

Mauao Base Track Remediation

Ecological Impact Assessment
Prepared for Tauranga City Council

11 July 2018



Boffa Miskell

Document Quality Assurance

Bibliographic reference for citation:

Boffa Miskell Limited 2018. *Mauao Base Track Remediation: Draft Ecological Impact Assessment*. Report prepared by Boffa Miskell Limited for Tauranga City Council.

Prepared by:

Prepared by:

Reviewed by:

s 7(2)(a) - Privacy

Status: FINAL

Revision / version: 2

Issue date: 11 July 2018

Use and Reliance

This report has been prepared by Boffa Miskell Limited on the specific instructions of our Client. It is solely for our Client's use for the purpose for which it is intended in accordance with the agreed scope of work. Boffa Miskell does not accept any liability or responsibility in relation to the use of this report contrary to the above, or to any person other than the Client. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No liability or responsibility is accepted by Boffa Miskell Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

Template revision: 20170727 0000

File ref: T17136_Assessment_of_Ecological_Effects.docx

Cover photograph: The slip area at Mauao, © Boffa Miskell Ltd, 2017

Executive Summary

This assessment considers the potential effects of the proposed track development at Mount Maunganui/Mauao in Tauranga.

Project Description

- In 2017, a slip damaged a section of the popular base track on Mauao. A temporary track was constructed above the slip, but it contains seven consecutive flights of box steps and compromises universal public access. Tauranga City Council is proposing to construct a new track (and associated rock revetment) that will be universally accessible and will tie into the existing base track.
- Boffa Miskell Ltd was engaged by TCC to prepare this assessment of effects on ecological values associated with the proposed track construction and operation.

Method

- A range of methods were used to describe and survey the vegetation, fauna and marine components/species within the indicative track alignment corridor.
- Once described, the significance of each ecological element was determined against the Bay of Plenty Regional Policy Statement significance criteria, and its ecological values were described based on EIANZ guidelines. An assessment of ecological effects was then carried out using the EIANZ methodology.
- The assessment of ecological effects considered the terrestrial flora, fauna and habitats, as well as the marine fauna and habitats within the indicative track alignment corridor.
- Measures to avoid, remedy and mitigate effects are described.

Existing Environment

- The indicative track alignment corridor includes vegetation within Significant Ecological Area (SEA) 32. Of note, is a fragment of mature coastal pohutukawa forest. Several avifauna species use, or may potentially use, habitat within the corridor, including *At Risk* species and a nationally *Not Threatened*, but regionally significant species (grey-faced petrel). Shore skink, an *At Risk* species and the *Threatened* land snail, *Succinea archeyi*, may be present within the corridor, but have not been detected to date. The marine environment within the corridor includes soft sediment and hard shore/boulder habitats. These habitats are inhabited by a diverse assemblage of *Not Threatened* species.

Determination of Significance

- We consider that the local ecology within the indicative track alignment corridor trigger six of the significance criteria within the Bay of Plenty RPS.

Assessment of Value

- The pohutukawa forest and shrubland community is considered to have Moderate Ecological Value.
- The coastal fringe vegetation is considered to have Moderate Ecological Value.
- The soft sediment and hard shore/boulder habitats are considered to have Moderate Ecological Value.
- The pohutukawa trees are considered to have Very High Ecological Value (Threatened species).
- The six *At Risk* avifauna species that use, or may potentially use the corridor (little blue penguin, variable oystercatcher, red-billed gull, pied shag, little black shag and black shag) are considered to have High Ecological Value.
 - Grey-faced petrel may potentially be present within the corridor and are considered to have Moderate Ecological Value (nationally *Not Threatened* but regionally significant).
 - Shore skink may potentially be present within the corridor and are expected to have High Ecological Value (At Risk species).
 - The land snail, *Succinea archeyi* may potentially be present within the corridor and is considered to have Very High Ecological Value (Threatened species).

Assessment of Effects

- For each of these valued elements, we have determined the Magnitude of Effect of the proposed works and the Overall Level of Ecological Effect. We have concluded that after mitigation, the Overall Level of Effects range between Low and Very Low.

Recommendations

- A range of recommendations are provided to avoid/minimise, remedy and mitigate potential effects on the valued ecological elements.
- These include:
 - Minimising the number of trees to be felled and ensuring they are marked prior to felling;
 - Limbing rather than felling trees wherever possible;
 - Use of an experienced arborist to undertake tree felling, and limbing to minimise risk of disease;
 - Remedial planting using appropriate native species in temporary works area;
 - Mitigation planting using appropriate native species as part of remediation of the temporary track to be retired from use, where appropriate, given other values e.g. heritage;
 - Planting appropriate coastal vegetation along parts of the revetment to replicate the coastal fringe habitat that is lost;
 - Conducting works during the non-breeding season for little blue penguins and grey-faced petrels if possible;
 - Conducting pre-works surveys for little blue penguins, grey-faced petrels, shore skink and the land snail *S. archeyi*;

- If grey-faced petrel and/or little blue penguin nests/burrows are detected, exclusion zones should be erected around the nests/burrows and works shall not be conducted in these areas until nesting activities are completed;
- Leaving a gap between the hillside and edge of the boardwalk so little blue penguins can access habitat on the hillside;
- The rock revetment design should mitigate little blue penguin habitat loss;
- Implement best practise erosion and sediment control techniques;
- Relocate natural boulders outside of the works disturbance area; and
- Reduce the permanent project footprint and area of disturbance within the CMA, where possible.

Conclusion

- The terrestrial and marine environments within the indicative track alignment corridor trigger some of the Ecological Significance criteria within the Bay of Plenty Regional Policy Statement.
- The terrestrial and marine environments (habitat and fauna) within the indicative track alignment corridor have ecological values that range from Low to Very High, as assessed using the EIANZ guidelines.
- With mitigation in place, the magnitude of the effects of the proposed works range from Negligible to Moderate.
- Combining Ecological Value with Magnitude of Effect gives a range in the Overall Level of Effect from Low to Very Low.
- A number of methods are recommended to avoid, remedy and mitigate these potential effects.

CONTENTS

1.0	Introduction	1
1.1	Background	1
1.2	This Assessment	3
1.3	Site Location and Context	3
2.0	Proposed Track Development	6
2.1	Site Establishment	6
2.2	Vegetation Clearance and Tree Protection	7
2.3	Slope Stabilisation	7
2.4	Revetment Construction	7
2.5	Boardwalk Construction	8
2.6	Existing Track Remediation and Landscape Planting	8
3.0	Methodology	9
3.1	Desktop	9
3.2	Field Investigation	10
3.3	Limitations	12
4.0	Existing Environment	13
4.1	Vegetation and Habitats	13
4.2	Avifauna	16
4.3	Herpetofauna	23
4.4	Terrestrial Invertebrates	24
4.5	Marine Environment	24
4.6	Summary	27
5.0	Significance	29
5.1	Introduction	29
5.2	Significance assessment	29
5.3	Conclusion	31
6.0	Ecological Value	33
6.1	Habitat	33
6.2	Species	34
7.0	Potential Effects Considered and Assessment Methodology	36

8.0	Assessment of Ecological Effects	38
8.1	Pohutukawa Forest and Shrubland Loss	38
8.2	Avifauna Species Loss, Habitat Loss and Disturbance Effects	38
8.3	Lizard Species and Habitat Loss Effects	40
8.4	Terrestrial Invertebrate Species	40
8.5	Marine Species and Habitat Effects	41
9.0	Recommendations	44
9.1	Pohutukawa Forest and Shrubland	44
9.2	Coastal Fringe Vegetation	44
9.3	Avifauna	45
9.4	Lizards	46
9.5	Terrestrial Invertebrates	46
9.6	Marine Environment	46
9.7	Monitoring and Adaptive management	47
9.8	Summary of Effects on Avifauna, Vegetation and the Marine Environment	47
10.0	Conclusion	49
11.0	References	50

Figures

Figure 1. Location of Mauao within the wider area. The orange polygon shows the approximate location of the Indicative Alignment Corridor. Source: GoogleEarth 2016	1
Figure 2. Location of the slip on Mauao as well as the existing track and proposed track location. The area assessed is that within the Indicative Track Alignment Corridor and the Indicative Heavy Machinery Extent.	2
Figure 3. Boundaries of the Special Ecological Sites/Areas (SEs/SEAs) on Mauao Historic Reserve (Wildland Consultants, 2000).	5
Figure 4: Area of disturbance within CMA and potential barge access point.	42

1.0 Introduction

1.1 Background

Mauao is a mountain located at the end of the Mount Maunganui peninsula at the entrance to Tauranga Harbour (Figure 1).

It is approximately 76 ha and is a Historic Reserve with numerous public walking tracks on it. A slip in 2017 damaged a section of the base track (one of the most popular tracks in the region; see Figure 2; Photos 5 and 6). A temporary track was constructed above the slip, but it contains seven consecutive flights of box steps and as such compromises universal public access. As described in Section 2, Tauranga City Council (TCC) is proposing to construct a new track (and associated rock revetment) that will be universally accessible and that will tie into the existing base track (Figure 2).

Boffa Miskell Ltd was engaged by TCC to prepare this assessment of effects on ecological values associated with the proposed track construction and operation.

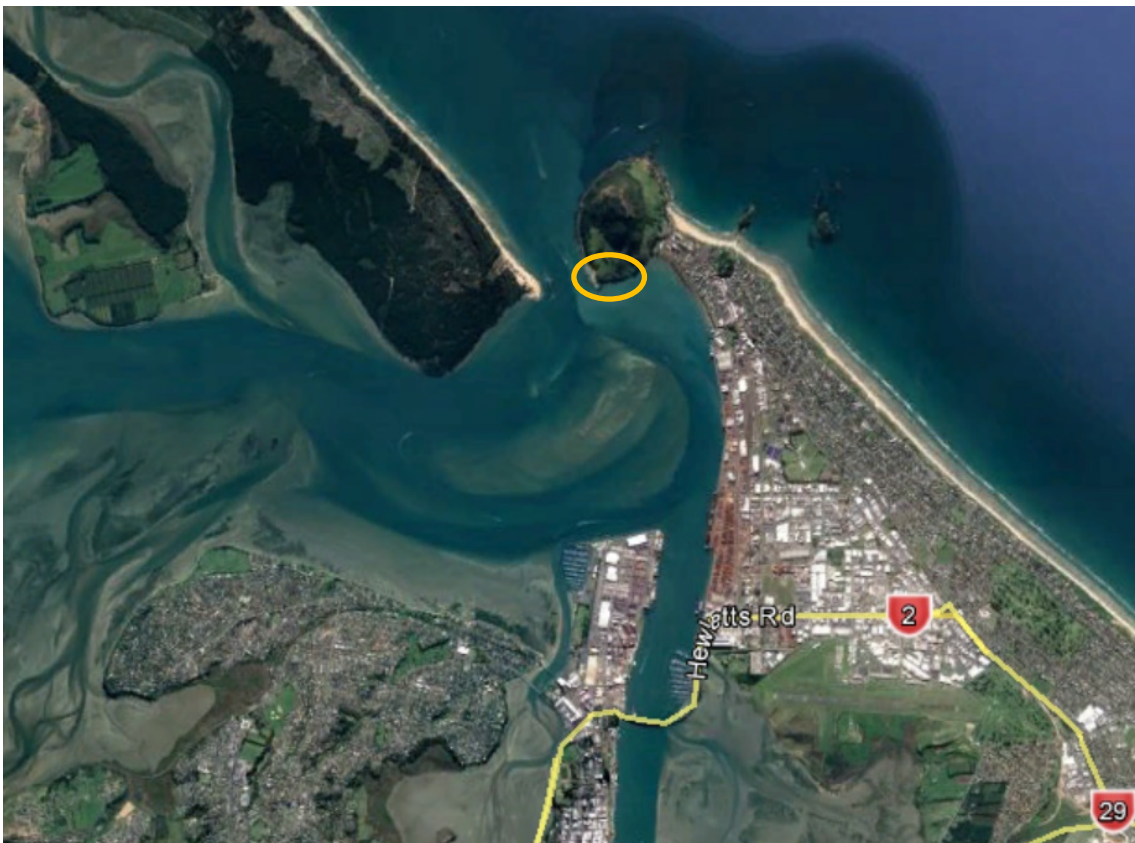


Figure 1. Location of Mauao within the wider area. The orange polygon shows the approximate location of the Indicative Alignment Corridor. Source: GoogleEarth 2016

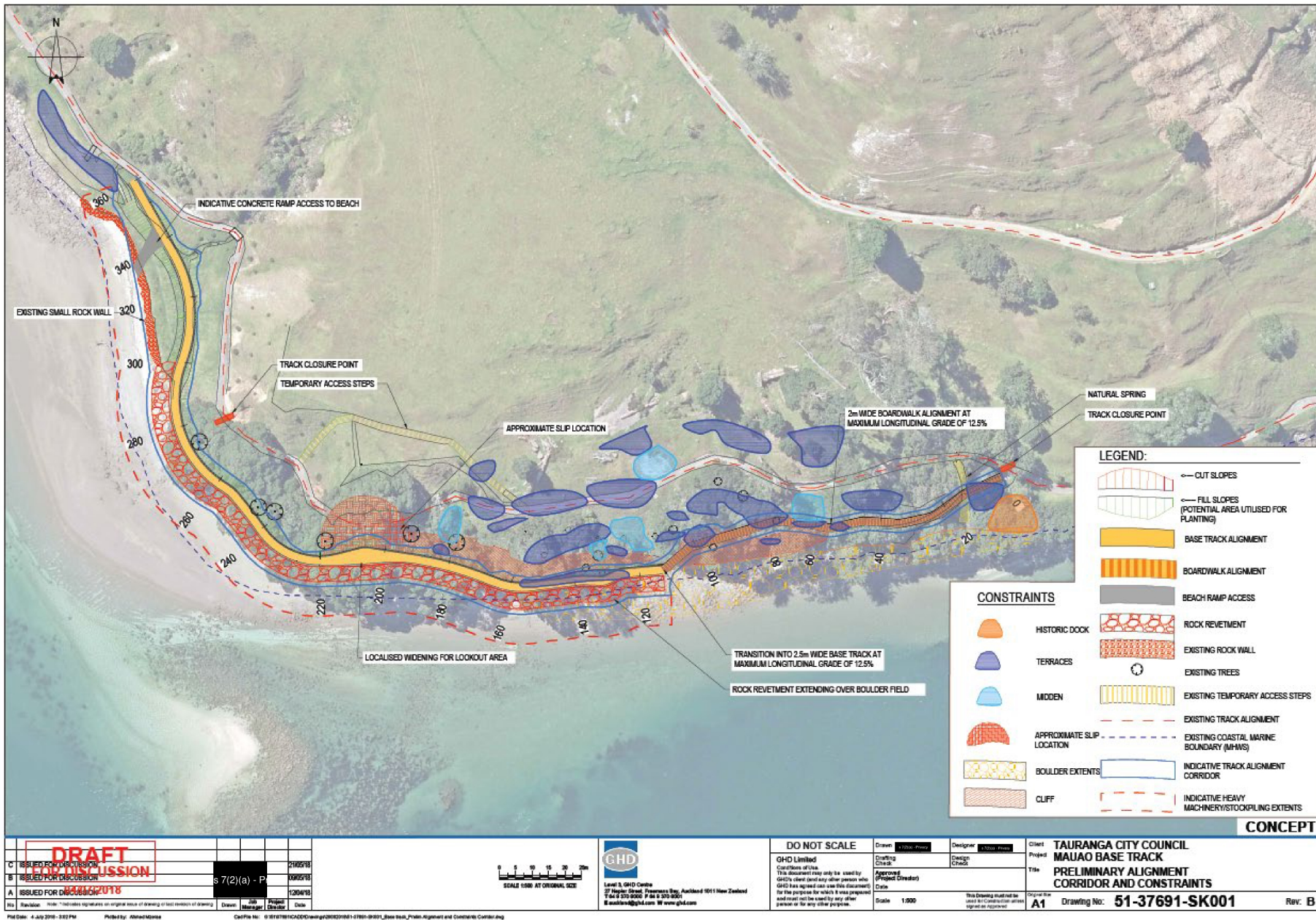


Figure 2. Location of the slip on Mauao as well as the existing track and proposed track location. The area assessed is that within the Indicative Track Alignment Corridor and the Indicative Heavy Machinery Extent.

1.2 This Assessment

This assessment begins with a brief description of Mauao and the proposal site (Section 1.3 and Section 2.0).

Details are then provided regarding the methodologies used to obtain information about the ecological values (habitat and species) present (Section 3.0), and a description of these values and their ecological significance (Sections 4.0 and 5.0).

The proposed track development and potential effects of the proposal are considered and methodologies used to assess any such effects are summarised (Sections 6.0 and 7.0).

This is followed by an assessment of the potential effects of the proposed track development on the ecological values in the area and recommendations to avoid, minimise or mitigate any significant adverse effects (Sections 8.0 and 9.0).

For the purpose of this report:

- Indicative track alignment corridor refers to the proposed area in which the track will be constructed as identified in Figure 2.
- Wider area refers to the area outside of the zone of influence (e.g. Tauranga harbour).

1.3 Site Location and Context

Mauao Historic Reserve (also known as Mount Maunganui and hereafter referred to as Mauao) is within the Tauranga Ecological District and is located at the eastern entrance of Tauranga Harbour in the Western Bay of Plenty (Shaw, 2005). Mauao is an extinct rhyolitic dome (Department of Conservation Bay of Plenty Conservancy, 1997) that is vegetated with indigenous vegetation (a mixture of remnant coastal stands and planted, regenerating vegetation) and exotic shrubs and grazed pasture (Mauao Trust & Tauranga City Council, 2017). The Mauao coastline forms part of a wider customary fisheries area over which the Te Maunga o Mauao Mataitai Reserve (2008) occurs.

With respect to ecology, Mauao is scheduled within the relevant planning documents as: an Area of Significant Conservation Value (Bay of Plenty Regional Council, 2003); an Indigenous Biological Diversity Area (Bay of Plenty Regional Council, 2017); and a Special Ecological Area (Tauranga City Council, 2013). Information on these classifications are provided below:

Area of Significant Conservation Value:

Mauao supports one of the few mainland breeding populations of grey-faced petrel (*Pterodroma macroptera gouldi*) in the Bay of Plenty (Bay of Plenty Regional Council, 2003).

Mauao is part of a reef system and ecological corridor with Motuotau Island and Moturiki. Mauao is the only mainland coastal rocky reef headland and nearshore island system between Coromandel Peninsula and Waihou Bay in the eastern Bay of Plenty. Around the base of Mauao, the reefs are settlement areas for juvenile crayfish, paua and kina. The western side of Mauao is subject to strong currents which influences the benthic community composition.

Indigenous Biological Diversity Area and Special Ecological Area/Site (SEA/SES):

There are two Special Ecological Areas/Sites (SEA/SES; hereafter referred to as SEA) on Mauao (Tauranga City Council, 2013) (referred to as Indigenous Biological Diversity Areas in the Proposed Bay of Plenty Regional Coastal Environment Plan (2017)), Mauao 1 (SEA 7) and Mauao 2 (SEA 32). Mauao 1 is a Category 1 SEA that encompasses 42.58 ha and Mauao 2 is a Category 2 SEA that encompasses 4.35 ha. The indicative track alignment corridor is within part of Mauao 2 and is adjacent to Mauao 1 (Tauranga City Council, 2013).

Mauao 2 is described as “modified, secondary, and planted pohutukawa treeland and coastal scrub” and as a “nesting site of northern little blue penguins (At Risk-Declining)” in the Proposed Bay of Plenty Regional Coastal Environment Plan (2017).

The Tauranga City Plan (2013) describes Mauao 2 as “containing numerous small areas of terrestrial vegetation (forest, treeland and scrub), generally on the lower southern and eastern slopes of Mauao. This area is contiguous with and complimentary to the Special Ecological Area – Mauao 1 (Special Ecological Area #7). It contains examples of pohutukawa forest on the toeslopes of Mauao, adjacent to the shore. Three regionally uncommon plant species are present (Wildland Consultants, 2013). This area is of significant wildlife value. Northern little blue penguins breed here. It is an area of regional conservation value”.

Mauao 2 has regional significance and is variously described as follows (Wildland Consultants, 2000, 2009, 2013):

- species typical of the habitats present;
- a few grey-faced petrel burrows present;
- a breeding site for little blue penguins;
- has some disturbance of the understorey by recreational users;
- contains numerous small areas of terrestrial vegetation;
- contains a mix of extensively modified indigenous vegetation and adventive vegetation and includes some indigenous revegetation planting;
- contains highly fragmented vegetation;
- exotic tree species common in the canopy;
- environmental pest plants present including Japanese honeysuckle, *Smilax*, *Tradescantia*, Sycamore maple, pampas and exotic grasses (Wildlands 2000, Wildlands 2010);
- no nationally uncommon plant species have been recorded. *Schoenus apogon*, *Zoysia pauciflora* and *Oxalis rubus* are present (all are regionally uncommon species);
- predominantly indigenous vegetation on the eastern-facing, lower slopes of Mauao. It includes pohutukawa treeland and coastal scrub that has mostly been planted through TCC restoration projects;
- the land snail *Succinea archeyi* (Threatened, nationally endangered¹) is noted as a rare inhabitant of foreshore dunes;
- copper skinks may be present and shore skinks are present but at low abundance;

¹ <https://www.doc.govt.nz/Documents/getting-involved/.../2013/.../nztc-land-snails.xls>

- New Zealand fur seal haul out area (however it is noted that this is around Mauao and does not specifically state if they haul out at Mauao 2); the main seal haul out is on the northern coast of Mauao
- provides a partial protective buffer to the nationally ranked Mauao 1 SES.

The Mauao Historic Reserve Management Plan describes Mauao (both SEA 7 and 32) as follows:

Although heavily modified by human activity and related fires, Mauao retains significant ecological values (Wildland Consultants 2016). These include remnant coastal forest and mainland populations of grey faced petrels (ōi) and blue penguins (kororā). There is considerable opportunity for ecological restoration of Mauao and nature conservation, in conjunction with the ongoing high levels of public usage.”

This management plan includes a number of objectives and management statements with regard to the ongoing protection and enhancement of vegetation, habitats and fauna.

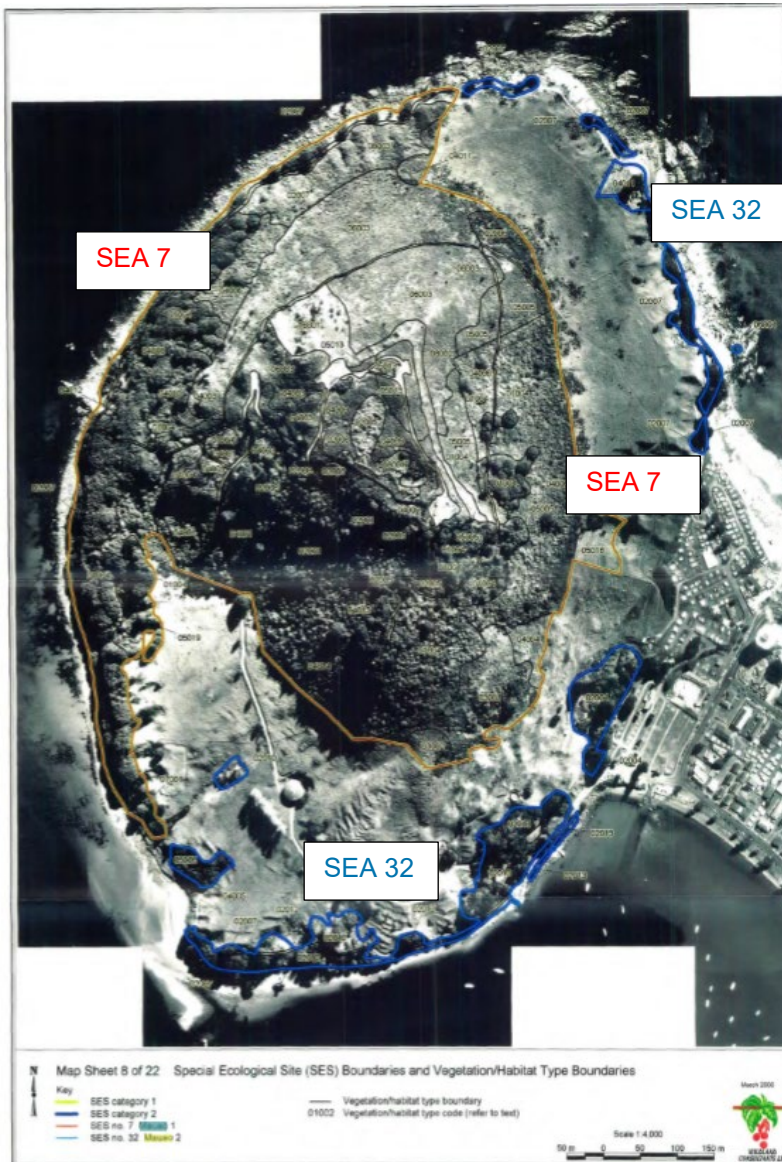


Figure 3. Boundaries of the Special Ecological Sites/Areas (SESS/SEAs) on Mauao Historic Reserve (Wildland Consultants, 2000).

2.0 Proposed Track Development

The proposed track development involves the construction of an approximately 360 m section of track that ties into the existing track at either end. Approximately 110 m of the track is a 2 m wide boardwalk; the rest of the track is an aggregate pathway that is proposed to be 2.5 m wide. Associated with approximately 190 m of the non-boardwalk section of the track is a rock revetment Figure 2.

The construction is proposed to be carried out in the following steps:

- Site establishment including fencing, signage, temporary staff facilities;
- Vegetation clearance including tree limbing and removal;
- Slope stabilisation by way of nets and rock bolts;
- Revetment structures approx. 190 m long along the edge of the existing shoreline;
- Construction of approx. 110 m of boardwalk; and
- Existing Track Remediation and Landscape Planting.

The following construction methods were provided from TCC. Of note is that works will only be conducted during the day and that for certain parts of the works, the methodology may be subject to change depending on the final detailed design and any alternatives proposed by the preferred contractor.

2.1 Site Establishment

Prior to starting work on site, the appointed Contractor will be required to prepare an approved Construction Management Plan (CMP). The CMP will include the following information:

- Detailed Construction Methodology (including the implementation of any Harbourmaster control requirements such as demarcation buoys or navigation lighting).
- Stakeholder Management Plan
- Erosion & Sediment Control Plan
- Health & Safety Plan

At the commencement of the project the Contractor's operatives (and all subcontractor staff) involved in site works will be required to attend a Contractor induction which will define any site protocols to be adhered to in relation to site archaeology, ecology etc.

The following establishment activities will be required to be completed prior to starting any bulk earthworks or piling on site:

- Establish suitable site fencing and signage to ensure security and public safety is maintained, and to protect any areas of sensitive vegetation or archaeology to be protected during the works.
- Set up a site compound at a location agreed with TCC (likely to be located at the end of Pilot Quay or in within the campground). The site compound will likely include a site office, lunch room, portable toilet facilities, lockable storage containers and Contractor parking spaces.
- Temporary power and water connections to the site facilities will be established.

- Sediment and erosion control measures will be put in place as per the Erosion & Sediment Control Plan.
- Emergency spill kits will be stored on site in the event of any oils, greases or chemicals being spilt on site.

2.2 Vegetation Clearance and Tree Protection

Some tree pruning and removal will be required along the proposed base track route to allow the construction of the revetment and boardwalk. A suitably experienced works arborist will be engaged to undertake all tree work.

The works arborist will be experienced in tree protection systems and will coordinate site works to ensure that any tree protection controls required are correctly implemented throughout the works.

2.3 Slope Stabilisation

Some slope stabilisation work is required to be carried out on existing slope failure surfaces. This work will be required to be completed prior to any other work being carried out below the slope failure areas to ensure the safety of any operatives working in the areas below. Stabilisation work is likely to consist of soil nailing and the installation of netting/geotextiles or similar. The work will be carried out using rope access from above the slope by trained operatives.

2.4 Revetment Construction

Approximately 190 m of rock revetment (at a slope of 1:1.5) with an aggregate pathway is to be constructed along the edge of the existing shoreline. Access to site for the delivery of all plant and materials to the revetment site will typically be via marine barge to the existing beach area.

Construction materials will be stockpiled as close to the work front as possible by a barge, mounted diggers or other suitable plant. At least three separate material stockpiles will be required on site for backfill, under layer rock and rock armour.

Construction plant which can be landed on the beach by barge which would be used to handle fill and armour material could include:

- Loaders
- Telehandlers
- Diggers
- Bobcats
- Or other suitable plant

Temporary pontoons/swamp mats can be used to assist with landing plant on the beach and for trafficking over soft areas or areas where there is a requirement to minimise disturbance to the foreshore.

Before commencing any excavation for the revetment foundation topsoil on the edge of the shoreline will be stripped and stockpiled for reuse on site. Any existing boulders under the revetment footprint will be moved to a suitable location.

It is anticipated that the revetment will be constructed in approximately 10-20 m sections each shift with armour being placed over the length of each section to minimise any potential erosion or undermining of the new revetment structure.

Rock armour will be placed on to the revetment by a 20T long reach digger (or similar) which may be land based or barge mounted.

2.5 Boardwalk Construction

An elevated boardwalk of approximately 110 m in length will be constructed to link the existing base track and the new revetment. The boardwalk section traverses the existing slope which contains archaeological features. Therefore, the disturbance to the existing site is to be minimised.

The boardwalk will be built on screw pile foundations which will be installed by light tracked piling plant. Conservatively, two 400 mm diameter piles may be required within or above the CMA boundary at the intersection of the boardwalk and the revetment. Some protection work, such as the installation of swamp mats etc to establish access for the piling plant, may be required in advance of piling work.

Access for piling may be from either end of the boardwalk section with plant being delivered to site by barge or tracked in to site along the track.

Construction of the boardwalk structure will typically be by hand with as much fabrication work carried out off site as much as possible.

2.6 Existing Track Remediation and Landscape Planting

The existing temporary track section (including the timber stairs) will be taken out of use and the area remediated as soon as possible after the completion of the new walkway. The area will be landscaped and planted in the following planting seasons.

3.0 Methodology

To assess the potential effects of the track construction on fauna, vegetation and the marine environment, information was gathered on the ecological values (habitat and species) present within the wider area through a desktop investigation and review of previous field observational data and associated reports.

3.1 Desktop

3.1.1 Terrestrial Environment

Data from the Ornithological Society of New Zealand's (OSNZ) atlas (C. J. R. Robertson, Hyvonen, Fraser, & Pickard, 2007) were collated from the two 10 x 10 km grid squares (279, 639 and 278, 639) that encompass Mauao. The primary and secondary habitats² for each of the species recorded within these grid squares was obtained from Heather and Robertson (2005), along with each species' New Zealand threat status according to Robertson et al. (2017). The species list obtained from the OSNZ atlas data served as a base list of avifauna species recorded at Mauao and the wider surrounding area and as such indicates which species are potentially present at or near the project site.

Literature (published and unpublished) and website searches (of citizen science databases such as eBird New Zealand and NatureWatch³) were undertaken to obtain additional information regarding avifauna species as well as plant, invertebrate and lizard (skinks and geckos) species known to occur at Mauao and the surrounding coastal habitats and that may be impacted by the construction of the new section of base track.

Threat statuses were assigned as follows:

- Indigenous plants - according to de Lange et al. (2018) and the Plant Conservation Network⁴
- Herpetofauna (skinks, geckos, frogs) - according to Hitchmough et al (2016)
- Invertebrates - assigned accordingly (terrestrial invertebrates do not have an all-encompassing threat status document like other groups of taxa but rather multiple documents, generally divided by taxonomic Class)
- Marine invertebrates - according to Freeman et al (2014)

Communications were also made with John Heaphy from the Department of Conservation (DOC), Dave Grimmer (the Mauao Parks Asset Coordinator) and personnel involved in the monitoring of the grey-faced petrel and little blue penguin populations at Mauao.

² For this report, primary habitat refers to the habitat in which the species spends most of its time. Secondary habitats are other habitat types which the species may also utilise.

³ The NatureWatch website is <http://naturewatch.org.nz/>, the eBird website is <https://ebird.org/newzealand/home> and

⁴ The Plant Conservation Network website is <http://www.nzpcn.org.nz/>

3.1.2 Marine Environment

Data from marine surveys carried out adjacent to the Mount Hot Pools water discharge point have informed our assessment of ecological values within the project area.

3.2 Field Investigation

3.2.1 Vegetation

The vegetation present within the indicative track alignment corridor was described and a species list compiled by two Boffa Miskell ecologists. This list along with data obtained from the literature review was used to inform the current assessment.

3.2.2 Avifauna

Initial Avifauna Survey

The initial survey observed all bird species within the area and included targeted searches for little blue penguin and grey-faced petrel burrows. The survey was conducted over a two-hour search period and was done by s 7(2)(a) - Privacy (Boffa Miskell ecologists).

The targeted search for little blue penguins was conducted in the indicative track alignment corridor, including an approximately 20 m buffer area either side of the proposed track location, on 11 December 2017.

- The timing of the survey coincided with the chick rearing stage of the little blue penguin breeding season (the breeding season is from approximately July to March), a time at which active burrows are permanently occupied (so if burrows were being used, chicks and potentially adult penguins would have been observed).
- Weather conditions during the survey were good, with sun, light winds, no rain and a temperature high of 25°C⁵.
- The survey was conducted along the rocky shoreline on an incoming tide (as penguins only nest above mean high water springs (MHWS); high tide was at 2:33 pm at a height of 1.9 m⁶) and in vegetated hillside areas that provided potential penguin habitat.
- The survey involved searching all rocky crevices and burrow-like areas for penguins and signs of penguins (guano (penguin poo), feathers, old burrows and abandoned eggs).

The targeted search for grey-faced petrels involved a search for burrows in the indicative track alignment corridor and in the pasture habitat above the slip and track area (Photo 4). The timing of the survey coincided with the mid-latter end of the chick rearing stage of the grey-faced petrel breeding season (the breeding season is broadly from approximately March to January), a time at which active burrows are permanently occupied (like the penguins).

A roaming inventory of other bird species observed while in the field was also recorded.

⁵ Weather condition data from <http://www.metservice.co./towns-cities/tauranga>

⁶ Tide data from <http://www.linz.govt.nz/>

Follow-up Surveys for Penguins and Petrels

Two repeat surveys for little blue penguins and grey-faced petrel were conducted in 2018.

- On 28 May 2018, [§ 7(2)(a) - Privacy] (trustee of the Western Bay Wildlife Trust and [§ 7(2)(a) - Privacy]) and [§ 7(2)(a) - Privacy] (trustee of the Western Bay Wildlife Trust, [§ 7(2)(a) - Privacy]) conducted an approximately 1.5 hours evening survey for these two species within the indicative track alignment corridor.
- On 7 June 2018 Boffa Miskell ecologist ([§ 7(2)(a) - Privacy]) and [§ 7(2)(a) - Privacy] carried out a burrow search within the indicative track alignment corridor followed by a search from dusk for petrels and penguins entering the area. These searches totalled approximately two hours.

Overall, the total search effort for little blue penguins and grey-faced petrels within the indicative track alignment corridor was approximately 11 search hours.

Information obtained from all surveys, previous field investigations, communications with DOC, the Mauao Parks Asset Coordinator and personnel involved in little blue penguin and grey-faced petrel monitoring on Mauao, data from the OSNZ atlas and data from the literature review were used to inform the current assessment.

3.2.3 Herpetofauna

No targeted sampling was carried out for lizards (or other herpetofauna (frogs)) as surveying for herpetofauna can be very labour intensive and often results are inconclusive. Instead information obtained during the literature review was used to inform the current assessment and a conservative approach of assuming the potential presence of some species was used.

3.2.4 Terrestrial Invertebrates

The endangered land snail *Succinea archeyi* was identified by Wildland Consultants (2013) in their description of the significant natural area “Mauao 32”. Advice from a Department of Conservation land snail expert was sought regarding this species and land snail surveys. A survey of potential habitat for the land snail was conducted by [§ 7(2)(a) - Privacy] on 26 June 2018. The survey involved walking the shoreline within the works area and identifying vegetation that is preferred by *S. archeyi* and searching for snails/dead shells⁷.

3.2.5 Marine Environment

As there is sufficient information on marine ecological communities within the general area no additional surveys were required. A visual survey of the marine ecological habitats and species present within the project works area was undertaken on 13th December 2017, to ground-truth existing epifaunal data.

⁷ This species hatches between June and August, reaching sexual maturity in April the following year and dying off between May and August (Brook, 1999). Mature snails are approximately 10-12mm long.

3.3 Limitations

Several limitations and assumptions need to be borne in mind when considering this assessment, as with all predictions of ecological effects based on such studies:

- A herpetofauna survey was not conducted, instead information from the literature review was used to inform this assessment.
- Only a summer survey for avifauna species (other than little blue penguins and grey-faced petrels) was conducted. Normally a spring survey is conducted as well to detect migratory birds, however given the lack of complex avifauna habitat in the area, this was not deemed necessary. The OSNZ Atlas data and other sources of information were relied on instead to inform which potential species may use the habitat within the indicative track alignment corridor.
- The marine environment was visually ground-truthed for epifauna. This was deemed sufficient as the data in the scientific literature was representative of the habitat within the indicative track alignment corridor.
- An intensive search for *Succinea archeyi* individuals was not undertaken. The survey was informed from advice from the DOC land snail expert and focussed on presence of appropriate habitat and searching for dead shells (due to the time of year and life cycle of this species).

In recognition of these limitations, a conservative approach was adopted as follows:

- We have assumed some lizard species may be present in the indicative track alignment corridor.
- We have assumed that *Succinea archeyi* could be present within the indicative track alignment corridor.

Overall, and taking account of the existing information available on the site, we believe the information collected provides a sufficient basis for this assessment.

4.0 Existing Environment

4.1 Vegetation and Habitats

4.1.1 Desktop Investigation

Historical Vegetation

The site lies within the Tauranga Ecological District (ED). Within this ED, tall podocarp-broadleaved forest would have historically covered all the hill country and some of the flat land and dune systems, with the exception of the foredunes and the freshwater wetlands on the plains (Wildland Consultants Ltd 2000e).

The non-forested dune areas would have had some cover of sand binding species such as pingao (*Desmoschoenus spiralis*), pohuehue (*Muehlenbeckia complexa*) and spinifex (*Spinifex sericeus*), with low shrubland areas of *Coprosma* spp., kanuka (*Kunzea ericoides*), karo (*Pittosporum crassifolium*), and pohutukawa (*Metrosideros excelsa*) further back from the beach (Beadel 1995e). Pohutukawa forest would also have occurred on the headlands and hill slopes near the harbour.

Current Vegetation

Today relatively little of the ED remains in indigenous vegetation/habitats (c.6.6 %) and most of the remaining examples (c.5.3 %) are in the coastal bioclimatic zone, concentrated on estuary margins, dunes along the open sea coast, and on Mauao (Wildland Consultants, 2000).

On Mauao are two significant ecological sites.

- Site 7 “Mauao 1” (Category 1 SES), 42.58 ha. The western and central parts of the Mauao.
- Site 32 “Mauao 2” (Category 2 SES), 4.35 ha. A section of the southern coastline.

The site that will be affected by this project is Site 32 “Mauao 2”. This site is described briefly in the (Tauranga City Council, 2013; Wildland Consultants, 2013) as:

32	Mauao	Very steep hill	<ul style="list-style-type: none"> • This Special Ecological Area contains numerous small areas of terrestrial vegetation (forest, tree land and scrub), generally on the lower southern and eastern slopes of Mauao. This area is contiguous with and complimentary to the Special Ecological Area - Mauao 1 (Special Ecological Area # 7). • It contains examples of pohutukawa forest on the toe slopes of Mauao, adjacent to the shore. Three regionally uncommon plant species are present. • This area is of significant wildlife value. Northern little blue penguin breed here. • It is an area of regional conservation value.
----	-------	-----------------	---

Mauao 2 is described as “modified, secondary, and planted pohutukawa treeland and coastal scrub” in the Proposed Bay of Plenty Regional Coastal Environment Plan (2017).

The threat status of pohutukawa has recently been re-classified from Not Threatened to Threatened – Nationally Vulnerable, as there is a risk that it will be affected at a national level by myrtle rust (de Lange et al., 2018).

Rare Plants

Three regionally (but not nationally) uncommon plant species, *Schoenus apogon*, *Zoysia pauciflora* and *Oxalis rubus*, have been recorded within SEA 32 (Wildland Consultants, 2013); these species were not recorded within the indicative track alignment corridor.

4.1.2 Field Investigation

The indicative track alignment corridor lies within SEA Site 32 “Mauao 2”. This SEA covers a fringe of predominantly pohutukawa forest along the rocky coastline. In the corridor the pohutukawa forest and treeland is surrounded by grazed and retired pasture, as well as occasional exotic trees and marginal shrublands.

The pohutukawa community is made up of a relatively small number of large mature trees with very large spreading canopies (Photo 3) and smaller planted pohutukawa (Photos 7 and 8). The trees canopies extend for some distance over the rocky coastland (Photos 9 and 10).

To the west these trees form an almost pure canopy; to the east exotic trees such as sycamore and macrocarpa intrude (Photo 11). Beneath the canopy are a range of understory communities, including grasslands where light allows, through native and native/exotic shrublands, particularly on the fringes Table 1.

Table 1. Terrestrial vegetation and habitats within and adjacent to the indicative track alignment corridor.⁸

Habitat	Description
Pohutukawa forest & shrubland	<ul style="list-style-type: none"> • Mature pohutukawa trees along the coastal edge (Photos 9 and 10). • To the east an increasing number of exotic trees enter the pohutukawa canopy (Photos 11 and 12). • Mix of low stature native and exotic scrub/shrub species under the pohutukawa tree canopy and on the margins. Some of this vegetation has been cleared to enable the archaeological survey to be conducted (Photo 14).
Coastal fringe	<ul style="list-style-type: none"> • A small fringe of vegetation sitting above the beach, and extending approximately 10 m along the coast. It is approximately 2 m wide and falls under the pohutukawa canopy. It contains a mixture of coastal plants (<i>Muehlenbeckia</i>, shore bindweed, clubrush, etc) and exotic grasses on sandy soils, and is potentially habitat for snail and terrestrial lizards. Occasional scattered clubrush plants are present outside of this discrete area within grass/weedland.
Farmland/open country	<ul style="list-style-type: none"> • Exotic grassland that is maintained (mowed/weed-whacked) with a few young, pohutukawa trees planted amongst it (Photos 7 and 8).

The proposed track lies primarily beneath the pohutukawa canopy, with the western margin exiting the canopy onto rank grassland. The track and section of revetment will predominantly be formed under the pohutukawa canopy either on soft shore habitats or within coastal fringe habitat and native and exotic scrub/shrub species. Two pohutukawa trees will be felled to construct the

⁸ Note: the hard and soft shore habitat including the rocky shoreline is described in Section 4.5.2.

track (Photo 13), and others limbed. Some native undergrowth will be affected (Figure 2, Table 2). The small, planted pohutukawa trees among the grassland area will be removed and where possible translocated. Based on aerial imagery, these trees were planted in 2010 or 2011 (i.e. <10 years old and immature). As there are numerous other planted pohutukawa on Mauao and translocation of immature pohutukawa is fairly easy and successful (providing appropriate translocation techniques are employed), the effects on this grassland/planted pohutukawa community are not considered further.

In summary, the only plant community habitats of concern are the pohutukawa forest and shrubland and the coastal fringe vegetation.

Table 2. Extent of terrestrial plant communities and habitats affected by the proposed works.

Habitat	Proposed Works
Pohutukawa forest and shrubland.	<ul style="list-style-type: none"> Approximately 200 m of track and rock revetment, predominantly on soft shore habitats but felling and liming of some pohutukawa trees and native and exotic shrubland and grasses. Approximately 100 m of boardwalk, predominantly in mixed native and exotic forest and shrubland.
Coastal fringe vegetation.	<ul style="list-style-type: none"> Approximately 10 m x 2 m of habitat lost under the rock revetment.
Farmland/open country	<ul style="list-style-type: none"> Approximately 75 m of track including part of the rock revetment.

4.1.3 Plant Species

During the initial survey, 39 plant species were recorded within the indicative track alignment corridor, including 17 indigenous species and 22 introduced species. One Threatened species (pohutukawa) was recorded. Table 3 lists the indigenous species recorded (the full species list can be found in Appendix 4).

Table 3. Indigenous vegetation recorded during the survey conducted at the indicative track alignment corridor.

Species	Scientific Name	Conservation Status
Bracken fern	<i>Pteridium esculentum</i>	Not Threatened
Carex spp.	<i>Carex sp.</i>	Not Threatened
Hangehange	<i>Geniostoma ligustrifolium</i>	Not Threatened
Harakeke	<i>Phormium tenax</i>	Not Threatened
Karaka	<i>Corynocarpus laevigatus</i>	Not Threatened
Karamu	<i>Coprosma robusta</i>	Not Threatened
Kawakawa	<i>Piper excelsum excelsum</i>	Not Threatened
Knobby clubrush	<i>Isolepis nodose</i>	Not Threatened
Mahoe	<i>Meliclytus ramiflorus ramiflorus</i>	Not Threatened
Maidenhair fern	<i>Adiantum cunninghamii</i>	Not Threatened
Muehlenbeckia hybrid	<i>Muehlenbeckia australis x complexa</i>	N/A
Pink bindweed	<i>Calystegia sepium</i>	Not Threatened

Pohutukawa	<i>Metrosideros excels</i>	Threatened – Nationally Vulnerable
Purei	<i>Carex dissita</i>	Not Threatened
Remuremu	<i>Selliera radicans</i>	Not Threatened
Shining spleenwort	<i>Asplenium oblongifolium</i>	Not Threatened
Shore bindweed	<i>Calystegia soldanella</i>	Not Threatened
Taupata	<i>Coprosma repens</i>	Not Threatened
Whau	<i>Entelea arborescens</i>	Not Threatened

With the exception of pohutukawa, all the species recorded within the indicative track alignment corridor are common and widespread locally and nationally. Pohutukawa has a national or regional threat classification.

Pohutukawa is the dominant tree at this site forming coastal forest. This species had its threat status changed this year from Not Threatened to Threatened – Nationally Vulnerable (De Designated, DP Data Poor). This change is not due to a sudden decline, but is in relation to the risk of decline as a result of the arrival in New Zealand of myrtle rust as follows.

*‘The panel is also concerned over the potential devastation that could be caused to Metrosideros if the Ceratocystis fimbriata strain responsible for ‘Rapid Ohia decline’ in Hawai’i (Mortenson et al. 2016) became established in New Zealand. Therefore, as a precautionary measure the panel has designated all the New Zealand Myrtaceae previously considered to be Not Threatened as ‘Threatened’, and elevated the status of those previously assessed as At Risk to Threatened’.*⁹

This species and the community it forms therefore requires further consideration as does the small area of coastal fringe vegetation as it provides potential habitat for the land snail *S. archeyi* and shore skink.

4.2 Avifauna

The observations gathered by the desktop investigations cover both national and harbour wide surveys, as well as observations within or near the proposed track location. This data is pooled with field observations to provide a master list of all possible birds potentially affected (Appendix 2). This list is then refined through consideration of habitat preference and availability, species abundance, and nest and roost requirements, to provide a smaller subset of birds that are likely to be present and affected (Key species).

4.2.1 Desktop Investigation

Habitat

With respect to habitat, both observational data and reports confirm that the Tauranga Harbour and surrounding coastline and vegetation provide a diversity of habitats for avifauna to undertake nesting, foraging, moulting and roosting activities in, including:

⁹ de Lange, P.J. et al. 2017

- Mauao SEA 7 – provides nesting and roosting habitat for pied shag, little blue penguin (moulting also) and grey-faced petrel. Roosting, foraging and nesting opportunities are provided for avifauna that use native forest and scrub/shrubland habitats (such as tui, grey warbler, New Zealand fantail etc) as this SEA has the most extensive and highest quality area of pohutukawa forest within Tauranga City and the Tauranga Ecological District as well as a diverse range of vegetation/habitat types (Tauranga City Council, 2013).
- Mauao SEA 32 – provides nesting and roosting opportunities for little blue penguin (Bay of Plenty Regional Council, 2017; Tauranga City Council, 2013) and grey-faced petrel. Treeland and coastal scrub habitats are inhabited by and provide roosting, foraging and nesting opportunities for species typical of these habitats (Wildland Consultants, 2009), such as tui, grey warbler, silvereye etc.
- Matakana Island – provides important nesting and high tide roosts for avifauna (of relevance to this assessment are red-billed gull, little black shag, little shag and variable oystercatcher (Bay of Plenty Regional Council, 2017).
- Motuotau – provides roosting habitat for little blue penguins (nesting also), grey-faced petrel and red-billed gulls (Bay of Plenty Regional Council, 2003).
- Moturiki – provides nesting habitat for little blue penguins (Bay of Plenty Regional Council, 2017).
- Mauao Reefs – reefs around the base of Mauao act as a setting area for juvenile crayfish, paua and kina and as such providing foraging habitat for avifauna (Bay of Plenty Regional Council, 2003).
- Tauranga Harbour – provides oceanic and inter-tidal mudflat foraging habitat and/or high tide roosts for little blue penguin, grey-faced petrel, grey-faced heron, variable oystercatcher, pied shag, little black shag, little shag, black shag, black-backed gull (Bay of Plenty Regional Council, 2015; Owen, 2013).

Species

With respect to species, the review of relevant published and unpublished literature, relevant databases and the OSNZ atlas data provided a base list of 69 avifauna species that have been recorded at Mauao and the wider surrounding area (refer to Appendix Figure 1 for the OSNZ atlas grid square locations and Appendix 2 for the full base list). Of these 69 species, 47 are native (including vagrant species) Table 4. Twenty-two are introduced.

Table 4. Indigenous avifauna species and their threat status as recorded in the OSNZ atlas grids that encompass the site and from other sources. Primary habitats are in dark green and secondary habitats in light green.

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Flesh-footed shearwater	<i>Puffinus carneipes</i>	Threatened – Nat. Vul.								
Sooty shearwater	<i>Puffinus griseus</i>	At Risk – Dec.								

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Little blue penguin	<i>Eudpytula minor</i>	At Risk – Dec.								
Pycroft’s petrel	<i>Pterodroma pycrofti</i>	At Risk – Rec.								
Northern giant petrel	<i>Macronectes halli</i>	At Risk – Rec.								
Little shearwater	<i>Puffinus assimilis</i>	At Risk – Rec.								
White-faced storm petrel	<i>Pelagodroma marina</i>	At Risk – Relict								
Common diving petrel	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Rel.								
Fluttering shearwater	<i>Puffinus gavia</i>	At Risk – Rel.								
Buller’s shearwater	<i>Puffinus bulleri</i>	At Risk – Nat. Unc.								
Australasian gannet	<i>Morus serrator</i>	Not Threatened								
Grey-faced petrel	<i>Pterodroma macroptera gouldi</i>	Not Threatened								
Reef heron	<i>Egretta sacra sacra</i>	Threatened – Nat End.								
Caspian tern	<i>Hydroprogne caspia</i>	Threatened – Nat. Vul.								
Red-billed gull	<i>Larus novaehollandiae scopulinus</i>	At Risk – Dec.								
Bar-tailed godwit	<i>Limosa lapponica baueri</i>	At Risk – Dec.								
White-fronted tern	<i>Sterna s. striata</i>	At Risk – Dec.								
New Zealand dotterel	<i>Charadrius obscurus aquilonius</i>	At Risk – Rec.								
Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk – Rec.								
Southern black-backed gull	<i>Larus dominicanus</i>	Not Threatened								
White-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened								
Black swan	<i>Cygnus atratus</i>	Not Threatened								
Siberian tattler	<i>Tringa brevipes</i>	Vagrant								
Black-billed gull	<i>Larus bulleri</i>	Threatened – Nat. Crit.								
South Island pied oystercatcher	<i>Haematopus finschi</i>	At Risk – Dec.								
Pied stilt	<i>Himantopus leucocephalus</i>	At Risk – Rec.								
New Zealand dabchick	<i>Poliiocephalus rufpectus</i>	At Risk – Rec.								
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Nat. Unc.								
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk – Nat. Unc.								
Pied shag	<i>Phalacrocorax varius varius</i>	At Risk – Rec.								
Little shag	<i>Phalacrocorax melanoleucos brevirostris</i>	Not Threatened								

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Paradise shelduck	<i>Tadorna variegata</i>	Not Threatened								
New Zealand kingfisher	<i>Todiramphus sanctus vagrans</i>	Not Threatened								
Pukeko	<i>Porphyrio melanotus</i>	Not Threatened								
Australasian grebe	<i>Tachybaptus novaehollandiae</i>	Coloniser								
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened								
Australasian harrier	<i>Circus approximans</i>	Not Threatened								
Welcome swallow	<i>Hirundo neoxena</i>	Not Threatened								
New Zealand falcon	<i>Falco novaeseelandiae</i>	At Risk – Rec.								
North Island kaka	<i>Nestor meridionalis septentrionalis</i>	At Risk – Rec.								
Grey warbler	<i>Gerygone igata</i>	Not Threatened								
Silvereye	<i>Zosterops lateralis</i>	Not Threatened								
Morepork	<i>Ninox novaeseelandiae</i>	Not Threatened								
New Zealand fantail	<i>Rhipidura fuliginosa placabilis</i>	Not Threatened								
Shining cuckoo	<i>Chrysococcyx lucidus</i>	Not Threatened								
North Island tomtit	<i>Petroica macrocephala toitoi</i>	Not Threatened								
Tui	<i>Prothemadera novaeseelandiae</i>	Not Threatened								

Of the 47 indigenous species listed in Table 4, two species; little blue penguin (At Risk) and grey-faced petrel (Regionally Significant), have been the subject of targeted surveys along this coastline, including at least parts of the study area (Bay of Plenty Regional Council, 2003; Mauao Trust & Tauranga City Council, 2017; Shaw, 2005; Tauranga City Council, 2013; Wildland Consultants, 2000, 2005, 2009). The little blue penguin and grey-faced petrel populations are considered important as they are breeding populations, which are rare on the mainland (Mauao Trust & Tauranga City Council, 2017).

Little blue penguin

With respect to little blue penguin, eleven active burrows were detected within the indicative track alignment corridor during the 1997-1998 breeding season (Winter, 2000) and five during the 2012-2013 breeding season (Sievwright, 2014) (Appendix 3). The Western Bay Wildlife Trust has also conducted recent little blue penguin surveys around Mauao as part of the Mauao penguin monitoring they conduct. Penguins were detected in the indicative track alignment corridor prior to the slip, however, no penguins were detected during the two

Mauao penguin monitoring surveys conducted after the slip in November 2017 (J. Graham pers. comm., 2017).

Grey-faced petrel

With respect to grey-faced petrel, the breeding population (a colony of approximately 200 pairs) has been monitored by members of the Tauranga branch of the Ornithological Society of New Zealand (with DOC assistance) since 1989 (29 years) (Wildland Consultants, 2009). A few active burrows are located above the indicative track alignment corridor (i.e. outside of it) on the cliff edge in the forested area between the new stair section of track and the original, currently closed, section of track. In the 2016-17 breeding season chicks from six grey-faced petrel burrows were banded from this area. A few burrows are also present in areas adjacent to the slip but also outside of the indicative track alignment corridor. Some burrows were present below the original track (P. Cuming pers. comm., 2018), however they were eliminated by the slip and are no longer present.

4.2.2 Field Investigation

During the initial avifauna survey, 17 avifauna species, comprising seven indigenous and 10 introduced species, were recorded within the indicative track alignment corridor. The seven indigenous avifauna species were: red-billed gull, variable oystercatcher (Photos 17 and 18), black-backed gull, New Zealand fantail, New Zealand kingfisher, tui (Photo 15) and welcome swallow. Two of these species are classified as At Risk species (red-billed gull and variable oystercatcher).

Our field surveys did not identify any new species in the corridor that had not been recorded in the literature. We therefore consider the 47 native species and 22 introduced bird species, listed in the OSNZ atlas (and other sources) to represent the full suite of birds requiring consideration in this assessment. The reasons we observed only a few of the 69 species potentially in the area are outlined below.

Of the 47 native species observed or potentially present at the site or wider area (based on the literature review), four species are Threatened (flesh-footed shearwater, reef heron, Caspian tern, black-billed gull) and 22 have a threat status of At Risk (Declining, Naturally Uncommon, Recovering, or Relict). The remaining 21 species are not threatened or vagrant.

Identification of Key Native Species

We have considered the 22 introduced species recorded locally (See Appendix 2), and none are believed to make an important contribution to the local ecology or local biodiversity. They are therefore not considered further in this assessment.

The 47 native species represent a diverse avifauna community. However, 15 species are vagrants or have only very rarely been sighted (e.g. only one individual of some species have ever been recorded such as cattle egret, Siberian tattler, and Pycroft's petrel). These 15 species are not considered further.

Also, 14 species occupy habitats, such as freshwater ponds and oceanic areas (rather than coastal areas), that although present in the wider area, are not present within the proposed track alignment corridor (such as New Zealand dabchick, northern giant petrel and white-faced storm petrel), so these species would not be impacted by the proposed track construction. These 14 species are not considered further.

Consequently, it has been determined that the indicative track alignment corridor, which has a limited number of habitat types, is potentially utilised by 18 species of indigenous avifauna for various activities (such as nesting, moulting, foraging and/or roosting), including six At Risk species and one regionally significant species (grey-faced petrel) (Table 5).

Table 5. Indigenous avifauna species for which primary habitat occurs within the indicative track alignment corridor¹⁰. Primary habitats are in dark green and secondary habitats in light green. With respect to habitat use, F = Foraging, R = Roosting/Resting, N= Nesting and M = Moulting.

Species	Scientific Name	Conservation Status ¹¹	Recorded in the indicative track alignment corridor during current survey	Observed or Potential Habitat Use	Habitat type								
					Oceanic	Coastal/estuary	Freshwater/wetlands	Scrub/shrubland	Native Forest	Farmland/open country	Exotic Forest	Urban/residential	
Little blue penguin	<i>Eudyptula minor</i>	At Risk – Declining	-	N, M, R	Dark Green	Light Green							
Red-billed gull	<i>Larus novaehollandiae</i>	At Risk – Declining	Yes	F, R		Dark Green	Light Green						
Pied shag	<i>Phalacrocorax varius</i>	At Risk – Recovering	-	R		Light Green	Dark Green						
Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk – Recovering	Yes	F, R		Dark Green	Light Green						
Black shag	<i>Phalacrocorax carbo</i>	At Risk – Nat. Uncommon	-	R		Light Green	Dark Green						
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk – Nat. Uncommon	-	R		Light Green	Dark Green						
Black-backed gull	<i>Larus dominicanus</i>	Not Threatened	Yes	F, R		Dark Green							
Grey warbler	<i>Gerygone igata</i>	Not Threatened	-	F, R, N				Dark Green	Light Green		Light Green	Light Green	
Grey-faced petrel	<i>Pterodroma macroptera gouldi</i>	Not Threatened	-	N	Dark Green								
Little shag	<i>Phalacrocorax melanoleucos</i>	Not Threatened	-	R		Light Green	Dark Green						
Morepork	<i>Ninox novaeseelandiae</i>	Not Threatened	-	F, R				Light Green	Dark Green		Light Green		
New Zealand fantail	<i>Rhipidura fuliginosa</i>	Not Threatened	Yes	F, R, N				Light Green	Dark Green		Light Green	Light Green	
New Zealand kingfisher	<i>Todiramphus sanctus vagrans</i>	Not Threatened	Yes	F, R			Dark Green	Light Green	Dark Green				
Shining cuckoo	<i>Chrysococcyx lucidus</i>	Not Threatened	-	F, R, N				Light Green	Dark Green				
Silvereye	<i>Zosterops lateralis</i>	Not Threatened	--	F, N, R				Dark Green	Light Green		Light Green	Light Green	

¹⁰ Note that exotic avifauna species have been omitted from this table as well as species that are vagrant or rare visitors to the area or whose primary habitat type is not represented within the indicative track alignment corridor. A full, unfiltered list of species recorded in the local and surrounding area is provided in Appendix 2.

¹¹ Robertson, H. A. et al., 2017

Species	Scientific Name	Conservation Status ¹¹	Recorded in the indicative track alignment corridor during current survey	Observed or Potential Habitat Use	Habitat type								
					Oceanic	Coastal/estuary	Freshwater/wetlands	Scrub/shrubland	Native Forest	Farmland/open country	Exotic Forest	Urban/residential	
Tui	<i>Prothemadera novaeseelandiae</i>	Not Threatened	Yes	F, N, R									
Welcome swallow	<i>Hirundo neoxena</i>	Not Threatened	Yes	F, R									
White-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened	-	F, R									

Discussion

For each of these 18 indigenous species the relative importance of habitat within the indicative track alignment corridor will vary according to the activity undertaken in the area (i.e. nesting, moulting, roosting, foraging), the size of their home range, and the availability of similar habitat elsewhere.

Oceanic Species

Little Blue Penguin

No little blue penguins were observed during the initial survey or the subsequent more targeted surveys that were conducted. During one survey, fresh guano was detected at one location within the buffer zone (the area adjacent to the proposed works area that was surveyed; Photo 16), however it did not form a trail to a burrow and no penguins or unoccupied burrows were detected nearby. No penguin feathers or abandoned eggs were detected either during any of the surveys. We are confident that although little blue penguins may use this area, it is not a key site for this species.

Grey-Faced Petrel

No grey-faced petrels or grey-faced petrel burrows were detected in the indicative track alignment corridor during the initial or targeted surveys. Grey-faced petrel burrows were found uphill of the indicative track alignment corridor and one active burrow was found above the proposed boardwalk area by the top of the slip, however this burrow is outside of the works area and it was deemed to be "of sufficient height for fledgling chicks to clear any obstacles upon first flight out of the burrow" (P. Cuming, pers. comm., 2018). Grey-faced petrels were also heard flying overhead during one survey, however they did not land within the indicative track alignment corridor. We have confirmed that the previously known burrows below the original track within the indicative track alignment corridor were in the slip area, and as such, are no longer present. We are confident that although grey-faced petrel may potentially use this corridor, it is not a key site for this species.

Coastal Species

Four indigenous coastal species were observed foraging within the indicative track alignment corridor (or they may potentially forage within this area); red-billed gull, variable

oystercatcher, black-backed gull and white-faced heron. These species are not restricted to the indicative track alignment corridor for foraging and they are not known to breed in the corridor; there is plentiful alternative habitat across Mauao and the wider area that these species can utilise. We are confident the indicative track alignment corridor is not a key site for these species.

Freshwater/Wetland Species

Six indigenous freshwater/wetland species were observed within the indicative track alignment corridor (or they may potentially use the habitat within this corridor); pied shag, black shag, little black shag, little shag, New Zealand kingfisher and welcome swallow. The indicative track alignment corridor is not used by the shag species for nesting (no guano was observed) and is unlikely to provide nesting habitat for kingfisher and welcome swallow. The corridor may be used for resting (i.e. shags drying their wings) or foraging (kingfisher and welcome swallow), however given that plentiful, alternative habitat is available for these species across Mauao and the wider area, we are confident that the indicative track alignment corridor is not a key site for these species.

Forest and Scrub Species

Six indigenous forest and scrub species were observed within the indicative track alignment corridor, (or they may potentially use the habitat within this corridor); morepork, New Zealand fantail, shining cuckoo, silvereye, tui and grey warbler. For these species, which may roost nest and/or forage within the indicative track alignment corridor, there is an abundance of suitable habitat available outside the project area in which they can conduct these activities. This includes similar habitat areas across Mauao and the wider coastal area as listed in Section 4.1.1 above).

Summary

In summary, several species of indigenous avifauna utilise, or may potentially utilise, the indicative track alignment corridor, however the corridor does not provide crucial habitat for any one species; and large areas of similar habitat is available elsewhere outside of the indicative track alignment corridor. In the subsequent assessment of effects, the 6 At Risk species observed in the corridor, or that may use the habitats within the corridor, as well as grey-faced petrel (nationally not threatened but a regionally significant species) are considered further.

4.3 Herpetofauna

4.3.1 Desktop Investigation

Information on herpetofauna populations on Mauao is sparse; only one formal baseline lizard survey has been conducted (November 2017) (Wildland Consultants, 2018). During this survey eight copper skink (*Oligosoma aeneum*; Not Threatened) and one plague skink (*Lampropholis delicata*; Introduced and Naturalised) were detected across Mauao.

Shore skink (*Oligosoma smithi*; At Risk, Naturally Uncommon) are also known to be present on Mauao but at low abundance (J. Heaphy, pers. comm., 2006). Other species have also been historically anecdotally reported, or suspected as potentially present in very low densities on Mauao. These species include moko skink (*Oligosoma moco*; At Risk, Relict), forest gecko (*Mokopirirakau granulatus*; At Risk, Declining) elegant gecko (*Naultinus elegans*; At Risk,

Declining) and Pacific gecko (*Dactylocnemis pacificus*; *At Risk, Relict*) (Wildland Consultants, 2018). This survey did not specifically target the indicative track alignment area but it did include equivalent habitats and landforms.

Records from DOC's herpetofauna database for Mauao are sparse and include copper skink and one historic record (from 1965) of a shore skink.

No field investigations for herpetofauna were carried out for this assessment. Based on this historical data, the data from the DOC database and the recent baseline survey conducted at Mauao, of the seven potential species present on Mauao, we assume that only copper skink, plague skink (an exotic skink that we do not consider any further in this assessment) and possibly shore skink may potentially be present in the indicative track alignment corridor. We conclude that it is highly unlikely that any of the other four species, historically, anecdotally or suspected to be present on wider Mauao, will be present at this small site. As copper skink are common and Not Threatened, they are not considered any further in this assessment.

In the absence of survey data, we propose to develop a management approach to survey for shore skink prior to construction and if detected, translocate them to alternative, suitable habitat prior to construction.

4.4 Terrestrial Invertebrates

4.4.1 Desktop Investigation

The Threatened land snail, *Succinea archeyi*, is noted as a rare inhabitant of foreshore dunes at Mount Maunganui (Wildland Consultants, 2013).

No other terrestrial invertebrate data were discovered.

4.4.2 Field Investigation

A survey of vegetation along the shoreline revealed that there are plant species present within the indicative track alignment corridor that could be inhabited by *S. archeyi*. Species detected included knobby clubrush and *Muehlenbeckia* sp. No live or dead snail shells were detected. At the time of the vegetation survey (26 June 2018), snails (if present) would be beginning to hatch (June-August) which makes them difficult to detect, given their small size.

Therefore, subject to advice from DOC's expert, we propose to assume that the snails could be present and develop a management approach to survey and/or translocate snails (and possibly their habitat) prior to construction.

4.5 Marine Environment

4.5.1 Desktop Investigation

Assessment of hard shore/boulder and soft sediment habitat of Mauao adjacent to the existing water discharge point from the Mount Hot Pools indicated a diverse assemblage of organisms (Boffa Miskell, 2016). It is expected that the hard shore/boulder assemblages are similar to those of the boulder habitat within the Project area, whereas the soft sediment assemblages are likely to have some differences between the two locations due to different exposure and hydrodynamic

environment. The more exposed south-west and western soft shore of Mauao would likely have lower diversity and abundance compared to the inner harbour site at the Pilot Bay boat ramp.

A wide range of fish are likely to be present around Mauao, but being mobile organisms, we have assumed that they will be able to avoid the works area and will not be affected by the project. Therefore, we have not considered fish further in this assessment of effect.

Fur seals (*Arctocephalus forsteri* (kekeno), Not Threatened) are known to occur around Mauao, with the key haul out areas being along the intertidal rocky shore on the northern exposed side. The indicative track alignment corridor does not comprise fur seal haul out habitat, being sandy shore interspersed with boulders and accordingly we have not considered seals further in this assessment of effect.

Soft sediment habitat

A total of 46 benthic invertebrate species were detected along the transect surveyed. Numerically dominant taxa included bivalves (especially nut shell (*Nucula hartvigiana*) and wedge shell (*Macomona liliiana*), a large variety of polychaete worms, tanaid shrimp, amphipods (Corophiidae family) and pill box crabs (*Halicarcinus* spp.).

Hard shore/boulder habitat

Twenty invertebrate taxa were detected in the boulder habitat in 2016, including green chiton (*Chiton glaucus*), gastropods (*Cominella adspersa*, *Crepidula monoxyla*, *Diloma aethiops*, *Nerita atramentosa*, *Onchidella nigrans*, *Turbo smaragdus*, *Zeacumantus subcarinatus*, *Haustrum haustorium*), rock oyster (*Saccostrea glomerata*), tube worm (*Protolaeospira* sp.), estuarine barnacle (*Elminius modestus*) and anemone (*Isactina tenebrosa*, *Isactina olivacea*).

4.5.2 Field Investigation

Photo 1 shows the two main marine habitat types present adjacent to the slip area, soft sediment and hard shore/boulder habitat.



Photo 1 Soft sediment and hard shore/boulder marine habitats adjacent to slip area.

Photo 2 shows the soft sediment beach habitat on the western side of Mauao. The boulders present at the top of the shoreline are a form of erosion protection, not naturally located.



Photo 2 Soft sediment beach habitat on the western shore.

Soft sediment habitat

The sandy upper shore habitat around MHWS has a naturally depauperate benthic invertebrate assemblage, dominated by sand hoppers (*Bellorchestia quoyana*). Middle to lower reaches of the soft sediment shore likely have a somewhat higher diversity of invertebrate infauna. However, given the high energy environment along the south west and west coast of Mauao, it is likely that the soft sediment species diversity is naturally low and dominated by common species that are present in similar habitats within the region.

The soft sediment environment provides potential habitat for non-marine species such as shore skink and land snail.

The soft sediment habitat is assessed as having Moderate ecological value.

Hard shore/boulder habitat

Boulders and reef/hard shore habitat around the low tide mark support a typical assemblage of common sessile and mobile organisms, including little black mussels (*Xenostrobus pulex*), barnacles (*Chaemosipho columna*, *Epopella plicata*, *Elmnius modestus*), whelks and snails (*Austrolittorina unifasciata*, *Turbo scobina*, *Nerita atramentosa*, *Melagraphia aethiops*, *Cominella adspersa*), Pacific oyster (*Crassostrea gigas*), rock oyster (*Saccostrea glomerata*) chitons (*Chiton pelliserpentis*, *Chiton glaucus*).

Whilst on site, oystercatchers, shags and black-backed gulls were observed foraging on hard shore organisms. The boulder habitat has provided habitat for little blue penguins in the past. However, no nesting little blue penguins were observed during the surveys conducted. These areas may provide potential habitat for shore skink.

Some of the boulders within the Project area can move and be tumbled with high energy waves which may dislodge or damage some organisms and contributes to the variability in the successional stage of the assemblage present.

The hard shore assemblages within the project area are assessed as having Moderate ecological value (full species list in Appendix 5).

4.6 Summary

In summary we consider the following habitats and fauna require further consideration in this assessment Table 6.

Table 6: Habitats and species with recognised ecological value requiring assessment.

Valued Species and Habitats	Explanation
Habitat	
Pohutukawa forest and shrubland	<ul style="list-style-type: none"> Fragment of larger forest with an understory of native and exotic scrub/shrubs. Regionally significant. Habitat for native birds and potentially lizards.
Coastal fringe vegetation	<ul style="list-style-type: none"> Small area of potential habitat for lizards and snails.
Hard shore/boulder habitat	<ul style="list-style-type: none"> Potential nest and roost habitat for little blue penguin. Potential habitat for shore skink. Habitat with limited distribution in the ecologist district.
Soft sediment habitat	<ul style="list-style-type: none"> Small area of potential habitat for lizards and snails

Species	
Pohutukawa	<ul style="list-style-type: none"> Threatened species.
Little blue penguin	<ul style="list-style-type: none"> Potential nest and roost sites. Observed historically, but not during this survey. At Risk – Declining
Grey-faced petrel	<ul style="list-style-type: none"> Potential nest site. Observed historically, but in the proposed corridor during this survey. Not Threatened, regionally significant.
Red-billed gull	<ul style="list-style-type: none"> Potential foraging and roost sites. At Risk – Declining.
Pied shag	<ul style="list-style-type: none"> Potential roost/resting sites. At Risk – Recovering.
Variable oystercatcher	<ul style="list-style-type: none"> Potential foraging and roost sites. At Risk – Recovering.
Black shag	<ul style="list-style-type: none"> Potential roost/resting sites. At Risk – Nat. Uncommon
Little black shag	<ul style="list-style-type: none"> Potential roost/resting sites. At Risk – Nat. Uncommon
<i>Succinea archeyi</i>	<ul style="list-style-type: none"> Threatened snail. Potential habitat for the species at this site.
Shore skink	<ul style="list-style-type: none"> Potential habitat for the species at this site. At Risk – Nat. Uncommon.

5.0 Significance

5.1 Introduction

RMA section 6(c) requires that “*all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance*” including “*The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna*”. As required, this section assessed indigenous vegetation and habitats of indigenous fauna against criteria (Representativeness, Rarity, Diversity, Context and Tangata Whenua¹²). If these criteria are met, the ecosystem or habitat is significant.

Assessment of ecological significance is a necessary test under the Resource Management Act 1991; Section 6C – protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

Based on the desktop and field data described in Section 4.0, the avifauna, vegetation and marine values identified within the indicative track alignment corridor have been assessed (Table 7) against the significance criteria listed within Appendix F (Criteria for Assessing Matters of National Importance in the Bay of Plenty Region), Set 3 (Indigenous Vegetation and Habitats of Indigenous Fauna) of the Bay of Plenty Regional Policy Statement (Bay of Plenty Regional Council, 2014).

We note that the last three significance criteria relate to Maori values, Historical values and Community Associations with the site. We do not provide an assessment of these last three non-ecological criteria.

5.2 Significance assessment

In summary, the use of the indicative track alignment corridor trigger six of the significance criteria (Table 7).

Table 7. Assessment of the proposed track location against the Bay of Plenty Regional Policy Statement Appendix F assessment criteria for determining significant vegetation and significant habitat of indigenous fauna.

Bay of Plenty RPS Significance Criteria		Rationale	Criterion Met?
Representativeness	3.1 - Indigenous vegetation or habitat of indigenous fauna contains associations of indigenous species representative, typical or characteristic of the natural diversity of the region or any relevant ecological districts.	<ul style="list-style-type: none"> Characteristic coastal vegetation is represented by pohutukawa trees. The indicative track alignment corridor provides observed or potential nesting, moulting, roosting and/or foraging habitat for At Risk species (little blue penguin, pied shag, variable oystercatcher, red-billed gull, little shag, little black shag, black shag) and a regionally important avifauna population (grey-faced petrel). Provides potential habitat for shore skink (At Risk). 	Yes

¹² We have not assessed Tangata whenua values as this is outside our area of expertise. We understand consultation with Tangata Whenua is occurring, and will be reported on in the AEE.

		<ul style="list-style-type: none"> Marine assemblages are typical of soft sediment and hard shore/boulder habitats in the region. 	
Rarity or Distinctive Features	3.2 - Indigenous vegetation or habitat of indigenous fauna supports an indigenous species or associations of indigenous species threatened or rare nationally, regionally or within the relevant ecological district.	<ul style="list-style-type: none"> Presence of pohutukawa trees (Nationally Vulnerable, DOC 2017) within the indicative track alignment corridor The indicative track alignment corridor provides observed or potential nesting, moulting, roosting and/or foraging habitat for At Risk species (little blue penguin, pied shag, little shag, little black shag, black shag, variable oystercatcher, red-billed gull) and a regionally important avifauna population (grey-faced petrel). Potential habitat for shore skink (At Risk) within the indicative track alignment corridor. Potential habitat for endemic land snail <i>Succinea archeyi</i> (Nationally Endangered) within the indicative track alignment corridor. 	Yes
	3.3 - Indigenous vegetation or habitat of indigenous fauna can contribute to the maintenance or recovery of a species threatened or rare nationally, regionally or within the relevant ecological district.	<ul style="list-style-type: none"> Presence of pohutukawa trees (Threatened) within the indicative track alignment corridor. The indicative track alignment corridor provides observed or potential nesting, moulting and/or foraging habitat for At Risk species (little blue penguin, pied shag, little shag, little black shag, black shag, variable oystercatcher, red-billed gull) and a regionally important avifauna population (grey-faced petrel). Potential habitat for shore skink (At Risk) within the indicative track alignment corridor. Potential habitat for endemic land snail <i>Succinea archeyi</i> (Nationally Endangered) within the indicative track alignment corridor. 	Yes
	3.4 - Indigenous vegetation or habitat of indigenous fauna is distinctive, of restricted occurrence, or at the limits of its natural distribution range, or has developed as a result of factors such as natural geothermal activity, historical cultural practises, altitude, water table, or soil type.		No
	3.5 - Indigenous vegetation or habitat of indigenous fauna is one of the largest remaining examples of its types within the region or any relevant ecological district.		No
	3.6 - Indigenous vegetation or habitat of indigenous fauna is significantly reduced in area and is degraded but	<ul style="list-style-type: none"> The habitat has been degraded by the slip and weeds, and exotic species are present 	Yes

	retains key natural ecosystem functions (for example hydrology) and has a high potential for restoration.	in the area, however restoration potential is high.	
<i>Diversity and Pattern</i>	3.7 - Indigenous vegetation or habitat of indigenous fauna contains a high diversity of indigenous ecosystem or habitat types, or changes in species composition, reflecting the existence of diverse natural features (for example landforms, soil types or hydrology), or communities along an ecological gradient.	<ul style="list-style-type: none"> Intertidal rocky shore habitat as well as indigenous and exotic vegetation communities/habitats are present representing a moderately diverse range of habitat types. 	Yes
<i>Naturalness</i>	3.8 - Indigenous vegetation or habitat of indigenous fauna is in a natural state or healthy condition, or is in an original condition.	<ul style="list-style-type: none"> Some natural and original vegetation components present (particularly pohutukawa trees), although exotics also present. Condition appears healthy outside of the slip area. 	Yes
<i>Ecological Context</i>	3.9 - Indigenous vegetation or habitat of indigenous fauna contributes to the ecological viability of adjoining natural areas and biological communities, by providing or contributing to an important ecological linkage or network, or providing a buffer from adjacent land uses.	<ul style="list-style-type: none"> The indicative track alignment corridor provides connectivity to other vegetation and habitats around Mauao (notably SEA/SEE #7 and Tauranga harbour). 	Yes
	3.10 - Indigenous vegetation or habitat of indigenous fauna provides habitat for indigenous species at key stages of their life cycle.	<ul style="list-style-type: none"> The indicative track alignment corridor provides potential nesting and moulting habitat for little blue penguin, an At Risk species. It also provides potential nesting habitat for a regionally important population of grey-faced petrel. Coastal fringe vegetation provides potential habitat for endemic land snail <i>Succinea archeyi</i> (Nationally Endangered) within the indicative track alignment corridor. 	Yes
<i>Viability and Sustainability</i>	3.11 - Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape and has the capacity to maintain its ecological viability over time.	<ul style="list-style-type: none"> Marginal significance but given that the indicative track alignment corridor is adjacent to SEA/SEE #7, ecological viability is likely to be maintained over time (e.g. nearby seed source). 	Yes
	3.12 - Indigenous vegetation or habitat of indigenous fauna supports intact habitats and healthy functioning ecosystems.	<ul style="list-style-type: none"> Indigenous vegetation and avifauna communities present within the indicative track alignment corridor. 	Yes
	3.13 - Indigenous vegetation or habitat of indigenous fauna is of sufficient size and compact shape to resist changes initiated by external agents.	<ul style="list-style-type: none"> Due to the small, narrow size of the area it may be impacted by edge effects and fragmentation. 	No

5.3 Conclusion

Based on these criteria, the indicative track alignment corridor is considered significant for a number of factors as summarised below Table 8.

Table 8. Summary of the significant components within the indicative track alignment corridor at Mauao.

Ecosystem Component	Representative	Rarity	Diversity	Context	Conclusion
Terrestrial Vegetation					
• Pohutukawa forest and shrubland	Yes	Yes	No	Yes	Significant
• Coastal fringe vegetation	No	No	No	Yes	Significant
Habitats of Significant Terrestrial Fauna					
• Avifauna habitat	Yes (At Risk species present)				Significant
• Lizard habitat	Potential shore skink habitat				TBC
• Terrestrial invertebrate habitat	Potential habitat, snail not seen during survey				TBC
Marine Ecosystems and Habitats					
• Coastline & Beach (including soft sediment and hard shore/boulder habitat)	Yes (potential habitat for shore skink and land snail). Representative assemblages present.				Significant

6.0 Ecological Value

Determination of 'significance' under Policy 23 is not a measure of ecological value, and therefore a determination of 'significance' under Policy 23 does not mean it is necessarily of high ecological value. Similarly, sites which are not considered significant under the Policy 23 criteria, may have ecological values worthy of further consideration. For this reason, an assessment of ecological value is required for both habitats and species.

This assessment of ecological value guides our consideration of site sensitivity to change, the magnitude and importance of ecological effects, and the need for, and quantum of required mitigation.

6.1 Habitat

Following the EIANZ guidelines (2018) we use the same four criteria (representativeness, rarity, diversity, context) but unlike Policy 23, we provide a score of ecological value (nil, low, moderate, high or very high) against each criterion.

This assessment is carried out for all vegetation communities and habitats within the site, whether or not they are significant according to Policy 23 criteria.

Pohutukawa Forest and Shrubland

- The native forest consists of pohutukawa trees (with a few exotic trees interspersed). The pohutukawa trees are mature and representative of historic vegetation in the area, however there is an exotic component through much of this community, both in the canopy and understory. We consider a moderate score for representativeness. Pohutukawa now has a nationally vulnerable threat status and is much reduced in area within the ecological district. We therefore score it high for rarity. The indigenous components are simple in structure and composition and has little diversity, and the exotic component does not add to the ecological value; it scores low for diversity. It lies within the range of several species of fauna, provides seasonal habitat for several common species and provides linkage to SEA 7. We consider it to score moderate for context.
- Overall, we conclude that this community has Moderate Ecological Value.

Coastal Fringe Vegetation

- This habitat is not widespread in the ecological district, but within the indicative track alignment area only contains a few of the expected species, as well as weed species, so we score it low for representativeness and diversity. It also contains no *Threatened* or *At Risk* species so consider it to score low for rarity. This vegetation may provide habitat for the land snail *S. archeyi* and shore skink, therefore we score it moderate for ecological context.
- Overall, we conclude that this community has Moderate Ecological Value.

Marine Soft Sediment and Hard Shore/Boulder Habitat

- The soft sediment and hard shore/boulder habitat contain benthic invertebrate assemblages that are typical of those habitat types. The marine environment within the alignment is largely unmodified and provides foraging, roosting and nesting habitat for a variety of birds, as well as habitat for shore skink and land snails. We have assessed the marine habitats as being significant.

6.2 Species

In addition to determining ecological significance for this assessment, ecological values have been assigned. For species, all New Zealand biota have been assessed by DOC against a standard set of criteria (described in Townsend et al. (2008) and lists published for each taxonomic group. This provides a consistent basis on which to assign ecological value for individual species (see Table 9). On this basis, the ecological value assigned to each of avifauna, vegetation and marine species that use/inhabit the indicative track alignment corridor and that may be impacted by proposed track development are provided in Table 10.

Table 9. Criteria for assigning ecological value to species (based on EIANZ (2018) guidelines).

Ecological Value	Species Classification
Very High	Threatened (<i>Nationally Critical, Nationally Endangered, Nationally Vulnerable</i>)
High	At Risk (<i>Declining, Recovering, Relict, Naturally Uncommon</i>)
Moderate	Locally Uncommon/Rare (but not <i>Threatened</i> or <i>At Risk</i>)
Low	Native – Not Threatened

Table 10. Ecological value of vegetation and indigenous fauna species within the indicative track alignment corridor or that potentially use habitat within the indicative track alignment corridor. Classification is based on Robertson et al. (2017) for avifauna, Hitchmough et al. (2016) for lizards, the Plant Conservation Network for vegetation and Mahlfeld et al (2012) for terrestrial gastropods.

Ecological Component	Species	Classification		Ecological Value
Avifauna	Red-billed gull	<i>Larus novaehollandiae</i>	At Risk - Declining	High
	Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk – Recovering	High
	Pied shag	<i>Phalacrocorax varius</i>	At Risk – Recovering	High
	Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk – Naturally Uncommon	High
	Black shag	<i>Phalacrocorax carbo</i>	At Risk – Naturally Uncommon	High
	Little blue penguin	<i>Eudyptula minor</i>	At Risk – Declining	High
	Grey-faced petrel	<i>Pterodroma macroptera gouldi</i>	Locally Uncommon/Rare but not Threatened or At Risk	Moderate
Vegetation	Pohutukawa	<i>Metrosideros excelsa</i>	Threatened – Nationally Vulnerable	Very High

Ecological Component	Species	Classification		Ecological Value
Herpetofauna	Shore skink	<i>Oligosoma smithi</i>	At Risk – Naturally Uncommon	High
Terrestrial Invertebrates	No common name	<i>Succinea archeyi</i>	Threatened – Nationally Endangered	Very High

In summary

In summary we conclude the following:

Table 11: Summary of ecological and biodiversity values assigned to flora and fauna communities within the site.

Ecosystem Component	Representative	Rarity	Diversity	Context	Conclusion
Terrestrial Vegetation and Habitats					
• Pohutukawa forest and shrubland	Moderate	High	Low	Moderate	Moderate
• Coastal fringe vegetation	Low	Low	Low	Moderate	Moderate
Marine Habitat (intertidal)					
• Soft sediment	Not significant. Common. Some modification. Subject to discharges.				Moderate
• Hard shore/boulder	Not significant. Common. Some modification. Subject to discharges.				Moderate
Threatened & At Risk species					
• Pohutukawa	Threatened – Nationally Vulnerable				Very High
• Red-billed gull	At Risk – Declining				High
• Variable oystercatcher	At Risk – Recovering				High
• Pied shag	At Risk – Recovering				High
• Little black shag	At Risk – Naturally Uncommon				High
• Black shag	At Risk – Naturally Uncommon				High
• Little blue penguin	At Risk – Declining				High
• Grey-faced petrel	Locally Uncommon/Rare not Threatened or At Risk				Moderate
• Shore skink	At Risk – Naturally Uncommon				High
• <i>Succinea archeyi</i>	Threatened - Nationally Endangered				Very High

7.0 Potential Effects Considered and Assessment Methodology

The potential direct and indirect effects on avifauna, vegetation and the marine environment associated with the proposed track development that have been considered in this assessment include:

- Direct effects on avifauna habitat and *At Risk* species loss (*Threatened* species are not considered as none are known to use habitat within the indicative track alignment corridor);
- Indirect effects on *At Risk* avifauna species associated with disturbance from machinery transport, track construction and operational use (such as indirect loss of nesting, moulting, foraging and roosting habitat);
- Direct and indirect effects on lizards associated with habitat loss, disturbance and *At Risk* species loss
- Direct effects of indigenous vegetation loss;
- Direct effects on potential *Threatened* land snail populations through vegetation removal;
- Direct marine habitat loss through construction of revetment;
- Compaction of soft sediment habitat and mortality of organisms due to depositing of fill and rock armour material and movement of heavy machinery within CMA;
- Loss of organisms from boulder habitat during translocation of boulders outside the construction area to enable barge access and movement of machinery; and
- Smothering / mortality of soft sediment organisms if barge is “beached” to unload and if pontoons / swamp maps are used;
- Discharge of sediment to the marine environment during construction;
- Spills or leaks of fuel to the marine environment from barge or heavy machinery.

The following matrices have been used to determine the level of ecological effect associated with the proposed track development. The level of the effect (Table 13) was determined by considering the magnitude of the ecological effect¹³ (Table 12) in association with the ecological values (Table 10). This methodology is consistent with the EIANZ guidelines for undertaking ecological impact assessments (EIANZ, 2018).

¹³ Magnitude takes both duration and extent of impact into consideration.

Table 12. Criteria for describing Magnitude of Effect (EIANZ, 2018).

Magnitude of Effect	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 baseline (pre-development) conditions such that post-development character/ composition/ 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 baseline conditions such that post development character/composition/attributes of baseline 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/attributes of 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 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 13. Level of Effect Matrix (EIANZ, 2018).

Level of Effect		Ecological/Conservation Value				
		Very High	High	Moderate	Low	Negligible
Magnitude	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

8.0 Assessment of Ecological Effects

8.1 Pohutukawa Forest and Shrubland Loss

The approximately 110 m section of boardwalk will be formed in the mixed native and exotic forest area to the east of the indicative track alignment corridor and will result in the loss or modification to native and exotic vegetation in the understory. This vegetation is part of SEA 32. This area has already been modified by clearance required for the archaeological survey (Photo 14). As the species within this area are common and widespread, the loss of these species is considered to have a Negligible Magnitude of Effect (i.e. *Having a negligible effect on the known population or range of the element / feature*). A Negligible Magnitude of Effect on a Moderate Value habitat, results in a Very Low Overall Level of Effect

The track corridor for the approximately 200 m section of rock revetment and aggregate pathway is largely on the soft shore habitat (that is not vegetated) beneath pohutukawa tree canopy. However, some areas of vegetation will be cleared, modified or limbed, including the coastal fringe vegetation and some native and exotic vegetation species in the understory of the pohutukawa forest. Two pohutukawa trees will be felled to construct this section of track and others potentially limbed.

The loss of these pohutukawa two trees and limbing of other trees is considered to have a Low Magnitude of Effect (i.e. *Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of 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*), given that only a few individual trees will be impacted (many other pohutukawa trees are present on Mauao). Most trees will remain unimpacted and will help retain connectivity with SEA 7. A Low Magnitude of Effect on a Moderate Value results in a Low Overall Level of Effect

The loss of the small section of coastal fringe vegetation is considered to have a Very High Level of Effect given that *S. archeyi* may potentially use this habitat (i.e. *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*). A Very High Magnitude of Effect on a Moderate Value habitat results in a High Level of Effect. However, with mitigation, as outlined in Section 9 below, we consider that this effect can be reduced to Low.

8.2 Avifauna Species Loss, Habitat Loss and Disturbance Effects

General Species

Foraging and roosting are activities that were observed being undertaken by avifauna within the indicative track alignment corridor. Construction works will result in the temporary loss of some of the foraging and roosting sites within the corridor. In remaining sites, foraging and roosting birds are likely to be disturbed due to construction activities. However, both of these activities are transient and short-term in nature and all of the species observed undertaking these activities within the indicative track alignment corridor (or likely to undertake these activities there) are not restricted to this corridor for roosting and foraging. They are all mobile species that can use the abundance of alternative foraging and roosting sites around Mauao and the wider area.

Consequently, there would be no direct loss of *At Risk* species that use habitats within the indicative track alignment corridor in such a manner. The Magnitude of Effect of species loss and disturbance on foraging and roosting birds is considered to be Negligible (i.e. *Having a negligible effect on the known population or range of the element / feature*). A Negligible Magnitude of Effect on High Value species, results in a Very Low Overall Level of Effect.

Construction works may decrease prey quality and foraging abilities of some avifauna species due to sediment discharged into the marine environment. However, any sediment plumes generated during the construction phase would be of similar magnitude or smaller to those currently generated by the ongoing weathering and erosion of the existing foreshore. With best practise sediment management in place these effects are considered to be Negligible (i.e. *Having a negligible effect on the known population or range of the element / feature*). A Negligible Magnitude of Effect on Moderate and High species results in a Very Low Overall Level of Effect.

Should a spill or leak of fuel/oil occur within the CMA, effects on avifauna, marine prey and the habitats they use could occur over a wider area. The magnitude of effect depends on the scale of the spill or leak, but if sufficiently large, could cause significant adverse effects on avifauna ecological values. With best practise fuel/oil discharge management in place the Magnitude of Effect is likely to be Negligible (i.e. *Having a negligible effect on the known population or range of the element / feature*) or Low (i.e. *Having a minor effect on the known population or range of the element / feature*). A Negligible or Low Magnitude of Effect on Moderate and High species results in a Very Low – Low Overall Level of Effect.

Little Blue Penguins

In comparison to foraging and roosting, nesting is a longer-term activity, during which avifauna are at risk from construction activities (particularly eggs, chicks and laying/incubating/brooding adults).

For penguins, another longer-period activity during which they are land-bound (and therefore vulnerable to construction activities) is during their moult period which occurs annually over two to three weeks during late summer. Nesting penguins have been previously recorded nesting and moulting in the indicative track alignment corridor (Sievwright, 2014; Winter, 2000); refer to Appendix 3) and in the pasture/indigenous vegetation above this area (J. Graham pers. comm., 2018), however, none were detected during the current surveys conducted.

The disturbance of the slip may have deterred them from the indicative track alignment corridor. Furthermore, some of the habitat that was previously inhabited by penguins has been infilled with debris and some potential habitat (under kawakawa and other dense vegetation) has recently been cleared for archaeological surveys. The remaining habitat is only marginal for penguin nesting and moulting activities (and potentially as temporary rest sites (roosting) for penguins coming ashore and seeking shelter during storm events).

The chance of encountering penguins during works is low; if penguins are found to be nesting, moulting or resting at the site during construction activities, they may be adversely affected by these works (the Magnitude of this Effect is considered to be Low (i.e. *having a minor effect on the known population or range of the element / feature*)). Since penguins are known to breed and moult all around Mauao (and other local areas such as Moturiki and Motuotau), there is plentiful nesting and moulting habitat elsewhere that potentially displaced penguins can use during construction. A potential Low Magnitude of Effect on a High Value species results in an Overall Low Level of Effect.

There are, however, measures that can be implemented to manage these effects and if implemented the Magnitude of Effect will be decreased to Negligible (i.e. *having a negligible effect*).

on the known population or range of the element / feature). These measures are outlined in Section 8.2.

Grey-Faced Petrels

Grey-faced petrels were not detected within the indicative track alignment corridor during the current surveys. The area of habitat that some grey-faced petrels previously occupied in the area, has been lost due to the slip. One active burrow was detected on the hillside by the slip and additional burrows are also present further up the hillside (P. Cuming pers. comm. 2018); these burrows however are outside of the proposed works area and will not be affected by the proposed construction works.

The proposed track development area only provides marginal habitat for grey-faced petrels, therefore it is unlikely that they will be encountered during works. However, if detected, track development is likely to adversely affect nesting grey-faced petrels (the Magnitude of Effect is considered to be Low (i.e. *having a minor effect on the known population or range of the element / feature*). A Low Magnitude of Effect on a Moderate Value species results in a Low Overall Level of Effect.

Like the penguins, there are however measures that can be implemented to manage this effect (see Section 9) and reduce the potential Magnitude of Effect to Negligible (i.e. *having a negligible effect on the known population or range of the element / feature*).

8.3 Lizard Species and Habitat Loss Effects

Surveys were not conducted for lizards, however, based on the literature review there is a low chance shore skink may be present within the indicative track alignment corridor as the corridor has suitable habitat for this species (copper skink may also be present, but as they are a common, not threatened species they have not been considered further in this assessment).

There is alternative habitat present that shore skink can use outside of the indicative track alignment corridor. Skinks are highly mobile species so movement between sites is feasible. Without mitigation, the loss of potential habitat and animals if present, is considered to have a Moderate Magnitude of Effect (i.e. *Loss of a moderate proportion of the known population or range of the element / feature*). As discussed in Section 9 there are however measures that can be implemented to reduce potential effects on skinks (pre-works survey and relocation). If implemented, we consider that the loss of skink habitat is likely to have a Low Magnitude of Effect (i.e. *having a minor effect on the known population or range of the element / feature*).

8.4 Terrestrial Invertebrate Species

Where the removal of knobby clubbrush and *Muehlenbeckia* sp. from the shoreline is required in places where the revetment is to be located, this may involve mortality of the Threatened (Nationally Endangered) land snail, *S. archeyi* (if present), as this species is known to inhabit those vegetation types. If the snail is present within the indicative track alignment corridor, mortality of some individuals through vegetation removal would have a Very High Magnitude of Effect. A Very High Magnitude of Effect on a Very High Value results in a Very High Overall Level of Effect. With mitigation in place, such as translocating any snails detected prior to works, effects can be managed to an Overall Low Level of Effect.

8.5 Marine Species and Habitat Effects

Construction of the revetment will result in both permanent and temporary direct effects on marine species and habitats.

Permanent marine habitat loss (reclamation and permanent occupation) towards the top of the soft sediment shore will occur through position of rock armour to create the revetment (Figure 4). It is estimated at this stage that 223 m² of habitat could be reclaimed for the revetment. Sediment dwelling organisms at the upper limits of the CMA within sandy soft sediment will suffer mortality. Organisms are likely to largely comprise a low density of common sand-hoppers.

Whilst a small area of upper shore soft sediment habitat (223m²) will be effectively removed due to the reclamation, the rock armouring will provide a different habitat (i.e. hard shore) for a different suite of organisms to colonise. It is likely that the rock revetment will over time be colonised by common organisms including whelks, limpets, chitons, oysters and tubeworms. Those organisms will provide some foraging prey for coastal birds.

Temporary effects on marine species and habitats include the disturbance and compaction of soft sediment through the operation of heavy machinery on the foreshore, beaching of barge to unload sediment and rock, placement of pontoons/swamp mats on the soft shore and deposition of material (sediment and rock) as stockpiles during construction. Sessile organisms on boulders that may need to be moved to enable barge access to the shore or movement of heavy machinery along the shore may be abraded or killed during relocation. Figure 4 shows an indicative area of disturbance on the shore (below MHWS, excluding revetment) of 1,125 m². It has been assumed that all organisms within that area could be disturbed or killed during construction.

All of the marine organisms likely to be present within the work area are commonly found on similar shores around north-east New Zealand. Whilst loss of organisms over 1,125 m² reduces the biodiversity within the Project area, the same suite of organisms will recolonise over time and in the long term it is unlikely that there will be any difference between disturbed areas and not disturbed areas.

Sediment discharged from the project area has the potential to affect marine organisms through suspended and deposited sediment. Elevated suspended sediment can block filter feeding structures (e.g. gills), cause organisms to cease feeding, alter reproductive behaviour, reduce light to photosynthesising organisms (e.g. seagrass), and cause mobile organisms (such as fish) to avoid the area affected. One of the most sensitive organisms to suspended sediment is pipi (*Paphies australis*), which begins to suffer sublethal effects at 80 mg/L after exposure for three days (Lohrer et al., 2006).

Deposited sediment can smother benthic organisms if the depth of fine deposited material exceeds 3-5mm for a period of more than three days. Any sediment plumes generated during the construction phase would be of similar magnitude or smaller to those currently generated by the ongoing weathering and erosion of the existing foreshore. Any concentrated plumes would be localised in nature and would be rapidly dispersed by tidal flushing once they reached the primary flow paths (pers.com. Craig Dengate, GHD). In addition, in the existing environment, the harbour receives sediment discharges during rainfall events from numerous sources in the catchment, which results in elevated suspended sediment. Marine organisms in the project area are tolerant of short periods of sediment discharge.

Should a spill or leak of fuel / oil occur within the CMA, effects on marine organisms and habitats could occur over a wider area. The magnitude of effect depends on the scale of the spill or leak, but if sufficiently large, could cause significant adverse effects on marine ecological values.

9.0 Recommendations

There are some potential adverse effects on avifauna, vegetation and the marine environment associated with the proposed track development. These effects can be avoided, remedied or mitigated as discussed below.

9.1 Pohutukawa Forest and Shrubland

Avoid / Minimise

- a) Prior to works trees to be felled or limbed to be marked. All other trees to be avoided.
- b) To avoid unnecessary loss of vegetation we recommend that any vegetation removal is done by a qualified and experience arborist (as is proposed).
- c) Ideally, effects to the large pohutukawa trees should be avoided during track construction. However, with the current proposed track design, it appears that some pohutukawa trees will be affected, including two trees that may be felled and a few others that may be limbed. Where possible, we recommend limbing branches rather than felling trees.

Remedy

- d) If removal of pohutukawa trees and limbs result in the opening of the current canopy, and exposure of the understory, then remedial planting is recommended to protect the margins from wind and to minimise the invasion of pest plant species. This planting to be detailed once the extent of works has been finalised. The planting design must also respond to changes to design that occur during construction.

Mitigate

- e) It is proposed to remediate the existing temporary track as this track will become surplus once the new track has been built. Planting of indigenous species (typical of the local area) on this track will fully mitigate for the loss of trees within the walkway alignment.

9.2 Coastal Fringe Vegetation

This small area of vegetation is potential habitat for shore skink and the land snail *S. archeyi*.

Avoid

- a) The rock revetment will be constructed in this area so likely that loss cannot be avoided.

Remedy

- b) Within rock revetment seek opportunities along its length for planting of the upper slopes with native coastal vines and grasses to replicate the lost habitat.

Mitigate

- c) Assuming an equivalent area of suitable habitat is created within or along the length of the rock revetment, no further mitigation for loss of this coastal fringe vegetation is required.

9.3 Avifauna

Even though little blue penguins and grey-faced petrels were not detected in the indicative track alignment corridor during this survey, we suggest that a conservative (precautionary) approach be taken when undertaking track construction works within the area.

Avoid

- a) Initially it was thought that potential areas of penguin and/or petrel habitat should be altered to make them unsuitable for these species to nest in. However, as no penguins or petrels were observed within the indicative track alignment corridor during the surveys conducted, and the area only provided marginal habitat for these species, habitat alteration was not deemed necessary. The habitat was deemed marginal as there were some thick stands of impenetrable blackberry, there were no existing trails or holes that could be used as burrows, there were very few logs or sheltered areas under which they may nest (penguins), the substrate was quite unstable and the area had been recently disturbed by the vegetation clearance for the archaeological surveys.
- b) To avoid potential effects on little blue penguins and grey-faced petrels, works would ideally not be conducted during the breeding season and moult period (that is not between July and March for little blue penguins and broadly not between June and the end of January for grey-faced petrels). However, the likely works schedule is during this time. As such, we recommend that another little blue penguin and grey-faced petrel survey is conducted by a seabird ecologist, or appropriately experienced person/people, just prior to the commencement of works. If non-breeding or non-moulting penguins and/or petrels are detected, they should be relocated away from the works area by a permitted penguin and/or petrel handler (we are in the process of obtaining a fauna handling and relocating permit from DOC). The Western Bay Wildlife Trust can also be contacted about this as they have a suitable penguin handling permit for the Mauao penguin monitoring they conduct, and § 7(2)(a) - Privacy is the co-ordinator of the Mauao petrel monitoring group for which they have a suitable permit to handle petrels). If breeding or moulting penguins and/or petrels are detected, an exclusion fence should be constructed around the nest/penguin/petrel (with an opening at night for penguins to leave the burrow to forage) and works should not be conducted in the area until nesting or moulting activities have been completed.
- c) We recommend that the boardwalk is constructed so that there is a gap (minimum 200 mm) between the hillside and the edge of the boardwalk so that penguins can access habitat on the hillside above the boardwalk.

Mitigate

- d) The loss of the potential marginal penguin habitat within the indicative track alignment corridor will be mitigated by the construction of the rock revetment along the boardwalk area. The revetment should provide suitable habitat for penguins to nest and moult in (and as such potentially enhance nesting opportunities in the area relative to the current marginal habitat present), providing that the rocks are not packed too tightly together (i.e. space is required between the rocks for penguins to nest and moult in). White-flipped penguin surveys of seawalls created at Lyttelton Port as part of reclamation works, have detected penguins breeding and moulting within these artificially created structures. This suggests that these man-made structures do provide suitable habitat for penguins (Boffa Miskell, unpublished data, 2017). Post-works native planting will also help mitigate the loss of marginal penguin habitat as post-works penguins may nest within these sheltered areas.

- e) The loss of the potential marginal grey-faced petrel habitat within the indicative track alignment corridor will be mitigated by the post-works native planting that will occur. Some areas within the corridor are sparsely vegetated, particularly where clearance has occurred for the archaeological surveys, so this re-vegetation will provide sheltered areas suitable for nesting.

9.4 Lizards

Avoid

- a) We recommend conducting a pre-construction lizard survey and relocating any lizards found to suitable habitat elsewhere on Mauao. Capture and handling will need to be conducted by a permitted lizard handler (we are in the process of obtaining a permit from DOC to undertake this if necessary). If a lizard is incidentally found during construction, works should halt until a DOC-permitted handler is present on site to relocate the lizard.

Remedy/Mitigate

- b) We consider that the rock revetment that will be constructed will provide suitable habitat for the lizard species potentially present in the area. The planting that will occur will also over time provide suitable habitat for these species.

9.5 Terrestrial Invertebrates

Avoid

- a) Rescue prior to works.
- b) In order to avoid potential effects on land snail, *S. archeyi*, we recommend that a survey of potential habitat within the indicative track alignment corridor is conducted after or during rainfall immediately prior to construction. If snails are detected, we recommend that individual plants (and attached snails) that form habitat for this species are transplanted carefully to outside of the works area.

Remedy/Mitigate

- c) Incorporation of appropriate native plants as snail habitat in the landscape planting plan.

9.6 Marine Environment

Avoid

- a) Sediment discharges will be minimised through the use of best practice erosion and sediment control practices, and the discharge of fuel or oil will be avoided through use of well-maintained machinery and refuelling outside of the CMA in bunded areas. Spill kits will also be held onsite and contractors will be trained in their use.
- b) We recommend that the contractor seeks to reduce the permanent project footprint (revetment and board walk piles) and the area of temporary disturbance. Such measures could include ensuring that stockpile of material is limited to a small number of sites and that the barge is “beached” in the same location each time.

Remedy

- c) None proposed.

Mitigation

- d) Revegetation of coastal fringe with appropriate native coastal plants where practicable.

9.7 Monitoring and Adaptive management

Conditions to ensure the following occur.

- **Remedial Planting** – Pohutukawa and indigenous plant replacement. Standard planting methodologies to be applied and seasonal monitoring to ensure establishment and growth as per good practice.

- **Habitat creation**

Snails

The survey, capture, habitat restoration and release of snails may still result in adverse effects through mortality of individuals despite accepted methods, or the delay to establish vegetation. For this reason, monitoring of capture, habitat restoration and release is necessary. If adverse effects are observed adaptive management will be required.

Little Blue Penguin

Construction of the rock revetment provides an opportunity to enhance penguin habitat, however, good design and installation will be necessary. For this reason, monitoring by a suitably qualified ecologist is necessary.

- **Sediment management** – We assume good practice sediment management will be put in place and detailed in a construction management plan. Monitoring of effects need to be specified in this plan as well as a description of remedial actions if a sediment breach event occurs.

9.8 Summary of Effects on Avifauna, Vegetation and the Marine Environment

Table 14 summarises the potential overall effect of the proposed track development, **assuming the recommended avoidance, remedy and mitigation actions described above are implemented.**

The summary considers species value and magnitude of the potential effects identified¹⁴. The level of effect on species and habitats associated with the proposed track development range from Very Low to Low for the terrestrial fauna, vegetation and marine values assessed.

Table 14. Species potentially affected by the proposed track development and the overall level of effect on each species assuming mitigation.

Species	Threat Classification	Potential Effect	Ecological Value	Magnitude of Effect	Overall Level of Effect
Red-billed gull	At Risk – Declining	Loss of foraging and roosting habitat	High	Negligible	Very Low

¹⁴ Magnitude of effect on marine species is assessed at the population level, not individual organism level.

Species	Threat Classification	Potential Effect	Ecological Value	Magnitude of Effect	Overall Level of Effect
Variable oystercatcher	At Risk – Declining	Loss of foraging and roosting habitat	High	Negligible	Very Low
Pied shag	At Risk – Recovering	Loss of potential roosting habitat	High	Negligible	Very Low
Little black shag	At Risk – Nat. Uncommon	Loss of potential roosting habitat	High	Negligible	Very Low
Black shag	At Risk – Nat. Uncommon	Loss of potential roosting habitat	High	Negligible	Very Low
Little blue penguin	At Risk – Declining	Potential loss of nesting, moulting and roosting habitat	High	Negligible	Very Low
Grey-faced petrel	Locally Uncommon but not <i>Threatened</i> or <i>At Risk</i>	Potential loss of nesting, moulting and roosting habitat	Moderate	Negligible	Very Low
Shore skink	At Risk	Potential disturbance and loss of habitat	High	Low	Low
Pohutukawa	Threatened	Limbing or felling of trees	Very High	Negligible	Low
<i>Succinea archeyi</i>	Threatened (Nationally Endangered)	Disturbance / mortality	Very High	Negligible	Low

With respect to the terrestrial habitats affected by the proposed works, with mitigation the Magnitude of Effect on the pohutukawa forest and shrubland, as well as the coastal fringe vegetation is assessed as Low (i.e. *having a minor effect on the known population or range of the element / feature*).

With respect to the marine habitats affected by the proposed works, the Magnitude of Effect of reclamation and permanent occupation is assessed as Low due to the post-development character/composition/attributes of the soft sediment habitat being partially changed (small area of habitat loss), and the Magnitude of Effect of habitat disturbance, is assessed as Low (i.e. having a minor effect on the known population/assemblage) and temporary.

The Ecological Value of the marine habitats affected is Moderate, which when combined with a Low Magnitude of Effect for permanent habitat loss results in a Low Overall Level of Effect which does not require mitigation.

The Magnitude of Effect of sediment discharge and fuel/oil discharge with best practice management practices in place is likely to be Low to Very Low, with a resultant Very Low Overall Level of Effect.

10.0 Conclusion

The terrestrial and marine environments within the indicative track alignment corridor trigger some of the Ecological Significance criteria within the Bay of Plenty Regional Policy Statement.

The terrestrial and marine environments (habitat and fauna) within the indicative track alignment corridor have ecological values that range from Low to Very High as assessed using the EIANZ guidelines (EIANZ, 2018).

With mitigation, the magnitude of the effects of the proposed works range from Negligible to Low.

Combining Ecological Value with Magnitude of Effect gives a range in the Overall Level of Effect from Very Low to Low.

Several methods are recommended to avoid, remedy and mitigate these potential effects.

11.0 References

- Bay of Plenty Regional Council. (2003). *Bay of Plenty regional coastal environment plan* (pp. 1–347). Bay of Plenty Regional Council.
- Bay of Plenty Regional Council. (2014). *Bay of Plenty regional policy statement*. Whakatane: Bay of Plenty Regional Council.
- Bay of Plenty Regional Council. (2015). *Te Awanui Tauranga harbour - literature review of scientific reports*. Bay of Plenty Regional Council.
- Bay of Plenty Regional Council. (2017). *Proposed Bay of Plenty regional coastal environment plan - appeals version* (pp. 1–427). Bay of Plenty Regional Council.
- de Lange, P. J., Rolfe, J. R., Champion, P. D., Courtney, S. P., Heenan, P. B., Barkla, J. W., ... Ladley, K. (2018). *Conservation status of New Zealand indigenous vascular plants, 2017* (New Zealand Threat Classification Series). Wellington: Department of Conservation.
- Department of Conservation Bay of Plenty Conservancy. (1997). *Conservation management strategy for Bay of Plenty Conservancy 1997-2007*. Rotorua: Department of Conservation Bay of Plenty Conservancy.
- EIANZ. (2018). *Ecological impact assessment (EclIA): EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems*. Melbourne: Environment Institute of Australia and New Zealand.
- Freeman, D., Schnabel, K., Marshall, B., Gordon, D., Wing, S., Tracey, D., & Hitchmough, R. (2014). *Conservation status of New Zealand marine invertebrates, 2013* (New Zealand Threat Classification Series No. 9). Wellington: Department of Conservation.
- Heather, B., & Robertson, H. A. (2005). *The field guide to the birds of New Zealand*. Auckland: Penguin Books.
- Hitchmough, R., Barr, B., Lettink, M., Monks, J., Reardon, J., Tocher, M., ... Rolfe, J. (2016). *Conservation status of New Zealand reptiles, 2015* (New Zealand Threat Classification Series No. 17). Wellington: Department of Conservation.
- Mahlfeld, K., Brook, F. J., Roscoe, D. J., Hitchmough, R. A., & Stringer, I. A. N. (2012). The conservation status of New Zealand terrestrial Gastropoda excluding Powelliphanta. *New Zealand Entomologist*, 35(2), 103–109.
- Mauao Trust, & Tauranga City Council. (2017). *Mauao historic reserve management plan - draft* (pp. 1–56). Mauao Trust and Tauranga City Council.
- Owen, K. (2013). *Birds of Tauranga harbour and their habitats*. Presented at the OSNZ Tauranga.
- Robertson, C. J. R., Hyvonen, P., Fraser, M. J., & Pickard, C. J. (2007). *Atlas of bird distribution in New Zealand: 1999-2004*. Wellington: Ornithological Society of New Zealand.
- Robertson, H. A., Baird, K., Dowding, J. E., Elliott, G. P., Hitchmough, R. A., Miskelly, C. M., ... Taylor, G. A. (2017). *Conservation status of New Zealand birds, 2016* (New Zealand Threat Classification Series No. 19). Wellington: Department of Conservation.

- Shaw, W. (2005). Restoration of indigenous biodiversity in Bay of Plenty urban centres. In *Greening the city: bringing biodiversity back into the urban environment* (pp. 85–92). Royal New Zealand Institute of Horticulture.
- Siewwright, K. (2014). *Post-release survival and productivity of oiled little blue penguins (Eudyptula minor) rehabilitated after the 2011 C/V Rena oil spill*. Massey University, Palmerston North.
- Tauranga City Council. (2013). *Tauranga city plan*. Tauranga City Council.
- Townsend, A. J., de Lange, P. J., Duffy, C. A. J., Miskelly, C. M., Molloy, J., & Norton, D. A. (2008). *New Zealand threat classification system manual*. Wellington: Department of Conservation.
- Wildland Consultants. (2000). *Indigenous biodiversity of Tauranga district - state of the environment reporting*. Report prepared for Tauranga City Council.
- Wildland Consultants. (2005). *Indigenous biodiversity of Tauranga district - state of the environment reporting*. Report prepared for Tauranga City Council.
- Wildland Consultants. (2009). *Indigenous biodiversity of Tauranga City – state of the environment reporting 2008: updated 2009*. Report prepared for Tauranga City Council.
- Wildland Consultants. (2013). *Significant natural areas in the coastal environment of Bay of Plenty region*. Report prepared for Tauranga City Council.
- Wildland Consultants. (2018). *Baseline survey and monitoring plan for herpetofauna on Mauao* (No. 4409) (pp. 1–27). Report prepared for Tauranga City Council.
- Winter, S. (2000). Number and distribution of blue penguin (*Eudyptula minor*) nests in the Mount Maunganui area, Bay of Plenty. *Notornis*, 47, 160–162.

Appendix 1: OSNZ Atlas Squares that Encompass the Study Area



Appendix 2: OSNZ Atlas Full Avifauna List for Relevant Squares (279, 639 and 278, 639) and Additional Species Recorded from Other Sources

OSNZ Atlas List:

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Sooty shearwater	<i>Puffinus griseus</i>	At Risk – Dec.								
Little blue penguin	<i>Eudyptula minor</i>	At Risk – Dec.								
Common diving petrel	<i>Pelecanoides urinatrix urinatrix</i>	At Risk – Rel.								
Fluttering shearwater	<i>Puffinus gavia</i>	At Risk – Rel.								
Australasian gannet	<i>Morus serrator</i>	Not Threatened								
Grey-faced petrel	<i>Pterodroma macroptera gouldi</i>	Not Threatened								
Reef heron	<i>Egretta sacra sacra</i>	Threatened – Nat End.								
Caspian tern	<i>Hydroprogne caspia</i>	Threatened – Nat. Vul.								
Red-billed gull	<i>Larus novaehollandiae scopulinus</i>	At Risk – Dec.								
White-fronted tern	<i>Sterna s. striata</i>	At Risk – Dec.								
New Zealand dotterel	<i>Charadrius obscurus aquilonius</i>	At Risk – Rec.								
Variable oystercatcher	<i>Haematopus unicolor</i>	At Risk – Rec.								
Southern black-backed gull	<i>Larus dominicanus</i>	Not Threatened								
White-faced heron	<i>Egretta novaehollandiae</i>	Not Threatened								
South Island pied oystercatcher	<i>Haematopus finschi</i>	At Risk – Dec.								
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Nat. Unc.								
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk – Nat. Unc.								
Pied shag	<i>Phalacrocorax varius varius</i>	At Risk – Rec.								
Little shag	<i>Phalacrocorax melanoleucos brevirostris</i>	Not Threatened								
Mallard duck	<i>Anas platyrhynchos</i>	Introduced								
New Zealand kingfisher	<i>Todiramphus sanctus vagrans</i>	Not Threatened								

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Pukeko	<i>Porphyrio melanotus</i>	Not Threatened								
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened								
Australian magpie	<i>Gymnorhona tibicen</i>	Introduced								
Chaffinch	<i>Fringilla coelebs</i>	Introduced								
Goldfinch	<i>Carduelis carduelis</i>	Introduced								
Greenfinch	<i>Carduelis chloris</i>	Introduced								
Hedge sparrow/dunnock	<i>Prunella modularis</i>	Introduced								
House sparrow	<i>Passer domesticus</i>	Introduced								
Myna	<i>Acridotheres tristis</i>	Introduced								
Skylark	<i>Alauda arvensis</i>	Introduced								
Song thrush	<i>Turdus philomelos</i>	Introduced								
Starling	<i>Sturnus vulgaris</i>	Introduced								
Yellowhammer	<i>Emberiza citronella</i>	Introduced								
Australasian harrier	<i>Circus approximans</i>	Not Threatened								
Welcome swallow	<i>Hirundo neoxena</i>	Not Threatened								
Blackbird	<i>Turdus merula</i>	Introduced								
California quail	<i>Callipepla californica</i>	Introduced								
Eastern rosella	<i>Platycercus eximius</i>	Introduced								
Ring-necked pheasant	<i>Phasianus colchicus</i>	Introduced								
Grey warbler	<i>Gerygone igata</i>	Not Threatened								
Silvereye	<i>Zosterops lateralis</i>	Not Threatened								
Morepork	<i>Ninox novaeseelandiae</i>	Not Threatened								
New Zealand fantail	<i>Rhipidura fuliginosa placabilis</i>	Not Threatened								
Rock pigeon	<i>Columba livia</i>	Introduced								

Additional Avifauna Species From Other Sources (not in the OSNZ bird Atlas list)

Sorted by Preferred habitat / threat status			Preferred habitats							
Common name	Scientific Name	Threat Status	Oceanic	Coastal / Estuary	Freshwater / wetlands	Farmland / open country	Scrub / shrubland	Native forest	Exotic Forest	Urban/Residential
Flesh-footed shearwater	<i>Puffinus carneipes</i>	Threatened – Nat. Vul.	■							
Pycroft’s petrel	<i>Pterodroma pycrofti</i>	At Risk - Recovering	■							
Northern giant petrel	<i>Macronectes halli</i>	At Risk - Recovering	■							
Little shearwater	<i>Puffinus assimilis</i>	At Risk - Recovering	■							
White-faced storm petrel	<i>Pelagodroma marina</i>	At Risk - Relict	■							
Buller’s shearwater	<i>Puffinus bulleri</i>	At Risk – Nat. Unc.	■							
Arctic skua	<i>Stercorarius parasiticus</i>	Migrant	■							
Bar-tailed godwit	<i>Limosa lapponica baueri</i>	At Risk - Declining		■						
Black swan	<i>Cygnus atratus</i>	Not Threatened		■	■					
Siberian tattler	<i>Tringa brevipes</i>	Vagrant		■						
Black-billed gull	<i>Larus bulleri</i>	Threatened – Nat. Crit.		■	■	■				
Pied stilt	<i>Himantopus leucocephalus</i>	At Risk - Recovering		■	■	■				
New Zealand dabchick	<i>Poliiocephalus rufopectus</i>	At Risk - Recovering		■	■	■				
Paradise shelduck	<i>Tadorna variegata</i>	Not Threatened		■	■	■				
Australasian grebe	<i>Tachybaptus novaehollandiae</i>	Coloniser		■	■	■				
Cattle egret	<i>Ardea ibis coromanda</i>	Migrant		■	■	■				
Canada goose	<i>Branta canadensis</i>	Introduced		■	■	■				
Helmeted guineafowl	<i>Numida meleagris</i>	Introduced		■	■	■				
Wild turkey	<i>Meleagris gallopavo</i>	Introduced		■	■	■				
New Zealand falcon	<i>Falco novaeseelandiae</i>	At Risk - Recovering					■	■	■	
North Island kaka	<i>Nestor meridionalis septentrionalis</i>	At Risk - Recovering					■	■	■	
Shining cuckoo	<i>Chrysococcyx lucidus</i>	Not Threatened					■	■	■	
North Island tomtit	<i>Petroica macrocephala toitoi</i>	Not Threatened					■	■	■	
Tui	<i>Prothemadera novaeseelandiae</i>	Not Threatened					■	■	■	

Appendix 3: Mauao Little Blue Penguin and Grey-Faced Petrel Burrow Locations

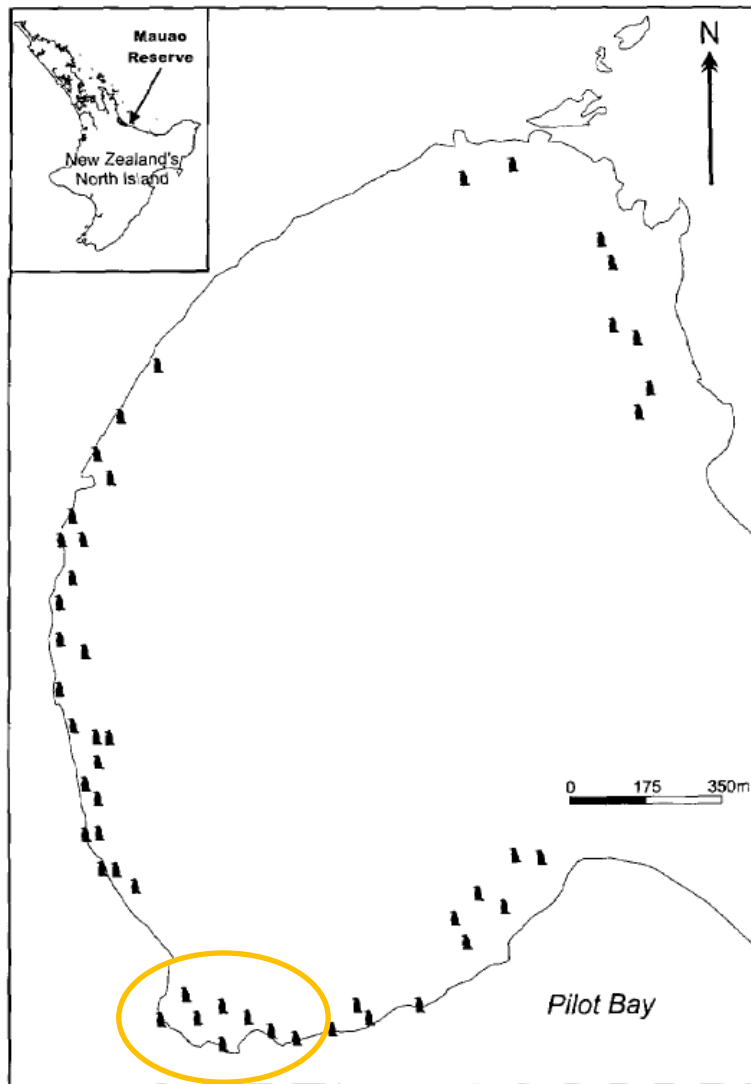


Fig. 2 The location of blue penguin nesting burrows on Mauao Historic Reserve, Eastern Bay of Plenty (source: Tauranga District Council).

Appendix 3a. The location of little blue penguin burrows detected around Mauao during the 1998-99 breeding season (Winter, 2000). The approximate location of the indicative track alignment corridor is indicated by the orange polygon.



Appendix 3b. The location of active little blue penguin burrows identified during the 2011-12 and 2012-13 breeding seasons. The green dots indicate the location of accessible active burrows and the black/red dots indicate the location of active but inaccessible burrows (inaccessible for monitoring purposes). The approximate location of the indicative track alignment corridor is indicated by the orange polygon (Sievwright, 2014).

Appendix 4: Vegetation Survey Full Plant List

Species	Scientific Name	Indigenous/Exotic
Pohutukawa	<i>Metrosideros excels</i>	Indigenous
Kawakawa	<i>Piper excelsum excelsum</i>	Indigenous
Taupata	<i>Coprosma repens</i>	Indigenous
Maidenhair fern	<i>Adiantum cunninghamii</i>	Indigenous
Karaka	<i>Corynocarpus laevigatus</i>	Indigenous
Bracken fern	<i>Pteridium esculentum</i>	Indigenous
Whau	<i>Entelea arborescens</i>	Indigenous
Karamu	<i>Coprosma robusta</i>	Indigenous
Hangehange	<i>Geniostoma ligustrifolium</i>	Indigenous
Remuremu	<i>Selliera radicans</i>	Indigenous
Pink bindweed	<i>Calystegia sepium</i>	Indigenous
Harakeke	<i>Phormium tenax</i>	Indigenous
Mahoe	<i>Melicytus ramiflorus</i>	Indigenous
Shore bindweed	<i>Calystegia soldanella</i>	Indigenous
Shining spleenwort	<i>Asplenium oblongifolium</i>	Indigenous
Muehlenbeckia hybrid	<i>Muehlenbeckia australis x complexa</i>	Indigenous
Purei	<i>Carex dissita</i>	Indigenous
Knobby clubrush	<i>Isolepis nodose</i>	Indigenous
Carex species	<i>Carex spp.</i>	Indigenous
Oak	<i>Quercus sp.</i>	Exotic
Birch tree	<i>Betula sp.</i>	Exotic
Macrocarpa	<i>Cupressus macrocarpa</i>	Exotic
Cocksfoot	<i>Dactylis glomerate</i>	Exotic
Lotus	<i>Lotus pedunculatus</i>	Exotic
Inkweed	<i>Phytolacca octandra</i>	Exotic
Cape gooseberry	<i>Physalis peruviana</i>	Exotic
Browntop	<i>Agrostis capillaris</i>	Exotic
Sycamore maple	<i>Acer psuedoplantatus</i>	Exotic
Japanese honeysuckle	<i>Lonicera japonica</i>	Exotic
Umbrella sedge	<i>Cyperus eragrostis</i>	Exotic
Thistle (unid.)	<i>Carduus sp.</i>	Exotic
Soft rush	<i>Juncus effusus var. compactus</i>	Exotic
Blackberry	<i>Rubus fruticosus</i>	Exotic
Pine tree	<i>Pinus sp.</i>	Exotic
Pampas grass	<i>Cortaderia selloana</i>	Exotic
Pink bindweed	<i>Calystegia sepium</i>	Exotic
Bridal creeper	<i>Asparagus asparagoides</i>	Exotic
Dandelion	<i>Taxacum sp.</i>	Exotic
Hawkbit	<i>Leontodon taraxacoides</i>	Exotic
Fruit tree unid.	<i>Unid.</i>	Exotic
Cleavers	<i>Galium aparine</i>	Exotic
Bindweed	<i>Convolvulus sp.</i>	Exotic

Appendix 5: List of Marine Invertebrate Species

<i>Scientific Name</i>	<i>Threat Status</i>
<i>Anthopleura aureoradiata</i>	<i>Not Threatened</i>
<i>Nemertea</i>	<i>Not Threatened</i>
<i>Cominella adspersa</i>	<i>Not Threatened</i>
<i>Cominella glandiformis</i>	<i>Not Threatened</i>
<i>Cominella virgata</i>	<i>Not Threatened</i>
<i>Neoguraleus sp</i>	<i>Not Threatened</i>
<i>Turbo smaragdus</i>	<i>Not Threatened</i>
<i>Zeacumantus subcarinatus</i>	<i>Not Threatened</i>
<i>Bulla quoyii</i>	<i>Not Threatened</i>
<i>Arthritica bifurca</i>	<i>Not Threatened</i>
<i>Austrovenus stutchburyi</i>	<i>Not Threatened</i>
<i>Felaniella zealandica</i>	<i>Not Threatened</i>
<i>Macomona liliana</i>	<i>Not Threatened</i>
<i>Nucula hartvigiana</i>	<i>Not Threatened</i>
<i>Paphies australis</i>	<i>Not Threatened</i>
<i>Scintillona zelandica</i>	<i>Not Threatened</i>
<i>Oligochaeta</i>	<i>Not Threatened</i>
<i>Scoloplos cylindrifera</i>	<i>Not Threatened</i>
<i>Paraonidae</i>	<i>Not Threatened</i>
<i>Aonides trifida</i>	<i>Not Threatened</i>
<i>Boccardia sp.</i>	<i>Not Threatened</i>
<i>Prionospio aucklandica</i>	<i>Not Threatened</i>
<i>Scolecopides benhami</i>	<i>Not Threatened</i>
<i>Scolelepis sp.</i>	<i>Not Threatened</i>
<i>Magelona dakini</i>	<i>Not Threatened</i>
<i>Capitella capitata</i>	<i>Not Threatened</i>
<i>Heteromastus filiformis</i>	<i>Not Threatened</i>
<i>Armandia maculata</i>	<i>Not Threatened</i>
<i>Syllidae</i>	<i>Not Threatened</i>
<i>Sphaerosyllis sp.</i>	<i>Not Threatened</i>
<i>Nereidae (juvenile)</i>	<i>Not Threatened</i>
<i>Lumbrineridae</i>	<i>Not Threatened</i>
<i>Cirratulidae</i>	<i>Not Threatened</i>
<i>Terebellidae</i>	<i>Not Threatened</i>
<i>Euchone pallida</i>	<i>Not Threatened</i>
<i>Cumacea</i>	<i>Not Threatened</i>

<i>Tanaid sp.</i>	<i>Not Threatened</i>
<i>Exosphaeroma obstatum</i>	<i>Not Threatened</i>
<i>Isocladus dulciculus</i>	<i>Not Threatened</i>
<i>Corophiidae</i>	<i>Not Threatened</i>
<i>Phoxocephalidae</i>	<i>Not Threatened</i>
<i>Amphipoda Unid.</i>	<i>Not Threatened</i>
<i>Halicarcinus cookii</i>	<i>Not Threatened</i>
<i>Halicarcinus whitei</i>	<i>Not Threatened</i>
<i>Macrophthalmus hirtipes</i>	<i>Not Threatened</i>
<i>Trochodota dendyi</i>	<i>Not Threatened</i>
<i>Chiton glaucus</i>	<i>Not Threatened</i>
<i>Chiton pelliserpentis</i>	<i>Not Threatened</i>
<i>Crepidula sp.</i>	<i>Not Threatened</i>
<i>Diloma aethiops</i>	<i>Not Threatened</i>
<i>Nerita atramentosa</i>	<i>Not Threatened</i>
<i>Onichidella nigricans</i>	<i>Not Threatened</i>
<i>Saccostrea glomerate</i>	<i>Not Threatened</i>
<i>Crassostrea gigas</i>	<i>Not Threatened</i>
<i>Protolaeospira sp.</i>	<i>Not Threatened</i>
<i>Elminius modestus</i>	<i>Not Threatened</i>
<i>Isactina tenebrosa</i>	<i>Not Threatened</i>
<i>Isactina olivacea</i>	<i>Not Threatened</i>
<i>Chaemosipho columna</i>	<i>Not Threatened</i>
<i>Epopella plicata</i>	<i>Not Threatened</i>
<i>Austrolittorina unifasciata</i>	<i>Not Threatened</i>
<i>Bellorchestia quoyana</i>	<i>Not Threatened</i>

Appendix 6: Site Photos



Photo 3. Very large pohutukawa at the western end of the site from above.



Photo 4. Part of the grassland/pasture area above the slip and proposed track site that was surveyed for grey-faced petrel.



Photo 5. The slip site.



Photo 6. The slip site. Showing large pohutukawa.



Photo 7. The oceanside area at the western end of the track corridor. The proposed track would traverse the grassland at the toe of the slope, in the approximate location of the dotted line.



Photo 8. The planted grassland area at the western end of the proposed track alignment. The track to follow the toe of the slope.



Photo 9. Very large pohutukawa overhanging the sandy beach at the western end of this community adjacent to the slip. The indicative track alignment corridor lies beneath this canopy.



Photo 10. Rocky shoreline typical of much of the coastline beneath the pohutukawa.



Photo 11. At the eastern end of the site the pohutukawa gives way to a mixed canopy containing exotic trees such as sycamore and macrocarpa overhanging the rocky shoreline.



Photo 12. An area of grassland, rushland, and shrubs adjacent to the shoreline. Note several exotic trees mixed with the pohutukawa.



Photo 13. One of the two pohutukawa trees that will be felled within the indicative track alignment corridor.



Photo 14. The area of understory to the west of the indicative track alignment corridor that was partially cleared for the archaeological survey.



Photo 15. Tui nest and chicks observed on the hillside above the indicative track alignment corridor.



Photo 16. Little blue penguin guano seen on a rock within the buffer zone (additional area surveyed either side of but outside of the proposed track location footprint).



Photo 17. Adult and juvenile red-billed gulls observed within the indicative track alignment corridor.



Photo 18. Red-billed gulls and variable oystercatchers observed within the indicative track alignment corridor.