminal.

3 ASSESSMENT FRAMEWORK

3.1 Introduction

The proposed BN and FN construction works sit within the lower Waitematā Harbour. The assessment is undertaken within the framework of the Fast-track Approvals Act 2024. A summary of the statutory provisions which are relevant to the assessment of ecological effects and this project specifically are set out below. The assessment includes the evaluation of the scale of activity and potential effects, the significance of the effect and the significance of the ecological resources as set out in the following sections.

3.2 Fast-Track Approvals Act and Part 2 of the RMA

The Fast-track Approvals Act 2024 sets out the framework for obtaining resource consent for a listed project and prescribes the specific form, manner and information requirements for consent applications submitted for approval.

When considering a resource consent application, the Act directly imports the decision-making framework from the RMA, which requires (amongst other things) that the Panel take into account the purpose and principles of the RMA, as contained in Part 2 of the RMA.

In relation to ecological effects, sections 6 and 7 specially include matters pertaining to ecological effects and the coastal environment. The relevant ecological matters for this Project in sections 6 and 7 include:

Section 6 Matters of National Importance

Section 6 provides that the following matters are of national importance:

- the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development (s6(a));
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna (s6(c));
- the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers (s6(d)); and
- the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga (s6(e)).

Section 7 Other matters

Section 7 provides other matters decision makers shall have regard to as:

- the efficient use of natural and physical resources (s7(b));
- intrinsic values of ecosystems (s7(d));
- maintenance and enhancement of the quality of the environment (s7(f)); and
- any finite characteristics of natural and physical resources (s7(g)).

3.3 Relevant Planning Documents

The Fast-track Approvals Act 2024 also requires decision makers to have regard to the relevant planning framework. Below is a summary of relevant planning documents for this assessment. These documents are discussed further in the Application prepared by Bentley & Co.

3.3.1 NZCPS

The purpose of the New Zealand Coastal Policy Statement 2010 (NZCPS) is to state the policies in order to achieve the purpose of the RMA in relation to the coastal environment of New Zealand. The NZCPS therefore includes a number of policies which are relevant to this Project, given the Project's location within the coastal environment.

The key elements of the NZCPS considered particularly relevant to this assessment include:

Policy 11 (a) avoid adverse effects of activities on:

(i) indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;
(ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare;
(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;
(v) areas containing nationally significant examples of indigenous community types; and
(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

Policy 11 (b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

(i) areas of predominantly indigenous vegetation in the coastal environment;
(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;
(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;
(iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;
(v) habitats, including areas and routes, important to migratory species; and
(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

Threatened taxa are taxa defined in current threat classification documents. Areas of ecological significance are as identified in the Auckland Unitary Plan (AUP) and within the New Zealand reserves classification system.

3.3.2 Hauraki Gulf Marine Park Act 2001

The Hauraki Gulf Marine Park Act (HGMPA) integrates the management of the Hauraki Gulf's islands and catchments across land and sea so that the effects of urban and rural land use are given proper attention, and its life supporting capacity is protected. The HGMPA also promotes the conservation and sustainable management of the natural, historic and physical resources of the Hauraki Gulf for the benefit and enjoyment of the people and communities of the Hauraki Gulf and New Zealand.

3.3.3 Auckland Unitary Plan (Operative in Part)

Within the lower Waitematā, there are a range of significant ecological habitats. Figure 11 identifies Significant Ecological Areas (SEAs) that include SEA-M1 areas (considered vulnerable to development), SEA-M2 areas (areas of regional, national or international significance) and SEA-M1w or SEA-M2w areas (significant wading bird habitat).

3.4 Wildlife Act

The Wildlife Act (1953) provides protection for native birds, bats, frogs, and reptiles, including those migratory species that visit New Zealand. It also covers some native invertebrates and marine species. It also covers many introduced birds, mammals, reptiles and amphibians living in New Zealand. The Act provides absolute protection for most wildlife and varying or no protection for others. Species with absolute protection under the Act include reptiles, marine mammals and some marine biota. Schedule 7A identifies what marine species are declared to be animals under the Act. The species include particular groups of corals, a number of shark, ray. skate and grouper.

In relation to the BN and FN project:

- Of the coastal seabirds identified in Section 4.2 all are protected under the Act except for black-backed gull.
- Marine mammals are not included under the Act but are protected via the Marine Mammals Protection Act 1978.

Where a project involves interaction with wildlife catching, holding or releasing wildlife requires permission (Wildlife Act Authorisation) from Department of Conservation (DoC). As described in this report, the species of concern is little penguin (Kororā, *Eudyptula minor iredalei*) (Refer Section 5.3.5). Wildlife salvage requires a species-specific management plan. This is discussed further in Section 10. A WAA is being sought as a precaution should any penguin be found within the BN construction site.

3.5 EIANZ Ecological Impact Assessment

The EIANZ guidelines (Roper-Lindsay et al. 2018) have been adopted widely for use in freshwater and terrestrial systems. Although, the guidance was not developed for use in coastal marine systems, the methods have been adapted for use with coastal marine systems (principally by S. de Luca, Boffa Miskell). This approach has been adopted here in relation to the assessment of coastal avifaunal values, coastal intertidal and sub-tidal values. Appendix B sets out the various elements of the framework as used for the assessments set out in following sections. The information in Appendix B also contains the assigned ecological values for species of coastal birds and marine mammals that have Conservation Threat Rankings (as set out in the New Zealand Threat Classification reports produced by the Department of Conservation).

4 WAITEMATĀ HARBOUR PHYSICAL ENVIVIRONMENT

4.1 Physical Environment

As shown in Figure 2, the water depths off the northern sides of the Bledisloe Terminal and Fergusson terminal are 12.0 m and deeper. The initial dredging for the berth pocket at the FN berth can be seen on the north side of the reclamation (already consented and implemented).

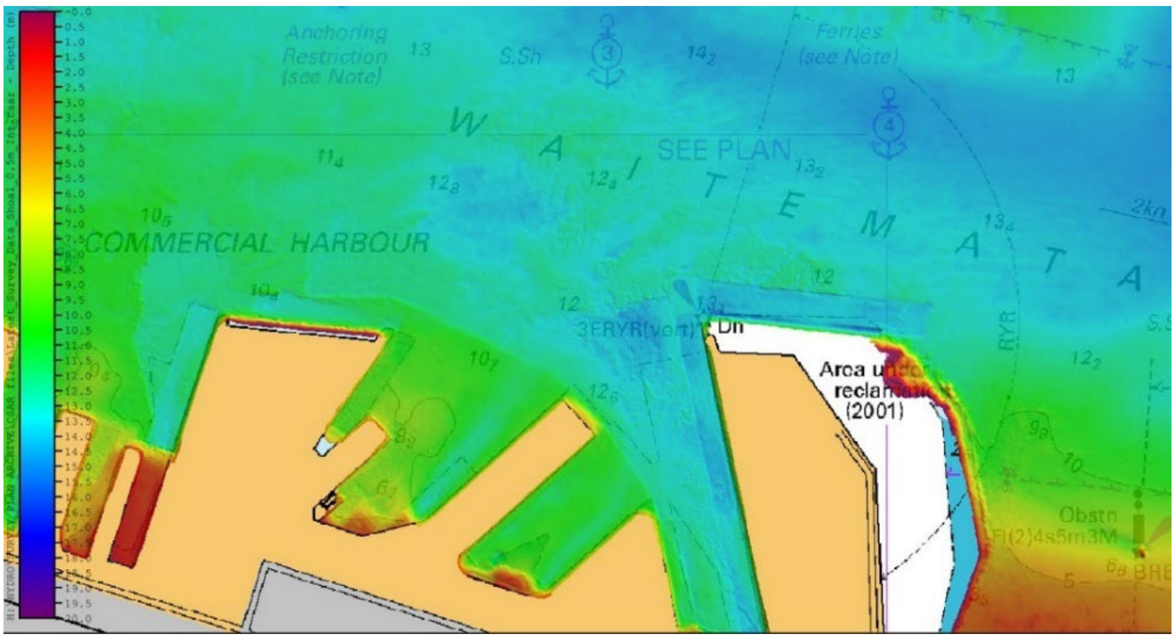


Figure 2: Bathymetry of Waitematā Harbour adjacent to Bledisloe Terminal and FN Wharf. Scale runs from chart datum at top to deeper than 15 m (blue). The figure can be enlarged as required.

Off the north side of Bledisloe, the water at the future berth is already deeper than 12 m (Figure 2) and further dredging is not required (refer also Beca 2024b).

Seabed physical characteristics have been examined in sediment cores and from observations of the seabed in remotely operated underwater vehicle (ROV) video and ROV photographs adjacent to both proposed BN and FN wharfs. The video and photographs show a seabed off BN that is typically flat with some bare areas and ripples. Some sediment was suspended by ROV movement close to seabed. Close to the BN revetment there appear to be small patches (banks) of soft sediments which were disturbed by the ROV. Patches of fine gravel in sediment were evident which may have been wash off from stormwater discharge on the revetment. Off the current FN, wharf dredging of the berth pocket has left a seabed covered in residual harder dredged fragments. Shell and muddier patches occur in places.

Beca (2024b and Appendix A of that report) describe the current environment in the two locations. As described by Beca, there is both measured data for tidal currents and data from current and past harbour modelling. Within the Port currents are weaker than within the main body of the harbour due to the sheltering effect of piled wharfs and solid reclamation. Peak measured tidal velocities directly off the FN dolphin are higher (~0.6-1.0 m/s) than off the north end of Bledisloe terminal (~0.5-0.9 m/s).

4.2 Water Quality

The proposed BN wharf and FN extension construction will occur within the main body of the Waitematā Harbour and as such the water quality is determined by the ebb and flow of tidal waters from outside the harbour and from the upper harbour beyond the harbour bridge. Circulation patterns within the port berth either side of Bledisloe Terminal have an influence on water quality at times as the port basins receive stormwater from the downtown areas of Auckland City.

Table 2 summarises water quality data collected (monthly) by Auckland Council at the 'Chelsea' monitoring site located above the Auckland Harbour bridge at the Chelsea Sugar Refinery Wharf. The monitoring site is located 5 km up-harbour from the Bledisloe terminal. Two different years of data are provided in Table 2 to illustrate the comparable year to year mean concentrations. For additional lower harbour waterfront water quality information, data for monitoring carried out at a site in Freemans Bay just outside the Outer Viaduct Harbour just up harbour from the Port is included in Table 2 (data from Golder 2018a).

Table 2. Water quality data for Chelsea Wharf and Freemans Bay.

	Chelsea 2016	**Chelsea 2022**	**Chelsea 2017-2022**	**Freemans Bay 2018**
Samples	12	12	47-58	5
Salinity (ppt)	33.5 (31.09-35.4)	33.6 (32.4-35.07)	33.6 (30.3-36.3)	-
TSS	8.7 (3.8-18.0)	8.8 (1.8-26.0)	7.0 (1.4-12.1)	14.4 ± 12.1
Turbidity	2.95 (1.6-5.9)	1.99 (0.54-3.4)	2.7 (0.53-10.6)	4.7 ± 8.0
Secchi depth (m)	0.8 (0.6-1.4)*	-	-	1.23 ± 0.27
Dissolved oxygen (DO)	7.87 (6.7-8.8)	7.45 (6.7-8.5)	7.5 (6.5-8.6)	-
DO (sat %)	97.25 (94.7-103.8)	97.13 (95.5-98.8)	96.8 (93.2-100.2)	-
pH (unitless)	7.98 (7.42-8.14)	8.01 (7.9-8.08)	8.03 (7.9-8.23)	-
Total nitrogen	0.12 (0.056-0.690)	0.15 (0.11-0.21)	0.15 (0.098-0.23)	0.19 ± 0.03
Nitrate-nitrogen	0.017 (0.004-0.031)	0.005 (0.001-0.018)	0.0049 (<0.001-0.037)	0.003 ± 0.002
Ammoniacal-nitrogen	0.006 (<0.005-0.024)	0.012 (0.007-0.017)	0.014 (0.006-0.032)	0.015 ± 0.003
DRP	0.015 (0.011-0.026)	0.015 (0.011-0.020)	0.016 (0.0095-0.023)	0.013 ± 0.001
Chlorophyll-a (mg/m^3)	2 (1-3)	1.3 (0.3-1.3)	0.9 (0.2-3.7)	2 ± 0.9
Copper (dissolved) (mg/m^3)	-	-	-	1.0 ± 0.8
Lead (dissolved) (mg/m^3)	-	-	-	<1.0
Zinc (dissolved) (mg/m^3)	-	-	-	5 ± 0.5

Notes: all data g/m^3 unless stated. Chelea wharf July 2015 to June 2016 data from Vaughn (2017), July 2021 to June 2022 data and July 2017 to June 2022 data from Kelly & Kamke (2023). All data median and range, Freemans Bay data from Golder (2018a), mean and 1 standard deviation, Secchi disc was subsequently removed from Auckland Council water quality monitoring programme after 2016.

Kelly & Karnke (2023) also provided seasonal (monthly) box plots for the 2018-2022 period for the Chelsea site data. Visual examination of those plots shows summer (spring/summer) highs for chlorophyll-a, turbidity (increased algal cells in water column) and higher concentrations of DRP in winter (less plant uptake). Total suspended solids (TSS) and turbidity in Freemans Bay over a short period in 2016 was slightly higher than at Chelsea Wharf. The Golder (2018a) monitoring in Freemans Bay (and also within Viaduct Marina) demonstrated that moored vessels moored contribute copper and zinc to water which is then dispersed on the tide.

Stormwater discharges to the waterfront and Port from the City Centre contribute a range of contaminants that can be detected in sediment within the Port and waterfront (these include dissolved and particulate copper, zinc and polyaromatic hydrocarbons). Existing Port operations also generates stormwater, which is authorised by the Ports Industrial and Trade Activities (ITA) Permit and managed through its approved Stormwater Management Plan.

A range of suspended sediment concentration data has been collected at control locations during dredging that has been carried out within the Port. Appendix E of Golder (2018a) tabulated that data which is summarised in Table 3.

Table 3. Summary of historical suspended solids monitoring data for the Port area.

Site	Year/date	Flood tide	Ebb tide
Wynyard Wharf	2001	4.6	-
Queens Wharf	2000-2001	6.9 ± 2.3	-
Queens Wharf mid-eastern side		5.7 ± 2.4	5.6 ± 2.5
Queens Wharf northeast side		8.2 ± 6.1	9.2 ± 5.3
Captain Cook Wharf, mid-western side		9.3 ± 6.5	6.6 ± 2.7
Captain Cook Wharf, mid-eastern side		12.3 ± 5.8	6.1 ± 3.1
Marsden Wharf		6.7 ± 3.1	6.6 ± 3.2
Bledisloe Wharf	2001	-	21.0 ± 7.3
Bledisloe Terminal		7.9 ± 3.4	8.5 ± 4.8
Bledisloe Wharf East	2008	8.4	9.2
Berth Jellicoe Wharf	1997-2005	7.1 ± 3.2	3.0 ± 0.6
Freyberg Wharf East	2008	7.9	8.5
Berth Freyberg Wharf	2000-2002	7.6 ± 5.4	8.8 ± 6.0
Berth Fergusson Wharf	1998-2002	4.4	-
Fergusson Wharf dredging	2015 - 2017	7.1 ± 3.8	15.0 ± 13.5
Fergusson Wharf Western	2011	5.4 ± 3.3	-
Port Approach Jellicoe Wharf	2005-2007	3.4 ± 2.6	11.2 ± 6.1

Notes: all data mean ± standard deviation, g/m^3.

The typical median TSS concentration is about 7 g/m^3 on the flood tide and 9.2 g/m^3 on the ebb tide. These concentrations are similar to those measured at the Chelsea site (Table 2).

In summary, water quality with the harbour reflects water quality in the ebb and flood tidal streams. Superimposed on this are the local effects of city centre stormwater discharges at multiple locations along the waterfront. These discharges influence water quality in the basins between port wharfs. Shipping and tug movements within the Port also suspend sediment intermittently within the Port. Water quality in areas of poor circulation such the marina areas on the waterfront have higher concentrations of copper and zinc than the main harbours due to the influence of vessel antifoulants. TSS concentrations in harbour water are typically low, are seasonal and influenced by phytoplankton growth.

4.3 Sediment Quality

4.3.1 Introduction

Sediment quality is assessed within the port berth areas every five years as a requirement of the resource consent granted to POAL for maintenance dredging (Permit No. 34673). The most recent five yearly sampling was carried out in 2021/2022 (KEL 2023). Quality is assessed separately for capital dredging. POAL have a marine dumping consent granted by Environmental Protection Authority (EPA) for the disposal of dredged sediment at the Cuvier Dumping Site (MDC EEZ400011). Disposal of any sediment at the disposal site requires prior assessment of sediment quality and prior approval of a sampling plan for the collection and examination of sediment quality.

4.3.2 Bledisloe North

Quality was assessed for sediments within the toe trench location. A summary of that sampling and the results obtained is summarised here as the methods and results are presented in KEL (2024a). A sampling plan was prepared prior to sampling and approved by EPA. Both the approved sampling plan (KEL 2024b) and KEL (2024a) are available on the POAL website (or upon request). Coring was undertaken between 10 and 17 June 2024 at four locations (one within each of four sampling units set out along the length of the BN toe-trench area). Coring was undertaken from a jack up barge/platform (Figure 3) using a SRS ML Duo Sonic drill rig.

Figure 3: Core sampling off BN on jack-up barge.

All sediment cores were collected to a depth of 2 m. Samples from each core were collected at depth intervals of 0-0.5m, 0.5-1.0 m and 1-2 m. Table 4 provides a summary of analysis undertaken on all samples collected from the toe trench. Sediment comprised muddy sands with low organic carbon content. The sediments showed no redox discontinuities or associated marked changes in colour with depth (mostly a greenish gray).

Table 4. Sediment quality data for BN toe trench and FN pocket berth.

	BN toe trench	FN pocket berth	ANZG (2018) DGV/GV-high
N	15	35	-
Mud %	46.5		-
TOC %	0.3 (0.07-0.72)	0.34 (0.07-1.06)*	-
Antimony	0.059 (0.04-0.11)	-	2.0/25
Arsenic	4.9 (0.8-18.9)	1.9 (<0.2-6.5)	20/70
Cadmium	0.052 (0.025-0.084)	0.02 (<0.01-0.069)	1.5/10
Chromium	13.8 (5.3-20)	5.6 (1.2-16.2)	80/370
Copper	12.8 (7.9-20)	7.3 (2.1-16.0)	65/270
Lead	10.3 (3.7-23)	7.5 (3.3-13.2)	50/220
Mercury	0.057 (0.02-0.11)	0.046 (<0.02-0.12)	0.15/1.0
Nickel	11.5 (2.9-18.6)	3.5 (0.5-14.9)	21/52
Silver	0.077 (0.01-0.23)	-	1.0/4.0
Zinc	51.1 (28-77)	22.2 (2.6-69)	200/410
TPH	<80-<90	<80-<90	280/550
PAH	0.72 (0.11-1.53)**	<0.211 (<0.05-1.70)*	10/50**
DDT	<0.002*	<0.002*	0.0012/0.005**
PCB	<0.034*	<0.035*	0.034/0.280**
TBT	0.0056 (<0.001-0.029)*	<0.004*	0.009/0.070**

Notes: * Fi=or FN sediments TOC, PAH, DDT, PCB n=20, TPH, TBT n=24, TPH = total petroleum hydrocarbons; PAH = polyaromatic hydrocarbons; PCB = polychlorinated biphenyls; TBT = tributyl tin; DDT = the organochlorine insecticide Dichlorodiphenyltrichloroethane; * not adjusted to 1 % Total Organic Carbon; ** - adjusted to 1 % TOC; DGV = default guideline value, GV-high = Guideline value high.

Concentrations of copper and zinc in toe trench surface sediments were higher in the vicinity of stormwater discharges from the Bledisloe Terminal. Overall, the analysis showed that concentrations of all trace elements in the toe trench sediments were below ANZG (2018) default guideline values (DGV).

Toe trench sediments contained no detectable total petroleum hydrocarbons (TPH). Polyaromatic aromatic hydrocarbons (PAHs) were detected with higher concentrations in surface sediment (maximum measured concentration 0.87 mg/kg (not adjusted to 1 % TOC)) and very low concentrations in subsurface sediments (max. concentration 0.025 mg/kg). No polychlorinated biphenyls (PCB) or any organochlorine pesticide compounds were detected. The antifoulant TBT was detected in some samples at BN above the DGV but the average unadjusted (to 1% TOC) concentration was below the ANZG (2018) DGV (Table 4). As described in KEL (2024a), the TBT concentrations in three surface samples were variable and the detectable but low concentrations in three deeper subsurface samples were considered to be false positive results (as the sediment was considered to be pre-European in age).

4.3.3 Fergusson North

Sampling of sediments along the front of the FN berth was carried out over 14-16 December 2021, based on an EPA approved sampling plan. Samples were collected from 12 locations to a depth of 3 m (using a CAT 308 rotary drill rig a on jack-up barge) systematically across the length of the berth frontage (Figure 4).

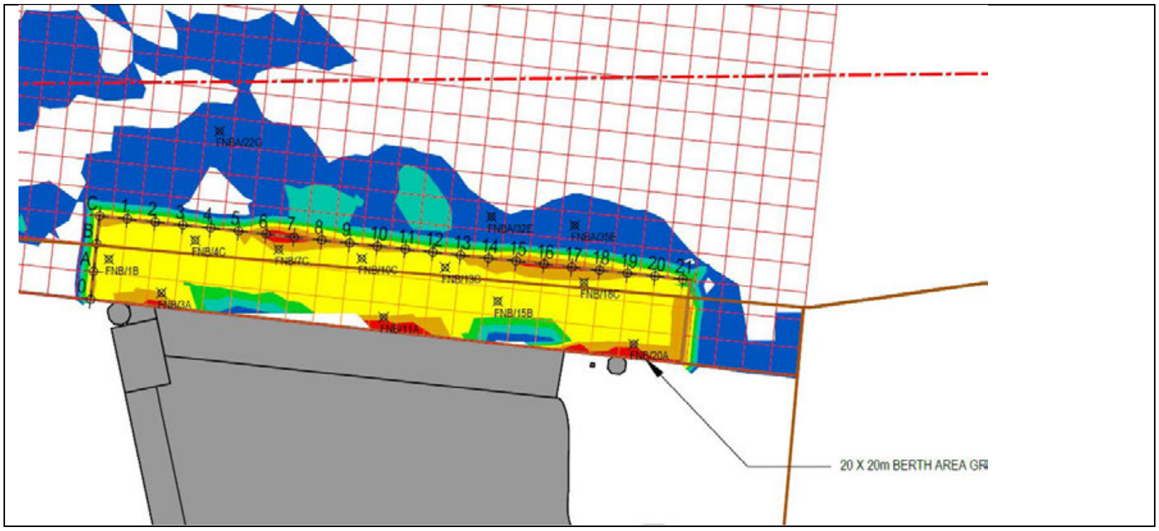


Figure 4: Core sample locations within the FN wharf pocket berth (from KEL 2022).

The approved sampling plan and the results of the sediment quality assessment (KEL 2022) are available on the POAL website (or upon request). A series of samples were also collected from the berth approaches (the area outside the berth pocket shown in Figure 4). That data is not included in this summary as they are some distance away and similar to those for the pocket berth.

Some colour changes with depth occur adjacent to FN likely due to natural changes in the nature of sediments deposited (a change from greenish gray to pale gray). The analysis showed that all concentrations of trace elements were below ANZG (2018) default guideline values (DGV). Sediments contained no detectable total petroleum hydrocarbons (TPH). Detectable polyaromatic aromatic hydrocarbons (PAHs) were measured with higher concentrations in surface sediment and very low concentrations in subsurface sediments (but all below the ANZG (2018) DGV concentration, refer Table 4). No polychlorinated biphenyls or any organochlorine pesticide compounds were detected. The antifoulant TBT was not detected in berth pocket sediments.

4.3.4 Overview

Sediment sampling was undertaken in 2024 within the footprint of the toe trench at the foot of the BN revetment. Sediments sampled had maximum contaminant concentration below ANZG (2018) DGVs with the exception of TBT in surface sediment where some samples had concentrations above the DGV.

Sediment sampling had been carried out within the FN berth pocket in December 2021. This sediment characterisation included samples close to the works at the east end of FN. The concentrations of all contaminants in sediment along the FN berth were all below the ANZG (2018) DGVs.

5 ECOLOGICAL ENVIRONMENT

5.1 Introduction

This section provides a description of the ecological resources within and adjacent to the proposed BN wharf and FN wharf extension. The ecological resources discussed include reptiles (lizards), birds (avifauna), intertidal and subtidal ecology plus marine mammals and fish. For each element of the ecological environment information is included about any high value elements of that particular resource (refer Section 3.8 and Appendix B). Where conservation status information for species is available on a national or regional level both are provided.

5.2 Reptiles

There are a range of reptile species that are known to be present within the coastal environment of the Auckland region. There are nine marine reptile species that have been sighted in the region. All are considered to be uncommon and unlikely to be encountered. Eight of the species are categorised as regional vagrants and one, the green turtle (*Chelonia mydas*) is categorised as migrant (national) and vagrant (regional). Melzer et al. (2022) indicates that there are less than 15 sightings a year of this species in the region. Information in the DoC herpetological database for the coastal area between Whangaparoa and Maraetai showed in the last 10 years green turtle had been found at Takapuna Beach and Beach Haven. Deceased specimens have been found at Torpedo Bay, Wynyard Wharf and Judges Bay (by Marine Rescue Centre, May 2021). Due to their uncommon occurrence marine reptiles are not considered further in this assessment.

Of the other 19 reptile species known to be present in the region, tuatara (*Sphenodon punctatus*) is a regionally critical species (Melzer et al. 2022) with the closest wild population being on Titritiri Matangi Island. There are seven gecko species which are either found on the Hauraki Gulf Islands or localised areas or require habitat not available in much of the Auckland City urban environment and not in the Port. These are not considered further.

There are 11 skink species including the introduced (and naturalised) plague skink (*Lampropholis delicata*). Of the 10 indigenous skink species, many are restricted to the Hauraki Gulf islands. The species that would have been present historically on the natural Waitematā shoreline would likely have included the copper skink (*Oligosoma aeneum*), the shore skink (*O. smithi*) and ornate skink (*O. ornatum*).

Examination of iNaturalist showed that there have been few sightings posted within the urbanised shoreline parts of Auckland. Information in the DoC herpetological database of skink sighting database showed that the copper skink was the only skink reported within the area examined (refer above). None were in close proximity of the Port.

No terrestrial habitat will be affected by any of the proposed FN works. The BN wharf works will require some reshaping and removal and the replacement of the revetment seaward face. The reclamation was constructed in the 1970s (Section 2.3.1) and the reclamation/revetment has no significant vegetation apart from a few weeds. The revetment was examined for possible presence of skinks. During historical walks over the revetment area, there was no indication that any reptiles were present in the upper section of revetment. No plague skinks were sighted. To provide an additional check, six tracking tunnels baited with banana were placed into the rocks in the upper metre of the revetment on 24 September 2024 and removed on 1 October 2024 (Figure 5).

Figure 5: BN rock revetment, tracking tunnel locations.

No ink tracks of any kind were found on the track cards. Bait stations (for mice/rats) are maintained throughout the Port and are maintained along the revetment (see green box in left of Figure 5). Overall, there is no indication that indigenous lizards are present within the rock revetment at the proposed BN wharf location.

5.3 Avifauna

5.3.1 Introduction

The land side of the Port does not contain any natural terrestrial habitat or planted areas due to the biosecurity controls within the port. There are trees on the city side of the port boundary and small Pohutukawa outside the red-fence adjacent to the Marine Rescue Centre in Judges Bay. These trees will provide some habitat for a range of common urban birds (predominantly introduced). The only bird species commonly seen within the port around wharf edges and on the BN revetment are rock pigeons (domestic pigeon, rock dove, Kererū aropari, *Columba livia*). They are present on (and in) the rock revetment, especially the east end where nesting pigeons and a chick have been seen.

A wide range of coastal bird species are seen in the lower Waitematā Harbour including a number of intertidal waders that use the intertidal beaches and mud-flats and shell banks in areas such as Shoal Bay. The intertidal feeders include pied stilt (*Haematopus leucocephalus*), wrybill (*Anarhynchus frontalis*), variable oystercatcher (*Haematopus unicolor*), white-faced heron (*Ardea novaehollandiae*) and the New Zealand dotterel (*Charadrius obscurus aquilonius (*northern sub-species)). The latter is found near the Port in areas of open wasteland/grassland such as the cleared areas at Wynyard Point.

Table 5 provides a summary of seabirds typically sighted in the Port and in the harbour close to the Bledisloe Terminal and FN wharf. Caspian tern (*Sterna caspia*) and Australasian gannets (*Morus serrator*) are occasionally seen in the harbour.

Table 5. Seabirds typically seen in the Waitematā Harbour near the project areas.

Common name	Scientific name	Conservation significance	
		National	**Regional**
Australasian gannet	*Morus serrator*	Not Threatened	Not Threatened
Black-backed gull	*Larus dominicanus*	Not Threatened	Not Threatened
Caspian tern	*Sterna caspia*	Threatened Nationally Vulnerable	Threatened – Regionally Critical
Little shag	*Phalacrocorax melanoleucos*	At Risk Relict	Threatened – Regionally endangered
Little black shag	*Phalacrocorax sulcirostris*	At Risk Relict	At Risk Regionally Naturally Uncommon
Little penguin	*Eudyptula minor iredalei*	At Risk Declining	Threatened Regionally Vulnerable
Pied shag	*Phalacrocorax varius*	At Risk Recovering	At Risk Regionally Recovering
Red-billed gull	*Larus novaehollandiae*	At Risk Declining	Threatened Regionally Vulnerable
Variable oystercatcher	Haematopus unicolor	At Risk Recovering	Threatened Regionally Vulnerable
White-fronted tern	*Sterna striata*	At Risk Declining	Threatened Regionally Vulnerable

Notes: Conservation significance from Robertson et al. (2021) and Wooley et al. (2024).

The Port does not include any intertidal soft-sediment habitat for intertidal wading species. Within the Port there are some floating structures (such as tyre fenders) that provide localised roost habitat for birds such as variable oystercatchers and pied shags (Figure 6).

Figure 6: Variable oystercatcher and pied shag on fender in port.

Examination of data in e-bird (https://ebird.org/home) indicates a larger number of species identified within the waterfront area (the Viaduct Harbour hot-spot). A number of these were species of petrels and albatross of high conservation significance typically seen in the mid and outer Hauraki Gulf. These species were likely not seen within the waterfront area but were recorded on a voyage to the Waitemata Harbour and likely entered into e-bird when berthed at the Viaduct Harbour. Some species of shearwaters such as fluttering shearwater (Pakahā) are occasionally seen in the Rangitoto Channel.

Overall, there are few species of coastal birds that commonly utilise the harbour close to the construction areas. Of those species seen within the Port, four nest within the Port and are described in the following sections.

5.3.2 Black-backed gulls

Black backed gull (*Larus dominicanus*) are common in the harbour with a small breeding colony on the Westhaven marina entrance breakwater and another larger colony on Rangitoto island. Black-backed gull have nested in variable numbers at various locations within the Port. This year (November) there were three nests at the top of the BN revetment. One nest contained a chick and one a single egg. A further nest with chick was identified at the northern end of the revetment on the east side of the Fergusson Container terminal.

Figure 7: Left: Black-backed gull and nest BN revetment. Right: Chick and nest Fergusson East container terminal revetment.

5.3.3 Red-billed gulls

Red-billed gull (*Chroicocephalus novaehollandiae scopulinus*) nest within the Port on several wharfs. Largest numbers nest at Marsden Wharf where they nest at the end of the wharf and in wooden nest boxes constructed by POAL on the old concrete wharf piles (Figure 8). Red-billed gull also nest in smaller numbers at the northern ends of the Bledisloe 1 wharf (B1) and Jellicoe wharf (Figure 9).

Counts in the last two seasons recorded 141 Adults (28 November 2022) with 20 chicks (at that time) and 255 adults (15 January 2024) with 43 chicks/juvenile birds. Of the January 2024 numbers (the end of the 2023-24 breeding season), 80 % were at or adjacent to Marsden wharf. A smaller number of red-billed gull also nest at the end of Wynyard Wharf at the western end of the waterfront and there is a large colony on the sea-frontage adjacent to Hamer Street in Westhaven Marina (~ 900 adult birds, November 2022). There is also a colony in the Tamaki estuary and colonies on the inner Hauraki Gulf islands.

Red-billed gull have a very long egg-laying period that can be between mid-September to January. At Hamer Street for example, most eggs have been laid in September and October with stragglers and second clutch eggs laid into January. Egg incubation lasts about 24 days with chicks fledged in 35 days (about 2 months old). Although they can fly, they are still fed by adults for about another month (Mills 2013).

Figure 8: Red-billed gulls (Marsden wharf and old piles) and white fronted terns in the Port.

Figure 9: Location of red-billed gull and white fronted tern nesting locations in the Port relative to BN and FN works locations.

5.3.4 White fronted tern

White fronted tern (*Sterna striata*, WFT) nest at a number of locations within the Port (typically at the edge of wharfs) with or close to red-billed gulls (Marsden, B1 and Jellicoe Wharfs) (Figures 8 and 9). They lay eggs starting in October (typically 1-2) which are incubated for about 24 days with chicks fledging at about 50 days (Mills 2013). Numbers nesting in the Port have varied from year to year with 33 adults in November 2022 and 118 adults in January 2024 (with 48 chicks). Variability is not uncommon from year to year (Frost 2017). WFT nest at other locations in the Harbour including nearby Wynyard Wharf. There are larger colonies on the inner Hauraki Gulf islands.

5.3.5 Little penguin

There is little information available about the numbers of little penguins (Kororā, *Eudyptula minor iredalei*) that are present and nest within the lower Waitematā Harbour. Little penguins have a national conservation status of At-Risk – Declining (Robertson et al. 2021)) and a regional status of Threatened Regionally Vulnerable (Wooley et al. 2024). There are few records of little penguins within Waitematā Harbour in sources such as iNaturalist or e-bird. There are occasional observations of penguins swimming within harbour waters with observations typically peaking in September through November. That period coincides with the period of penguin chick rearing. There are also observations of deceased penguins washed up on shore.

In 2023, works on the Westhaven Marina rock revetment disturbed breeding little blue penguin resulting in the death of chicks. This finding provided an indication that little penguins nest and rear chicks within the lower harbour.

There have been no sightings or 'hearing' of little penguin active within the Port. The BN revetment is one of the few locations where penguin could potentially get ashore within the Port. The only other potentially penguin friendly shore adjacent to the Port is the revetment on the eastern side of the Fergusson Container Terminal south of the eastern end of the FN berth (in Judges Bay).

To provide information regarding possible little penguin presence, the likely habitat at BN and adjacent to FN was examined. An initial walkover survey of the BN revetment was carried out in July 2024 to check for any sign of earlier presence (sign of activity (e.g., feathers) and smell (of penguin or guano)). Although nothing was noted, a survey was then undertaken with a Department of Conservation approved penguin detector dog ("miro") (shown in Figure 10). The BN revetment was searched during low tide on 22 and 23 August 2024. No evidence of little penguin was detected by the dog. This search was repeated on 28 November 2024 with no detection of penguin by the detector dog.

A search was conducted on 23 August 2024 of the revetment on the eastern side of the Fergusson Container terminal (Figure 10) from the northerly end of the revetment (where it abuts against the unfinished mudcrete reclamation) down to the red-fence and then from the red fence down to the Heliport and the Marine Rescue Centre (MRC) in Judges Bay. There was one detection by the dog in each section (smell and or guano, but no sounds or identifiable presence of penguin) (Appendix C). The closest detection (the northern in Figure 10) was 250 m from the FN Dolphin and ~120 m from the end of the current rock revetment.

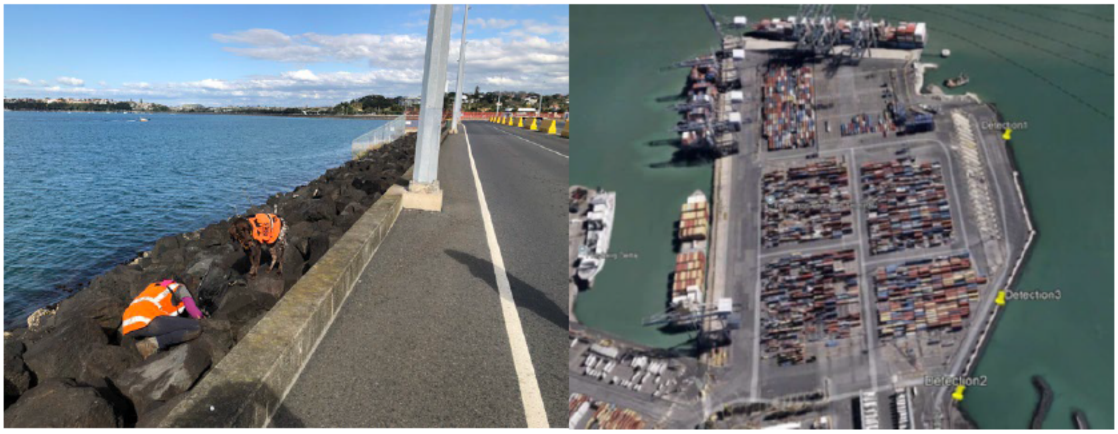


Figure 10: penguin detector dog searching FN revetment (left) and Fergusson Container Terminal showing detections from the second survey (right).

This section of revetment was re-checked on 28 November 2024 and the detector dog identified positive sign at the two locations again. In both locations the burrows were very deep in the revetment and no penguin were heard or seen. A third positive detect was also found by the detector dog (and guano was observed) at a location mid-way between the two other locations (Figure 10).

On 24 August 2024 the revetment around the MRC and the revetment down to Tamaki Drive were searched. Adjacent to the MRC building there were three detections all with birds heard in burrow and in one a confirmation photograph was able to be taken (the areas searched are described in the two survey reports in Appendix C). There were also detections under the MRC building.

Little penguins spend a high proportion of their time feeding at sea. They come ashore just after it gets dark and leave at dawn. Little penguins lay eggs between July and mid-November. They can lay second clutches late in the breeding season. Egg incubation lasts about 36 days, chicks are brooded for a further 18-38 days and fledge after 7-8 weeks (Flemming 2013). During incubation, one parent incubates for a period and the other goes to sea then they swap. When the chicks hatch one parent does to sea each day and returns to feed the chicks and one spends the day at sea. There is a period when both parents can be at sea to collect food. Chicks may also emerge from the burrow at night. After chicks leave the burrow, the adults stay ashore for about two weeks when they moult. This occurs between January and March. Little penguins are known to return to the same burrow location.

5.3.6 Avifaunal values

Two bird species with high conservation significance (red-billed gull and white fronted tern) nest within the Port within 300 m of the BN works and also within 500 m of the FN works. Both species have nested in the Port in variable numbers for a number of years. The numbers nesting in the Port are large enough that they contribute significantly to the overall population of these species nesting within the Waitematā Harbour. Nesting of both of these species is assisted by adding nest boxes where it can provide additional nest sites.

There have been no sightings or 'detection' of little penguin (also of high conservation significance) within the Port. No little penguin were detected along the BN rock revetment. A single detection by detector dog (but no confirmed sighting) was identified in the section of the eastern container terminal revetment between the northern end of the revetment (south of the proposed FN extension) and the red fence (~120 m from the end of the existing revetment and 250 m from the FN wharf extension). Positive detections by detectors dog were made at two further locations along the eastern container terminal revetment (Figure 10). Little penguin were also found in burrows within the shore/rock revetment at and adjacent to the MRC some 700 m south of the proposed FN extension.

Under the EIANZ species value classification system (Appendix B), red-billed gull, white fronted tern and little penguin are classed as having high value.

5.4 Marine Mammals

5.4.1 Introduction

At least 27 cetacean and two pinniped species have been sighted (or identified from shoreline strandings) along the northeastern coastline of the North Island. More than 22 species of whales and dolphins have been recorded in the Hauraki Gulf (Hauraki Gulf Forum 2014, Dwyer 2014).

5.4.2 Species in Waitematā

As summarised in Table 6 there are five species that are seen in the Waitematā Harbour as visitors and residents. No marine mammals are considered to be permanent residents (in the Waitematā Harbour) but some species such as New Zealand fur seal (*Arctocephalus forsteri*) and leopard seal (*Hydrurga leptonyx*) spend extended periods of time in the harbour. These species make up a high proportion of sightings within the Harbour. Documented sightings based on those in the Department of Conservation (DoC) marine mammal sighting database and in INaturalist were used to provide an overview of species sighted within the harbour.

Table 6. Marine mammals that are typically seen in the Waitematā Harbour.

Common name	Scientific name	Seen in lower Waitematā Harbour	Conservation Significance
Whales and dolphins			
Common dolphin	*Delphinus delphis*	Yes	Not Threatened
Bottlenose dolphin	*Tursiops truncatus*	Yes	Threatened Nationally Endangered
Killer whale	*Orcinus orca*	Yes	Threatened Nationally Critical
Seals			
New Zealand fur seal	*Actocephalus forsteri*	Yes	Not Threatened
Leopard seal	*Hydrurga leptonyx*	Yes	At Risk Naturally uncommon

Notes: Conservation significance from Baker et al. (2019).

Leopard seals which are now classified as a resident species in New Zealand waters (Baker et al. 2019) are the most well-known visitors as they take up short term residence at various locations in the harbour including Viaduct harbour, Westhaven Marina and Bayswater Marina and where they can be seen hauled out on pontoons, the public boat ramp etc (see Figure 11). Historically the visitor was a single female (named Owha), who was joined by a second younger seal (Novy) in 2018. Owha has not been sighted since 2022.

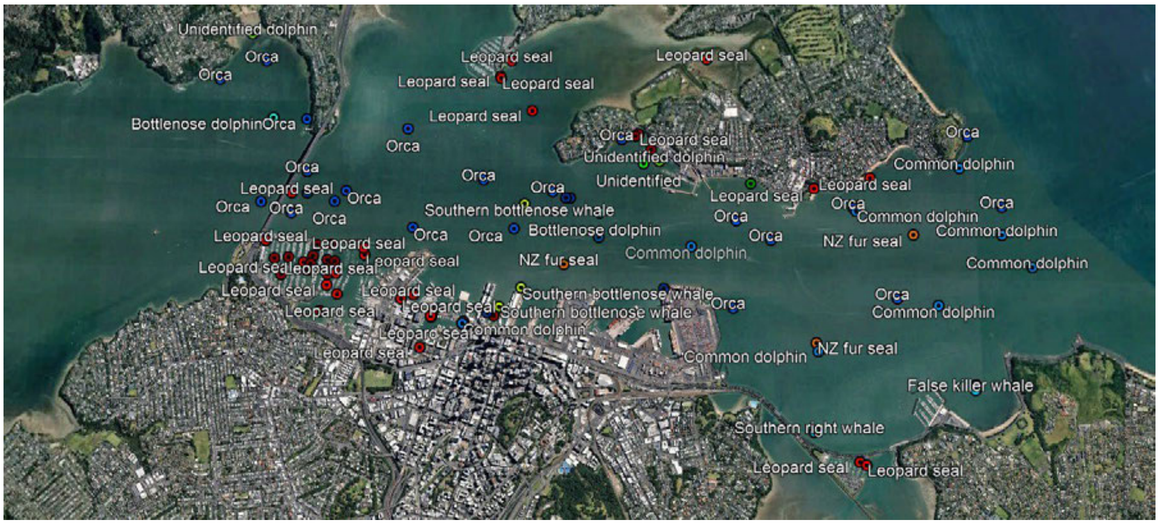


Figure 11: Marine mammal sightings in Waitematā Harbour (DoC Marine mammals sighting database).

Fur seals which can be seen hauled out on channel marker buoys are also considered to be regular visitors, seen in the marina and in the harbour channel (Figure 12). iNaturalist provides records of fur seal in the lower harbour off Viaduct Harbour and Fergusson container terminal and to the east off Tamaki Drive. The latter in July 2024 (Figure 11). Eke Pānuku have a specific page on their website in relation to seals in the marina (https://www.westhaven.co.nz/westhaven/using-the-marina/seals-in-the-marina/).

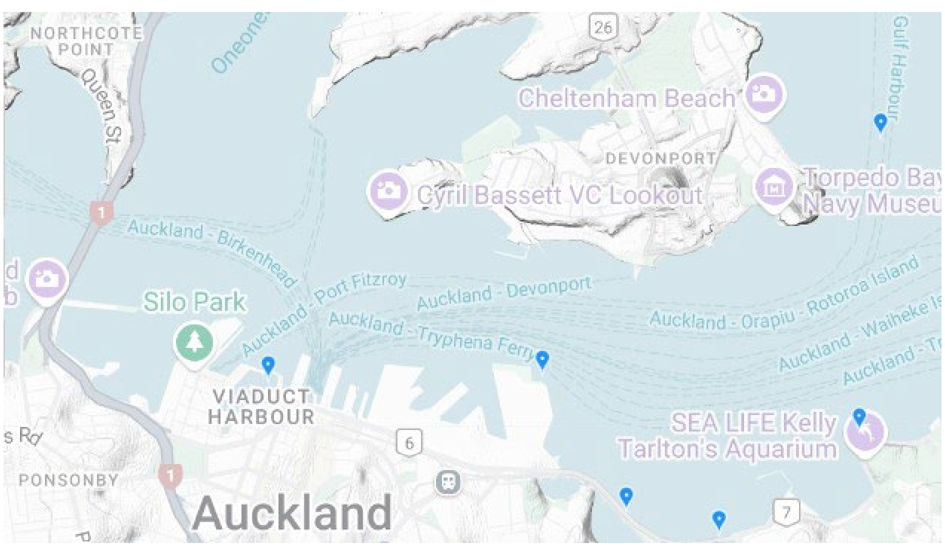


Figure 12: New Zealand fur seal sightings in iNaturalistNZ (accessed 16 November 2024).

Other marine mammal species documented in the lower harbour include bottlenose (*Tursiops truncatus*) and common dolphins (*Delphinus delphis*) and Orca (*Orcinus orca*). Dolphins (mostly species not specified) are seen in pods of varying sizes. Orca are typically sighted (in groups of two to eight) in the lower harbour anywhere from North Head, Devonport, adjacent to the port and from Harbour Bridge up to Birkenhead. Orca (which are a member of the dolphin family) have been seen in lower harbour relatively frequently and sometimes close to the waterfront (Figure 12). Examples of sightings include:

- Off Wynyard Point 3 December 2014.
- In the outer Viaduct harbour on 9, 11 November 2015,
- Off waterfront 6 May 2016.
- Alongside Bledisloe terminal in November 2017 (link to video),
- At Auckland harbour bridge May 2018.
- In harbour 26 September 2019.
- In the outer Viaduct harbour on 9 September 2023.
- Off Westhaven, in outer Viaduct harbour 17 November 2024.

iNaturalist has multiple records of Orca in the lower harbour.

False killer whales (a member of the dolphin family) were seen at Okahu Bay in 2005. Other cetaceans that have visited the harbour include a southern right whale sighted just off the eastern breakwater of the container terminal in August 2015 and off Tamaki Drive the same day (iNaturalist records), a false killer whale in March and April 2022.

5.4.3 Marine mammal values

As summarised in Table 6, two of the five most common marine mammal visitors to the Waitematā harbour, bottlenose dolphin and Orca have a “Threatened” conservation status which identifies them as have very high ecological values. The national population of Orca is estimated as 150-200 individuals within New Zealand waters. Leopard seal are considered to have a high value status as they are uncommon visitors.

Most marine mammals (with the exception of seals) are short term visitors to the lower Waitematā Harbour. The most common cetacean visitors are common dolphin, bottlenose dolphin and orca. New Zealand fur seal are more common than leopard seal which is typically represented by a solitary visitor.

In summary, under the EIANZ species value classification system (Appendix B), fur seal and common dolphin are categorised as having low value, leopard seal have moderate value, bottlenose dolphin and orca have very high value.

5.5 Fish

The waterfront area and shores of the Waitematā Harbour provide a range of habitats (open water, intertidal and subtidal sediment, intertidal natural hard shore and subtidal reef and man-made structures such as wharf piles and pontoons) utilised by coastal fish. The habitat provide shelter and food for a range of common hard shore and reef fish species and sediment contains a range of food species such as crabs, shrimps and molluscs taken by bottom feeding fish.

A wide range of fish species would be expected in the available harbour habitats based on earlier studies and overviews (Morton & Miller 1968, Biggs 1990) or are observed or caught by recreational fishers. Inglis et al. (2010 a,b,c) surveyed fish present in Westhaven Marina, the Viaduct and the Port using baited opera house traps. Table 7 provides a summary of species identified. The fish fauna includes introduced species such as the Asian goby, the bridled goby and oyster blenny (Francis et al. 2003, 2004). The wider harbour supports a greater number of fish species including flatfish, rays and sharks.

Table 7. Fish species identified from biosecurity surveys in Port and other Auckland waterfront locations.

Common Name		Westhaven	Viaduct	Port
Indigenous species				
Congor eel	*Conger wilsoni*			**Y**
Short-finned eel	*Anguilla australis*			**Y**
Yellow-eye mullet	*Aldrichetta forster*	**Y**		**Y**
Kahawai	*Arripis trutta*	**Y**		
Spotty	*Notolabrus celidotus*	**Y**		**Y**
Snapper	*Pagrus auratus*	**Y**		**Y**
Spotted robust triplefin*	*Grahamina capito*	**Y**		
Mottled triplefin	*Forsterygion malcolmi*	**Y**		
Common triplefin	*Forsterygion lapillum*			**Y**
Striped/variable triplefin	*Forsterygion varium*			**Y**
Striped clingfish (goby)	*Trachelochismus melobesia*	**Y**		**Y**
Goby sp.	*Eviota sp.*		**Y**	
Tarakihi	*Nemadactylus macropterus*			**Y**
Trevally	*Pseudocaranx dentex*	**Y**		
Yellowtail horse mackerel	*Trachurus novaezelandiae*	**Y**	**Y**	**Y**
Silver trevally	*Caranx georgianus*	**Y**		**Y**
Koheru	*Decapterus koheru*			**Y**
Blue-striped goatfish	*Upeneichthys lineatus*			**Y**
Goatfish	*Upeneichthys porosus*			**Y**
Silver sweep	*Scorpis lineolata*			**Y**
Non-Indigenous				
Asian goby	*Acentrogobius pflaumii*			
Bridled goby	*Arenigobius bifrenatus,*			**Y**
Australian oyster blenny,	*Omobranchus anolius*			

Notes. * triplefins are also referred to as blennies. Information from Inglis et al. (2010 a,b,c).

Snapper are the most sought-after fish for recreational fishers in the harbour, but a range of other fish are caught including squid (*Sepioteuthis australis*). Fishing (from small boats) occurs off the Fergusson container terminal and in Judges Bay around the Compass Dolphin marker. Shoreline fishing is common from the eastern rock revetment of the Fergusson Container terminal (public access), from the end of Queens Wharf and Wynyard Point and other nearby public wharfs (e.g., Okahu Bay).

Overall, there is no information that indicates that the areas within the harbour adjacent to the BN or FN areas provides habitat that supports fish species of conservation significance or provides substantial nursery area for any species of commercial significance or provides high quality recreational fishing.

None of the fish known to be present within the lower Waitematā Harbour have significant conservation values or are protected under the Wildlife Act 1953 Schedule 7 species.

5.6 Intertidal Ecology

5.6.1 Bledisloe North

The BN intertidal environment comprises steel piles at both ends of the reclamation with wooden fender piles at the west end (upper middle in Figure 14) along with a basalt revetment making up the northern face of the reclamation (upper right through second row in Figure 14).

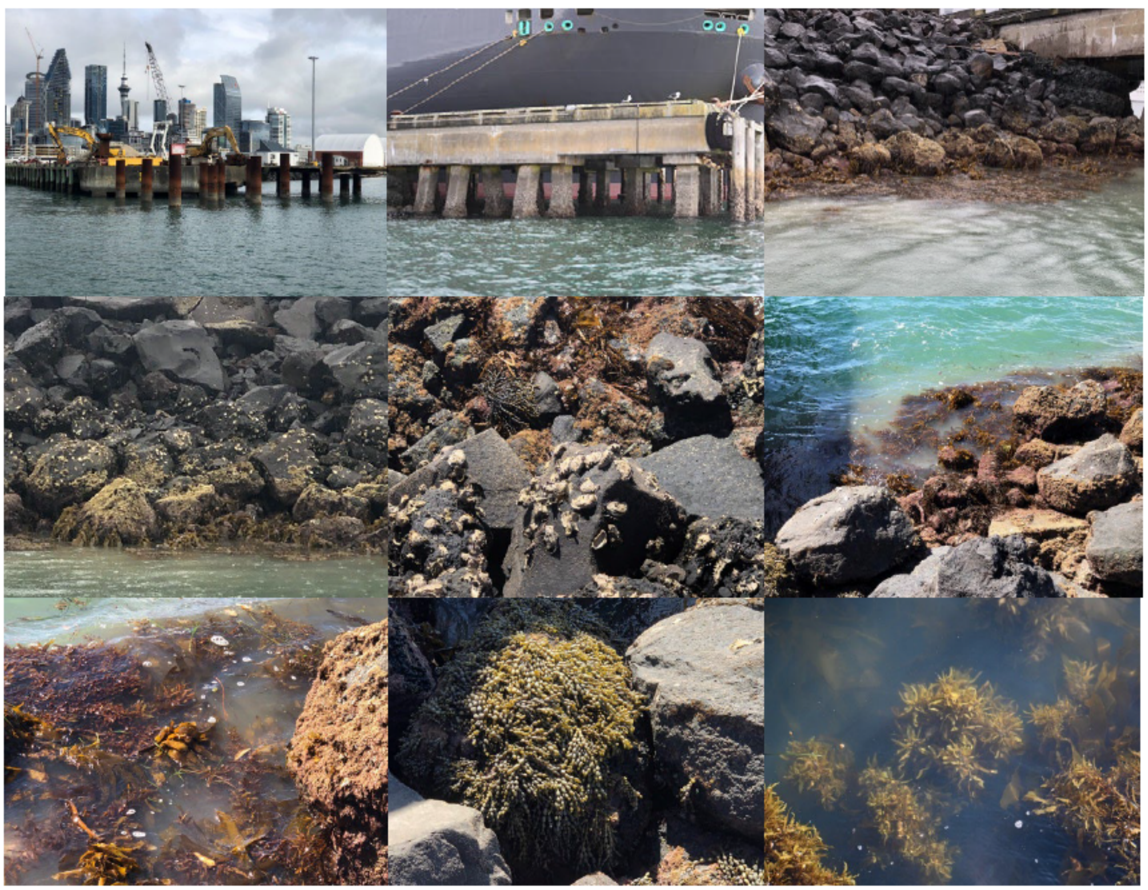


Figure 13: Intertidal rock revetment BN (April to October 2024).

The tidal height on the revetment ranges over 0.2-3.5 m (3.3 m) during spring tides and 1.1-2.8 m (1.7 m) during neap tides. The images of the low tide rock on the revetment in Figure 13 were taken during spring low tides. Upper intertidal zonation is typical of that seen around the

Waitematā Harbour. In the lower harbour, basalt rocks have been used (till 2024) on all revetments in the lower harbour (Wynyard Point to Tamaki Drive etc.).

The colonisation process on the basalt likely differs slightly from the natural sandstone shore (due to the harder nature of the basalt surface) but that seen on the BN revetment is the result of 40-48 years of colonisation and growth. The length of time to reach the full intertidal communities would likely have taken at least 10 years. Within the upper more exposed section of shore, revetment rocks support scattered northern rock oyster (Tio Repe, *Saccostrea glomerata*), ornate limpets (Ngakina, *Cellana ornata*), snakeskin chitons (*Sypharochiton pelliserpentis*) spotted black top shell (Maihi, *Diloma aethiops*) and common catseye (Pupu, *Lunella smaragda*). Towards low tide, the ecology becomes dominated by a range of encrusting and foliose alga. The ecological communities on the basaltic rocks that forming the eastern tide deflector were described by Larcombe (1973) and the ecological communities present on the rock revetment of the small breakwater present prior to the construction of the MRC were described in POAL (1989).

The study of the now inner breakwater at the MRC by POAL (1989) found 23 species of gastropod and 11 species of bivalve molluscs along with nine polyplacophoran mollusc species (chitons) along with at least nine crustaceans and four echinoderms (including kina (*Evechinus chloroticus*)) in addition to other biota. Many of these species will inhabit the basalt revetments around the container terminal and Bledisloe Terminal.

Key algal species on the BN revetment rocks are Neptune's necklace (*Hormosira banksia*) and rock velvet (likely *Codium convolutum*) and below them the larger "kelp" species such as paddle weed (*Ecklonia radiata*) along with *Sargassum sinclairii and Carpophyllum species.* The introduced wakame (*Undaria pinnatifida*) is present within the harbour but its growth is seasonal, dying back in winter. The other key alga at the low tide are the encrusting species (pink paint and *Corallina officianalis*).

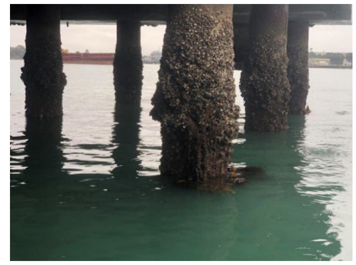
There are steel piles supporting the existing wharf deck at the end of B2 wharf (east) and B3 (west) ends of the revetment (Figure 14). Like the revetment, the piles have been in place for at least 40 years with the exception of the piles without decking located at the northern end of the B2 wharf which are more recent (and will be removed as part the proposed project).

The piles in both locations have similar tidal zonation's dominated, by Pacific oysters (*Megalenna gigas*) and kelp (*Ecklonia radiata*) forming a band at low tide with Sargassum and Carpophyllum below that (Figure 14).

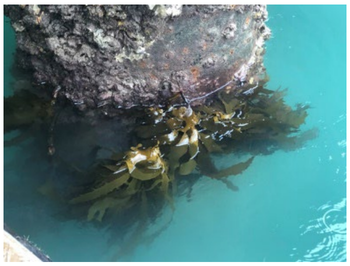
Kelp beds, species of true kelp, (the large brown alga present in the harbour) and bull kelp (Durvillaea) are notable habitats within the regional and national intertidal environment. Kelp beds (and other alga within that community) provide a range of significant natural resource values or services including structural habitat for other biota, food, provide carbon sinks and dissolved and particulate carbon for other biota and shelter for juvenile fish. *Ecklonia radiata* is a widespread kelp species/community typically on coastlines with at least moderate exposure. The existing habitat is considered to have moderate to high ecological values due to its historical loss from this part of the Waitematā Harbour shoreline. This community has however re-established on the revetment shorelines around the harbour.

East BN

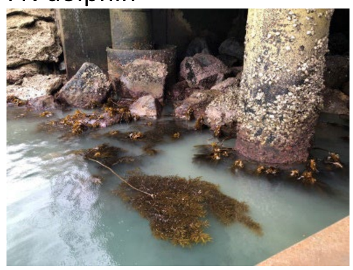
FN dolphin



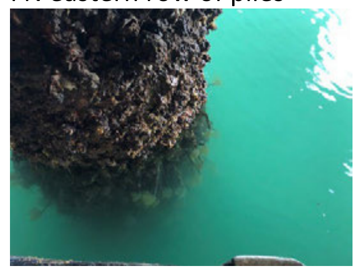
FN eastern row of piles



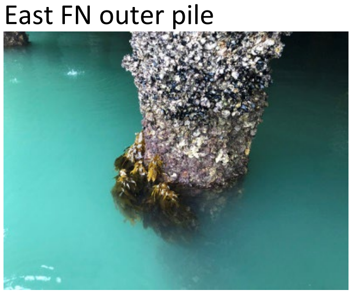
East FN outer pile



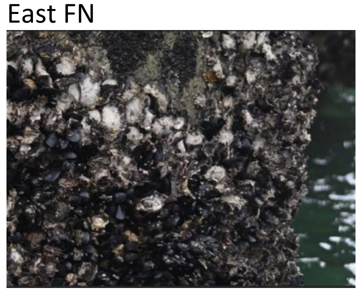
East FN



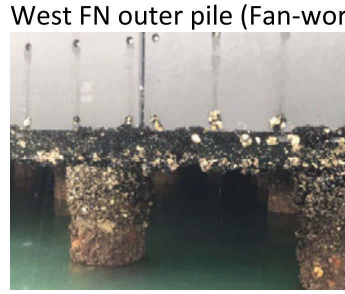
West FN outer pile (Fan-worms)



West FN north face outer pile



West FN pile



North face FN fender, little black mussels

Figure 14: Existing steel piles at BN and FN (September and October 2024).

5.6.2 Fergusson North

The rock revetment at FN wharf is entirely under the wharf within a light reduced environment apart from the eastern end where it abuts the reclamation. *Ecklonia* can be seen on the rocks at the eastern end but within a short distance under the wharf the kelp disappears due to the reduced light. Ecklonia is also present at low tide water level on outer wharf steel piles on the north face and at the east and west ends (e.g., see Figure 13). It is likely that both Sargassum and or Carpophyllum are present submerged below the Ecklonia.

Piles at FN are encrusted with pacific oysters (*Magallana gigas*). Within the oyster cover, blue mussel (Mediterranean mussel *Mytilus. galloprovincialis*) and probably the indigenous blue mussel (*M. edulis*) are common and green lipped mussel (*Perna canaliculus*) are less common but present. The steel piles at FN have been in place for about 10 years (section 2.3.2). Little black mussels (*Xenostrobus neozelandicus*) can also be seen around the edges of the main wharf face fenders where they can't be rubbed off. Mediterranean fan-worm was observed on some piles.

The intertidal rock revetment under the wharf has a very monotonic appearance, no significant epifauna (e.g., molluscs) and no alga. This reflects the lack of light under the wharf (Figure 14).

Examination of revetment rocks under the Fergusson Container Terminal wharf (west side) has identified encrusting sponges such as *Cliona celata* and *Microciona coccinsa and Tethya aurantium* a golf ball sponge dominated (POAL 1996).

Figure 15: FN under wharf environment (October 2024).

5.6.3 Habitat & conservation value

Habitat and conservation values within the intertidal zone can be considered in relation to a number of factors including presence of an area of regional conservation significance, presence of habitat of regional or local significance or presence of a species of conservation significance (rarity and being a protected species).

The BN revetment intertidal habitat is a man-made hard substrate habitat that forms a major part of the shoreline habitat around the lower Waitematā Harbour.

The shoreline is not within any Significant Ecological area (Marine) (as set out in Schedule 4 of the Auckland Unitary Plan). There are Significant ecological areas within the Waitematā harbour. To the south-east of the Fergusson Container Terminal is an SEA-M2 and M2w area (Orakei Basin and Hobson Bay) used by wading bird species (including terns, gulls and pied stilts) and nesting shags (1,200 m distance) (Figure 16).

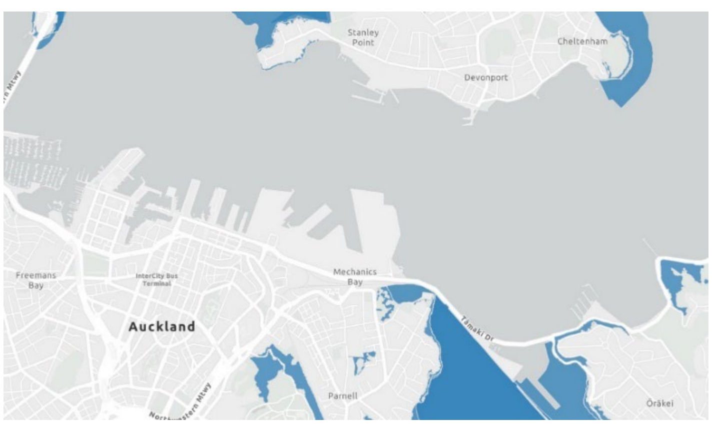


Figure 16: Location of SEAs in proximity to the POA (Auckland Council Open data, 8 October 2024).

Across the harbour to the north-west are the SEA-M2 areas of Shoal and Ngataringa Bays (2,000 m and 3,000 m distance), SEA-M1 and M1w areas associated with shell banks used for roosting by coastal birds including New Zealand dotterel. Around North Head to Takapuna is an SEA-M2 area that includes ecology associated with rocky shore, headlands and intertidal beaches (closest distance 2,600 m). The closest areas of significance for intertidal/subtidal ecological resources not identified in the Unitary Plan are the eelgrass beds in Stanley Bay across the harbour (1,400 m) and in Okahu Bay to the east of the Port (2,600 m) (Figure 16).

In relation to significant ecological areas within the coastal marine area (CMA) (Significant ecological overlays), the habitat is not at the limit of its natural range, it is not a threatened or rare indigenous ecosystem, and it is not a natural habitat that is vulnerable to modification.

Section 7A of the Wildlife Act provides protection for a number of specified marine invertebrate species (declared to be animals protected under the Act). The species include a number of corals and hydrocoral species that are found in deeper waters of New Zealand but not associated with intertidal environments such as the project site.

The community present on the BN revetment rocks structure is very similar to that present on revetment rocks elsewhere within the lower harbour in particular the eastern revetment of the Fergusson Container Terminal. The location represents one of the more wave exposed locations of its kind and supports a relatively major band of kelp and associated biota.

A comparison of known species with the marine invertebrates of conservation significance (Funnell et al. 2023) was not carried out. Based on previous surveys within the Waitematā Harbour there are no known indigenous taxa present listed as threatened or at risk in New Zaland (based on the NZ Threat Classification System).

5.6.4 Summary

The BN revetment supports a good example of kelp habitat on ‘constructed" hard substrate (in terms of the Waitematā Harbour). At BN this habitat has developed over a period of some 40 years. Although not uncommon it is considered to be a diverse community supporting a range of algal species and invertebrates.

At FN, there is kelp on the outer row of piles on all seaward facing sides of the wharf. The piles have abundant oysters along with blue mussel and some green mussel. The rock revetment under the existing FN supports a community adapted to low light conditions. The FN habitat has established over the last ten years.

5.7 Subtidal Ecology

5.7.1 Bledisloe North

The biology of the seabed off BN has been examined previously on two occasions. In 2000, box core samples were collected by diver to examine benthic infauna along a south to north transect (A) that ran from the eastern corner of BN out into the harbour channel (Figure 17). The samples were collected as part of the 2001 proposed dredging within the port approaches (Kingett Mitchell 2001). In February 2019, video was collected using a Seabotrix vLBV 300 ROV (operated by Fugro from MV Toanui) along four east west transects off BN (labelled FN1 through 4 on Figure 17).

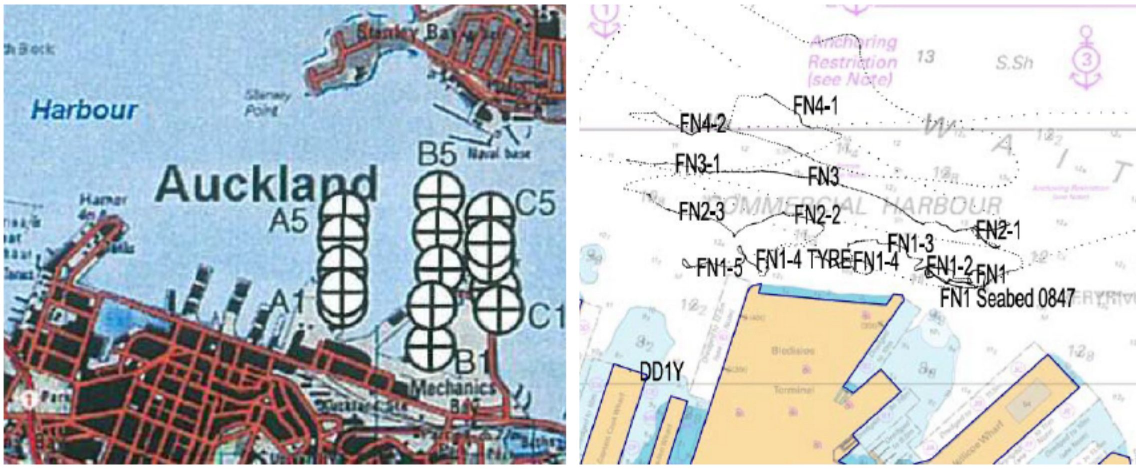


Figure 17: Location of benthic sample transects from Kingett Mitchell (2001) (left) and ROV transects in 2019 (right).

The 2001 survey seabed sampling provided qualitative epifaunal and quantitative infaunal biological information across the harbourside of both BN and FN. The biota was considered to be a sea squirt community (*Corella eumyota*). Four key species included two introduced species – the file shell (*Limaria orientalis*) and the amphipod *Corophium acherusicum*. The other two were the rose brittlestar (*Amphiura* sp.) and a *Prionospio* sp. polychate. Turret shells (*Maoricolpus roseas*) become more common closer to the main channel. The community composition was considered to be similar to that described by Hayward et al. (2000).

The 2019 ROV survey identified occasional golf ball sponges (possibly *Aaptos globosum*) along the inshore transect closest to the northern side of the reclamation (Figure 18). Appendix D provides more images from the transects in that survey.

FN1 FN1 FN1

Figure 18: Images from transect 1 off Bledisloe Terminal in February 2019 (refer Figure 8).

Further ROV video was collected across and adjacent to the toe trench by POAL (Chasing M2 ROV) in April 2024. The examination showed that the seabed off from the revetment appeared to be current influenced (some ripples) with minor to moderate shell fragments and shells with little shell appearing to be recent in origin. There was some evidence of bed disturbance by 'fish' excavating for food.

The epifauna was dominated by scattered sponges (mostly red golf-ball sponges and yellow finger sponges) with small islands of epifauna developed around points of attachment. These were mostly of low stature with Mediterranean fan-worm present on many islands along with some finger sponges. Mobile fauna was dominated by scattered red cushion stars (*Patiriella regularis*) which are a common starfish in the harbour and scallops (*Pecten novaezealandiae*) were seen occasionally (Figure 19 illustrates examples of epifauna).

Water depth from low tide is about 10 m at the revetment. Kelp species occupy much of that space but subtidally, kelp fronds appear to carry some sediment load. Kelp is replaced with tall finger sponges (*Calyspongia ramosa* which grows to over 0.5 m and higher) plus a number of other encrusting sponges and cushion stars (bottom row Figure 19). At the base of the revetment, there were areas of soft sediment up against the revetment which showed signs of burrows (probably shrimp) (e.g., right bottom row of Figure 20). The revetment rocks provided substrate for a range of sponges including tall finger sponges. Cushion starts were common.

Golf ball sponges | Fan-worm | Starfish (cushion star)

Scallop

Revetment base (west end) | Cushion stars and sponges on rock | Soft sediment burrow

Figure 19: Images from toe trench transect and base of BN revetment (April 2024).

5.7.2 Fergusson North

On 13 March 2019, seabed photographs were obtained using a Seabotrix vLBV 300 ROV operated from the wharf (as no vessel was berthed). Information was collected from eight transects (W1 at the western end and W8 at eastern end) as shown in Figure 20. Transects W7 and W8 (the two transects at the stern of the container ship) from that survey are adjacent to the area of piling for the FN extension. Figure 21 shows some image examples with more examples provided in Appendix E.

The first 3-4 sites on each of the transects in Figure 20 are located within the berth pocket which was dredged at the time the FN wharf was constructed. Seabed along transects W7 and W8 were defined as hard substrate, comprising sandstone or firm clay-type sediments and including rocks and gravel (derived from berth dredging). Most sites had no visible epifauna or occasional epifauna (Figure 21). Epifauna seen at two locations comprised sponges and hydroids.

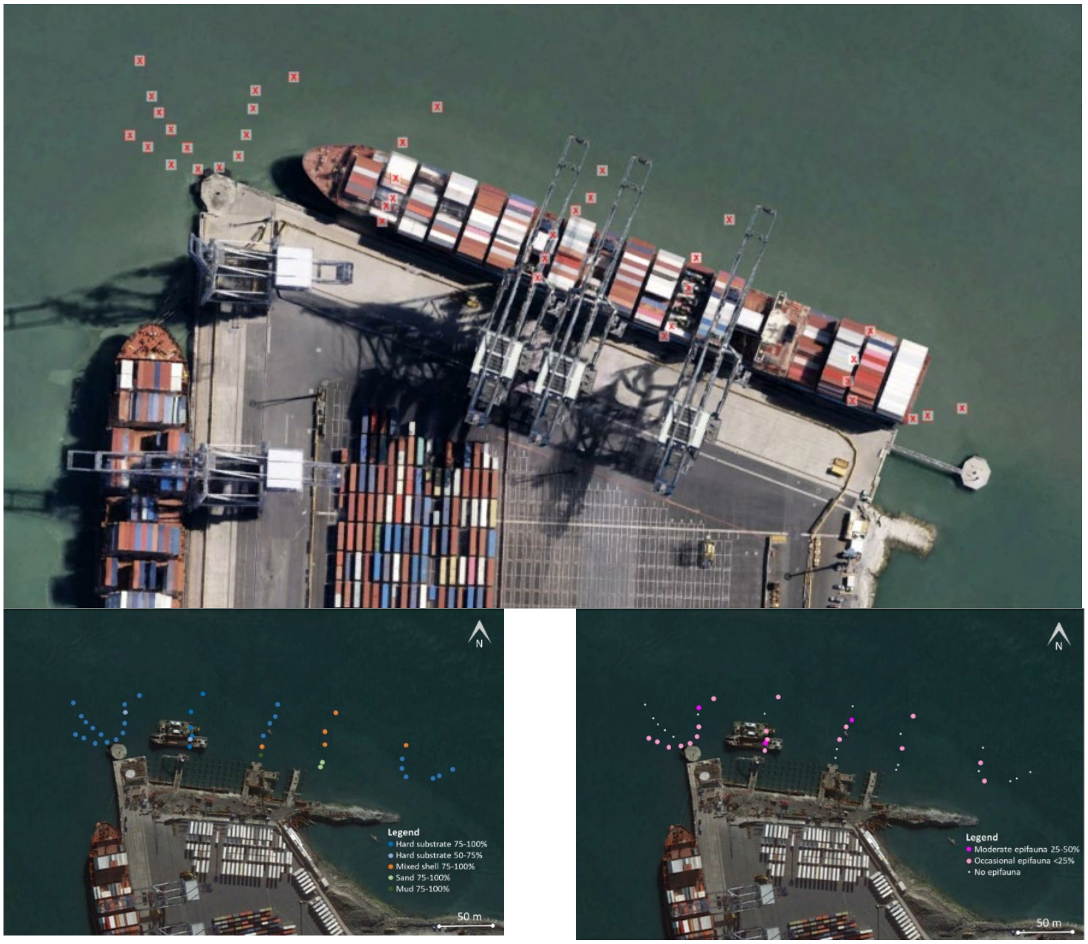


Figure 20: Upper: Location of ROV survey locations off FN berth March 2019. Lower: Dominant substrate types and epifaunal abundance from Ramboll (2019) (Note the two lower aerial images from Ramboll (2019) were taken in 2016 and construction of FN berth had been completed by the survey date).

The sites sampled in the Kingett Mitchell (2001) study were within the approaches to the now FN berth. The sites which were considered a coarse substrate community had ~50 species on average dominated by polychaetes and arthropoda, with smaller numbers of other species. Prior to the 2001 benthic study, a previous examination of the seabed ecology was carried on the eastern side of the then container terminal where three transects were sampled from the reclamation out into Judges Bay. The northern transect was located just south of the end of the current rock revetment. The substrate was dominated by sand and shell gravel. The invertebrate community was dominated by small bivalves (e.g., *Limaria orientalis*), turret shells (*Maoricolpus roseas*), hermit crabs and echinoderms along with sponges and bryozoans (POAL 1996).

The 2019 ROV survey off the FN wharf showed a relatively coarse seabed with little deposited fine material. As shown in the images in Figure 21 many of the photographed locations showed a firm substrate with material suggestive of past local dredging with the surface clear of fines due to high current velocities.

W7 W8 W8

Figure 21: Images from the ROV transects off FN in February 2019 (refer Figure in Appendix E).

5.7.3 Habitat & conservation value

The subtidal seabed habitat close to the north side of Bledisloe Terminal did not support any habitat of note. Scattered sponges were present, but these were not considered to constitute sponge gardens as there was significant areas of sediment without epifauna. BN revetment intertidal habitat is a man-made hard substrate habitat that forms a major part of the shoreline habitat around the lower Waitematā Harbour.

The community present on the subtidal revetment rock structure is expected to be very similar to other revetment locations of similar depths elsewhere in the harbour. The location represents one of the more wave exposed locations of its kind in the harbour and supports a relatively major band of kelp and associated biota. The revetment does support sponges towards its base, but the community composition is expected to be similar to adjacent areas of the harbour (e.g., the eastern revetment of the container terminal).

5.7.4 Introduced species (Biosecurity)

5.7.4.1 Introduction

The National Marine High Risk Surveillance Surveys (NMHRSS) provide data on the presence of non-indigenous species (NIS) in the Waitematā Harbour of which the Port is a key area. The surveys use multiple sampling techniques to assess the presence of species across the varying habitats. These principally include diver surveys (e.g., on wharf piles), benthic sled sampling (seabed sediment) and crab (box) traps (around structures). As part of that program two 'baseline' surveys were carried out in 2003 and 2006 (Inglis et al. 2006, 2010). To provide information about possible presence of NIS species within the area of the BN toe trench, the information collected in the 2021-2022 and 2022-2023 surveys (Woods et al. 2022, 2023) was examined. Figure 22 shows the sites sampled using benthic sled sampling in the 2021-2022 summer survey. The focus of the available information are samples collected within the area from the east end of the FN berth across to the end of the Captain Cook wharf. A full biosecurity review was undertaken as a requirement of the assessment prepared for approval to dispose of excavated sediment at the CDS (KEL 2024). The information in this section has utilised information collated in that assessment. In the case of the excavation, the primary biosecurity issue is whether the excavation will enhance the spread of any NIS of concern

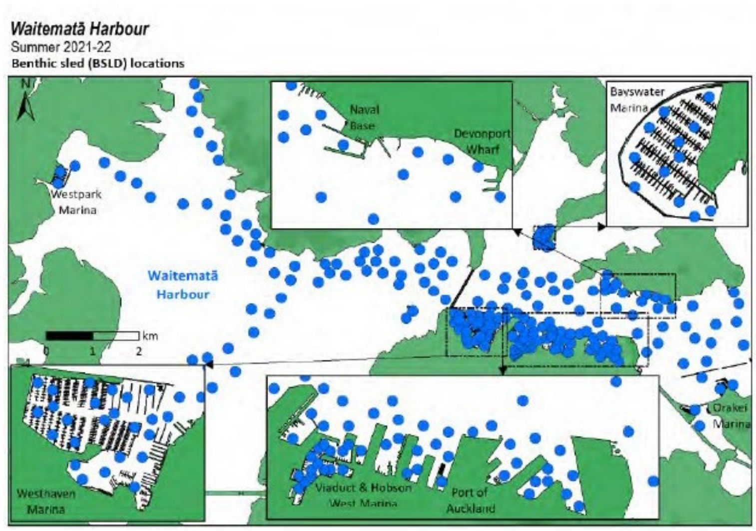


Figure 22:Extent of benthic sled sampling locations in the summer 2021-2022 biosecurity survey (from Woods et al. 2022).

5.7.4.2 Primary target species

None of the five Biosecurity New Zealand primary target species have been detected in New Zealand (KEL 2024).

5.7.4.3 Secondary target species

There are four secondary target organisms that have established in New Zealand. These are the Asian date mussel (*Arcuatula senhousia*), Australian droplet tunicate (*Eudistoma elongatum*), Mediterranean fanworm (*Sabella spallanzanii*) and clubbed tunicate (*Styela clava*). The fan-worm is a notifiable organism under Biosecurity (Notifiable Organisms) Order 2016.

Three of the four secondary target species (have been found in the wider Waitematā Harbour. Table 8 summarises the results of sampling undertaken as part of the MHRSS over the last two survey periods with full published reports (Woods et al. 2022, 2023). The Asian date mussel has been intermittently historically present but has not been found in samples in the four surveys summarised in Table 8.

The Australian droplet tunicate was not detected in the Waitematā Harbour in the four surveys identified in Table 8 (Woods et al. 2022, 2023). However, the Marine Biosecurity Porthole (https://www.marinebiosecurity.org.nz/search-for-species/) does show detects (identified as MITS records) on Motuihe and Waiheke Island and a location at Birkdale within the harbour.

Table 8. Secondary target species in the Port Precincts in Waitematā Harbour.

Species/MHRSS	**Winter July 2021**	**Summer April 2022**	**Winter August 2022**	**Summer April 2023**
Number of Benthic sled sites*	24	251	30	27
Number of crab pot sites in Port*	23	25	25	22
Arcuatula senhousia (Asian date mussel)	0	0	0	0
Sabella spallanzanii (Mediterranean fanworm)	8	13	6	13
Styela clava (clubbed tunicate)	4	1	3	5
Survey reference	Woods et al. (2022	Woods et al. (2022)	Woods et al. (2023)	Woods et al. (2023)

Note. * In the section of the Port described in Section 5.7.4.1.

5.7.4.4 New NIS in the harbour

In the last two published MHRSS surveys and the two subsequent surveys (summary information provided by MPI) there have been five new to New Zealand species detected and five new species to the harbour which represent range extensions (Table 9).

Table 9. NIS species in the Port Precincts (adjacent to the toe trench) in Waitematā Harbour.

Species/MHRSS	**Winter July 2021**	**Summer April 2022**	**Winter Aug. 2022**	**Summer April 2023**
Number of Benthic sled sites	24	251	30	27
Number of crab pot sites in Port	23	25	25	22
Crustaceans				
Charybdis japonica (Asian paddle crab)	14	7	11	6
Pyromaia tuberculate (pear crab)	1	0	1	3
Molluscs				
Polycera hedgpethi	-	-	0	2
Theora lubrica (bivalve, Asian semele)	5	3	12	13
Tritia burchardi (gastropod)	13	15	20	16
Reference	Woods et al. (2022)	Woods et al. (2022)	Woods et al. (2023)	Woods et al. (2023)

No exotic Caulerpa (*Caulerpa brachypus and Caulerpa parvifolia*) was detected during these surveys in the Waitematā. The nearest known populations of exotic Caulerpa are from coastal waters at Waiheke Island. Information on new species is summarised below.

Golder (2018b) identified 49 NIS in the wider port and waterfront area. Of the NIS species many are associated with artificial structures (e.g., piles and pontoons). Table 9 identifies those NIS that are more likely to be found within the area off Bledisloe Terminal as they have been found on the seabed or have been found within the Port and are mobile (from KEL 2024). The ROV information obtained from at and adjacent to the toe trench in April 2024 showed that the principal NIS within the area is the Mediterranean fan worm. This species appears as one of the more common species present within 'mini' habitat islands (refer Section 4.7.1).

5.8 Summary

The key components of the coastal marine environment at the site of the proposed BN and FN works comprises:

- There is no indication that indigenous lizards are utilising the rock revetment at the proposed BN wharf location. The revetment immediately behind the FN extension is yet to be constructed.
- Two of the five most common marine mammal visitors to the Waitematā harbour, bottlenose dolphin and killer whales have a "Threatened" conservation status which identifies them as have very high ecological values. Leopard seal are considered to have a moderate value status as they are uncommon but regular visitors. Marine mammals (with the exception of seals) are short term visitors to the lower Waitematā Harbour.
- Two bird species with a very high conservation significance (red-billed gull and white fronted tern) nest relatively close to the location of BN works. Both species have nested in the Port in variable numbers for a number of years and both nest in close proximity to busy port operations. There have been no sightings, sign or 'detection' of little penguin (also a species of conservation significance) within the port. No little penguin were detected on the BN rock revetment using a penguin detector dog. A single detection (but not found) was identified by the dog (during two different surveys) in the section of the eastern container terminal revetment south of the location of FN works. Little penguin are known the nest within the rock revetments at and adjacent to the Marine Rescue Centre some 620 m south of the proposed FN extension.
- Areas adjacent to the BN or FN works do not provide habitat that supports fish species of conservation significance or provides substantial nursery area for any species of commercial significance or provides high quality recreational fishing. None of the fish known to be present within the lower Waitematā Harbour have significant conservation values.
- The BN revetment supports a good example of kelp habitat on 'constructed" hard substrate (in terms of the Waitematā Harbour). At BN this habitat has developed over a period of some 40 years. Although not uncommon it is considered to support a diverse community.
- Intertidal ecology of steel piles at BN and FN are dominated by oysters with mussels along with a zone of kelp below. The habitat on the wharf piles has developed in about ten years.

- The subtidal seabed habitat close to the north side of Bledisloe Terminal and FN wharf did not support any habitat of note. Scattered sponges were present.
- A range of NIS are known to be present within the Port through six monthly surveys of NIS. Several epifuanal and infaunal NIS have been identified associated with seabed adjacent to Bledisloe Terminal. Fan-worms were identified in the toe trench footprint and appeared to be the most common NIS present.

6 EFFECTS OF PROPOSED CONSTRUCTION WORKS

6.1 Introduction

This section examines the effects of proposed construction activities in relation to effects on the various physical and ecological resources with the Waitematā Harbour. The key matters examined include:

- Effects of demolition of the deck structure at the western end of BN.
- Construction of the BN and FN revetment.
- Excavation of the BN toe trench.
- Construction of the BN and FN wharf structures (piling works).

6.2 Demolition Works (BN)

As described in Section 2, a section of the existing wharf structure located at the eastern end of the Bledisloe Terminal will be removed. The demolition involves:

- Removal of the reinforced concrete deck associated with the extension constructed in 2017 (refer Figure 23).
- Removal of concrete filled steel cased piles to seabed level associated with the structure shown in Figure 23. It is expected that 8-9 piles will be removed.

No adverse environmental effects are anticipated from the demolition of the deck structure.

There are two options for removal of the steel piles:

- Remove the piles from their sockets. This is normally accomplished by breaking the seal between the pile/steel jacket and the surrounding material. It may require drilling and vibro-hammering to be able to pull the piles out. The depth of the existing piles is expected to make this very difficult.
- Cut the piles at the seabed. This is typically carried out by divers.

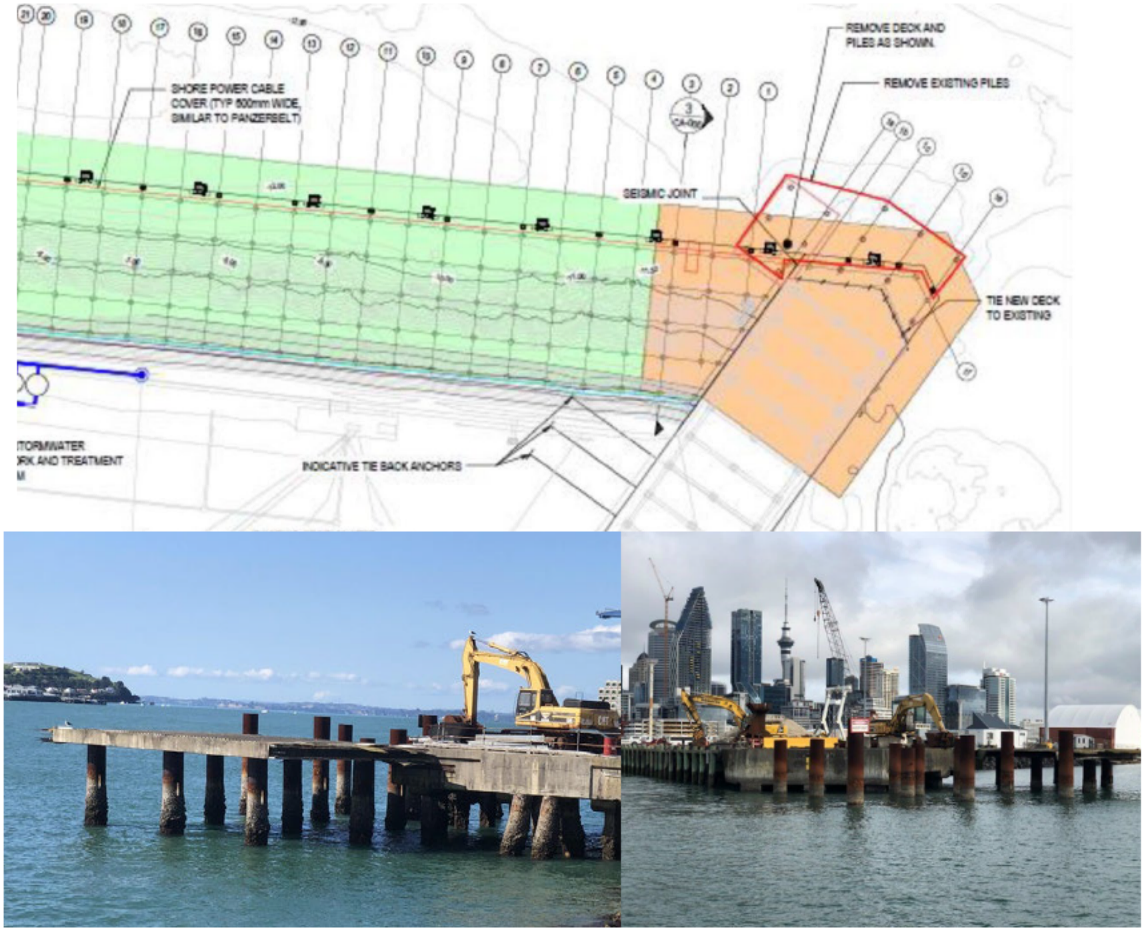


Figure 23: Piles and deck at north-east corner of Bledisloe Terminal to de demolished.

Given current uncertainties regarding the success of the first option, it is assumed that piles will be cut at the seabed. The piles will then be craned onto the Bledisloe Terminal. In relation to potential effects associated with either pile removal method:

- It is recommended that if the piles are cut, the piles are cut below the surface (e.g., 0.1-0.2 m). This will allow the top of the piles to become covered with sediment.
- Removal of piles would generate minor underwater turbidity and noise. Both are short term and considered negligible compared to effects associated with toe excavation and piling (both assessed further in following sections). Short term localised disturbance of fish might occur as piles are lifted from the water.
- Some minor loss of marine growth from the piles may occur during lifting. As described in Section 4.6, fan worm are well established in the Port, on the seabed alongside the BN reclamation and elsewhere in the lower Waitematā Harbour. This pest species is a notifiable organism (Section 45 and Biosecurity (Notifiable Organisms) Order 2016) under the Biosecurity Act 1963. Section 52 of the Act sets out restrictions of the spread of an unwanted organism. This requires the piles are not transported elsewhere with fan-worm attached as there are other locations in the north island that have fan-worm management programs in place.

None of the potential effects associated with this work element are considered adverse, all are localised and of a temporary nature. The site ecological value is considered moderate, the magnitude of effect low and as a result the overall level of effect is considered low.

6.3 Revetment Works (BN and FN)

6.3.1 Introduction

Activities including revetment works, toe trench excavation (Section 6.4) and piling (Section 6.5) have the potential to result in discharges. Those occurring within the Port Precinct must comply with the water quality standards set out in Section F2.21.8.1 for the General Coastal Marine Zone (within the Waitematā Harbour) to be a permitted activity. If the discharges do not comply, then POAL will need to separately obtain a resource consent under the AUP. The standards in F2.21.8.1 are:

1) The discharge must not, after reasonable mixing, give rise to any or all of the following effects:

(a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

(b) any conspicuous change in the colour or visual clarity water in the coastal marine area;

(c) any emission of objectionable odour; and

(d) any significant adverse effects on aquatic life

As set out below, the activities would be expected to meet these requirements. Procedures used during the proposed works will assist in managing changes that might influence water quality.

6.3.2 Bledisloe (BN)

The methodology to undertake the upgrading of the Bledisloe revetment is described in Beca (2024a). The key elements of the works are:

- Trim and removal some of the existing revetment rocks (seaward face) within a narrow strip (up to 13 m width).
- Installation of piles (two rows of five piles each except at both ends where new pile numbers are reduced due to presence of existing piles and deck).
- Installation of geotextile onto bed around piles and into toe trench.
- Placement of new underlayer and armour rock (to specification) on the revetment surface.

A work platform is constructed on the first two rows of piles and following completion of the work associated with the first rows of piles the work is repeated in the adjacent strip. This is then repeated along the length of the existing revetment. This methodology is typical for construction of this kind and a similar construction method was used for the construction of the FN wharf that was completed in 2019 (refer Figure 26).

During the revetment works it is expected that some man-made debris will be encountered especially in the upper part of the revetment. This debris will be removed from the revetment and taken away for disposed to landfill.

The works on the revetment will have no effect on coastal bird species nesting within the Port. As described in Section 5.3.5, no little penguin have been detected in the revetment in surveys to date. Overall effects are considered likely to be negligible. As part of ongoing investigations prior to construction, further little penguin surveys will be carried out to confirm their absence (refer Section 9.4).

The work will result in the loss of existing intertidal and subtidal habitat (described in Section 5.6 and 5.7). With the proposed construction, the community will not re-establish on the new revetment due to the new revetment being shaded by the new wharf deck. The expected loss is of a local nature. The completion of the remaining revetment for the container terminal reclamation will provide further exposed revetment habitat. The overall effect of the revetment upgrading work on existing habitat (particularly intertidal habitat) will be moderate to high. Mitigation is proposed to provide ecological benefit for this habitat loss.

6.3.3 Fergusson

The works associated with the revetment will involve:

- Trimming the seaward edge of the final mudcrete reclamation edge (existing edge shown in Figure 24) to provide a slope to lay revetment rock onto. The trimmed material will be placed onto the reclamation or disposed to landfill.
- Placement of new revetment rock to extend the existing revetment around to meet the existing revetment under the east end of FN wharf (refer Figure 24).

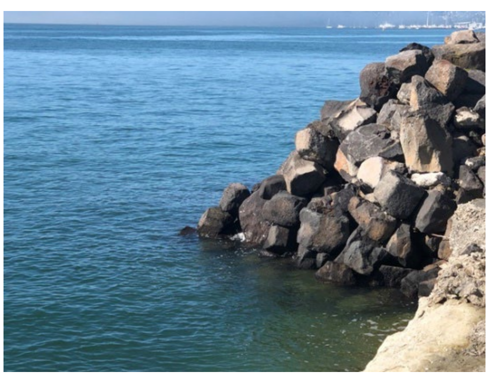


Figure 24. Upper: West end of Fergusson North berth showing Interface between end of existing eastern revetment and mudcrete reclamation.

In relation to the revetment works:

- The placement of mudcrete to complete the reclamation will be carried out under an existing resource consent (28384) and is not part of this application.

- Trimming and placement of rock to complete the reclamation would also have been carried out under the existing resource consent (28384). Initial rock placement on the seabed at base of reclamation will create minor local temporary disturbance with some suspension of sediment. The effects are considered to be negligible. Subsequent build of the revetment up from the base will result in little sediment disturbance.
- The end of the current revetment was layered with smaller rock. This will be removed and larger rock placed. This work will create some disturbance in the form of noise which will be of a short-term duration (several days during the day). The key receptor of any impacts at this location would be little penguins. The revetment is not a noise free environment due to truck movements alongside the revetment. Trucks queuing to pick up containers pass directly above the closest detected little penguin burrow. The burrow where penguin were seen was a burrow adjacent to the MRC located at the edge of the heliport. Marshall day (2021) undertook a review of noise disturbance effects on penguin and concluded based on indirect studies that noise levels above 80 dBL_{Aeq} might initiate behavioural responses. Although the short-term revetment works are being undertaken under an existing consent, disturbance related effects which will occur during the day are considered to be minor and restricted to periods during the day. Overall potential effects are considered to be low.
- There is no loss of intertidal habitat as will occur at BN with the construction of the BN wharf deck.

6.3.4 Meeting Standards

Overall, following reasonable mixing, discharges arising from the proposed revetment works for the BN wharf and FN extension would be expected to meet the water quality requirements of the F.2.21.8 standards of the AUP relating to discharges (Section 6.3.1 above).

6.4 BN Toe Trench Excavation

6.4.1 Introduction

Backhoe excavation has been used for nearly all maintenance and capital works dredging carried out across the Auckland waterfront for the last 25 years. This has included capital dredging for AC36 (Golder 2018a), Sealink ferry terminal capital dredging (Golder 2018b), Rangitoto Channel maintenance dredging (KEL 2021) and maintenance dredging at the Port undertaken under the existing resource consent for maintenance dredging (Permit No. 34673).

Backhoe excavation has also been consented (Coastal and discharge Permit CST60348302) for the major capital works deepening of the approaches to the Port and within the navigation channel (part of the Rangitoto Channel) (KEL 2019). Figure 25 shows the area of seabed between the FN berth and the Bledisloe Terminal which has been consented to be dredged using the same backhoe method proposed for the Bledisloe toe trench. Sediment to be dredged from the area shown in Figure 25 has also had approval granted by the EPA for disposal at the CDS.

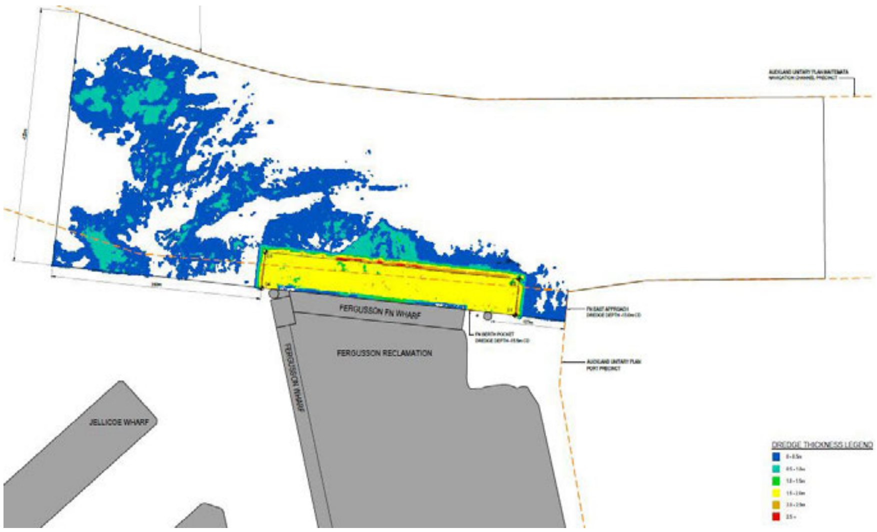


Figure 25: Consented areas of dredging within the Port approaches.

The proposed toe trench excavation is not part of the already consented approaches dredging.

The backhoe dredge will excavate sediment from the BN toe trench as part of each tranche of revetment works. It is currently proposed that sediment will be placed into a hopper barge positioned alongside. The sediment will be disposed to the CDS under POAL's Marine Dumping Consent EEZ400011 following approval of the assessment for marine disposal required by the MDC or alternatively disposed to an approved landfill or reclamation.

6.4.2 Loss of habitat

The proposed BN excavation will remove the current seabed within the toe-trench footprint. Existing soft-bottom habitat and associated in-fauna will be lost over a width of approximately 10 m. Examination of the footprint area as described in Section 4.6 found no epifaunal communities of ecological note. Overall, fauna was sparse through the area.

The toe-trench will provide a footing for the new rock revetment. As such the seabed will change from sediment to rock. The edge of the toe trench disturbed by excavation will relatively quickly stabilise as surface irregularities are evened by currents. The biological community inhabiting that sediment will recover over time following completion of excavation and revetment construction. That community would be expected to be very similar to currently present.

The effect is localised and is within an area subject to historical dredging activity. The effect on local habitat from the proposed BN excavation is therefore considered to be negligible to low.

6.4.3 Biosecurity

Construction barges will be sourced locally (currently working within the Waitematā Harbour) minimising biosecurity risks associated with importing NIS. Contractors such as Heron

Construction have Pest Free Warrants for their vessels and operate under Biosecurity Management plans.

As described in Section 5.7, the six-monthly marine biosecurity surveys carried out in Waitematā Harbour have shown that there are a high number of NIS present. Nearly all of these species are present on structures (e.g., piles and pontoons) with few on the seabed. The most common NIS seen within the trench footprint is the secondary target species, the Mediterranean fan worm. Other species such as the Australian whelk *Tritia burchidai* are likely to be present.

Excavation may result in loss of some NIS species to seabed adjacent to excavation. This may include fragments of Mediterranean fan worn produced during excavation. Although this species is able to regrow from fragments its presence on the seabed both up and down harbour would indicate that any loss of fan-worm pieces would be unlikely to adversely increase the harbour fan-worm population.

Biosecurity maters arising from the disposal of toe trench sediment to the CDS are not considered in this report as the disposal of sediment at the CDS (should it occur) is not part of this Application. They are required to be evaluated as part of the disposal assessment process under the MDC. The biosecurity aspects of the assessment are reviewed by MPI as part of the approval to dispose process.

The biosecurity effects relating to the proposed BN toe trench excavation are considered negligible.

6.4.4 Effects on Water Quality

6.4.4.1 Suspended sediment

During the proposed BN excavation (i.e., backhoe dredging), the amount of sediment that becomes suspended is dependent on a variety of factors but seabed sediment type and cohesion, bucket type, excavation operation, water depth and currents all influence losses of sediment during the excavation and transport up to the barge. Lumps and aggregates will fall adjacent to the point of excavation and will not contribute to downstream sediment plumes.

Estimates of losses from bucket dredgers have included 2.1 % and 4 % for mechanical dredgers (Anchor 2003, Becker et al. 2015). Beca (2019) also provided an evaluation of sediment loss during backhoe dredging identifying that about 10 % of the total dredged sediment mass would be lost to the adjacent water (80 kg/m^3 of material dredged). Larger aggregates would fall back to the seabed within the dredging area or at the edges of the dredging area. The offsite loss is dependent on nearfield currents, water depth and sedimentation.

Monitoring of TSS down-current of dredging activity has been reviewed previously and presented in Priestley (1997), BCHF (2001) and Beca (2019). The reviews included data from at least nine monitoring programs of various lengths. Monitoring has been undertaken during on-going port maintenance dredging (since 2001) and during the previous channel dredging 2004-2007 and Americas Cup dredging in 2018-2019. The previous Americas Cup and Rangitoto Channel dredging required sampling at a control site (500 m up-current), 50 and 200 m down-current from the dredging. Of the 35 sample events only one sample exceeded the 25 mg/L trigger value identified in the resource consent conditions granted for the previous Rangitoto Channel capital works dredging. A trigger value of 25 mg/L was also required (above that of a control site) in conditions granted for dredging associated with the recent Americas Cup development in Auckland and for the consented capital dredging in the Port Approaches and Rangitoto Channel.

Overall, monitoring has shown that elevated TSS can occur close to the proposed excavation, but downstream (200 m away from the dredging site) concentrations are similar to those measured upstream. Significant off-site changes in water clarity are not expected during the toe trench excavation. However, monitoring conditions are proposed (refer Section 9.2) and the excavation would be carried out under a Monitoring Plan (or standard operating procedure) which will allow for observation-based changes to excavation management to deal with significant visual plumes or elevated TSS concentrations should they occur.

6.4.4.2 Other contaminants

Water quality changes occur during excavation activities as a result of:

- Disturbance of the seabed which allows pore water held within the sediment (in animal burrows and between sediment grains) to mix with seawater that enters the hole created by the excavator bucket.
- Mixing of suspended sediment with seawater which results in desorption of some contaminants.

Pore water in burrows and in the surface layer of sediment is in a natural dynamic equilibrium with seawater as pore water diffuses into the water overlying the sediment. Biota (e.g., shrimps) moving in and out of the burrows and holes in sediment release pore-water from within the burrows. The likely water quality changes that can occur when sediment from dredging is mixed with seawater can be assessed in the laboratory using a surrogate test called the elutriate test which is the standard test method used to assess likely water quality changes during disposal of dredged material (e.g., refer Ludwig et al. 1989, USEPA 1991).

Elutriate testing has been carried out on a considerable number of sediment samples from the within the Port and the wider Auckland waterfront over the last 30 years. Elutriate testing was most recently undertaken for sediments (maintenance dredging) from within the Port (KEL 2022). It was also undertaken for some sediment samples collected as part of the testing and approvals for marine disposal of sediment from the Port approaches and the Rangitoto Channel. Typically elutriate testing is carried out when the concentration of a contaminant exceeds the ANZG (2018) DGVs (refer Section 4.3). For the toe trench sediment, an elutriate test was carried out for TBT (the sample with highest TBT concentration) and the elutriate contained no detectable TBT. No TBT has been detected in any elutriate testing carried out on port sediments (KEL 2022) to-date. The testing work for EPA marine disposal approvals carried out for sediments from the Port approaches provides sufficient data to show that no waterborne toxicity is associated with contaminants known to be present in the sediment.

The most significant (natural) contaminant released during dredging is total ammoniacal-nitrogen. Ammoniacal nitrogen is a key constituent of sub-anoxic and anoxic sediments. The toe trench sediments are sub-oxic and had no odour. Concentrations in elutriate from Waterfront sediments are typically above the ANZG (2018) DGV. Recent data reported in KEL (2022) showed that deeper soft, muddy sediments in the Port can have higher concentrations than shallow sediment. This is not expected in the toe trench sediments as the subsurface sediments have low moisture contents and low organic matter contents. For the average concentrations, some dilution is required to reduce in-water concentrations below the ANZG (2018) DGV concentration. However, this occurs at the point of excavation. Following dilution, the ammonia contributes little to toxicity potential and acts as a nutrient.

Overall, the release of some constituents will occur to the water column during excavation. Concentrations of contaminants would be expected to be below ANZG (2018) 95 % protection DGVs close to the dredging location and have no waterborne toxicity. Waterborne related toxicity issues are considered to be negligible.

6.4.4.3 Meeting standards

Following reasonable mixing, discharges arising from toe-trench excavation would meet the requirements of the F.2.21.8 water quality standards relating to discharges under the AUP (refer Section 6.3.1).

6.4.5 Sedimentation

During the proposed BN excavation localised sedimentation of larger sediment aggregates will occur adjacent to the excavation area. Stokes law indicates that a 0.06 mm and 0.1 mm diameter particle settle at a rate of 3-10 mm/s which would indicate that under ideal conditions any particles at or larger than 0.063 mm (i.e., sand size) would settle in about an hour but smaller particles would take longer depending upon particle coagulation etc. The strong tidal currents off BN will result in any sediment in suspension from excavation quickly becoming part of the mass of sediment in the harbour tidal stream.

The effects of sediment deposition on the benthic fauna inhabiting the downstream seabed will be dependent on how much sediment is transported out of the dredging area, the depth of sedimentation and the tolerance of the biota to smothering, should it occur.

Sedimentation effects have been assessed previously for the adjacent similar environments within the Port approaches and Rangitoto Channel and were assessed for other projects involving sediment dredging (using backhoe).

Marine biota have varying sensitivities to sedimentation with small sessile biota being most sensitive. Burrow building biota are unlikely to be affected by deposition.

Some short-term localised effects (construction period and temporary for a period after construction) on sediment dwelling biota very close to the proposed BN toe trench excavation will occur but effects will be short term with effects considered to be negligible to no-more than minor (due to the low value biological community present).

6.4.6 Underwater noise from excavation

Excavation of sediment from the BN toe trench utilises the same methods as used in already authorised dredging activity within the Port and Port approaches. Vessels and hydraulic excavators generate underwater noise which will be like that generated by consented dredging activity in the Auckland waterfront.

Marshall Day (2019b) provided an assessment of underwater dredging noise using very similar dredging/excavation equipment to be used for the proposed works. In that assessment Marshall Day reported measured and calculated underwater noise source levels for backhoe dredging activity of 141 dB re 1 µPa RMS at 1m. They concluded that for dredging activity similar to the proposed excavation, there was no risk of auditory injury to fish or marine mammals irrespective of exposure duration.

6.4.7 Summary

The proposed BN excavation will result in the loss of a low value marine habitat. The habitat will return following completion of the new marina construction.

Underwater noise from construction vessels and dredging would not be expected to have noise related effects on fish or marine mammals irrespective of exposure duration.

Historical monitoring of local dredging projects has shown that elevated TSS can occur close to the dredging, but downstream (200 m downstream) concentrations are similar to those measured upstream. Significant off-site changes in water clarity are not expected.

The release of some contaminants will occur to the water column during dredging. Concentrations of contaminants would be expected to be below ANZG (2018) DGVs close to the dredging location after reasonable mixing.

Downstream sedimentation will occur during the proposed BN excavation. Some local burial will be expected at the margins of the toe trench. These areas will recover post excavation. Effects associated with the toe trench excavation are transitory apart from the loss of habitat associated with the toe trench excavation which will become the toe of the improved revetment. The ecological resources are moderate and the magnitude of effects low resulting in an overall level of effect of low.

6.5 Effects of Piling Works

6.5.1 Introduction

Piling is one of the key elements of the proposed BN wharf construction and FN extension. The key effects of the proposed piling which are relatively similar between the BN and FN elements are:

- The potential for suspension of marine sediment during piling.
- Changes in water quality during piling.
- Effects on underwater noise from piling.

Environmental effects of piling within the Auckland waterfront area have been previously assessed by Golder (2018a,b) (America's Cup and Sealink Ferry terminal construction) and KEL (2019, 2020) (piling undertaken by Pānuku Developments Auckland in the Westhaven Precinct and within the Port Precincts) and the underwater noise effects relating to piling in the same projects by Marshall Day (2018, 2019 and 2020) respectively. All applications were granted with conditions specifically related to piling but only in relation to noise.

6.5.2 Installation of piles (BN and FN)

As noted in Section 2 a total of 241 piles need to be installed to support the wharf deck for the new Bledisloe Wharf and 50 piles need to be installed for the extension to the existing Ferguson North wharf. All new piles to be installed are steel cased (1,200 mm and 900 mm diameter) with reinforced concrete placed inside (refer Drawings 3237885-CA-005 and 237885-SE-2113 in Beca 2024a for pile location and detail). The larger piles are those at the rear of each pile row. At Bledisloe the piles are installed through the rock revetment whereas at Fergusson North they are installed directly through varying depths of mudcrete in the completed container terminal reclamation.

At BN as part of pile installation, a larger 2 m diameter steel tube (outer casing) will be inserted through the revetment. Rocks will be removed from inside the tube by crane. When the tube is through the existing revetment the pile will then be driven through residual reclamation material and through the underlying marine sediment to the Waitematā sandstone. An auger will then remove the sediment and sandstone.

At FN, the new piles will need to be installed through the existing mudcrete reclamation where the mudcrete overlaps with the pile footprint. Rock revetment addition will be completed following pile installation.

Overall, the wharf construction works at BN and FN are expected to be similar to the construction work carried out for the FN wharf in 2016-2017 as shown in Figure 26.

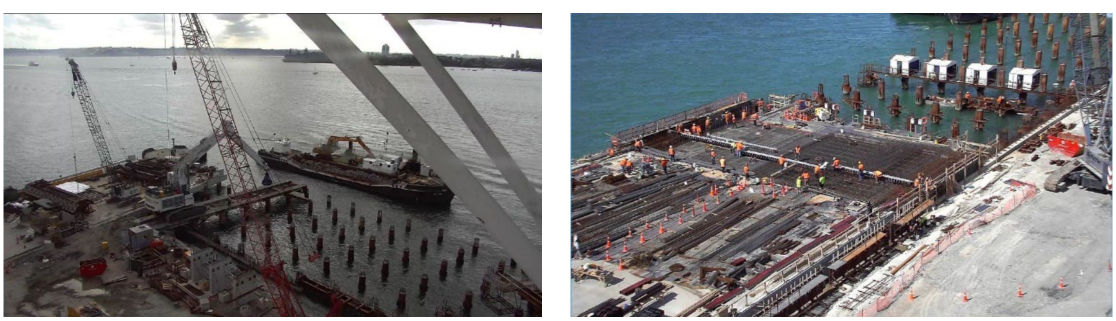


Figure 26: Top: West end of Fergusson North berth construction at early stages. Bottom: Wharf deck construction looking east (Source POAL, 2016-2017).

Pile installation at BN is expected to occur at a rate of 1.5-2 piles per day and at FN at a rate of 2-3 piles per day. For a continuous program the FN driving would be expected to be carried out within 18-24 days (i.e., within about one month). At BN the installation will occur in batches relating to the sections of revetment resurfacing. This process will result in a program where 10 piles would be installed in a batch over 3-6 days with about 25 batches.

Once the pile is bored to the sandstone, it is then pumped dry and the reinforcing cage installed, and the concrete is then pumped into the pile. Once a bay of piles is complete, precast pile caps and precast deck are installed whilst the piling rig advances to the next section / bay of piles.

6.5.3 Effects of Installation of piles on water quality

6.5.3.1 Suspended sediment

Suspension of sediment at the seabed surface would normally occur when the pile casing contacts the seabed or revetment. Once the casing has been driven into the seabed, the driving activity would be expected to result in little disturbance and only temporary generation of suspended sediment. Sediment disturbance during pile installation is considered to be very minor compared to sediment excavation (Section 6.4.4).

Where piles are drilled (within steel casing) prior to inserting reinforcing and cement, the sediment removed from the casing would be taken off site for disposal. No sediment physically removed during piling would be deposited within the harbour.

Pile driving has been carried out within the waterfront area for a several major projects over the last decade. Examples include construction of the FN wharf, AC36 construction of Hobson Wharf Extension, piled wave protection adjacent to Wynyard Wharf and adjacent to the Halsey St extension wharf. During those projects, no specific conditions were recommended in relation to generation of TSS arising from piling and there is no information that would indicate that any piling created visible sediment plumes. No visible sediment plumes are expected during piling.

Overall, effects of piling on generation of suspended sediment are considered negligible.

6.5.3.2 Contaminants

As described for sediment excavation, seabed disturbance has the potential to result in release of contaminants from sediment and transport of contaminants with particles. Sediment disturbance during pile installation is considered to be very minor compared to sediment excavation (Section 6.4.4). Site specific piling related effects (water clarity and quality) are considered to be negligible.

Prior to concrete pouring, the pile casings will be dewatered. The water will be pumped ashore and disposed. There will be no discharge to the harbour environment.

During pouring of concrete into pile casings, concrete will have no direct contact with seawater. As such no water quality issues arise during this phase of works. There were no known issues associated with concrete pouring during the construction of identified projects/works noted above.

Overall, effects of piling on release of contaminants associated with seabed sediment disturbance are considered negligible.

6.5.3.3 Meeting standards

Following reasonable mixing, discharges arising from toe-trench excavation would meet the requirements of the F.2.21.8 water quality standards (refer Section 6.3.1).

6.5.4 Effects of piling noise on ecological communities

6.5.4.1 Introduction

Both airborne and underwater noise have the potential to disturb ecological communities within the port and in the harbour. Given the noise environment within the port adjacent to both BN and FN wharfs and restrictions on airborne noise generated by activities (through the Unitary Plan), underwater noise is considered to be more restrictive in terms of potential effects. Bird species nesting successfully within the Port (refer Section 4.2) are likely to have habituated to common noise activities (and other disturbing activities associated with people, vehicle movements and shipping) within the port.

The effects of piling activity on the underwater noise environment within the Auckland City waterfront and Waitematā Harbour has been examined previously including:

- KEL (2019) and KEL (2020) examined effects of piling within Westhaven Marina and the waterfront (including port) based upon a range of pile types and sizes and methods of driving piles (hammered or vibrated) based on noise profiles set out in Marshall Day (2019, 2020). In those assessments piling ranged from 350 mm timber to 507-750 mm steel tubes.
- Golder (2018) based on work by Marshall Day (2018) assessed effects of underwater noise generated by piling for the breakwaters and Hobson Wharf extension built as part of the Americas Cup (AC36). The larger of the AC36 pile sizes (900 mm) were similar to those to be used for the BN and FN project (refer Section 2).
- Marshall Day (2021) examined underwater acoustics for piling associated with the redevelopment of the downtown ferry terminal. The largest steel tube piles were 1,000 mm diameter.

For BN it is estimated that 1.5-2 piles may be installed in a working day. All piles will be installed through the revetment. Based on the rate, it may require 120-160 days to complete work.

Underwater noise has been modelled conservatively as each row of steel piles will be piled for a varying proportion of time out of water. It would be expected that, the 1,200 mm piles at the rear of the revetment/wharf deck will be piled out of the water and the 900 mm piles in rows 1 and 2 will in the water for 100 % of the time. Although it is considered that there may be some reduction in the transmission of noise from the piling through the ground, the noise modelling is not able to account for that. As such the modelling undertaken by Marshall Day (2025a) is likely to be conservative as all underwater noise modelling has been carried out for piles in 10 m of water.

At FN, 2-3 piles per day are likely to be installed. With 48 piles to be installed, the work is expected to take about 16-24 working days. Although this piling will be through the mudcrete reclamation adjacent to the wharf, it is assumed that all piles will be in water.

At both BN and FN all piling will occur during daylight hours (sunrise to sundown) (Marshall Day 2025a,b).

To assess the effects of underwater noise on biota adjacent to both the BN piling and the FN piling, there are guidance as to the effects of underwater noise on marine biota. Man-made noise is an important potential effect on marine biota due to potential physical and behavioural effects (see NOAA (National Oceanic and Atmospheric Administration) for information about marine biota and sound).

6.5.4.2 Effects on marine mammals

The principal international guidance used to assess/manage the potential effects of underwater noise on marine mammals to-date has been NMFS (2018). This was the guidance used in the assessment of underwater noise effects on marine mammals for the environmental assessments for projects identified in Section 6.5.4.1 (and completed). NOAA released a revision to the 2018 guidance during the initial stage of this project. During the project, the draft guidance was finalised and released (NMFS 2024). The threshold guidance values in the updated 2024 guidance were used by Marshall Day (2025a). Marshall Day (2025a) sets out the changes to the guidance from the 2018 to 2024 editions.

The updated technical guidance provides thresholds (based on updated data) for onset of auditory injury and temporary threshold shifts (TTS) in marine mammal hearing for underwater and airborne sound sources. Effects of noise on marine mammals is dependent upon the type of hearing with marine mammals falling into different hearing groups. Of those known to be present in the Waitematā Harbour the key species are:

- Leopard seals which are classified as phocid (earless or true seals) have an underwater hearing range of 40 Hz to 90 kHz and a hearing range in air of 42 Hz to 52 kHz.
- New Zealand fur seals which are classified as otariid (eared) pinnipeds have an underwater hearing range of 60 Hz to 68 kHz and a hearing range in air of 90 Hz to 40 kHz.
- Dolphin and orca which are classified as high-frequency cetaceans have an underwater hearing range of 150 Hz to 160 kHz.

The 2024 guidance provides the following thresholds:

- Level A Harassment: auditory injury onset from impulsive and non-impulsive sound levels which are provided for each marine mammal hearing group. Auditory injury may or may not result in a permanent threshold shift (PTS).
- Level B Harassment: Exposure resulting in behavioural harassment. Underwater noise levels above root-mean square (RMS) received levels of 120 dB re 1µPa for continuous sound (e.g., vibratory pile driving) or 160 dB re 1µPa for impulsive sound (impact pile driving).

Marshall Day (2025a) summarises the NMFS (2024) guidance thresholds for the different marine mammal auditory groups for mammals seen in the harbour for Level A and B underwater noise harassment.

Marshall Day (2024) evaluated underwater sound generated by the proposed piling at both BN and FN and developed predicted zones for specific thresholds based on a series of piling and piling location scenarios. That report should be referred to for further detail on the basis of modelling and input information to the model.

Zones were predicted for PTS and TTS physiological effects and also for potential behavioural effects. Marshall Day (2025a,b) identify that vibro piling will be the prioritised method of piling to minimise underwater noise. An impact hammer may be required as a second driving method to reach the required piling depth.

- Predicted PTS effect threshold boundaries for marine mammals during vibro piling were very small (<50 m for seals or below criteria for high frequency cetaceans). For impact piling, with bubble curtain mitigation, the zones were the same as for vibro piling at BN. At FN the zone for effects during impact piling (with mitigation) for high-frequency cetaceans was <50 m and for both species of seals <200 m.
- For predicted TTS zones, vibro piling zones were small for high frequency cetaceans and at both BN and FN (below criteria). For seals they were <200 m at both BN and FN. For impact piling with (bubble curtain), the predicted zones were <200 m for high frequency cetaceans at both locations. For seals at BN the TTS zone ranged in distance from 445 m to 585 m and at FN, the zones ranged from 655 m to 825 m.
- Predicted behavioural threshold distances for vibro piling without mitigation using impulsive criteria are small. For non-impulsive criteria the zones are larger being 2,050 m and 2,880 m respectively for BN and FN. The impact piling with mitigation the zones are about 20 % larger (Marshall Day 2025a).

A range of factors are likely to correlate with cetacean distribution and occurrence within the Waitematā Harbour. One key one being the state of the tide with movement of prey species at low and high tide. Orca will chase rays within the harbour. Cetaceans may enter TTS zones if chasing prey (Leunissen et al. 2019). The study by Leunissen et al. (2019) on the effects of pile driving (steel tube, up to 0.71 m) on Hectors dolphin in Lyttelton Harbour identifed that where hectors dolphin have small home ranges, dolphins spent less time close to piling activity than away from piling activity. And that this effect lasted several days post piling before dolphin distribution returned to normal. Similar responses have been observed in bottlenose dolphins (*T. aduncus* in Freemantle Harbour) with reduced observations during piling activity (Pavia 2015). Avoidance before or within the behavioural zone will likely reduce the probability of both seals and cetaceans coming close to the small TTS zones during vibro piling. The overall level of potential effects associated with vibro piling are considered to be very low for seals and low for high frequency cetaceans (without mitigation).

Should impact piling be required, TTS zones (with mitigation) are <200 m for high-frequency cetaceans. The overall level of potential effects associated with impact piling (with noise mitigation) is considered to be low to moderate given the two species have Very High ecological value and the effects may be negligible to moderate (effects are expected to be temporary and the likelihood of cetaceans being within the predicted TTS zones is very low).

For both species of seals, the TTS zones associated with impact piling are larger extending out into the harbour at both locations. Fur seals and leopard seal have low and medium ecological value respectively. There is potential for seals to enter the TTS zone but it is likely that seals may exhibit avoidance behaviour in advance of the zones and the frequency of occurrence in this section of the harbour is considered low to very low. The overall level of potential effects associated with impact piling are considered to be low for seals (with noise mitigation).

It is understood that no adverse effects of underwater piling noise occurred (on the key marine mammal species) during steel tube piling work within Auckland Waterfront projects (Americas Cup construction work, Sealink ferry terminal, Downtown ferry terminal). These projects involved piles of varying diameters but included piles which were steel tube and some of similar diameter.

Overall vibro-piling is the preferred method of piling. Physiological effects-based response zones (TTS) for marine mammals are considered to be small (<200 m) relative to the numbers of marine mammals likely to be present in the lower harbour on any given day.

Overall, the effects of underwater noise from impact piling (should it be required) with noise mitigation is expected to be negligible to moderate for high frequency cetaceans and low to moderate for seals. Further mitigation through the use of marine mammal observers (MMOs) is recommended in the draft UCNMP prepared by Marshall Day (2025b) (Section 10.4). This will reduce the potential risk of effects further.

6.5.4.3 Effects on fish

Effects of "noise" on fish are complex and there are different groupings of fish in terms of hearing anatomy and sound pressure and particle motion are both (Popper et al. 2014, Popper & Hawkins 2019). Sound guidance has been developed to reduce effects of underwater sound to fish (see NMFS 2018, Popper & Hawkins 2019).

For fish, Marshall Day (2025a) adopted the TTS and PTS thresholds set out in Popper & Hawkins (2019) (TTS 186 dB re. 1 µPa $SEL_{cum\ (unweighted)}$ and mortality 207 dB re. 1 µPa $SEL_{cum\ (unweighted)}$) and for behavioural effects, the threshold set out in CalTrans (2020) of 150 dB re 1µPa rms. For fish the Marshall Day modelling identified:

- Predicted PTS effect threshold boundaries for fish are <50 m for both vibro and impact piling at all piling locations.
- For predicted TTS, vibro piling zones are <200 m. For impact piling with mitigation, the TTS zone at BN and FN are predicted to be <200 m and 210 m respectively.
- Predicted behavioural threshold distances for vibro piling or impact piling with mitigation at BN and FN were predicted to be <200 m.

As noted previously a significant amount of steel tube piling has been undertaken around the Auckland waterfront over the last five to ten years. No reports of fish mortality or injury at piling locations have been identified.

Overall, no adverse physiological effects to fish are expected unless they are in immediate proximity of the piling (using either method). Behavioural effects are expected around the site of piling (for both types of piling). These effects are localised, temporary and only occur during daylight hours, the localised effects are considered to be very low to low level.

6.5.4.4 Effects on coastal birds

In Section 4.2 it was identified that there are three bird species of Conservation significance (At Risk declining) known to be present above or in waters adjacent to the BN and FN project areas. These are red-billed gull, white-fronted tern along with little penguin. Pied shag an At Risk recovering species also utilises harbour waters.

Red-billed gull and white fronted tern are known to feed in harbour waters. Red-billed gulls are surface feeders while tern are plunge diver catching small fish. Pied shags typically spend 20-30 seconds underwater feeding (Heather & Robertson 2005). Little penguin are underwater swimmers and feeders that spend all their time in or on the water when away from their burrow.

Given the time in water neither gulls nor terns are likely to be affected by piling activity.

Penguins respond to underwater sound cues. Penguins may also have similar pressure equalisation systems to seals (Beaulieu et al. 2024) and due to long periods underwater may be affected to the same extent as seals. Recent work has been published on underwater sound and penguins. Of note Wei & Erbe (2024) examined hearing in little penguins. They predicted the hearing capabilities of little penguins across a broad frequency range (100 Hz to 10 kHz), both in air and under water. Predicted in air and underwater audiograms are similar to measured data for cormorant (shag) species. The cormorant data is one of the few measured diving bird audiograms (Larsen et al. 2014). Further examination of penguin audiograms is discussed in Beaulieu et al. (2024). Penguin were not considered as a species of concern in earlier Waitematā Harbour environmental assessments due principally to a lack of information about their nesting behaviour within the lower harbour.

There is no regulatory underwater sound guidance for birds as there are for marine mammals. In the absence of that, Marshall Day (2025a) utilised thresholds developed by Southall (2019) for PTS and TTS effects and for behaviour related effects, the response threshold of 120 dB re 1 µPa identified by Sorenson et al (2020) based on lab responses (from sound in the range 200 Hz to 6 kHz) with gentoo penguins. Sorenson et al. (2020) found that penguins showed a graded reaction to the noise bursts, ranging from no reactions at 100 dB to strong reactions in more than 60% of the playbacks at 120 dB re 1 µPa.

The effects of piling on little penguins has been reviewed by Lawrence et al. (2023). They noted that penguin can habituate to local airborne sound but can be disturbed by construction activities but there is little quantitative information about the level of disturbance they can tolerate. The review reported that burrow environments provide an overall noise reduction of about at least 5 dB. They also noted that a noise threshold (80 dB LAeq(1s) had been previously accepted by Auckland Council to minimise behavioural disturbance due to construction activities but may not be appropriate in all locations.

Based on these thresholds, Marshall Day (2025a) found:

- Predicted PTS effect threshold boundaries for little penguin are <50 m for impact piling (with noise mitigation) and below criteria for vibro piling at BN and FN piling locations.

- For predicted TTS, vibro piling zones are very small (below criteria) at both BN and FN. For impact piling with noise mitigation, the TTS zone at BN and FN is predicted to be <200 m. Without bubble curtain mitigation, the zone is 270 m at FN.
- Predicted behavioural threshold distances for vibro piling at BN and FN were predicted to be 610 m and 640 m respectively. For impact piling with mitigation, the zone was 1,450 m and 1,750 m respectively.

Based on the modelling undertaken by Marshall Day (2025a), PTS and TTS effects on penguins are very unlikely. This is also assisted by the dawn and dusk departure movements of at least one of the parents from burrow sites within Judges Bay (i.e., before and after piling activity).

Using the unweighted 120 dB value, avoidance or behavioural responses in penguins may occur during vibro piling over an area immediately off BN. Off FN the modelled zone touches the rock revetment on the eastern side of the container terminal. However, the effects zone is only generated during daylight hours and is localised. As penguin make use of sound stimuli for orientation and prey detection during diving, they may be sensitive to anthropogenic noise like marine mammals. Little penguins are expected to hear most urban/marine airborne environmental noises (planes, ships, construction etc). Having noted that, little penguins are adept at setting up home in burrows adjacent to noisy environments. A good example is a pair nesting at the edge of the MRC / Heliport adjacent to the Port, and the burrow under the revetment adjacent to the container trucking queue (refer Appendix C).

Physiological effects-based response zones (TTS) for marine mammals are (<200 m) during vibro piling. The effects of underwater noise from impact piling (should it be required) with noise mitigation is expected to be negligible to moderate for high frequency cetaceans and low to moderate for seals. Further mitigation through the use of marine mammal observers (MMOs) is recommended in the draft UCNMP prepared by Marshall Day (2025b) (Section 10.4). This will reduce the potential risk of effects further.

Little penguin have High ecological value. The risk of TTS related effects during vibro piling are considered to be negligible resulting in an overall effects level of very low. Should impact piling be required, (with noise mitigation) the level of overall effect is considered to be low. The low level of effect is aided by the dawn and dusk departure movements of penguins from burrow sites within Judges Bay (i.e., before and after piling activity). Off BN penguins transiting the harbour adjacent to the BN revetment may respond the piling noise by moving out of the disturbance area. Off FN where a burrow was identified towards the northern end of the container terminal revetment, there may be occasions when penguins transiting the harbour near the container terminal reclamation may be temporarily affected (behaviourally not physiologically) by the piling related noise.

6.5.5 Summary

Piing will only be carried out during daylight hours. Vibro-piling is the preferred method of piling at both BN and FN with impact piling only being utilised where required.

No effects on fish from underwater noise are expected. Given that there may be a requirement for some impact piling, the effects on fish during use of this piling methodology is expected to behavioural and transitory.

Physiological effects-based response zones (TTS) for marine mammals during vibro piling were modelled as small (<200 m) for seals and below criteria for cetaceans at both BN and FN. For seals numbers in the harbour are considered to be low at any time reding any risk further.

When impact piling is required, the TTS zone (with mitigation) for seals extends a greater distance with the largest zone estimated to be up to 825 m at FN. For the cetaceans, TTS zones during any impact piling have been assessed at <200 m. This zone is considered small relative to the frequency and geographic use of the harbour by these mammals. Additional mitigation through the use of land based MMOs who will monitor for marine mammals is proposed. This is documented in a draft UCNMP.

Little penguin have high ecological value. The risk of TTS related effects during vibro piling are considered to be negligible resulting in an overall effects level of very low. Should impact piling be required, (with noise mitigation) the level of overall effect is considered to be low.

6.6 Other Construction Related Effects

6.6.1 Effects of construction on Port avifauna

The construction of the BN wharf will prevent black-backed gulls from nesting at the top of the existing revetment. Black backed gulls are not a protected species under the Wild-Life Act. No mitigation is considered necessary for the loss of nesting space. The reduction may be a positive benefit for the nearby Marsden Wharf nesting colony of red-billed gull and white fronted tern.

In the lead up to works on the BN revetment (and in the vicinity of works at FN), black backed gull should be deterred from nesting to ensure there are no nests or chicks on the revetment as adults will be very defensive of nests if close to work areas. No wildlife authorisation is required for ensuring that this species doe not nest in the location prior to work commencing.

Noise and vibration (during the day) is not expected to have adverse effects as noise is only during daylight hours and within the Port some habituation to noise/disturbance is likely. Closest nesting red-billed gull or white fronted tern are ~128 m from the west end of BN and 150 m from the east end of BN. Both bird species have high ecological values but the magnitude of effects is considered negligible to low with an overall level of effect of very low to low.

In relation to the effects of the excavation of the BN revetment trench on food sources of the key bird species. The excavation is not a continuous excavation, will only occur for a short duration each time a section is excavated. Disturbance will not directly affect food supply based on a) area of seabed where habitat is disturbed b) the limited generation of suspended solids and the type of food consumed as both species feed within a much wider environment (and are not feeding on benthic species). No temporary disruption of food sources would be expected.

6.6.2 Effects of changes in coastal processes on ecology

The key physical change arising from the proposed works is the introduction of piles into an environment at BN where there are no piles along the northern face of Bledisloe Terminal. At FN, there will be an increase in the number of piles along the face of the FN wharf.

Beca (2024b,c) examined the effects of the new BN wharf structure and FN extension on the physical environment at those locations. The key findings of the modelling were.

- Current velocities are expected to increase near both wharves by up to 5% and also in the main channel. No significant change in the harbour wave environment was predicted.
- When a vessel is berthed at BN, a site-specific increase in local current velocities was predicted of 15% in the vicinity of the wharf. The changes in wind associated wave environment at both locations was not expected to change. When a vessel was berthed at BN, reflection of other harbour vessel waves was predicted to increase in the vicinity of the wharf. Reflection would already be occurring when large cruise ships anchored in the channel off the waterfront. No change was predicted at FN as vessels already berth at the wharf.

The predicted changes in wave environment in the vicinity of the proposed BN wharf should have no impact on any shoreline habitat as all local habitat in the vicinity of the location is man made. The seabed adjacent to both of the new wharf structures is already influenced by high tidal current velocities. It is considered that the increases in the absence of a vessel will not alter the physical environment such that seabed physical characteristics will change significantly and consequently habitat/ecology would not be expected to change.

At BN, vessel berthing and while at berth will result in localised and short term additional local changes in current velocities. These changes may produce a seabed within the vessel berth footprint that has more of the characteristics of those seen at FN. That is, a surface within the berthing footprint that appears ‘washed’. This may result in some change to local seabed ecology due to disturbance caused by berthing vessels. However, such a change will be localised and would represent a no more than minor change in the nature of the local seabed habitat. Negligible changes are expected to seabed habitat due to the construction of the FN extension.

In summary, some changes in tidal current velocities have been predicted at both BN and FN locations. Some changes in appearance of seabed within the BN wharf berthing footprint are indicated but the changes will have little effect on seabed habitat.

6.6.3 Changes to seafloor landscape

The proposed structures at BN and FN do result in changes to the physical nature of the seabed.

At BN although the wharf structure is defined as extending 34 m into the harbour all of the piles do not intrude directly into exposed seabed. Based on the proposed construction methodology, the first four of five rows (from top of revetment) do not have any direct influence on seabed character or ecology. The final row (50 piles) are embedded into “seabed” and will result in the loss of 32 m^2 of muddy sand seabed with an increase in hard vertical habitat.

At FN, the additional piles convert some soft seabed habitat to hard vertical habitat. The piles increase the total piled habitat at the FN wharf.

6.6.4 Risk of vessel strike during construction

There will be limited vessel movements associated with construction activities at the two wharfs. At BN there will be some tug and barge movements associated with the excavation of the BN toe trench. The vessel movements all occur at very low speeds and the number of movements is a fraction of the daily movements by ferries, recreational vessels and commercial vessels on the harbour.

Operation of vessels associated with project marine activities does not pose a strike risk for coastal seabirds.

The risk of vessel strike to marine mammals is negligible and less than what might be calculated from the daily vessel movements in this part of the harbour. Any vessels associated with the project construction program will comply with the harbour speed requirements as do all vessels transiting the harbour. Vessels close to and on-site when required will be moving at speeds that are lower than other vessels on the harbour. As such no specific speed reduction requirement is required. However, as part of the overall proposed Environmental Management Plan, marine mammal awareness will be included.

7 STORMWATER MANAGEMENT

7.1 Bledisloe North Wharf

7.1.1 Construction

Stormwater and erosion control practices will be followed based on standard construction site management practices during construction. The main body of the Bledisloe Terminal adjacent to the revetment and proposed wharf is sealed. It is expected that exposed ground during site works will be minor. Rock removal from the revetment is not expected to expose fine erodible materials. However, management controls will be implemented via:

- A contractors "earthworks" erosion and sediment control plan. This document would include specific controls should moveable (by rain) fine material be exposed at any point.
- Protocols for exposure of unexpected material that may require erosion protection or other management to prevent any loss of material to the CMA (refer Beca 2024d including protocols in Section 7 of that document).

7.1.2 Operational

With the construction of the BN wharf, the stormwater generated on the new wharf surface will be directed via the slot drains on the land side of the wharf deck to a new treatment device prior to discharge to the CMA under the wharf (Figure 27).

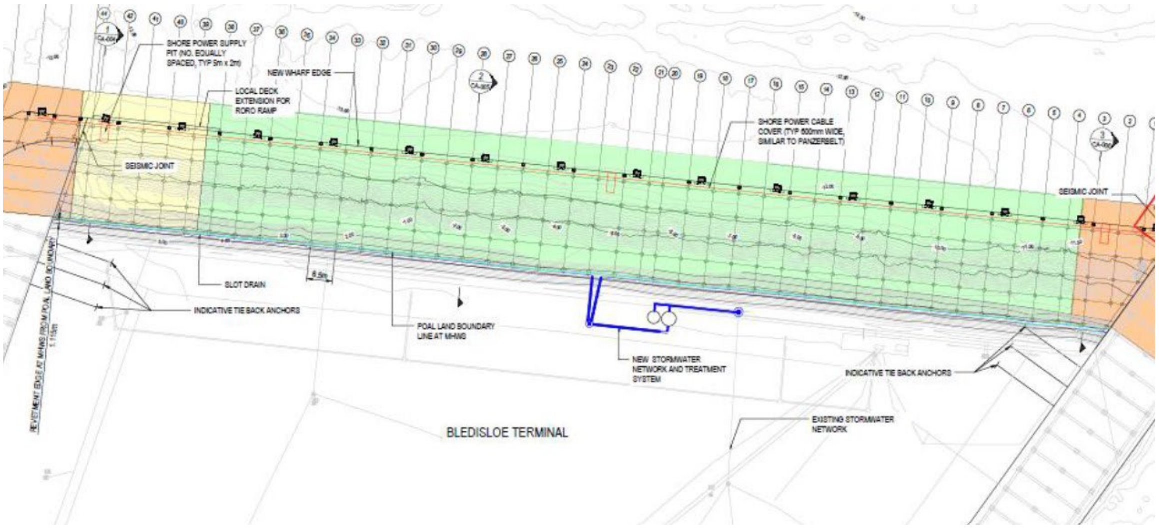


Figure 27: BN showing location of stormwater treatment system for proposed BN wharf (from Beca 2024a).

The management of the treatment device and activities that might affect stormwater quality will be carried out under the existing Port wide ITA consent granted to POAL (Permit 25179).

The current devices within the Port include:

- Sand filters on the Fergusson Container terminal and a Jellyfish treatment device serving the existing FN wharf deck.
- A Stormfilter at the tug berth facility.
- A series of SPEL stormwater devices and an ESK oil/water separator at key locations (refuelling and workshops).

The device would be an Auckland Council approved device and would meet the treatment requirements of GD05 (Cunningham et al. 2017). The device would effectively trap litter and debris transported by stormwater and would remove a high proportion of sediment generated on the deck surface. This would effectively remove a significant proportion of particulate associated contaminants such as TPH, PAHs, copper and zinc.

7.2 Fergusson North Wharf

As noted above, stormwater generated on the existing FN berth deck and is collected via slot drains and passes through a jellyfish filter located at the eastern end of the existing wharf deck.

The jellyfish uses is a membrane filtration system. The device removes floatable trash and debris, sediment and contaminants associated with the sediment particles. Pretreatment traps debris and sand sized material which is collected in a sump. Filtered water then upflows through membranes which allows finer particles to be removed on the filters. The filters are passively backwashed to remove adhered sediment. The device manufacturers identify (In device performance verification statements) that the device removes ~90 % (median) of total suspended solids and associated particulate contaminants. It is expected that the discharge TSS concentration will be <20 mg/L. The device does not remove dissolved contaminants.

The FN wharf area has no significant contaminant generating areas. It will generate some vehicle sourced contaminants. Stormwater from all new deck areas will be captured by the existing treatment system. This device is an Auckland Council approved stormwater treatment device.

8 SUMMARY OF ECOLOGICAL EFFECTS

This section provides a tabular summary of key environmental/ecological effects in relation to the key project elements. Overall level of effect is determined from ecological value and magnitude of effect. Where final effect includes mitigation, this is identified. Mitigation is discussed in Section 9.4.

Table 10. Summary of other project related effects.

Potential effects	Location	Ecological receptor	Ecological value	Considered magnitude of Effect	Overall level of effect	Report Section
Extraction of BN piles	BN	Seabed	Moderate	Low	Low	6.2
Effects of revetment replacement	BN only	Intertidal/subtidal kelp habitat (loss of habitat)	Moderate-High	Moderate (with mitigation)	Low to High (with mitigation)	6.3
Effects of revetment construction	BN	Water column/seabed	Moderate	Low	Low	6.3
	FN	Water column/seabed	Moderate	Low	Low	6.3
Loss of seabed habitat from toe trench excavation	BN only	Seabed biota	Moderate	Low	Low	6.4

Table 11. Disturbance during phases of construction.

Potential effects	Location	Ecological receptor	Ecological value	Considered magnitude of Effect	Overall level of effect	Report Section
Disturbance of avifauna during construction	BN	Threatened nesting bird species	High	Low (general)	Low	6.6.1
	FN	Threatened nesting bird species	High	Negligible (general)	Very low	6.6.1
Disturbance of little penguin during revetment work	BN	Little penguin	High	Negligible	Very low	6.3.2
	FN	Little penguin	High	Low	Low	6.3.3

Table 12. Summary of effects related to underwater noise effects on marine mammals and penguins.

Potential effects	Location	Ecological receptor	Ecological value	Considered magnitude of Effect	Overall level of effect	Report Section
Disturbance of seals during vibro piling TTS	BN/FN	NZ Fur seal/Leopard seal	Low/moderate	Low-moderate (UW noise with mitigation).	Very low	6.5.4.2
Disturbance of seals during Impact piling behaviour	BN/FN	NZ Fur seal/Leopard seal	Low/moderate	Moderate (UW noise with mitigation)	Very low to low	6.5.4.2
Disturbance of cetaceans during vibro piling TTS	BN/FN	Orca, Bottle nose dolphin	Very high	Negligible (UW noise with mitigation).	Low	6.5.4.2
Disturbance of cetaceans during impact piling behaviour	BN/FN	Orca, Bottle nose dolphin	Very high	Negligible (UW noise with mitigation).	Low	6.5.4.2
Disturbance of penguin during vibro piling TTS	BN/FN	Little penguin	High	Negligible (UW noise with mitigation).	Very low	6.5.4.4
Disturbance of penguin during impact piling behaviour	BN/FN	Little penguin	High	Low (UW noise with mitigation).	Low	6.5.4.4

9 MONITORING, MANAGEMENT & MITIGATION

9.1 Introduction

This section discusses recommendations for:

- Monitoring during various project elements.
- Environmental management plans or protocols.
- Other mitigation relating to those project elements with effects outcomes of moderate or higher in Section 9.

9.2 Monitoring

9.2.1 Toe trench excavation

As set out in Section 6.4.4.4, water quality monitoring has been recommended during the toe-trench excavation for BN. The purpose of the monitoring is to confirm that the expected increase in TSS downstream of excavation activity is within the expected range. The monitoring would comprise:

- Sampling carried out on 12 occasions (every second day).
- Sampling at an upstream control site and two downstream sites (50 and 200 m).
- Sampling just below water surface and just above the seabed.
- Sampling on the half tide and during slower tidal conditions.
- Analysis for TSS and turbidity.

A total of 12 sets of samples will be collected from commencement of excavation. If 200 m sample concentrations are <25 mg/L above upstream concentrations, the monitoring should continue with daily observations of the downstream plume during excavation made within the same tidal windows. Observations can be made from the BN revetment.

- Specific visual assessment will be carried out every fifth day of excavation when photographs will be taken of conditions and any plume on each occasion.
- If a plume is considered to be a significant visual plume, then sampling and water quality analysis as described above will be carried out.

This monitoring has been incorporated into recommended draft conditions.

9.2.2 Underwater noise

Marshall Day (2025a) have recommended that:

- Noise monitoring be carried out during the initial phases of piling to verify the underwater noise modelling predictions.
- Early stage underwater acoustic monitoring to assess effectiveness of bubble curtains (if used).

This monitoring is set out in the draft UCNMP (Marshall Day 2025b)

9.3 Environmental Management

Environmental management within the project will be embedded principally within Contractor Management Plans. The key areas where Environmental Management Plans or Protocols will be utilised and or are recommended include:

- Erosion and Sediment Control Plan during surface works on the existing reclamation at BN. The plan should include specific material/operating procedures for exposure of fine material during revetment works (rock removal) (refer Beca 2024d).
- A contaminated material exposure discovery protocol during works at BN (refer Beca 2024d).
- Oil spill contingency plan for on land and over water works on both BN and FN construction.
- A little penguin management plan (LPMP) (KEL 2025b, Appendix F of this report) that sets out ongoing monitoring and management to meet draft consent conditions and any associated with any Wildlife Authorisation issued by Department of Conservation.
- An UCNMP (Marshall Day 2025b) that sets out the use of mitigation and marine mammal observers (MMOs). The assessment of underwater noise prepared by Marshall Day (2025a) has shown that potential effects are minimised using vibro piling and if impact piling is required bubble curtain mitigation should be used during that piling to reduce the scale of effect. Based on the ecological receptors examined:
    - When impact piling (with mitigation) is used, for seals, the distance within which TTS effects may occur ranged from 445 m - 585 m at BN and 655 m - 825 m at FN. Seals are “uncommon” and their size in water makes observations to identify seals within the

full extent of the predicted zone difficult. MMOs however may still provide value within distances of several hundred meters if observation are made from a well elevated position. The draft UCNMP sets out information on MMOs and MMO observations (refer 9.4.2 below)

- When impact piling is used, the TTS zone for both cetaceans and little penguin is small, and MMOs will be able to identify cetaceans approaching the zone.
- When vibro piling is occurring MMOs will not need to watch out for cetaceans and little penguin. However, the modelled TSS zone at both BN and FN is <200 m and MMOs will be required to monitor for potential seal presence.

9.4 Environmental Mitigation

9.4.1 Toe trench excavation

No specific mitigation is considered necessary for the BN toe trench excavation.

9.4.2 Mitigation and management for piling

Based on the ecological receptors examined mitigation and management is required principally for cetaceans that might visit the harbour. The key species being orca and bottlenose dolphin.

The assessment of underwater noise prepared by Marshall Day (2025a) has shown that potential effects are minimised using a number of techniques. These include using vibro piling and if impact piling is required bubble curtain mitigation can be used to reduce the scale of potential effects. Mitigation can reduce the size of the zones within which physiological effects might occur and also reduce the zone within which behavioural effects might occur.

Marshall Day (2025a) also discusses the use of marine MMOs. The purpose of MMOs are to spot marine mammals so that piling can be adjusted and or ceased till the marine mammal is outside the nominal effects zone. The use of observers would apply to the physiological effects zone (the TTS zones). To be successful MMOs must be appropriately trained and use binoculars for observation and should conduct observation at a height above the ground to improve the distance that quality observations can be made (Marshall Day 2025b).

9.4.3 Rock revetment ecological mitigation

The assessment of effects set out in Section 5.6 identified that although the intertidal (and low tide subtidal) community present on the BN revetment was not unique, the habitat formed there was extensive (high value) when considered in relation to the Port environment and of moderate value when considered in relation to the wider harbour. As this community would not replace itself on the new BN rock revetment (due to lack of light, refer Section 5.6), it is considered that mitigation for the loss should be included in the overall project. The completion of the container terminal revetment will provide like for like habitat (125 m) compared to the loss at BN (330 m). The mitigation might include the following:

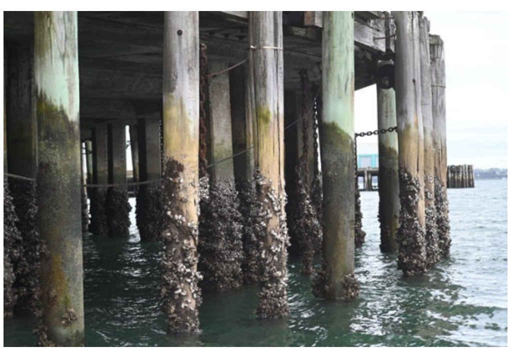
In relation to rock-reuse:

- If the construction work for the Fergusson revetment is carried out prior to the BN revetment works, some rock from the spring low tide region could be transferred to the Fergusson revetment. This rock would be additional to that already placed on the new revetment adjacent to FN. The rocks would be those encrusted with coralline alga as shown at low tide in Figure 13.

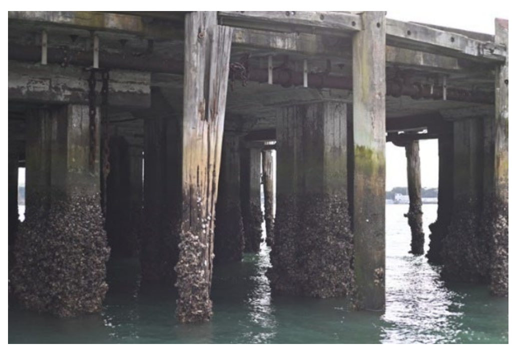
In relation to ecological enhancement to compensate for lost habitat:

- The addition of fish habitat 'houses' to the outside of steel piles at both ends of the new BN wharf. These units likely made of eco-concrete or pottery clay like materials would be attached to piles using straps with at least two per strap and two straps per pile with units at different tidal levels (low tide to 5 m below low tide). Number of piles with attachments expected to three at either end of the wharf for a total of 24 fish hotels installed.
- The addition of blue or green mussel rope units between the outside 1-2 rows of piles at selected locations within the Port (typically external wharf areas with higher current velocities). Ropes would be maintained at or below mean low tide. Suggested locations include the seaward ends of the B1, Jellicoe and Freyberg wharfs (Figure 28). At each end at least three clusters of rope would be installed. The final site selection requires further review to confirm that the installations would have no effect in relation to vessel berthing or other port activities.
- The placement of small artificial rock pools onto the new section of container terminal reclamation revetment adjacent to the FN extension. It is recommended that at least 6-10 rock pools are seated between mean low and low water springs.

It is considered that the introduction of the various ecological enhancement items will aid in compensating for the loss of the habitat at BN. POAL is embarking on a wider Harbour Health program. The recommended enhancement options fit within the enhancements being considered as a part of that wider program.



Freyberg wharf (north end).



Jellicoe wharf (north end).

Figure 28:Examples of possible mussel rope installation locations.

10 SUMMARY & CONCLUSIONS

10.1 Resource Summary

- Water quality with the harbour reflects water quality in the ebb and flood tidal streams. Superimposed on this are the local effects of city centre stormwater discharges at multiple locations along the waterfront. These discharges influence water quality in the basins between port wharfs. Ship movements at Port berths also generate suspended sediments. Water quality in areas of poor circulation such the marina areas on the waterfront have higher concentrations of copper and zinc than the main harbours due to the influence of vessel antifoulants. TSS concentrations in harbour water are typically low, are seasonal and influenced by phytoplankton growth.

- Sediment sampling was undertaken in 2024 within the footprint of the toe trench at the foot of the BN revetment. Sediments sampled had maximum contaminant concentration below ANZG (2018) DGVs with the exception of TBT in surface sediment where some samples had concentrations above the DGV. Sediment sampling had been carried out within the FN berth pocket in December 2021. This sediment characterisation included samples close to the works at the east end of FN. The concentrations of all contaminants in sediment along the FN berth were all below the ANZG (2018) DGVs.

- There is no indication that indigenous lizards are utilising the rock revetment at the proposed BN wharf location.

- Marine mammals (with the exception of seals) are short term visitors to the lower Waitematā Harbour. Two of the five most common marine mammal visitors to the Waitematā harbour, bottlenose dolphin and killer whales have a "Threatened" conservation status which identifies them as have very high ecological values. Leopard seal are considered to have a moderate value status as they are uncommon but regular visitors. Fur seals have a low value status as they are relatively common

- Two bird species with a very high conservation significance (red-billed gull and white fronted tern) nest relatively close to the location of BN works. Little penguin which also is a species of conservation significance is also present in the harbour. No little penguin were detected on the BN rock revetment. Three detections (using detector dog) of little penguin were located in the container terminal eastern revetment (all three are considered detections, with penguin sign even though penguin were not physically found).

- Areas adjacent to the BN or FN works do not provide habitat that supports fish species of conservation significance or provides substantial nursery area for any species of commercial significance or provides high quality recreational fishing.

- The BN revetment supports a good example of kelp habitat on 'constructed" hard substrate (in terms of the Waitematā Harbour). At BN this habitat has developed over a period of some 40 years. Although not uncommon it is considered to support a diverse ecological community.

- Intertidal ecology of steel piles at BN and FN are dominated by oysters with mussels along with a zone of kelp below.

- The subtidal seabed habitat close to the north side of Bledisloe Terminal and FN wharf did not support any habitat of note. Scattered sponges were present.

- A range of NIS are known to be present within the Port through six monthly surveys of NIS. Several epifaunal and infaunal NIS have been identified associated with seabed adjacent to Bledisloe Terminal. Fan-worms were identified in the toe trench footprint and appeared to be the most common NIS present.

10.2 Effects on Environment & Resources

- Any effects associated with removal of old steel piles and decking at Bledisloe terminal are considered to be low overall (localised and temporary).
- The proposed BN toe trench excavation will result in the loss of a low value marine habitat. The disturbed habitat adjacent to the work area (from sedimentation) will recover following completion of the works. Overall effects are considered to be low.
- Historical monitoring of local dredging projects has shown that elevated TSS can occur close to the dredging, but downstream (200 m downstream) concentrations are similar to those measured upstream. Significant off-site changes in water clarity are not expected.
- The release of some contaminants will occur to the water column during excavation works. Concentrations of contaminants would be expected to be below ANZG (2018) DGVs close to the dredging location after reasonable mixing and meet the requirements relating to discharges under the AUP.
- The biosecurity effects relating to the proposed BN toe trench excavation are considered negligible.
- Underwater noise from construction vessels and dredging would not be expected to have noise related effects on fish or marine mammals irrespective of exposure duration.
- Replacement of rock on the BN revetment and construction of the BN wharf deck will result in the loss of existing intertidal habitat. Intertidal habitat similar to that present today will not reform due to the shading effects of the deck. Deeper subtidal rocky habitat is expected to regrow with some elements of existing habitat returning.
- Site specific piling related effects (water clarity and quality) are considered to be negligible.
- Vibro-piling is the preferred method of piling at both BN and FN, although some impact piling will be required. Mitigation is proposed for when impact piling is required.
- No long-term adverse effects on fish from underwater noise are expected.
- For marine mammals, the modelled under water zones for TTS effects vary from seals to high frequency cetaceans (dolphins and orca). For seals, the TTS zone during vibro piling is at both BN and FN are <200 m in size. When impact piling is required, the TTS zone extends a greater distance with the largest zone estimated to be up to 825 m for FN. Additional mitigation through the use of land based MMOs who will monitor for marine mammals is proposed. This is documented in a draft UCNMP. For the cetaceans, TTS zones during vibro piling are very small (below criteria). During any impact piling the TTS zone has been

assessed at <200 m. This zone is considered small relative to the frequency and geographic use of the harbour by these mammals. The MMOs will be able to monitor cetacean movement within the harbour which will assist management should any come close to the BN or FN piling locations.

- For the little penguin, TTS related effects are very unlikely. TTS zones during vibro piling are very small (below criteria) and slightly larger during impact piling with mitigation (<200 m). This is also assisted by the dawn and dusk departure movements of penguins from burrow sites within Judges Bay (i.e., before and after piling activity). Off BN, penguins transiting the harbour adjacent to the BN revetment may respond the piling noise by moving out of the disturbance area. Off FN where a burrow was identified towards the northern end of the container terminal revetment, there may be occasions when penguins transiting the harbour near the container terminal reclamation may be temporarily affected (behaviourally not physiologically) by the piling related noise.
- At BN, vessel berthing and while at berth will result in localised and short term additional local changes in current velocities. These changes may produce a seabed within the vessel berth footprint that has more of the characteristics of those seen at FN. That is, a surface within the berthing footprint that appears 'washed'. This may result in some change to local seabed ecology due to disturbance caused by berthing vessels. However, such a change will be localised and would represent a no more than minor change in the nature of the local seabed habitat. Negligible changes are expected to seabed habitat due to the construction of the FN extension.

10.3 Mitigation

Mitigation for the loss of the BN revetment intertidal community is proposed. This might include:

- Limited intertidal rock reuse if rock can be transferred to the FN revetment completion (not as additional ecological surface material).
- The inclusion of small artificial rock pools within the surface rock of the new section of revetment at the container terminal.
- The addition of fish habitat 'houses' to the outside of steel piles at both ends of the new BN wharf. These units likely made of eco-concrete or pottery clay like materials would be attached to piles from low tide to subtidal.
- The addition of blue or green mussel rope units between the outside 1-2 rows of piles at selected locations within the Port (typically external wharf areas with higher current velocities).
- Although no little penguin have been located in burrows within the BN revetment, a draft LPMP has been prepared to provide for continued monitoring of little penguin presence and to set out protocols should little penguin be found in the revetment during construction.

- Mitigation is also proposed to reduce potential effects to marine mammals that might come within the modelled TTS zones during impact piling. The latter would take the form of MMOs. MMO work would be undertaken as set out in the draft UCNMP.

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Appendix A: Historical photographs of Bledisloe Terminal and Fergusson Container Terminal

Bledisloe Terminal development

1933 Waterfront showing Kings wharf at right AN52

March 1941 early construction of Bledisloe export wharf AN52

October 1973 AN55

September 1974 AN56

September 1975b AN57

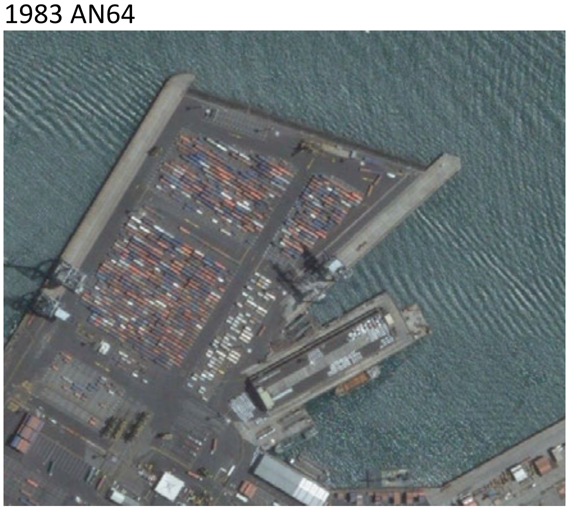
July 1976 AN58


December 1976 AN58


October 1977 AN59


1983 AN64


December 1985 AN65


Geomaps 2002


Geomaps 2015

Fergusson container terminal development

1967 AHB AN 17

July 1969 AHB AN 36

October 1969 AHB AN36

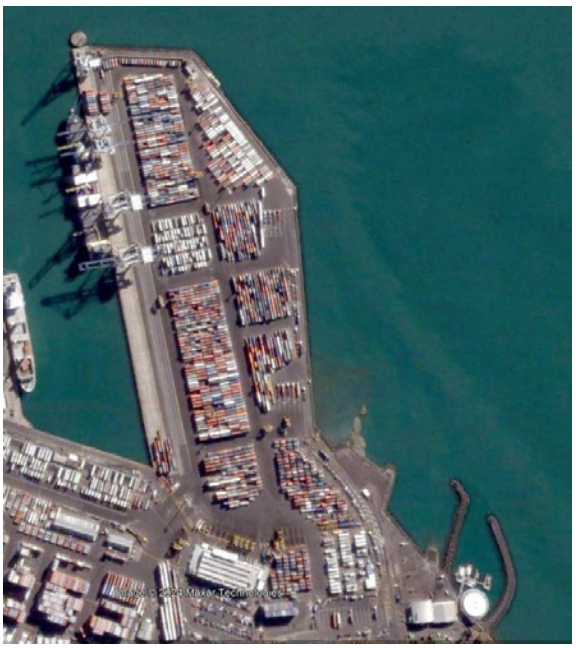
August 1972 AHB AN55

September 1974 AHB AN 36

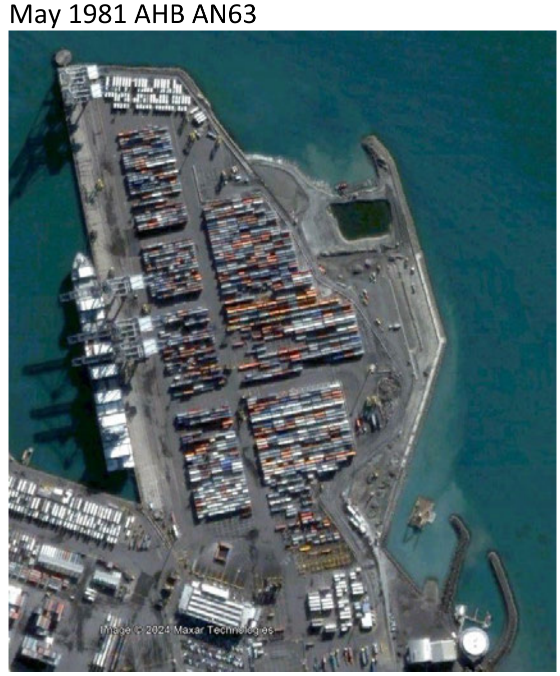
October 1977 AHB AN59

October 1978 AHB AN60

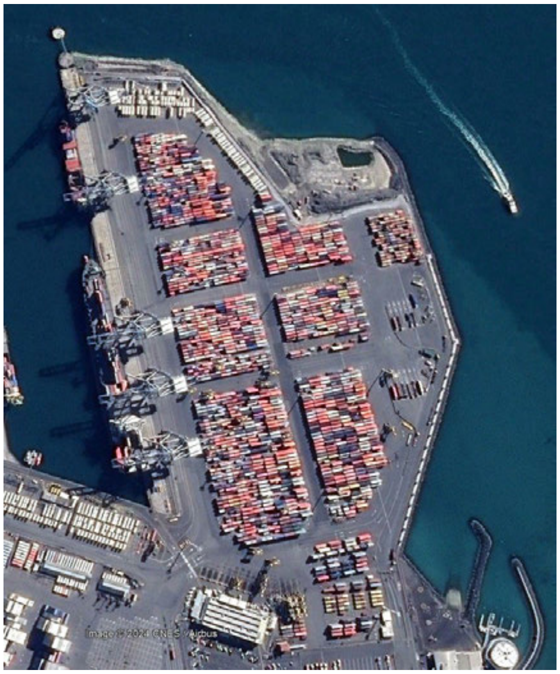
May 1981 AHB AN63



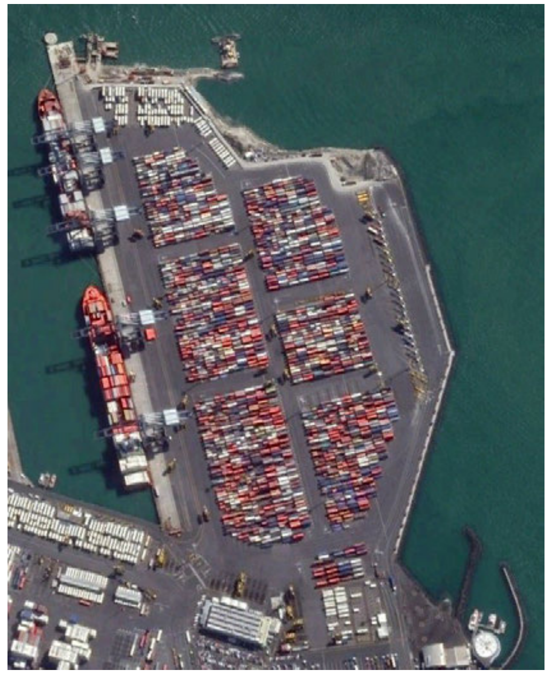
Google Earth May 2004



Google Earth September 2007

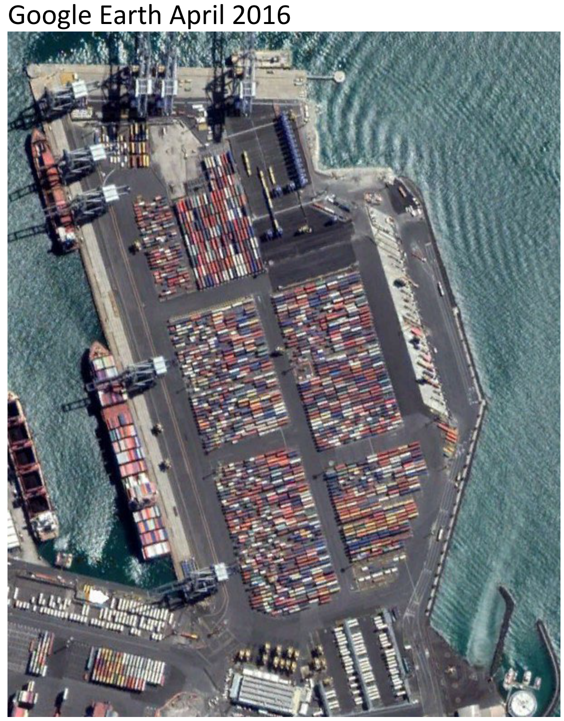


Google Earth August 2013

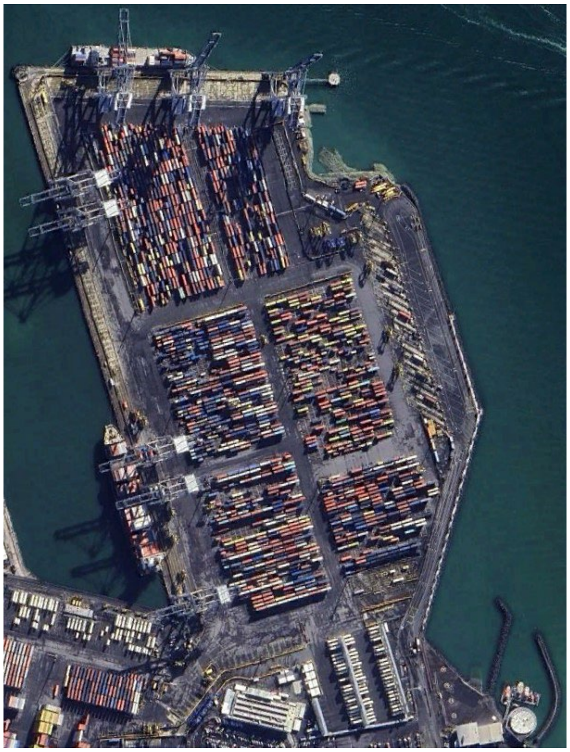


Google Earth April 2016

Google Earth September 2017



Google Earth January 2019



Google Earth May 2023

Appendix B: EIANZ Guidelines for species and ecosystems in New Zealand.

B1. Ecological values for species corresponding levels of assessed conservation threat.

Ecological value	Species threat classification
Negligible	Exotic species, including pests, species having recreational value.
Low	Nationally and locally common indigenous species.
Moderate	Species listed as any other category of At Risk (Recovering, Relict, Naturally Uncommon) found in the area of interest either permanently or seasonally; or Locally (ED) uncommon or distinctive species.
High	Species listed as At Risk – Declining found in the area of interest either permanently or seasonally
Very High	Nationally Threatened (Nationally Critical, Nationally Endangered, Nationally Vulnerable) species found in the area of interest either permanently or seasonally

B2. Ecological values for key species identified in this report based on threat classification (Tables 5 and 6).

Species	EIANZ species value
Little penguin	High
Red-billed gull	High
White-fronted tern	High
Bottlenose dolphin	Very High
Killer whale	Very High
New Zealand fur seal	Low
Leopard seal	medium

Table B3: Criteria for assigning ecological value to marine habitats (from Boffa Miskell 2020) (additional authors notes in blue).

Value	Ecological characteristics	Physical/sediment quality
Very low	• Benthic invertebrate community degraded with very low species richness, diversity and abundance. • Benthic invertebrate community dominated by tolerant organisms with no sensitive taxa present.	• Marine sediments dominated by silt and clay grain sizes (>85%). • Surface sediment anoxic (lacking oxygen). • Elevated contaminant concentrations in surface sediment, above DGV threshold concentrations [particularly GV-high) (ANZG 2018).

	• Invasive, opportunistic and disturbance tolerant species highly dominant. • Vegetation/macroalgae absent. • Habitat extremely modified.	
Low	• Benthic invertebrate community degraded with low species richness, diversity and abundance. • Benthic invertebrate community dominated by tolerant organisms with few/no sensitive taxa present. • Invasive, opportunistic and disturbance tolerant species dominant. • Vegetation/macroalgae provides minimal/limited habitat for native fauna. • Habitat highly modified.	• Marine sediments dominated by silt and clay grain sizes (>75%). • Surface sediment predominantly anoxic (lacking oxygen). • Elevated contaminant concentrations in surface sediment, above DGV threshold concentrations (ANZG 2018).
Moderate	• Benthic invertebrate community typically has moderate species richness, diversity and abundance. • Benthic invertebrate community has both tolerant and sensitive taxa present. • Few invasive opportunistic and disturbance tolerant species present. • Vegetation/macroalgae provides moderate habitat for native fauna. • Habitat modification limited.	• Marine sediments typically comprise less than 75% silt and clay grain sizes. • Shallow depth of oxygenated surface sediment. • Contaminant concentrations in surface sediment generally below DGV threshold concentrations (ANZG 2018).
High	• Benthic invertebrate community typically has high diversity, species richness and abundance. • Benthic invertebrate community contains many taxa that are sensitive.	• Marine sediments typically comprise <50 % smaller grain sizes • Surface sediment oxygenated. • Contaminant concentrations in surface sediment rarely exceed DGV threshold concentrations (ANZG 2018)
Very High	• Benthic invertebrate community typically has very high diversity, species richness and abundance. • Benthic invertebrate community contains dominant taxa that are sensitive.	• Marine sediments typically comprise <25% smaller grain sizes. • Surface sediment oxygenated with no anoxic sediment present. • Contaminant concentrations in surface sediment significantly below DGV threshold concentrations [unless confirmed to be of natural origin] (ANZG 2018).

Table B5: Criteria for describing magnitude of effect (Roper-Lindsay et al. 2018)

Magnitude	Description
Very high	• Total loss of, or very major alteration, to key elements/ features of the baseline conditions such that the post development character/ composition/ 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 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
Low	• Minor shift away from 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/patterns; AND/OR • Having a minor effect on the known population or range of the element / feature
Negligible	• Very slight change from existing baseline condition. Change barely distinguishable, approximating to the "no change" situation; AND/OR • Having a negligible effect on the known population or range of the element / feature.

Table B6. Possible timescales for duration of effects

Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as approximately 25 years).
Long term	Where there is likely to be substantial improvement after a 25 year period (e.g. the replacement of mature trees by young trees that need > 25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'.
Temporary	Long term (15-25 years or longer – see above) • Medium term (5-15 years) • Short term (up to 5 years) • Construction phase (days or months).

Table B7. Criteria for describing level of effects (Adapted from Regini (2000) and Boffa Miskell (2011))

	Ecological value				
Magnitude of Effects	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

Table B8. Extent of adverse effects of a proposal (from QP website, 2017)

Nil Effects	No effects at all
Less than Minor Adverse Effects	Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons.
Minor Adverse Effects	Adverse effects that are noticeable but that will not cause any significant adverse impacts
More than Minor Adverse Effects	Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
Significant Adverse Effects that could be remedied or mitigated	An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
Unacceptable Adverse Effects	Extensive adverse effects that cannot be avoided, remedied or mitigated.

https://www.qualityplanning.org.nz/node/837

Appendix C: Little Penguin BN and FN shoreline search reports

Appendix D: February 2019 images from ROV survey off Bledisloe Terminal (refer Figure 7 in main report for transect locations)


FN1


FN1


FN1


FN2


FN2


FN2


FN3


FN3


FN3


FN4


FN4


FN4

Appendix E: March 2019 ROV images from Fergusson North wharf.

Fergusson North Berth and approaches showing location of ROV dive sites (For original location figures refer Fugro report in Appendix of Ramboll 2019 (Appendix C)).

W1

W2

W1

W2

W1

W2

W3

W4

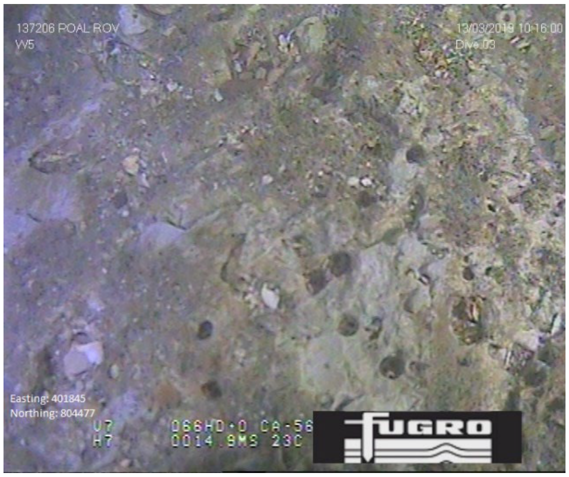
W3

W4

W3

W4

W5

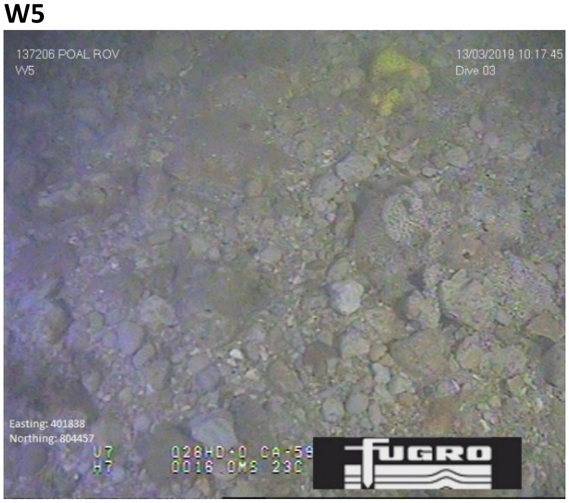


W5

W5

W5

W5



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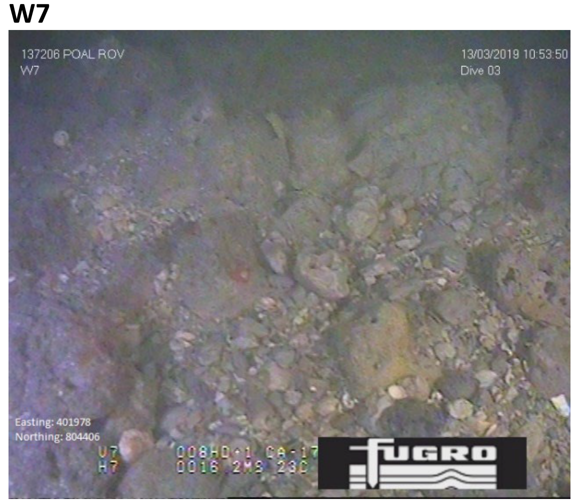
W7

W6

W7

W6

W7



W8


137206 POAL ROV
W8
13/03/2019 10:59:51
Dive 03
Easting: 402026
Northing: 804415
FUGRO

W8


137206 POAL ROV
W8
13/03/2019 11:00:29
Dive 03
Easting: 402012
Northing: 804408
FUGRO

W8


137206 POAL ROV
W8
Easting: 402006
Northing: 804405
FUGRO

Appendix F: Draft Little Penguin Management Plan.

KENNEDY ENVIRONMENTAL LIMITED

DRAFT LITTLE PENGUIN MANAGEMENT PLAN FOR BN AND FN WHARF PROJECT

Prepared for Port of Auckland Limited

March 2025

1 Limitations

2 Document Revision History

Revision	Author	Version	Date of release
1	P Kennedy	Issue to POAL for review.	20 December 2024
2	P Kennedy	Final draft issue to POAL	4 February 2025
	P Kennedy	Re-issue of final draft issue to POAL	3 March 2025

3 Bibliographic Reference

This report should be referenced as:

KEL 2025. Little Penguin Management Plan for BN & FN Wharf Project (draft). Prepared by Kennedy Environmental Limited for Port of Auckland, March 2025.

Table of Contents

Contents

1 INTRODUCTION

The Port of Auckland Limited (POAL) operates the Port of Auckland (the Port). POAL is intending to progress construction of two new wharf structures at the Port in accordance with consents obtained under the Fast-track Approvals Act 2024 (the Project). The Project involves:

- The construction of an additional wharf/berth at the seaward side of the existing Bledisloe Terminal. This is referred to as the Bledisloe North (BN) wharf. The new wharf provides for large cruise ships (>300 m in length) and existing roll on roll off (RoRo) needs.
- The construction of an extension to the existing Fergusson North (FN) berth at the Fergusson container terminal which improves vessel container management at the berth (i.e., loading / unloading time).

Under the conditions of consent, POAL is required to prepare a Little Penguin Management Plan (LPMP). This document is the draft LPMP required under those consent conditions. It provides the framework for undertaking pre-construction and construction surveys, responding to little penguin finds in pre-construction surveys or an unexpected find of little penguin during construction works. It also provides the necessary information for meeting the requirements of a Department of Conservation (DoC) Wildlife Act Authorisation (WAA) for handling and relocating little penguin should it be required.

For context, the assessment of potential ecological effects prepared in support of POAL's application for resource consent (KEL 2024) concluded that although little penguin (kororā, *Eudyptula minor iredale*) had not been located within the rock revetments within the Project area, there was a possibility that penguin may be present. As a contingency it was identified that should little penguin be discovered during works that a WAA under the Wildlife Act should be in place to allow the capture, handling and relocation of penguin if required.

2 This Plan

This LPMP has been prepared in accordance with the proposed conditions submitted with POAL's resource consent application. As such this draft LPMP is an outline plan only and will be revised and updated following resource consent being granted, taking into account any revisions made to the conditions of consent and any specific conditions imposed through the WAA process (to be included in Appendix A). The key elements of this plan include:

- Section 3 which sets out key definitions.
- Section 4 which provides a summary of little penguin breeding and ecology.
- Section 5 identifies the points where the plan intersects with the Construction Management Plan (CMP).
- Section 6 sets out management processes where a WAA has been granted.
- Section 7 sets out some recommended draft conditions.
- Section 8 provides information about communications.

Figure 1 below shows the location of the existing revetments at Bledisloe terminal and Fergusson Container terminal.

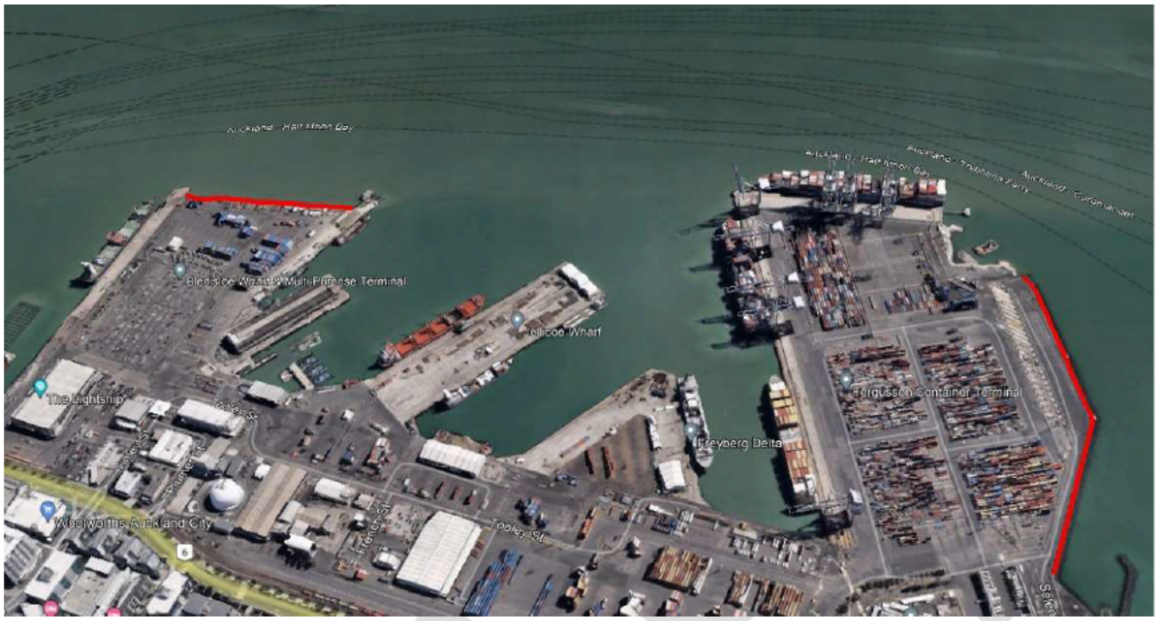


Figure 1: Location of revetment at Bledisloe Terminal (left) and Fergusson Container Terminal, (right) at Port of Auckland (from KEL 2024). Existing FN wharf is the wharf with container ship berthed at north of container terminal.

This LPMP does not include matters such as predator control as the Port is a biosecurity-controlled area and POAL has an extensive pest control program in relation to terrestrial pests such as mice and rats.

3 Definitions

This LPMP makes reference to a number of matters that require definition. These are set out below.

Suitably Qualified Coastal Ecologist

A person who with a tertiary ecology qualification and experience working with coastal birds. They will be responsible for supervising and advising on the overall kororā management actions for the Project as required.

Suitably Qualified Kororā Specialist

A person who with a tertiary ecology qualification and experience working with kororā (or if a tertiary qualification is lacking, a person with kororā experience that is approved by DoC). They will be responsible for supervising and advising on kororā management actions for the Project as required.

DoC-Permitted penguin handler

A person who is listed in the WAA (Permit) for the Project to capture, handle and relocate kororā.

Active burrow

A burrow containing, or suspected to contain, a nesting bird, viable nest contents (egg(s) and / or chicks (s)), or moulting bird based on the identification of penguin sign by a suitably qualified and experienced coastal ecologist.

Penguin sign

The sighting of guano, feathers, odour or penguin sounds at a suspected burrow.

As set out in this LPMP, due to the length of the Project construction period, two penguin handlers will be identified. The Korora specialist can be one of those handlers.

4 Kororā

4.1 Introduction

There is little published information available about the numbers of little penguins that are present and nest within the lower Waitematā Harbour. Little penguins have a national conservation status of At-Risk – Declining (Robertson et al. 2021)) and a regional status of Threatened Regionally Vulnerable (Wooley et al. 2024). There are few records of little penguins within Waitematā Harbour in sources such as iNaturalist or e-bird. There are occasional observations of penguins swimming within harbour waters with observations typically peaking in September through November. Little penguin have been found during other construction works within the harbour. The most recent being in 2023 on the Westhaven Marina breakwater during rock replacement.

4.2 Breeding

Kororā / little blue penguins are nocturnal, typically coming ashore after dusk and leaving before dawn. Adults are present at colonies throughout the year. For most colonies in New Zealand the breeding season begins around July and continues until February when chicks fledge. The yearly cycle involves occupation of burrows and pair formation; breeding with egg laying/incubation/hatching/chick rearing/moulting. There is fluidity in timing of breeding activity around New Zealand so it is generally assumed that penguin can be present for most of the year with a short period around May and June when they will be at sea for a few weeks feeding preparing for the breeding season (refer Fleming 2013).

4.3 Burrow Habitat

Kororā utilise a diverse range of habitat for nesting. Burrows are dug where ground is suitable or where natural or artificial features provide a dark space where they can nest. In urban areas on the coast penguin have often bred under houses. As much of the lower Waitematā Harbour shoreline is man-made, penguin have found suitable nesting locations in revetments and under buildings that are up against the shore (e.g., the marine Rescue Centre on Tamaki Drive by the Port).

The two surveys (using a penguin detector dog) caried out in 2024 (KEL 2024) on the BN revetment did not detect penguin sign. Examination of the revetment from the northern end of the Fergusson Container Terminal west to Tamaki Drive, found positive dog detects and several burrow with audible and or visual evidence of penguin presence (Figure 1). Little penguin are not present at the location of the FN works as the rock revetment is yet to be constructed adjacent to this location.

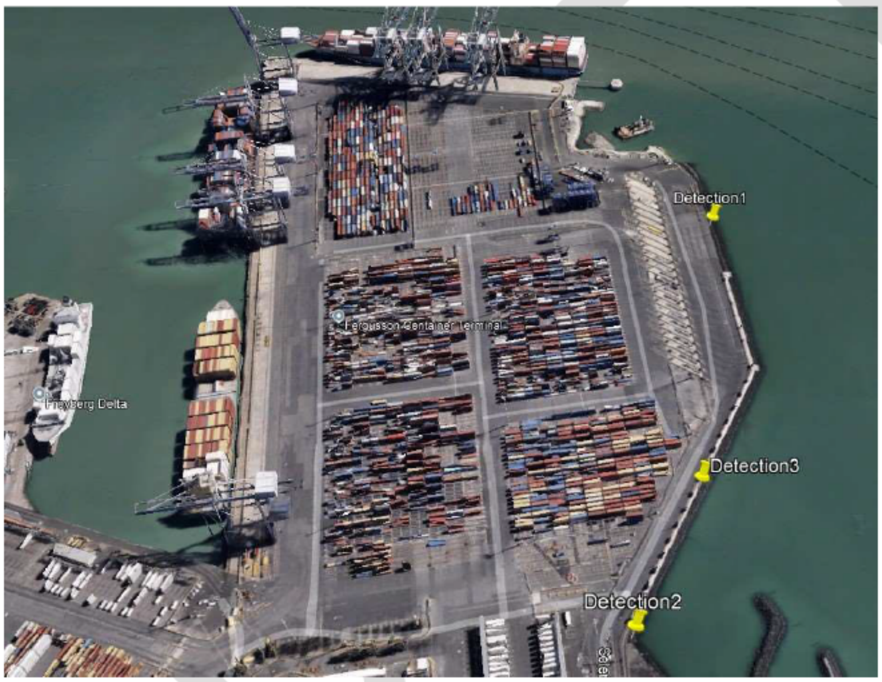


Figure 1: Fergusson Container Terminal, locations where little penguin burrow were detected (from KEL 2024).

The ability to detect little penguin in their burrow using burrow scopes is very dependent upon how deep the burrow is within rocky areas such as revetments. Although little penguin nest above the high tide mark, some burrows can be several metres or more within the revetment.

4.4 Site Fidelity

Little penguin in general return to the colony they fledged from. An overview of fidelity in little penguin colonies is provided by Wilson & Mattern (2024).

5 MANAGEMENT

5.1 Introduction

Rock revetment works will only occur at BN as a component of the overall construction program. Those works will occur for multiple short periods though the entire BN works period. The physical works will involve:

- The removal of rock to allow steel pile tubes to be installed.
- Removal of smaller rock from sections of the revetment to ensure the rock in the revetment is of suitable size. Replacement with rock of defined size.

5.2 Health & Safety

Prior to any surveys being conducted to establish presence of little penguin, a Health and Safety assessment will be carried out and a Job Safety Analysis (JSA) prepared for this element of work. The JSA which will be prepared prior to the first pre-construction survey will focus on field work on the revetment and penguin handling. The JSA which will be included as Appendix B of this Plan, will include relevant matters included in NZPI (2024), and will include:

- Reference to kororā handling protocols (e.g., as a standard operating procedure (SOP)) as they apply to who is permitted to handle under the Wildlife Act 1953 (WA).
- Information about hygiene practices and biosecurity during all site work.
- Safety procedures to be followed while working around the water's edge within the Port/on the revetments.

5.3 Preconstruction/Construction Penguin Communications

Prior to any construction starting information will be communicated to all worksite staff involved in works on the revetment (crane drivers, piling equipment) about little penguin. The information will be sufficient to ensure that site workers will be able to spot little penguin with their work areas and respond accordingly. The key information that will be communicated will include:

- Why there is a need to watch out for penguin.
- Where they could be found.
- What they look like.
- What to do if you see one within a work zone.
- Who to advise if you see a penguin.

Training will be provided to onsite contractors to identify signs of penguin habitation (e.g., moulted feathers and guano (penguin poo)) and to discuss actions required to secure work sites, construction materials and equipment to prevent kororā access. This training will be run by a suitably qualified and experienced ecologist.

During construction and at toolbox meetings:

- What to do if you see one within a work zone and what to do if a penguin is injured.
- Who to advise if you see a penguin.

Information will be re-communicated should there be changes in personnel on site.

5.4 Approved Penguin Handlers

Prior to the commencement of work on the project work site, two approved DoC penguin handlers should be identified and available to assist if required. Two handlers are required due to the duration of the project and to ensure one handler is available at any time.

The identity of the approved handlers should be communicated to DoC through the finalisation of the LPMP.

The work commencement timetable should be communicated to DoC approved penguin handlers.

5.5 Preconstruction Surveys

Prior to any construction starting at BN, a pre-construction survey will be carried to identify any sign of penguin burrow activity within the BN revetment area. As set out in Section 3 of this LPMP, detection is defined as:

- A positive detect by an approved detector dog but no penguin sign or
- The identification of penguin sign (refer definitions and Section 5.6) at a locality identified by a dog.

If a detection is made, a burrow-scope or other suitable tool camera will be used to assist with identifying the burrow contents.

5.6 Information Recorded in Surveys

If a detection is made of any kind, the following information will be recorded (as applicable):

- The location of dog detection(s) or by detection by specialist/handlers.
- The GPS location of the nest (GPS or phone GPS).
- The identification of any penguin sign including guano, feathers, odour, penguin sounds.
- The identification of any penguin within the burrow (e.g., using a burrow-scope) and whether they are moulting).
- The number of eggs or chicks if seen in the burrow.
- Photographs to confirm location.

Information collected in the field will be recorded on the field record form provided in Appendix C.

5.7 Construction Surveys

Following commencement of construction works at BN and FN, little penguin surveys will be conducted no less than every three months on the BN revetment and on the Fergusson Container terminal eastern revetment down to the start of the red fence (identified by Detection 2 in Figure 1). Surveys will cease when piling work is completed.

The surveys will record the information set out in Section 5.6.

5.8 Finding Little Penguin at BN

During penguin surveys (pre-construction)

If little penguin are found during a pre-construction survey, the location(s) will be identified and location communicated to the Project manager.

A temporary exclusion zone of 20 m will be put in place until a review of penguin management options within this area is carried out.

If non-breeding or non-moulting kororā are discovered within the effects zone during a pre-construction survey, or incidentally during works (both within and outside of the kororā breeding and moult periods), works will not commence, or if underway, halt immediately, until the penguin/s has been moved to the relocation site by an authorised person / handler.

Upon discovery of the kororā, the construction manager and Port of Auckland will be informed, and the process outlined in Appendix D will be implemented immediately to arrange the capture, handling and relocation of the bird.

While waiting for the arrival of an authorised person, the kororā will not be handled or disturbed further. If the kororā is injured, DoC will be immediately contacted to receive advice on what actions to undertake.

During construction

On the basis that no little penguin burrows have been identified within the BN revetment, it is not intended that a specialist be on site during all rock removal. However:

- Excavator operators will receive training to ensure they know how to identify little penguin.
- A stop work process will be in place in the event of a penguin sighting. If a little penguin is sighted, the location(s) will be identified and location communicated to project manager and ecology specialists. An exclusion zone of 20 m will then be implemented.

- Work will resume when the penguin has left the area or has been removed for relocation by the approved handler (as specified in the WAA). Relocation will be carried out as set out in Appendix E.

5.9 Capture, Handling, Relocation

These procedures require a Wildlife Act Authority (WAA) under the Wildlife Act.

Penguin handling

All kororā capture and handling will be carried out by an approved handler and will be carried out in accordance with a SOP (which will be included in appendix F of the final draft of the Plan).

Records will be kept to trace all movements of handled/captured penguin.

Should any kororā have a band then the band details should be recorded.

Relocation site

A relocation site will be identified in conjunction with the DoC and the approved kororā handlers prior to the finalisation of the LPMP.

It is recommended that any kororā relocated from the work site should be marked to allow easy identification should it return to the work site.

Suitable transportation cages will be made available for transport of kororā.

5.10 Changes to Management Plan

Following approval (certification) of the LPMP, no material changes will be made to the Plan without the approval of DoC and recertification by Council in accordance with the conditions of consent. In relation to the review of Plan contents:

- The Plan (or specific sections) will be reviewed should site construction activities change in any way that affects management actions within the Plan.
- The overall Plan should be reviewed 30 days prior to the yearly anniversary of the Plan.
- A copy of all changes proposed to the plan will be provided to DoC for approval prior to their final incorporation into the Plan.

6 FINDING INJURED OR DECEASED KORORA

6.1 Injured

Should an injured or sick kororā be identified on site:

Contact the approved handler.

If the handler recommends use the appropriate PPE and place the injured kororā into a suitable transportation carrier as set out in the SOP.

For injured or sick penguins contact the nominated wildlife rehabilitation centre. In this case it is:

BirdCare Aotearoa

74 Avonleigh Road
Green Bay, Waitakere, Auckland
Phone: (09) 816 9219
Website: www.birdcareaotearoa.org.nz

If the centre is unavailable contact DoC through the DOC emergency hotline **0800 DOC HOT (0800 362 468).**

6.2 Deceased

Under the Wildlife Act the kororā is a protected species. In the event that a dead kororā is located within the project area:

- The finding will be reported to DoC (Auckland Office) with 24 hours. Refer contact details in Section 8.
- A photograph should be taken of the bird as found. The photograph should include any information (e.g., on the ground) that might relate to cause of death. The photograph(s) should be included in the findings email to DoC.
- The dead bird should be collected with all handling carried out with disposable gloves and placed into a ziplock plastic bag. The bag should then be stored in a fridge if the carcass is to be transported within 24 hours.
- The project 'ecologist' or' penguin specialist' should determine (in conjunction with DoC) if an autopsy is required. If an autopsy is to be performed, then the carcass should be placed into a suitable container and sent by courier to the vet lab or Massey University [contact details to be included in final plan) or alternative veterinary facility (e.g., Pet Doctors St Lukes & Exotics Centre).

7 CONDITIONS

This section of the LPMP will set out any specific conditions in the Consent as granted and the WAA that relate to:

- Little penguin monitoring.
- Surveys and monitoring.
- Training of construction staff.
- Reporting and communications.

- Responses to penguin sightings.
- The management and relocation of little penguin.

8 COMMUNICATIONS

8.1 Key Contacts

The key contacts for matters set out in this LPMP are set out in Table 1.

Table 1 Key contacts.

Party	Person	Phone	Email
POAL Project manager			
Project ecologist	**P Kennedy**	[redacted]	[redacted]
DoC approved penguin expert			
DoC approved penguin handler			
DoC approved penguin handler			
Department of Conservation			
Auckland Council			

8.2 Summary of Reporting to Department of Conservation and Auckland Council

This section will include all key reporting requirements associated with the consent as granted and the WAA.

4 REFERENCES

NZPI 2024. Penguin monitoring: Health and safety awareness. New Zealand Penguin Initiative. Version 1, August 2024. Available at https://www.nzpi.nz/korora/littlepenguin-resources.

Robertson HA, Baird K, Elliot GP, Dowding JE, Elliott JP, Hitchmough RA, McArthur N, Miskelly CM, O'Donnell CFJ, Sagar PM, Scofield RP, Taylor GA, Mochel P 2021. Conservation status of birds in Aotearoa Zealand, 2021. New Zealand Threat Classification Series 19. Department of Conservation.

Wilson K-J, Mattern T 2024. Little (Blue) penguin/kororā. Available at https://sop.penguinarchive.org/little-penguin. Accessed 17 December 2024.

Woolly J, Lovegrove T, Robertson H, Dell'Ariccia G, Melzer S 2024. Conservation status of birds in Tāmaki Makaurau / Auckland. Auckland Council technical report, TR2024/5

Appendix A: Wildlife Act Authorisation.

To be appended when granted by Department of Conservation.

Appendix B: Job Safety Analysis.

This Appendix contains a draft JSA. This will be reviewed and updated by the Ecologist, Penguin specialist, POA and Contractor prior to inclusion in the LPMP for certification. The project site will be under the control of the Contractor.

JOB SAFETY ANALYSIS (JSA) WORKSHEET

LOCATION/ SITE:	Bledisloe North wharf construction/Fergusson North wharf addition Little Penguin Management	**JOB PLAN / SHEET** (if applicable)		**JSA NO:**	POAL_6
COMPANY NAME (CONDUCTING WORK):	KEL, POA staff, Dabchick and any Project Contractor staff who might assist as required. To be updated prior to finalisation of LPMP.				
WORK ACTIVITY / JOB / TASK OR ACTIVITY DESCRIPTION	Little penguin surveys on BN revetment; Fergusson container terminal revetment. Barge mounted coring of seabed sediment off northern face of Bledisloe reclamation. For work to be undertaken between 10 June and 15 June 2024.			**DATE JSA DEVELOPED:**	02 March 2025 First unreviewed draft
NAME OF EMPLOYEES INVOLVED IN INITIAL JSA DEVELOPMENT:	Paul Kennedy (Ecology Co-ordinator). Dabchick staff and conservation dogs; Project LP specialist, POA support staff.	Toolbox meetings prior to daily work			
AUTHORISING PERSON: (PRINT)	Paul Kennedy (KEL)	**SIGNATURE:**		**DATE OF AUTHORISATION:**	Not authorised

NOTE: This JSA has been prepared in advance of pre-work review and will be reviewed and approved by POA prior to any field work being undertaken.

S: Safety **E:** Environment	**CONSEQUENCE**		
LIKELIHOOD	**S:** Onsite treatment (first aid) **E:** Minor impact (onsite)	**S:** Offsite treatment (Medical) **E:** Minor impact (offsite)	**S:** Fatality or permanent injury **E:** Major impact (onsite/offsite)
Almost Certain (Will probably occur)	CHECK	STOP	STOP
Possible (May occur, has happened)	START	CHECK	STOP
Unlikely (could occur - known to happen)	START	START	CHECK

ACTION TABLE			
Uncontrolled Risk Level	What do we need to do?	Controlled Risk Level	What should happen next?
STOP	Hazards must be eliminated or the uncontrolled risk level reduced through substitution, isolation, engineering or a design change.	STOP	TASK MUST STOP The task CANNOT proceed until company has agreed to what (IF ANY) further controls must be applied.
CHECK	Ensure that the highest possible controls have been applied (e.g., elimination, substitution, isolation, engineering, several administrative controls and PPE).	CHECK	TASK MUST BE CHECKED COMPANY MUST review controls and ensure they are appropriate and effective before the task can start.
START	The Supervisor or equivalent MUST review the controls and ensure they are appropriate and effective before the task can start.	START	TASK MAY START Continually review controls are in place and working effectively.

	ACTIVITY / TASK SEQUENCE	HAZARDS	UNCONTROLLED RISK LEVEL	CONTROLS	UNCONTROLLED RISK LEVEL	WHO WILL DO THIS?
	Break the job down into tasks. Each task should accomplish some major activity and be in a logical sequence.		STOP CHECK START	☐ Work in Adjacent Areas ☐ Licenses, Qual's, Permits ☐ Training requirements ☐ Approvals, Plans & Permits ☐ Maintenance / Inspection ☐ Safety Equipment ☐ PPE ☐ MSDS	STOP CHECK START	Wherever possible list who specifically (by name) and when this needs to be done.
1	**Personnel well-being and Covid/Respiratory illnesses**					
	State of health	All field team to confirm that they are well/fit to conduct work prior to work start (no temperature, coughs etc.)	Check		Start	All team members
	Work area		Check	All work is outdoors Hand sanitiser will be provided. To be used prior to and regularly during workday and before all meal/tea breaks. Review requirements each day at toolbox.	Start	All team members
2	**Pre-checks for field survey work/site work.**					
2.1	PPE	Ensure required/ appropriate PPE is being worn/used.	Check	Following PPE is mandatory for pre-construction surveys: High vis vest Safety boots/shoes. Approved lifejacket. Following additional PPE to be available during construction should site H&S require: Safety glasses, gloves and noise protection (to be available).	Start	All team members
2.2	Weather	Weather	Check	Met-service weather (or windy) forecast to be checked prior to field work by Team Lead. Any unusual weather conditions to be identified via forward weather forecast and communicated to team prior to start of workday including any specific additional PPE requirements.	Start	All team members.
2.3.	Weather	Weather check	check	If ok, ensure weather related PPE is available/being used by field team: Winter: appropriate field clothing/wet weather gear. Summer: Sun hats/sunscreen/ long sleeve shirt where appropriate.	Start	All team members.
2.4	Work on revetment	Work above and near water. Be aware of wave and swell conditions if working towards low tide areas of revetment.	check	It is a POA requirement that all field staff working adjacent to water within Port wear suitable lifejackets. Any field team or co-opted team members will be provided by lifejackets. Be aware of unusual swell and wave conditions near work areas.	Start	All team members.
3	**Toolbox**					

3.6	Weather	Variable weather conditions.	Check	Weather issues to be discussed at daily toolbox before work start. All field staff to ensure they have appropriate field gear to allow for weather changes. Field staff to have: Waterproof rain gear. Sufficient warm clothing should air temperature drop (wind change etc.). Field staff to ensure they stay hydrated. Bottled water to be available. Sunscreen to be available.	Start	All team members.
3.7	Survey risks	Work on revetment	Check	All staff to understand risks associated with working on/moving across revetment. Care with footing and stability and match to weather conditions.	Start	All team members.
3.7	Work risks	Work on revetment and around construction areas	Check	As above. During construction all work will be undertaken in conjunction with key construction team persons/equipment operators so ensure that any LP related work is clear of any active equipment.	Start	All team members.
3.8	Comms	Not being able to communicate incident	Check	At least 2 members of field team must have mobile phone during field work All team members must know incident call in procedures (refer below).	Start	All team members.
4	**Field work**					
4.1	Falls on revetment	Injury	Check	All work on revetment to be to conditions. All falls to be logged and noted for following toolbox. All minor injury (scrapes, bruising etc.) to be reported for following toolbox. Non-minor injury requiring first aid to be called in using POA DEFINED PROCEDURE. Non-minor injury requires root-cause analysis to be carried out following event. .	Start	All team members.
4.2	Person in water (surveys)	Injury/drowning	Check	All field staff to wear lifejackets. Field team to have lifeline available to aid retrieval. Incident to be called in using POA DEFINED PROCEDURE.	Start	All team members.
4.3	Person in water (during construction)	Injury/drowning	Check	All field staff to wear lifejackets. Field team to have lifeline available to aid retrieval. Location of emergency equipment (life rings etc) within construction area to be known. Incident to be called in using POA DEFINED PROCEDURE.	Start	All team members.
4.4	LP handling	Injury	Check	All LP handling to be carried out be LP specialist/approved persons (refer SOP for LP handling). Appropriate PPE to be worn.	Start	All team members.
4.4	LP handling	Disease	Check	All LP handling to be carried out be LP specialist/approved persons (refer SOP for LP handling and information regarding bird diseases). Appropriate PPE to be worn.	Start	All team members.

WORK DIAGRAM (IF APPLICABLE)

E.g., sketch or attach relevant diagrams or drawings of task hazards such as services, other plant or equipment, hazardous areas, environmental considerations etc.).

WORKER NAME	SIGNATURE (I have been consulted in and understand this JSA)	DATE	EMPLOYEE NAME	SIGNATURE (I have been consulted in and understand this JSA)	DATE

Note: Attach additional signature pages if necessary.

REVIEW NO:	1	2	3	4	5	6	7	8	9	10
Date:										
Initial:										

Note: JSA's must be reviewed at a minimum weekly.

JSA AMENDMENT REASON/DETAILS	CHANGE MANAGEMENT ACTIONS (e.g., actions taken to communicate changes)	DATE

Appendix C: Field Record Forms.

Field record form for kororā burrow discovery during construction . V1 2 March 2025 Pre-review draft.

Location		
Date of survey		
Time of LP burrow detection		
Unique burrow ID	i.e., BN-1, FN-1 etc.	
GPS (if available)		
Method of detection	Person	
	Detector dog	
Penguin sign	Guano	
	Odour	
	Tracks	
	Feathers	
	Heard	
	Seen visual	
	Seen burrow-scope	
Site location photographs taken	Yes/No	
	Time	
Other notes		

Field forms will be supplemented with the following additional forms when required:

Record form for all PIT tagging of LP.

Record form for all morphometric measurements taken of captured LP.

Appendix D: Notification Process (kororā on site).

Note: This appendix provides a summary of all activities that require notification within project and to various organisations on the occasion that kororā are discovered. Actions will be modified based on requirements of WAA. This Appendix may be integrated into the main body of the LPMP.

1 Discover of injured kororā

1a Injured natural causes

Action	Party	Contact details
Collect and transport to vet specialist	Birdcare Aotearoa Vets, St Lukes.	Phone, address Phone, address
Communicate by email to DoC Auckland.	Department of Conservation	Email.

1a Injured during handling

Action	Party	Contact details
Collect and transport to vet specialist	Birdcare Aotearoa Vets, St Lukes.	Phone, address Phone, address
Communicate **by phone** and email to DoC Auckland.	Department of Conservation	Phone Email.

2 Discover of deceased kororā (unknown causes)

1a Known cause

Action	Party	Contact details
Communicate **by phone** and email to DoC Auckland.	Department of Conservation	Phone Email

1a Unknown cause

Action	Party	Contact details
Communicate **by phone** and email to DoC Auckland.	Department of Conservation	Phone Email
Communicate **by phone** and email to MPI.	Ministry of Primary Industries	Phone Email.

3 Relocation of kororā

Following completion of a relocation, relocation information will be emailed to DoC.

Action	Party	Contact details
Communicate email to DoC Auckland.	Department of Conservation	Email

4 Discovery of kororā during construction

Should a kororā be discovered on site or during construction.

Situation/Action	Communication to	Contact details
If sighted off revetment adjacent to BN or FN work location		
1. Notify kororā team	Team ecologist Project team	Phone Phone
Action	Kororā team to capture and relocate kororā and or transport to Birdcare or vet.	
If sighted on revetment at BN		
1. Operator/person making observation	Project site contact.	Phone
Action	Establish 20 m buffer zone around sighting.	
2. Project site contact	Team ecologist Specialist	Phone Phone
3. Kororā team.	Initiate “kororā” toolbox meeting at site with Project “lead” as to how kororā will be managed at specific site.	
4. Kororā team.	Remove kororā from site for relocation. Remove need for buffer zone	
Communicate outcome to DoC/AC.	Auckland Council, Department of Conservation	Email Email

Appendix E: Relocation Site.

Kororā Relocation Site.

Note: This Appendix will contain the map showing the location of the relocation site, which is to be determined in consultation with DOC Auckland Conservator, in line with the management procedures detailed in the LPMP and supported by the Handling SOP.

Appendix F: Kororā Handling SOP.

Kororā Handling Standard Operating Procedure.

Note: This document is a pre-review SOP prepared to set out the key aspects/requirements should kororā handling/management be required as part of the Project. It is intended that this document will be:

Reviewed and updated where required by the project penguin specialist.

Provided to Auckland Council as part of the LPMP certification.

Provided to Department of Conservation as part of the confirmation of specialist/penguin handling training and to assist in ensuring that all methods are appropriate.

1 Introduction

This SOP sets out specific information relating to:

- Appropriate training for kororā handlers.
- Health & safety related to handling.
- The handling of kororā following discovery during project works.
- The management of kororā following capture.
- Relocation of kororā.
- The management of injured kororā.
- The management of deceased kororā.

The latter two items are included for completeness although they are included in the LPMP.

Permissions are required from Department of Conservation (DoC) to interact with kororā, capture kororā for obtaining data, checking bands/tags and inserting new PIT tags and or relocating Korora if required during construction works. These permissions are obtained through a Wildlife Authorisation granted under the Wildlife Act 1953 (https://www.doc.govt.nz/get-involved/apply-for-permits/).

2 Appropriate Training

The kororā specialist must have appropriate experience in the following:

- Handling of kororā and must have handled kororā previously in the field.
- Handling kororā to take morphometric measurements and taking the required measurements (refer below).

And training/certification in the following:

- Banding kororā or inserting PIT tags (if PIT tagging of captured birds is confirmed).

Training/certification to Level 3 (DoC banding certification) will be required if PIT tagging of kororā is to be undertaken. If PIT tagging is not required, then a lower level of overall experience may suffice for general handling of kororā.

It is expected that the Project will have two handlers available. If the second is not Level 3 certified for banding then PIT tagging may not occur on that day.

A formal team induction will be undertaken prior to field work starting.

3 Health & Safety

3.1 JSA

All kororā management team members must have read the LPMP JSA prior to commencing work and understand the risks associated with working on the project and working with kororā. The key aspects of the JSA include:

- Being aware of the work environment especially while on the Port revetments.
- Being aware of risks while handling or assisting with handing of kororā.

3.2 Working on revetment

No field team members will undertake field work alone/out of site when near water or on any section of port revetment. Life jacket to be worn.

When working on the revetments, all field staff must be fully aware of footing when moving over the revetment. Ensure you are comfortable at all times in locations you are working. Take extra care if windy or during rain. If any concerns are raised, Take 5 and discuss state of work conditions. No work is planned during times of darkness.

3.3 Well-being of LP

There are a number of areas where well-being of LP should be considered. NZ Penguin Initiative (2024) has been referred to as the document is one of the few Health & Safety evaluations of working with Kororā.

The penguin specialist (and any person who may assist) should wear gloves to avoid direct contact with penguin to reduce transfer of oil to feathers.

Kororā are susceptible to stress and injury during handling. Handlers should be familiar in recognising stress during handling.

3.4 Diseases

As discussed by NZPI (2024) kororā are susceptible to a range of diseases.

Most penguin have not been in direct contact with humans. As such they are susceptible to a variety of pathogens that can be communicated by humans. With current concerns about bird flu, the potential for communication to LP must also be considered.

No field team members should have been in contact with poultry. If there has been contact, the clothes being worn should have been laundry washed.

Refer section 8 on handling injured, ill or Section 9 on handling deceased kororā.

4 Kororā handling

Penguin specialist and any team member who may assist will have had appropriate training in handling of kororā prior to construction commencing.

Gloves will be worn while handling kororā.

Hands are to be washed before touching face or eating.

It is assumed at this stage that kororā will need to be captured if:

- A burrow is identified at BN during pre-construction survey (during moult period).
- Penguin are identified during works (rock removal).

During revetment rock removal if a kororā is seen, the penguin specialist will approach the kororā from behind. The penguin is grabbed gently with both hands with flippers held against its sides. The penguin is held away from the handlers body to reduce potential for pecking. The carrier box (lined with a towel) will be brought to the handler and the kororā placed into the cage. The cage will then be taken to a level location close to the revetment for checks/measurements (refer below) then transported to overnight care or vets or to relocation site.

The pet cage should be placed in shade and should not be left in a stationary vehicle unattended especially in summer.

Time in pet-cage should be as short as possible.

If the timing is suitable, the kororā should be transported to the relocation site, same day.

If the relocation cannot happen same day, the penguin should be transported asap to the agreed holding facility (e.g., BirdCare Aotearoa) who will have been notified in advance. The penguin will then be collected the following day and released at the relocation site.

5 Checking for identification

Any LP caught will be checked for identification which could be either:

A flipper tag. Tag details will be recorded

A pit tag. The LP will be checked for PIT (Passive Integrated Transponder) tag using a handheld electronic reader. NZ made options include Gallagher HR4 but there are a range of simple reader options available.

6 Banding/tagging

It is preferred that any kororā relocated from the site are banded/tagged so that they can be identified in the future. Unless agreed otherwise, it is assumed that unidentified kororā will be identified with PIT tags.

The project will confirm that the specialist has sufficient training in the implanting of PIT tags in kororā (i.e., is a Level 3 certified bander). If not additional assistance/training will be sought prior to construction commencing.

It is assumed that the specialist will be trained to level 3 (NZPI 2024) and can insert tags independently. The Level 3 person can supervise tag insertion by a Level 1 or 2 person if persons with those levels of certification are part of the project team (https://www.doc.govt.nz/our-work/bird-banding/how-to-become-a-certified-bander/).

PIT tags would likely be 11 mm Trovan, injected using Trovan injector.

It is assumed that all kororā that are tagged will be adults. Birds should be at least 600 g to be tagged and should be in good condition. Only one PIT tag insertion should be attempted on an individual penguin. Inserted PIT tags to be checked following insertion. Refer Section 7.42 and 7.4.3 of NZPI (2024) re insertion failure and fail to read tags.

All work (if tagging is undertaken) would be in accordance with DoC banding office regulations.

A PIT tag insertion SOP may be prepared to ensure that all tags are inserted correctly. However, the PIT tag insertion procedure in Section 9 of NZPI (2024) may be utilised. The NZPI procedure was adapted from the DoC best practice for tagging yellow eyed penguin (DoC undated). A PIT tag record sheet will be maintained [Action].

7 Taking morphometric measurements

Prior to the certification of the LPMP, discussion with AC/DoC will confirm whether morphometric data will be collected for any LP collected from within the Project work area.

The project will confirm that the specialist has sufficient training in the taking of measurements from Korora. If not additional assistance/training will be sought prior to construction commencing.

If data is to be collected, a data collection SOP will be prepared to ensure that all data collected is collected in a specific pre-determined way and data records are complete [Action].

The expected measurements would include weight and bill measurements.

If a bird bag is used the bag should be washed prior to use again.

Morphometric measurements will follow the methods set out in Section 6.12 of Wasiak (2020).

8 Injured Kororā

Ther are two situations where injured Korora may need to be managed.

During the Project If at any time a kororā is injured as part of the translocation process, DOC will be immediately contacted to receive advice on what actions to undertake.

If a kororā has been injured while at sea by a predator or boat. Protocol will be to take bird to either of the identified veterinary facilities.

Handling of injured kororā should be carried out as noted in the following section.

9 Collection and handling of dead Kororā

Should a dead kororā be found during pre-construction surveys or during construction, the following will be carried out/information collected. The final process will be confirmed with DoC prior to the LPMP certification. Although unlikely if multiple deceased Korora are identified, leave birds in place and advise DoC and MPI as required. This is precautionary due to the potential for avian flu to be the cause (refer discussion on avia influenza on DoC website and by NZPI 2024).

A photograph will be taken in situ.

Several close-up photos of kororā should be taken.

Field notes should be taken of any observation of surroundings and of state of penguin to assist in interpreting photographs or specimen.

When handling dead kororā, gloves must be worn. NZPI (2024) recommends that a mask is also worn and that post handling if any skin scratches etc. are identified by handlers, wounds should be treated with disinfectant.

At this stage it is assumed that a check for cause of death will be carried out be a veterinarian specialist. The extent of autopsy will be confirmed prior. The specimen should be placed into a large paper bag and placed into a sturdy plastic container and if the specimen cannot be taken to the vet same day, stored in a refrigerator at 4oC. The specimen should be delivered to one of the two identified veterinarians in the LPMP within 48 hours. DoC should be notified of the death and delivery to Vet. Final autopsy information should be forwarded to DoC.

10 References

DoC undated. Use of transponders to monitor yellow-eyed penguins: Updating best practice.

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NZPI 2024. Penguin monitoring: health and safety awareness. New Zealand Penguin Initiative. Version 1 August 2024. Website: www.nzpi.nz.

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Wasiak P 2020. Fieldwork procedures for working with little penguins. Phillip Island Nature Parks, Conservation Department. Issue 1, June 2020.