Raglan Wastewater Consent

Ecological Impact Assessment

Prepared for Watercare Services Ltd
Prepared by Beca Limited

26 June 2025

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Emily Fensham	Draft for internal review	22/04/2025
2	Emily Fensham	Final for Client Review	17/06/2025
3	Emily Fensham	Final	26/06/2025

Document Acceptance

Action	Name	Signed	Date
Prepared by	Emily Fensham		26/06/2025
Reviewed by	Claire Webb		26/06/2025
Approved by	Garrett Hall		26/06/2025
on behalf of	Beca Limited		

Executive Summary

Beca Limited (Beca) has been engaged by Watercare Services Limited to prepare an Ecological Impact Assessment to support the resource consent application for the proposed new Raglan Wastewater Treatment Plant discharge location to Wainui Reserve Western Gully.

The proposed wastewater discharge design to the gully wetland includes:

- Construction of new discharge outlet and headwall
- Estimated discharge flow rates (dry weather flows) increasing from present day dry weather flows of 10L/s to 14L/s in 2030 and 18L/s in 2055.
- Class A treatment for up to 6,000m^3/day by 2030 and 7,500m^3/d by 2050.

The following measures have been integrated into the proposed discharge design[1]:

- Bifurcation of the polishing channel to dissipate flows
- Construction of a rock lined polishing channel from the outlet to the top of the gully wetland
- Restoration wetland and gully planting.

With these management measures incorporated into the proposed discharge design, the overall ecological effects of the proposal are assessed as **Low – Very Low** with a **Net Gain** in biodiversity values for the site.

[1] Letter – Raglan Wastewater Treatment Plan – Recommendations. Prepared by Beca, 17 September 2024.

1 Introduction

Beca Limited (Beca) has been engaged by Watercare Services Limited (Watercare) to prepare an Ecological Impact Assessment to support the resource consent application for the proposed discharge of treated wastewater associated with the Raglan Wastewater Plant. This EcIA is limited to the regional consenting matters only, in relation to the proposed discharge to the Wainui Reserve Western Gully.

1.1 Purpose and Scope

The purpose of this report is to determine the ecological values of the Wainui Reserve Western Gully site, and the types and levels of ecological effects associated with the proposed discharge.

The scope of this report includes the following:

- A desktop review of publicly accessible information;
- A site investigation to the receiving environment of the proposed discharge including undertaking wetland delineation surveys, watercourse habitat assessments, and terrestrial habitat assessments;
- An assessment of the ecological features and values in the project footprint; and
- An assessment of ecological effects and recommended mitigation prepared in general accordance with the Ecological Impact Assessment New Zealand (EIANZ) Guidelines (Roper-Lindsay et al., 2018).

1.2 Statutory Context

1.2.1 Existing Environment

The Raglan WWTP currently operates/ is consented under the Waikato Region Plan and the WWTP site is designated for wastewater treatment purposes (Reference M52).

The exiting Raglan WWTP outfall, is located near the entrance to the Harbour approximately 1.2km from the proposed new discharge location. The current consent[2] for the WWTP discharge is an interim consent which has been placed on hold and is operating under s124 of the RMA.

The proposed works requiring consent includes the primary discharge of treated wastewater to land (coastal gully system located in Wainui Reserve). New consents are needed under the Waikato Regional Plan and the Waikato Regional Coastal Plan (WRCP) to allow for the land discharge activities proposed on Wainui Reserve Western Gully. Any construction related consents will be sought at a later date.

Based on the consented baseline, this assessment is limited to the ecological effects of the proposed physical works and discharge of treated wastewater into the Wainui Reserve Western Gully.

1.2.2 Ecologically Relevant Policy and Provisions

This application is to discharge treated wastewater to land under the Waikato Regional Plan chapters 3, 5, 6 (water, land, air) and under the Operative WRCP and Proposed WRCP. Relevant policies and objectives are provided in Chapter 24 of the proposed WRCP, in particular Policy WD-P5 relating to the discharge of treated human sewage.

Consideration under the National Environmental Standards for Freshwater (NES:F) and National Policy Statement for Freshwater Management (NPS:FM) has been given as related to the extent and value of natural inland wetland and streams.

[2] Resource Consent Application – Raglan Wastewater Discharge/ Assessment of Environmental Effects. Prepared by Beca, 2019.

The resource consent requirements in relation to ecological matters regarding the proposed project footprint are as follows:

- The discharge of treated wastewater from the Raglan WWTP to land at the Wainui Reserve, and seepage to land at the WWTP via the pond systems is a Discretionary activity under section 3.5.4.5 of the WRP.
- The discharge of treated wastewater within, or within 100m from a natural inland wetland is a Discretionary activity under section 45 of the NES:F.
- Earthworks or land disturbance outside a 10 m, but within a 100 m, setback from a natural inland wetland is a Discretionary activity under section 45 of the NES:F.

Overall, a resource consent application for a **Discretionary** activity is being sought. Further details of consent requirements are detail in Section 4 for the Assessment of Environmental Effects[3].

1.3 Project Overview

This application is for the construction of a new wastewater discharge outfall and rock-lined channel to enable the primary discharge of treated wastewater from the Raglan WWTP to land. The exact location of the new outfall within the Wainui Reserve has not yet been confirmed however, a proposed location and a concept design have been prepared.

The treated wastewater will be discharged into a coastal gully system within the Wainui Reserve, located 3 km west of the Raglan township (Figure 1). The location of the discharge outfall headwall and naturalised rocky channel is within an area of pasture, with evidence of recent stock presence upgradient of the gully wetland. The channel is proposed to discharge into the gully wetland, which eventually leads to an ephemeral watercourse. This area has been planted within the last 15 – 20 years, however the plantings have not been overly successful with numerous stunted and windswept plants observed.

[3] Raglan Wastewater Discharge - Assessment of Environmental Effects. Prepared by Beca, 2025.

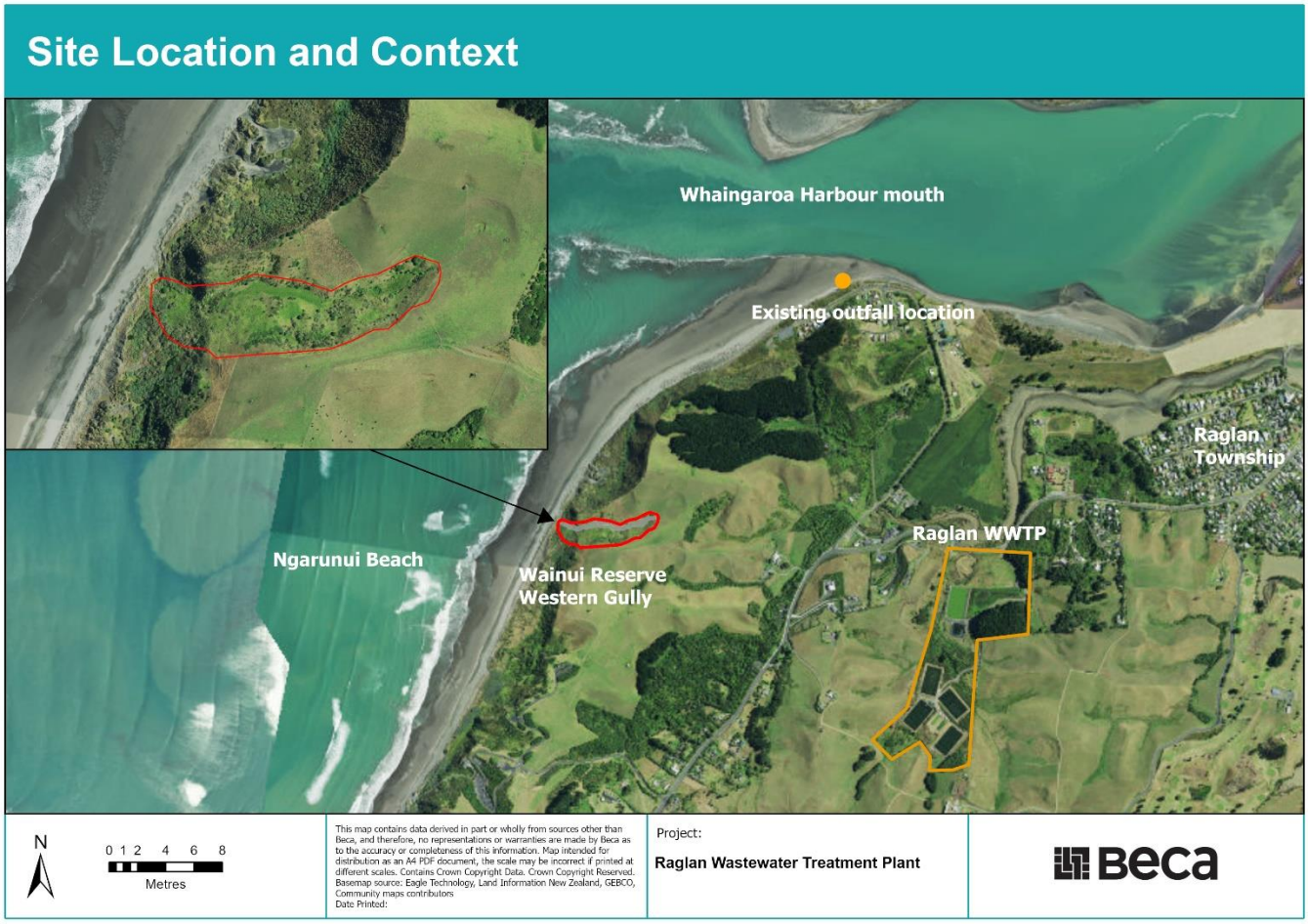

Figure 1. Location of the Wainui Reserve Western Gully system for the proposed wastewater discharge from the Raglan WWTP and the location of the existing harbour outfall.

2 Methodology

2.1 Desktop Review

A desk-based study was undertaken using information from publicly available sources. This was utilised to inform the field surveys undertaken, as well as provide an understanding on native fauna expected within the site:

- Google Earth and Land Information New Zealand (LINZ) aerial imagery;
- New Zealand Freshwater Fish Database (NZFFD): (Stoffels, 2022);
- New Zealand eBirds (Sullivan et al., 2009);
- Bioweb Herpetofauna Database;
- iNaturalist;
- Geospatial layers and other publicly accessible reports or information;
- Waikato Regional Council Maps Significant Natural Areas.

2.1.1 Identification of Potential Wetlands

Desktop screening for areas of ‘potential wetlands’ was undertaken using ecological information from the following sources:

- Google Earth and LINZ aerial photography;

- Retrolens historical imagery;
- Ecosystems of New Zealand (FENZ) historic wetland typology geospatial layer (Leathwick et al., 2010);
- Manaaki Whenua soil information from S-Map (Manaaki Whenua, 2021).

The topography and underlying geology across the pipeline alignment was first examined using contours, modelled overland flow paths and S-Map to understand where 'wet' areas might be located. Subsequently, recent aerial imagery from Google Earth and Retrolens were visually inspected for wetland features. The photography was analysed for hydrophytic plant communities using visual cues such as colour, shape, texture, and location. Particular attention was also paid to low stature vegetation which may be indicative of rushlands, and sharp changes in vegetation composition.

This information is used to inform the scope of field investigations needed to confirm wetland characteristics and condition to enable an assessment of ecological values and fulsome description of wetland ecosystem types

2.2 Field Investigations

Field investigations were undertaken Wednesday 28 August 2024 on a clear and sunny day, with short periods of rainfall in the morning and late afternoon. There has been approximately 140 mm of rainfall four weeks prior to the site visit[4] from the Waitetuna River (Old Mountain Road) monitoring site[5]. The field investigations comprised an overall site walkover of the gully system noting key ecological observations along the way, as well as undertaking wetland delineation surveys and watercourse assessments, which are detailed below.

2.2.1 Watercourse Surveys

During the site visit, a watercourse classification within the Wainui Reserve Western Gully in accordance with the Waikato Regional Council's definition of rivers which is outlined below:

A continually or intermittently flowing body of fresh water and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).

2.2.2 Wetland Delineation

Wetland delineation investigations were undertaken Wednesday 28 August 2024 within the receiving environment of the discharge (Figure 2). Four wetland plots (P1 – P4) were undertaken in accordance with the New Zealand Wetland Delineation Protocols and current Ministry for the Environment guidance in order to classify wetlands (Clarkson, 2014; Ministry for the Environment, 2022). Wetland determination was undertaken in accordance with the Waikato Regional Council definition of wetland, which reverts to the Resource Management Act (1991) - "*Includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions*."

[4] Waikato Regional Council – Environmental Data Hub. Retrieved 2/09/2024.

[5] Waitetuna River – Karamu Walkway (Old Mountain Road) is the closest monitoring site to the Raglan region.

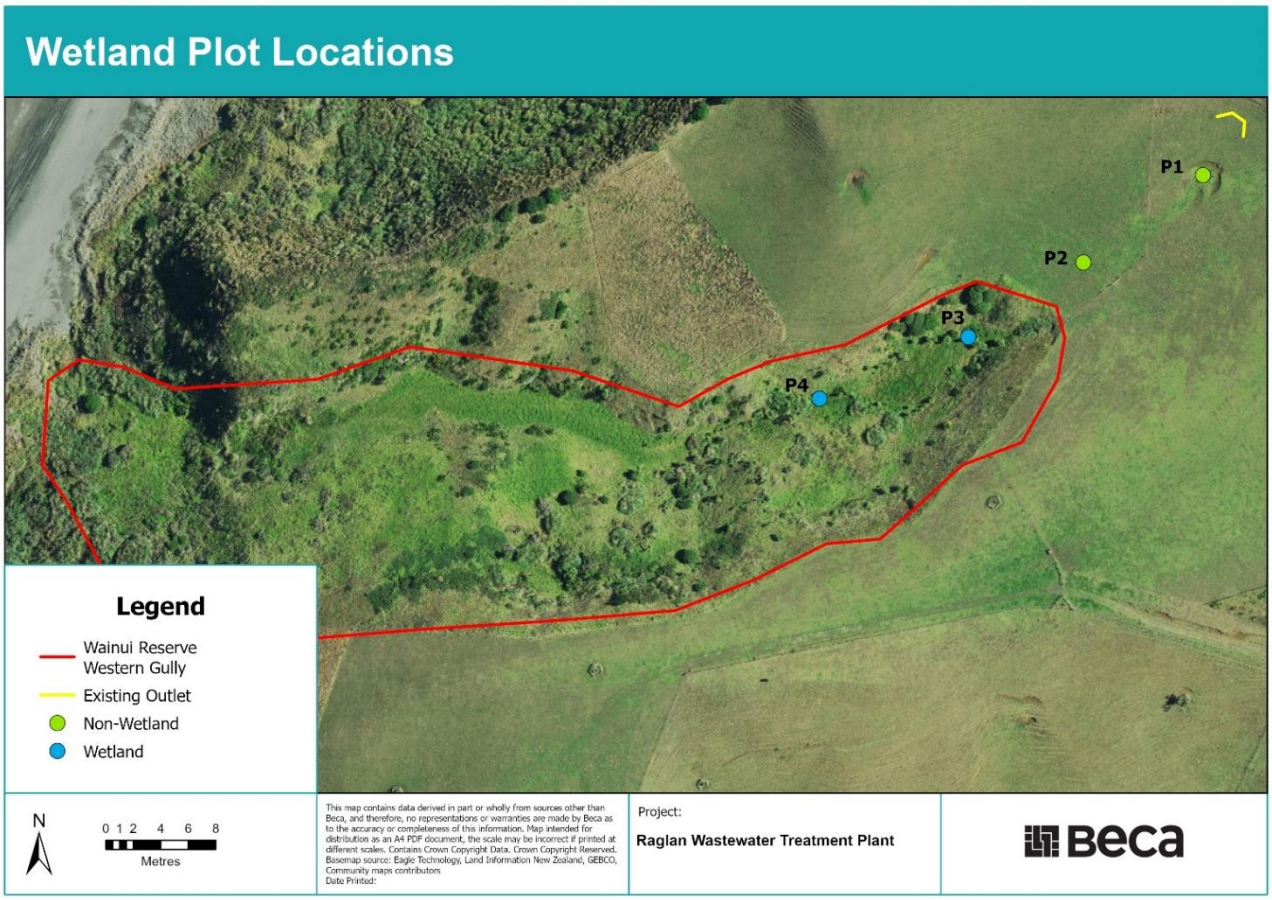

Figure 2. Wetland investigation plots within the Wainui Reserve Western Gully and within 100m.

2.2.2.1 Vegetation Assessment

Detailed investigations were not deemed necessary where an area was dominated by pasture species (> 50%) and/or only contained a few very scarce rushes amongst pasture vegetation. Additionally, where non-pasture species (facultative, facultative wetland, and obligate vegetation types) were identified, vegetation passed the rapid habitat assessment.

2.2.2.2 Soil Samples and Hydrological Assessment

Soil sampling was not conducted because the wetland area was inundated with surface water. Presence of surface water and other hydrological indicators were recorded in line with the Wetland Delineation Hydrology Tool for Aotearoa New Zealand (Ministry for the Environment, 2021).

2.2.2.3 Wetland Extent and Boundary Mapping

To delineate the wetland boundary, visual clues such as changes in topography and vegetation was used to determine an indicative wetland boundary. Topography within the site was sharply steeping southwest towards the beach.

2.2.3 Likelihood for Presence

The likelihood of presence of fauna species has been presented using a qualitative 5-point scale based on an assessment of species records, habitat, and landscape modification and history (adapted from Ussher, 2015). The likelihood scale is (from lowest to greatest likelihood of occurrence):

- **Unlikely** – There is no evidence to support enduring presence of that species and interaction with the Site, or the evidence available supports their absence;

- **About as likely as not** - the balance of evidence provides some small support for the enduring presence of the species, and their interaction with the Site;
- **Likely** – the balance of evidence provides a moderate degree of support for the enduring presence of the species, and their interaction with the Site;
- **Very likely** – the balance of evidence provides compelling support for the enduring presence of the species, and their interaction with the Site; and
- **Virtually certain** – the balance of evidence is overwhelming (albeit still circumstantial) such that it is almost certain that the Site supports that species; and
- **Confirmed** –observed during site visit.

2.2.4 Assessment Methodology

An assessment of ecological effects was undertaken in accordance with *Ecological Impact Assessment (EcIA) EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems* (Roper-Lindsay et al., 2018). Criteria are reproduced in this report as a series of tables in Appendix A.

Following the completion of these investigations, features were mapped using ArcGIS Pro (Version 3.1.3).

3 Ecological Features and Values

3.1 Ecological Context

Wainui Reserve Western Gully is located within the Wainui Reserve within the Raglan Ecological District (ED). Prior to human modification, vegetation coverage across the Raglan ED would have comprised kauri-podocarp-broadleaved forest in the northwest and northeastern areas, with taraire forests also common in the northwest. Intensive deforestation only occurred within Raglan around 1987, and vegetation coverage for the Raglan ED in 1995 indicated only 53.3% of freshwater and wetland habitat remains (van der Zwan & Kessels, 2017b).

The Wainui Reserve is a Waikato District Council owned reserve that comprises approximately 140 ha of farm park. The wider reserve is publicly accessible with farm tracks running through the property, and parts of the reserve are utilised for agriculture, with stock present. The reserve has steep terrain, which slopes westward towards Ngarunui Beach, and there are numerous small gully systems that have been replanted in recent years.

The ultimate receiving environment for the treated wastewater discharge is Ngarunui Beach located to the west and is one the main sandy swimming beaches in the Raglan area. The entire extensive and rugged coastline of the west coast is mapped as a proposed Significant Natural Area (SNA) and comprises steep cliffs, pockets of indigenous forests and remnant wetlands which provides indigenous fauna and flora habitats (van der Zwan & Kessels, 2017a).

3.2 Gully Wetland

Ecological features and values within the Wainui Reserve Western Gully are presented in Figure 3 and described below.

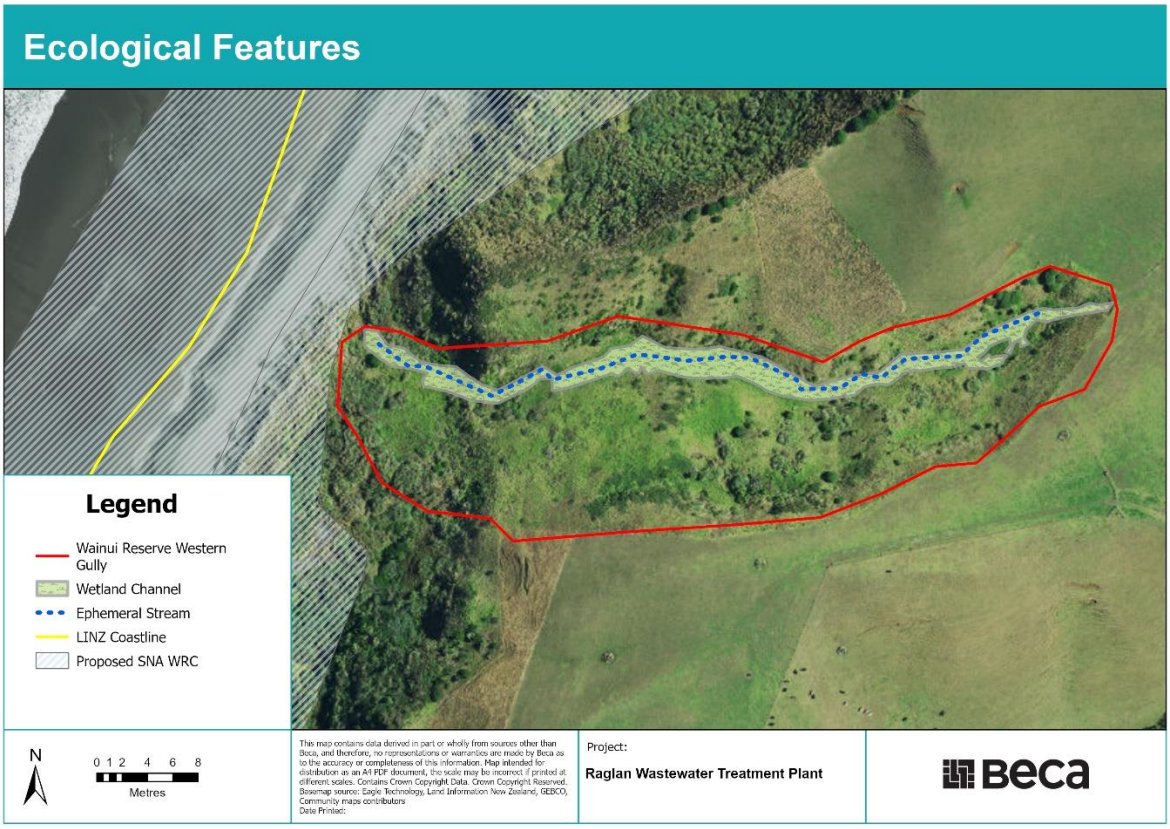

Figure 3. Ecological Features within and adjacent to the Wainui Reserve Western Gully.

3.2.1 Watercourse Classification

An ephemeral overland flow path (OLFP) was observed along the base of the gully at the time of the site visit. No defined channel characteristics were identified, and water did not appear to be flowing. However, the waterbody is considered to meet the definition of an ephemeral watercourse under the WRP.

The value of the ephemeral watercourse is **Very Low** due to the lack of instream habitat, persistence, and connectivity to other watercourses, however, is hydrologically connected to the gully wetland.

3.2.2 Gully Wetland

The value of the gully wetland is **Low** due to the dominance of two exotic hydric plant species.

Wetland investigations confirmed the presence of a *natural inland wetland* within the Wainui Reserve Western Gully. Wetland vegetation and hydrology was found at plots P3 and P4 (Figure 2 and Figure 3) which passed the rapid test while P1 and P2 passed the pasture exclusion test therefore are 'non-wetland'.

The natural inland wetland has likely formed due to the presence of an overland flow path fed by rainfall and groundwater seepages that emerge throughout the gully[6] (Johnson & Gerbeux, 2004). The vegetation within the gully wetland is dominated by kikuyu (*Cenchrus clandestinus*) in the upper section with scattered patches of with scattered patches of birds-foot trefoil (*Lotus corniculatus*), bindweed (*Calystegia soldanella)*, and creeping buttercup (*Ranunculus repens*). Vegetation transitions to sweet reed grass (*Glyceria maxima:* obligate wetland species) within the upper-mid section, before being dominated by kikuyu again near the bottom end (Figure 3). Soil saturation was also higher at the upper and mid sections of the gully, which likely influences this transitional vegetation zones.

3.2.1 Coastal Shrubland (Gully Slopes)

The value of the coastal shrubland is **Low** due to the dominance of exotic grasses, patchy restoration planting

Restoration planting efforts with terrestrial species, has been undertaken several years ago along the steep banks of the gully and comprised a mix of species including flax (*Phorium tenax*), cabbage trees (*Cordyline australis*), and toetoe (*Austroderia* sp.). However, some plants were noted to be stunted in growth and plant distribution was low, indicating a low survival rate. Weed species identified included gorse (*Ulex europaeus*) and bindweed (*Convolvulus* sp.). Despite this, the coastal shrubland along the gully slopes may provide some, albeit limited, habitat to indigenous fauna including potentially Australasian bittern (*Botaurus poiciloptius;* Threatened – Nationally Critical) which can be found in wet pastures and farmland where is there is dense vegetation and has been recorded in nearby environments (Section 3.2.3).

3.2.1 Overall Value of the Gully Wetland

Overall, the gully floor wetland and coastal slopes are of a **Low** ecological value. The reasons for this are outlined in the Table 1 below.

Table 1. Scoring and justification for the assigned ecological value for the gully wetland system.

Matter	Rating	Justification
Representativeness	Low	Gully wetland is dominated by exotic species, including sweet reed grass which is a recognised pest plant. Native terrestrial vegetation within the gully has mainly been planted as part of restoration efforts.

[6] Raglan Wastewater Consent – Groundwater Risks Assessment. Prepared by Beca, 3 June 2025.

Matter	Rating	Justification
Rarity/Distinctiveness	Low	No rare or threatened plant species or fauna were identified or observed within the site.
Diversity and Pattern	Moderate	Due to the geomorphology of the gully wetland, there are several habitats present with a range of hydrological conditions and dominant vegetation types.
Ecological context	Low	The gully system is not directly contiguous with any areas of native forest / wetlands / streams. Ecological values within the gully system are not expected to be sensitive to environmental changes given the dominance of introduced species.
		Overall value: **Low**

Figure 4. Representative site photos from the upper section of the gully wetland (top) which is dominated by kikuyu and the restoration plantings along the cliffside, adjacent to the gully wetland (bottom).

3.2.2 Duneland (Confluence with Beach)

The dune system within the receiving environment is considered to have a **Moderate** ecological value.

Despite the dune system being relatively short, consisting of a steeply sloped foredune before meeting the gully wetland it is a regionally uncommon habitat type and is vulnerable to modification (Figure 5). The vegetation within the receiving dune ecosystem is dominated by exotic grasses including pampas (*Cortaderia selloana*) however, more typical species such as *Spinifex* spp. are present along the crest of the active foredune. Furthermore, the duneland is connected to the wider Ngarunui Beach and Aotea Harbour which is classified as a Significant Indigenous Biodiversity Area B (SIBA – B) under the Proposed WRCP.

Figure 5. View of the dune confluence with Ngarunui Beach and geomorphology of the lower gully.

Overall, the duneland receiving environment is assessed as having a **Moderate** ecological value. The reasons for this are outlined in the Table 2 below.

Table 2. Scoring and justification for the assigned ecological value for the receiving dune system.

Matter	Rating	Justification
Representativeness	Moderate	Native plant species are not present in high abundance or diversity however, key natural features and characteristics are intact.
Rarity/Distinctiveness	Moderate	Dunelands are an uncommon habitat within the Waikato Region however, this particular area of the duneland is not identified as supporting rare species.
Diversity and Pattern	Moderate	The duneland is short however, contributes to the mosaic of habitats within the receiving environment.
Ecological context	High	The coastal / beach environment is mapped as a proposed SNA in the Waikato Region.

Matter	Rating	Justification
		Indigenous dune ecosystems are vulnerable to modification in the Waikato Region and provide critical habitat for threatened flora and fauna. Dune systems act as buffers between the CMA and terrestrial ecosystems and have high connectivity.
		Overall value: **Moderate**

3.3 Fauna

3.3.1 Freshwater Fish

Overall, the freshwater fish values of the gully system are assessed as **Negligible**.

Currently, the gully system has limited habitat characteristics which could potentially support eels (i.e. surface water observed within the mid-section of the gully). However, freshwater fish populations within the gully are considered unlikely due to the low level and permanence of surface water within the gully system. There is no distinctive channel or surface water present at the bottom end of the gully and there is a lack of connectivity with other waterways. There are no native fish records within the gully system identified on NZFFD.

3.3.2 Avifauna

The native bird values of the site are assessed as **High** due to the presence of At Risk species within the surrounding environment (Table 3).

Given the current context of the gully and adjacent farmland environment for the proposed treated wastewater discharge, species with a higher conservation concern that may utilise the gully system habitat is primarily expected to be Australasian bittern (*Botaurus poiciloptius*) which can be found in wet pastures and farmland where is there is dense, rank vegetation.

In addition to this, the site is expected to be utilised by a range of common native birds and introduced species. During the site visit, species observed included fantail (*Rhipidura fuliginosa*), bellbird (*Anthornis melanura*), and sacred kingfisher (*Todiramphus sanctus*), all of which are Not Threatened and red billed gull (*Chroicocephalus novaehollandiae*), which is At Risk – Declining.

Table 3 provides a list of Threatened and At-Risk species recorded on eBird within the immediate site surroundings. A full list of species can be found in Appendix B.

Table 3. Native coastal birds recorded within a 4 -5 km radius of the gully wetland and filtered based on the likelihood of presence within the site and receiving environment. Conservation status assigned according to Robertson et al., (2021).

Common name	Scientific name	Conservation Status	Comment	Presence or likely presence at the site
Little shag	*Microcarbo melanoleucos*	Relict	Coastal and freshwater habitat, and nest in trees over-hanging water.	Likely to be interacting with the receiving environment.
South Island pied oystercatcher	*Haematopus finschi*	At Risk - Declining	Found within harbours and estuaries and are known to breed in high country grasslands.	Likely to be interacting with the receiving environment.

Common name	Scientific name	Conservation Status	Comment	Presence or likely presence at the site
Red-billed gull	*Chroicocephalus novaehollandiae*	At Risk - Declining	Coastal, but adapted to urban environments. Breed in colonies along the coast including river mouths, and sandy shores.	Interactions with the receiving environment are certain.
White fronted tern	*Sterna striata*	At Risk – Declining	Common near the coast and forage within river systems.	As likely as not to be interacting with the beach and dune system.
Pied shag	*Phalacrocorax varius*	At Risk - Recovering	Primarily forage within coastal marine waters and estuaries, or rivers near the coast. Roost on undisturbed beaches, trees, and artificial structures.	Likely to be interacting with the receiving environment.
Variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	Predominantly forage in grassy areas near the coast and breed on sandy beaches.	Very likely to be interacting with the beach and dune receiving environment.

3.4 Lizards

The likelihood of lizard populations within the site and values are **Low**. There are no herpetofauna records at the site however, copper skink (*Oligosoma aeneum*) andgreen gecko (*Naultinus elegans*) between 1km and 5km from the site have been recorded. Additionally, forest gecko (*Hoplodactylus granulatus*) are typically found in similar habitat as the green gecko.

The presence of the green gecko and forest gecko within the site is *unlikely* due to the lack of suitable habitat within the gully wetland. The copper skink is considered *about as likely as not* to be interacting with the coastal scrub and dune areas which provides some suitable habitat albeit is disconnected with other areas of suitable copper skink habitat. Copper skinks are *unlikely* to be found within the gully floor wetland due to the shallow surface water found throughout this area.

3.5 Bats

There are no bat values for the site due to the absence of suitable habitat. Therefore, no further assessments have been made for bats.

4 A Technical Summary of the Proposed Discharge Design

4.1 Proposed Discharge Design

The proposed discharge design presented in Figure 4 below includes the installation of a rock lined channel below the outlet which will spilt the discharge into two branches to diffuse flows into the gully wetland. Wetland and terrestrial planting will be undertaken throughout the gully along with the construction of a number amenity features (i.e. cycle and walkway). Further details of the proposed discharge design can be found within the Concept Design Report[7].

[7] Raglan WWTP Concept Design – Conveyance & Discharge. Prepared by Beca, 21 May 2025.

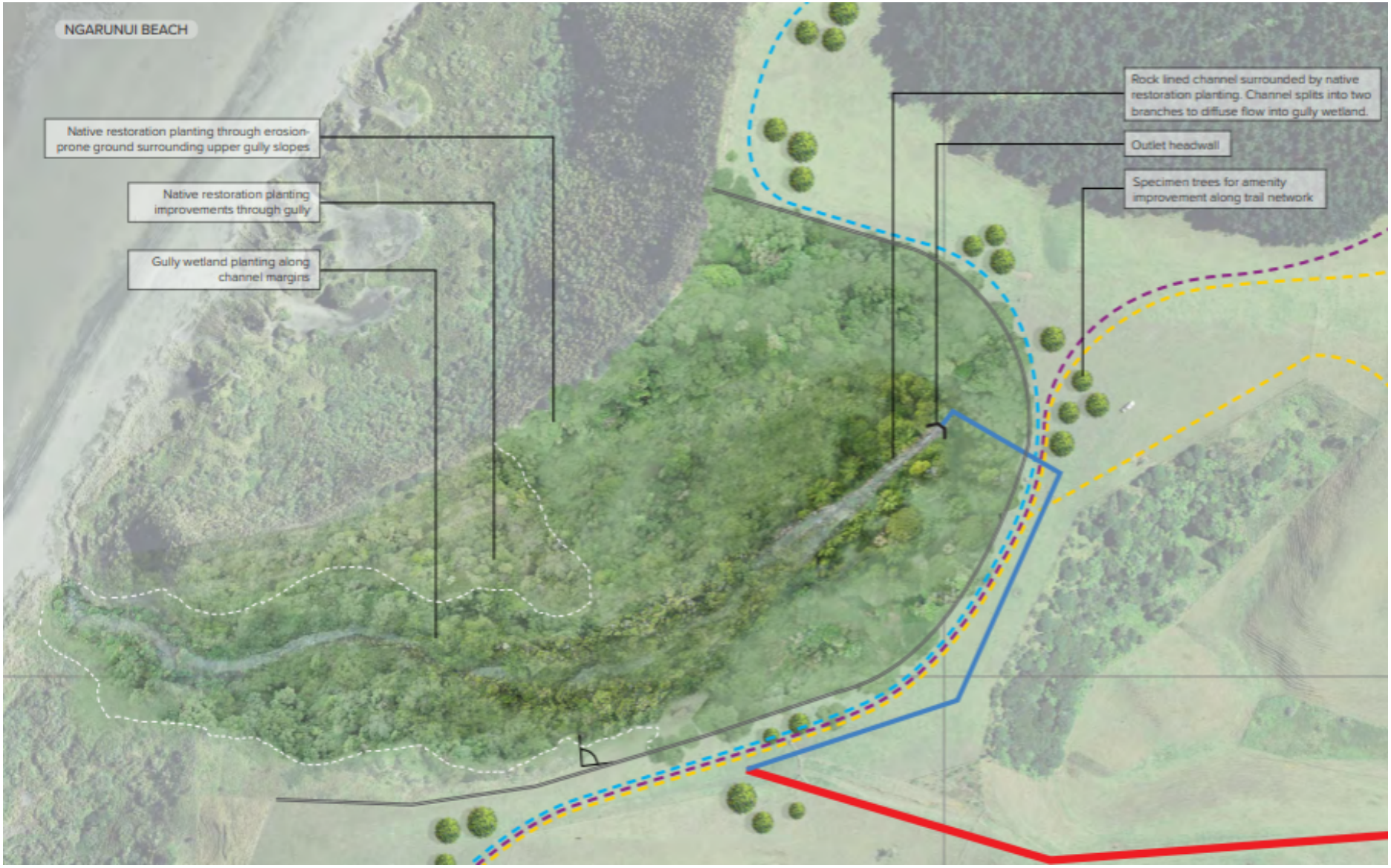

Figure 4. Proposed Wainui Reserve Western Gully Discharge – Concept Landscape Design Plan. Prepared by Beca, May 2025.

4.2 Wastewater Treatment Quality

A Water Quality Effects Assessment has been prepared by Beca[8] which provides a qualitative baseline water quality assessment for the proposed discharge of wastewater into the gully system and is summarized below.

The Raglan WWTP is currently undergoing extensive upgrades, with an installation of a / Membrane Aerated Biofilm Reactor (MABR) / Membrane Bioreactor (MBR) currently underway. Once completed, the MABR/MBR system has the ability to treat up to 5,250m^3/day of wastewater prior to discharge into the gully. The quality of treated wastewater discharged after treatment is expected to be of significantly higher quality when compared to the current discharge regime and will meet the requirements of Class A under the Australian Guidelines for Water Recycling and Victoria guidelines for water recycling. The following consenting limits outlined in Table 4 have been established.

Table 4. Prosed Raglan WWTP treated wastewater consent limits (excluding the MABR/MBR bypass contingency discharge).

Parameter	Unit	Proposed Treated Wastewater Consent Limits	
		Median	90%ile
$cBOD_5$	mg/L	4	6
Total Suspended Solids (TSS)	mg/L	4	6
Total Nitrogen (TN)	mg/L	8	14
Ammoniacal Nitrogen (NH_4-N)	mg/L	2	4
Total Phosphorus (TP)	mg/L	4	6
pH	pH units	6.5 – 8.5	
UV Dose	mWs/cm^2	UV dose rate limit* of 35 mWs/cm^2	

* A validated UV dose of 35 mWs/cm^2 is delivered by the UV disinfection facility for 99% of the time (calculated on the basis of a 15-minute average) over each calendar month.

The Water Quality Assessment concludes that due to the very high quality of the treated wastewater as well as the likelihood that discharge will directly infiltrate into the groundwater before reaching coastal waters, the overall impact of the discharge on surface water quality is negligible. Similarly, effects of the discharge on groundwater are also assessed as negligible given the high quality of treatment which will meet the relevant guidelines, as well as the additional treatment that would be provided by the gully restoration.

4.3 Groundwater Risk Assessment

Hydrogeological investigations have been undertaken by Beca to support the resource consent application[9]. The surveys included undertaking four hand auger samples and installing two standpipe piezometers, measuring the short- and long-term fluctuations in groundwater. The upper gully consists of wetland features and seepage zones which reflect the low permeability of volcanic soils, resulting in limited capacity for infiltration. Groundwater encountered near the bottom end of the gully also suggests a higher water table. The presence of low permeability soils limits infiltration of the discharged wastewater within the gully, r

[8] Water Quality Effects Assessment – Raglan Wastewater Consent. Prepared by Beca, June 2025.

[9] Groundwater Risk Assessment – Raglan Wastewater Consent. Prepared by Beca, June 2025.

esulting in most of the discharged flows remaining at or near the surface, contributing to surface water rather than percolating into the subsurface level.

4.4 Hydraulic Assessment

Hydraulic modelling has been conducted by Beca[10] to support the resource consent application. The report provides a range of flow scenario assessments for present day, 5-year, 10-year, and 100-year rainfall events, wastewater discharge flows as well as combined wastewater and rainfall events.

The proposed wastewater discharge flowrate projections incorporated into the models include:

- Present-day maximum wastewater flowrate 45L/s
- 2030 maximum wastewater flowrate 70L/s
- 2050 maximum wastewater flowrate 90L/s

These models provide flow paths, depth and velocities to demonstrate potential effects. The report concludes that the proposed wastewater flow is likely to create a visible overland flow path however, no channelisation, or significant alterations to the morphology of the gully will result. Most importantly, the minor increases in velocities (0.2m/s to 0.3 m/s) from wastewater flows will not pose an increased erosion risk to the gully, wetland.

[10] Raglan Wastewater Discharge – Hydraulic Assessment of Overland Flow Path. Prepared by Beca, April 2025.

5 Ecological Effects Assessment of the Proposed Discharge

The assessment of ecological effects was undertaken in accordance with the EIANZ guidelines (2018). Levels of effects are assessed as the product of **magnitude** (determined according to the duration of effects, the degree of change that will be caused and the extent of the potential impact), and the ecological values impacted.

5.1 Proposed Works

The proposed new wastewater discharge to the wetland gully will involve the following:

- Construction of new discharge outlet and headwall
- Estimated discharge flow rates (dry weather flows) increasing from present day dry weather flows of 10L/s to 14L/s in 2030 and 18L/s in 2055.
- Class A treatment for up to 6,000m^3/day by 2030 and 7,500m^3/d by 2050.

The following management options have been integrated into the proposed works design[11]. These include:

- Bifurcation of the polishing channel
- Construction of a rock lined polishing channel from the outlet to the top of the gully wetland
- Restoration wetland and gully planting.

5.2 Zone of Influence / Scale of Assessment

Assessment of effects on native avifauna and lizards has been undertaken at the local population level which is assumed to include the gully wetland and wider catchment. Effects on vegetation identified within the site has been assessed at the site scale, which includes the gully floor wetland and coastal scrub vegetation within the gully system. Effects on the dune receiving environment has also been assessed at the site scale.

5.3 Key Potential Ecological Effects

Key potential ecological effects include:

- Alterations to wetland hydrology due to potential works within 100m
- Alteration to the hydrological regime of the wetland receiving environment due to increased flows
- Alterations to gully morphology due to increased flows
- Alterations to wetland function due to nutrient inputs
- Changes to fauna habitat quality

5.3.1 Alterations to wetland hydrology due to potential works within 100m

The magnitude of effect of potential earthworks within 100m of the gully wetland is **Low** with an overall **Low** level of effect.

The location of the new proposed wastewater discharge outfall and rock-lined channel has not yet been confirmed however, has the potential to fall within the 100m buffer from the gully wetland but is expected to be outside of the 10m buffer. No changes to wetland hydrology due to the potential earthworks is anticipated due to the seepage hydrosystem of the gully wetland and works existing outside of the wetland footprint.

[11] Letter – Raglan Wastewater Treatment Plan – Recommendations. Prepared by Beca, 17 September 2024.

5.3.2 Alteration to the Hydrological Regime of the Wetland

The magnitude of effect of increased hydrological inputs on the receiving gully wetland is **Moderate** with an overall **Low** overall level of effect.

Hydraulic modelling has determined that the new wastewater discharge will alter the hydrological regime of the gully wetland by increasing the volume of water within the system. The hydraulic assessment indicates that a visible and persistent overland flow path (OLFP) is likely to result from proposed discharge rates which are expected to increase incrementally overtime. This OLFP is likely to be visible during dry weather conditions however, during wet weather, stormwater flows are expected to dominate the flow.

Wetlands are highly sensitive to fluctuations in hydrological input, as an increase in flow can alter water depths, change the processes that lead to the deposition of sediment, and increase the frequency and depth of flooding, which in turn can alter vegetation communities and animal assemblages utilising the wetland (Cooke, 1991; Sorrel & Gerbeaux, 2004).

While the magnitude of hydrological changes within the wetland from baseline conditions are **Moderate**, the effect of this within the gully wetland is not necessarily considered to be adverse. This is because the shift in hydrological conditions has the potential to alter the existing wetland plant community which currently consists of two exotic grasses adapted to wet conditions. The shift in hydrology will provide suitable growing conditions for the wide range of native wetland species proposed[12] to be planted.

5.3.3 Potential Erosion and Scour within the Gully and Dunes due to Increased Flows

The magnitude of effect of increased hydrological inputs on the morphology of the gully wetland and dune system is **Low** with a **Low** overall level of effect.

The hydraulic assessment has determined that discharge rates are not expected to significantly alter gully morphology due to minor increases in velocity and flow power. Furthermore, the proposed integrated management (the rock-lined bifurcated channel) will reduce potential erosion and scour. Bifurcating the outflow channel will dissipate flows and volumes across a wider area and the proposed wetland gully planting which includes species such as raupō, will reduce flow speeds and sedimentation through the wetland gully. The dunes at the lower end of the gully are already shaped by ephemeral flows and high permeability allows surface water flows to dissipate onto the beach without substantively changing dune vegetation or morphology of the dunes i.e. no scour channel within the dune is expected.

5.3.4 Ongoing Changes to Wetland and Duneland due to Potential Nutrient Inputs

The magnitude of effect of nutrient inputs on vegetation composition within the gully wetland and duneland is **Low** with an overall **Very Low- Low** level of effect.

This is primarily due to the high quality (Class A) wastewater treatment and any storm event overflows diverted to the existing harbour outfall as a contingency. While a low likelihood, any residual nutrient input has the potential to cause changes in wetland vegetation composition downstream of the discharge.

Generally, the potential adverse effects of increased nutrients within a wetland system includes an increase in reducing conditions at the soil-water interface, higher rates of nutrient cycling and decomposition, and the increased risk of algal blooms in areas of low/no flow. However, these potential effects are highly dependent on the concentrations of nutrients in excess.

It is expected that any residual nutrients supplied to the gully wetland by the discharge will be taken up by existing and proposed vegetation. Current gully wetland vegetation is primarily comprised of exotic grasses which thrive on high nutrient inputs and nutrient tolerant species have been selected for the proposed

[12] Wetland Gully Restoration Planting Plan - Raglan Wastewater Treatment Plan. Prepared by Beca, 23 May 2025.

wetland planting (Tibebe *et al.* 2024). Therefore, excess nutrients within the gully wetland are not expected to occur at levels which induce adverse effects.

While dune systems have low fertility, it is considered a low likelihood that residual nutrients will reach the dune system therefore, the magnitude of effect is **Low**. This is based on the proposed wetland planting which will slow discharge flows and take up any residual nutrients prior to discharge into the dunelands.

5.3.5 Changes to Fauna Habitat Quality

The magnitude of effect of fauna habitat quality is **Positive** with an overall **Net gain**.

Freshwater Fish

The proposed discharges and likely creation of freshwater habitat within the wetland gully which is likely to be intermittently connected to the ocean. The freshwater habitat characteristics likely to be created include a permanent OLFP and channelisation and dense wetland vegetation cover. It is anticipated that longfin eels and shortfin eels will have the opportunity to migrate into the freshwater system albeit populations are expected to remain low.

Avifauna

The current low stature wetland vegetation and surrounding planted gully vegetation provides moderate habitat for a range of avifauna. The proposed changes in dominating wetland plant species to raupō reedland buffered by the proposed terrestrial planting along the hillsides is considered to positively affect species such as the cryptic Australasian bittern (Threatened – Nationally Critical) and spotless crake (At Risk – Declining) which both favour raupō and other dense wetland vegetation but generally feed in more open areas (Hadden 1972; Robertson *et al*., 2016).

Lizards

The current coastal scrubland and duneland provides some suitable copper skink habitat (dense grasses and flaxes). The proposed discharges are considered to have a **Negligible** effect on potential lizard populations within the gully wetland due the unsuitable habitat in this area of the gully. Additionally, the proposed coastal scrubland planting along the gully slopes is likely to increase habitat diversity and ecosystem services (i.e. food sources and refuges) for copper skink populations.

5.4 Summary of Ecological Effects

The threshold for effects management is determined by the nature and level of adverse effects. In general, effects that are of moderate or higher level require effects management and some residual effects may require biodiversity offset or compensation.

Due to the proposed management including wetland gully planting (Planting Plan provided as Appendix C) which has been integrated into the discharge design, no additional effects management is required (Table 5).

Table 5. Overall level of ecological effects considering effects management.

Ecological Impact	Ecological Component	Ecological Value	Revised Magnitude of Effect	Overall Level of Effect
Alteration to the hydrological regime	Gully wetland	Low	Moderate	**Low**
Alterations to gully morphology	Gully wetland	Low	Low	**Very Low**
	Duneland	Moderate	Low	**Low**

Ecological Impact	Ecological Component	Ecological Value	Revised Magnitude of Effect	Overall Level of Effect
Alterations to wetland function due to nutrient inputs	Gully wetland	Low	Positive	**Net Gain**
	Duneland	Moderate	Low	**Low**
Changes to fauna habitat quality	Avifauna	Very High	Positive	**Net Gain**
	Freshwater Fish	High	Positive	**Net Gain**
	Lizards	Low	Positive	**Net Gain**

6 Conclusion

Watercare Services Limited (Watercare) are proposing to discharge treated wastewater from the Raglan Wastewater Plant to Wainui Reserve Western Gully. The proposed works include the following integrated management which has been considered during the effects assessment:

- Bifurcation of the polishing channel
- Construction of a rock lined polishing channel from the outlet to the top of the gully wetland
- Restoration wetland and gully planting.

Within the implementation of the integrated management measures, the effects of the proposed works are considered to be **Low – Very Low** with a **Positive** effect on biodiversity values, within no residual effects expected.

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A

Appendix A – Ecological Impact Assessment Guidelines

Appendix A: Ecological Impact Assessment Guidelines

Assigning Ecological Value

Freshwater and terrestrial habitat

The ecological values of freshwater and terrestrial systems (riparian vegetation, habitats and species present) potentially impacted by the works were assessed against the following attributes:

- Representativeness;
- Rarity or distinctiveness;
- Diversity or pattern; and
- Ecological context.

These attributes are described in Table 1.1 and Table 1.2 below.

Table 1.1. Attributes that may be considered when assigning ecological value to a freshwater site or area (adapted from Roper-Lindsay et al., 2018).

Value	Explanation	Characteristics
Very High	A reference quality watercourse in condition close to its pre-human condition with the expected assemblages of flora and fauna and no contributions of contaminants from human induced activities including agriculture. Negligible degradation e.g., stream within a native forest catchment	Benthic invertebrate community typically has high diversity, species richness and abundance. Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. Benthic community typically with no single dominant species or group of species. MCI scores typically 120 or greater. EPT richness and proportion of overall benthic invertebrate community typically high. SEV scores high, typically >0.8. Fish communities typically diverse and abundant. Riparian vegetation typically with a well-established closed canopy. Stream channel and morphology natural. Stream banks natural typically with limited erosion. Habitat natural and unmodified.
High	A watercourse with high ecological or conservation value but which has been modified through loss of riparian vegetation, fish barriers, and stock access or similar, to the extent it is no longer reference quality. Slight to moderate degradation e.g., exotic forest or mixed forest/agriculture catchment.	Benthic invertebrate community typically has high diversity, species richness and abundance. Benthic invertebrate community contains many taxa that are sensitive to organic enrichment and settled sediments. Benthic community typically with no single dominant species or group of species. MCI scores typically 80-100 or greater. EPT richness and proportion of overall benthic invertebrate community typically moderate to high. SEV scores moderate to high, typically 0.6-0.8. Fish communities typically diverse and abundant. Riparian vegetation typically with a well-established closed canopy. No pest or invasive fish (excluding trout and salmon) species present.

Value	Explanation	Characteristics
		Stream channel and morphology natural. Stream banks natural typically with limited erosion. Habitat largely unmodified.
Moderate	A watercourse which contains fragments of its former values but has a high proportion of tolerant fauna, obvious water quality issues and/or sedimentation issues. Moderate to high degradation e.g., high-intensity agriculture catchment.	Benthic invertebrate community typically has low diversity, species richness and abundance. Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. Benthic community typically with dominant species or group of species. MCI scores typically 40-80. EPT richness and proportion of overall benthic invertebrate community typically low. SEV scores moderate, typically 0.4-0.6. Fish communities typically moderate diversity of only 3-4 species. Pest or invasive fish species (excluding trout and salmon) may be present. Stream channel and morphology typically modified (e.g., channelised) Stream banks may be modified or managed and may be highly engineered and/or evidence of significant erosion. Riparian vegetation may have a well-established closed canopy. Habitat modified.
Low	A highly modified watercourse with poor diversity and abundance of aquatic fauna and significant water quality issues. Very high degradation e.g., modified urban stream	Benthic invertebrate community typically has low diversity, species richness and abundance. Benthic invertebrate community dominated by taxa that are not sensitive to organic enrichment and settled sediments. Benthic community typically with dominant species or group of species. MCI scores typically 60 or lower. EPT richness and proportion of overall benthic invertebrate community typically low or zero. SEV scores low to moderate, typically less than 0.4. Fish communities typically low diversity of only 1-2 species. Pest or invasive fish (excluding trout and salmon) species present. Stream channel and morphology typically modified (e.g. channelised). Stream banks often highly modified or managed and maybe highly engineered and/or evidence of significant erosion. Riparian vegetation typically without a well-established closed canopy. Habitat highly modified.

Table 1.2. Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/ habitat/community.

Matters	Attributes to be assessed
Representativeness	Criteria for representative vegetation and aquatic habitats: Typical structure and composition Indigenous species dominate Expected species and tiers are present Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: Species assemblages that are typical of the habitat Indigenous species that occur in most of the guilds expected of the habitat type
Rarity/distinctiveness	Criteria for rare/ distinctive vegetation and habitats: Naturally uncommon, or induced scarcity Amount of habitat or vegetation remaining Distinctive ecological features National priority for protection Criteria for rare/ distinctive species or species assemblages: Habitat supporting nationally Threatened or At Risk species, or locally uncommon species Regional or national distribution limits of species or communities Unusual species or assemblages Endemism
Diversity and pattern	Level of natural diversity, abundance, and distribution Biodiversity reflecting underlying diversity Biogeographical considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	Site history, and local environmental conditions which have influenced the development of habitats and communities The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (form "intrinsic value" as defined in RMA) Size, shape and buffering Condition and sensitivity to change Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material Species role in ecosystem functioning – high level, key species identification, habitat as proxy

The freshwater habitat features were assessed considering each of the attributes in Table 1.1, and terrestrial habitat features were assessed considering attributes in Table 1.2. Features of interest were subjectively given a rating on a scale of 'Very Low' to 'High' for each attribute and assigned a value in accordance with the description provided in Table 1.3.

Table 1.3. Rating system for assessing ecological value of terrestrial and freshwater systems (Roper-Lindsay et al. 2018)

Value	Description
Negligible	Feature rates Very Low for at least three assessment attributes and Low to Moderate for the remaining attribute(s).

Value	Description
Low	Feature rates Very Low to Low for most assessment attributes and moderate for one. Limited ecological value other than providing habitat for introduced or tolerant indigenous species.
Moderate	Feature rates High for one assessment attribute and Low to Moderate for the remainder, OR the project area rates Moderate for at least two attributes and Very Low to Low for the rest. Likely to be important at the level of the Ecological District.
High	Feature rates High for at least two assessment attributes and Low to Moderate for the remainder, OR the project area rates High for one attribute and Moderate for the rest. Likely to be regionally important.
Very High	Feature rates High for at least three assessment attributes. Likely to be nationally important.

Species

The EIANZ provides a method for assigning value (Table 1.4) to species for the purposes of assessing actual and potential effects of activities.

Table 1.4. Criteria for assigning ecological values to species

Ecological Value	Species
Very High	Nationally Threatened species found in zone of influence, either permanently or seasonally
High	At Risk – Declining species found in the zone of influence, either permanently or seasonally
Moderate	Species listed as any other category of At Risk found in the zone of influence, either permanently or seasonally. Locally (ED) uncommon or distinctive species found in the zone of influence, either permanently or seasonally
Low	Nationally and locally common indigenous species
Negligible	Exotic species, including pests, species having recreational value.

Assigning Magnitude of Impacts

The magnitude of impacts is determined by the scale (temporal and spatial) of potential impacts identified and the degree of ecological change that is expected to occur as a result of the proposed WWTP discharge (Roper-Lindsay *et al*. 2018).

Based on the assessor's knowledge and experience, the magnitude of identified impacts on the ecological values within the project area and zone of influence were assessed and rated on a scale of 'Very High' to 'Negligible' based on the description provided in Table 1.5.

Table 1.5. Criteria for describing the magnitude of effects (Roper-Lindsay et al. 2018)

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

Magnitude	Description
Low	Minor shift away from existing conditions. Change arising from the loss/alteration will be discernible, but underlying attributes will be similar to pre-development circumstances; and/or having a minor effect on the known population or range of the feature.
Negligible	Very slight change from existing conditions. Change barely distinguishable, approximating "no change"; and/or having negligible effect on the known population or range of the feature.

Assessment also considered the temporal scale at which potential impacts were likely to occur:

- Permanent (>25 years).
- Long-term (15-25 years).
- Medium-term (5-15 years).
- Short-term (0-5 years).
- Temporary (during construction)

Assessing the Level of Effects

The overall level of effect on each ecological feature identified within the zone of influence were determined by considering the magnitude of impacts and the values of impacted ecological features (Roper-Lindsay *et al*. 2018).

Results from the assessment of ecological value and the magnitude of identified impacts were used to determine the level or extent of the overall impacts on identified ecological features within the project area and zone of influence using the matrix described in Table 1.6.

Table 1.6. Matrix combining magnitude and value for determining the level of ecological impacts (Roper-Lindsay et al. 2018).

Effect Level		Ecological and/or Conservation Value				
		Very High	**High**	**Moderate**	**Low**	**Negligible**
	Very High	Very High	Very High	High	Moderate	Low
Magnitude	**High**	Very High	Very High	Moderate	Low	Very Low
	Moderate	High	High	Moderate	Low	Very Low
	Low	Moderate	Low	Low	Very Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low	Very Low
	Positive	Net Gain	Net Gain	Net Gain	Net Gain	Net Gain

Results from the matrix were used to determine the type of responses that may be required to mitigate potential direct and indirect impacts within the project area and within the zone of influence, considering the following guidelines (Roper-Lindsay *et al*. 2018):

- A 'Low' or 'Very Low' level of impact is not normally of concern, though design should take measures to minimise potential effects.
- A 'Moderate' to 'High' level of impact indicates a level of impact that qualifies careful assessment on a case-by-case basis. Such activities could be managed through avoidance (revised design) or appropriate mitigation. Where avoidance is not possible, no net loss of biodiversity values would be appropriate.

A 'Very High' level of impact is unlikely to be acceptable on ecological grounds alone and should be avoided. Where avoidance is not possible, a net gain in biodiversity values would be appropriate.

B

Appendix B – Avifauna Species List

Appendix B: Avifauna species list

Common Name	Scientific Name	Conservation Status	Main Habitat Preference
Gray warbler	*Gerygone igata*	Not Threatened	Terrestrial – woody vegetation
New Zealand fantail	*Rhipidura fuliginosa*	Not Threatened	Terrestrial
New Zealand pigeon	*Hemiphaga novaeseelandiae*	Not Threatened	Terrestrial – woody vegetation
Sacred kingfisher	*Todiramphus sanctus*	Not Threatened	Coastal and inland freshwater habitats
Silvereye	*Zosterops lateralis*	Not Threatened	Terrestrial – woody vegetation
White-faced heron	*Egretta novaehollandiae*	Not Threatened	Rocky shore and estuarine mudflats, but generally nest within trees and/or high manmade structures
Southern black backed gull	*Larus dominicanus*	Not Threatened	Coastal and estuaries but adapted to urban environments.
Bellbird	*Anthornis melanura*	Not Threatened	Native and exotic forests
Morepork	*Ninox novaeseelandiae*	Not Threatened	Nest in cavities of live or dead trees and broken logs.
Grey faced petrel	*Pterodroma gouldi*	Not Threatened	A burrowing petrel species that digs long burrows and builds nests in soil/vegetation. Frages over deeper oceanic waters
Australasian gannet	*Morus serrator*	Not Threatened	Predominantly cliffside environments.
Pūkeko	*Porphyrio melanotus*	Not Threatened	Typically, near fresh or brackish systems, adjacent to open grassy areas and pastures.
Pied stilt	*Himantopus Himantopus*	Not Threatened	Brackish estuaries, saltmarshes, freshwater lakes, swamps, and braided rivers.
Red-billed gull	*Chroicocephalus novaehollandiae*	At Risk - Declining	Coastal, but adapted to urban environments. Breed in colonies along the coast including river mouths, and sandy shores.
Bar tailed godwit	*Limosa lapponica*	At Risk – Declining	Widely distributed, inhabiting harbours and estuaries, but also has been found foraging within wet pastures.
Little penguin	*Eudyptula minor*	At Risk – Declining	Widely distributed along the coastlines of the North Island.
Pied shag	*Phalacrocorax varius*	At Risk - Recovering	Primarily forage within coastal marine waters and estuaries, or rivers near the coast.

Common Name	Scientific Name	Conservation Status	Main Habitat Preference
			Roost on undisturbed beaches, trees, and artificial structures. Nest in trees within proximity to the coast.
Buff banded rail	*Gallirallus philippensis*	At Risk – Declining	In North Island, restricted to mangrove and saltmarsh.
White fronted tern	*Sterna striata*	At Risk – Declining	Common near the coast
Sooty shearwater	*Ardenna grisea*	At Risk - Declining	Breed in large dense colonies, with nest located at the end of a dug burrow. Annual breeders that usually return to the same areas. Forage along the coast and deeper oceanic waters.
Fairy prion	*Pachyptila turtur*	At Risk – Relict	More common around offshore islands and areas within the South Island. Often observed at sea and rarely enter coastal waters.
Variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	Predominantly forage and breed near the coast.
Northern Giant Petrel	*Macronectes halli*	At Risk - Recovering	Pelagic species and circumpolar generally between 30 - 64°S. Unlikely to be present / breeding near the Raglan area.
Royal spoonbill	*Platalea regia*	At Risk – Naturally Uncommon	Breeds in exposed canopy of tall trees or on the ground near estuaries, rivers, and harbours – usually in reeds. Forage around estuaries and wetlands.
Little shag	*Microcarbo melanoleucos*	Relict	Coastal and freshwater habitat, and nest in trees over-hanging water.
Salvin's prion	*Pachtptila salvini*	Migrant	Nest in short (up to 1.5 m) burrows under tussock. Wide breeding range but can be present along the west coast of the North Island.
Caspian tern	*Hydroprogne caspia*	Threatened – Nationally Vulnerable	Widely distributed, often frequenting sheltered bays and harbours, and inland lakes.
Reef heron	*Egretta sacra*	Threatened – Nationally Endangered	Forage along rocky shores and estuarine mudflats. Nest low to the ground in rocky caverns.
Australasian bittern	*Botaurus poiciloptius*	Threatened – Nationally Critical	Utilises a network of different wetland types including drains and wetlands on farmlands.

C

Appendix C – Wetland and Riparian Planting Plan

Wetland and Riparian Planting Plan

Raglan Wastewater Consent

Prepared for Watercare Services Ltd
Prepared by Beca Limited
Click or tap here to enter text.

11 June 2025

Contents

Appendices

Revision History

Revision N°	Prepared By	Description	Date
0	Emily Fensham	Final for Issue	11/06/2025

Document Acceptance

Action	Name	Signed	Date
Prepared by	Emily Fensham		11/06/2025
Reviewed by	Claire Webb		11/06/2025
Approved by	Garrett Hall		11/06/2025
on behalf of	Beca Limited		

1 Introduction

1.1 Purpose and Scope

Watercare Services Limited (Watercare) are proposing a new wastewater discharge associated with the Raglan Wastewater Plant to Wainui Reserve Western Gully.

Beca Limited (Beca) has been engaged to prepare a Wetland and Riparian Planting Plan to support the resource consent application for the proposed works.

1.2 Background

The Wainui Reserve Western Gully is located within the Wainui Reserve, 3 km west of the Raglan township. The site is steeply sloped and drains westward into the black sandy Ngarunui beach. The location of the proposed discharge outfall headwall and naturalised rocky channel is within an area of pasture, with evidence of recent stock presence. The channel is proposed to discharge into an exotic wetland complex, downgradient of the site, which eventually leads to a narrow unnamed ephemeral stream. This area has been planted within the last 15 – 20 years, however the plantings have not been overly successful with numerous stunted and windswept plants observed.

1.3 Replanting Requirements

Restoration planting has been considered as integrated effects management of the proposed works according to the Ecological Impact Assessment[1] and reduces potential effects to low levels according to the EIANZ guidelines (Roper-Lindsay et al., 2018).

2 Site Description

2.1 Existing Environment

Field investigations were undertaken Wednesday 28 August 2024 on a clear and sunny day, with short periods of rainfall in the morning and late afternoon.

The Wainui Reserve gully wetland is a seepage system located within the upper to mid-section of the gully. The identified natural inland wetland is dominated by kikuyu (*Cenchrus clandestinus*) in the upper section and transitioning to sweet reed grass (*Glyceria maxima:* obligate wetland species) within the upper-mid section, before being dominated by kikuyu again in the lower section.

Restoration planting efforts, with terrestrial species, has been undertaken several years ago along the steep banks of the gully and comprised a mix of species including flax (*Phorium tenax*), cabbage trees (*Cordyline australis*), toetoe (*Austroderia* sp.). However, some plants were noted to be stunted in growth and plant distribution was low, indicating a low survival rate. Weed species identified included gorse (*Ulex europaeus*) and bindweed (*Convolvulus* sp.).

[1] Raglan Wastewater Treatment Plant – Ecological Impact Assessment. Prepared by Beca, May 2025.

3 Restoration Methodologies

3.1 Terrestrial Planting

The proposed location for terrestrial planting is shown in Figure 1 and covers an area of approximately 5 hectares. This area was selected as the site is primarily retired pasture with minimal native vegetation coverage therefore provides a greater restoration opportunity.

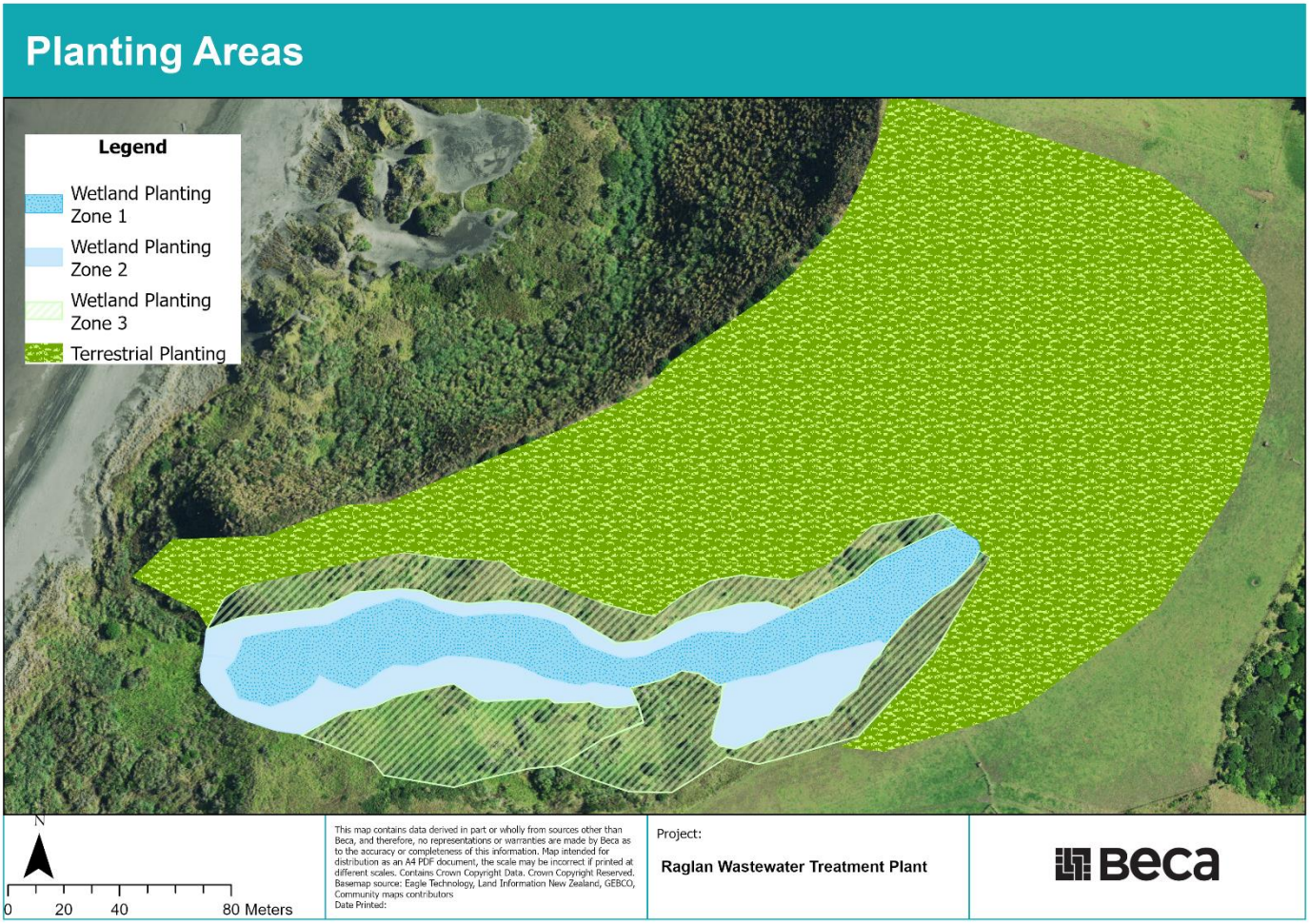

Figure 1. Proposed wetland planting zones and area of terrestrial planting for the Raglan WWTP treated wastewater discharge receiving envrionment.

3.1.1 Objectives

The primary objectives of the proposed terrestrial restoration planting are to enhance ecological values of the site, reduce scour and erosion, provide wetland buffering and amenity value to the site. Recommended species are presented in Table 1 below.

3.1.2 Species selection

Plant species selection was guided by the '*Planting guide for Western Waikato – Raglan Coast'* prepared by the Department of Conservation (DOC, *n.d.*) and include the following considerations:

- Existing and historical native plant communities at site – species have been selected that are typically found buffering raupō reedland wetlands, and also according to the potential ecosystem extent (WF4 - Pōhutukawa, pūriri, broadleaved forest ecosystem).

- Likelihood of establishment based on immediate in-situ conditions.
- Preference of native species potentially utilising the site – notably, banded rail (Gallirallus philippensis, At Risk – Declining) and spotless crake (Zapornia tabuensis, At Risk – Declining).

Table 1. The recommended terrestrial planting schedule for margins of the wetland complex and hill slopes.

Common Name	Scientific Name	Grade	Spacing	Comment
Giant umbrella sedge	*Cyperus ustulatus*	1	0.5	Plant near the wetland edge.
Pūkio/purei	*Carex secta*	1	0.5	Plant near the wetland edge.
Toetoe	*Austraderia toetoe*	1	1	
Coastal astelia	*Astelia banksii*	1	1	
Harakeke	*Phormium tenax*	1	1	Not an ideal species for bank stabilisation.
Kawakawa	*Piper excelsum*	1	2	
Cabbage tree	*Cordyline australis*	1	2	Plant on steeper areas.
Whau	*Entelea arborescens*	1	2	Plant on steeper areas.
West Coast Kowahi	*Sophora fulvida*	1	2	Plant on steeper areas.
Pūriri	*Vitex lucens*	2	5	
Koekoe	*Didymocheton spectabilis*	2	5	
Pohutukawa	*Metrosideros excelsa*	2	5	Can plant on steeper areas and is a coloniser species.

3.2 Gully Wetland Planting

The proposed location for wetland plantings is shown in Figure 2. This area was selected as it maintains characteristics that allow it to be converted into a functioning wetland (low contours and hydrological input from mapped overland flow paths and permanent stream). Additionally, the current botanical values of this area are very low as it is currently covered in pampas, rank grassland and exotic weedy groundcover.

There are two defined zones within this area as described below:

- **Zone 1 (Flood/wet area):** Aerial imagery and contours show that this zone is generally saturated and are expected to contain moist soils for much of the year.
- **Zone 2 (Moist):** This area is located on a slight slope and it is likely that these soils will experience some saturation during the wetter seasons but occasional dryness during the drier seasons.
- **Zone 3 (Moist to dry):** This area is located on slopes and selected plants can tolerate moist – dry soils and exposed conditions including, strong winds and salt spray.

3.2.1 Objectives

The primary goal of the wetland restoration planting is to provide ecosystem services to the gully wetland to mitigate potential effects from the proposed wastewater discharge while enhancing the ecological value and function of the existing wetland complex. This will be achieved through the selection of nutrient and water tolerant wetland species (Table 2), weed control and ongoing maintenance.

The following species selection has been complied in accordance with the '*Planting guide for Western Waikato – Raglan Coast'* prepared by the Department of Conservation.

Table 2. The recommended planting schedule for planting of the gully wetland complex across three planting zones according to anticipated hydrology. The species selected are suitable for the Raglan coastal region and can be eco-sources from local nurseries.

Common Name	Scientific Name	Grade	Spacing	Comment
Zone 1 Species				
Raupō	*Typha orientalis*	1	0.5	Typically inhabits shallow fertile water or waterlogged soil. Grows up to 4m tall in large clusters. Provides water purification benefits and valuable habitat for native species.
Lake clubrush	*Eleocharis sphacelata*	1	0.5	Found in shallow freshwater habitats. Stems emerge ~1.5m above the water surface. Dense root mats help stabilize soils.
Oioi	*Apodasmia similis*	1	0.5	Not shade tolerant.
Sea rush	*Juncus maritimus var australiensis*	1	0.5	
Jointed twig rush	*Machaerina articulata*	1	0.5	
Pūkio/purei	*Carex secta*	1	0.5	Grows particularly well alongside Raupō.
waoriki	*Ranunculus amphitrichus*	1	0.5	
Zone 2 Species				
Saltmarsh ribbonwood	*Plagianthus divaricatus*	1	1.5	Not shade tolerant.
Pohuehue	*Muhlenbeckia complexa*	1	1.5	
Cabbage tree	*Cordyline australis*	1	1.5	
Oioi	*Apodasmia similis*	1	0.5	Not shade tolerant.
Wiwi	*Juncus kraussi*	1	0.5	
Sea primrose	*Samolus repens*	1	0.5	
Zone 3 Species				
Mānuka	*Leptospernum scoparium*	1	2	Plant in drier soils. Can tolerate exposed locations. Colonizer species.
Karamu	*Coprosma robusta*	1	1.5	Plant in drier areas. Coloniser species.
Koromika	*Hebe stricta*	1	1.5	Can tolerate dry - moist soils and exposed locations. Coloniser species.
Toetoe	*Austroderia toetoe*	1	1.5	
Harakeke	*Phormium tenax*	1	1.5	
Solandri's sedge	*Carex solandri*	1	0.5	Plant in moist sites under shade cover.
Oioi	*Apodasmia similis*	1	0.5	Not shade tolerant.

3.3 Site Preparation

3.3.1 Initial Weed Control

The restoration sites should be prepared immediately prior to planting, with clearance and/or targeted spraying of all exotic species, including nuisance weeds and grass, to enable successful development.

For large infestations and / or persistent weed species, several rounds of weed control may be necessary to prepare the site for planting. This should be considered by the Contractor when scheduling preparation and planting.

3.4 Plant Sourcing

Plants to be used should be of good quality and eco-sourced from the Raglan ED. Eco-sourcing is key to ensure plants are well adapted to local conditions, increasing survivorship through to establishment. Plants purchased should also be of pure stock with no hybrids or cultivars used.

Optimal plant stock to be used in the planting will have following attributes:

- Healthy, vigorous, and free from obvious signs of disease and pests;
- Of at least average size for the specified pot/plastic bag size;
- Well-developed root system with a high amount of new root growth;
- Not root bound; and
- Well-branched and symmetrically shaped.

The above will be checked upon delivery by the nursery / supplier. The plant quality will also be tested by the contractor with visual inspections, and by lifting no less than 10 supplied plants by the stem to confirm whether the planter bag / root trainer of each plant is supported (i.e., the plant does not pull out of bag). Plants considered by the contractor to be of poor quality will be rejected and will need to be replaced by the nursery.

3.5 Planting Methods

In general, 0.5L grades for rushes, grasses, and sedges must be used, and 1.5L to 2L grades for shrubs and trees. For 0.5L grades, plant density (spacing) should be 0.5m and 1m spacing for 1L-2L grades. This will enable native plantings outcompete the high density of exotic grasses and weeds, lower maintenance requirements and achieve performance standards within 5 years.

Plants must be laid out in a natural pattern (not grid) to recognise the growth and spread of all plantings.

Holes will be dug approximately twice the size of the root ball. Hand dug holes are preferred, but machinery can be used (e.g., moisture auger) if the walls of each hole are scarfed to facilitate root penetration. Plant roots will be slightly loosened at the base of the root mass to aid roots to grow outward once planted, rather than remain in a tight root ball.

Care must be taken when removing plants from bags/pots to minimise root disturbance and plant will need to be pressed/ heeled in firmly once in the ground to minimise air pockets around the root system.

3.6 Timing

Planting should occur between late April to September, as most plants are adapted to moist conditions and higher rainfall will ensure that plants are adequately watered.

Terrestrial and wetland planting will be carried out in the first planting season following the completion of the new wastewater discharge outlet structure and rock-lined channel.

4 Maintenance Regime

4.1 Weed Management

Maintenance of plantings involves releasing grass and weeds from around the plants, and removal of any pest plants that are present within the planting areas. This reduces the competition for resources such as nutrients and light. Weed control will be required in all planted areas of indigenous vegetation for a minimum period of five years from the date planted to achieve at least 90% canopy cover of indigenous species, with no more than 5% total cover of exotic species in any tier. If monitoring shows that 90% cover has not been achieved after four years of maintenance, the maintenance period shall be extended until that is achieved

During planting establishment phase (Year 1 – beginning of Year 2), three weed control rounds, will be required and thereafter annually in spring prior to planting season. This will address any reoccurring weed issues prior to infill planting in May – August each year.

4.2 Pūkeko control

The New Zealand eBird database and eDNA results indicate that pūkeko (*Porphyrio melanotus*; Not Threatened) are likely to be present at the site and are known to damage recently planted specimens. Should damage from pūkeko become an issue at the planting site, several options are available for managing them. This includes, the pinning of plants, planting at an angle, and / or planting other favourable grass crops adjacent to new plantings as an alternative and more attractive food source.

4.3 Infill Planting

Infill planting will be required to make sure that coverage of native plants meets performance standards and that gaps do not develop in the planting. Infill planting requirements should be identified during site maintenance visits prior to the upcoming planting season.

During the final year of the 5-year restoration programme, enrichment planting should be undertaken to infill plant species typical of the mid-late stages of succession that would be unlikely to survive during initial planting rounds. This will help ensure plantings follow a natural successional trajectory.

5 Monitoring and Reporting

5.1 Compliance Monitoring

Upon completion of the initial works, the planting will be monitored for five years or until canopy closure is achieved. This includes an annual site walkover by an appropriately qualified ecologist to survey the following:

- Identify weeds and pest animal damage;
- Identify any areas showing adverse effects of excess nutrients (de-oxygenation/ anaerobic mud, plant litter).
- Estimate planting survival, and potential infilling with new native seedlings as required.
- Estimate canopy closure; and
- Estimate cover of indigenous and exotic species.
- Successful vegetation establishment is demonstrated by 90% species survival rate and 80% canopy closure.

5.2 Planting Completion Report

A planting completion report will be submitted to Waikato Regional Council at the end of the five year programme. The report shall include:

- Survey findings from the site walkovers;
- Representative photos showing the progress of wetland and riparian plantings;
- Information/data on plant survival, infill planting completed, and progress towards canopy closure; and
- Relevant notes on setbacks faced (i.e., poor establishment, plant death, and weed invasion).

6 Programme Summary

Table 6 below provides an annual programme for re-establishing vegetation and monitoring pest plant/animal presence. Pest control will be undertaken on an as-needed basis according to the results of pest damage assessments.

Table 6. Five year programme of works including maintenance.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 1		#	#	#	□	□	□	□		#		
Year 2		#	#	*◊	■	■	■	■		#		
Year 3				*◊	■	■	■	■		#		
Year 4				*◊	■					#		
Year 5					■					*◊#		$

= Weed control and plant release.

□ = Initial planting.

■ = Infill and enrichment planting.

◊ = Assessment of pest browse damage.

* = Monitoring for planting requirements and success of vegetation establishment.

$ = Completion report.

References

Department of Conservation. (n.d.). Planting guide for Western Waikato – Raglan coast. https://www.doc.govt.nz/Documents/conservation/native-plants/waikato-ecological-restoration/planting-guide-raglan-coast.pdf

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