

Nelson Wastewater Treatment Plant

Resource Consent

Ecological Impact Assessment

PREPARED FOR NELSON CITY COUNCIL | MAY 2023

We design with community in mind

Revision schedule

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Abbreviations

Abbreviation	Full Name
ASL	Average Sea Level
BPO	Best Practicable Option
CMA	Coastal Marine Area
m ³	Cubic metre
CHI	Cultural Heath Indicator
DOC	Department of Conservation
EcIA	Ecological Impact Assessment
EIANZ	Environment Institute of Australia and New Zealand
eDNA	Environmental Deoxyribo Nucleic Acid
EPT	Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly)
e.g.	Exempli Gratia
FENZ	Freshwater Environments New Zealand
ha	Hectare
HAT	Highest astronomical tide
km	Kilometre
LCDB	Land Cover Data Base
LTP	Long-Term Plan
MCI	Macroinvertebrate Community Index
MALF	Mean Annual Low Flow
MHWN	Mean high water neaps
MHWS	Mean high water springs
MLWN	Mean low water neaps
MLWS	Mean low water springs
MSL	Mean Sea Level
MSL	Mean sea level
m	Metre
MfE	Ministry for the Environment
MCA	Multi Criteria Analyses
NOF	National Objectives Framework
The Council	Nelson City Council
NWWTP	Nelson Wastewater Treatment Plant
NRMP	Nelson Resource Management Plan
NZCPS	New Zealand Coastal Policy Statement
NZFFD	New Zealand Freshwater Fish Database
NZTCS	New Zealand Threat Classification System
NZVD	New Zealand Vertical Datum
n/a	Not Applicable
n.i.	Not Identified
QEII	Queen Elisabeth II (covenant)
RMA	Resource Management Act 1991
REC	River Environment Classification
sec	Second
SNA	Significant Natural Area
TSS	Total Suspended Solids
WWTP	Wastewater Treatment Plant

1 Introduction

The Nelson Wastewater Treatment Plant (NWWTP) located at Boulder Bank Drive, Nelson is owned by Nelson City Council (the Council) and has been operated by Nelmac since 2011. The NWWTP receives wastewater from the northern catchment of Nelson City, which is primarily residential with a small percentage of commercial/industrial inputs. The NWWTP is an oxidation pond-based treatment system, comprising preliminary treatment (grit removal and screening), pre-treatment (clarification and trickling filter used as required), facultative pond, maturation pond and wetland system. Treated wastewater is discharged via an ocean outfall into Tasman Bay.

The NWWTP obtained consents on 23 November 2004 to, inter alia:

- Discharge treated wastewater to Tasman Bay;
- Discharge wastewater onto or into land, namely the existing oxidation pond and proposed wetlands and flow buffer storage pond;
- Discharge contaminants, namely wastewater treatment plant gases to air from a wastewater treatment plant;
- Use, maintain and renew a pipeline and outfall structure and to occupy the seabed;
- Deposit in or on the seabed substances from the outfall pipe; and
- Carry out where applicable, vegetation clearance, soil disturbance and earthworks for the construction of the treatment plant upgrade works.

The current resource consents for NWWTP expire on 1 December 2024 and the Council requires new consents to continue to operate at its current location. Council shall be applying for consents for:

- Discharge treated wastewater to coastal water;
- Discharge treated wastewater to land (in a manner it may enter water, being groundwater and surface water);
- Discharge contaminants to air (odours), including during desludging; and
- Placement and use of outfall pipe and diffuser within the, coastal marine area (CMA), including replacing existing diffuser.

1.1 Qualifications/Experience

My full name is Dr Bram Theodorus Maria Mulling.

I am a Principal Environmental Scientist at Stantec since 2021. Previously I have been employed by Cardno NZ Ltd as senior freshwater ecologist and by Precise Consulting as environmental scientist.

My qualifications include a Ph.D in Biology (2013) from the University of Amsterdam (The Netherlands), a Master of Science in Biological Sciences (2008) from the University of Amsterdam (the Netherlands) and a Bachelor of Science in Laboratory Sciences (2005) from the University of Professional Education Larenstein (the Netherlands). I am member of the Environment Institute of Australia and New Zealand (EIANZ).

I have 10-years' experience in environmental science focused on ecology of which four-years within the New Zealand private consultancy sector.

My work routinely involves providing assessments of effects on ecology and water quality recommending impact management measures, designing, and implementing and aquatic ecology monitoring programmes, and assessing compliance with resource consent conditions.

I was the lead ecologist on the Porirua City Council the Te Awarua-o-Porirua Harbour catchment stream reach prioritisation for riparian management project. This project consisted of geospatial analyses of publicly available databases to assess the risk for sediment and nitrogen release of riparian margins.

I am involved as an advising ecologist at the Transmission Gully highway since January 2018. Works included, amongst other, fauna salvage, input into stream diversion design, success monitoring, biodiversity offsetting programs and impact assessments.

I have been the lead ecologist for the re-opening (2018) and the expansion consenting (2022) for the Willowbank Quarry (Judgeford, Wellington). This included initial Ecological Impact Assessments (EclA) for aquatic, terrestrial and wetland habitat, flora and fauna. I was furthermore involved within input into stream diversions and fish ladders, design input for sediment erosion structures, input into management plans, receiving environment monitoring and development of biodiversity offset schemes.

1.2 Identified BPO

The identified BPO is a mature assessment of the BPO approved by the Council following the alternatives MCA by Stantec. It is the framework for preparing an application subject to and informed by the analysis and outcomes of the iterative expert charette (in dialogue with the Council) that commences in 2023.

Following the assessment of alternatives the identified BPO for NWWTP is currently:

- Wastewater treatment to remain at its current location;
- Existing pre-treatment and pond / wetland system;
- Existing marine outfall with continuous discharge into the Tasman Bay;
- New modern diffuser to replace existing outlet discharge structure at the end of the current marine outfall;
- Upgrade and maintenance of planting around existing wetlands and swale, and surrounding Council owned land throughout the life of the consent (in discussions with iwi and an agreed planting plan. Reviewed as part of ongoing Cultural Health Indicator (CHI) monitoring);
- Upgrade of odour control system (air extraction and treatment) from inlet works, pre-treatment facility and solids treatment facility, in accordance with the recommendations of the specialist odour assessment as part of the AEE;
- Ongoing pond health management by active pond management team and deploy appropriate mitigation measures when needed, to minimise risk of pond crashes and malodour;
- Monitor and if needed improve treatment to reduce total suspended solids (TSS) to ensure compliance to resource consent conditions and changes in national standards and implement appropriate technology as required;
- Monitor and if needed improve treatment to remove pathogens and implement appropriate technology as required; and
- Ongoing environment and CHI monitoring programme (frequency to be confirmed).

This BPO will be refined further following the technical assessment and recommendations to be undertaken as part of the AEE process. Any trigger values identified as part of the AEE will be allowed for within draft consent conditions. The frequency and scope of the CHI monitoring to be confirmed with iwi.

1.3 Scope of this Technical Assessment

This document provides a summary of the potential ecological impacts of wastewater discharges from the NWWTP on the receiving environment. The main discharge of treated wastewater occurs through a short oceanic outfall and associated potential impacts on the coastal marine environment are assessed within a separate impact assessment (Morrissey and Campos 2023). This document focusses on secondary discharge environments due to potential leaching of the maturation ponds and/or wetland systems. These receiving environments include:

- Aquatic ecosystems (Hillwood Stream and Hillwood Stream North tributary);
- Terrestrial ecosystems (Wakapuaka sandflats); and
- Estuary ecosystem (Nelson Haven/Paruparuroa).

It should be noted that this document assesses the potential impacts of the NWWTP discharges only. Any potential impacts due to the presence or operating of the NWWTP are excluded from the scope.

2 Methodology

A desktop ecology assessment was undertaken in order to determine the ecological values of coastal and terrestrial habitat in the vicinity of the site. The project involved:

- A desktop assessment of existing ecological information, namely:
 - Publicly available reports on the ecology of the area.
 - Environmental databases e.g. Land Cover Data Base (LDCB v5.0).
- Conduct field sampling for eDNA within the Hillwood Stream near the NWWTP to complement the existing aquatic fauna information.
- Conduct an impact assessment based on the EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystem (Roper-Lindsay, et al. 2018).
- Preparation of a brief report summarising the findings of the assessment.

3 Site Description

A general overview of the NWWTP and surrounding environment is provided in Figure 3-1. The project site is located approximately 14 kms north of the centre of Nelson township and is ~500 m north of SH6. The NWWTP is located within the Wakapuaka sandflats with pasture to the east, the Todd Valley sub-catchment to the South, the Nelson Haven/Paruparuroa to the west and the Tasman Bay/Te Tai-o-Aorere to the north.

The NWWTP sits on an area of reclaimed land. Before the establishment of Boulder Bank Drive (Figure 3-1) the area now referred to as Wakapuaka sandflats was part of the Nelson Haven estuary. Historic aerial images from the 1940's (Appendix A, Figure A-1) and the 1980's (Appendix A, Figure A-2) illustrate the significant modification of the area due to the land reclamation.

Along the NWWTP and the through the Wakapuaka sandflats run the Hillwood Stream (east to west) and Hillwood Stream North tributary (north to south). The Hillwood Stream confluent with the Todd Valley Stream just upstream of the discharge point into the Nelson Haven/Paruparuroa.

3.1 Ecological Context

The NWWTP is located within the Nelson ecological region but falls outside the identified ecological districts within the ecological region (McEwen 1987) (Appendix A, Figure A-3). The Wakapuaka sandflats and the NWWTP lie adjacent to the ecological districts of Bryant (east and south) with the Motueka district (south-west). Although the NWWTP area is slightly outside the Bryant ecological district, the region description is still relevant for the ecological context of the area. The Hillwood Stream and Todd Valley Stream both originate and run through the Bryant ecological district.

The Bryant ecological district has steep hill country which are generally <1500m Average Sea Level (ASL). The highest point within the district is Gordon's Knob at 1664m above ASL (McEwen 1987). Much of district is covered with exotic forests and farms (semi-extensive sheep and beef; dairying with sheep and cattle for finishing).

The climate in the district is sunny and sheltered in the north-west with very warm summers and mild winters. Cooler and wetter climate occurs in the south and at higher altitudes of the district. High intensity precipitation events occur from time to time in the north-east and north. Average annual precipitation is 1200-2000mm (McEwen 1987).

The geology of the district is complex and consists of Permian rocks including large areas of green sandstone and argillite. Several important areas of ultramafic rocks and mafic volcanics are present. Maitai Group greywackes, siltstones, mudstones, tertiary marine and non-marine sediments, Jurassic non-marine and Triassic marine sediments can also be found within the district (McEwen 1987).

The soils basic intrusive rocks in north-east with clayey moderately deep subsoils, have medium natural fertility but are droughty in summer. Soils on ultramafic dunite and serpentine rocks of Dun Mountain region have low natural fertility with toxic levels of magnesium, chromium and nickel. Calcareous rocks on hilly and steep country along north-west boundary have moderately deep fertile soils (rendzinas and related soils) with clayey subsoils. Steep land soils on greywacke, argillite and schist near the coast are shallow and stony with yellowish brown friable subsoils; natural fertility moderate to low. At higher altitudes and rainfalls soils are very strongly leached to podsolised with low natural fertility (McEwen 1987).

Indigenous vegetation is restricted to higher hills in the east and south. Forests consist of mixed beech-podocarp forest. These are generally dominated by red beech, silver beech, the black beech-mountain beech complex and occasionally hard beech, with rimu, miro, matai and occasionally totara. Tanekaha may be quite common in sub-canopy. Beech species (except mountain beech), diminish with altitude and on higher altitude (mainly on non-ultramafic materials) mountain beech forest with kaikawaka, Hall's totara and *Dacrydium bidwillii* occurs (McEwen 1987). At lower altitudes closed, mixed, manuka dominated scrub occurs. Open mixed scrub and shrubland dominated by slow growing manuka, mountain flax and *Cassinia vauvilliersii* var *serpentina* are found on the ultramafics rocks.



Figure 3-1: Overview of the NWWTP and surrounding environment. The overview includes labels for the main aspects of the WWTTP (white text) and indicative flow direction through the WWTTP (white arrows). A tabular representation is provided within Table 1

Estuary vegetation within the Motueka ecological district include *Scirpus nodosus*, *Samolus repens*, *Selliera radicans*, *Leptocarpus simplex*, *Juncus maritimus*, *Salicornia australis* with *Spartina x townsendii* spreading. Dunes are in marram

grass with ngaio occurring on bluffs. *Calystegia soldanella*, *Carex pumila* and *Muehlenbeckia complexa* are generally present on gravel and sandy shores (McEwen 1987).

The district provides important shore bird habitat inside Boulder Bank including both Arctic breeding and New Zealand migrant waders. It also provides a breeding site for red-billed gull and blue penguin. Forest birds in the area include New Zealand falcon, kaka, kea and blue duck. In the south yellow-crowned and red-crowned parakeet can be found (McEwen 1987).

Nelson green gecko (*Heteropholis stellatus*) common along the western slopes of the Bryant Range; this is the north-eastern limit and here it adjoins the range of Marlborough green gecko (*Heteropholis manukanus*). Spotted skink (*Leiopisma lineocellatum*) occurs at scattered sites along the coast south of Cable Bay, on the Boulder Bank, and along the western foothills of the Bryant Range and Richmond Range. These are the westernmost localities for spotted skink.

4 Receiving Environment

This chapter aims to provide a summary of the environmental state and ecological values that are present within the area surrounding the NWWTP, including the Hillwood Stream, Wakapuaka sandflats and the Nelson Haven/Paruparuroa. This chapter is divided into the following sections:

- Terrestrial ecology (4.1);
- Aquatic ecology (4.2);
- Estuary ecology (4.3); and
- Avifauna (4.4).

4.1 Terrestrial Ecology

The site is situated adjacent to the Wakapuaka sandflats, which are composed of highly modified saltmarsh, former estuarine mudflat with low coastal vegetation and low productive grassland to the east of the NWWTP (Figure 4-1). The land use in the wider catchment is dominated by high producing exotic grassland, in the form of pasture (Table 4-1; Figure 3-1). This is particularly common in the area east of the Wakapuaka sandflats. The lower section of the hills within the catchment are largely covered with gorse and/or broom, broadleaf indigenous hardwoods and exotic forest, with a large area of manuka and/or kanuka on the south/south-east edge of the catchment. Landcover to the south of the site in the Todds Valley area is fragmented (Figure 4-1).

The catchment landcover is generally represented within threatened environment classification (Appendix A, Figure A-5) with decreasing indigenous landcover from the top of the hills (>30% indigenous cover left) to the foothills and the coastal plains (<10% indigenous landcover left). The Wakapuaka sandflats are the exception with an estimated >30% indigenous cover left in the area. Two Department of Conservation reserves are in proximity of the NWWTP. The Wakapuaka Raupo Swamp and Boulder Bank Scenic Reserve (Appendix A, Figure A-4). The Boulder Bank ecosystem is categorised as a shingle beach ecosystem and is considered naturally uncommon and endangered ecosystem (North and Simpson 2017). Within the draft Nelson Plan, the Nelson City Council is proposing to assign "Significant Natural Area" (SNA) status to sections within the Wakapuaka sandflats (Ure and North 2007, Simpson 2013, North and Simpson 2017).

The high producing exotic grassland east of the site are known as the Wakapuaka flats, enclosed by Drumduan to the east and the Wakapuaka foothills to the south. Aerial imagery shows the area has been used as pasture since at least the 1940s. The flats are a coastal plain made up of mud, sand and gravels, formed by swamp deposits. The area was likely to have been swamp/wetland/estuary prior to human alteration. This is in line with the potential vegetation models for the area (Figure A-6). Areas of the land remain below the mean high-water springs which is controlled via stop banks (Boulder Bank Drive) and floodgates. Drainage channels are present throughout the area alongside Hillwood Stream and Hillwood Stream North tributary.

The pastureland is dispersed with exotic shelterbelt species such as gum, poplar and macrocarpa. Native species such as flax and ngaio are dispersed along the margins. Pasture use is predominantly cattle/dairy. The sandflats have well established saltmarsh vegetation (Figure 4-1) that is encroached by coastal scrubs and exotic species. The Todds Valley area, forms the main catchment area of the Wakapuaka foothills, and drains through the Wakapuaka flats in the Todd Valley Stream (Boffa Miskell 2015). The catchment drains through the saltmarsh/sandflat into the Nelson Haven estuary (Figure 3-1).

Table 4-1: Land cover (Landcare Research 2020) within the Hillwood Stream catchment (Ministry for the Environment 2019). A visual representation is provided within Figure 4-1

Land cover type	Area (ha)	Percentage of total
High Producing Exotic Grassland	788.2	39.7%
Manuka and/or Kanuka	357.0	18.0%
Gorse and/or Broom	214.9	10.8%
Broadleaved Indigenous Hardwoods	204.1	10.3%
Exotic Forest	185.4	9.3%
Low Producing Grassland	49.9	2.5%
Built-up Area (settlement)	47.0	2.4%
Herbaceous Saline Vegetation	40.9	2.1%
Forest - Harvested	40.0	2.0%
Sand or Gravel	18.7	0.9%
Deciduous Hardwoods	14.4	0.7%
Indigenous Forest	10.2	0.5%
Orchard, Vineyard or Other Perennial Crop	9.3	0.5%
Lake or Pond	4.8	0.2%
Mixed Exotic Shrubland	2.0	0.1%
Transport Infrastructure	0.9	0.0%
Total	1987.7	

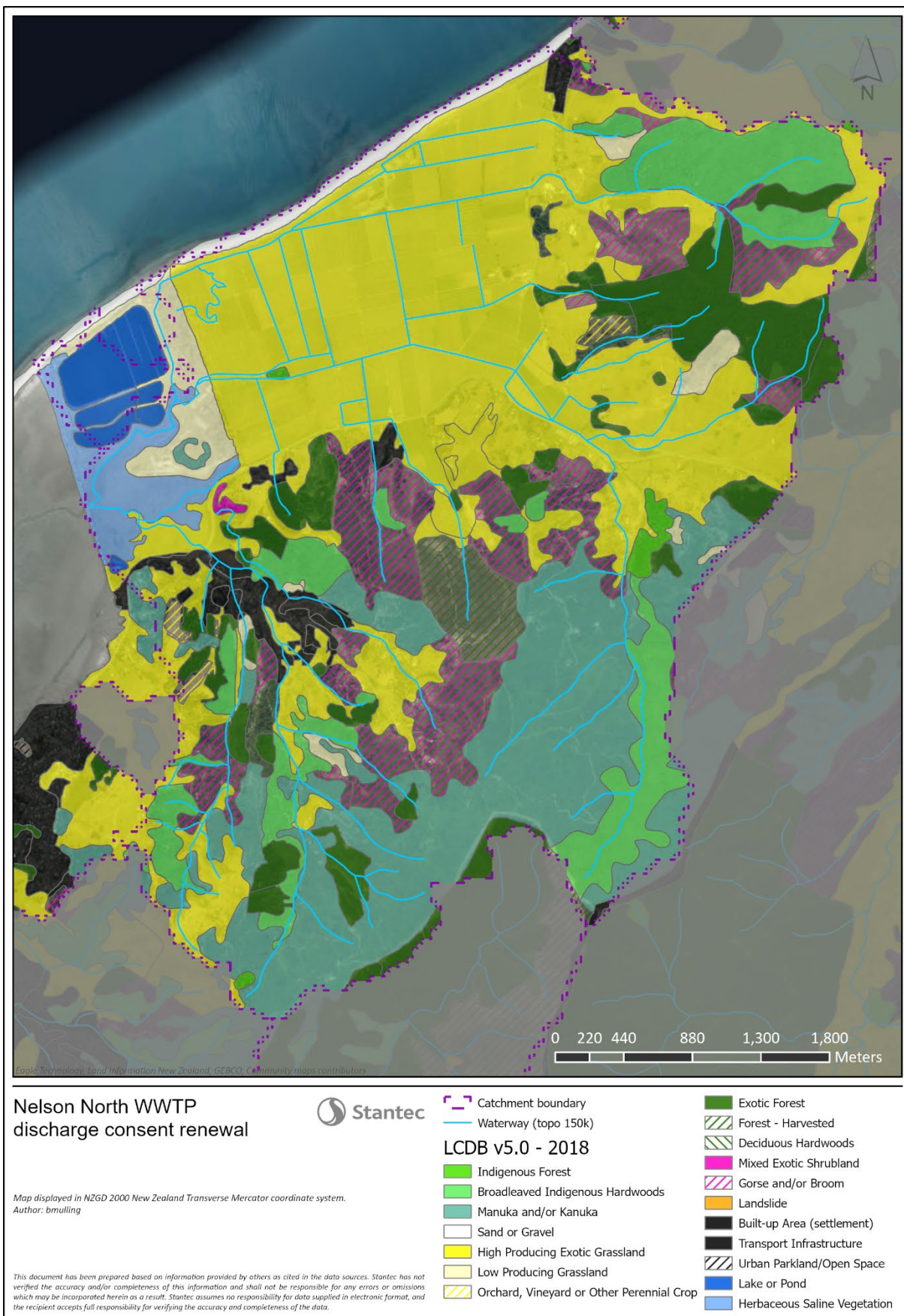


Figure 4-1: Land cover (Landcare Research 2020) within the Hillwood Stream catchment including the Todd Valley sub-catchment in the south east (Ministry for the Environment 2019)

4.1.1 Wakapuaka Sandflats

The Wakapuaka sandflats are one of the largest reserves managed by the Council. The sandflats cover an area of old estuarine mudflat and saltmarsh wetland. The sandflats are currently in a highly modified state, arising from drainage and reclamation activities, including the construction of the Boulder Bank Drive roadway. Reduction of tidal influence has contributed to the alteration from the area natural saltmarsh state. The sandflats are in a state of ongoing change from the natural saltmarsh state to low coastal shrubland (FuturEcology 2019).

Approximately 30% of saltmarsh habitats within Nelson Tasman region (excluding within the Abel Tasman National Park) have disappeared in the past 120 years (Wriggle Coastal Management Limited 2012).

Aerial imagery from the 1940s (Figure A-2), 1980s (Figure A-1) and present (Figure 3-1) indicates a considerable rate of change highlighted in the presence and density of vegetation. The area containing the current WWTP, and wetlands appears to have largely been historic estuarine mudflat, with limited pockets of vegetation. Vegetation was constrained to the edges of the area and small areas of higher elevation.

The area was considerably more vegetated in the 1980s compared to the 1940s with increasing abundance of vegetation in the form of shrubs appearing in the low-lying areas.

Current aerial photography indicates further development of vegetation within the sandflats, in areas that remained sandy in the 1980s. Additionally there appears to be an increase in shrubs and taller species. Taller species that have developed recently are predominant in the higher elevation areas, that were also vegetated during the 1940s.

In the northern section of the area, along Boulder Bank, ephemeral brackish water pans occur, likely induced by the construction of the WWTP oxidation ponds (North and Simpson 2017). The pans support a range of saltmarsh herbs and the ecosystems can be locally and nationally rare (North and Simpson 2017).

4.1.1.1 Vegetation

The current vegetation, further encouraged by the altered state of the area, consists of saltmarsh and estuarine rushes, exotic grasses and coastal scrub species (Figure 4-1). Active planting occurred at some stage prior to 2008, with mixed results. The planted species are not typically representative of sandflat ecology, and may, to some extent contribute to the ongoing change in state.

A 2008 report notes the presence of Old Mans Beard (*Clematis vitalba*) (Nelson City Council 2008) which was subject to low level control, alongside gorse. Old Mans Beard is not recorded as present within the iNaturalist database or a 2019 survey of the area (FuturEcology 2019) and may have been removed in the interim.

A number of at-risk, or otherwise threatened flora species have been recorded in the area (Table 4-2). Monro's forget-me-not (*Myosotis monroi*) is a range restricted species, endemic to ultramafic soils within the wider Nelson region. Native musk (*Thyridia repens*) is a coastal species, usually found near estuaries or salt marshes in wet, saline soils. They are intolerant of competition by taller species and faster growing mat species. *Thyridia repens* is widespread across the country, but naturally uncommon. Due to the ongoing rate of change within the Wakapuaka sandflats there is a reasonable likelihood that the local population of the species will decline as competition increases.

Historic vegetation maps of the Nelson Haven Inlet, for 1840, 1931 and 1985 indicate a major shift in species composition and salt marsh extent. A major reduction of the vegetation on the Wakapuaka end of the inlet occurred sometime between 1840 and 1931, with a considerable shift in composition of the remaining species. *Juncus* spp. were formerly common on the eastern end of the inlet, however remaining distribution is patchy. As of 1985 *Sarcocornia* sp. were likely the most prevalent on the Wakapuaka end of the inlet (Gillespie 2009).

Due to ongoing change from a former estuarine mudflat and salt marsh to low coastal shrubland, changes in overall species composition over the medium to long term are likely, if (further) actions are not undertaken to limit the rate of change.

Table 4-2: List of threatened and at-risk vascular plant species within the Wakapuaka sandflats (FuturEcology 2019, Simpson 2013)

Scientific Name	Common Name	Threat status ¹
<i>Kunzea ericoides</i>	Kanuka ²	Threatened - Nationally Vulnerable
<i>Leptospermum scoparium</i>	Manuka ²	At Risk - Declining
<i>Melicactus crassifolius</i>	Thick-leaved mahoe	At Risk - Declining
<i>Myosotis monroi</i>	Monro's forget-me-not	At Risk - Naturally uncommon
<i>Thyridia repens</i>	Native musk	At Risk - Naturally uncommon
<i>Olearia lineata</i>	Small-leaved tree daisy ³	At Risk - Declining

4.1.1.2 Fauna

The Wakapuaka sandflats provides habitat for a variety of fauna including insects, lizards and birds. The avian community will be discussed within a separate section (4.4) as the habitat of many of these mobile animals will likely stretch over the Wakapuaka flats and the Nelson Haven estuary.

The iNaturalist database did not show any at-risk fauna observations within the Wakapuaka sandflats. The fauna includes common species including North Island coastal copper (*Lycaena salustius*), common garden katydid (*Caedicia simplex*), aurora bluetail (*Ischnura aurora*), monarch butterfly (*Danaus plexippus*), common lagoon fly (*Eristalinus aeneus*), *Eudonia leptalaea*, fishing spiders (*Dolomedes* spp.) and glass snails (*Oxychilus* spp.).

A search in the herpetological database from the Department of Conservation revealed observations of five species of lizards and two species of amphibians within a 10km radius of the NWWTP (Table 4-3). The two amphibian species are brown tree frog (*Litoria ewingii*) and southern bell frogs (*Ranoidea raniformis*). Both frog species are introduced and naturalised within New Zealand. As exotic species they do not have a threat status within New Zealand, however the southern bell frog is included in the International Union for Conservation of Nature (IUCN) red list as endangered (Hero, et al. 2004). The starred gecko (*Naultinus stellatus*) is the most numerous recorded species, but all records are outside the Hillwood Stream catchment, >8.90km away from the NWWTP. Other lizard species observed include the northern grass skink (*Oligosoma polychroma*), the glossy brown skink (*Oligosoma zelandicum*), a common gecko species (*Woodworthia* sp.) and the northern spotted skink (*Oligosoma kokowai*). The northern spotted skink has been observed the closest to the NWWTP (540m) with records within the Boulder Bank Scenic Reserve. Considering the habitat in the area it is likely that northern grass skinks and possibly common gecko will occur within the Wakapuaka sandflats area. Both these species have been observed 2.15km from the NWWTP.

Table 4-3 Herpetological Records (0-20-years of age) within a 10km Radius of the NWWTP

Scientific Name	Common Name	Threat Status ⁴	Number of Records	Distance to Closest Record (km)	Notes
<i>Litoria ewingii</i>	Brown tree frog	Introduced and Naturalised	2	6.09	
<i>Naultinus stellatus</i>	Starred gecko	Threatened - Nationally Vulnerable	114	8.90	
<i>Oligosoma kokowai</i>	Northern spotted skink	At Risk - Relict	6	0.54	Boulder bank
<i>Oligosoma polychroma</i>	Northern grass skink	Not Threatened	4	2.15	
<i>Oligosoma zelandicum</i>	Glossy brown skink	At Risk - Declining	1	8.54	
<i>Ranoidea raniformis</i>	Southern bell frog	Introduced and Naturalised	2	2.15	
<i>Woodworthia</i> sp.	-	-	1	2.15	

¹ Based on (de Lange, et al. 2017)

² Threat status of Kanuka and Manuka were increase in response to the arrival and spreading of the myrtle rust disease

³ Species was likely planted in the area

⁴ Based on (Hitchmough, et al. 2021)

4.2 Aquatic Ecology

Both the Hillwood Stream and the Todd Valley Stream flow through the Wakapuaka flats before their confluence near the discharge point, at the Boulder Bank Drive and into the Nelson Haven estuary. A flood gate located at Boulder Bank Drive reduces the tidal influence on the Wakapuaka flats which affects the aquatic habitat, riparian vegetation and soil salinity throughout the flats. The lowland reaches of both streams are very degraded with straightened and incised channels constructed to manage the flood risk of adjacent coastal agricultural lands and State Highway 6.

4.2.1 Hillwood Stream

Hillwood Stream runs along the NWWTP from the east (Wakapuaka Valley) to the west (Nelson Haven estuary) with a tributary running north to south along the eastern side of the NWWTP. The lower Hillwood Stream is a second order stream with an estimated mean annual flow of 0.2m³ sec⁻¹ (Table 4-4; Figure 4-2). The Hillwood Stream reach along the NWWTP has a near flat gradient, with mainly run habitat. Model data suggests that the dominant sediment particle size is coarse gravel, however, given the site characteristics it is likely a most reaches have a soft bottom with sand and silt as the prevalent sediment particle size.

The freshwater ecosystems New Zealand (Leathwick, et al. 2010) database indicates that the current stream shading (40%) is relatively similar to the expected historic stream shading (46%). This shading is mainly caused by low status riparian vegetation (Figure 4-3). The lower reaches of the stream have a relatively high proportion of native vegetation cover (76%). The FENZ (Leathwick, et al. 2010) database suggests that upstream vegetation consisting of 34% pasture and 62% indigenous vegetation, however, the more recently published Land Cover Data Base (LCDB) (Landcare Research 2020) (Figure 4-1) indicates that pasture is predominate within the upstream catchment.

4.2.1.1 Tidal influence

The LCDB (Landcare Research 2020) (Figure 4-1) shows herbaceous saline vegetation along the lower reaches of the Hillwood Stream indicating current and/or past tidal influence. Considering that the Wakapuaka flats are reclaimed mudflats from the Nelson Haven estuary, the stream channel is at very low elevation (Figure 4-4), and the tidal characteristics within the area (Table 4-5), it is surmised that saline water enters the Hillwood Stream on a regular basis. The extent and intensity of the saline influence will be strongly reduced by the flood gate located at Boulder Bank Drive which is likely the main cause of ongoing vegetation changes within the Wakapuaka sandflats (section 4.1).

Table 4-4 Modelled stream characteristics (Leathwick, et al. 2010) for the lower Hillwood Stream running along the NWWTP (east to west). No data is available for the Hillwood Stream North tributary (north to south)

Attribute	Value	Unit
NZ reach ID	10009460	-
Stream order	2	-
Mean annual flow	0.1951	m ³ sec ⁻¹
Mean annual 7-day low flow	0.0007	m ³ sec ⁻¹
Slope	0.0	Degrees
Dominant sediment size	Coarse gravel (4.0)	-
Dominant stream habitat	Run (3.9)	-
Riparian shading	0.40	Proportion
Historic riparian shading ⁵	0.46	Proportion
Native riparian vegetation ⁶	0.76	Proportion
Downstream average slope	0.0	Degrees
Upstream average slope	17.7	Degrees
Upstream indigenous forest cover	0.005	Proportion
Upstream indigenous vegetation cover	0.62	Proportion
Upstream pasture cover	0.34	Proportion

⁵ Estimated shade assuming complete vegetation cover as could be expected during pre-human conditions

⁶ Proportion of native riparian vegetation within a 100 m buffer of the river

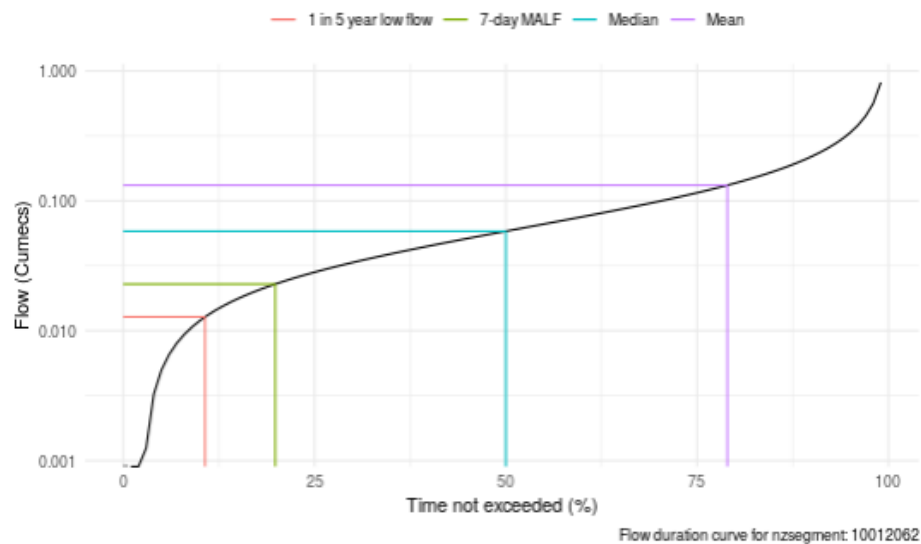


Figure 4-2: Modelled annual mean flow, annual median flow, 7-day mean annual low flow (MALF) and 1 in 5-year low flow (Booker and Woods 2014) for the lower Hillwood Stream running along the NWWTP (east to west). No data is available for the Hillwood Stream north tributary (north to south).



Figure 4-3: Overview of Hillwood Stream image/plate locations



Plate 1: Hillwood Stream at location 1 (upstream view)



Plate 2: Hillwood Stream at location 2 (upstream view)



Plate 3: Hillwood Stream at location 3 (upstream view)

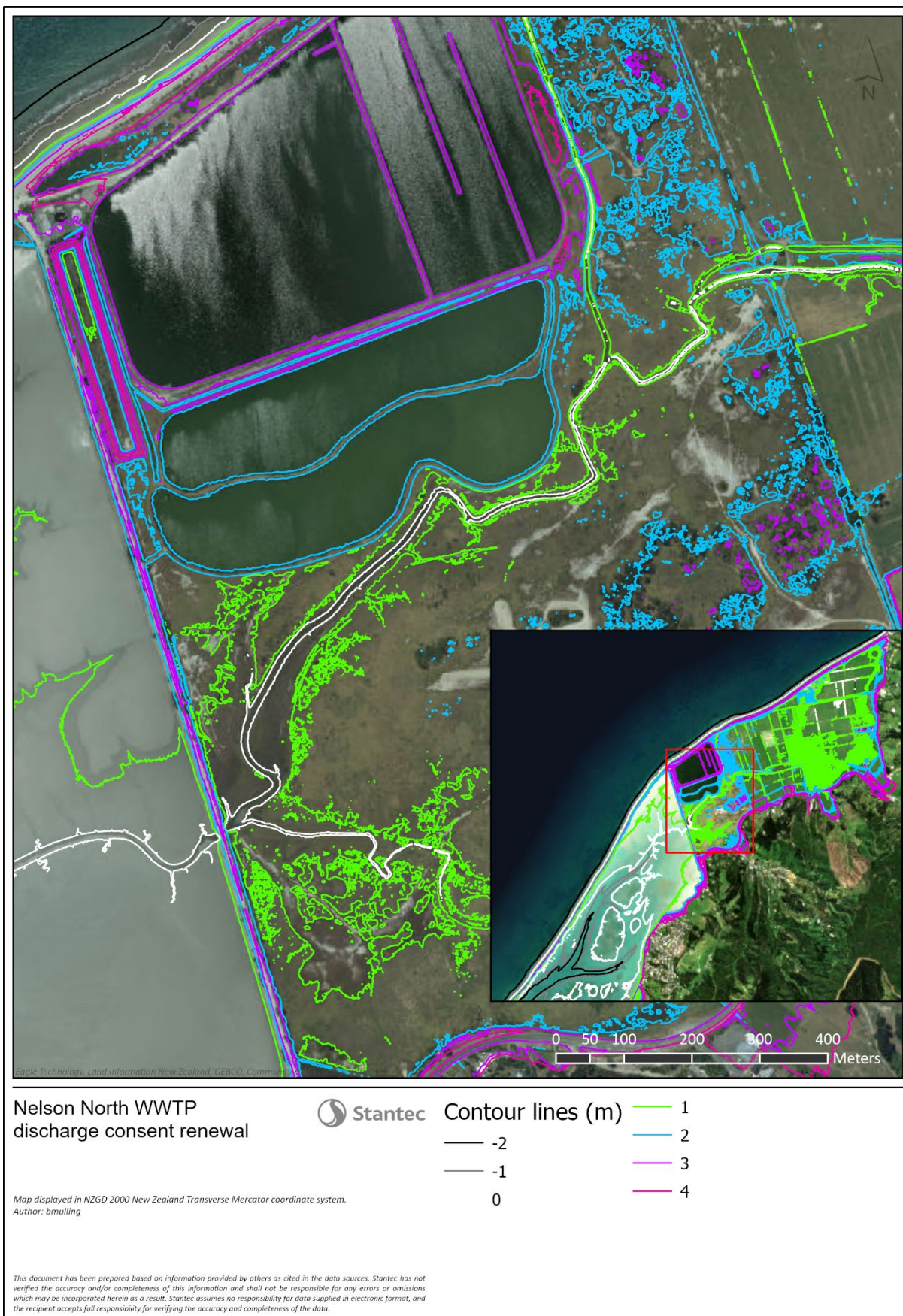


Figure 4-4: Contour lines (1m) generated from the 2021 Nelson Digital Elevation Model (DEM) (0 corresponds to NZ Vertical Datum 2016)

Table 4-5: Nelson standard port tidal levels (Land Information New Zealand n.d.) referenced against NZ Vertical Datum 2016

Attribute	Tide height (m)
Highest astronomical tide (HAT)	2.31
Mean high water springs (MHWS)	1.89
Mean high water neaps (MHWN)	0.86
NZ vertical Datum (NZVD2016)	0.00
Mean sea level (MSL)	-0.15
Mean low water neaps (MLWN)	-0.84
Mean low water springs (MLWS)	-1.78
Lowest astronomical tide (LAT)	-2.23

4.2.1.2 Groundwater influence

A detailed description of the influence of groundwater on the receiving freshwater environments is provided in the technical groundwater report (Stantec 2023a). The findings of that report indicate that the freshwater receiving bodies including the Nelson Haven estuary and Tasman Sea are hydraulically connected to the wastewater discharge through groundwater flow. Modelling undertaken as part of the report indicates groundwater discharges into these features are 'at very low volumes'.

Modelling has indicated that daily volumes of potentially contaminated groundwater from the NWWTP discharging into the Hillwood Stream and Hillwood Stream North tributary are respectively in the order of of $\approx 1.6 \text{ m}^3 \text{ day}^{-1}$ and $\approx 2.1 \text{ m}^3 \text{ day}^{-1}$ (Stantec 2023a). These volumes are negligible in comparison to the natural flow through the receiving waterways. Groundwater infiltration is therefore expected to be a negligible influence on the Hillwood Stream and its tributary.

4.2.1.3 Water quality

A detailed description of the water quality within the Hillwood Stream is provided in the technical water quality report (Stantec 2023b).

Results from the report indicate that the water quality of the freshwater receiving environments (lower reach of the Hillwood Stream) is degraded. Nutrient levels are generally elevated and patterns in nitrogen species indicate likely influence of upstream land use which includes extensive agriculture in the form of cattle and dairy farming. eDNA results (Table 4-6) support this theory with the detection of several domesticated animals within the Hillwood Stream water. It should also be noted that no human (*Homo Sapien*) DNA was detected. This suggests no significant connections between the NWWTP waterbodies and the Hillwood Stream.

Considering the degraded state of the water quality within the Hillwood Stream prior to flowing along the NWWTP and the negligible infiltration of groundwater from the NWWTP (section 4.2.1.2) it is expected that the operation of the NWWTP has a negligible influence on the water quality within the Hillwood Stream and its tributary.

Table 4-6 Number of detected eDNA fragments from mammalian species within the lower Hillwood Stream

Scientific name	Common name	Hillwood Stream at NWWTP	
		Low tide	High tide
<i>Sus scrofa</i>	Pig	34	0
<i>Rattus norvegicus</i>	Norway Rat	0	7
<i>Bos taurus</i>	Cattle	4050	1108
<i>Ovis aries</i>	Sheep	33	0
<i>Cervus elaphus</i>	Red Deer	284	151
<i>Mus musculus</i>	House mouse	169	78

4.2.1.4 Macroinvertebrates

Due to the saline influence along the lower Hillwood Stream, sampling for freshwater macroinvertebrates is not recommended. However, two state of the environment sampling points are within the catchment. Both are upstream of the NWWTP and located where State Highway 6 crossed the Todd Valley Stream and the Hillwood Stream. The macroinvertebrate community sampling results at both locations (Table 4-7) are indicative of severe organic pollution and severe loss of ecological integrity (Ministry for the Environment 2020). eDNA sampling results (Table 4-8) detected 22 taxa of macroinvertebrates including insects, worms, molluscs, crustacea and bryozoa. The majority of detected taxa have a low tolerance value (Stark, et al. 2001), indicating dominance of pollutant tolerance species within the lower Hillwood Stream. These results concur with the conclusion from the water quality assessment (Stantec 2023b) that

water quality upstream of the NWWTP is in a degraded state. None of the detected taxa are classified as at-risk or threatened within the New Zealand Threat Classification System (NZTCS) (Department of Conservation n.d.).

Table 4-7: Macroinvertebrate data (LAWA n.d.) from the two monitoring stations within the Hillwood Stream catchment. Data represents the median values from the last five-years of monitoring data

Site ID	Taxa richness	% EPT taxa	MCI	NOF Attribute band ⁷
Hillwood Stream at Glen Road	19.0	21.4	87.5	D
Todd Valley Stream at SH6	21.5	16.7	81.0	D

Table 4-8: Number of detected eDNA fragments from macroinvertebrate species within the lower Hillwood Stream

Group	Common name	Taxa	Number of taxa detected	Tolerance value (soft-bottom) ⁸
Bryozoans	Bryozoa	<i>Hyalinella punctata</i>	1	4.0
Crustaceans	Copepoda	<i>Copepoda</i>	1	2.4
Insects	Ephemeroptera	<i>Deleatidium</i>	1	5.6
Insects	Trichoptera	<i>Hydrobiosis</i>	1	6.7
Insects	Trichoptera	<i>Oxyethira</i>	1	1.2
Insects	Trichoptera	<i>Aoteapsyche colonica</i>	1	6.0
Insects	Trichoptera	<i>Oxyethira albiceps</i>	1	1.2
Insects	Trichoptera	<i>Psilochorema bidens</i>	1	7.8
Insects	Diptera	<i>Austrosimulium australense</i>	1	3.0
Insects	Diptera	<i>Chironomus cloacalis</i>	1	3.4
Insects	Diptera	<i>Corynoneura scutellata</i>	1	1.7
Insects	Diptera	<i>Paratanytarsus grimmii</i>	1	3.8
Insects	Diptera	<i>Tanytarsus</i> sp. EJD-2015	1	-
Insects	Diptera	<i>Chironomus</i>	1	3.4
Insects	Diptera	<i>Polypedilum</i>	1	8.0
Insects	Hemiptera	<i>Sigara</i>	1	2.4
Molluscs	Mollusca	<i>Physella</i>	1	0.1
Molluscs	Mollusca	<i>Gyraulus corinna</i>	1	1.7
Molluscs	Mollusca	<i>Physella acuta</i>	1	0.1
Molluscs	Mollusca	<i>Potamopyrgus</i>	3	2.1
Segmented worms	Oligochaeta	<i>Oligochaeta</i>	16	3.8
Flatworms	Platyhelminthes	<i>Girardia</i>	1	0.9

4.2.1.5 Fish

Although the water quality is degraded and the physical characteristics of the waterways highly modified, the New Zealand Freshwater Fish Database (NZFFD) indicates seven different fish species as well as freshwater crayfish occurring within the Hillwood Stream catchment (Table 4-9). eDNA samples taken at State Highway 6 detected three species, all of which were previously recorded within the NZFFD. eDNA sampling within Hillwood Stream near the NWWTP detected a total of eight species. These results indicate that the fish community in the lower Hillwood Stream near the NWWTP consists of yelloweye mullet (*Aldrichetta forsteri*), shortfin eel (*Anguilla australis*), longfin eel (*Anguilla dieffenbachii*), īnanga (*Galaxias maculatus*), common bully (*Gobiomorphus cotidianus*), giant bully (*Gobiomorphus gobioides*) and redfin bully (*Gobiomorphus huttoni*). Furthermore, the stream reach provides a connection route for koaro (*Galaxias brevipinnis*) and banded kōkopu (*Galaxias fasciatus*) that primarily live further upstream.

The fish community composition determined from monitoring results aligns well with predictions from the Freshwater Ecosystems New Zealand (FENZ). The fish community can be described as a typical community associated with coastal

⁷ Based on (Ministry for the Environment 2020)

⁸ Based on (Stark, et al. 2001)



low gradient rivers and streams, that generally have moderately high nitrogen loads and low indigenous catchment cover. It is associated with low elevation alluvial plains throughout both main islands, although is generally more extensive in the North Island (Leathwick, et al. 2009).

The Fish Index of Biological Integrity (F-IBI) calculated based on the available data (Table 4-10) indicates that the Hillwood Stream catchment as a whole and the lower Hillwood Stream (near NWWTP) have a high integrity of fish community with minimal degradation of habitat and migratory access (NOF attribute band score A) (Ministry for the Environment 2020).

The reaches of the Hillwood Stream and the Todd Valley Stream within the Wakapuaka sandflats have suitable vegetation for Īnanga spawning, however, the floodgates at Boulder Bank Drive prevent inundation of the vegetation during spring tides, substantially limiting the possibility of Īnanga spawning in the area. This has been recognised by the Council and restoration of spawning habitat along Todd Valley Stream is being considered. However, currently Īnanga spawning habitat within the Wakapuaka sandflats can be considered limited.

Table 4-9: Fish species within the Hillwood Stream catchment recorded during traditional surveying, eDNA sampling and predicted by modelling

Scientific name	Common name	Threat Status ⁹	NZFFD – no. of records ¹⁰	At SH6	eDNA signature ¹¹		FENZ - Predicted probability of occurrence ¹²
					Near NWWTP - Low tide	Near NWWTP - High tide	
<i>Aldrichetta forsteri</i>	Yelloweye mullet	Not Threatened	0		✓	✓	n.i.
<i>Anguilla australis</i>	Shortfin eel	Not Threatened	1		✓	✓	0.75
<i>Anguilla dieffenbachii</i>	Longfin eel	At Risk -Declining	8	✓	✓	✓	0.89
<i>Galaxias brevipinnis</i>	Koaro	At Risk -Declining	2				0.03
<i>Arenigobius bifrenatus</i>	Bridled goby	Introduced and Naturalised	0			✓	n.i.
<i>Galaxias fasciatus</i>	Banded kōkopu	Not Threatened	4				0.13
<i>Galaxias maculatus</i>	Īnanga	At Risk -Declining	1	✓	✓	✓	0.85
<i>Gobiomorphus cotidianus</i>	Common bully	Not Threatened	1		✓		0.71
<i>Gobiomorphus gobioides</i>	Giant bully	At Risk - Naturally Uncommon	0		✓	✓	0.71
<i>Gobiomorphus huttoni</i>	Redfin bully	Not Threatened	1	✓			0.33
<i>Mugil cephalus</i>	Grey mullet	Not Threatened	0		✓	✓	<0.01
<i>Paranephrops planifrons</i>	Kōura	Not Threatened ¹³	8			✓	n.i.
<i>Retropinna retropinna</i>	Common smelt	Not Threatened	0				0.73
<i>Salmo trutta</i>	Brown trout	Introduced and Naturalised	0				0.69

Table 4-10: Fish Index of Biological Integrity (F-IBI) and associated NOF attribute scores

Sites ¹⁴	No. of species ¹⁵	Altitude (m)	Distance from sea (km)	IBI score	NOF Attribute band ⁷
Hillwood Stream catchment	11	35	4	60	A
Hillwood Stream NZFFD	7	35	4	54	A
Hillwood Stream near NWWTP	8	1	1	44	A
Hillwood Stream at SH6	3	4	2	30	B

⁹ Based on (Dunn, et al. 2017)

¹⁰ Records within the Hillwood Stream catchment between 2011 and 2022 were included

¹¹ Sample at SH6 was taken on the 2023.03.02 (NCC) and the near NWWTP samples on 2023.04.28 (Stantec)

¹² Prediction of occurrence relate to the lower reach (NZ reach ID 10009460) of the Hillwood Stream

¹³ Based on (Grainger, et al. 2018)

¹⁴ IBI scores have been calculated using a) all available catchment data (including NZFFD and eDNA) and separate data from b) the NZFFD records and c, d) the eDNA results

¹⁵ Kōura (*Paranephrops planifrons*) not included in numbers and Bridled goby (*Arenigobius bifrenatus*) are not included into the F-IBI score calculations

4.3 Estuary Ecosystem

Nelson Haven/Paruparuroa is a well-flushed, shallow tidal estuary that is dominated by seawater influence (LAWA n.d.). Nelson Haven is located at the southern end of Tasman Bay and has an elongate shape without side arms with relatively straight shoreline including few embayment's. The seaward margin is enclosed within an 8.75km long narrow boulder bank (Nelson Boulder Bank) that protects the estuary from the more exposed Tasman Bay. Developments (seawalls, drainage channels and infrastructure) along the estuary have over time resulted in the modification of substantial sections of the shoreline (LAWA n.d.). A large opening between the estuary and the Tasman Bay was created in 1906 to allowing a more direct access route for shipping into the estuary and Nelson Port. Since 2009 the estuary has been regularly dredged to maintain access for the Nelson port, resulting in the removal of an average of 40,000m³ of sediment on an annual basis.

The estuary has a large tidal range of approximately 3m, during neap and spring tides. The upper ends of the estuary are nearly completely drained during tidal fluctuations, leading to a near complete exchange of water with the returning tide (Gillespie 2009). Although a variety of potential nutrient sources exist, the high flushing rate and oceanic mixing has prevented the development of eutrophication.

The ecological value of the estuary has reduced since European settlement, due to development within the estuary, and the wider catchment. Projected maps of historic vegetation cover of the estuary since European settlement show a marked decline in vegetation cover. However, the Inlet continues to provide habitat for avian and marine species within Tasman Bay. The Inlet contains one of the largest Eelgrass (*Zostera* sp.) meadows within the Nelson-Tasman region and are considered to provide high biodiversity values. Seagrass meadows are highly productive ecosystems, providing habitat for a variety of marine species, including as a nursery area for fish species. Seagrass meadows also provide feeding grounds for waterfowl and marine bird species, through vegetative browsing, and by providing habitat for fish species and macroinvertebrates.

Mapping of historical vegetation indicates that there was a decrease of approximately 24% of estuary area (at MHWS) between 1840 and 1985 due to reclamation, infilling, drainage and flood control (Gillespie 2009). The development of the Nelson port area, and the development of the WWTP have contributed significantly to this decline.

The estuary is valued for, amongst others, its aesthetics, cultural values, recreational values, biodiversity values, white baiting and fishing (LAWA n.d.). The estuary functions as a nursery area for marine and freshwater fish, has an extensive shellfish population, and provides valued avian habitat (LAWA n.d.).

Dominant features of the intertidal seabed of the Nelson Haven are extensive sandflats with significant coverage of eelgrass (*Zostera* sp.), macroalgae (e.g. *Ulva* sp. and *Gracillaria* sp.) and glasswort (*Sarcocornia quinqueflora*). Small remnant areas of rush land, primarily searush (*Juncus kraussii*) still persist in the upper estuary. (Gillespie 2009).

4.4 Avifauna

The coastal areas on the northern end of the South Island provide extensive foraging and breeding habitat for coastal and marine avian species. Multiple areas are of national or international importance for one or more coastal or marine bird species. Both the NWWTP site and adjacent areas provide habitat for a significant number of avian species.

The adjacent Wakapuaka sandflats host one of two populations of fernbirds (*Poodytes punctatus*) in the Nelson city area (FuturEcology 2019). The species has faced population decline due to mammalian predation and loss of suitable wetland habitat¹⁶. The Nelson Haven estuary is an important habitat for avian species, including significant numbers of annual migrants, and a number of at-risk, or otherwise threatened species. The Nelson Boulder Bank adjacent to the WWTP is considered to provide a regionally, nationally and international important breeding site for indigenous coastal birds (Nelson City Council 2021).

A full list of avifauna recorded within a 10km radius of the site are recorded in Appendix B Table B-2 and includes information on the likelihood of utilising the NWWTP pond(s) and wetlands.

Avian species are highly mobile and may have considerable home ranges or migrate large distances. Birds observed at the NWWTP include a number of vagrant species, or species otherwise not found within the Nelson-Tasman region, including birds utilising the site for short periods of time during migration or due to weather events. The site is surrounded by a large variety of highly productive habitats, including the Wakapuaka sandflats, saltmarsh, the Nelson Haven estuary, The Horoirangi Marine reserve, and the wider Tasman Bay, as such it is difficult to determine the actual, ongoing use of the site by specific avian species. Additionally, the location provides suitable access to the Cook Strait and the North Island.

¹⁶ (nzbirdsonline.org.nz)

A December 2020 survey of coastal bird species in the Council region identified a mean of 5.6 native bird species per 1km of coastline, however hotspots with higher-than-average species diversity were identified, including the Glenduan coastline and the Boulder Bank. The proportion of at risk or threatened coastal species was found to be similar in the Council region when compared to other regions within Central New Zealand. The Boulder Bank has relatively unmodified sections of coastline, with suitable habitat above the MHWS for bird breeding and roosting activities (Nelson City Council 2021).

A total of 36 threatened or at-risk species were recorded (Table 4-11) within 10km of the NWWTP, due to the highly variable habitat within this area, and limited population or distribution of some species, not all will be present, or likely to utilise the site, or directly adjacent areas. eDNA results from the Hillwood Stream (Table 4-12) provided some insight into the avian species utilising the stream within the Wakapuaka sandflats area.

Table 4-11: At Risk or Threatened Species Observed within a 10km Radius of the Site

Scientific Name	Common Name	Māori Name	Threat Classification	Occurrence ¹⁷			
				NWWTP Ponds and/or Wetlands	Wakapuaka SandFlats	Nelson Haven Estuary	Boulder Bank
<i>Podiceps cristatus australis</i>	Australasian crested grebe	Pūteketekete	Threatened – Nationally Vulnerable	✓	x	x	x
<i>Gallirallus philippensis assimilis</i>	Banded rail	mioweka	At Risk - Declining	✓	☑	x	x
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	kūaka	At Risk - Declining	✓	☑	☑	✓
<i>Phalacrocorax carbo novaehollandiae</i>	Black shag	kawau tuawhenua	At Risk - Relict	✓	✓	✓	☑
<i>Larus bulleri</i>	Black-billed Gull	tarāpuka	At Risk - Declining	✓	☑	☑	☑
<i>Chlidonias albobristatus</i>	Black-fronted Tern	tarapirohe	Threatened – Nationally Endangered	✓	x	☑	x
<i>Hymenolaimus malacorhynchos</i>	Blue duck	whio	Threatened – Nationally Vulnerable	x	x	x	x
<i>Hydroprogne caspia</i>	Caspian Tern	taranui	Threatened – Nationally Vulnerable	✓	x	✓	☑
<i>Charadrius bicinctus bicinctus</i>	Double banded plover	tūturiwhatu	At Risk – Nationally Vulnerable	x	x	✓	✓
<i>Fulica atra australis</i>	Eurasian Coot		At Risk – Naturally Uncommon	✓	☑	x	x
<i>Pachyptila turtur</i>	Fairy Prion	tītī wainui	At Risk - Relict	x	x	-	☑
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	toanui	At Risk - Relict	x	x	☑	☑
<i>Puffinus gavia</i>	Fluttering shearwater	pakaha	At Risk - Relict	x	x	✓	✓
<i>Puffinus huttoni</i>	Hutton's Shearwater	Kaikōura tītī	Threatened – Nationally Vulnerable	x	x	x	x
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant/shag	kawau tuī	At Risk – Naturally Uncommon	✓	☑	✓	✓
<i>Eudyptula minor</i>	Little penguin	kororā	At Risk – Declining	x	x	☑	☑
<i>Phalacrocorax melanoleucos brevirostris</i>	Little Pied Cormorant	kawau paka	At Risk - Relict	✓	✓	✓	✓
<i>Porzana pusilla affinis</i>	Marsh crake	koitareke	At Risk - Declining	✓	☑	x	x
<i>Falco novaeseelandiae</i>	New Zealand Falcon	kārearea	Threatened - Nationally Vulnerable	✓	☑	x	x
<i>Poodytes punctatus</i>	New Zealand Fernbird	mātātā	At Risk - Declining	✓	✓	x	x

¹⁷ Where ✓ stands for observed within the habitat, ☑ stands for not observed but use of habitat possible based on species habitat preferences and x stands for not observed and use of habitat is unlike based on species habitat preferences.

Scientific Name	Common Name	Māori Name	Threat Classification	Occurrence 17			
				NWWTP Ponds and/or Wetlands	Wakapuaka SandFlats	Nelson Haven Estuary	Boulder Bank
<i>Poliocephalus rufopectus</i>	New Zealand Grebe	weweia	Threatened – Nationally Increasing	✓	☑	✓	x
<i>Anthus novaeseelandiae novaeseelandiae</i>	New Zealand Pipit	pīhoihoi	At Risk - Declining	✓	☑	x	☑
<i>Anas superciliosa</i>	Pacific Black Duck	pārera	Threatened – Nationally Vulnerable	✓	☑	x	x
<i>Egretta sacra sacra</i>	Pacific Reef-Heron	matuku moana	Threatened – Nationally Endangered	x	x	✓	✓
<i>Phalacrocorax varius varius</i>	Pied Cormorant/Shag	kāruhiruhi	At Risk - Recovering	✓	✓	✓	✓
<i>Calidris canutus rogersi</i>	Red Knot		At Risk - Declining	x	x	✓	x
<i>Larus novaehollandiae scopulinus</i>	Red-billed gull	tarāpunga	At Risk - Declining	☑	☑	☑	✓
<i>Platalea regia</i>	Royal Spoonbill	kotuku ngutupapa	At Risk – Naturally Uncommon	✓	☑	✓	☑
<i>Puffinus griseus</i>	Sooty shearwater	tītī	At Risk – Declining				
<i>Haematopus finschi</i>	South Island Oystercatcher	tōrea	At Risk - Declining	✓	✓	✓	✓
<i>Petroica australis australis</i>	South island robin	kakaruai	At Risk - Declining	x	x	x	x
<i>Stictocarbo punctatus</i>	Spotted Shag	kawau pāteketeki	Threatened – Nationally Vulnerable	✓	x	✓	☑
<i>Haematopus unicolor</i>	Variable Oystercatcher	tōrea pango	At Risk – Recovering	✓	✓	✓	✓
<i>Ardea alba modesta</i>	White heron	kōtuku	Threatened – Nationally Critical	✓	☑	✓	✓
<i>Sterna striata striata</i>	White-fronted Tern	tara	At Risk - Declining	✓	x	✓	✓
<i>Anarhynchus frontalis</i>	Wrybill	ngutu-pare	Threatened – Nationally Increasing	x	x	x	x

Table 4-12: Number of Detected eDNA Fragments from Avian Species within the Lower Hillwood Stream

Scientific name	Common name	Threat status	Hillwood Stream at NWWTP	
			Low tide	High tide
<i>Porphyrio melanotus</i>	Pūkeko	Not Threatened	422	362
<i>Anas platyrhynchos</i>	Mallard duck	Introduced and Naturalised	693	1103
<i>Phalacrocorax carbo</i>	Black Shag	At Risk - Relict	76	257
<i>Aythya novaeseelandiae</i>	New Zealand scaup	Not Threatened	0	82
<i>Cygnus atratus</i>	Black swan	Not Threatened	37	14
<i>Hirundo neoxena</i>	Welcome swallow	Not Threatened	27	19

4.4.1 NWWTP Pond and Wetlands

The oxidation ponds, maturation ponds, wetlands and associated habitat are considered to be part of the NWWTP and not the receiving environment. However, the characteristics of these waterbodies do provide suitable habitat for fauna including native eels (*Anguilla* spp.) (occurrence not confirmed) and a variety of avian species (Table 4-11). The NWWTP waterbodies provide for relatively rare freshwater waterbody within a coastal setting, with generally above ambient water temperatures during winter months and a high abundance of food (phytoplankton, zooplankton, benthic fauna and particulate organic matter).

Among other species (Table 4-11, Appendix B Table B-2) the New Zealand scaup (*Aythya novaeseelandiae*; not threatened) has been observed utilising the NWWTP waterbodies, especially the wetlands, for foraging and breeding (Field, et al. 2022). The population of New Zealand scaup within the NWWTP waterbodies has been subject of ongoing

monitoring (Field, et al. 2022). New Zealand Scaup make considerable use of the NWWTP ponds and wetlands and the population has shown an increase from 0 records in 2008 to over 1000 birds in 2021. New Zealand Scaup have started breeding at the NWWTP waterbodies (mainly within the wetlands) from 2012 (Field, et al. 2022). The NWWTP population of New Zealand Scaup from a significant portion of the known New Zealand, and therefore global, population, making the habitat of international importance for this species (Field, et al. 2022). The suitability of the NWWTP waterbodies for the New Zealand scaup is theorised to have occurred due to the abundance of Chironomids (food source) within the benthic environment of the wetlands (Field, et al. 2022) and the characteristics of the wetlands resembling preferred habitat of the New Zealand scaup in the area (Walker 1987).

Although the New Zealand scaup has established a significant population with the NWWTP waterbodies, the type of environment and concentrated densities do pose the potential risk of disease affecting a large portion of the population at once. Avian botulism is a disease that affects (paralysation) wild and captive bird populations, especially waterfowl. The disease is most often observed within wetland systems and outbreaks have been recorded within New Zealand. Ideal conditions for the bacteria (*Clostridium botulinum*) to flourish consist of high-protein under low-oxygen conditions. Conditions that can occur within NWWTP wetland systems. Although it has been shown that the NWWTP provides suitable (artificial) habitat for a large population of New Zealand scaup the site can be considered a risk area at the same time.

5 Impact assessment

This chapter aims to provide an impact assessment of the NWWTP discharge on potential receiving environments that are present within the area surrounding the NWWTP, including the Hillwood Stream, Wakapuaka sandflats and the Nelson Haven/Paruparuroa. This chapter is divided in several sections including:

- Assignment of ecological value to habitats and species (5.1);
- Description of potential impacts of NWWTP discharges (5.2); and
- Determination of overall level of effect associated with the NWWTP discharges (5.3).

5.1 Ecological Value

Based on the information provided within sections 3 and 4 of this report Table 5-1 provides an overview all the different habitats within proximity of the NWWTP.

Table 5-1 Ecological values determined as per the Ecological Impact Assessment Guidelines (Roper-Lindsay, et al. 2018)

Habitat	Aspect	Ecological value	Description/justification
Wakapuaka sandflats	Habitat	High	The Wakapuaka sandflats still have substantial areas of rare saline herbaceous vegetation, and several wetlands are present within the area. Both these habitats are regionally and nationally rare and of very high value.
	Vegetation	High	Several threatened and at-risk flora species are present within the Wakapuaka sandflats area. However, the area would historical be dominated by saline herbaceous vegetation which currently is slowly decreasing in extent due to a downstream flood gate.
	Reptile community	Moderate	Although no records of observation within the area were found, the Wakapuaka sandflats there likely to have suitable for northern grass skink and common gecko.
	Avian community	Very high	The Wakapuaka sandflats provide suitable habitat for a multitude of observed and likely to occurring avian species, many of which are classified as threatened or at risk.
Hillwood Stream	Habitat	High	The lower Hillwood Stream has been significantly modified through channel straightening and deepening with degraded water quality. However, due to the riparian vegetation (native grasses and sedges) and tidal influence, although limited due to the presence of a downstream flood gate, the area will likely provide spawning habitat for Inanga and habitat for estuary species. The stream reach also functioning as a migration route for native fish species living upstream of the lower Hillwood Stream.
	Fish community	Very high	The fish community within lower Hillwood Stream is diverse which is reflected with a high F-IBI score and a NOF attribute score of A.
	Macroinvertebrate community	Low	The macroinvertebrate community consists mainly out of pollutant tolerant species and reflects the degraded water quality, most likely caused by upstream land use. The MCI scores are with the D band of the relevant NOF attribute.
	Avian community	High	eDNA indicate that several native avian species utilize the Hillwood Stream including the at risk (relict) black shag, New Zealand scaup and pūkeko. It can be expected that many other avian species will intermittently use the stream reach.
Boulder Bank	Habitat	Very high	The Boulder Bank habitat is naturally uncommon and will provide niche habitat to flora and fauna species.
	Reptile community	High	The Boulder Bank has a population of northern spotted skink, an at risk (relict) species.

Habitat	Aspect	Ecological value	Description/justification
	Avian community	Very high	Boulder Bank has a large avian community, including a multitude of threatened and at-risk species, that regularly or intermittently uses the habitat.
Nelson Haven estuary	Habitat	Very high	Estuary habitat is naturally rare, and the dynamic nature of the ecosystems provide niche habitat for a multitude of species. It provides nursery habitat for fish, foraging habitat of wader/shore avian species, habitat for intertidal specialists.
	Avian community	Very high	The Nelson Haven estuary has a large avian community, including a multitude of threatened and at-risk species, that regularly or intermittently uses the habitat.
NWWTP waterbodies	Habitat (ponds) ¹⁸	Moderate	This is an artificial system that is considered to be part of the NWWTP and hydrologically placed before the NWWTP discharge point (oceanic outfall). However, the open freshwater body will provide habitat for avian species, especially waterfowl, due to the inherent high density of food and higher than ambient water temperature.
	Habitat (wetlands) ¹⁸	Moderate - high	This artificial system is specifically designed to increase the efficiency of the NWWTP and is considered to be part of the NWWTP and hydrologically placed before the NWWTP discharge point (oceanic outfall). For similar reasons as for the NWWTP ponds the wetlands will provide suitable habitat, with additional habitat quality due to riparian vegetation.
	Avian community	High	Observations have shown that the NWWTP waterbodies attract a variety of avian species and especially the wetlands provide sustain a significant proportion of the known global population of New Zealand scaup.

5.2 Potential Impacts of NWWTP Discharges

The potential impacts of the NWWTP discharge on receiving environments including the Wakapuaka sandflats, Hillwood Stream, Boulder Bank and Nelson Haven estuary, are related to potential leaching of water and associated nutrients and chemicals from the NWWTP ponds and wetlands. Hydrogeological studies have shown that the volumes of leaching are very low, with respective leaching rates less than $3\text{m}^3\text{ day}^{-1}$ and less than $15\text{m}^3\text{ day}^{-1}$ into the Hillwood Stream and Nelson Haven estuary (Stantec 2023a). The report further acknowledges that occasional dredging of the NWWTP waterbodies will not affect these leaching rates. The modelled leaching volumes are very low in comparison with the mean annual flow through the Hillwood Stream and the substantial tidal flushing occurring within the Nelson Haven estuary. The water quality report concluded that the water quality within the lower Hillwood Stream reach is degraded but that this is already the case upstream of the NWWTP and that there is no evidence that the NWWTP degrades the water quality further (Stantec 2023b). Given that the leaching rate into the receiving environment are expected to be very low (Stantec 2023a) and does not influence the water quality of the Hillwood Stream (Stantec 2023a), the ecological effects of the leaching on the receiving environment are in general expected to be very low as well. Table 5-2 provides a more detailed description of potential impacts on receiving environments. The modelled leaching rates have been considered within the determination of the magnitude of effect.

Table 5-2 Magnitude of effects as per the Ecological Impact Assessment Guidelines (Roper-Lindsay, et al. 2018)

Habitat	Aspect	Potential impacts	Timescale of effect	Magnitude of effect
Wakapuaka sandflats	Habitat	Nutrient enrichment of the soil between the NWWTP and the surrounding waterways and waterbodies.	Permanent	Very low
	Vegetation	Changes in vegetation structure and species composition within the area between the NWWTP and the surrounding waterways and waterbodies due to altered nutrient availability within the soil.	Permanent	Negligible
	Reptile community	Changes in vegetation composition can alter the habitat suitability of lizard species.	Permanent	Negligible
	Avian community	Changes in vegetation composition can alter the habitat suitability of avian species.	Permanent	Negligible
Hillwood Stream	Habitat	Degradation of the water quality due to influx of nutrients that can consequently shift the trophic state and community composition of the stream habitat.	Permanent	Very low
	Fish community	Toxic effects from influx of nutrients, other toxic compounds and indirect toxic effects due to degraded water quality (e.g., low oxygen levels).	Permanent	Negligible
		Reduced suitability of habitat due to changes in water quality and potential consequent habitat changes.	Permanent	Negligible
	Macroinvertebrate community	Toxic effects from influx of nutrients, other toxic compounds and indirect toxic effects due to degraded water quality (e.g., low oxygen levels).	Permanent	Negligible

¹⁸ The NWWTP waterbodies are not considered receiving environment

Habitat	Aspect	Potential impacts	Timescale of effect	Magnitude of effect
	Avian community	Reduced suitability of habitat due to changes in habitat and food sources (macrophytes and macroinvertebrate communities).	Permanent	Negligible
Boulder Bank	Habitat	Nutrient enrichment of the soil between the NWWTP and the Tasman Bay	Permanent	Very low
	Reptile community	Changes in vegetation composition can alter the habitat suitability of lizard species.	Permanent	Negligible
	Avian community	Changes in vegetation composition can alter the habitat suitability of avian species.	Permanent	Negligible
Nelson Haven estuary	Habitat	Nutrient enrichment of the Nelson Haven estuary mudflats and degradation of the water quality.	Permanent	Very low
	Avian community	Eutrophication and toxic effects within the benthic and littoral environments could degraded the food availability and quality for avian species.	Permanent	Negligible
NWWTP waterbodies	Habitat (ponds)	This is not considered a receiving environment	n/a/	n/a
	Habitat (wetlands)	This is not considered a receiving environment	n/a/	n/a
	Avian community	The NWWTP waterbodies provide habitat, that is dependent on the WWTP discharges, for the avian community.	Permanent	Net gain
		Risk of disease outbreak due to inherent water quality conditions within the NWWTP waterbodies and high population density of avians.	Permanent risk of occurring	High

5.3 Level of Effect

Based on a combination of the ecological value and expected magnitude of effect, Table 5-3 summaries the expected overall effect on ecological values within the receiving environment.

Table 5-3 Overall level of effect adapted from the Ecological Impact Assessment Guidelines (Roper-Lindsay, et al. 2018)

Habitat	Aspect	Ecological value	Timescale of effect	Magnitude of effect	Level of effect
Wakapuaka sandflats	Terrestrial habitat	High	Permanent	Very low	Very low
	Vegetation	High	Permanent	Negligible	Very low
	Reptile community	Moderate	Permanent	Negligible	Very low
	Avian community	Very high	Permanent	Negligible	Very low
Hillwood Stream	Aquatic habitat	High	Permanent	Very low	Very low
	Fish community	Very high	Permanent	Negligible	Very low
		Very high	Permanent	Negligible	Very low
	Macroinvertebrate community	Low	Permanent	Negligible	Very low
	Avian community	High	Permanent	Negligible	Very low
Boulder Bank	Terrestrial habitat	Very high	Permanent	Very low	Very low
	Reptile community	High	Permanent	Negligible	Very low
	Avian community	Very high	Permanent	Negligible	Very low
Nelson Haven estuary	Habitat	Very high	Permanent	Very low	Very low
	Avian community	Very high	Permanent	Negligible	Very low
NWWTP waterbodies	Habitat (ponds)	Moderate	n/a/	n/a	n/a
	Habitat (wetlands)	Moderate - high	n/a/	n/a	n/a
	Avian community	High	Permanent	Net gain	Net gain
		High	Permanent low risk of occurring	High (if occurs)	Very high (if occurs)

6 Conclusion

The NWWTP is situated within a highly modified environment. The site would originally have been part of the transitional zone between the Nelson Haven estuary mudflats and surrounding salt marshes. The establishment of Boulder Bank Drive and associated flood gates are considered to be the main driver for the habitat changes within the Wakapuaka sandflats area and the lower Hillwood Stream and Todd Valley Stream. Vegetation within the Wakapuaka sandflats is slowly losing its saline herbaceous vegetation which is being replaced with native shrubs and exotic/invasive grasses. Water quality within the Hillwood Stream is considered degraded due to upstream land use including dairy and cattle farming (Stantec 2023b). However, regardless of the degraded water quality, aquatic habitat and ongoing changes within the flora community the Wakapuaka sandflats provide habitat for a wide range of fauna including threatened and at risk avian and fish species. The Nelson Haven estuary and Boulder Bank reserve provides a multitude of ecological and social-economic services and is valuable habitat for a wide range for fauna including substantial numbers of threatened and at-risk species of fish, avians and reptiles. In general, the habitats and flora and fauna species adjacent to the NWWTP can be considered to be of high ecological value.

A hydrogeological study (Stantec 2023a) showed that discharge of water from the NWWTP ponds and wetlands though leaching into the adjacent areas (Boulder Bank, Wakapuaka sandflats, Hillwood Stream and Nelson Haven estuary) is minimal under normal operating conditions or after completion of occasional dredging on the NWWTP waterbodies. Compared to the mean annual flow within the Hillwood Stream and frequent tidal flushing of the Nelson Haven estuary these findings indicate that leaching from the NWWTP is expected to have a negligible to very low level of adverse effect on water quality and soil nutrient concentrations within the surrounding environments. This consequently limits the potential for indirect effects on habitat integrity and flora and fauna species, including fish, avian, reptile and plant populations and communities. Considering the very low leaching rates and the high ecological the overall level of effect of the NWWTP discharges on the surrounding environment (Boulder Bank, Wakapuaka sandflats, Hillwood Stream and Nelson Haven estuary) are considered to be very low.

The NWWTP ponds and wetland are considered to be part of the NWWTP and not receiving environment. However, these waterbodies are openly accessible to avifauna and have shown to provide suitable permanent or intermittent habitat for several threatened and at-risk species. Furthermore, a recent study has shown the dependency of the local New Zealand scaup on the NWWTP waterbodies for providing suitable foraging and breeding habitat (Field, et al. 2022). Given that the presence of the NWWTP ponds and wetlands is dependent on the WWTP discharges these can be considered a net gain for several avifauna species.

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Appendixes

We design with community in mind



Appendix A Additional Maps



Figure A-1 Historical image of the site and surrounding area, 1980s. Note current streams and SH6 overlaid.¹⁹



Figure A-2 Historical image of the site and surrounding area, 1940s. Note current streams and SH6 overlaid.²⁰

¹⁹ <https://www.topofthesouthmaps.co.nz/app/>

²⁰ <https://www.topofthesouthmaps.co.nz/app/>





Nelson North WWTP discharge consent renewal

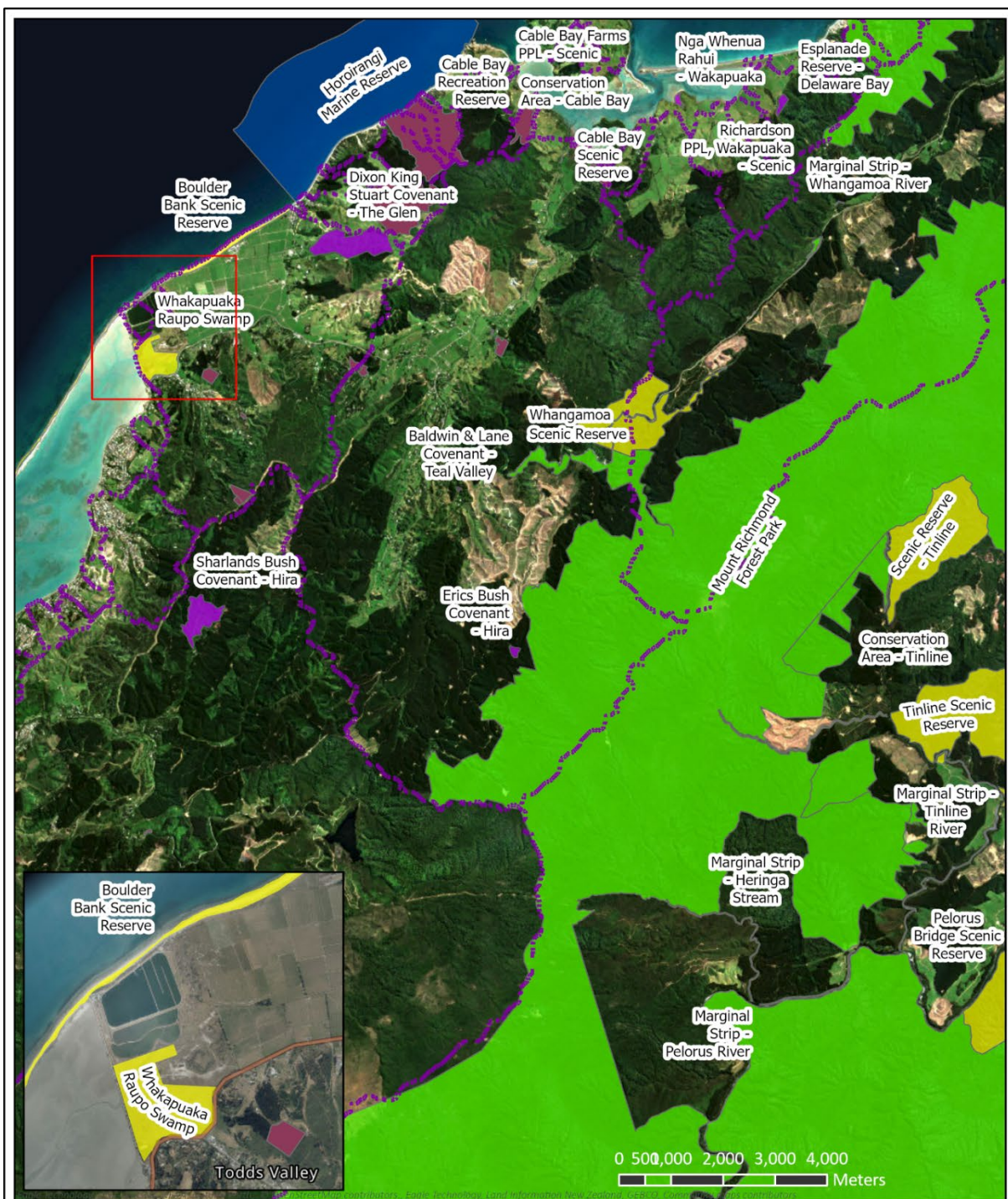
 Stantec  Ecological district boundary (DOC)

Map displayed in NZGD 2000 New Zealand Transverse Mercator coordinate system.
Author: bmmlling

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Figure A-3 Ecological regions and districts near Nelson





Nelson North WWTP discharge consent renewal



DOC public conservation area

- Conservation Area
- Marginal Strip
- Marine Area
- Reserve

Covenant area

- DOC
- QEII

Map displayed in NZGD 2000 New Zealand Transverse Mercator coordinate system.
Author: bmmilling

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Figure A-4 DOC public conservation areas and DOC and Queen Elisabeth II covenant areas

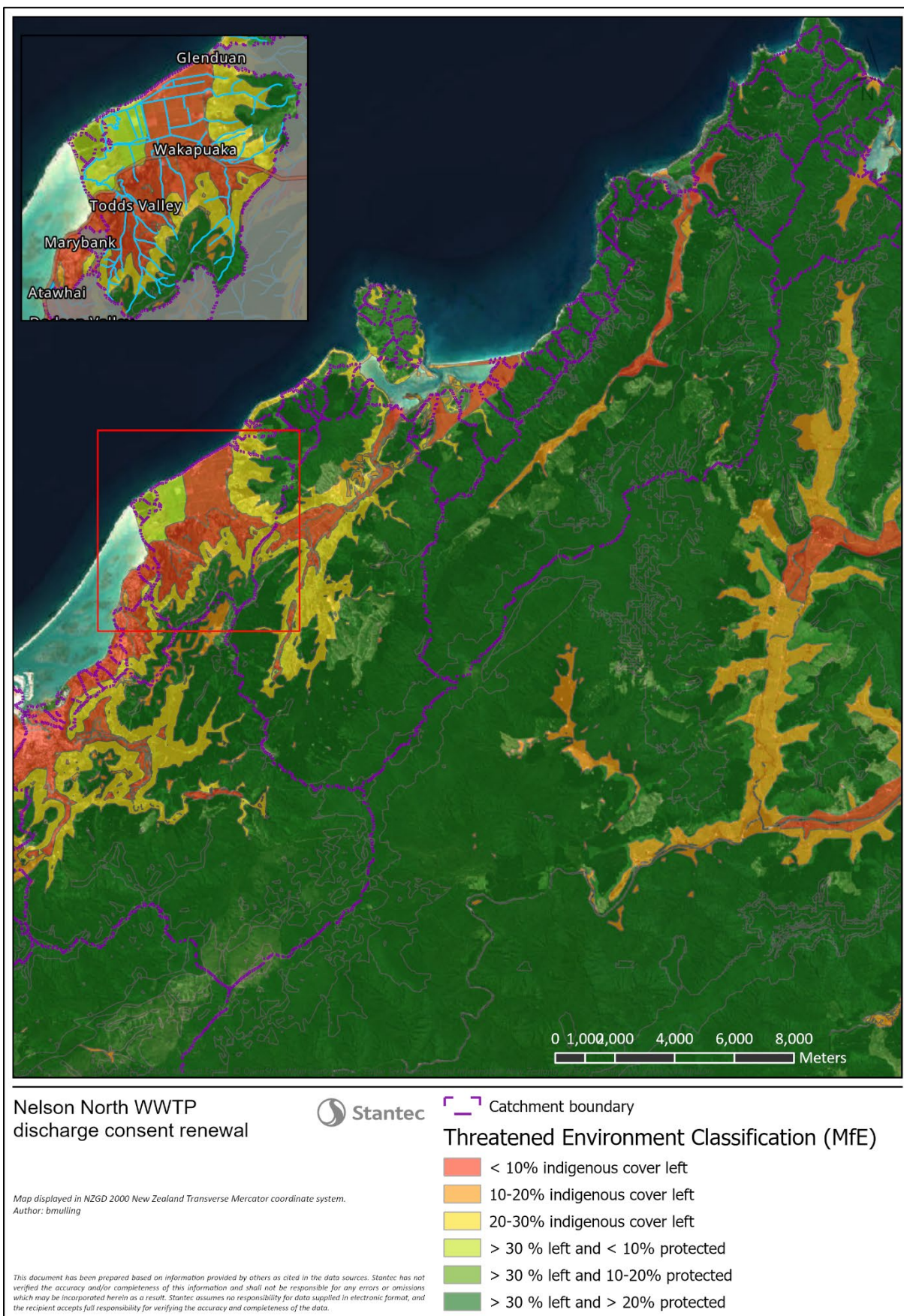
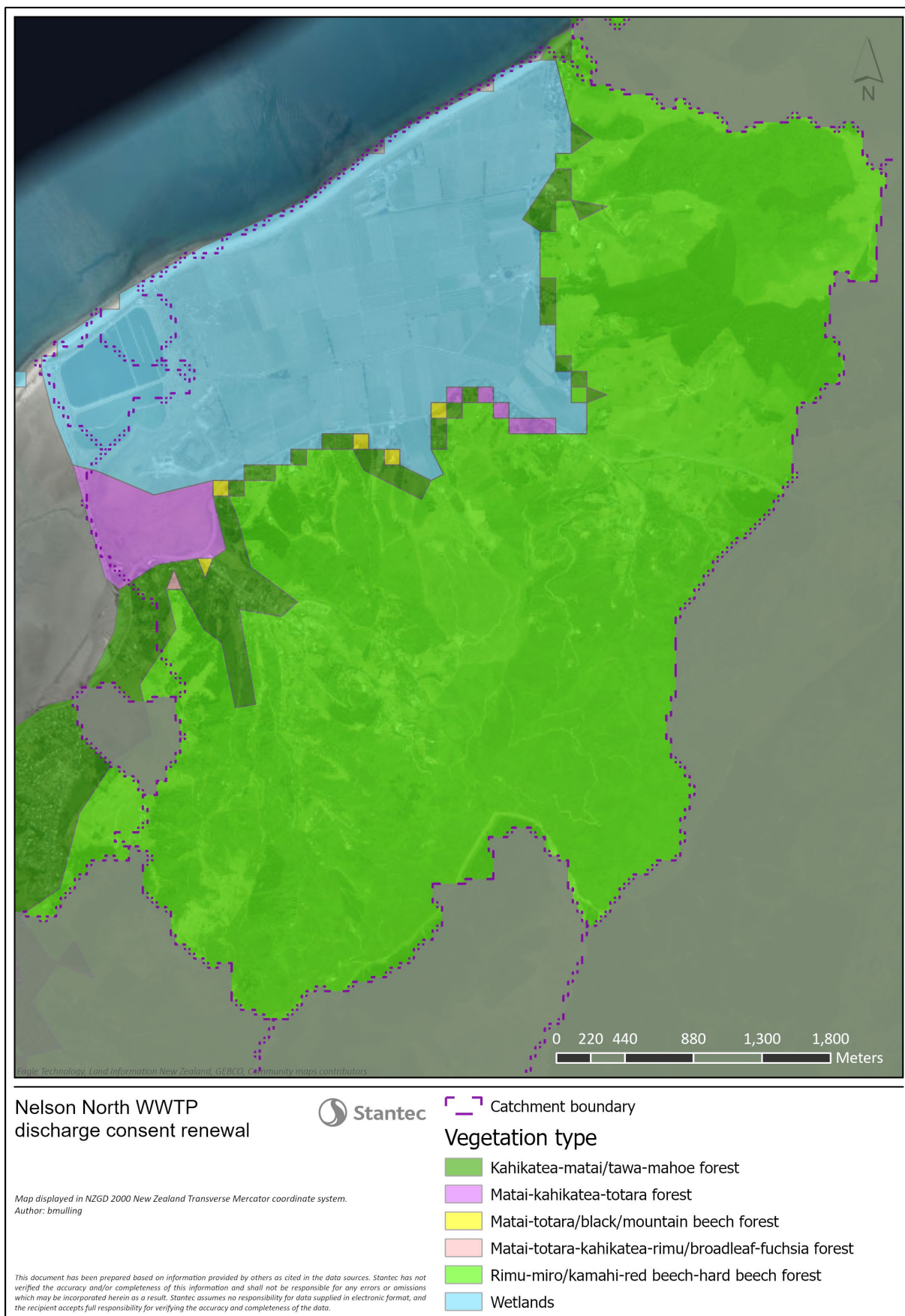


Figure A-5 Threatened Environments Classification (Ministry for the Environment 2012)



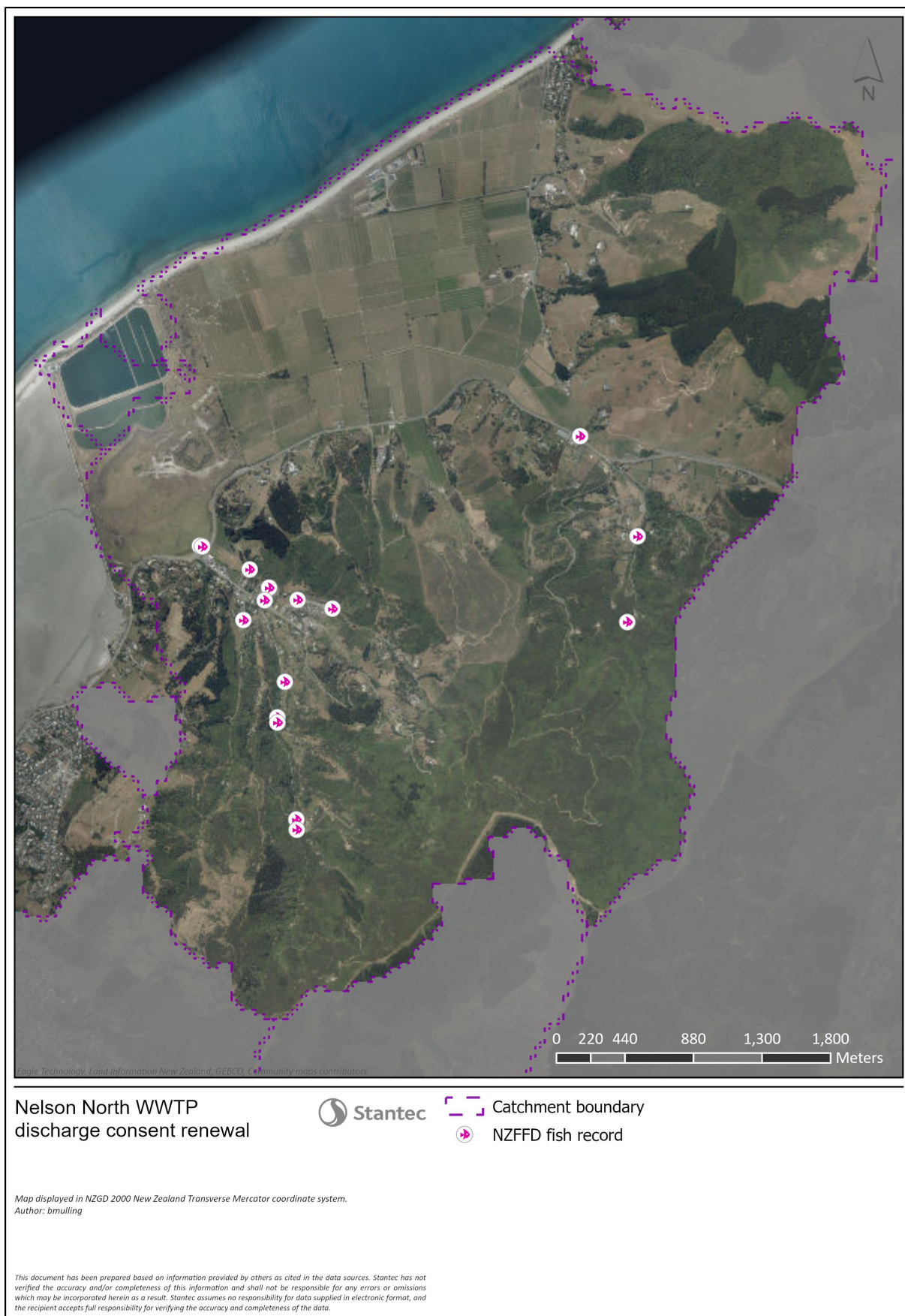


Figure A-7 Location of NZFFD records within the catchment between 2012 and 2022





Appendix B Additional Tables

Table B-1: Flora species recorded at the Wakapuaka Sandflats (FuturEcology 2019, Simpson 2013, iNaturalist n.d.)

Common Name	Māori Name	Scientific Name	Threat status ²¹
New Zealand celery		<i>Apium prostratum</i>	Not Threatened
Jointed rush	Oioi	<i>Apodasmia similis</i>	Not Threatened
Shining spleenwort		<i>Asplenium oblongifolium</i>	Not Threatened
Hen and chicken fern		<i>Asplenium bulbiferum</i>	Not Threatened
		<i>Asplenium polyodon</i>	Not Threatened
Ground spleenwort		<i>Asplenium terrestre</i>	Not Threatened
Estuary tussock		<i>Austrostipa stipoides</i>	Not Threatened
Bindweed		<i>Calystegia silvatica</i>	Introduced
Shore Bindweed	Rauparaha	<i>Calystegia soldanella</i>	Not Threatened
Mingimingi	Mingimingi	<i>Coprosma propinqua</i>	Not Threatened
Taupata	Taupata	<i>Coprosma repens</i>	Not Threatened
Cabbage Tree	Ti kōuka	<i>Cordyline australis</i>	Not Threatened
Pampas grass		<i>Cortaderia selloana</i>	Introduced
Toetoe		<i>Cortaderia richardii</i>	Not Threatened
Yellow Buttons		<i>Cotula coronopifolia</i>	Not Threatened
Fairy Stonecrop		<i>Crassula multicava</i>	Introduced
Macrocarpa		<i>Cupressus macrocarpa</i>	Introduced
Umbrella sedge		<i>Cyperus eragrostis</i>	Introduced
Coastal cutty grass		<i>Cyperus ustilatus</i>	Not Threatened
Broom		<i>Cytisus scoparius</i>	Introduced
New Zealand Ice Plant	Horokaka	<i>Disphyma australe australe</i>	Not Threatened
Akeake	Akeake	<i>Dodonaea viscosa</i>	Not Threatened
Knobby club rush	Wiwi	<i>Ficinia nodosa</i>	Not Threatened
Tall Fescue		<i>Festuca arundinacea</i>	Introduced
Fennel		<i>Foeniculum vulgare</i>	Introduced
Salt barley		<i>Hordeum marinum</i>	Introduced
Sea rush		<i>Juncus kraussii</i>	Not Threatened
Giant Rush		<i>Juncus pallidus</i>	Not Threatened
Kanuka	Kānuka	<i>Kunzea ericoides</i>	Threatened - Nationally Vulnerable
Manuka	Mānuka	<i>Leptospermum scoparium</i>	At Risk - Declining
Common Mallow		<i>Malva sylvestris</i>	Introduced
Thick-leaved mahoe		<i>Meliccytus crassifolius</i>	
Onion-leaved orchid		<i>Microtis unifolia</i>	Not Threatened
Small-Leaved Pohuehue		<i>Muehlenbeckia complexa</i>	Not Threatened
Tasmanian Nagio		<i>Myoporum insulare</i>	Introduced
Monro's forget-me-not		<i>Myosotis monroi</i>	At Risk - Naturally uncommon
Parrots feather		<i>Myriophyllum aquaticum</i>	Introduced

²¹ Based on (de Lange, et al. 2017) and/or NZPCN website



Common Name	Māori Name	Scientific Name	Threat status ²¹
Small-Leaved Tree daisy		<i>Oleari lineata</i>	At Risk - Declining
Coastal Tree Daisy		<i>Olearia solandri</i>	Not Threatened
Tauhinu	Tauhinu	<i>Ozothamnus leptophyllus</i>	Not Threatened
Swamp Flax	Harakeke	<i>Phormium tenax</i>	Not Threatened
Hounds tongue fern		<i>Phymatosorus pustulatus</i>	Not Threatened
Salt marsh Ribbonwood		<i>Plagianthus divaricatus</i>	Not Threatened
Bucks horn plantain		<i>Plantago coronopus</i>	Introduced
Ribwort Plantain		<i>Plantago lanceolata</i>	Introduced
Portulaca		<i>Portulaca oleracea</i>	Introduced
"Sabre"		<i>Pseudopanax crassifolius x lessonii</i>	-
Houpara	Houpara	<i>Pseudopanax lessonii</i>	Not Threatened
Bracken	Rarauhe	<i>Pteridium esculentum</i>	Not Threatened
Saltgrass		<i>Puccinellia stricta</i>	Not Threatened
English Oak		<i>Quercus robur</i>	Introduced
Blackberry		<i>Rubus fruticosus</i>	Introduced
Dock		<i>Rumex obtusifolius</i>	Introduced
Sea primrose		<i>Samolus repens</i>	Not Threatened
Glasswort		<i>Salicornia australis</i>	Not Threatened
Beaded samphire		<i>Salicornia quinqueflora</i>	Not Threatened
Mexican Stonecrop		<i>Sedum mexicanum</i>	Introduced
Selleria	Remuremu	<i>Selleria radicans</i>	Not Threatened
Shore groundsel		<i>Senecio lautus</i>	Not Threatened
Native musk		<i>Thyridia repens</i>	At Risk - Naturally uncommon
Strawberry clover		<i>Trifolium fragiferum</i>	Introduced
Three-Ribbed Arrowgrass		<i>Triglochin striata</i>	Not Threatened
Gorse		<i>Ulex europaeus</i>	Introduced
Great mullein		<i>Verbascum thapsus</i>	Introduced
Periwinkle		<i>Vinca major</i>	Introduced

Table B-2 List of avian species recorded within a 10km radius from the NWWTP

Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Anthus novaeseelandiae novaeseelandiae</i>	New Zealand Pipit	pīhoihoi	✓	✓		At Risk - Declining	Terrestrial	Observed. Site is suitable, near the coastline	Terrestrial. Widespread in rough open habitats. Often along coastlines and rivers. They are present within felled areas of pine forest in the central North Island and remaining wetlands
<i>Calidris canutus rogersi</i>	Red Knot		✓			At Risk - Declining	Terrestrial	Unlikely. Sites within the wider region are significantly more suitable for the species	Terrestrial. Migrant species. Limited distribution in the South Island, predominantly the Northern South Island (Especially Farewell Spit) and Southland. Mainly found in areas with extensive sand and mudflats
<i>Charadrius bicinctus bicinctus</i>	Double banded plover	tūturiwhatu	✓	✓		At Risk - Declining	Freshwater	Unlikely. Seashore and estuary are adjacent to the site and are likely preferred. However, settlement pond could be utilized when accessing adjacent areas.	Freshwater. Common on seashores, estuaries and riverbeds.
<i>Eudyptula minor</i>	Little penguin	kororā		✓		At Risk - Declining	Marine	Unlikely. Significantly more suitable habitats are present adjacent to the site, and within the wider area.	Marine, widely distributed along the New Zealand coastline, remaining within 25km of the coast during breeding season.
<i>Gallirallus philippensis assimilis</i>	banded rail	mioweka	✓		✓	At Risk - Declining	Terrestrial	Observed. Site is adjacent to a wetland, and estuary.	Terrestrial. Predominantly in Mangrove and saltmarsh vegetation in the upper North Island, Marlborough and Nelson
<i>Haematopus finschi</i>	South Island Oystercatcher	tōrea	✓	✓		At Risk - Declining	Terrestrial	Observed. Site is adjacent to suitable habitat	Terrestrial. Occurring throughout the country, in most estuaries and harbours. Breeding usually occurs inland in the South Island. Breeding

²² Coastal Birds of the Tasman/Nelson Region, Shuckard R & Melville D S. 2019 ([Nelson-Nature-Coast-Coastal-birds-of-NelsonTasman-BirdsNZ-Feb19.pdf](#))

²³ Based on (Robertson, et al. 2021)

²⁴ Based on habitat description

²⁵ Information retrieved from nzbirdsonline.org.nz / nzbirdsonline.org.nz.



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
									has been attempted in Hawkes Bay and the Wairarapa
<i>Larus bulleri</i>	Black-billed Gull	tarāpuka	✓	✓	✓	At Risk - Declining	Freshwater	Observed. Adjacent to suitable habitat. Settlement pond may be considered suitable habitat itself	Freshwater; Inland rivers, coastal shell banks, sandspits, and lakes
<i>Larus novaehollandiae scopulinus</i>	red-billed gull	tarāpunga	✓	✓	✓	At Risk - Declining	Marine	Likely. Species is widespread, and the site is near the coast.	Marine. Most coastal locations throughout New Zealand, often found in towns. Forms dense breeding colonies
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	kūaka	✓	✓		At Risk - Declining	Terrestrial	Observed. Near estuary and farmland	Marine. Primarily in Harbours and estuaries (seasonally due to migration). Predominantly forage in soft intertidal substrates, occasionally in wet pasture.
<i>Petroica australis australis</i>	South island robin	kakaruai	✓	✓		At Risk - Declining	Terrestrial	Unlikely. More suitable habitat is present within the wider area.	Terrestrial. Occurs in the North, and the South of the South Island. Occurs in mature forest, scrub and exotic plantations, especially with an open understory
<i>Poodytes punctatus</i>	New Zealand Fernbird	mātātā	✓	✓	✓	At Risk - Declining	Terrestrial	Observed. Site is adjacent to a wetland	Terrestrial. Wide but patchy distribution in dense wetland vegetation. Locally common in suitable habitat
<i>Porzana pusilla affinis</i>	marsh crake	koitareke	✓	✓		At Risk - Declining	Freshwater	Observed. Site is adjacent to a wetland	Freshwater, Recorded throughout the country, with more observations in the South Island. Recorded in a large variety of inland and coastal wetland types. <i>Carex secta</i> and <i>Typha orientalis</i> swamps in particular. Occasionally observed in estuarine reed beds and modified wet pasture
<i>Puffinus griseus</i>	sooty shearwater	tītī		✓		At Risk - Declining	Marine	Unlikely. Species is marine, site could be utilized for short periods of time	Marine. A marine bird with a wide distribution. Present in New Zealand coastal waters
<i>Sterna striata striata</i>	White-fronted Tern	tara	✓	✓	✓	At Risk - Declining	Marine	Observed. Site is at the coast	Marine. Coastal species. Rarely found far from the coast.



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Acanthis cabaret</i>	Lesser Redpoll		✓			Introduced and naturalized	Terrestrial	Observed. Site is surrounded by open areas, providing suitable habitat	Terrestrial. Occurs in all types of open country. Including rough scrubby farmland and tussock grasslands. Also found in forests and scrubland, however typically in clearings
<i>Alauda arvensis</i>	Eurasian Skylark		✓			Introduced and naturalized	Terrestrial	Observed. Suitable habitat adjacent	Terrestrial. Widespread in farmland, dune fields, tussock grassland and other open habitats. Typically absent from wooded areas/forest
<i>Anas platyrhynchos</i>	Mallard	rakiraki	✓	✓		Introduced and naturalized	Freshwater	Observed. Site is adjacent to pastoral areas, and urban environments are nearby. Provides freshwater habitat	Freshwater. Occurs throughout New Zealand. Typically, in pastoral or urban environments
<i>Anser anser</i>	Greylag goose	kuihi*	✓	✓		Introduced and naturalized	Freshwater	Likely. Site is a pond and pasture is nearby	Freshwater. Widespread in New Zealand. Usually in Urban parks, pasture, or ponds
<i>Branta canadensis</i>	Canada Goose	kuihi*	✓			Introduced and naturalized	Freshwater	Observed. Site is a large pond; agricultural land is nearby-	Freshwater. Pastoral land adjacent to lakes or large ponds is preferred
<i>Callipepla californica</i>	California Quail	tikaokao	✓	✓		Introduced and naturalized	Terrestrial	Observed. Nearby suitable habitat	Terrestrial. Prefers uncultivated open scrubland. Frequents rough scrubby edges of rivers, inlets, forests, roads, and rural gardens
<i>Carduelis carduelis</i>	European Goldfinch		✓	✓		Introduced and naturalized	Terrestrial	Observed. Suitable habitat adjacent. Species inhabits a wide variety of habitats	Terrestrial. Almost anywhere but dense native forest. Typically, farmland, orchards, coastal vegetation, riverbeds, plantations, and urban areas
<i>Carduelis chloris</i>	European Greenfinch		✓	✓		Introduced and naturalized	Terrestrial	Observed. Suitable habitat adjacent. Large amounts of human altered environment are nearby	Terrestrial. Predominantly in human altered environments such as farmland, scrub, pine plantations, orchards, and parks/gardens
<i>Columba livia</i>	Rock Pigeon		✓	✓		Introduced and naturalized	Terrestrial	Observed. Urban areas and agricultural land are nearby	Terrestrial. Widespread, but mostly constrained to urban areas and agricultural land
<i>Emberiza cirius</i>	Cirl Bunting		✓			Introduced and naturalized	Terrestrial	Observed. Suitable habitat is nearby	Terrestrial, predominantly on the eastern south island, sparse or not present elsewhere. Prefers dry,



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
									open pastoral country with some scrub, trees or hedgerows
<i>Emberiza citrinella</i>	Yellowhammer		✓	✓		Introduced and naturalized	Terrestrial	Observed. Species is widespread and common. Area surrounding site may be considered open.	Terrestrial. Widespread and common in open country.
<i>Fringilla coelebs</i>	Common Chaffinch		✓			Introduced and naturalized	Terrestrial	Observed. Suitable habitat is nearby	Terrestrial. Occupy a large range of habitats, wherever there are trees or scrub. They inhabit indigenous and exotic forests and sub-alpine scrub. Common in gardens, parks, orchards and farms with trees.
<i>Gymnorhina tibicen</i>	Australian Magpie		✓	✓		Introduced and naturalized	Terrestrial	Observed. More suitable habitat is nearby; however, the species is abundant.	Terrestrial. Abundant on farmland, in shelterbelts of pine, macrocarpa and gum trees. Often in urban environments such as parks
<i>Meleagris gallopavo</i>	Wild turkey	korukoru		✓		Introduced and naturalized	Terrestrial	Unlikely. Species has a sparse distribution, and habitat type is not preferred	Terrestrial. Sparsely distributed, often in rough farmland with scattered trees.
<i>Passer domesticus</i>	House Sparrow		✓	✓		Introduced and naturalized	Terrestrial	Observed. Farmland and human settlements are nearby	Terrestrial. Found everywhere except high mountains and bush. Species is associated with arable farmland and human habitation
<i>Phasianus colchicus</i>	Ring-necked pheasant			✓		Introduced and naturalized	Terrestrial	Unlikely. More suitable sites are present within the Nelson region	Terrestrial. Mainly found in drier areas of Nelson and Canterbury in the South Island. Most abundant in the North Island.
<i>Prunella modularis</i>	Dunnock		✓			Introduced and naturalized	Terrestrial	Observed. Suitable habitat is adjacent	Terrestrial. Common in orchards, farms, gardens, scrub and forest. Distributed throughout New Zealand, aside from the Northern North Island.
<i>Sturnus vulgaris</i>	European Starling	tāringi	✓	✓		Introduced and naturalized	Terrestrial	Observed. Widespread distribution	Terrestrial. Occurring throughout the country, aside from alpine areas and native forest.
<i>Turdus merula</i>	Eurasian Blackbird		✓	✓		Introduced and naturalized	Terrestrial	Observed. Suitable habitat adjacent	Terrestrial. Widespread throughout the country. Occurring in Urban areas, farmland, orchards and indigenous lowland forest

Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Turdus philomelos</i>	Song Thrush		✓	✓		Introduced and naturalized	Terrestrial	Observed. Adjacent habitat is suitable	Terrestrial. Widespread throughout the country, occurring in urban areas, farmland, orchards, and lowland indigenous forest
<i>Arenaria interpres</i>	Ruddy Turnstone		✓			Non-resident Native - migrant	Terrestrial	Unlikely. Adjacent habitats are significantly more suitable	Terrestrial. Typically inhabiting coastal areas during their time in New Zealand, preferring rocky or stony shores
<i>Chlidonias leucopterus</i>	White-winged Tern		✓	✓	✓	Non-resident Native - migrant	Freshwater	Observed. Site is adjacent to preferred habitat, and likely provides suitable habitat itself	Freshwater. Summer migrants to New Zealand, preferring shallow coastal lagoons, estuaries and associated wetlands.
<i>Coprotheres pomarinus</i>	Pomarine Jaeger		✓			Non-resident Native - migrant	Terrestrial	Unlikely. Species is uncommon in New Zealand, and habitat is not preferred.	Terrestrial/Marine. Regular but uncommon visitor to New Zealand between December and April. Often seen off sandy coastal beaches.
<i>Stercorarius parasiticus</i>	Parasitic Jaeger		✓			Non-resident Native - migrant	Marine	Unlikely. Site is not suitable, adjacent areas are significantly more likely to be utilized	Marine. Occurs around the Mainland and Chatham islands in coastal waters, harbours, sounds and estuaries from November to April.
<i>Sternula albifrons sinensis</i>	Little tern				✓	Non-resident Native - migrant	Marine	Unlikely. Species is a seasonal migrant. More suitable habitat is present nearby	Marine. Typically in New Zealand between October and March, however younger birds may arrive as late as May. In New Zealand they inhabit sheltered coastal waters, including Harbours and Estuaries
<i>Ardea alba modesta</i>	white heron	kōtuku	✓		✓	Threatened – Nationally Critical	Freshwater	Observed. Site is suitable habitat, and adjacent to further suitable habitat	Freshwater. Most often seen in harbours or estuaries. Occasionally seen at freshwater wetlands and high-country lakes.
<i>Chlidonias albobristatus</i>	Black-fronted Tern	tarapirohe	✓		✓	Threatened – Nationally Endangered	Marine	Observed. Adjacent to suitable habitat.	Marine/Freshwater. Primarily on the braided rivers of the South Island during breeding season. Outside of breeding they are primarily found in coastal areas such as harbours, estuaries and lagoons.
<i>Egretta sacra sacra</i>	Pacific Reef-Heron	matuku moana	✓			Threatened	Terrestrial	Unlikely. Adjacent habitats are significantly more suitable	Terrestrial. Prefers rocky shores and estuary mudflats. Rarely seen inland



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Anarhynchus frontalis</i>	Wrybill	ngutu-pare	✓			Threatened - Nationally Increasing	Freshwater	Unlikely. Habitat is not suitable. Could be utilized during migration, or in between foraging efforts	Freshwater. Breeding only on the South Island on braided riverbeds. Feeding occurs on intertidal mudflats.
<i>Poliocephalus rufopectus</i>	New Zealand Grebe	weweia	✓	✓		Threatened - Nationally Increasing	Freshwater	Observed. Likely a recent reintroduction as breeding pairs, or non-breeding visitors	Freshwater. Formally widespread on the South Island, the species went extinct as a breeding species on the South Island in the 1940s, breeding pairs have been observed in upper South Island since 2012. Breeding birds prefer shallow water with dense vegetation in small freshwater lakes and ponds, sand-dune lakes and lagoons.
<i>Anas superciliosa</i>	Pacific Black Duck	pāpera	✓			Threatened - Nationally Vulnerable	Freshwater	Observed. Habitat is suitable.	Freshwater. Population has significantly diminished; species is often mistaken for hybrids and mallards.
<i>Hydroprogne caspia</i>	Caspian Tern	taranui	✓		✓	Threatened - Nationally Vulnerable	Marine	Observed. Adjacent to suitable habitat.	Marine. Primarily sheltered bays and harbours. Seen regularly at inland lakes and rivers.
<i>Hymenolaimus malacorhynchos</i>	Blue duck	whio		✓		Threatened - Nationally Vulnerable	Freshwater	Highly Unlikely. Site is far from suitable habitat. However, a bird was observed within the Nelson CBD	Freshwater. Patchy distribution, largely in forested headwater catchments. Extends downstream provided suitable gradient, riparian forest and suitably clean water
<i>Puffinus huttoni</i>	Hutton's Shearwater	Kaikōura tītī	✓			Threatened - Nationally Vulnerable	Marine	Unlikely. Site is not near a breeding site and distribution is poorly understood outside of breeding season	Marine, breeding colonies are near Kaikōura during September to March. Distribution at sea is poorly understood, however includes migration.
<i>Stictocarbo punctatus</i>	Spotted Shag	kawau pāteketeke	✓	✓	✓	Threatened - Nationally Vulnerable	Marine	Observed. Species is coastal	Marine. Mainly in South Island coastal waters. Populations on the Kapiti coast and in Wellington harbour
<i>Falco novaeseelandiae</i>	New Zealand Falcon	kārearea	✓	✓		Threatened - Nationally Vulnerable	Terrestrial	Observed. Species has low preference of habitat types.	Widely distributed across the country, where suitable habitat is present. Breeding occurs in a wide



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
									variety of habitat from coastal areas to above the tree line.
<i>Fulica atra australis</i>	Eurasian Coot		✓			At Risk - Naturally Uncommon	Freshwater	Observed. Settlement pond and adjacent wetland are suitable habitat	Freshwater. Found throughout New Zealand, although population is low. The species is entirely aquatic, preferring freshwater lakes and ponds with submerged vegetation and reedy, grassy areas
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant/shag	kawau tuī	✓		✓	At Risk - Naturally Uncommon	Freshwater	Observed. Site is suitable, and adjacent to other suitable habitats	Freshwater. Mostly in harbours and lakes. Also braided rivers and muddy edges of inlets, lakes, and ponds
<i>Platalea regia</i>	Royal Spoonbill	kotuku ngutupapa	✓	✓	✓	At Risk - Naturally Uncommon	Terrestrial	Observed. Adjacent habitat is suitable	Terrestrial. Inhabits estuaries and wetlands outside of breeding season. Breeding occurs in coastal areas
<i>Psittacula krameri</i>	rose-ringed parakeet			✓		Introduced - Not Established	Terrestrial	Unlikely. No viable wild populations in New Zealand	Terrestrial. No viable wild populations within New Zealand.
<i>Anas gracilis</i>	Gray Teal	tētē-moroiti	✓	✓		Not Threatened	Freshwater	Observed. Suitable habitat and adjacent to further suitable habitat.	Freshwater. Distributed throughout New Zealand, preferred habitat is shallow freshwater lakes, lagoons, and swamps with extensive marginal cover. Occasionally observed on salt or brackish water
<i>Anthornis melanura melanura</i>	New Zealand Bellbird	korimako	✓	✓		Not Threatened	Terrestrial	Observed. Suitable habitat near the site	Terrestrial. Found in both native and exotic forest, scrub, shelter belts, urban parks and gardens
<i>Aythya novaeseelandiae</i>	New Zealand Scaup	pāpango	✓	✓		Not Threatened	Freshwater	Observed. Site provides suitable habitat, and is adjacent to suitable habitat	Freshwater. Wide but patchy distribution. Preferring large, deep lakes, but increasing in lowland lakes, slow rivers, and salt water
<i>Chrysococcyx lucidus lucidus</i>	Shining bronze cuckoo	pīpīwharaua		✓		Not Threatened	Terrestrial	Unlikely. Grey warbler is not recorded at the site	Terrestrial. Distribution largely follows the grey warbler. The species is not present during winter
<i>Circus approximans</i>	Swamp Harrier	kāhu	✓	✓		Not Threatened	Terrestrial	Observed. Wide niche and prefers open habitat	Terrestrial. Wider ecological niche, and abundant throughout most of the county. Adapted to hunt in open habitat



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Cygnus atratus</i>	Black Swan	kakīānau	✓	✓		Not Threatened	Freshwater	Observed. Adjacent to suitable habitat. Settlement pond may be considered suitable habitat itself	Freshwater. Occurring on most lakes, larger constructed ponds and some estuaries
<i>Egretta novaehollandiae</i>	White-faced Heron	matuku moana	✓	✓	✓	Not Threatened	Terrestrial	Observed. Site is suitable habitat, and adjacent to further suitable habitat	Terrestrial. Primarily rocky shores and estuary mudflats. Also found near lake edges and farm ponds.
<i>Gallirallus australis australis</i>	Weka		✓	✓		Not Threatened	Terrestrial	Observed. Site provides suitable habitat, and nearby areas may be considered habitat margins	Terrestrial. Occurs in a variety of habitats, from coastline to above the treeline. Includes wetlands, pasture, scrubland, native and exotic forest. Often found at habitat margins.
<i>Gerygone igata</i>	Gray Gerygone	riroriro	✓	✓		Not Threatened	Terrestrial	Observed. Nearby habitat is suitable	Terrestrial. Occurring throughout the country in areas with trees or scrubs
<i>Hemiphaga novaeseelandiae</i>	New Zealand Pigeon	kererū	✓	✓		Not Threatened	Terrestrial	Unlikely. Site is not forested. Nearby areas provide significantly more suitable habitat	Terrestrial. Inhabit a wide variety of forest types, including exotic forestry
<i>Himantopus himantopus leucocephalus</i>	Pied Stilt	poaka	✓	✓		Not Threatened	Freshwater	Observed. Site is adjacent to a wetland	Freshwater. Habitat is a wide variety of wetlands. Population is widespread throughout New Zealand
<i>Hirundo neoxena neoxena</i>	Welcome Swallow	warou	✓	✓		Not Threatened	Terrestrial	Observed. Site is adjacent to wetland and the coast	Terrestrial. Occurring in most habitats other than dense forest or alpine areas. Typically seen near wetlands or the coast.
<i>Larus dominicanus dominicanus</i>	Southern Black-Backed gull / Kelp Gull	karoro	✓	✓	✓	Not Threatened	Marine	Observed. Habitat is suitable and the species is common	Marine. Common throughout New Zealand, in most habitats other than forest and scrub. Typically, coastal
<i>Morus serrator</i>	Australasian gannet	takapu	✓	✓		Not Threatened	Marine	Unlikely. There is more suitable habitat within a relatively short distance from the site.	Marine/Terrestrial. Occurs in all types of open country. Including rough scrubby farmland and tussock grasslands. Also found in forests and scrubland, however typically in clearings
<i>Ninox novaeseelandiae novaeseelandiae</i>	morepork	ruru		✓		Not Threatened	Terrestrial	Unlikely. Area near the site is not well forested. Areas of suitable, and expansive habitat are present within the nearby region	Terrestrial. Wide distribution through forests in New Zealand. Roosting occurs in dark forested areas with high overhead cover
<i>Petroica macrocephala</i>	Tomtit	miromiro	✓			Not Threatened	Terrestrial	Possible. Suitable habitat is nearby, and the species has a wide preference	Terrestrial. Occurs in a variety of habitats from sea level to subalpine zones throughout the country.



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Porphyrio melanotus</i>	Australasian Swamphen	Pukeko	✓	✓		Not Threatened	Freshwater	Observed. Site is adjacent to wetland, and an estuary, which may be brackish at times. Further suitable habitat is nearby	Freshwater. Typically, near sheltered fresh or brackish water. Frequently observed near roadside or drainage ditches and forest margins
<i>Prosthemadera novaeseelandiae novaeseelandiae</i>	Tui	tūī	✓	✓		Not Threatened	Terrestrial	Observed. Species utilizes a wide variety of habitats	Terrestrial. Adaptable and uses a range of habitats, particularly forests.
<i>Rhipidura fuliginosa</i>	New Zealand Fantail	pīwakwaka	✓	✓		Not Threatened	Terrestrial	Observed. Species utilizes a wide variety of habitats	Terrestrial. A wide variety of habitats are utilized by the species.
<i>Spatula rhynchotis</i>	Australasian Shoveler	kuruwhengi	✓	✓		Not Threatened	Freshwater	Observed. Site is adjacent to a wetland, and a relatively sheltered estuary	Freshwater. Occurs primarily on large freshwater wetlands, occasionally sheltered estuaries and brackish lakes.
<i>Tadorna variegata</i>	Paradise Shelduck	pūtangitangi	✓	✓		Not Threatened	Freshwater	Observed. Site and adjacent habitats are suitable	Freshwater. The species is widely distributed through New Zealand, both by geography and habitat. They occur throughout pastoral areas, river flats, and shorelines of large lakes, among other areas
<i>Todiramphus sanctus vagans</i>	New Zealand Kingfisher	kōtare	✓	✓	✓	Not Threatened	Terrestrial	Observed. Habitat is suitable and/or adjacent to suitable habitat	Terrestrial. Coastal and freshwater habitats. Habitat is a wide range of forest, river margins, farmland, estuaries, and rocky coastlines. Prefers water with elevated perches adjacent
<i>Vanellus miles novaehollandiae</i>	Masked Lapwing		✓	✓		Not Threatened	Terrestrial	Observed. Suitable habitat at and around the site	Terrestrial. Widespread across a range of open habitats in New Zealand. May be found in any area with low vegetation, often near water, such as wetlands, riverbeds, lakes and estuaries or beaches.
<i>Zosterops lateralis lateralis</i>	Silvereye	tauhou	✓	✓		Not Threatened	Terrestrial	Observed. Adjacent habitat is suitable	Terrestrial. Common species widely distributed throughout New Zealand. In urban area, farmlands, orchards, forests and scrublands
<i>Haematopus unicolor</i>	Variable Oystercatcher	tōrea pango	✓	✓		At Risk	Terrestrial	Observed. Species is widespread, abundant, and utilizes a wide range of habitat	Terrestrial. Widespread and locally abundant. A wide range of habitat is suitable for the species.



Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Phalacrocorax varius varius</i>	Pied Cormorant/Shag	kāruhiruhi	✓	✓	✓	At Risk - Recovering	Terrestrial	Observed. Harbours and estuaries are nearby the site.	Terrestrial. Mainly coastal distribution, with foraging occurring in coastal marine waters, harbours and estuaries
<i>Pachyptila turtur</i>	Fairy prion	tītī wainui	✓	✓		At Risk - Relict	Marine	Unlikely. Nearby habitat is not preferred, and large amounts of suitable habitat are between the site and any breeding sites within the region	Marine, breeding colonies are predominantly on islands, such as in the outer Marlborough sounds. Usually seen over open sea near breeding colonies. Rarely seen in sheltered coastal areas.
<i>Phalacrocorax carbo novaehollandiae</i>	Black shag	kawau tuawhenua	✓		✓	At Risk - Relict	Freshwater	Observed. Site adjacent to multiple types of suitable habitat	Freshwater (and marine). Primarily in coastal waters, estuaries, harbours, rivers, streams, lakes and ponds
<i>Phalacrocorax melanoleucos brevirostris</i>	Little Pied Cormorant	kawau paka	✓	✓	✓	At Risk - Relict	Freshwater	Observed. The site provides suitable habitat	Freshwater. Widespread in coastal and freshwater habitats, including lakes, rivers, ponds, and streams
<i>Puffinus carneipes</i>	Flesh-footed Shearwater	toanui	✓			At Risk - Relict	Marine	Unlikely. Nearby habitat is not preferred, and large amounts of suitable habitat are between the site and any breeding sites within the region	Marine, Nesting occurs on 15 islands in New Zealand, in the Cook straight and Northern New Zealand. Foraging occurs north of 43S over shallow inshore seas or past the continental shelf. Migrating North after breeding season.
<i>Puffinus gavia</i>	Fluttering shearwater	pakaha	✓	✓		At Risk - Relict	Marine	Unlikely. Nearby habitat is not preferred, and large amounts of suitable habitat are between the site and any breeding sites within the region	Marine. Predominantly breeding on offshore islands, foraging largely occurs in inshore waters
<i>Phalaropus lobatus</i>	Red-necked Phalarope		✓			Non-resident Native - Vagrant	Marine	Observed. Unlikely. Despite being observed at the site, the species rarely visits New Zealand	Marine. Only 12 accepted records from New Zealand
<i>Spatula clypeata</i>	Northern Shoveler		✓			Non-resident Native - Vagrant	Freshwater	Observed. Unlikely. Despite being observed at the site, the species rarely visits New Zealand, and only 30 verifiable records exist in the country	Freshwater. Only 30 records from New Zealand, very limited occurrence in New Zealand.

Scientific name	Common name	Māori name	Ebird.org	iNaturalist.org	Council ²²	Threat status ²³	Habitat type	Likelihood of utilizing the NWWTP ponds and/or wetlands ²⁴	Habitat detail ²⁵
<i>Anas platyrhynchos x superciliosa</i>	Mallard x Pacific Black Duck (hybrid)		✓	✓		-	Freshwater	Observed. Habitat suitable, or nearby suitable habitat for parent species	Freshwater. Habitat assumed to be similar to parent species. Occurring in areas where both parent species are present.
<i>Cairina moschata</i>	Muscovy duck		✓	✓		Introduced and not established	Freshwater	Unlikely. Species is not established in New Zealand. Site may provide suitable habitat, however low population and distribution make it unlikely	Freshwater. The species is not established in the wild in New Zealand. Sparse distribution in lakes, ponds, slow moving streams and pasture
<i>Himantopus leucocephalus x novaezelandiae</i>	Pied x Black Stilt (hybrid)		✓			-	Freshwater	Unlikely. Black stilt are critically endangered and breeding population is confined to south canterbury / north Otago	
<i>Aythya australis</i>	Australian white-eyed Duck	Karakahia			✓ ²⁶	Non-resident Native - Vagrant	Freshwater	Unlikely. The habitat is suitable for the species, as emphasised by the high population of New Zealand Scaup, a similar species. However, the species is no longer established in New Zealand	Freshwater. The species is not established in New Zealand. Migration typically occurs when drought is likely within their home range in Australia. Prefers deep, still, freshwater. Rarely seen on land or in coastal marine areas.
<i>Podiceps cristatus australis</i>	Australasian crested grebe	Pūteketeki			✓ ²⁶	Threatened - Nationally Vulnerable	Freshwater	Unlikely. The species is not established in the Nelson region, with strongholds further south in Canterbury and Otago.	Freshwater. The species utilizes lakes in the Canterbury and Otago regions. Population across NZ and AUS is estimated to be under 3000, with approx. 600 in Otago.

²⁶ Spotted on the NWWTP wetlands in April 2023



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