ASSESSMENT OF ECOLOGICAL EFFECTS FOR A PROPOSED BOARDWALK IN WAITARA RIVER SCENIC RESERVE, TARANAKI

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ASSESSMENT OF ECOLOGICAL EFFECTS FOR A PROPOSED BOARDWALK IN WAITARA RIVER SCENIC RESERVE, TARANAKI

Contract Report No. 4219

December 2016

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EXECUTIVE SUMMARY

New Plymouth District Council is seeking consent to construct a boardwalk through the Waitara River Scenic Reserve to create a continuous coastal path which joins to an existing concrete walkway. This report provides an assessment of ecological effects for the proposed works, which is required to obtain permission to undertake works on land administered by the Department of Conservation, and for consent from Taranaki Regional Council (TRC).

The Waitara River Scenic Reserve comprises a small area of predominantly indigenous habitat containing a good representative example of saltmarsh vegetation in good condition, tidal mudflat, terrestrial scrub, and terrestrial grassland habitats (see Section 5, pages 6 and 7 for more detail). The site has been identified as a Key Native Ecosystem by the Taranaki Regional Council because it provides important habitat for whitebait congregating and spawning, provides habitat for many wading bird species including nationally Threatened and At Risk species, and contains populations of nationally Threatened and regionally uncommon plant species (see Sections 5, 6, and 7 (pages 6-9) for more detail). The Waitara River Scenic Reserve is also located within an 'Acutely Threatened' land environment.

The proposed boardwalk will require a small amount of vegetation clearance (approximately 5 m^2) and some disturbance within saltmarsh and exotic grassland habitats, including substrate disturbance within the tidal mudflats. The saltmarsh and tidal mudflat habitats are of high ecological value. Potential adverse ecological effects of the proposed boardwalk could result from vegetation clearance, potential weed invasion, loss or degradation of harbour habitats due to vehicle access and sedimentation, leaching of metals from treated timber, displacement of avifauna, and increased rubbish following construction (see Section 9, pages 11-14 for more detail). However, the total impact of the boardwalk construction and use, will be no more than minor, provided that a number of protocols are followed to minimise impacts. These include: vegetation only being cleared where piles are to be driven, that the only access route used for construction is the proposed boardwalk alignment, that minimal trips are taken across saltmarsh vegetation, that populations of the nationally At Risk plant species are not removed, that treated timber is 'dried off' for at least one month before use, and that sediment management best practice is applied (see Section 10 for a discussion of options to avoid minimise or mitigate potential ecological effects).

Potential restoration and enhancement opportunities to offset and/or minimise the ecological impacts include pest plant and pest animal control, and restoration planting with indigenous eco-sourced species (see Section 11 for more detail).

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Reviewed and approved for release by:

_____
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1. INTRODUCTION

New Plymouth District Council is seeking consent to construct a boardwalk through the Waitara River Scenic Reserve, near the mouth of the Waitara River, to create a continuous coastal path which joins to an existing concrete walkway. An assessment of ecological effects is required to obtain permission to undertake works on land administered by the Department of Conservation, and for consent from Taranaki Regional Council (TRC). The site has been identified as a Key Native Ecosystem by the Taranaki Regional Council.

This assessment of ecological effects describes the vegetation and habitat types present within, and adjacent to, the proposed route and provides information to underpin relevant consent requirements and inform discussions with neighbouring landowners, Department of Conservation, TRC, and other stakeholders. It also includes measures to avoid sites of particular ecological significance and minimise potential adverse ecological effects.

2. PROPOSED BOARDWALK LOCATION

The proposed alignment is illustrated in Figure 1. The proposed boardwalk will start near the existing Waitara Boat Club slipway and extend south across tidal mudflats and through indigenous saltmarsh to a raised earth bank on the true left side of the Waitara River. The boardwalk will traverse exotic grassland, indigenous saltmarsh, and open intertidal mudflats.

3. METHODS

A literature search was undertaken to identify relevant existing ecological and technical information and then evaluated.

A field survey of the project area was carried out on foot on 8 December 2016 in light rain with moderate wind. Vegetation and habitat types were described and mapped onto aerial photographs at a scale of 1:1,000.

A list of vascular plants was compiled (Appendix 1). Representative photographs were taken (Appendix 2).

All bird species seen or heard during the site visit were recorded. Footprints of banded rail (*Gallirallus philippensis assimilis*) were searched for in potential habitat. A second visit was made to the site on 20 December 2016 to play bird tapes due to inclement weather during the field assessment on 8 December.

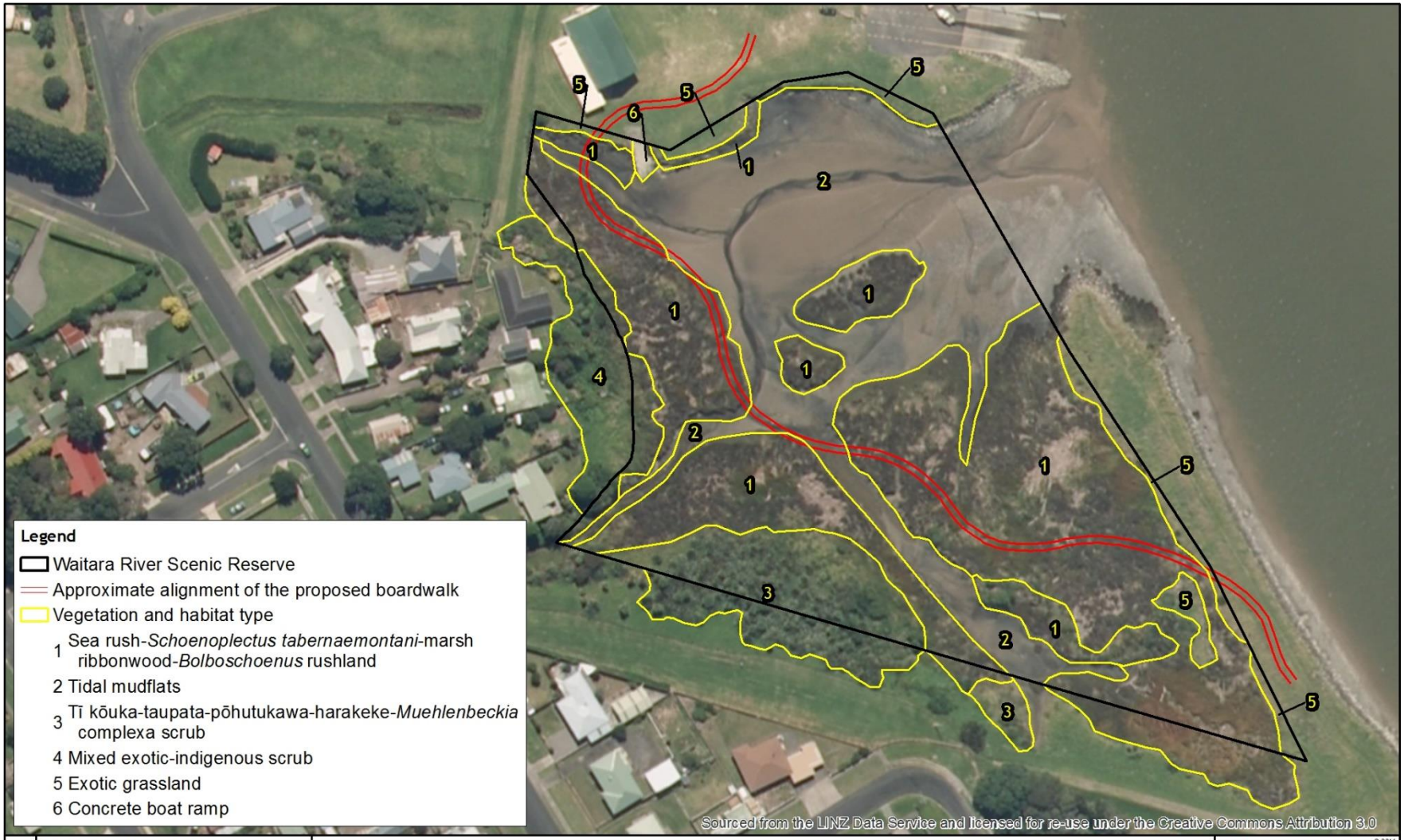

Figure 1. Vegetation and habitat types in Waitara River Scenic Reserve, December 2016

4. EXISITING INFORMATION

4.1 Egmont Ecological District

The proposed boardwalk is located within a small reserve administered by the Department of Conservation (Waitara River Scenic Reserve) within the coastal bioclimatic zone of the Egmont Ecological District. The following description of the Ecological District is derived from the Egmont Ecological District Protected Natural Areas Programme survey report (Bayfield and Benson 1986).

The site is located along the north-eastern coast of the Egmont Ecological District, which covers *c.*128,370 hectares. Egmont Ecological District encompasses the volcanic peaks of Mt Egmont, Pouakai, and Kaitake, and the associated ring plains. This District includes environments and habitats that range from coastal and estuarine areas to lowland hill country and alpine environments.

At the time of human settlement, spinifex (*Spinifex sericeus*) and pīngao (*Ficinia spiralis*) likely dominated the coastal sand dunes, swampy depressions contained raupō (*Typha orientalis*) and harakeke, and coastal forests were found further inland up to five kilometres from the coast in the Egmont Ecological District. At the time of European arrival much of the coastal forest had been cleared by māori. The coastal forests were comprised of stunted karaka (*Corynocarpus laevigatus*), kohekohe (*Dysoxylum spectabile*), tī kōuka (*Cordyline australis*), rangiora (*Brachyglottis repanda*), ngaio (*Myoporum laetum*), harakeke, and taupata.

Prior to human settlement wetlands are estimated to have covered 40,278 hectares of the Taranaki Region (Taranaki Regional Council 2013). These wetlands would have included a range of types that varied in wetness, fertility, acidity, and salinity. In the Taranaki Region only 8.1% (3,273 ha) of the original wetlands remain (Taranaki Regional Council 2013). Estuarine river mouths would have been a key wetland type within Taranaki. These habitats are likely to have been dominated by saltmarsh communities (sea rush, oioi, and *Bolboschoenus fluviatilis* with marsh ribbonwood shrublands) grading into freshwater wetlands.

The Taranaki west coast is one of only three North Island locations for *Hebe elliptica*, and the only North Island location for *Anaphalioides hookeri* (Druce 1972). Puriri (*Vitex lucerns*) and koheriki (*Scandia rosifolia*) reach their southern limit of distribution on the western Taranaki coast and *Juncus usitatus* reaches its southern limit in the North Island (Druce 1972; Clarkson and Boarse 1982).

The Sugar Loaf Islands off the coast from New Plymouth are an important colony for breeding seabirds. The Sugar Loaf Islands are the southern-most breeding location for grey-faced petrel (*Pterodroma macroptera gouldi*) and support the only colony of diving petrel (*Pelecanoides urinatrix*) that occurs off the west coast of New Zealand. Australasian gannet (*Morus serrator*), sooty shearwater (*Puffinus griseus*), red-billed gull (*Larus novaehollandiae scopulinus*), white-fronted tern (*Sterna striata*), and spotted shag (*Stictocarbo punctatus ssp*) also breed there (McEwen 1987).

Table 1 presents a list of all Threatened and notable species in the coastal bioclimatic zone of the Egmont Ecological District (Druce 1972; Clarkson and Boarse 1982; and McEwen 1987).

Table 1: Threatened and notable species present in the coastal bioclimatic zone of Egmont Ecological District.

Common Name	Scientific Name	Threat Classification/ Significance[1]
VASCULAR PLANTS		
Threatened		
Cook's scurvey grass	*Lepidium oleraceum*	Threatening-Nationally Endangered
	Ranunculus recens	Threatening-Nationally Vulnerable
At Risk		
New Zealand spurge	*Euphorbia glauca*	At Risk-Declining
Sand pimelea	*Pimelea villosa*	At Risk-Declining
Koheriki	*Scandia rosifolia*	At Risk-Declining
Sea sedge	*Carex litorosa*	At Risk-Declining
Other Notable Species		
Saltmarsh ribbonwood	*Plagianthus divaricatus*	Regionally uncommon
	Austrostipa stipoides	Regionally uncommon
	Bolboschoenus caldwellii	Regionally uncommon
	Carex lambertiana	Regionally uncommon
	Crassula sieberiana	Regionally uncommon
	Limosella lineata	Regionally uncommon
	Lophomyrtus bullata	Regionally uncommon
	Melicope ternata	Regionally uncommon
	Olearia solandri	Regionally uncommon
	Senecio quadridentatus	Regionally uncommon
	Tetraria capillaris	Regionally uncommon
BIRDS		
Threatened		
Reef heron	*Egretta sacra sacra*	Threatening-Nationally Endangered
Red-billed gull	*Larus novaehollandiae scopulinus*	Threatening-Nationally Vulnerable
White heron	*Egretta alba modesta*	Threatening-Nationally Critical
Black-billed gull	*Larus bulleri*	Threatening-Nationally Critical
New Zealand fairy tern	*Sterna nereis davisae*[2]	Threatening-Nationally Critical
Australasian bittern	*Botaurus poiciloptilus*	Threatening-Nationally Endangered
Wrybill	*Anarhynchus frontalis*	Threatening-Nationally Vulnerable
North Island brown kiwi	*Apteryx mantelli*	Threatening-Nationally Vulnerable
Banded dotterel	*Charadrius bicinctus bicinctus*	Threatening-Nationally Vulnerable
Northern New Zealand dotterel	*Charadrius obscurus aquilonius*	Threatening-Nationally Vulnerable
Bush falcon	*Falco novaeseelandiae sensu stricto*	Threatening-Nationally Vulnerable
North Island weka	*Gallirallus australis greyi*	Threatening-Nationally Vulnerable
Pied shag	*Phalacrocorax varius varius*	Threatening-Nationally Vulnerable
Caspian tern	*Sterna caspia*	Threatening-Nationally Vulnerable
At Risk		
North Island fernbird	*Bowdleria punctata vealeae*	At Risk-Declining
Banded rail	*Gallirallus philippensis assimilis*	At Risk-Declining
New Zealand pied oystercatcher	*Haematopus finschi*	At Risk-Declining
Pied stilt	*Himantopus himantopus leucocephalus*	At Risk-Declining
White-fronted tern	*Sterna striata striata*	At Risk-Declining
Spotless crake	*Porzana tabuensis plumbea*	At Risk-Relict
Long-tailed cuckoo	*Eudynamys taitensis*	Naturally Uncommon
Black shag	*Phalacrocorax carbo novaehollandiae*	Naturally Uncommon

Common Name	Scientific Name	Threat Classification/ Significance[1]
Little black shag	*Phalacrocorax sulcirostris*	Naturally Uncommon
Royal spoonbill	*Platalea regia*	Naturally uncommon
Variable oystercatcher	*Haematopus unicolor*	Recovering
Other Notable Species		
Lesser knot	*Calidris canutus*	Migrant
Bar-tailed godwit	*Limosa lapponica*	Migrant
FRESHWATER FISH		
At Risk		
Longfin eel	*Anguilla dieffenbachia*	At Risk-Declining
Torrentfish	*Cheimarrichthys fosteri*	At Risk-Declining
Giant kōkopu	*Galaxias argenteus*	At Risk-Declining
Kōaro	*Galaxias brevipinnis*	At Risk-Declining
Inanga	*Galaxias maculatus*	At Risk-Declining
Shortjaw kōkopu	*Galaxias postvectis*	At Risk-Declining
Bluegill bully	*Gobiomorphus hubbsi*	At Risk-Declining
Redfin bully	*Gobiomorphus huttoni*	At Risk-Declining

Notes
1 National threat classifications follow de Lange *et al.* 2012 and Robertson *et al*. 2012, and regional threat status for vascular plants is Bayfield and Benson (1986).

4.2 Waitara River and environs

The Waitara River Scenic Reserve is located near the river mouth of the Waitara River. The Waitara River is the largest river in the Taranaki Region (Taranaki Regional Council 2004). An extensive reef system is present offshore from the village of Waitara and is exposed at low tide. This area is predominantly comprised of uplifted marine terrace. The headwaters of this river are near Tahora, in the North Taranaki Ecological District.

The Waitara River Scenic Reserve has been identified as a Key Native Ecosystem (KNE) within the Taranaki Region (TRC Reference #0863-0; Taranaki Regional Council 2006). The Taranaki KNE report identifies the Scenic Reserve as important habitat for whitebait congregating and spawning, provides habitat for many wading bird species including royal spoonbill (*Platalea regia*; At Risk-Naturally Uncommon) and white heron (*Ardea modesta*; Threatened-Nationally Critical), and contains threatened and regionally uncommon plant species (*Carex litorosa*; At Risk-Declining) and saltmarsh ribbonwood *Plagianthus divaricatus*; regionally uncommon).

Freshwater species records for the Waitara River are provided in Section 7 below.

4.3 Threatened land environments

The Threatened Environment Classification is based on analysis of Land Environments of New Zealand, the Landcover Database, and data on the protected natural area network to determine which land has suffered past loss of indigenous vegetation and what is lacking formal protection at a national scale (MfE and DOC 2007a and 2007b). There are six categories of land environments (listed in decreasing order of risk): 'Acutely Threatened' (less than 10% indigenous vegetation cover remains), 'Chronically Threatened' (between 10 and 20% indigenous vegetation cover remains), 'At Risk' (between 20 and 30% of indigenous cover remains), 'Critically Underprotected' (greater than 30% of indigenous vegetation cover remains, but less

than 10% is protected), 'Underprotected' (greater than 30% of indigenous vegetation cover remains, but only between 10 and 20% is protected), and 'Less Reduced and Better Protected' (greater than 30% of indigenous vegetation cover remains and more than 20% is protected).

The proposed boardwalk is entirely within an 'Acutely Threatened' land environment, with less than 10% indigenous vegetation cover remaining nationally.

5. VEGETATION AND HABITAT TYPES

Six vegetation and habitat types were identified within the Waitara River Scenic Reserve. These are mapped in Figure 1 and described below.

1. **Sea rush-*Schoenoplectus tabernaemontani*-marsh ribbonwood-*Bolboschoenus* rushland (1.23 ha)**

   Most of the site comprises indigenous saltmarsh dominated by swards of sea rush (*Juncus kraussii* var. *australiensis*) and *Schoenoplectus tabernaemontani*, with local patches of marsh ribbonwood and *Bolboschoenus fluviatilis*[1], and occasional patches of oioi (*Apodasmia similis*). Where the rush cover is less dense, a range of indigenous species can be found growing on the bare mud including *Carex litorosa*, *Isolepis cernua*, New Zealand celery (*Apium prostratum* subsp. *prostratum* var. *filiforme*), and *Lobelia anceps*. There are small areas of drier habitat within the saltmarsh which are too small to accurately map as a discrete habitat type. These areas support mixed indigenous-exotic shrubland dominated by harakeke, gorse (*Ulex europaeus*), and taupata with occasional pōhutukawa (*Metrosideros excelsa*) and sheoak (*Casuarina cunninghamiana*). Wīwī (*Ficinia nodosa*) occurs locally in these areas.

   Small patches of raupō are present where the saltmarsh grades into terrestrial habitat and a patch of *Carex geminata* is present in the southeast corner of the saltmarsh. There is also one patch of spike sedge (*Eleocharis acuta*).

2. **Tidal mudflats (0.78 ha)**

   Tidal mudflats comprising an uplifted marine terrace with a layer of surface silt with areas of river gravel and sand. Patches of *Lilaeopsis* sp. are present near the transition from mudflat to saltmarsh.

3. **Tī kōuka-taupata-pōhutukawa-harakeke-*Muehlenbeckia complexa* scrub (0.27 ha)**

   This area comprises indigenous species scrub on a gentle slope where public access meets the Waitara River Scenic Reserve. Small groves of tī kōuka (*Cordyline australis*) are interspersed with areas of harakeke and areas dominated by taupata and pōhutukawa. *Muehlenbeckia complexa* is locally common

[1] *Bolboschoenus medianus* may also be present. Without flower heads it is difficult to distinguish *Bolboschoenus* species.

scrambling over lower growing shrubs. Most of the indigenous vegetation within this area appears to have been planted however some natural regeneration is likely to be occurring. Gorse, pampas (*Cortaderia selloana*), and tall fescue (*Schedonorus arundinaceus*) are present in parts of this vegetation type.

4. Mixed exotic-indigenous scrub (0.17 ha)

These areas contain a wide variety of predominantly exotic species with some planted indigenous species. The largest area of this vegetation type comprises the extension of private gardens into the scenic reserve and contains numerous exotic tree and shrub species including hydrangea (*Hydrangea macrophylla*), red hot poker (*Kniphofia praecox*), rice paper plant (*Tetrapanax papyriferus*), tree privet (*Ligustrum lucidum*), Chinese privet (*L. sinsense*), Magellan fuchsia (*Fuchsia magellanica* var. *macrostema*). The smaller of the two areas is dominated by canna lily (*Canna indica*), Kahili ginger (*Hedychium gardnerianum*), and bear's breeches (*Acanthus mollis*) with garden nasturtium (*Tropaeolum majus*) and arum lily (*Zantedeschia aethiopica*).

5. Exotic grassland (0.10 ha)

Exotic grassland is present on the margins of the scenic reserve where it meets public access ways and recreational reserve beside the boat club. This grassland is dominated by tall fescue and cocksfoot (*Dactylis glomeratus*) with locally common kikuyu (*Cenchrus clandestinus*). Vetch (*Vicia sativa*), lotus (*Lotus pedunculatus*), red clover (*Trifolium pratense*), and white clover (*T. repens*) are common, and emergent fennel (*Foeniculum vulgare*) and gorse are scattered throughout areas of this type that are not regularly mown.

6. Concrete boat ramp (<0.10 ha)

A concrete boat ramp.

6. FLORA

Twenty-nine indigenous and 67 exotic vascular plant species were recorded within the project area (refer to Appendix 1).

Carex litorosa (At Risk-Declining as per de Lange *et al.* 2013) is present within the project area. Two regionally uncommon[1] vascular plant species (*Schoenoplectus tabernaemontani* and marsh ribbonwood) are common within the Scenic Reserve.

[1] Regionally uncommon species are listed in Bayfield and Benson (1986).

7. FAUNA

7.1 Avifauna

Four indigenous bird species were recorded within the project area: black-backed gull (karoro, *Larus dominicanus dominicanus*), red-billed gull, and tūī (*Prosthemadera novaeseelandiae*), and welcome swallow (*Hirundo neoxena neoxena*). Red-billed gull are classified as Threatened-Nationally Vulnerable by Robertson *et al*. (2012).

Five exotic species were recorded: mallard (*Anas platyrhynchos*), blackbird (*Turdus merula merula*), chaffinch (*Fringilla coelebs*), house sparrow (*Passer domesticus*), and yellowhammer (*Emberiza citrinella*).

Royal spoonbill (At Risk-Naturally Uncommon) and white heron (Threatened-Nationally Critical) have been observed occasionally within the Scenic Reserve.

Other indigenous and exotic bird species are likely to be present but were not observed due to inclement weather.

7.2 Aquatic fauna

A search of the NIWA Freshwater Fish Database was undertaken on 16 December 2016. This indicated that 15 indigenous fish species, one introduced fish species, and two indigenous freshwater invertebrate species have been recorded within the Waitara River catchment. Table 2 lists the species found and their threat status as per Goodman *et al*. (2014) for freshwater fish and Grainger *et al*. (2014) for freshwater invertebrates.

Table 2: Fish and macroinvertebrate species recorded from the Waitara River catchment.

Group	Species Name	Common Name	Threat Ranking
Indigenous Fish	*Aldrichetta forsteri*	Yelloweye mullet	Not Threatened
	Anguilla australis	Shortfin eel	Not Threatened
	Anguilla dieffenbachii	Longfin eel	At Risk-Declining
	Cheimarrichthys fosteri	Torrentfish	At Risk-Declining
	Galaxias argenteus	Giant kōkopu	At Risk-Declining
	Galaxias brevipinnis	Koaro	At Risk-Declining
	Galaxias fasciatus	Banded kōkopu	Not Threatened
	Galaxias maculatus	Inanga	At Risk-Declining
	Galaxias postvectis	Shortjaw kokopu	Threatened-Nationally Vulnerable
	Gobiomorphus cotidianus	Common bully	Not Threatened
	Gobiomorphus huttoni	Redfin bully	At Risk-Declining
	Mugal cephalus	Grey mullet	Not Threatened
	Retropinna retropinna	Common smelt	Not Threatened
	Rhombosolea retiaria	Black flounder	Not Threatened
Introduced Fish	*Gambusia affinis*	Mosquito fish	Introduced and Naturalised
Indigenous Invertebrates	*Paranephrops planifrons*	Koura	Not Threatened
	Paratrya curvirostris	Freshwater shrimp	Not Threatened

In addition to the fish species recorded in the NZ Freshwater Fish Database, lamprey (*Geotria australis*) is known from Matau Stream, a tributary to the Waitara River

(Taranaki Regional Council 2016). Lamprey are classified as Threatened-Nationally Vulnerable by Goodman *et al*. (2013).

7.3 Introduced pest animals

Domestic dogs (*Canis familiaris*) and cats (*Felis catus*) are likely to frequent the project area due to it being adjacent to residential land. Although not noted during field survey the usual complement of small pest mammals will also be present: ship rat (*Rattus rattus*), Norway rat (*R. norvegicus*), mouse (*Mus musculus*), hedgehog (*Erinaceus europaeus*), and stoat (*Mustela erminea*).

8. ECOLOGICAL VALUES

8.1 Vegetation

Saltmarsh vegetation within the project area (Vegetation Type 1) is of high ecological value. It is a good representative example of saltmarsh vegetation that is in good condition, contains few exotic species, and is likely to provide important habitat for a range of indigenous fauna including inānga and birds. One nationally At Risk plant species and two regionally uncommon plant species are also present within the saltmarsh vegetation.

The intertidal mudflats are also of high ecological value given their potential to provide important feeding grounds for wading birds.

The remaining indigenous dominant habitat (Vegetation Type 3) is of moderate ecological value. Although it has been re-created by planting of indigenous species, it provides an important buffering function to the saltmarsh and tidal mudflats from the surrounding residential land use and run-off from impermeable road and footpath surfaces.

Other vegetation/habitat types (4, 5, and 6) within the project area include mixed indigenous-exotic scrub of low ecological value, highly modified exotic dominant vegetation of low ecological value, and constructed non-vegetated surfaces; these have little or no ecological constraints.

8.2 Vascular plants

Sea sedge, classified as At Risk-Declining (de Lange *et al.* 2012), was present in the saltmarsh communities in the intertidal zone. *Schoenoplectus tabernaemontani* and marsh ribbonwood, which are classified as regionally uncommon (as per Bayfield and Benson 1986), are also present in the saltmarsh vegetation. The proposed boardwalk passes through habitat in which all of these plants grow and may therefore have some impact on the populations of these species within the site.

8.3 Avifauna

Three indigenous bird species were recorded within the project area during field survey, of which one (red-billed gull)) is classified as Threatened-Nationally Vulnerable by Robertson *et al.* (2014). Two other Threatened or At Risk indigenous bird species have been intermittently recorded from the project area: white heron (Threatened-Nationally Critical) and royal spoonbill (At Risk-Naturally Uncommon).

The proposed boardwalk passes intertidal mudflats which is the predominant vegetation and habitat type of consequence for the species listed above. Although the mudflats are of high significance for these species, the construction of the boardwalk is unlikely to significantly affect the use of the area by birds except briefly during the construction phase.

8.4 Aquatic fauna

The Waitara River and its tributaries support at least 16 indigenous fish species. The lower tidal reaches near the project area are likely to support a range of diadromous, estuarine and marine species. Six of the 16 indigenous fish species recorded from the Waitara River catchment have a threat status of 'At Risk-Declining' and two (shortjaw kōkopu and lamphrey) are classified as 'Threatened-Nationally Vulnerable'.

8.5 Summary

A summary of relative ecological values and constraints is provided in Table 3 below.

Table 3: Relative ecological values and constraints along the proposed boardwalk alignment, Waitara River Scenic Reserve.

Vegetation and Habitat Type	Area (ha) Effected by Works	Relative Ecological Value	Relative Ecological Constraint
1. Sea rush-*Schoenoplectus tabernaemontani*-marsh ribbonwood-*Bolboschoenus* rushland	<0.01	**High**	**High**
2. Intertidal mud flats	<0.01	**High**	**High**
3. Tī kōuka-taupata-pōhutukawa-harakeke-*Muehlenbeckia complexa* scrub	0	Moderate	Moderate
4. Mixed exotic-indigenous scrub	0	Low	Low
5. Exotic grassland	<0.01	Low	Low
6. Concrete boat ramp	N/A	Low	Low

9. POTENTIAL ECOLOGICAL EFFECTS

9.1 Overview

The proposed boardwalk is to have a total length of *c.*346.6 m and be two metres wide, with an additional 30×2 m viewing platform within the saltmarsh. The proposed path of the boardwalk extends across exotic grassland, indigenous saltmarsh, and intertidal mudflat habitats. Subject to the construction approach used, potential ecological effects of the proposed boardwalk could result from vegetation clearance, potential weed invasion, loss or degradation of harbour habitats due to

vehicle access and sedimentation, leaching of metals from treated timber, and displacement of avifauna. Each of these potential effects is discussed below.

9.2 Vegetation clearance

The proposed two metre wide boardwalk passes directly through *c.*201.6 m of indigenous saltmarsh vegetation. Providing that vegetation will be cleared only where piles are to be driven, the saltmarsh vegetation clearance will be in the order of four square metres[1] (this does not include additional piles required for the wetland viewing platform). Additional piles required for the wetland viewing platform will not raise the total vegetation clearance to more than five square metres which would represent only 0.04% of total the saltmarsh vegetation within the Waitara River Scenic Reserve. Consequently, the amount of vegetation clearance required for construction of the boardwalk will have no more than minor adverse effects on indigenous vegetation and habitats within the project area. The *Carex litorosa* (At Risk-Declining) population is relatively small (*c.*20 plants in 1994; Ogle 1994, and more than 10 were seen during the current site visit. Therefore although very little salt marsh vegetation will be cleared, individual plants of *Carex litorosa* should be avoided.

Some crushing of indigenous saltmarsh vegetation will occur along the boardwalk route as it proposed that the boardwalk alignment will be used for access and construction. However, as long as trips for material collection and disposal are kept to a minimum, no additional access tracks are created, and piles of waste material are not dumped on top of saltmarsh vegetation, there should be no more than minor adverse effects to the saltmarsh vegetation. Lightly crushed saltmarsh will recover relatively quickly (within three years) as long as the hydrology of the area is not affected.

Clearance of exotic grassland will not have any adverse effects on indigenous vegetation or habitats of indigenous fauna as long as appropriate sediment control is undertaken.

9.3 Potential pest plant invasion

Areas that are cleared of indigenous vegetation are susceptible to invasion by pest plants. The following invasive plant species are already present at the site: she-oak, tree privet, Chinese privet, gorse, Spanish heath (*Erica lusitanica*), lupin (*Lupinus arboreus*), boxthorn (*Lycium ferocissimum*), blackberry (*Rubus fruticosus* agg.), crack willow (*Salix fragilis*), pampas, castor oil plant (*Ricinus communis*), hydrangea, ornamental cherry (*Prunus* sp.), rice paper plant, bear's breeches, canna lily, taro (*Colocasia esculenta*), grape vine (*Vitis vinifera*), agapanthus (*Agapanthus praecox*), Kahili ginger, tradescantia (*Tradescantia fluminensis*), arum lily, montbretia (*Crocosmia* ×*crocosmiiflora*), gladiolus (*Gladiolus undulatus*), watsonia (*Watsonia meriana* cv. Bulbillifera), corn marigold (*Chrysanthemum segetum*), garden nasturtium, Mercer grass (*Paspalum distichum*), and kikuyu grass. These species could spread into newly-cleared areas and along the proposed boardwalk margins.

[1] Based on the proposed pile locations within saltmarsh vegetation shown on the Framegroup Ltd boardwalk route drawing.

9.4 Vehicle access and damage

Care will need to be taken to avoid damage to indigenous vegetation and habitats by vehicles used during the construction phase. Vehicle tracking can have severe adverse effects on harbour margin vegetation and sediments that provide habitats for benthic fauna.

9.5 Intertidal habitat

Intertidal mudflats within the Waitara River Scenic Reserve provide important habitat for whitebait congregating and access to spawning habitat and, given the presence of wading birds, is likely to provide habitat to indigenous freshwater and marine species. Disturbance of intertidal habitats should be kept to a minimum during the construction phase.

9.6 Sediment

There will be some disturbance of terrestrial soils and harbour sediments. Disturbance during construction may temporarily increase sediment inputs into the intertidal area and into the Waitara River which could potentially affect the recreational fishing values of the Waitara River mouth. Soil disturbance should be kept to a minimum and methods and procedures should be designed to minimise sediment inputs into the harbour during construction. If construction methods and procedures minimise sediment loss into the harbour during construction it is expected that there will be little or no adverse effects.

9.7 Tanalised timber

Tanalised timber is one of the building materials to be used to construct the proposed boardwalk. Tanalised timber contains three metals used as preservatives: chromium, copper, and arsenic (CCA), each of which is known to be toxic to aquatic biota when present above trace levels (Weis and Weis 1995). A number of studies have found low to moderate amounts of leaching of these metals from treated timber placed in water (e.g. Warner and Solomon 1990). These toxins can accumulate in biota that live on the wood, and when these animals are eaten the contaminants in these organisms may be transferred into the food chain and accumulate in body tissues, with resultant deleterious effects. Metals leached from treated wood can also be adsorbed onto fine sediment particles, from which they can be accumulated by benthic organisms (Weis and Weis 1995).

In an assessment of risks associated with use of CCA-treated timber in sensitive environments prepared for the Department of Conservation, Hedley (1997) states that "some leaching does occur, particularly from freshly-treated material and especially in sea water, but most studies show that this leaching adds little to background levels of copper, chromium, and arsenic in either soil, water or sediments". Consequently, these levels will not significantly affect ecosystem health. A study by Comfort (1993) reports that there have been few reported environmental problems associated with the use of CCA treated timber. In the Tasmanian World Heritage Area, for instance, "it

has been used in walking track construction for more than 15 years with no obvious effects on the environment".

In general, leaching is reduced if the wood is dried over a period of weeks, when compared with freshly-treated wood (HSE 2001). It is important to note that leaching decreases markedly with time. Leaching studies show that there is an initial rate over the first few days of use that rapidly decreases to a barely measurable rate. Other factors include climate and the amount of CCA used, although the main factor affecting leaching rate is exposure to high acidity (Read 2003).

Subject to the wood being treated in accordance with prescribed specifications and standards, and the necessary quality assurance and regulatory procedures required for its production having been implemented (including a minimum drying off period after treatment of one month during the summer), the ecological effects of using treated timber for the proposed bridge and boardwalks will be negligible.

9.8 Avifauna

Creation of the proposed boardwalk will involve small scale modification of avifauna habitat through the removal of saltmarsh vegetation. This will have little or no effect on the wider populations of birds identified at the site as they are relatively widespread and mobile. However some displacement to individual birds could occur as a result of activities associated with the boardwalk construction during the construction phase.

9.9 Fish

The proposed boardwalk will not result in the loss of freshwater stream habitat, nor will it impede fish passage through the site. No new culverts are required for the proposed works. Works to install the piles will cause localised disturbance which any resident fish are likely to avoid. As mentioned in Section 9.2 above, there will be a minor loss of saltmarsh vegetation. Given that inānga spawn in autumn and then migrate upstream in spring, adverse effects on this species can be avoided by undertaking the works during summer.

9.10 Boardwalk use

The proposed boardwalk will result in people being able to access a previously fairly inaccessible site. The site is likely to be used by a suite of migratory wading birds for feeding, at certain times of the year and tidal cycle. People walking across the boardwalk may cause some minor disturbance to these birds. As there is other suitable habitat for these birds nearby, the effects are likely to be no more than minor. Dogs should be encouraged to be kept under control by only being allowed on a leash over the boardwalk area, which will ensure no additional impacts on wading birds.

10. OPTIONS TO AVOID, MINIMISE OR MITIGATE POTENTIALLY ADVERSE ECOLOGICAL EFFECTS

10.1 Extent of works

The most effective measure by which to reduce and/or minimise potential adverse effects is to minimise the extent of clearance of indigenous habitat. Although the exact extent of vegetation clearance had not been specified when this assessment was undertaken, the proposed boardwalk will generally be two metres wide with piles driven at regular intervals along the boardwalk as shown on the Framegroup Ltd drawings. Assuming that two piles will be driven at each circle along the proposed boardwalk route, a pile size of 400 cm^2 (20 × 20 cm piles), and assuming vegetation clearance only at the pile locations, the minimum saltmarsh vegetation clearance will be *c*.4 m^2 for the entire boardwalk length.

In addition to this, the following approach should be used:

- A suitably-qualified and experienced ecologist should assist with delineation of the alignment, particularly where sensitive habitats are present, e.g. identification of areas with At Risk and Naturally Uncommon plant species.
- All plants of *Carex litorosa* should be avoided.
- Where possible, avoid populations of marsh ribbonwood and *Schoenoplectus tabernaemontani* (both of these are regionally uncommon species, and marsh ribbonwood is uncommon within this site).
- Boardwalks, and access to the boardwalk/trail, should be designed to allow legitimate user access and restrict others (including motorbikes and ATV).
- Sediments removed during construction within areas of high ecological value (e.g. during boardwalk construction) should not be 'dumped' into indigenous vegetation, or areas of high ecological value.
- In habitats of high or moderate ecological value, construction materials should either be carried by hand or transported over already-constructed sections of the trail.
- Minimise use of any machinery (e.g. bobcats, quad bikes) that is required for boardwalk construction.
- The proposed steam cleaning of plant used in boardwalk construction is appropriate to limit weed and pathogen spread.

10.2 Drainage and water flows

- Natural drainage patterns should not be altered.
- Tidal flows should not be altered.

10.3 Sediment management

- Appropriate design and construction of the boardwalk will minimise erosion effects.
- The use of boardwalks in sensitive areas will help to protect intertidal habitats and will avoid adverse effects on waterways.

10.4 Pest plant control

- Biosecurity measures should be implemented to prevent the further spread and establishment of pest plants in indigenous habitats.
- Pest plants identified in Section 9.2 should be controlled prior to boardwalk construction. Most of these pest plant species will require ongoing control; surveillance and pest plant control should be undertaken about every six months.
- Any new invasive species identified during monitoring should be added to the control schedule.

10.5 Ongoing use of the boardwalk

- Dogs should be kept under control by enforcement of the use of a leash when walking here.

10.6 Overview of potential ecological effects

A summary of potential ecological effects and opportunities to avoid or reduce any effects, outside of the proposed boardwalk footprint, are set out in Table 4 below.

Table 4: Summary of potential ecological effects associated with construction of the proposed Waitara River Scenic Reserve boardwalk.

Vegetation and Habitat Type		Ecological Value	Opportunities to Mitigate, Avoid or Reduce Effects
1	Sea rush-*Schoenoplectus tabernaemontani*-marsh ribbonwood-*Bolboschoenus* rushland	**High**	• Select route alignment to avoid or minimise clearance. • Control pest plant species. • Reduce width of boardwalk. • Manually carry materials to construction site over newly created boardwalks. • Work within trail footprint. • Select route to avoid At Risk and regionally uncommon plants.
2	Intertidal mud flats	**High**	• Manually carry materials to construction site over newly created boardwalks. • Work within trail footprint. • Work at low tide.
3	Tī kōuka-taupata-pōhutukawa-harakeke-*Muehlenbeckia complexa* scrub	Moderate	• Control pest plant species.
4	Mixed exotic-indigenous scrub	Low	• Control pest plant species.
5	Exotic grassland	Low	• Control pest plant species.
6	Concrete boat ramp	Nil	• n/a

11. POTENTIAL RESTORATION AND ENHANCEMENT OPPORTUNITIES

Construction of the boardwalk has the potential to facilitate ecological improvement for the entire Scenic Reserve. Opportunities for restoration and enhancement could be initiated during boardwalk construction, with longer term follow up by a care group (or groups) along the boardwalk. Potential enhancement activities include pest plant control, indigenous planting, and pest animal control, as discussed below.

11.1 Pest plant control

The following invasive pest plant species were identified during the field survey: sheoak, tree privet, Chinese privet, gorse, Spanish heath, lupin, boxthorn, blackberry, crack willow, pampas, castor oil plant, hydrangea, ornamental cherry, rice paper plant, bear's breeches, canna lily, taro, grape vine, agapanthus, Kahili ginger, tradescantia, arum lily, montbretia, gladiolus, watsonia, corn marigold, garden nasturtium, Mercer grass, and kikuyu. Targeted control of these species will allow naturally-occurring indigenous species to become dominant, or, alternatively, will provide opportunities for restoration planting.

11.2 Restoration planting

Restoration planting will not be required within the saltmarsh vegetation as it should recover relatively quickly as long the hydrology of the site is not affected by the proposed works. However, mitigating the disturbance within the Scenic Reserve could include pest plant control and associated restoration planting within the adjacent habitats (indigenous scrub and mixed indigenous-exotic scrub), which will increase the extent and quality of indigenous vegetation within the Reserve as well as reducing potential sources of pest plants.

Species selection for revegetation planting should be based on existing naturally-occurring indigenous vegetation within the project area. A relatively small number of species could be used for revegetation planting, as once areas are free of pest plants they will be augmented by natural establishment from local, adjacent, seed sources.

11.3 Pest animal control

As noted above in Section 7.3 above, the usual complement of pest animal species is likely to be present within the project area. Of particular concern are stoats, feral (and domestic) cats, ship rats, and Norway rats as they are predators of birds, eggs, and young chicks, and lizards and invertebrates. Control of key pest species would help to protect and enhance bird populations on the harbour margins.

12. CONCLUSIONS

Potential ecological effects associated with the construction of a proposed boardwalk within the Waitara River Scenic Reserve have been assessed. The proposed boardwalk could potentially result in the clearance of up *c*.5 m^2 of indigenous vegetation.

Indigenous-dominant habitats within the Scenic Reserve are of high to moderate ecological value, providing good quality habitat for indigenous plants and fauna, including various Threatened and At Risk species, regionally uncommon species, and recreationally important species.

The most important requirement is to select the route alignment in a way that avoids or minimises adverse effects on high value vegetation and habitats such as saltmarsh. Vegetation clearance should be kept to a minimum, vehicle and machinery movements along the alignment should be kept to a minimum, and no additional access tracks should be created.

Earthworks associated with track construction have the potential to result in localised sedimentation and best-practice erosion control measures should be adopted.

Pest plant surveillance and control should be undertaken where the boardwalk passes through indigenous vegetation and habitats. Surveillance and associated pest plant control will be required at six-monthly intervals. Species that currently require control include sheoak, tree privet, Chinese privet, gorse, Spanish heath, lupin, boxthorn, blackberry, crack willow, pampas, castor oil plant, hydrangea, ornamental cherry, rice paper plant, bear's breeches, canna lily, taro, grape vine, agapanthus, Kahili ginger, tradescantia, arum lily, montbretia, gladiolus, watsonia, corn marigold, garden nasturtium, Mercer grass, and kikuyu. Additional pest plant species found during monitoring should be included in any control programme. Vegetation clearance has the potential to result in minor displacement of fauna.

Provided that best practice techniques are utilised in boardwalk construction it is expected that the proposed construction will have some minor short-term effect but no long-term adverse effects on terrestrial habitats or estuarine environments.

Any clearance or disturbance of indigenous vegetation and aquatic habitats can be mitigated on-site by pest plant control and replanting with indigenous species.

ACKNOWLEDGMENTS

Trevor Hornby, Parks Consultant, initiated this project and provided construction and concept plans.

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VASCULAR PLANT SPECIES OBSERVED ON SITE, NOVEMBER 2016

INDIGENOUS SPECIES

Monocot. trees and shrubs

Cordyline australis (P)	tī kōuka, cabbage tree

Dicot. trees and shrubs

Coprosma repens	taupata
Dodonaea viscosa (P)	akeake
Hebe stricta var. *stricta*	koromiko, kōkōmuka
Metrosideros excelsa (P)	pōhutukawa
Metrosideros excelsa × *M. kermadecensis* (P)	
Plagianthus divaricatus	marsh ribbonwood mākaka

Dicot. lianes

Calystegia sepium subsp. *roseata*	pōhue
Muehlenbeckia complexa	pōhuehue

Ferns

Blechnum novae-zelandiae	kiokio

Sedges

Bolboschoenus fluviatilis	pūrua grass, kukuraho
Carex dissita	
Carex geminata agg.	rautahi
Carex litorosa	sea sedge
Eleocharis acuta	spike sedge
Ficinia nodosa	wīwī
Isolepis cernua	
Machaerina rubiginosa	
Schoenoplectus tabernaemontani	kāpūngāwhā

Rushes

Apodasmia similis	oioi
Juncus kraussii var. *australiensis*	wi, wīwī sea rush

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

Phormium tenax	harakeke, flax
Triglochin striata	arrow grass
Typha orientalis	raupō

Dicot. herbs (other than composites)

Apium prostratum subsp. *prostratum* var. *filiforme*	tūtae-kōau, New Zealand celery
Lilaeopsis sp.	
Lobelia anceps	punakura
Persicaria decipiens	tutunawai

NATURALISED AND EXOTIC SPECIES

Dicot. trees and shrubs

Casuarina cunninghamiana	sheoak, common river oak
Erica lusitanica	Spanish heath
Fuchsia magellanica var. *macrostema*	Magellan fuchsia
Hydrangea macrophylla	hydrangea
Ligustrum lucidum	tree privet
Ligustrum sinense	Chinese privet
Lupinus arboreus	lupin
Lycium ferocissimum	boxthorn
Prunus sp.	ornamental cherry
Ricinus communis	castor oil plant
Rubus sp. (*R. fruticosus* agg.)	blackberry
Salix fragilis	crack willow
Tetrapanax papyriferus	rice paper plant
Ulex europaeus	gorse

Dicot. lianes

Calystegia silvatica	greater bindweed
Rumex sagittatus (check)	climbing dock
Vitis vinifera	grape

Grasses

Agrostis capillaris	browntop
Cenchrus clandestinus	kikuyu grass
Cortaderia selloana	pampas
Dactylis glomerata	cocksfoot
Ehrharta erecta	veldt grass
Holcus lanatus	Yorkshire fog
Lolium perenne	rye grass
Paspalum distichum	Mercer grass

Poa annua	annual poa
Schedonorus arundinaceus	tall fescue
Sporobolus africanus	ratstail

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

Agapanthus praecox	agapanthus
Canna indica	canna lily, Indian shoot
Colocasia esculenta	taro
Crocosmia ×crocosmiiflora	montbretia
Gladiolus undulatus	gladiolus
Hedychium gardnerianum	kahili ginger, wild ginger
Kniphofia praecox	red hot poker
Tradescantia fluminensis	tradescantia
Watsonia meriana cv. Bulbillifera	watsonia
Zantedeschia aethiopica	arum lily

Composite herbs

Aster subulatus	sea aster
Chrysanthemum segetum	corn marigold
Cirsium arvense	California thistle
Conyza sumatrensis	broad-leaved fleabane
Crepis capillaris	hawksbeard
Hypochaeris radicata	catsear
Leontodon taraxacoides	hawkbit
Sonchus oleraceus	puha, sow thistle

Dicot. herbs (other than composites)

Acanthus mollis	bear's breeches
Callitriche stagnalis	starwort
Digitalis purpurea	foxglove
Foeniculum vulgare	fennel
Lotus pedunculatus	lotus
Lotus suaveolens	hairy birdsfoot trefoil
Modiola caroliniana	creeping mallow
Nasturtium officinale	watercress
Phytolacca octandra	inkweed
Plantago coronopus	buck’s-horn plantain
Plantago lanceolata	narrow-leaved plantain
Plantago major	broad-leaved plantain
Prunella vulgaris	selfheal
Ranunculus repens	creeping buttercup
Raphanus raphanistrum subsp. *raphanistrum*	wild radish
Rumex obtusifolius	broad-leaved dock
Silene gallica	catchfly
Solanum nigrum	black nightshade
Stellaria media	chickweed
Trifolium pratense	red clover

Trifolium repens	white clover
Tropaeolum majus	garden nasturtium
Vicia sativa	vetch

SITE PHOTOGRAPHS

Plate 1: Mixed indigenous-exotic scrub is located between residential properties and the Waitara River Scenic Reserve on the left-hand side of the photograph. Where terrestrial vegetation grades into saltmarsh vegetation *Bolboschoenus* species and raupō is often present which then grades into a mosaic of sea rush and *Schoenoplectus tabernaemontani* rushland with local pockets of marsh ribbonwood.

Plate 2: Generally the salt marsh is a mosaic dominated by sea rush and *Schoenoplectus tabernaemontani*, however some large patches of *Bolboschoenus* are present in places.

Plate 3: Islands of *Schoenoplectus tabernaemontani* and sea rush are present within the intertidal mudflats.

Plate 4: Large parts of the saltmarsh vegetation comprise thick swards of *Schoenoplectus tabernaemontani* (left and right hand sides) and sea rush (centre-right). The bamboo pole visible in the left of the photograph represents the exit of the proposed boardwalk in part of the site.

Plate 5: Grape vines are present within the saltmarsh vegetation.

Plate 6: *Carex litorosa* within rocky, intertidal habitat.

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