Sensitivity: General

Application No.: .....

Office Use Only

PO: .....

Application for a Resource Consent – Resource Management Act 1991

This application form must be provided with applications to the council for new and replacement resource consents, and changes to the conditions on an existing resource consent.

If you would like to talk or meet with a consents officer to discuss your application prior to lodging with the council, please phone **0800 002 004** or email request to **info@nrc.govt.nz**.

PART 1: Administration Matters

1 Full Name of Applicant(s) *(the name(s) that will be on the resource consent document)*

Surname: .....

First Names: .....

OR

If the application is being made on behalf of a trust, the Trustee(s) who has/have signing authority for the trust must be named.

Trust Name: .....

Trustee's Name(s): .....

OR

Company Name: Northland Transportation Alliance

Contact Person: Zander Cutang

Email address: Zander.Cutang@nta.govt.nz

Please Note: ***If an email address is provided, then all correspondence for this application will be via email.***

Postal address: .....

Telephone: *(please tick preferred contact number)*

☐ Residential .....

☑ Business 09 470 3169

☑ Mobile 021 530 673

Northland REGIONAL COUNCIL

Te Kaunihera ā rohe o Te Taitokerau

2 Details of the Address for Service of documents if different from the Applicant (e.g. Consultant). This address will be used for all documents if completed.

Company Name: Beca Ltd

Contact Person: Leon Keefer

Email address: Leon.Keefer@beca.com

Please Note: ***If an email address is provided, then all correspondence for this application will be via email.***

Postal address:

Telephone: *(please tick preferred contact number)*

☐ Residential ☑ Business 09 300 9749

☐ Mobile

3 Invoices

Charges relating to the processing of this resource consent application should be sent to:

☐ Applicant ☑ Address for service

Charges relating to the ongoing monitoring of a resource consent should be sent to:

☑ Applicant ☐ Address for service

4 Name and Address of all Owners/Occupiers of the Site relating to Application if different from the Applicant

Owner(s): Same as applicant

Postal Address:

Telephone: *(please tick preferred contact number)*

☐ Residential ☐ Business

☐ Mobile

Occupier(s):

Postal Address:

Telephone: *(please tick preferred contact number)*

☐ Residential ☐ Business

☐ Mobile

Please Note: ***If the applicant is not the owner of the land to which the activity relates, then it is good practice to submit the application with written approval from the landowner.***

5 Extending Timeframes

The Resource Management Act 1991 (RMA) specifies timeframes for processing resource consent applications (e.g. 20 working days for a non-notified application); however, these timeframes can be extended, if necessary, with the Applicant's agreement. If the council does not meet these timeframes, then it is required to refund 1% of the total processing cost of the application for each day it exceeds the timeframe up to a maximum of 50%.

Do you agree to the council extending RMA resource consent processing timeframes?

☐ **Yes**, provided that I can continue to exercise my existing resource consent until processing of this application is completed.
(Replacement application only. No refund is required to be paid until after the existing resource consent expires.)

☐ **Yes**, provided that the extension is for the specific purpose of discussing and trying to agree on resource consent conditions.

☐ **Yes**, provided that the application process is completed before this date (dd/mm/yy):

☑ No.

6 Deposit Fee

An initial minimum fee is payable with this application. These fees can be found on the council's website www.nrc.govt.nz – **Schedule of Minimum Estimated Initial Fees** information. Please contact council consents staff if you need assistance with determining the correct minimum initial fee.

Unless agreed to prior to lodging your application, the council will not commence processing your resource consent application until payment of the minimum initial fee is received (i.e. the statutory processing time for the application will not start).

This minimum initial fee may be paid online, by cheque, or by EFTPOS at one of the council's offices.

Instructions for paying online can be found on the council's website at "Pay online". Please use either the first six numbers of your resource consent (e.g. CONXXXXXX or AUT.XXXXXX), if known, or the Applicant's name as the Reference/Customer number when paying online.

If you do pay online, then please enclose evidence of payment so that the council is aware that the payment has been made.

If the costs of processing the resource consent application are greater than the minimum estimated initial fee, then the applicant will be required to pay the additional actual and reasonable costs of processing the application.

Note: Annual User Charges for Resource Consent Holders

Holders of resource consents will in most cases be required to pay a "Minimum Annual Charge" for administration of the resource consent once issued. There is also likely to be additional annual charges for the monitoring of the resource consent, which will be dependent on the type of activity the resource consent is for. These charges are detailed on the council's website www.nrc.govt.nz in the Annual Charges section of the council's **Charging Policy**.

7 Applications for Activities within the Coastal Marine Area (CMA)

Prior to lodging an application with the council to undertake any activity in the coastal marine area (CMA), the applicant is required under the Marine and Coastal Area (Takutai Moana) Act 2011 to notify the application to all groups who have applied for customary marine title in that location, and seek their view on the application. This notification should, as a minimum, include a summary of the application that provides sufficient detail for a group to understand what is being proposed

The council cannot accept an application to undertake an activity in the CMA unless the applicant for the resource consent provides evidence of this notification occurring. A response from customary marine title groups is not required by the council.

To ensure you meet the above requirement, you are advised to contact council consents staff to obtain a list of all of the current customary marine title applicant groups within the area where you are proposing to apply for a resource consent.

Information on customary marine titles is available on the **Ministry of Justice/Marine and Coastal Area Applications** website.

8 Consultation

The RMA does not require any person, including the applicant or council, to consult with anyone. It is, however, best practice to do so and will allow the council to make a more informed decision.

It is important to remember that consultation does not require reaching an agreement – it is to allow you and the council to be informed about a person's views. If you do consult, and there are concerns raised that cannot be resolved and you still want to go ahead with your application, then you should have made a genuine attempt to consult with that person(s) in an open and honest manner. Their views should be recorded so they can be taken into account by the council when considering your resource consent application.

PART 2: Application Details

1 Description of Activity

Please describe in detail the activity for which resource consent is being sought.

Replacement and minor upgrade of a culvert and tidal flap gate on Whangaroa Road, with ancillary works either side of the culvert.

2 Location Description of Activity

Site Address: Opposite 266 Whangaroa Road (within the road reserve)

Legal Description: Road reserve

(Legal description can be obtained from your Certificate of Title, valuation notice, or rates demand)

3 Site Plan

On a separate page *(minimum A4 size)*, please provide a site plan showing the location of the activity, site layout, and surrounding environment in relation to property boundaries. Please include any buildings or developments on the site.

These plans should be provided electronically and be of good quality, to enable use in resource consent documentation.

If you do not have access to mapping software, we recommend you use the council's **"Property and Boundaries"** map available on our website https://localmaps.nrc.govt.nz/LocalMapsGallery/.

This council map contains aerial photography and shows property boundaries and details. You can carry out a property search and print maps of aerial photography.

4 Resource Consent(s) being Applied for

Coastal Permit

☐ Mooring ☐ Marine Farm ☐ Structure

☐ Pipeline/Cable ☑ Other *(specify)* Temporary disturbance ancillary to structure alteration

Land Use Consent

☐ Quarry ☐ Earthworks ☐ Dam Structure

☐ Vegetation Clearance ☐ Construct/Alter a Bore ☑ Structure in/over Watercourse

☑ Other *(specify)* Passive tidal flap gate

Water Permit

☐ Stream/Surface Take ☐ Damming ☐ Groundwater Take

☐ Diverting Water ☐ Other *(specify)* .....

Discharge Permit

☐ Domestic Effluent to Land ☐ General Discharge to Land ☐ Farm Dairy Effluent to Land/Water

☐ Air ☐ Water ☐ Other *(specify)* .....

5 Is this application to replace an existing or expired resource consent(s)? ☐ Yes ☑ No

If Yes:

(a) Please state the resource consent number(s):

.....

.....

(b) Do you agree to surrender the existing resource consent once a new one has been issued:

☐ Yes ☐ No

6 Is this application to change a condition of an existing resource consent? ☐ Yes ☑ No

If Yes, please state the resource consent number(s):

.....

.....

7 Please specify the duration sought for your resource consent(s) –
Only for new or replacement applications.

5 years ..... months

8 Do you also require consent(s) from a district council? ☐ Yes ☑ No

If Yes, please complete the following:

Type of consent required? .....

Has it been applied for? ☐ Yes ☐ No

Has it been granted? *(If Yes, please attach)* ☐ Yes ☐ No

PART 3: Assessment of Environmental Effects (AEE)

1 An AEE must be provided with your application that has been completed in accordance with the requirements of Schedule 4 of the RMA.

As a minimum, your AEE must include the following:

- Description of the environmental effects of the activity.
- Description of ways in which adverse environmental effects can be avoided, remedied or mitigated.
- Names of people affected by the proposal.
- Record of any consultation you have undertaken, including with affected persons (if any).
- Discussion of any monitoring of environmental effects that might be required.
- An assessment of the activity against any relevant objectives, policies, or rules in the Regional Plans.
- For a coastal permit, an assessment of your activity against any relevant objectives and policies of the New Zealand Coastal Policy Statement.
- An assessment of effects on tangata whenua and their taonga.

This AEE needs to be provided in a separate document attached to this application form.

Any activity needing a resource consent will have some environmental effects. The council will not accept an AEE that says there are no environmental effects from the activity.

You will need to complete the AEE at a level that corresponds with the scale and significance of the effects that the activity may have on the environment. Depending on the scale of the activity, you may need to get help from an expert(s) to prepare your AEE.

The council has a set of standard AEE forms for a selection of common activities. These AEE forms do not cover the relevant objectives, policies, or rules in the Regional Plans nor effects on tangata whenua. If you use one of these forms, then you will need to provide a separate assessment of these matters. These AEE forms can be found on the council's website www.nrc.govt.nz – **"Forms and Fees"**.

It is important that you provide the council with a complete and well-prepared AEE, otherwise the council may not accept your application.

If your application is for a change to a condition of resource consent under Section 127 of the RMA, then your AEE only needs to cover the effects of the change being requested.

2 Assessment of Effects on tangata whenua and their taonga

The Regional Plan for Northland requires that an AEE must also include an assessment of the effects on tangata whenua and their taonga if one or more of the following is likely:

- Adverse effects on mahinga kai or access to mahinga kai; or
- Any damage, destruction or loss of access to wāhi tapu, sites of customary value and other ancestral sites and taonga with which Māori have a special relationship; or

- Adverse effects on indigenous biodiversity in the beds of waterbodies or the coastal marine area where it impacts on the ability of tangata whenua to carry out cultural and traditional activities; or
- Adverse effects on taiāpure, mātaitai or Māori non-commercial fisheries; or
- Adverse effects on protected customary rights; or
- Adverse effects on sites and areas of significance to tangata whenua mapped in the Regional Plan for Northland (refer Maps |Ngā mahere matawhenua).

Your AEE must include an assessment of whether any of the above affects are likely to occur.

If they are likely to occur, then you will need to complete a Cultural Impact Assessment (CIA) and provide this with your resource consent application. The Regional Plan for Northland provides details of what must be included in this CIA, and should be referred to.

The best way to find out what the effects of your proposal may be on tangata whenua is to contact local iwi/hapū groups (who represent tangata whenua) and discuss your proposal with them. Council consents staff can provide a list of contact details for local iwi/hapū groups in the area of your proposal. You can then send a copy of your proposal to these groups and seek feedback from them prior to lodging your application. Some iwi/hapū have also developed iwi/hapū Environmental Management Plans that are useful documents that can assist to identify issues of concern to those iwi/hapū for activities occurring in their rohe. The iwi/hapū Environmental Management Plans can be obtained directly from the iwi/hapū or from the council upon request.

3 Assessment of Affected Persons

If the adverse effects of your activity on a person are likely to be minor, or more than minor, then that person is deemed to be an "affected person" for your resource consent application.

An affected person may include neighbouring land owners and occupiers, and/or organisations such as the Department of Conservation, Land Information New Zealand (LINZ), Fish and Game Council, Iwi and Hapū, and community groups.

If you do not think there will be any affected persons for your resource consent application, then you do not need to provide any details on this matter in your AEE. However, the council will still undertake an assessment of whether there are any affected persons as part of processing the resource consent application.

If there are persons you have identified who may be affected, and you have discussed your proposal with these persons, please record any comments made by them and your response, and include this information with your application. If you have written approvals from these parties, then these should be provided as well. The council has a written approval form that can be used for this purpose.

Iwi Settlement Acts

If there is an **Iwi Settlement Act** that covers the area of your application, then there may be "Statutory Acknowledgement" areas which could be adversely affected by your activity. If the location of your activity is within, adjacent to, or may have an adverse effect on, a Statutory Acknowledgement area, then you will need to assess whether the trustees of the Statutory Acknowledgement are affected persons. Information about Statutory Acknowledgements in Northland can be found on the council's webpage at "Statutory Acknowledgements in Northland".

Checklist

The following information **must** be included in your application to ensure that is not returned as incomplete under Section 88 of the RMA.

- ☑ All applicable application form details have been completed.
- ☑ Assessment of Environmental Effects in accordance with Schedule 4 of the RMA.
- ☑ Assessment of effects on tangata whenua and their taonga.
- ☑ Site plan(s). These are required to be of good quality, and preferably electronically, to enable use in resource consent documentation.
- ☑ Evidence of payment of the required minimum estimated initial fee.
- ☐ If you are applying for a coastal permit, evidence that you have provided notice of your application to all groups who have applied for customary marine title in the location of your application and that you have sought their view on the application. The council cannot legally accept an application without evidence of this.

Information Privacy Issues

The information you provide in this application is regarded as official information. It is required under the provisions of the Resource Management Act 1991 to process this application. The information will be held by the council and is subject to the provisions of the Local Government Official Information and Meetings Act 1987, and the Privacy Act 1993. The information you provide in this application will generally be available to the public.

Under Section 88 and/or 127 of the Resource Management Act 1991 (RMA), the undersigned makes this application for resource consent(s).

1 **I/We confirm that I have authority to sign on behalf of the person(s) named as the applicant(s) for this application for resource consent.**

2 **I/We have read, and understand, all of the information contained within this application form, including the requirement to pay any additional actual and reasonable costs for the processing of the application.**

3 **I/We confirm that all of the information provided is true and correct and I understand that any inaccurate information provided could result in my resource consent (if granted) being cancelled.**

Signature(s):  **Date:** 11/07/2023

Signature(s): ..... **Date:** .....

Signature(s): ..... **Date:** .....

Please note that a signature is not required if submitting application electronically.

Resource Consent Application - Whangaroa Road Culvert Replacement

Assessment of Effects on the Environment

Prepared for Northland Transportation Alliance (Far North District Council)
Prepared by Beca Limited

7 July 2023

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	Leon Keefer	First draft	30/06/2023
2	Leon Keefer	Final draft	06/07/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Leon Keefer		06/07/2023
Reviewed by	Graeme Roberts		07/07/2023
Approved by			10/07/2023
on behalf of	Beca Limited		

1 Introduction

This Assessment of Effects on the Environment (AEE) Report has been prepared by Beca Limited (Beca) on behalf of the Northland Transportation Alliance (NTA) (the Applicant), which includes Far North District Council (FNDC), to support a resource consent application pursuant to Sections 12 and 13 of the Resource Management Act 1991 (the RMA) to replace and upgrade an existing culvert and a passive flap gate on Whangaroa Road near 266 Whangaroa Road, Kaeo.

1.1 Project Context

NTA maintain and operate road networks throughout Northland, including roads and assets within Far North District. The culvert subject to this AEE has deteriorated to the point where a complete replacement is required to prevent collapse and subsequent damage to Whangaroa Road, which is the primary road servicing Whangaroa township. The culvert conveys water from a ~140ha catchment consisting of steep, bush covered hills and a large, flat area that appears to have been used for rural production over recent decades.

The culvert carries flows out to a small embayment within the Kaeo River estuary / Whangaroa Harbour and has a wooden passive tidal flap gate affixed to its downstream outlet. The flap gate was likely installed historically to mitigate coastal flooding. It is proposed to upgrade this flap gate inline with the proposed culvert replacement to maintain the *status quo* of the upstream environment.

The works will be undertaken during the 2023/2024 summer construction season and are anticipated to take approximately 2 weeks. A range of effect management measures are proposed to minimise potential adverse effects.

Consents are sought for a 5-year duration to account for any potential construction programme delays.

1.2 Summary of Consents Required

Consents are required pursuant to s15 of the RMA, relating to the upgrade of the existing culvert and flap gate on Whangaroa Road. This is provided for by:

- Regulation 71(1) of the *Resource Management (National Environmental Standards for Freshwater) Regulations 2020* (NES:F) for the extension and reconstruction of a culvert in, on, over, or under the bed of a river is a discretionary activity if it does not comply with any of the conditions in regulation 70(2);
- Regulation 74(1) of the *Resource Management (National Environmental Standards for Freshwater) Regulations 2020* (NES:F) for the reconstruction of a passive flap gate in, on, over, or under the bed of any river or connected area as a non-complying activity;
- Rule C.1.5.12 of the Proposed Northland Regional Plan (PNRP) for dredging, deposition, and disturbance activities as a discretionary activity; and
- Rule C.2.1.10 of the Proposed Northland Regional Plan (PNRP) for Freshwater structures as a controlled activity.

1.3 Structure of the Report

Schedule 4 of the RMA sets out the information requirements for a resource consent application. This application has been prepared in a manner consistent with Schedule 4 and contains the following information:

- A description of the existing environment within which the activity takes place.
- Summary of the proposed activities.
- An assessment of alternatives.

- Reasons for consent.
- An assessment of effects on the environment.
- A summary of consultation undertaken to date; and
- An assessment of the relevant statutory framework.

2 Existing Environment

The proposed works will take place within the road reserve of Whangaroa Road, near the property entrance for 266 Whangaroa Road, and an unnamed stream that flows into the Kaeo River Estuary. Whangaroa Road is classified as a two-lane collector road by Far North District Council, but is the primary road connection between Whangaroa township and Kaeo to the south.

Whangaroa Road along this shoreline appears to have been built as a causeway sometime prior to the 1940s. A review of historical aerial photos indicates that the land to the east of the road may have been built up using reclaimed fill over what was a saltwater marsh. The construction of the road and subsequent culvert would have had significant impacts on the natural hydraulics of this system as well, potentially resulting in the build-up of sediment on the landward side of the road.

At present, drainage channels / streams carry freshwater flows from the catchment to the 1.8x1.8m box culvert. The channels are incised with steep banks on both sides of the road. The ground and intertidal foreshore downstream of the culvert comprises soft marine silts and mud. A mature mangrove forest has established within the intertidal margins along the shoreline.

Figure 2.1. Aerial of proposed works area adjacent to the General Coastal Marine Zone / Significant Marine Mammal and Sea Bird Overlay (Proposed Northland Regional Plan Maps) shown as a blue overlay within the Whangaroa Harbour. Freshwater streams / drains are shown as dashed blue lines.

Based on a review of the Northland Regional Council's GIS Maps, the works will take place outside of the General Coastal Marine Area and above the indicative mean high water springs that defines the Cross-River Coastal Marine Area Boundary; however, the culvert and upstream drains are known to be subject to tidal influence and as such the seaward side of the culvert is considered to be the landward boundary. The structure is therefore considered to be a freshwater structure, with the potential for temporary construction works to occur within the Coastal Marine Area downstream of the culvert.

2.1 Receiving Environment

The culvert is located on a shoreline of the Whangaroa Harbour near the mouth of the Kaeo River estuary. The harbour is identified under the Proposed Northland Regional Plan maps as being Significant Marine Mammal and Sea Bird Habitat, as well as having a saltmarsh / mangrove complex along the shoreline adjacent to Whangaroa Road. The culvert empties into an incised channel that has been formed through fine marine silts in the intertidal zone. The intertidal flats adjacent to the culvert contain a mature mangrove forest with native terrestrial vegetation growing from the roadside berm.

The harbour is also home to the Moana New Zealand oyster farms, which are located a few hundred metres north of the proposed works.

2.2 Aquatic and Riparian Fauna

An Ecological Impact Assessment and Report (Appendix B) has been prepared by Beca Ltd. This report summarises the findings from a site visit on 18 May 2023 that included taking eDNA samples from locations within the stream during low tide both upstream and downstream of the culvert. The full report is attached as Appendix B.

In summary, the assessment found:

- The upstream environment is likely habitat for a range of freshwater aquatic organisms, including shortfin and longfin eels, bullies, and commonly found athropods;
- Fish passage may be limited due to the presence of the flap gate, but water exchange was observed and the presence of anadromous fish species upstream of the culvert corroborates the indication that fish passage is present; and
- Pest fish species DNA was limited to mosquito fish, and together with the presence of the array of indigenous species, the upstream aquatic habitat has been assessed as having High Ecological Value.

Downstream eDNA sampling was also undertaken, within the tidal reach of the estuarine creek. This resulted in a similar array of species as the upstream samples, with additional marine species such as but not limited to mullets, snapper, triplefin, mahi-mahi, and parore.

No pinniped or cetacean DNA had been recorded, with the only mammal species found being from the Common brushtail possum, rodents, bovines, and dogs.

2.3 Avifauna

As shown in Figure 2.1 above, the Whangaroa Harbour is identified as being subject to the Significant Marine Mammal and Sea Brid Overlay. NRC's *Significant Ecological Estuarine Assessment Sheet for Wading and Aquatic Birds* identifies a range of threatened and at-risk bird species, including shags, herons, bitterns, gulls, banded rails, terns, pied stilts, the Northern New Zealand dotterel, and others.

During a site visit undertaken in May 2023, shore birds (including shags and red billed gulls) were observed feeding within the intertidal margins of the estuary approximately 200m from the works area. A single kotare was observed flying overhead.

The harbour is also identified as providing feeding and breeding habitat for the kororā (*Eudyptula minor).* As Whangaroa Road was built as a causeway utilising large boulders and rocks imported to support the seaward edge of the road, there is potential habitat for kororā, which could utilise these rocks for breeding, nesting, and chick rearing. Breeding and egg laying usually occurs between July and November, with nesting, egg hatching, and chick fledging continuing through to February.

Figure 2.2. Statutory Acknowledgement Areas (FNDC GIS) within the vicinity of Whangaroa Harbour. The Statutory Acknowledgement Area of Ngātikahu ki Whangaroa is shown in green and covers the whole of the Whangaroa Harbour.

2.4 Riparian and Coastal Vegetation

The Ecological Assessment (Appendix B) provides details on the vegetation surveyed within proximity of the works area. In summary, the vegetation observed included:

- Mature mangroves within the intertidal area downstream of the culvert, including pneumatophores protruding up through the mudflats;
- A mature pōhutukawa growing immediately adjacent the culvert on its northern side, with roots likely extending horizontally along the soil lens lining the coastal edge of the road;
- An indigenous forest covers the hills upstream of the culvert, with some self-seeded plants immediately adjacent the culvert, including tōtara and harakeke;
- Introduced grasses, reeds, rushes, and herbaceous plants dominate the upstream riparian environment, including pampas grass and banana. The roadside along the freshwater stream is dominated by kikuyu and a range of low-growing weed plant species.

2.5 Site Hydrology

The Design and Options Report (Beca) in Appendix A includes a hydrological and hydraulic assessment of the contributing catchment and existing culvert, confirming the following quanta:

- 100year ARI flood flow rate: 14.3m^3/s
- 100year ARI flood flow velocity: 6.51m/s
- Mean High Water Springs: 0.754 mRL
- Mean Low Water Springs: -1.446 mRL
- Mean Sea Level: -0.346 mRL

Based on the NRC modelling reviewed by the design team, it is expected that in extreme events during high tide, coastal waters could likely overtop Whangaroa Road. The existing tidal flap gate is assumed to have been installed to minimise the frequency of coastal inundation and would be effective for all events that did not result in overtopping.

Figure 2.3 below shows the modelled extent of coastal flooding within the catchment (NRC GIS Natural Hazard Maps).

Figure 2.3. NRC GIS Natural Hazard Maps showing the contributing catchment within the Coastal Flood Hazard Zones 2 and 3.

3 Proposed Works

3.1 Structural Components

As discussed previously in this report, the existing 1.8 x 1.8m, 16.5m-long reinforced concrete box culvert under Whangaroa Road has deteriorated and requires replacement. Both inlet and outlet have concrete wingwalls and an apron, and the outlet (downstream end) of the culvert is fitted with a wooden and steel passive tidal flap gate. The road is built upon a mixture of construction fill and imported boulders.

It is proposed to replace the existing culvert and flap gate with a 2.5 x 2.0m concrete box culvert and an upgraded flap gate to cover the increased cross-sectional area of the culvert. This culvert design will reduce the risks of flood flows overtopping the road surface and subsequent damage. This also will reduce the velocity of flows at the outlet during a 100year ARI event to 3.82m/s.

The design for the replacement flap gate has not yet been confirmed; however, it is envisaged that a similar style will be chosen with the addition of a self-regulating mechanism (either using a counterweight or float system) to prolong the duration for which the gate aperture is open. This is in general alignment with the 'fish friendly' tide gates identified in Section 5.3.5 of the New Zealand Fish Passage Guidelines.

Figure 3.1. Indicative area of the proposed works overlaying an aerial photo of the site. The proposed structure is shown in green and blue with the extent of the earthworks and disturbance in red.

3.2 Construction Activities

The construction of the replacement culvert will be planned and managed by the successful contractor engaged by NTA to undertake the works. It is considered likely that the works will require:

- The use of heavy construction plant and machinery to excavate the existing culvert and remove the structure from the stream and CMA;
- Temporary damming and diversion of water during excavations as far as practicable, potentially using coffer damming methods (sandbags or sheet piles) and pumping;
- In-stream sediment and silt management, such as silt curtains downstream of the works;
- Excavation of the stream bed, stream banks, and the coastal foreshore to enable the installation of the widened structure and new headwalls/aprons;
- Excavation and relaying of bedding material to support the replacement culvert structure;
- The use of swamp mats or similar to support any required tracking of machinery within the foreshore;
- The removal of vegetation to enable the construction of the new structure and associated movement of machinery and equipment; and
- The installation of pre-cast concrete box culvert sections and associated grouting.

The successful contractor will be required to undertake the works in accordance with industry best practice, which will include the requirement to adhere to the erosion and sediment control principals and methods set out in Auckland Council's Guideline Document 2016/005 (GD-05): *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region.*

The duration of the works will ultimately depend on the proposed methodology undertaken by the successful contractor and associated traffic management requirements. Road closures would accelerate the construction programme; however, the only detour option requires a detour of ~40km through Matauri Bay.

3.3 Consideration of Alternatives

During the design options assessment, Beca and NTA considered upgrading the existing culvert without the replacement of the passive flap gate, which would result in unhindered fish passage at all times. However, the purpose of the flap gate is to prevent tidal surges from flooding the land upstream of the culvert. The removal of the flap gate, while provided for as a Permitted Activity under the NES:Freshwater, could result in unintended significant adverse flooding risks to properties upstream of the culvert. As such, the decision was made to proceed with an upgraded culvert and replace the passive tidal flap gate.

4 Rules Assessment

The proposed works require resource consents pursuant to the regulations and rules of the National Environmental Standard: Freshwater and the Proposed Northland Regional Plan. The overall activity status of the application is non-complying due to the provision of a passive tidal flap gate.

The specific rules that apply to the works are described below.

4.1 National Environmental Standard: Freshwater (NES:F)

The proposal is subject to the following regulations and standards under the NES:F:

- ***Construction of specified infrastructure:***
  Regulation 45 – Discretionary Activities

  (1) Vegetation clearance within, or within a 10m setback from, a natural inland wetland; and

  (2) Earthworks or land disturbance within, or within a 10m setback from, a natural inland wetland.

Comment

Based on a review of historical and present aerial photographs, the paddocks located at 232 Whangaroa Road and the flat grassed area at 266 Whangaroa Road, immediately upstream of the culvert, likely meet the definition of a natural inland wetland under the NPS:FM. Excavations and minor vegetation removal will occur at the location of the culvert for the purposes of reconstructing that specified infrastructure and will be within 10m from the edge of the natural inland wetland.

- ***Culverts***
  Regulation 71 – Discretionary Activities
  (1) The placement, use, alteration, extension, or reconstruction of a culvert in, on, over, or under the bed of a river is a discretionary activity if it does not comply with any of the conditions in regulation 70(2).

Comment

The culvert will contravene Condition 70(2):

(e) the culvert must be open-bottomed or its invert must be placed so that at least 25% of the culvert's diameter is below the level of the bed; and
(f) the bed substrate must be present over the full length of the culvert and stable at the flow rate at or below which the water flows for 80% of the time.

The proposed culvert will have a concrete bottom and has not been specifically designed to be below the level of the bed or to enable the bed substrate to be over the full length of the culvert.

- ***Passive Flap Gates***
  Regulation 74 – Non-complying Activities
  (1) The placement, use, alteration, extension, or reconstruction of a passive flap gate in, on, over, or under the bed of any reiver or connected area is a non-complying activity.

Comment

The existing flap gate will be replaced and upgraded along with the culvert.

4.2 Proposed Northland Regional Plan

The Proposed Northland Regional Plan (Appeals version, updated June 2023) is not fully operative until all appeals are resolved. Where a rule in the PNRP has not been appealed, in accordance with Section 86F of the RMA, it must be treated as operative (and any previous rule as inoperative).

The plan has been through a robust appeals process and currently only two provisions are subject to appeals:

- PNRP Rule C.1.5.1 Coastal dredging, disturbance, and disposal;
- PNRP Rule C.1.8 Coastal works general conditions.

In these cases, both the Proposed and Operative Coastal Regional Plans should be assessed. It is noted that the only appeals relevant to this application relate to specific conditions Rule C.1.8, but that these largely relate to permitted activities associated with structures, their construction, and ancillary activities involving the disturbance of the foreshore. Resource consents for these activities are being sought in accordance with PNRP Rule C.1.5.12 (see below) and therefore there are no appeals to the provisions of the PNRP that are relevant to this application/

As such, all relevant provisions of the PNRP are treated as operative for the purposes of assessing and preparing this application.

4.2.1 Resource Consent Requirements

Resource consent is required for:

- the replacement of the existing culvert within the bed of a stream in accordance with Rule C.2.1.10 of the PNRP; and
- associated disturbance within the foreshore in accordance with Rule C.1.5.12 of the PNRP.

Rule C.1.5.12 Dredging, deposition, and disturbance activities – discretionary activity

The damage, destruction, or disturbance of the foreshore or seabed, or deposition of material onto the foreshore or seabed, that is not the subject of any other rule of this Plan are discretionary activities, provided they are not in a mapped:

1) *Nationally Significant Surfbreak; or*
2) *Outstanding Natural Feature; or*
3) *Area of Outstanding Natural Character; or*
4) *Historic Heritage Area or Site; or*
5) *Significant Ecological Area; or*
6) *Site or Area of Significance to tāngata whenua; or*
7) *Outstanding Natural Landscape; or*
8) *Significant Bird Area – critical bird habitats.*

Comment

The works within the foreshore will be ancillary to the upgrade of the culvert and will require minor disturbance to widen the outfall channel immediately adjacent to the culvert and may also require the use of machinery from the foreshore. The Whangaroa Harbour is identified as a Significant Bird Area; however, this mapped area does not extend to the works area, as shown in Figure 2.1 above.

Rule C.2.1.10 Freshwater structures – controlled activity

The erection, reconstruction, placement, alteration, or extension of a structure in, on, under, or over the bed of a lake or river, any associated temporary damming, taking or diversion of water around the activity site, and any associated bed disturbance or deposition of a substance in, on, or under the bed, that is not permitted by Rule C.2.1.8 Construction and installation of structures – permitted activity are controlled activities, provided:

1) *the activities are not in a significant wetland, an outstanding freshwater body or a mapped:*
    a. *Outstanding Natural Character Area; or*
    b. *Outstanding Natural Feature; or*
    c. *Site or Area of Significance to tāngata whenua;*

    Unless necessary for the purpose of meeting rule C.8.1.2(5); and
2) *The length of a culvert does not exceed 25m unless it passes under a local authority road; and*
3) *The structure does not prevent indigenous fish or trout passage; and*
4) *The activities do not impede legal public access to the river.*

Comment

The proposed culvert replacement will not meet the Permitted Activity standards set out under Rule C.2.1.8 due to the proposed culvert invert not meeting standard C.2.1.8(3)(f). The culvert will, however, meet the standards for a controlled activity as set out in Rule C.2.1.10.

4.2.2 Permitted Activities

Other aspects of the proposed works will likely be compliant with the Permitted Activity rules and standards provided for in the PNRP, including:

- Pruning or removal of a mangrove within 5m of the edge of the formed road pursuant to Rule C.1.4.2;
- Disturbance of the foreshore by construction machinery incidental to the removal and replacement of the box culvert under the road pursuant to Rule C.1.5.1 and in compliance with the conditions in C.1.8; and
- Minor clearance of material around the culvert outlet pursuant to Rule C.1.5.5 and in compliance with the conditions in C.1.8.

It is noted that Rule C.1.5.1 and the conditions in C.1.8 are the only provisions in the PNRP that are still subject to appeals. The related rules and standards set out in the Operative Northland Regional Coastal Plan have therefore been considered below.

5 Assessment of Effects on the Environment

5.1 Positive Effects

The existing culvert has deteriorated to the point where it is at risk of failure. The proposal will involve the replacement and upgrade to the culvert, which will enable the continued useability of Whangaroa Road and therefore provide for the health, safety, and well-being of communities connected to the rest of the region via this road.

The widened culvert will also improve water conveyance on the outgoing tide, including during flood events, thus reducing flood risks to the catchment above the freshwater streams and drains.

5.2 Hydrological Effects

The potential adverse effects on natural hydrology of freshwater catchments arising from the placement of a culvert include:

- acute effects within the immediate vicinity of the culvert, such as erosion of stream banks due to the concentration of flows; and
- overall catchment effects, such as backwater flooding effects due to constrained flows.

Due to the location of this culvert and the upstream catchment, the description of potential hydrology effects is more complicated than a typical freshwater stream.

Whangaroa Road was built as an earth and masonry causeway within the Kaeo River estuary. The road now restricts the natural tidal flushing of the historical estuarine environment to the northeast of the road, restricting the hydrological connectivity to the harbour to a single 1.8 x 1.8m concrete box culvert. Over time, this may have contributed to the infilling of environment on the landward side of the road. In addition, the culvert (and its proposed replacement) has a passive tidal flap gate installed to minimise flooding upstream of the culvert associated with tidal surges.

The proposed upgrade has been designed to maintain the existing tidal flood protection while providing greater capacity for flows on the outgoing tide with the wider culvert. Coastal inundation over the road is likely to occur in extreme events regardless of the proposed works, but the larger culvert will provide improved flood conveyance on the outgoing tides.

Given the upgrade is a replacement of the existing structure with a similar, albeit slightly larger structure, adverse effects on the catchment hydrology will likely be negligible with some potential benefits to flood relief.

5.3 Ecological Effects

As set out in the Northland Regional Policy Statement, the Proposed Northland Regional Plan, and described in the Ecological Assessment (Appendix B), the Whangaroa Harbour has a wide range of significant ecological values, provides habitat for a range of significant marine mammals, sea birds, and indigenous fish species, and has ecologically important intertidal mudflats that are critical for the wider coastal food web.

The proposed works are relatively minor and will have a correspondingly minor impact on the Whangaroa Harbour and the freshwater streams that flow through the culvert. The particular ecological effects assessed in the Ecological Assessment are summarised below. Refer Appendix B for the full report.

5.3.1 Freshwater Habitat

The streambed upstream of the culvert diverges into two channels:

- Watercourse 1 – a 4m wide, 500mm deep drain that flows parallel to the road; and
- Watercourse 2 – a narrow, shallow stream bed that flows along the foot of the nearby hills.

Based on site observations and a review of aerial photos, it appears that Watercourse 2 flows through a mixed canopy indigenous vegetation on its true right bank and a mixture of introduced grasses on the true left bank. An more in-depth investigation of potential habitat in this stream was not possible during the site visit due to the stream flowing through private property; however, no works are proposed in this stream and as such no effects are anticipated as a result.

Watercourse 1 flows parallel to the road is straight with steep incised banks on both sides with a silty, muddy stream bed. The true left bank of the stream is formed by the eastern edge of the road causeway, comprising a mixture of large rocks and imported fill. Vegetation growing along this bank largely comprises roadside weed vegetation and kikuyu grass, but also includes remnant mangroves and some pōhutukawa upstream of the culvert. The true right bank comprises soft soils and is overgrown with exotic plants including banana, ginger, and pampas. The aquatic habitat therefore comprises primarily of 'run' and the overall ecological value of Watercourse 1 has been scored as 'moderate'.

The banks closer to the culvert inlet are predominately weeds on the left bank with a small area of native juvenile trees. The proposed upgrade will require excavating soil and rocks within the road to facilitate the removal of the existing culvert and installation of its replacement. This will result in the removal of exotic grasses and riparian weeds, and the juvenile trees as discussed in the Ecological Assessment. The temporary disturbance of stream banks could result in an increase in sedimentation during the works, but long-term adverse effects are anticipated to be negligible due to the existing lack of habitat in the area of the works.

On completion of the works, the streambank will be reinstated in accordance with the Erosion and Sediment Control Plan. No riparian planting is proposed as mitigation.

5.3.2 Fish Passage

As described in Section 3 of this report, the existing culvert provides limited fish passage due to the passive tidal flapgate affixed to its downstream outlet. The flapgate functions by closing on the incoming tide and opening on the outgoing tide, or when the differential water pressure is higher on the upstream side, thus enabling flows through the culvert. As a result, fish are only able to traverse through the flapgate during low tides. With the flapgate open, fish can enter the culvert from the bottom sides of the flapgate. This has been assessed as resulting in poor connectivity with the upstream habitat. However, as discussed in Section 2.2, eDNA analysis shows the presence of a range of indigenous fish species, indicating that there is at least partial fish passage.

As discussed in section 5.2 above, the flapgate is anticipated to provide significant flood mitigation and will therefore be upgraded to match the proposed culvert reconstruction. As part of this upgrade, it is proposed to modify the gate to be 'fish friendly', a term used to described tidal gates with a passive system that extends the opened period of the gate to increase the time available for fish to move between environments. This can be achieved by using a counterweight or float system, depending on which design is procured.

By installing a fish friendly tidal gate, and increasing the width of the culvert, it is anticipated that fish passage will be improved over the existing *status quo*. Given this, the overall effects on fish passage will be positive despite the inherent effects associated with tidal flap gates.

5.3.3 Avifauna Habitat

As described in Section 2, the wider Whangaroa Harbour is known for providing habitat and forage for a wide range of significant indigenous avifauna. During the site visit, several wading bird species had been observed grazing along the tidal mudflats of the Kaeo River estuary, over 100m away. Native passerines were also observed including a kōtare flying overhead; however, no wading bird species had been observed within proximity to the proposed works area.

The rocky seaward edge of the road causeway has been identified in the Ecological Assessment as potential kororā habitat, albeit unlikely due to the high degree of disturbance that would arise from proximity to vehicles along the road and the presence of preferable habitat within the wider harbour.

The Ecological Assessment concludes that the proposed works will take place within a very small area for a short amount of time. Any disturbance to avifauna would be temporary and only for the duration of construction. This would not result in significant adverse effects, as birds would likely demonstrate avoidance behaviour and seek habitat and forage elsewhere within the harbour, of which the extent of available alternatives is plentiful.

While considered unlikely for birds to be affected during works, it is proposed that a suitably qualified ecologists undertakes a pre-construction survey to confirm the absence of kororā nests within the vicinity of the works. Where kororā are found to be present, a Bird Management Plan will be prepared to identify options to avoid nests and interference with the kororā nesting cycle.

Considering the short duration of works, the relatively unchanged landscape following works completion, and the avoidance of effects on kororā nesting, adverse effects arising from the works on avifauna will be less than minor.

5.3.4 Vegetation Clearance

Mangroves – Within CMA

As set out in Section 3.2 above, the reconstruction of the culvert will require excavations on the land within the road reserve and within the foreshore and stream. This will include potential removal or pruning of a few mangroves, as well as the positioning of machinery on the mudflats within vicinity of mangroves and pneumatophores. It is proposed to place machinery as close to the road bank as possible, where the ground is approximately 1m higher than the tidal mudflats and has a stone bottom. Where machinery tracking or placement is required on a mudflat, swamp mats will be utilised to maximise stability for the digger and reduce disturbance of the foreshore.

Pōhutukawa – Coastal Edge

A self-seeded pōhutukawa is growing out of the side of the road embankment. It appears to be approximately 4m in height and has several trunks and branches growing from its crown at ground level. Its root system can be seen along the berm of the road and likely stretches out a few metres either side of the tree, given the road berm provides the only available permeable soil. While the tree is located about 2m north of the extent of the works area, the excavation of the road and culvert will likely result in the severance and destruction of a significant amount of tree roots.

Mixed Indigenous Vegetation – Riparian Area

A small area of approximately 6m^2 of mixed indigenous vegetation will likely be cleared on the true right bank of the stream upstream of the culvert. This vegetation includes a young tōtara, harakeke, māhoe, hangehange, and a mixture of low-growing fern species. These are coloniser species that have spread onto the road reserve from the nearby stand of remnant forest.

Clearance of this vegetation will be required for the road bank excavation and culvert installation. It is expected that the coloniser species, particularly māhoe, hangehange, and the low-lying ferns, will naturally

recolonise the area within a few seasons following ground reinstatement. Tōtara will also likely recolonise, although being a slow-growing species will not be as conspicuous.

Summary of Vegetation Clearance Effects

Section 5.2.4 of the Ecological Assessment (Appendix B) has assessed this proposed vegetation clearance as having a very low effect without any proposed management. As such, it is considered that the adverse effects on vegetation disturbance and removal will be less than minor. No mitigation is considered necessary beyond using best practice methodologies and minimising vegetation disturbance as far as practicable.

5.4 Sedimentation Effects

As noted above, the proposal will require disturbance of a muddy, silty stream and part of the coastal foreshore that is subject to tidal influences. The eastern coastline of the estuary comprises very fine silts and muds and will likely result in temporary sedimentation of waters where disturbance occurs.

The disturbance of sediments within waterbodies results in increased turbidity and the potential for suspended sediments to be deposited elsewhere downstream or within the harbour. Such conditions are common in rivers and streams with pastoral and horticultural catchments, or steep lands subject to frequent slips, due to rain events and overland flows carrying sediments into the waterways. High turbidity reduces overall amenity and decreases habitat ranges for particularly sensitive aquatic fauna.

The works area is located at the mouth of a stream with a catchment of approximately 140ha. While bounded by very steep slopes, these are largely covered in bush. The flattened land within the former tidal estuary is grassed and potentially functioning as an inland wetland. Water turbidity during normal conditions is therefore likely to be low; but can quickly increase with even a small amount of disturbance of the stream bed sediment. These characteristics were corroborated during the site visit undertaken in May 2023.

The temporary suspension of sediments during construction is inevitable due to the streambed and foreshore substrates. It is proposed to minimise the generation of suspended sediment and manage the extent of turbidity through a range of erosion and sediment controls that will be prepared and implemented by the successful contractor. The contract conditions stipulate that these controls must be in general accordance with Auckland Council's GD05, which also provides management methodologies for coastal marine disturbance. This will meet the requirements of Appendix H.2 of the Proposed Northland Regional Plan. While ultimately dependent on the works methodology and the controls available, it is expected that management methods will include:

- Sediment controls within the CMA, including the use of swamp mats for any machinery that needs access to the foreshore and silt curtains to limit the extent of suspended sediment transport;
- Sediment controls within the stream bed, including the use of temporary diversions where possible and the reduction of water levels within the works areas; and
- Erosion and sediment controls on land above the stream beds, particularly during vegetation removal, to prevent soil loss during works and to manage the timely stabilisation of disturbed earth following completion of earthworks.

With good management practices in place and the short-term duration of works, the disturbance of the foreshore and stream bed will result in the temporary discharge of suspended sediment during construction, but the magnitude of effects will be limited through appropriate controls, and ongoing adverse effects are anticipated to be less than minor.

6 Statutory Context

The section below provides an assessment of the proposal against the relevant statutory documents:

- The Resource Management Act 1991 (RMA);
- National Policy Statement for Freshwater Management 2020 (NPS:FM);
- National Environmental Standard for Freshwater (NES:F);
- Northland Regional Policy Statement (RPS); and
- Proposed Northland Regional Plan (appeals version, June 2023) (PNRP).

6.1 Resource Management Act 1991

6.1.1 Assessment against Part 2

The RMA outlines the functions, powers, and duties of consenting authorities to be exercised in order to give effect to the purpose and principles of the RMA and defines a hierarchy whereby priority is given to the matters set out in Part 2 – Purpose and Principles.

As set out in Section 5 of the RMA, the purpose of the Act is to promote the sustainable management of natural and physical resources, which includes enabling "people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety." This must be achieved in the context of Section 5(2), in particular the responsibility of (c) for "avoiding, remedying, or mitigating any adverse effects of activities on the environment."

Section 6 of the RMA sets out matters of national importance that one must recognise and provide for when exercising functions and powers under the Act. Of relevance to this application includes under s6(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.

Section 7 of the RMA sets out other matters that one must have particular regard to when exercising functions and powers under the Act. Of relevance to this application includes:

(d) intrinsic values of ecosystems;
(f) maintenance and enhancement of the quality of the environment;
(g) any finite characteristics of natural and physical resources; and
(i) the effects of climate change.

Section 8 of the RMA requires that all persons exercising functions under the Act in relation to managing the use, development, and protection of natural and physical resources shall take into account the principles of Te Tiriti o Waitangi.

Comment

The proposal seeks to replace a failing asset on a critical transport route for an isolated community in the Far North, therefore providing for the social and economic well-being and the health and safety of the community within Whangaroa. The culvert has been designed to provide improved flood resilience and improved fish passage, while limiting the extent of construction as far as practicable.

Most of the construction effects arising from the works will be temporary, only occurring during construction, and will be mitigated through a range of management controls and methods. Ongoing effects arising from the operation of the culvert and floodgate will be less than minor and may improve hydrological and aquatic values upon the *status quo*. The small amount of vegetation clearance is otherwise provided for as a Permitted Activity and is therefore considered to have less than minor effects.

6.1.2 Section 104 of the RMA

Section 104 of the RMA sets out the matters a consent authority must, subject to Part 2 – Purpose and Principles of the Act, have regard to when considering resource consent applications:

(1) When considering an application for resource consent and any submissions received, the consent authority must, subject to Part 2 and section 77M, have regard to –

a) any actual and potential effects on the environment of allowing the activity, refer to section 6 of this AEE; and

aa) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and

b) any relevant provisions of –

i. any national environmental standard (including the NES for Freshwater);

ii. other regulations;

iii. a national policy statement (including the National Policy Statement for Freshwater Management;

iv. a New Zealand Coastal Policy statement;

v. a regional policy statement or proposed regional policy statement;

vi. a plan or proposed plan; and

c) Any other matter the consent authority considers relevant and reasonably necessary to determine the application.

The effects have been assessed above in section 5 of this report.

Analysis of the relevant provisions of the National Environmental Standards for Freshwater and the rules set out in the Proposed Northland Regional Plan are discussed in Section 4 of this report.

An analysis of the relevant objectives and policies within the National Policy Statement for Freshwater Management, the New Zealand Coastal Policy Statement, and the relevant Northland Regional planning documents are set out below.

6.2 National Policy Statement Freshwater Management (2020) (NPS:FM)

The objective of the NPS:FM is to ensure that natural and physical resource are managed in a way that priorities:

a) First, the health and well-being of water bodies and freshwater ecosystems;

b) Second, the health needs of people (such as drinking water);

c) Third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

The relevant policies to the proposed works include:

Policy 6: *there is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted;*

Policy 9: *the habitats of indigenous freshwater species are protected.*

Policy 15: *communities are enabled to provide for their social, economic, and cultural well-being in a way that is consistent with this NPS.*

As described in the sections above, the proposed works will take place within a wetland's connected area. The proposed culvert upgrade has been designed to maintain the hydrological *status quo* with the provision of a 'fish friendly' passive tide gate, which will provide minor improvements to the existing fish passage barriers within the catchment. Minimal changes to the upstream habitat and no changes to the upstream wetland will result from the works. Further to this, the reconstruction of the culvert will continue to enable a critical transport route for the community within Whangaroa, providing for their social, economic, and cultural well-being.

The proposal is therefore consistent with the objectives and policies of the NPS:FM.

6.3 Northland Regional Policy Statement 2016

The Northland Regional Policy Statement (RPS) provides an overview of the key resource management issues across Northland while setting out policies and methods for underling regional and district plans to achieve Part 2 of the RMA. The RPS provides specific policies, relevant to this application for resource consent, that seek to improve the overall quality of Northland's fresh and coastal waters, protecting indigenous biodiversity in freshwater environments, and recognising the importance of regionally significant infrastructure and the role these serve to the economic and social wellbeing of communities.

The RPS was made operative in 2016 and updated in 2018. Given its status, it is considered that the more recent PNRP adequately gives effect to the RPS. As such, the proposed activities subject of this application have been assessed against the relevant objectives and policies of the PNRP.

6.4 Proposed Northland Regional Plan

While the PNRP is not yet fully operative, the specific rules pertaining to the proposed municipal wastewater discharge has no outstanding appeals and relates to the protection of water and is therefore treated as operative pursuant to s86B and s86F of the RMA. The Northland Soil and Water Regional Plan and the Regional Air Quality Plan have therefore not been assessed as part of this application.

Relevant key policies that the consent authority must consider in determining an application subject to the above rules include the following:

Relevant Policies	Commentary
Policy D1.1 – When an analysis of effects on tangāta whenua and their taonga is required A resource consent application must include in its assessment of environmental effects an analysis of the effects of an activity on tangāta whenua and their taonga if one or more of the following is likely: 1. adverse effects on mahinga kai or access to mahinga kai, or 2. any damage, destruction or loss of access to wāhi tapu, sites of customary value and other ancestral sites and taonga with which Māori have a special relationship, or 3. adverse effects on indigenous biodiversity in the beds of waterbodies or the coastal marine area where it impacts on the ability of tangāta whenua to carry out cultural and traditional activities.	The proposed works involve temporary disturbance of a streambed and the foreshore immediately downstream of a culvert outlet. The works area is very limited and does not impact any of the values outlined in Policy D1.1.
D.2.3 Climate change and development Particular regard must be had to the potential effects of climate change on a proposed development requiring consent under this	Climate change will not have effects on what is proposed.

Plan, taking into account the scale, type and design-life of the development propose	
D.2.7 Minor adverse effects arising from the establishment and operation of regionally significant infrastructure Enable the establishment and operation (including reconsenting) of regionally significant infrastructure by allowing any minor adverse effects providing: 1. The regionally significant infrastructure proposal is consistent with: a. all policies in Section D.1 Tangāta whenua, and b. Policy D.2.16 Managing adverse effects on historic heritage, and c. Policy D.2.17 Managing adverse effects on natural character, outstanding natural landscapes and outstanding natural features, and d. Policy D.2.18 Managing adverse effects on indigenous biodiversity, and 2. the regionally significant infrastructure proposal will not likely result in over-allocation having regard to the allocation limits in H.4.3 Allocation limits for rivers, and 3. other adverse effects arising from the regionally significant infrastructure are avoided, remedied, mitigated or offset to the extent they are no more than minor.	All adverse effects associated with the proposed discharge will be remedied or mitigated to have no more than minor effects; however, at this time the cultural effects cannot yet be assessed, nor can the appropriate measures to avoid, remedy, mitigate, or offset these effects be identified.
D.2.8 Maintenance, repair and upgrading of regionally significant infrastructure Enable the maintenance and upgrading of established regionally significant infrastructure wherever it is located by allowing adverse effects where: 1. The adverse effects whilst the maintenance or upgrading is being undertaken are not significant or they are temporary or transitory; and 2. The adverse effects after the conclusion of the maintenance or upgrading are the same, or similar, to those arising from the regionally significant infrastructure before the activity was undertaken.	Regionally significant infrastructure is defined within Appendix H.9 of the PNRP and includes the transport network; specifically state highways and roads that are of strategic significance as identified in the Regional Land Transport Strategy, which subsequently references the national One Network Framework. Neither document clearly defines what a road of strategic significance is; however, Whangaroa Road is unlikely to meet the criterion for reginal strategic significance. However, the road is the primary route enabling access to Whangaroa and is at risk of failure due to the state of the culvert. The proposed upgrade will enable this route to continue to function while managing the potential effects arising during construction.
D.2.14 Resource consent duration When determining the expiry date for a resource consent, have particular regard to: 1. security of tenure for investment;	Construction is planned to occur within the same construction season as this application (i.e. 2023/2024). A 5-year expiry is considered appropriate to account for delays in

2. administrative benefits of aligning the expiry date with other resource consents for the same activity in the surrounding area or catchment; 3. certainty of effects; 4. whether the activity is associated with regionally significant infrastructure; and 5. the following additional matters where the resource consent application is to re-consent an activity: a. the applicant's past compliance with the conditions of any previous resource consent; and b. the applicant's voluntary adoption of good management practice.	procurement and preparation of management plans as required without decreasing the certainty of potential effects.
D.2.18 Managing adverse effects on indigenous biodiversity Manage the adverse effects of activities on indigenous biodiversity by: 4. recognising damage, disturbance or loss to the following as being potential adverse effects: a. connections between areas of indigenous biodiversity, and b. the life-supporting capacity of the area of indigenous biodiversity, and c. flora and fauna that are supported by the area of indigenous biodiversity, and d. natural processes or systems that contribute to the area of indigenous biodiversity, and 5. assessing the potential adverse effects of the activity on identified values of indigenous biodiversity, including by: a. taking a system-wide approach to large areas of indigenous biodiversity such as whole estuaries or widespread bird and marine mammal habitats, recognising that the scale of the effect of an activity is proportional to the size and sensitivity of the area of indigenous biodiversity, and b. recognising that existing activities may be having existing acceptable effects, and c. recognising that minor or transitory effects may not be an adverse effect, and d. recognising that where effects may be irreversible, then they are likely to be more than minor, and e. recognising that there may be more than minor cumulative effects from minor or transitory effects,	The Ecological Assessment (Appendix B) has identified the existing biodiversity values and has assessed the potential effects on those values as being low. The proposed construction will be managed to minimise potential effects; minimal disturbance of established vegetation will occur; and the ongoing effects arising from the culvert upgrade will likely provide a minor improvement to fish passage. Overall, the works will not have any irreversible adverse effects and those that do occur will be temporary and less than minor.
D.4.25 Freshwater fish When considering resource consent applications for activities in freshwater bodies recognise:	The eDNA results indicated that the upstream environment does provide some habitat for indigenous fish including eels, bullies, and inanga.

1) that in the absence of alternative evidence, most Northland [freshwater bodies] provide habitat for Threatened or At Risk indigenous fish species; and 2) that all fish species have varying degrees of sensitivity to habitat disturbance, changed water flow, and degraded water quality, particularly increased turbidity or sedimentation; and 3) the need to maintain the ability for non-pest fish species to effectively move up and downstream of the activity site; and 4) opportunities to reduce the risk of spreading or introducing pest species; and 5) the benefits of avoiding: a) activities in […] rivers during fish migration periods; and b) spawning habitat disturbance, particularly during spawning periods.	The works will have temporary diversions in place that will prevent passage while construction occurs, but will improve fish passage at the completion of the works due to the installation of a fish-friendly flap gate in place of the existing flap gate. Habitat disturbance will be extremely limited as works will only occur in the stream in the immediate vicinity of the culvert structure.
D.4.26 Benefits of freshwater structures, dams, and diversions Recognise the significant benefits activities in water bodies can provide to local communities, Māori, and the region, including: 1) socio-economic well-being and resilience of communities or industries; and 3) enhanced fish passage and ecological connectivity between the CMA and the upstream extent of water bodies; and 4) flood protection and the safeguarding of public health and safety	The culvert replacement will enable the continued operation of Whangaroa Road, which is a critical transport route to the community of Whangaroa. As above, the proposed flap gate upgrade will improve fish passage while maintaining the existing levels of tidal flood protection.
D.4.27 Land preparation, earthworks, and vegetation clearance When assessing an application for a resource consent for an earthworks, vegetation clearance, or land preparation activity and any associated discharge of a contaminant, ensure that the activity: 1) will be done in accordance with established good management practices; and 2) avoids significant adverse effects, and avoids, remedies, or mitigates other adverse effects on: b) areas of high recreational use; and c) aquatic ecosystem health, indigenous biodiversity in water bodies and coastal water and receiving environments that are sensitive to sediment or phosphorous accumulation.	The works on land, in-stream, and within the foreshore will be undertaken in accordance with best practice management for the generation and minimisation of sediment and suspended sediment transport. The works will be temporary and of a small scale, resulting in less than minor effects on the receiving environments in both freshwater and coastal waters. Vegetation removals will be limited to only what is required to install the upgraded culvert and safely manoeuvre construction plant.
D.5.24 Dredging, disturbance, and deposition activities Dredging, disturbance, and deposition activities should not: 1) cause long-term erosion within the coastal marine are or on adjacent land; and 2) cause damage to any authorised structure.	All disturbed areas will be stabilised or will naturally revert to a stable state at the end of disturbance activities.

D.5.25 Benefits of dredging, disturbance, and deposition activities Recognise that dredging, disturbance, and deposition activities may be necessary: 1) for the continued operation of existing infrastructure;	The works are required to maintain the culvert and Whangaroa Road.
D.5.28 Mangrove removal – purpose Subject to Policy D.2.18, mangrove pruning or removal may be appropriate where: 1) it is demonstrated that the purpose of the mangrove removal in 2 a) to n) below can be achieved and; 2) It is necessary to maintain, restore, or improve one or more of the following: k) infrastructure; and 3) its purpose is not for the improvement of private views.	The pruning of mature mangroves and disturbance of mangrove pneumatophores may be required to manoeuvre construction machinery and materials to remove the existing culvert and install the new culvert. The full extent of this is not yet known and will ultimately be dependent on the contractor's chosen methodologies; however, it is anticipated that the extent of pruning or removal will be limited the immediate vicinity of the culvert outlet and may only involve pruning of one or two specimen.
D.5.29 Mangrove removal – adverse effects When considering resource consents for mangrove removal, take into account effects specific to the removal of seedlings or of mature trees and shrubs, and have regard to a range of potential adverse effects, in particular: 1) effects on ecological values, including: a) disturbance, displacement, or loss of fauna and habitat; and b) disturbing or displacing birds classified as Threatened or At Risk in the NZ Threat Classification System, particularly within Significant Bird Areas; and c) Disturbing ecological sequences or corridors; and d) Removal of a buffer o sensitive ecological areas; and e) Disturbance of the foreshore and seabed, including compaction, sediment redistribution, and mangrove biomass deposition; and 2) increased risk of coastal erosion where mangroves provide a buffer against coastal processes causing erosion; and 3) effects on tāngata whenua cultural values; and 4) amenity impacts from removal and disposal including noise, smoke, odour, and visual impacts; and 5) short and long-term effects on local sediment characteristics and hydrodynamics; and 6) changes to natural character	The potential adverse effects identified in Policy D.5.29 will likely not arise from the proposed works considering the small scale and proposed mitigation of effects.

7 Conclusion

Northland Transportation Alliance is seeking resource consent to undertake works associated with a culvert replacement and upgrade, including associated disturbance of a stream bed and coastal foreshore, and the reinstallation of a passive tidal flap gate on a stream that flows under Whangaroa Road. The existing culvert is failing and the minor upgrade is being progressed to allow for improved flood flow conveyance. The passive flap gate is being retained to maintain the hydrological *status quo*, but design measures will be implanted to improve fish passage over what currently exists. Due to the retention of the flap gate, the works are considered to be a **Non-Complying Activity** pursuant to the NES:Freshwater.

As the key potential adverse effects arising from the proposal includes effects on indigenous fish, birds, and flora, an Ecological Impact Assessment has been undertaken to determine existing ecological values and potential adverse effects arising from the works. The general conclusion of that assessment is that the environment has poor – moderate ecological values, the works will have a small magnitude of effects, and the adverse effects on the environment will be less than minor with the mitigation measures proposed.

An assessment of the works against the relevant objectives and policies of the National Policy Statement, Northland Regional Policy Statement, and Proposed Northland Regional Plan has been undertaken to show that the works are consistent with the direction of those objectives and policies.

Overall, the proposed works have been assessed as having less than minor adverse effects on the environment.

A

Appendix A – Basis of Design (Beca, June 2023)

Whangaroa Road Culvert UN28

Design Report

Prepared for Far North District Council
Prepared by Beca Limited

5 May 2023

Creative people together transforming our world

Revision History

Revision Nº	Prepared By	Description	Date
1	Michael McKillop	For client review	4/05/2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Michael McKillop		4/05/2023
Reviewed by	James Ring		5/05/2023
Approved by	Will Williams		5/05/2023
on behalf of	Beca Limited		

1 Introduction and Site Description

The Northland Transport Alliance (NTA) has commissioned Beca Ltd. (Beca) to undertake the design of replacement culverts identified as needing replacement throughout the Northland Region. As part of this contract, Whangaroa Road Culvert UN28, located near 266 Whangaroa Road, Kaeo (refer to Figure 1) has been identified as requiring replacement due to it being in poor condition as a result of extensive corrosion.

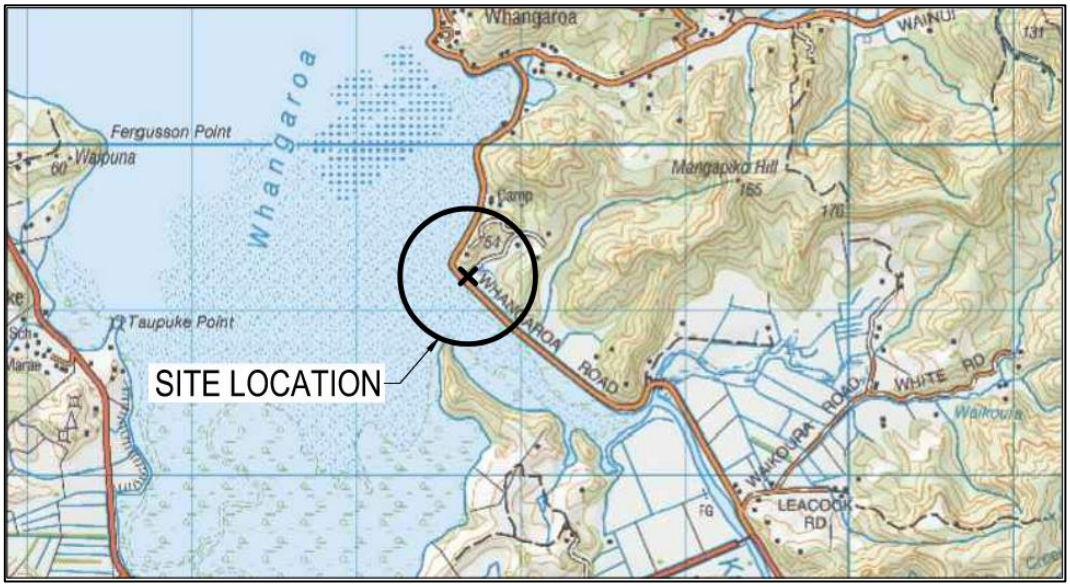


Figure 1: Site Location Map

This document sets out the proposed civil engineering works and stormwater assessment.

The existing Whangaroa Road culvert UN28 is situated on a two-lane sealed road with a 100km/hr posted speed limit. No barriers are present at the carriageway level.

It is a 1.8m x 1.8m reinforced concrete box culvert approximately 11 m long at soffit level and 16.5m long at invert level (including apron). Both the inlet and outlet of the culvert have concrete wingwalls (refer to Figure 2, Figure 3, and Figure 4 below). The culvert is in a tidal location and is exposed to immersion in saline/brackish seawater. There is a tidal gate at the downstream end of the culvert. The structure was not considered as a council asset for a significant portion of its life, and hence, has never been maintained.

Figure 2: Culvert Inlet

Figure 3: Culvert Inlet

Figure 4: Culvert Outlet

In February 2023 Beca prepared a culvert replacement options report for NTA outlining potential replacement options of various shapes, sizes, and materiality. After reviewing the options report, NTA selected the 2.5m x 2m concrete box culvert option and requested Beca to take this forward as the preferred replacement option.

2 Sizing and Materiality

The preferred replacement culvert option is a 2.5m wide (internally), 2m high (internally), and 12.40m long concrete box culvert. The culvert is required to be supplier designed and must comply with HN/HO NZTA loading with 100-year design life.

Refer to Figure 5 for a schematic diagram of the proposed culvert. Refer to Appendix A for the full drawing set which sets out the culvert design.

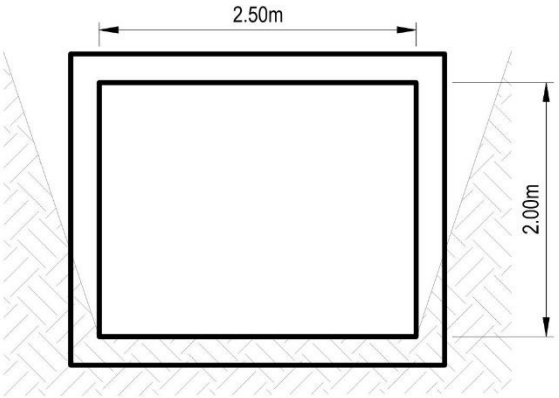


Figure 5: Proposed culvert schematic

3 Hydrology and Hydraulics

3.1 Design Performance

During the optioneering phase of the project, a hydrology assessment for the wider site and hydraulic assessment of the existing 1.8m x 1.8m culvert and the proposed 2.5m x 2m box culvert was undertaken.

Standard design criteria for culverts are set out in the Far North District Council Engineering Standards 2022 Issue 0.4 (FNDCES), which references the Waka Kotahi Bridge Manual (SP/M/022) design criteria and classifies the culvert as a "major culvert". When referring to the Bridge Manual, the key hydraulic assessment criteria the culvert would need to be designed for serviceability limit state 2 (SLS 2). For Whangaroa Road, SLS 2 is the 100yr event.

The hydrological assessment used rainfall from HIRDS and has accounted for climate change effects by increasing the historic rainfall by 20% as per BM section 2.3.2.c and FNDCES section 4.3.10.

Sea levels used in the culvert assessment have been retrieved from the LINZ Secondary Ports 2021-22 tidal predictions and are shown in Table 1 below. Two climate chance scenarios have been considered: current climate, and a 0.5m sea level rise.

Table 1: Tidal Information

Design Tide	NZVD16 level (mRL)
MHWS	0.754
MLWS	-1.446

Refer to Table 22 for a summary of key hydrological and hydraulic design information. Refer to Appendix B for the hydrological and hydraulic calculations.

Table 2: Culvert hydrological design parameters summary

Hydrology Parameters	
Catchment area	142ha
100Yr rainfall intensity (with climate change allowance)	290mm
Time of concentration	75min
% Impervious	5%
100Yr design flow	14.3m^3/s

The downstream tailwater conditions are tidal as the outlet discharges into the Whangaroa Harbour. The culvert's hydraulic performance has been assessed under four downstream tail water condition scenarios:

- Mean high-water spring and mean low-water spring have been used as a high tail water condition and low tail water condition respectively.
- Current and future (that is, with 0.5m sea level rise) sea levels.
- These assessments can be found in Appendix B, and the most extreme results from either scenario have been summarised in Table 3.

The hydraulic assessments show the culvert is adequately sized to convey the design events without overtopping the road when climate change is not accounted for, but marginally passes the design event containing climate change assumptions.

Table 3: Hydraulic Assessment

Hydraulic Assessment	
Design outlet velocity	3.8m/s
Design freeboard to road's edge of seal (no climate change)	0.53m
Design freeboard to road's edge of seal (with climate change)	0.06m

A passive flap gate has been incorporated into the design to replicate the existing, however head loss due to the gate has not been calculated as the type of flap gate will be confirmed by the contractor. The culvert achieves 0.5m freeboard to the edge of road under current design event conditions, which we anticipate will accommodate the flap gate head losses. The culvert achieves under 100mm freeboard to the edge of road under future design event conditions, which we anticipate could overtop the road.

3.2 Passive Flap Gate and Freshwater Wetlands

Historical aerial photos of the site indicate that the passive flap gate installed on the culvert has enabled the transition of the upstream environment from a saltwater marsh to productive rural land. Aerial photos show that this land has been in pasture, or has at least been used to grow and cut grass since about 1960. Photos also indicate that the land may be subject to intermittent periods of inundation, potentially being classified as a natural inland wetland under the National Environmental Standard for Freshwater.

The aquatic environment upstream of the culvert is likely brackish, with continuous freshwater influence and limited saline influence. The water salinity has not been tested, but there are remnant patches of mangrove within the stream channel that indicate there is some level of salinity.

The replacement culvert has been designed with a passive flap gate to match the existing situation. Under NES-F Regulation 74, the use of a passive flap gate is a non-complying activity and will require applying for a resource consent due to the potential effects on wetland ecology from hydrological changes and barriers to fish passage.

Communication with Northland Regional Council (NRC) and with Far North District Council (FNDC) asset teams has confirmed that neither organisation has records of owning and/or operating the gate. A review of publicly available records indicates that the gate is not subject to any resource consents. A review of historical aerial photos indicate that a flap gate may have been installed between 1950 and 1968, as pre-1968 aerial photos show a largely unmodified coastal estuary upstream of the Whangaroa Road culvert / bridge.

A flap gate installed during this period would have been subject to significantly different legislation and could have been installed by a now defunct or superseded government entity.

The use of a passive flap gate on the culvert is not required from a hydraulic standpoint for road drainage or culvert capacity reasons. Rather, it has been included in the design to replicate the existing situation. Beca views the right to exclude the use of a flap gate as the discretion of NTA as the asset owner, so if NTA has any reason or desire to exclude its use, NTA should advise Beca before the design is sent to tender. If the

flap gate is to be excluded, this could lead to a change in the upstream environment and have secondary effects on land which may be a natural inland wetland. These need to be considered to advise potential planning implications.

3.3 Fish Passage

The culvert is already a non-complying activity (refer to section 3.2) due to the presence of the passive flap gate. As such a resource consent will be required which will have its own conditions for fish passage. If the flap gate is removed from the design, the proposed culvert would likely become a discretionary activity under Regulation 71 as described below.

The culvert has been designed to meet all the criteria set out under NES-F Regulation 70, except for clause (2e) that requires the culvert to be open bottomed or placed so that 25% of the pipe diameter is embedded (noting that a box culvert does not have a diameter). The mean sea level lies at 28% of the culvert height which will provide sufficient fish passage through the culvert.

An ecological assessment will be required to support an application for resource consent.

4 Culvert Foundation

The design of the culvert relies on the excavated insitu subgrade achieving a minimum bearing strength of 80kPa.

Beca's NTA – Culvert Renewals Geotechnical Factual Report (October 2022) was unable to determine the expected subgrade strength due to onsite geotechnical testing meeting refusal on the hand auger . As the environment is surrounded by marine sediment it is probably that once the existing culvert has been removed, the insitu subgrade may not achieve the minimum bearing strength. Should this situation eventuate, a provisional undercut detail has been prepared to form the bedding for the culvert.

5 Inlet and Outlet

The design philosophy for the inlet and outlet is that both areas will be protected by precast wingwalls tied together with a cast insitu apron.

No rip rap has been specified upstream or downstream of the headwalls. This is due to the risk of dislodged rock interfering with the functionality or performance of the flood gate. The benefit of the culvert being situated in a marine environment is that marine sedimentary material is likely to redeposit itself if scour occurs during any storm events. Beca's topographical survey suggests evidence that sedimentary redeposition is currently occurring supporting our decision to exclude rip rap protection in the stream bed.

6 Pavement

No pavement investigations have been undertaken; however Mobile Roads shows the existing pavement to be 150mm thick.. The proposed pavement design has been developed in accordance with FNDC engineering standards Table 3-9 Pavement Layer Thickness for Urban and Rural Classifications.

Whangaroa Road is classified as a secondary collector road with 1333 vehicles per day (10% heavy vehicles). The existing carriageway is sealed. As per table 3-9 the required pavement depth is 220mm (GAP65 sub-base) and 120mm (AP40 basecourse). A grade 3/5 chipseal is proposed to match the existing.

7 Existing Utilities

A Before You Dig investigation was carried out and shows that there is one existing utility within the vicinity of the proposed works.

On the eastern edge of Whangaroa Road there is an existing Chorus underground communications cable. The Chorus cable will require temporary relocation during the works. Chorus will need to be engaged directly by the the Contractor to facilitate the temporary relocation and reinstatement.

8 Guardrail Considerations

The existing culvert is currently not protected by any guardrails. The existing road shoulders are very narrow, and the road embankments are close to the edge of the road (within 0.5m). The culvert is considered a roadside hazard and ideally road users would be protected by provision of a guardrail system.

If a guardrail system were to be provided, then the overall length of the existing culvert would need to be increased to provide more width adjacent to the road shoulders to facilitate the installation of the guardrail system. The road shoulders on each approach to the culvert would also need to be widened to accommodate compliant guardrail end terminals.

Due to the existing site constraints and the existing road geometry, it is not practicable or cost effective to install a guardrail system as part of the culvert upgrade. This is consistent with the remainder of Whangaroa Road which has a number of unprotected roadside hazards along its length. It is also noted that the traffic volumes on Whangaroa Road are relatively low, 1,333 vehicles per day.

9 Constructability

As the replacement culvert is proposed in the same location as the existing culvert, the most significantly anticipated issues surrounding the construction of the proposed culvert are summarised and discussed in Table 4 below.

Table 4: Constructability Issues

Constructability issue	Considerations
1. Maintaining traffic flow during construction	Whangaroa Road provides the most direct access to Whangaroa from State Highway 1. Should the road close, the closest detour is via Matauri Bay and adds an additional 45km (approximately 42 minutes without traffic). To avoid this significant detour, the road will likely need to remain operational throughout construction. Staging of construction will need to be considered by the contractor to ensure the road remains operational or road closures are co-ordinated with affected property owners.
2. Conveyance of stream throughout construction	As the proposed culvert is in the same location as the existing culvert, the existing culvert will not be able to be used to convey stream flow during construction. The contractor will need propose a methodology for maintaining the conveyance of the stream throughout construction.
3. Culvert subgrade undercutting to achieve minimum undrained shear strength	The culvert design requires a minimum undrained shear strength of 80kPa for the culvert to be bedded on. If the design excavation depth does not yield the minimum undrained shear strength, the material will need to be undercut until the minimum strength is achieved. Potential undercutting will add cost to the project.

10 Safety in Design

Beca conducted a safety in design workshop to identify the key health and safety risks that are likely to be present during the construction, operation, maintenance, and demolition phases of the culvert's life.

The workshop focused on recording the key identified risks associated the replacement of the culvert and identifying controls to manage and mitigate the risks.

Refer to Appendix C for the full risk register, including controls that require action from either NTA or the contractor post design phase.

11 Engineer's Estimate

The Engineer's Estimate for the proposed culvert is $703,640.

This excludes costs for protecting/relocating the underground services in the area. Chorus will need to be engaged directly concerning all works associated with their services.

Please refer to Appendix D for a full breakdown of the cost estimate.

A

Appendix A – Drawing Set

NTA CULVERT RENEWALS

CIVIL ENGINEERING

Prepared for FAR NORTH DISTRICT COUNCIL
Prepared by Beca Limited (Beca)
At: WHANGAROA ROAD

Project No.: 3127184
28 APRIL 2023
DETAILED DESIGN

DRAWING LIST

DRAWING No.	DRAWING TITLE
3127184-100-CA-000	COVER SHEET & DRAWING LIST & NOTES
3127184-100-CA-001	WHANGAROA ROAD - PROPOSED CULVERT - LAYOUT
3127184-100-CA-002	WHANGAROA ROAD - PROPOSED CULVERT - LONGITUDINAL SECTIONS
3127184-100-CA-003	WHANGAROA ROAD - PROPOSED CULVERT - DETAILS

CO-ORDINATE SYSTEM AND VERTICAL DATUM:

1. CO-ORDINATES ARE IN TERMS OF NEW ZEALAND TRANS 2000.
2. LEVELS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016.
3. EXISTING BOUNDARIES HAVE BEEN EXTRACTED FROM LAND INFORMATION NEW ZEALAND XML DATA, EXTRACTED AUGUST 2022.

PLAN GENERAL NOTES:

4. COMPLIANCE WITH SITE ENVIRONMENTAL MANAGEMENT REQUIREMENTS OF ANY RELEVANT AUTHORITY SHALL REMAIN THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL COMPLETE ALL NECESSARY PLANS, LODGE WITH THE AUTHORITY AND GAIN APPROVALS PRIOR TO COMMENCING ANY WORK ON SITE.
5. THE CONTRACTOR SHALL POTHOLE AND LOCATE ALL SERVICES PRIOR TO CONSTRUCTION AND ADVISE THE ENGINEER OF ANY DISCREPANCIES BEFORE PROCEEDING.
6. THE CONTRACTOR IS TO ENSURE THAT ALL EXISTING SURVEY REFERENCE MARKERS ARE PRESERVED,OR REINSTATED IF DAMAGED.
7. THE CONTRACTOR IS RESPONSIBLE FOR LIAISON WITH UTILITY SERVICE PROVIDERS TO AGREE AND IMPLEMENT ANY DIVERSION OR TEMPORARY SUPPORT/PROTECTION WORKS THAT THEY MAY REQUIRE AND TO A METHOD THAT THEY SPECIFY.
8. ALL CONCRETE IS TO BE MARINE GRADE UNLESS NOTED OTHERWISE.
9. 8.ALL CULVERT FITTINGS TO BE MARINE GRADE STAINLESS STEEL UNLESS NOTED OTHERWISE.
10. THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND REINSTATEMENT OF ANY ROAD BARRIER OR FARM FENCES TO FAR NORTH DISTRICT COUNCIL AND LAND OWNER REQUIREMENTS.
11. CONTRACTOR IS RESPONSIBLE FOR PAVEMENT AND MARKING REINSTATEMENT TO FAR NORTH DISTRICT COUNCIL REQUIREMENTS.
12. CONTRACTOR TO REINSTATE ANY DISTURBED SURFACES WITH TOPSOIL AND GRASS.

LONGSECTIION GENERAL NOTES:

13. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
14. CONTRACTOR TO CONFIRM BED LEVELS OF EXISTING DRAIN ONCE ISOLATED AND DE-WATERED.
15. CONTRACTOR TO CARRY OUT GEOTECHNICAL TESTING OF THE TRENCH BED ONCE DE-WATERED AND THE EXISTING CULVERT IS REMOVED TO PROVE THAT THE EXISTING MATERIAL BELOW THE PIPE TRENCH BED ZONE DOES NOT NEED TO BE UNDERCUT AND REPLACED WITH HARD-FILL.
16. WATER LEVEL IN THE DRAIN MAY REQUIRE THE CONTRACTOR TO UNDERTAKE DE-WATERING TO ALLOW PROPER CONTROLLED COMPACTION OF MATERIALS.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING SUBGRADE STRENGTH AND UNDERCUT REQUIREMENTS. TO BE CONFIRMED WITH ENGINEER ON SITE.
18. SUBGRADE MUST HAVE MINIMUM 80kPa UNDRAINED SHEAR STRENGTH FROM SHEAR VANE TESTING, OR ACHIEVE AN AVERAGE OF >4 BLOWS PER 100mm WHEN TESTED WITH A DCP (SCALA) ADVANCED OVER 1m DEPTH (MIN). CONTRACTOR TO PROVIDE TESTING CONDUCTED ON A 3m GRID ACROSS THE AREA.
19. SOFT OR UNSUITABLE MATERIAL ENCOUNTERED AT THE BASE OF FOUNDATION EXCAVATIONS SHOULD BE REMOVED AND REPLACED WITH COMPACTED HARDFILL AS PER DRAWING CA-003 DETAIL 2.
20. THE ENGINEER SHOULD APPROVE THE SUBGRADE AND TEST RESULTS PRIOR TO PLACEMENT OF FILL MATERIALS OR CULVERTS.
21. THE CONTRACTOR SHALL PUT IN PLACE ALL NECESSARY WATER DIVERSIONS AND/OR PUMPING SYSTEMS TO ENABLE CONSTRUCTION OF THE CULVERT.
22. 2500 (W) x 2000mm (H) PRECAST CONCRETE BOX CULVERT SECTIONS TO HN-HO-72 HYNDS OR HUMES OR SIMILAR APPROVED.

TYPICAL DETAILS GENERAL NOTES:

23. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
24. ALL PIPES TO BE HS2 TYPE BEDDING.
25. TRENCH BACKFILL/EMBANKMENT FILL TO BE COMPACTED GAP65 OF 150mm LAYERS. FILL SHALL ACHIEVE 95% OF MDD IN PAVEMENT AREAS & 90% OF MDD IN BERM AREAS.
26. ALL CONCRETE TO BE 30MPa AT 28 DAYS.
27. WELL GRADED, FREE DRAINING MATERIAL COMPACTED IN LAYERS (UP TO 150mm) USED WITHIN BOTH BED AND HAUNCH (REFER TO TABLE 6 AS/NZS3725:2008).
28. CONTRACTOR TO CARRY OUT GEOTECHNICAL TESTING OF THE TRENCH BED AND CONFIRM WITH ENGINEER ON SITE IF UNDERCUT OF UNSUITABLE MATERIAL AND REPLACING WITH SUITABLE MATERIAL IS ACCEPTABLE.

TRENCH NOTES:

29. BEDDING / HAUNCHING / SIDE / EMBEDMENT MATERIAL TO BE TYPE A2 IN ACCORDANCE WITH C0203. THESE ZONES TO BE COMPACTED IN 150mm MAX. LAYERS TO MIN. 95% OF MDD. THE FOLLOWING TESTING SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION C0203 FOR STRUCTURAL FILL -TYPE 2, WITH TESTING CARRIED OUT EVERY 5m.

FLOOD GATE NOTES:

30. FLOOD GATE DESIGN HAS BEEN BASED OFF CONCEPTS DERIVED FROM CONVERSATIONS WITH CROMPTON ENGINEERING LTD. IT IS RECOMMENDED THE CONTRACTOR ENGAGE CROMPTON ENGINEERING LTD AS THE SUPPLIER AND SUPPLIER TO PROVIDE DESIGN CHECK FOR INSTALLATION OF THE FLOOD GATE.
31. ALTERNATIVE FLOODGATE OPTIONS MAY BE PUT FORWARD BY THE CONTRACTOR TO BE APPROVED BY THE ENGINEER.

HANDRAIL NOTES:

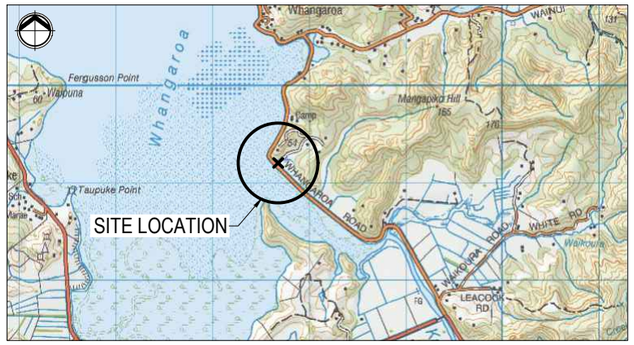
32. HANDRAILS ARE TO BE INSTALLED IN ACCORDANCE WITH SUPPLIERS SPECIFICATIONS.
33. HANDRAILS TO TERMINATE WHEN ELEVATION DIFFERENCE OF 1m IS REACHED RELATIVE TO TOP OF HEADWALL.

make everyday better.

Far North District Council
Te Kaunihera o Tai Tokerau ki te Raki

Creative people together transforming our world

Document No. 3127184-100-CA-000.DWG



LOCATION PLAN

CULVERT AND RIP RAP SETOUT

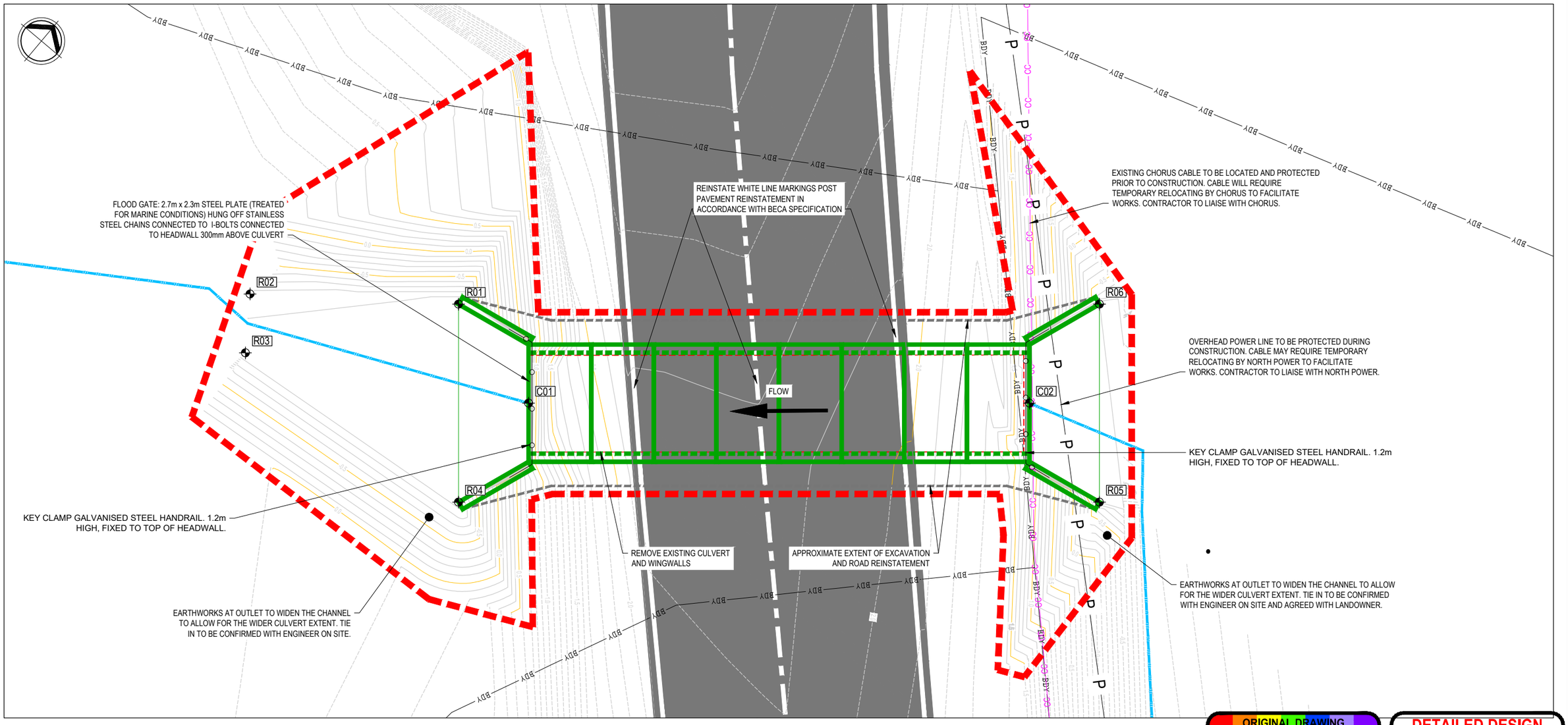
SET OUT TABLE			
Description	Northing	Easting	Elevation
C01	-1 667 605.146	-6 119 226.733	-0.923
C02	-1 667 614.642	-6 119 234.707	-0.901
R01	-1 667 602.244	-6 119 227.496	-0.923
R02	-1 667 598.128	-6 119 224.369	-0.843
R03	-1 667 598.977	-6 119 223.179	-0.961
R04	-1 667 605.395	-6 119 223.743	-0.923
R05	-1 667 617.544	-6 119 233.944	-0.901
R06	-1 667 614.393	-6 119 237.697	-0.901

LEGEND :

- EXTENT OF EARTHWORKS
- CC — EXISTING CHORUS CABLE
- VO — EXISTING VODAFONE CABLE
- FO — EXISTING FIBRE OPTIC CABLE
- P — EXISTING POWER
- POWER POLE
- BDY — PROPERTY BOUNDARY
- EXISTING CULVERT
- PROPOSED CULVERT
- SETOUT CO-ORDINATE
- FLOW PATH
- KEY CLAMP HANDRAIL

NOTES:

REFER TO DRAWING 3127184-100-CA-000 FOR ALL NOTES



ORIGINAL DRAWING IN COLOUR

DETAILED DESIGN
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	DETAILED DESIGN - FOR CLIENT REVIEW	MM	JR	WW	28.04.23

Original Scale (A1)	1:50	Reduced Scale (A3)	1:100

Design	M.MCKILLOP	28.04.23	Approved For Construction* Date
Drawn	M.MCKILLOP	28.04.23	
Dsg Verifier	J.RING	28.04.23	
Drg Check	W.WILLIAMS	28.04.23	

* Refer to Revision 1 for Original Signature

Beca

Client: Far North District Council — Te Kaunihera o Tai Tokerau ki te Raki

Project: NTA CULVERT RENEWALS

Title: WHANGAROA ROAD PROPOSED CULVERT LAYOUT

Discipline: CIVIL ENGINEERING

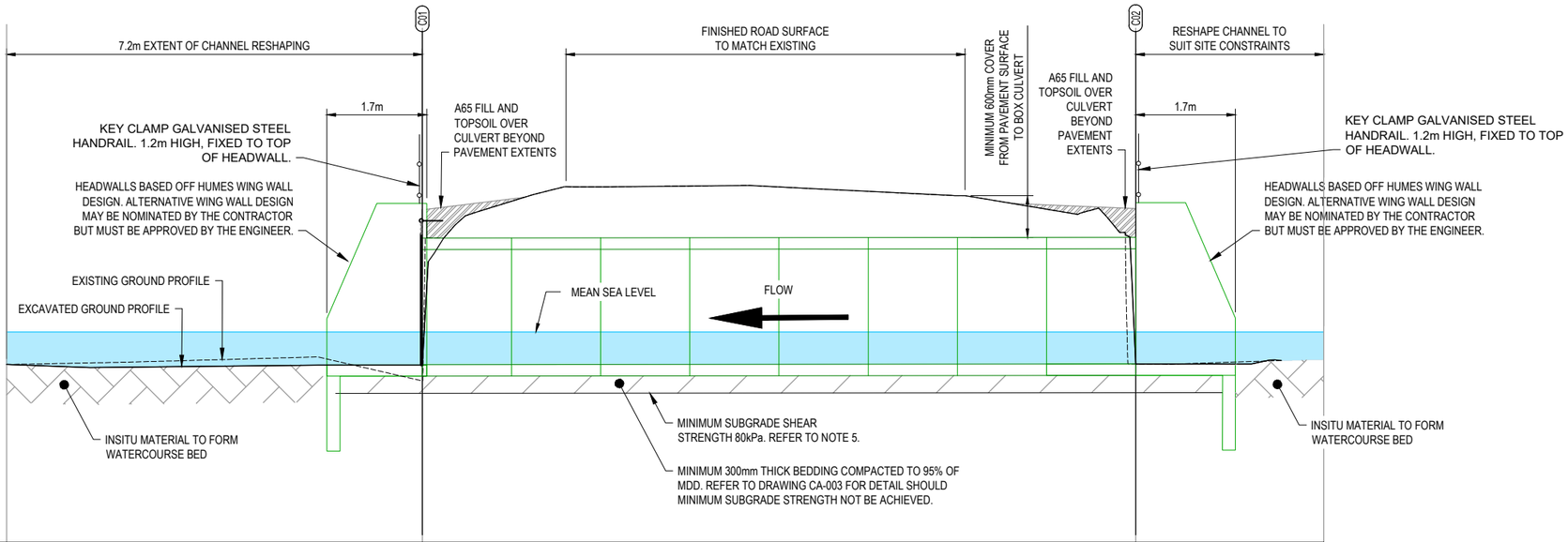
Drawing No.: 3127184-100-CA-001

Rev.: A

DO NOT SCALE FOR SET OUT DIMENSIONS

NOTES:

REFER TO DRAWING 3127184-100-CA-000 FOR ALL NOTES



SCALES (@A1):
Horizontal 1:50
Vertical 1:50

DATUM -4.000

TOP OF CULVERT AND (INVERT) LEVEL (m)	1.29 (-0.91)		1.30 (-0.90)
PIPE INVERT LEVEL (m)	-0.91		-0.90
DEPTH TO INVERT (m)			
PIPE SIZE AND CLASS		2,500 x 2,000 mm CONCRETE BOX CULVERT - CLASS 4	
PIPE GRADE		1:1000 (0.10%)	
DISTANCE AND CHAINAGE	0.00	12.40	12.40

LONGITUDINAL SECTION
CULVERT UN28

ORIGINAL DRAWING IN COLOUR

DETAILED DESIGN NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	DETAILED DESIGN - FOR CLIENT REVIEW	MM	JR	WW	28.04.23

Original Scale (A1)	1:50		
Reduced Scale (A3)	1:100		
Design	M.MCKILLOP	28.04.23	Approved For Construction*
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Dsg Verifier	J.RING	28.04.23	
Drg Check	W.WILLIAMS	28.04.23	Date

* Refer to Revision 1 for Original Signature

Client: Far North District Council — Te Kaunihera o Tai Tokerau ki te Raki

Project: NTA CULVERT RENEWALS

Title: WHANGAROA ROAD PROPOSED CULVERT LONGITUDINAL SECTION

Discipline: CIVIL ENGINEERING

Drawing No.: 3127184-100-CA-002

Rev.: A

Document No. 3127184-100-CA-002.DWG

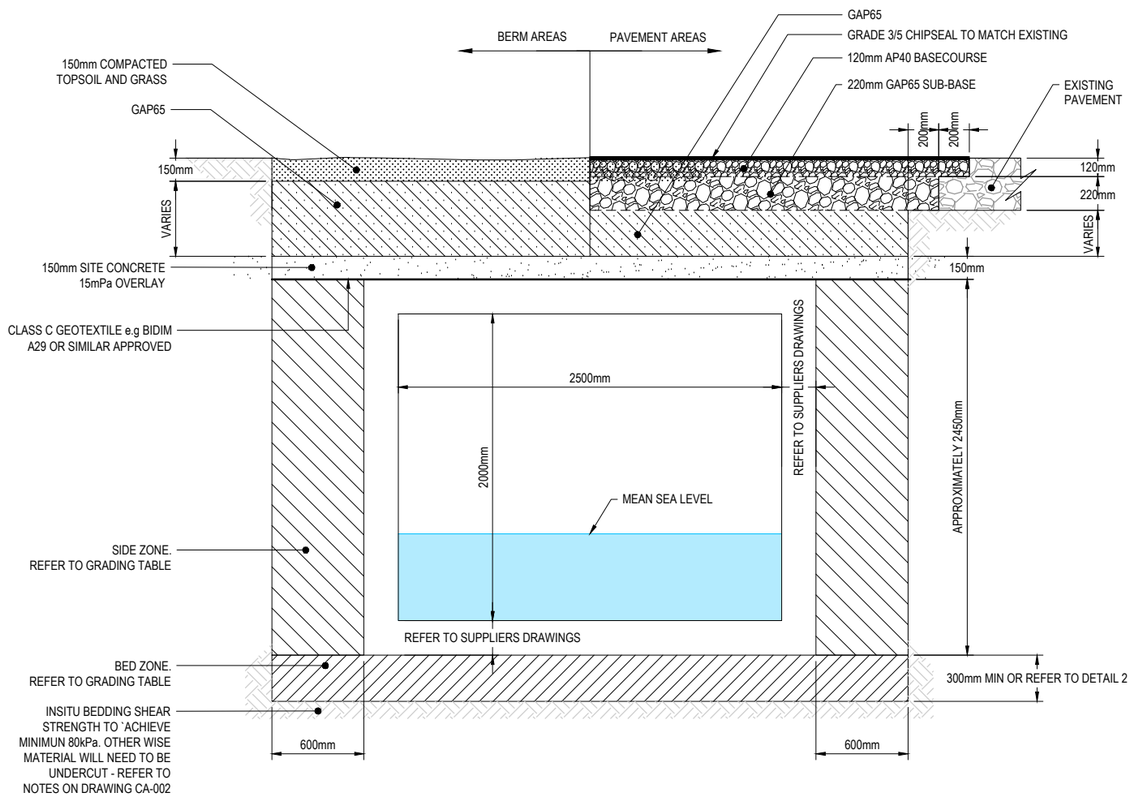
DO NOT SCALE FOR SET OUT DIMENSIONS

NOTES:

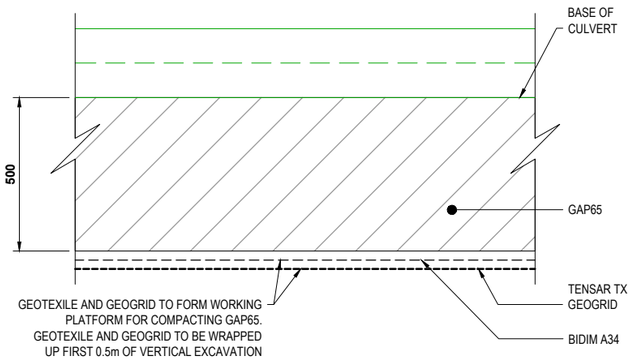
REFER TO DRAWING 3127184-100-CA-000 FOR ALL NOTES

BACKFILL MATERIAL GRADING

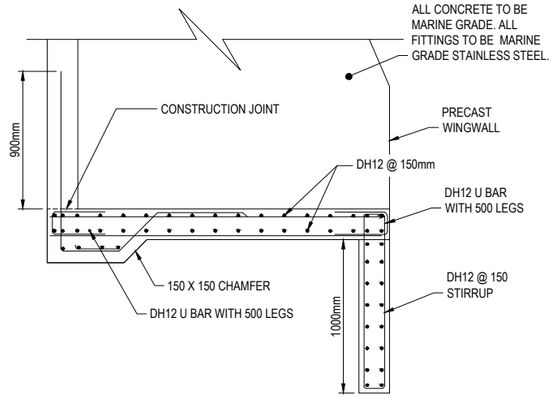
SIEVE SIZE (mm)	75.0	19.0	9.5	2.36	0.6	0.3	0.15	0.075
BED & HAUNCH ZONES (%MASS PASSING)	-	100	-	100-50	90-20	60-10	25-0	10-0
SIDE ZONE (%MASS PASSING)	100	-	100-50	100-30	50-15	-	-	20-0



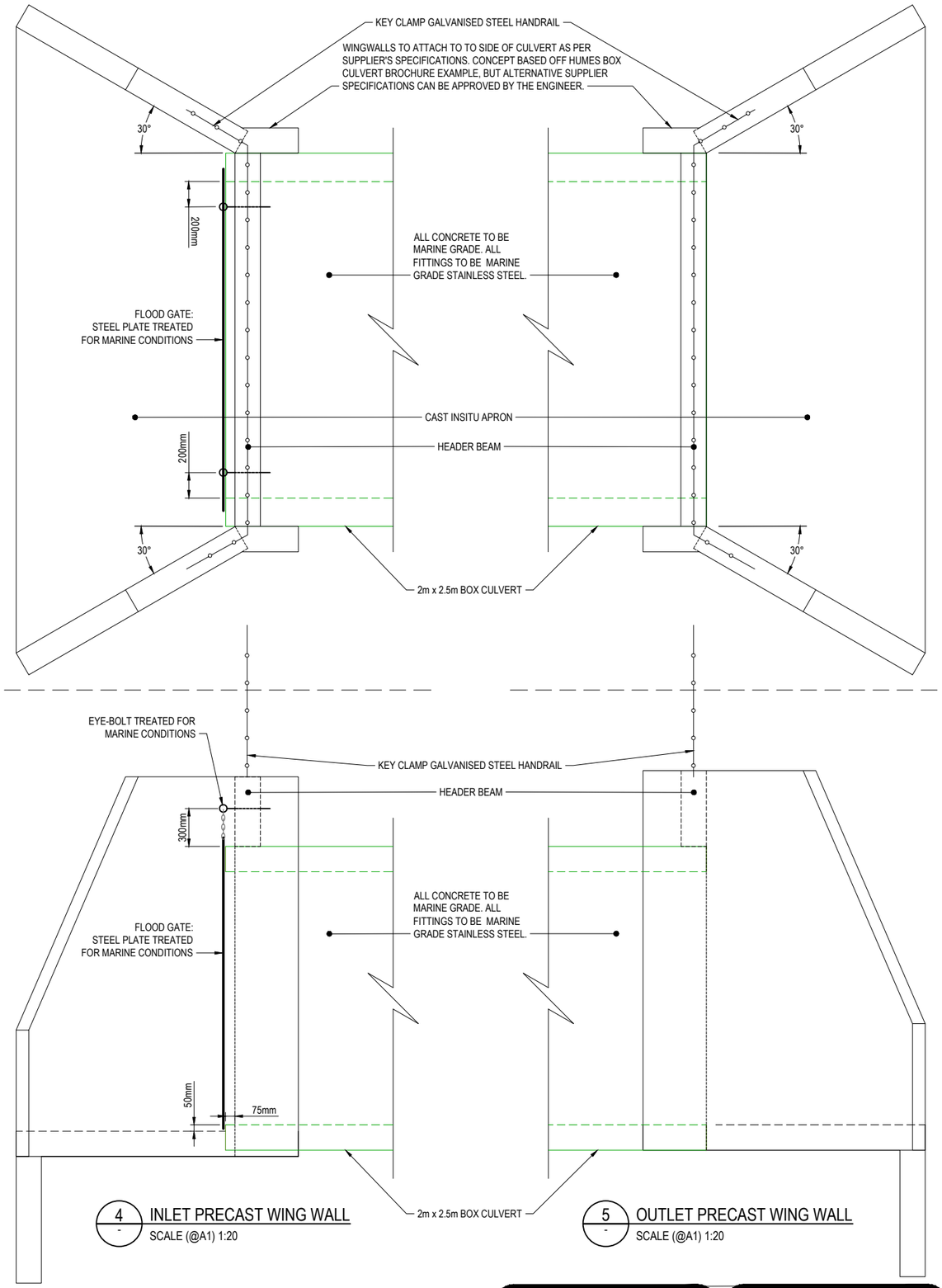
1 - CULVERT BEDDING AND REINSTATEMENT DETAIL
SCALE (@A1) 1:20



2 - PROVISIONAL CULVERT UNDERCUT DETAIL
SCALE (@A1) 1:10



3 - CULVERT APRON REINFORCING DETAIL
SCALE (@A1) 1:20



4 - INLET PRECAST WING WALL
SCALE (@A1) 1:20

5 - OUTLET PRECAST WING WALL
SCALE (@A1) 1:20

ORIGINAL DRAWING IN COLOUR

DETAILED DESIGN NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
A	DETAILED DESIGN - FOR CLIENT REVIEW	MM	JR	WW	28.04.23

Original Scale (A1)	AS SHOWN		
Reduced Scale (A3)	HALF SHOWN		
Design	M.MCKILLOP	28.04.23	Approved For Construction*
Drawn	M.MCKILLOP	28.04.23	
Dsg Verifier	J.RING	28.04.23	
Drg Check	W.WILLIAMS	28.04.23	Date

* Refer to Revision 1 for Original Signature

Client: Far North District Council — Te Kaunihera o Tai Tokerau ki te Raki

Project: NTA CULVERT RENEWALS

Title: WHANGAROA ROAD PROPOSED CULVERT DETAILS

Discipline: CIVIL ENGINEERING

Drawing No.: 3127184-100-CA-003

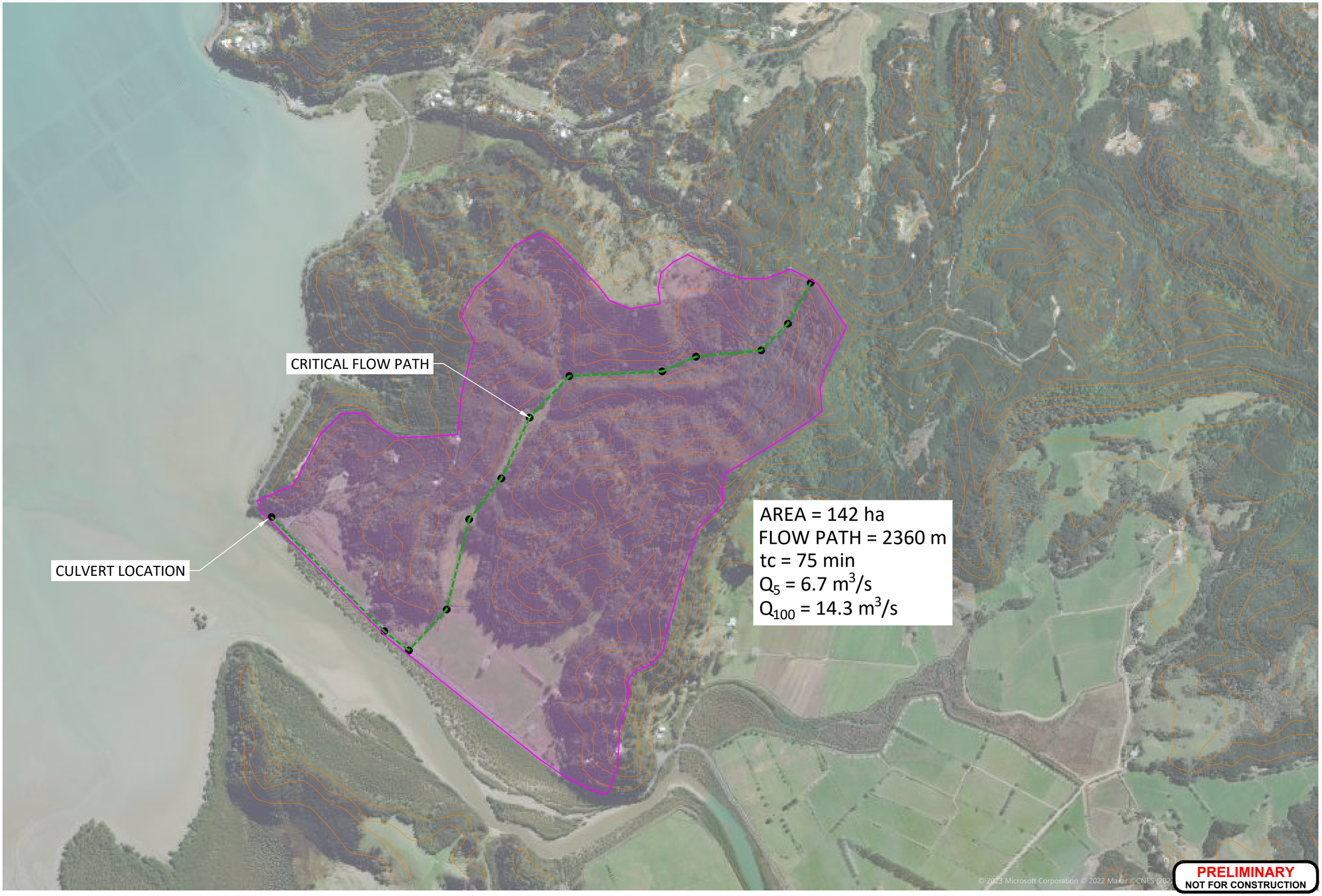
Rev.: A

Document No. 3127184-100-CA-003.DWG

B

Appendix B – Hydrological and Hydraulic Calculations

Drawing Plotted: 23 Feb 2023 2:00 pm



PRELIMINARY
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
+	WHANGAROA ROAD CATCHMENT PLAN				

Original Scale (A1) 1:5000
Reduced Scale (A3) 1:10000

Design			Approved For Construction*
Drawn			
Dsg Verifier			
Drg Check			Date

* Refer to Revision 1 for Original Signature

Beca

Client:

Project:

Title: WHANGAROA ROAD CATCHMENT PLAN

Discipline: STORMWATER

Drawing No.: 3127184-K-001

Rev.: +

Document No. 3127184-K-001.DWG

www.beca.com

DO NOT SCALE FOR SET OUT DIMENSIONS

Sensitivity: General

Beca Ltd

JOB NO: 3127184
BY: MM

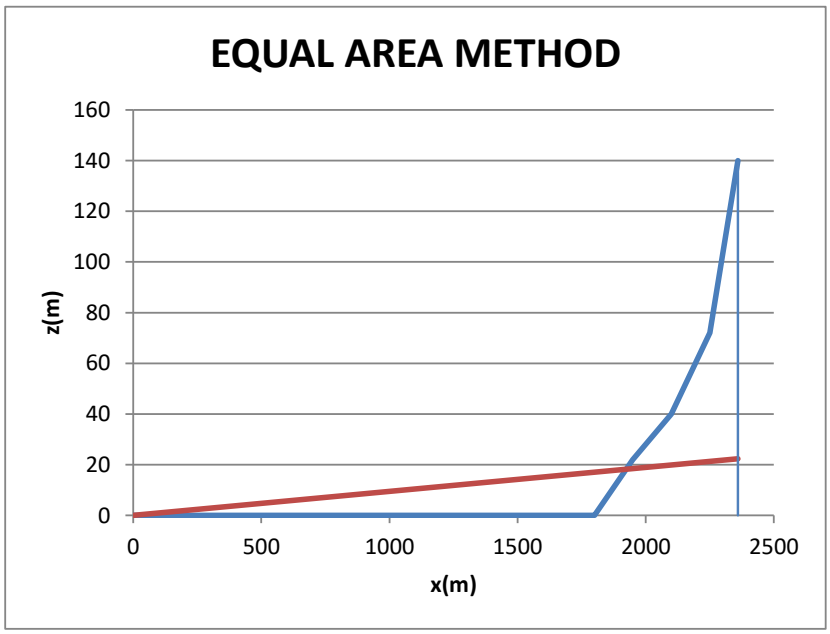
EQUAL AREA for SLOPE

Project Description Whangaroa Rd Catchment

Sc (m/m) 0.009

Inputs (Refer to catchment plan: Beca Dwg 3127184-K-001)

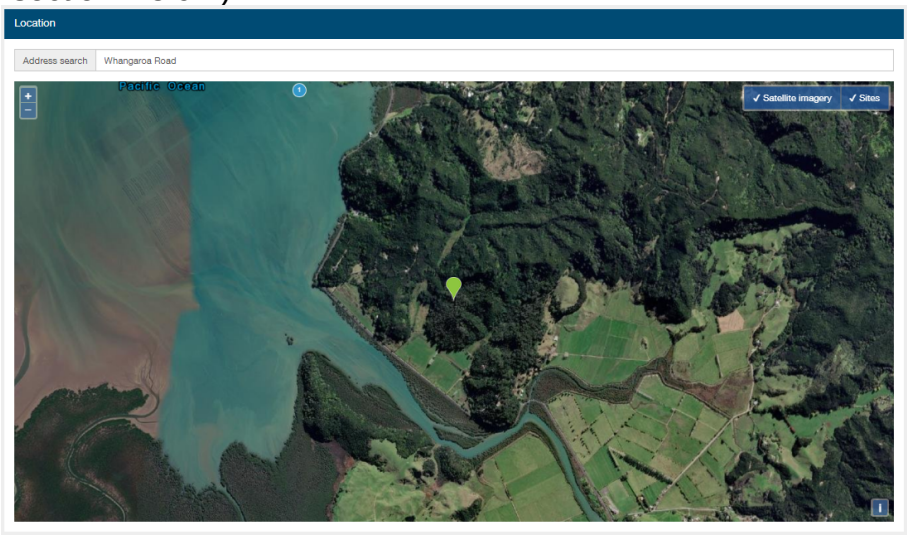
Channel Profile	
x (m)	z (m)
0	0
150	0
300	0
450	0
600	0
750	0
900	0
1050	0
1200	0
1350	0
1500	0
1650	0
1800	0
1950	22
2100	40
2250	72
2360	140
-1	

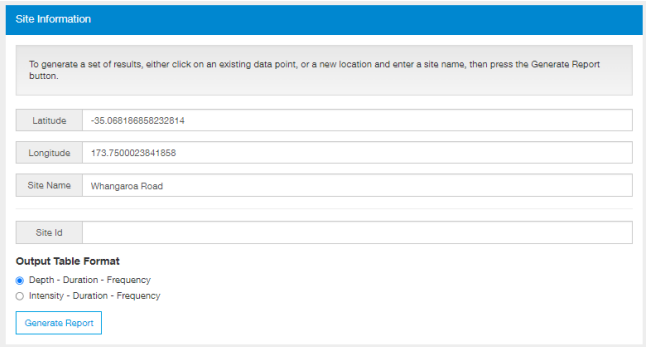


TP 108 -Time of Concentration		
Channel Length L (km)	2.36	
Slope S_c (m/m)	0.009	
Channel factor C_1	1	(No engineered channels)
Channel factor C_2	0.8	
CN_1	80	(Soil group D: Northland Allochthon/Estuarine deposits, as per NZGD Qmap)
CN_2	98	(Future land use: Rural Production/general coast, as per FNDC district plan zone map 21)
		Vel. (m/s)
tc_1 (min)	74.89	0.53
tc_2 (min)	49.00	0.80

Whangaroa Road Culvert Replacement - Hydrology calcs

HIRDS rainfall data (as per Far North District Council Engineering Standards 2022 (Draft) (FNDC ES) section 4.3.9.1)





Results — Spreadsheet Download

Site Details | Historical Data | RCP2.6 Scenario | RCP4.5 Scenario | RCP6.0 Scenario | RCP8.5 Scenario

Rainfall depths (mm) :: Historical Data

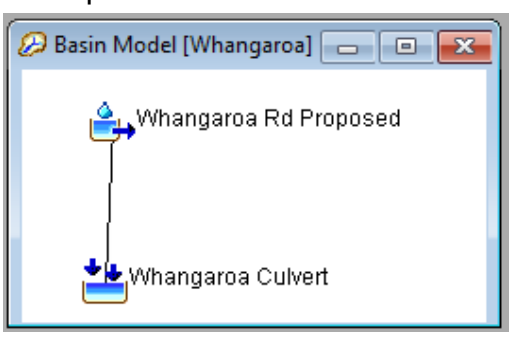
ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	8.98	13.4	16.8	24.3	34.4	56.3	73.6	92.5	111	122	128	132
2	0.500	9.84	14.7	18.4	26.7	37.8	61.8	80.9	102	123	134	141	146
5	0.200	12.8	19.1	24.0	34.8	49.3	80.9	106	133	161	176	185	192
10	0.100	15.0	22.4	28.1	40.8	57.9	95.2	125	157	190	208	219	227
20	0.050	17.2	25.7	32.3	47.0	66.7	110	144	182	220	240	253	263
30	0.033	18.5	27.7	34.8	50.7	72.0	119	156	197	238	260	274	284
40	0.025	19.5	29.1	36.6	53.3	75.8	125	164	207	251	274	290	300
50	0.020	20.2	30.3	38.1	55.4	78.8	130	171	216	261	286	301	312
60	0.017	20.8	31.2	39.2	57.1	81.3	134	176	223	269	295	311	322
80	0.013	21.8	32.7	41.1	59.8	85.1	141	185	233	283	310	327	339
100	0.010	22.5	33.8	42.5	61.9	88.2	146	191	242	293	321	339	351
250	0.004	25.6	38.4	48.3	70.5	100	166	219	277	336	368	389	403

Climate change rainfall = historical rainfall + 20% (as per FNDC ES section 4.3.9.1)
= 242 *1.2 = 290mm
5Yr climate change rainfall = historical rainfall + 20% (as per WDC ES section 4.3.10.1)
= 133 * 1.2 = 160mm

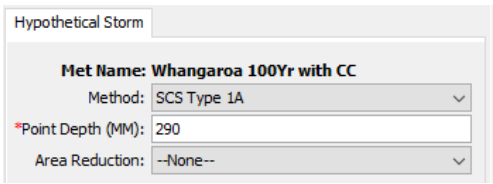
Post development run-off coefficients based off: FNDC District Plan, and NZGD QMap soil classification. Time of concentration based of assumptions: the contributing environment is a single catchment with no attenuation devices, and the catchment topography is based off LINZ contour data (refer to Equal Area for Slope calc)

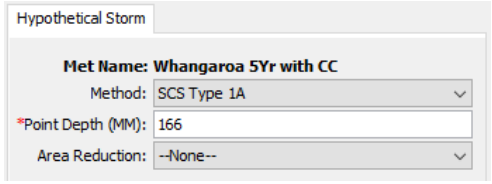
HEC-HMS: SCS method (as per FNDC ES section 4.3.9.2)

Set-up

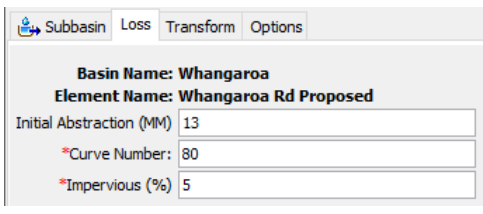


Rainfall profile

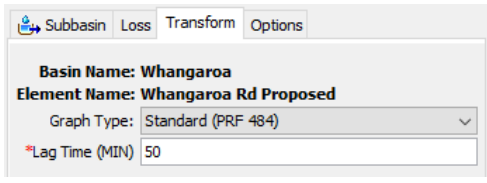




Curve number (%Impervious to acount for future development)

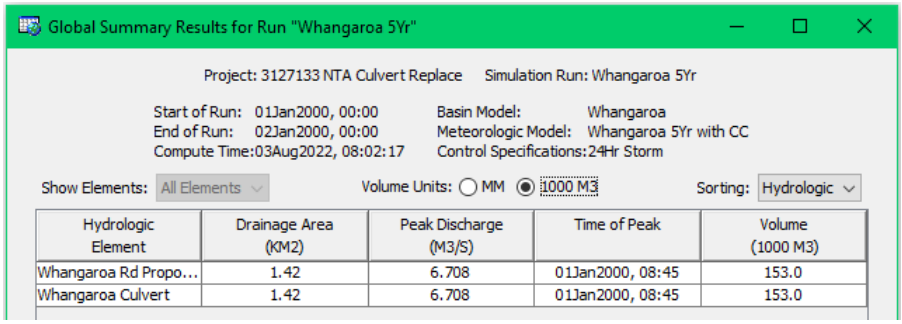


Lag time (=2/3 tc)



Initial Abstraction
I_a = 0.2*S (as per TR-55)
where S = (1000/CN - 10)*25.4
I_a = 0.2*(1000/80 - 10)*25.4
= 12.7 ≈13mm

HEC-HMS results

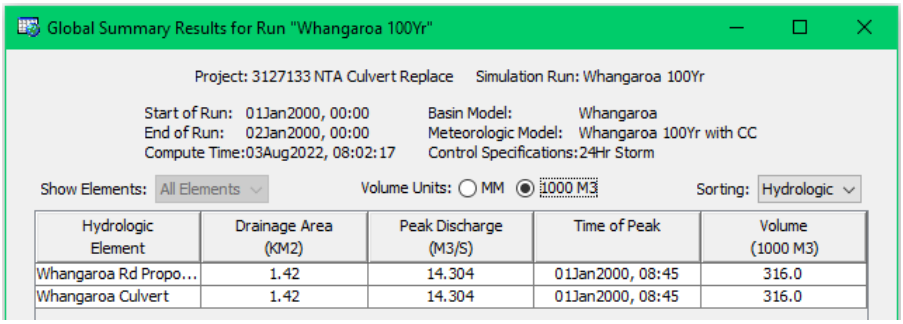

Global Summary Results for Run "Whangaroa 5Yr"

Project: 3127133 NTA Culvert Replace Simulation Run: Whangaroa 5Yr

Start of Run: 01Jan2000, 00:00 Basin Model: Whangaroa
End of Run: 02Jan2000, 00:00 Meteorologic Model: Whangaroa 5Yr with CC
Compute Time: 03Aug2022, 08:02:17 Control Specifications: 24Hr Storm

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Whangaroa Rd Propo...	1.42	6.708	01Jan2000, 08:45	153.0
Whangaroa Culvert	1.42	6.708	01Jan2000, 08:45	153.0


Global Summary Results for Run "Whangaroa 100Yr"

Project: 3127133 NTA Culvert Replace Simulation Run: Whangaroa 100Yr

Start of Run: 01Jan2000, 00:00 Basin Model: Whangaroa
End of Run: 02Jan2000, 00:00 Meteorologic Model: Whangaroa 100Yr with CC
Compute Time: 03Aug2022, 08:02:17 Control Specifications: 24Hr Storm

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Whangaroa Rd Propo...	1.42	14.304	01Jan2000, 08:45	316.0
Whangaroa Culvert	1.42	14.304	01Jan2000, 08:45	316.0

Whangaroa Harbour Tidal Information & Downstream Tailwater Condition

Tidal information has been obtained from the Ministry for the Environment Coastal Hazards and Climate Change Appendicies and LINZ website.

Marsden Point (closest standard port retrieved from LINZ):
- MHWS = 2.73
- MLWS = 0.49
- HAT = 3.02
- LAT = 0.14

Whangaroa Harbour (Secondary Ports Table):
- MHWS = 2.5
- MLWS = 0.3
- Mean Sea Level = 1.4

Conversion of Chart datum to NZVD 16 datum (assumes Whangaroa Chart Datum matches Marsden Point Chart Datum):
- MHWS = 0.754mRL
- MLWS = -1.446mRL
- Mean Sea Level = -0.346mRL

MHWS in the current climate (ie. no climate change sea level rise) is close to the existing culvert soffit level (0.6mRL) and within 1240mm of the road level. In extreme events, storm surge and wave runoff could see the road overtop from the coastal side, as evidenced by the NRC coastal hazard mapping. The frequency of such an event will increase with climate change.

For the purpose of this project (which does not include changing road levels) we have assessed culvert capacities against two tidal conditions 1) MHWS (current climate) and 2) mid / low tide (eg. RL0)

Q5 and Q100 tested against both tide conditions.

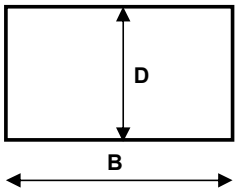
Job Name	Job Number	Date
Whangaroa Rd Culvert	3127184	19/03/2023
Calculation Sheet Description		Designer
Hydraulic Analysis of Box Culvert		M.McKillop

Calculation

Project Description Whangaroa Rd Culvert - Proposed 2.5m x 2m Box culvert - 100Yr event High Tide

Inputs

Roughness - ks (mm)	4
Height - D (m)	2
Width - B (m)	2.5
Flow - Q (m^3/s)	14.3
Length - L(m)	12.4
Culvert Slope (%)	0.1
K_{entry}	0.5
C_{entry}	0.61
Downstream IL (m)	-0.91
Tailwater Level (m)	1.66
TWL (mRL)	0.75



Results

Equivalent Mannings 'n'	0.0155
Flow Full area (m^2)	5.00
Flow Full Friction Slope (%)	0.43
Critical depth (m)	1.496
Critical velocity (m/s)	3.82
Normal depth (ND-m)	N/A
ND velocity (m/s)	N/A

Actual Tailwater Level

TWL depth (m)	1.664
Outlet velocity (m)	3.44

Headwater Level:

HWL (outlet control)	1.458
HWL (inlet control)	1.422
HWL (m)	1.458
HW depth (m)	2.355
HW/D	1.18
Inlet Velocity (m/s)	2.86

Outlet Conditions Predominate

*

*

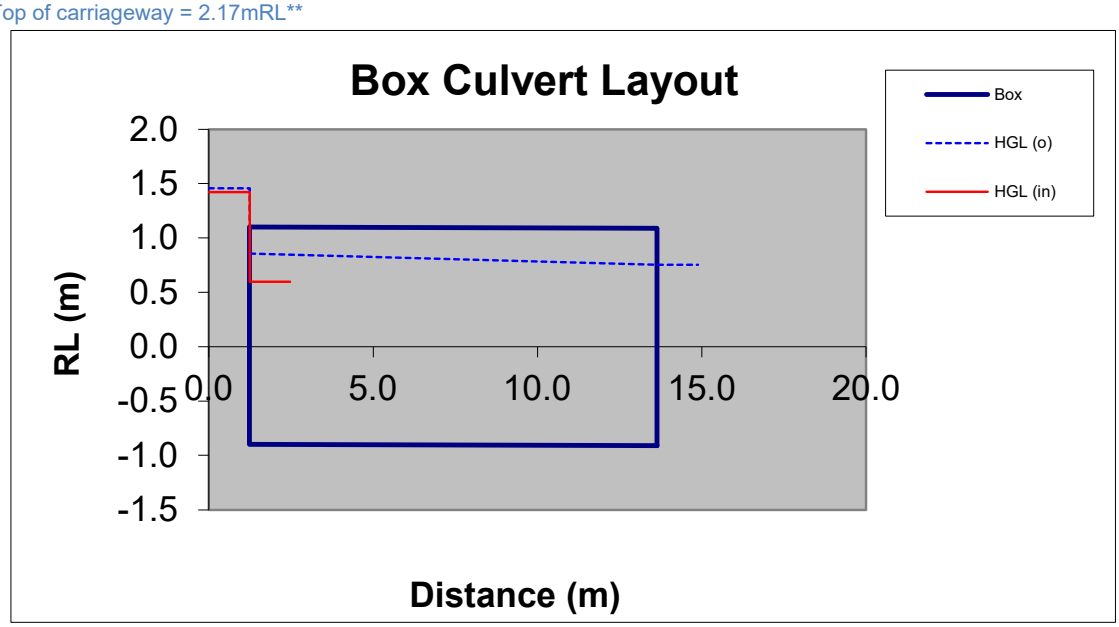
Assumptions:

1. Inputs are in yellow, results in red
2. No significant upstream velocity (ie. HWL=Energy Level)
3. For general K_{entry} and C_{entry}, choose from Table.
4. K_{outlet} is assumed as 1.0

Entry Type	K_{entry}	C_{entry}
Square ended	0.50	0.61
Socketed end	0.20	0.70
Rounded (r>0.1*D)	0.15	0.80
Bellmouth/Parabola	0.1	0.95

Edge of carriageway = 1.99mRL

Top of carriageway = 2.17mRL



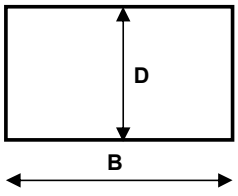
Job Name	Job Number	Date
Whangaroa Rd Culvert	3127184	19/03/2023
Calculation Sheet Description		Designer
Hydraulic Analysis of Box Culvert		M.McKillop

Calculation

Project Description Whangaroa Rd Culvert - Proposed 2.5m x 2m Box culvert - 100Yr event Low Tide

Inputs

Roughness - ks (mm)	4
Height - D (m)	2
Width - B (m)	2.5
Flow - Q (m^3/s)	14.3
Length - L(m)	12.4
Culvert Slope (%)	0.1
K_{entry}	0.5
C_{entry}	0.61
Downstream IL (m)	-0.91
Tailwater Level (m)	-0.54
TWL (mRL)	-1.45



Results

Equivalent Mannings 'n'	0.0155
Flow Full area (m^2)	5.00
Flow Full Friction Slope (%)	0.43
Critical depth (m)	1.496
Critical velocity (m/s)	3.82
Normal depth (ND-m)	N/A
ND velocity (m/s)	N/A

Actual Tailwater Level

TWL depth (m)	1.496
Outlet velocity (m)	3.82

Headwater Level:

HWL (outlet control)	1.432
HWL (inlet control)	1.422
HWL (m)	1.432
HW depth (m)	2.329
HW/D	1.16
Inlet Velocity (m/s)	2.86

Outlet Conditions Predominate

*

*

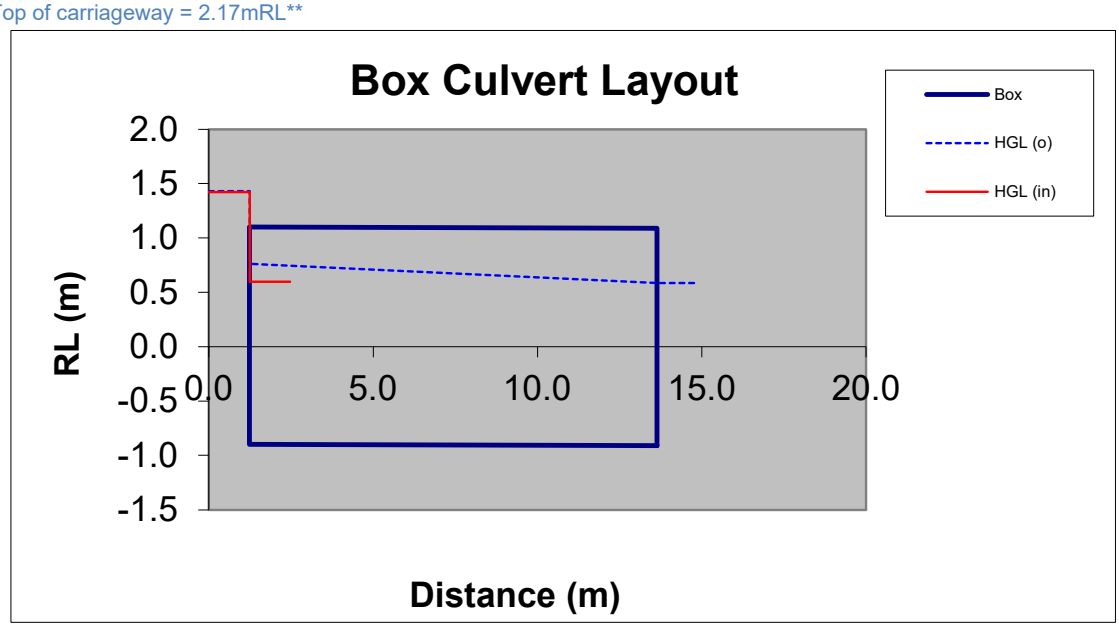
Assumptions:

1. Inputs are in yellow, results in red
2. No significant upstream velocity (ie. HWL=Energy Level)
3. For general K_{entry} and C_{entry}, choose from Table.
4. K_{outlet} is assumed as 1.0

Entry Type	K_{entry}	C_{entry}
Square ended	0.50	0.61
Socketed end	0.20	0.70
Rounded (r>0.1*D)	0.15	0.80
Bellmouth/Parabola	0.1	0.95

Edge of carriageway = 1.99mRL

Top of carriageway = 2.17mRL



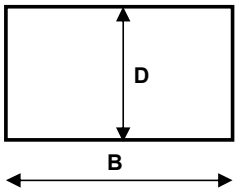
Job Name	Job Number	Date
Whangaroa Rd Culvert	3127184	19/03/2023
Calculation Sheet Description		Designer
Hydraulic Analysis of Box Culvert		M.McKillop

Calculation

Project Description Whangaroa Rd Culvert - Proposed 2.5m x 2m Box culvert - 100Yr event MHWS+0.5

Inputs

Roughness - ks (mm)	4
Height - D (m)	2
Width - B (m)	2.5
Flow - Q (m^3/s)	14.3
Length - L(m)	12.4
Culvert Slope (%)	0.1
K_{entry}	0.5
C_{entry}	0.61
Downstream IL (m)	-0.91
Tailwater Level (m)	2.16
TWL (mRL)	1.25



Results

Equivalent Mannings 'n'	0.0155
Flow Full area (m^2)	5.00
Flow Full Friction Slope (%)	0.43
Critical depth (m)	1.496
Critical velocity (m/s)	3.82
Normal depth (ND-m)	N/A
ND velocity (m/s)	N/A

Actual Tailwater Level

TWL depth (m)	2.164
Outlet velocity (m)	2.86

Headwater Level:

HWL (outlet control)	1.932
HWL (inlet control)	1.422
HWL (m)	1.932
HW depth (m)	2.830
HW/D	1.42
Inlet Velocity (m/s)	2.86

Outlet Conditions Predominate

*

*

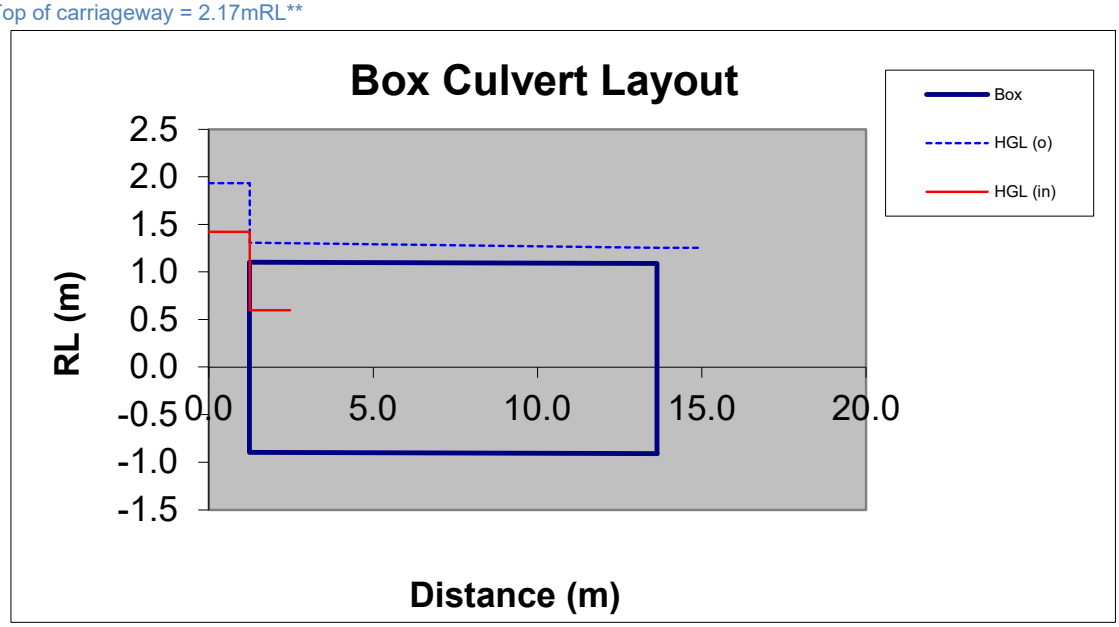
Assumptions:

1. Inputs are in yellow, results in red
2. No significant upstream velocity (ie. HWL=Energy Level)
3. For general K_{entry} and C_{entry}, choose from Table.
4. K_{outlet} is assumed as 1.0

Entry Type	K_{entry}	C_{entry}
Square ended	0.50	0.61
Socketed end	0.20	0.70
Rounded (r>0.1*D)	0.15	0.80
Bellmouth/Parabola	0.1	0.95

Edge of carriageway = 1.99mRL

Top of carriageway = 2.17mRL



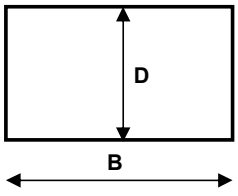
Job Name	Job Number	Date
Whangaroa Rd Culvert	3127184	19/03/2023
Calculation Sheet Description		Designer
Hydraulic Analysis of Box Culvert		M.McKillop

Calculation

Project Description Whangaroa Rd Culvert - Proposed 2.5m x 2m Box culvert - 100Yr event MLWS+0.5

Inputs

Roughness - ks (mm)	4
Height - D (m)	2
Width - B (m)	2.5
Flow - Q (m^3/s)	14.3
Length - L(m)	12.4
Culvert Slope (%)	0.1
K_{entry}	0.5
C_{entry}	0.61
Downstream IL (m)	-0.91
Tailwater Level (m)	-0.04
TWL (mRL)	-0.95



Results

Equivalent Mannings 'n'	0.0155
Flow Full area (m^2)	5.00
Flow Full Friction Slope (%)	0.43
Critical depth (m)	1.496
Critical velocity (m/s)	3.82
Normal depth (ND-m)	N/A
ND velocity (m/s)	N/A

Actual Tailwater Level

TWL depth (m)	1.496
Outlet velocity (m)	3.82

Headwater Level:

HWL (outlet control)	1.432
HWL (inlet control)	1.422
HWL (m)	1.432
HW depth (m)	2.329
HW/D	1.16
Inlet Velocity (m/s)	2.86

Outlet Conditions Predominate

*

*

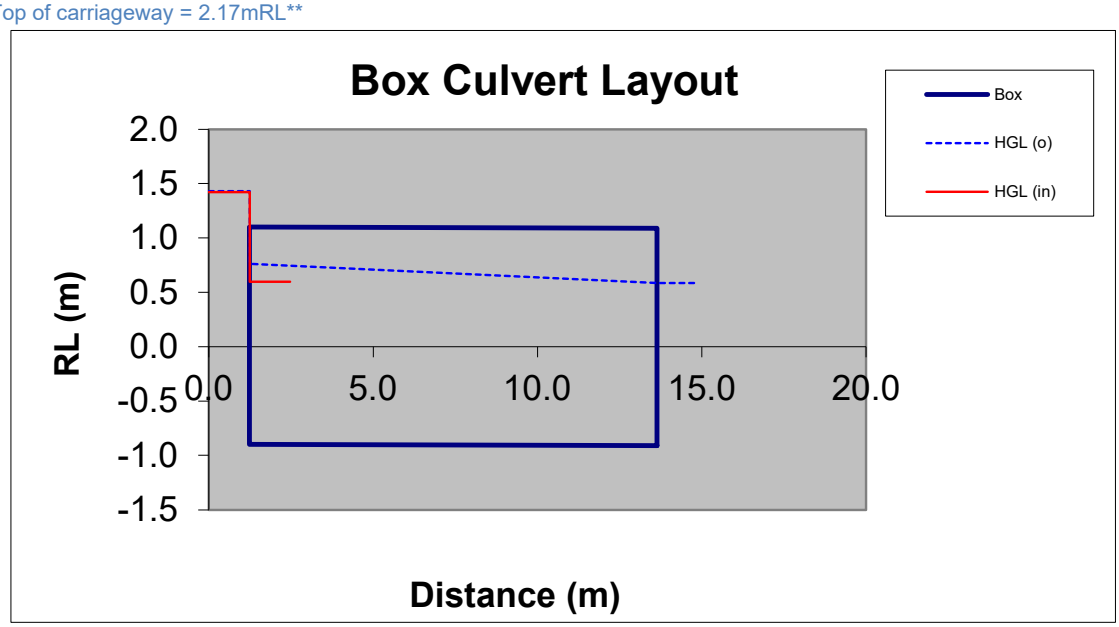
Assumptions:

1. Inputs are in yellow, results in red
2. No significant upstream velocity (ie. HWL=Energy Level)
3. For general K_{entry} and C_{entry}, choose from Table.
4. K_{outlet} is assumed as 1.0

Entry Type	K_{entry}	C_{entry}
Square ended	0.50	0.61
Socketed end	0.20	0.70
Rounded (r>0.1*D)	0.15	0.80
Bellmouth/Parabola	0.1	0.95

Edge of carriageway = 1.99mRL

Top of carriageway = 2.17mRL



B

Appendix B – Ecological Impact Assessment (Beca, June 2023)

Whangaroa Road Culvert - Ecological Impact Assessment

To support a resource consent application

Prepared for Far North District Council
Prepared by Beca Limited

23 June 2023

Revision History

Revision Nº	Prepared By	Description	Date
1	Sarah Busbridge	Draft for Technical Review	9/6/23
2	Sarah Busbridge	Draft for Verification	12/6/23
3	Sarah Busbridge	For client issue	23/6/23

Document Acceptance

Action	Name	Signed	Date
Prepared by	Sarah Busbridge		6/7/23
Reviewed by	Connor Whiteley		6/7/23
Approved by	Will Williams		6/7/23
on behalf of	Beca Limited		

Executive Summary

Far North District Council are proposing to replace a culvert and tidal flap gate near 266 Whangaroa Road, Kaeo on the shoreline of the Whangaroa Harbour.

The project footprint includes a small amount of indigenous vegetation, mangroves, a section of a rock wall, and an unnamed watercourse, while the receiving environment includes the Whangaroa harbour. Little blue penguin/kororā (*Eudyptula minor*) are known to be present in the harbour, and the rock wall may provide potential burrow habitat. In addition, although the tide gate presents at least a partial barrier to fish passage, there is some evidence that At Risk and Not Threatened native fish species are present in the watercourse upstream (and are confirmed to be present in the harbour).

Construction phase and operational adverse effects considered as a result of the proposed culvert replacement include:

- Potential injury and/or mortality of aquatic fauna
- Disturbance of native avifauna
- Earthworks leading to potential erosion and deposition of suspended sediments into receiving environments
- Vegetation clearance
- Ongoing loss of connectivity/prevention of fish passage

Proposed measures to address these effects include:

- Fish salvage and relocation
- Kororā survey and preparation of a kororā management plan if they are confirmed to be present
- Implementation of erosion and sediment controls
- Installation of a “fish friendly” tide gate

The overall ecological effect of the proposal is considered to be **Very Low** assuming the recommended mitigation measures are implemented. Once construction is complete, replacement of the tide gate is likely to result in **Positive** ecological effects due to improved connectivity with the upstream catchment during incoming tides.

1 Introduction

Beca Ltd (Beca) have been engaged by Far North District Council (FNDC) to undertake an Ecological Impact Assessment (EcIA) to support the resource consent application for a proposed culvert and tidal flap gate replacement located near 266 Whangaroa Road, Kaeo on the shoreline of the Whangaroa Harbour. The EcIA relates to the construction, and operation of the new culvert and passive tidal flap gate that will be installed at the Site.

1.1 Purpose and scope

The purpose of this ecological impact assessment is to quantify the values of the ecological features and species within the Site, and to determine the level of ecological effects arising from the proposed activity (culvert replacement).

The scope of this report includes:

- A site visit undertaken on the 18th May, 2023.
- A desk-based review of:
  - Information held by local authorities on the ecological values of the site, including SEA information.
  - iNaturalist, New Zealand Freshwater Fish Database, and eBird species data; and
  - Other publicly accessible reports or information.
- An assessment of the ecological values within the site.
- An assessment of ecological effects and recommended mitigation prepared in general accordance with the EIANZ Ecological Impact Assessment Guidelines (Roper-Lindsay et al., 2018)

1.2 Project overview

The Whangaroa Road culvert UN28 is a 1.8m x 1.8m reinforced concrete box culvert approximately 11 m long at soffit level and 16.5m long at invert level (including apron). The culvert is in a tidal location and is exposed to immersion in saline/brackish seawater. Both the inlet and outlet of the culvert have concrete wingwalls and an apron. There is a tidal gate at the downstream end of the culvert. The culvert has been identified as requiring replacement due to it being in poor condition as a result of extensive corrosion. The new culvert will also require a tidal gate to protect the upstream environment from sea surge. Indicative design of the proposed culvert and extent of works is shown in Figure 1.

Resource consent is required to replace and maintain a passive flood gate at the culvert under Regulation 74 of the National Environmental Standards for Freshwater which states that the placement, use, alteration, extension, or reconstruction of a passive flood gate in, on, or under the bed of any river is a **Non-Complying** activity.

Figure 1. Location and extent of proposed works.

2 Site Location and Ecological Context

The Site is located between a small patch of cleared land bordered by indigenous forest, and Whangaroa Road which runs adjacent to the shores of the Whangaroa Harbour. The Whangaroa Harbour (~2600 ha) occupies a drowned valley system and has a highly indented coastline (Conning, 1999). It includes small tidal flats in its upper reaches and patches of mangrove and saltmarsh (Northland Regional Council, n.d.).

The site is situated within the Whangaroa Ecolgocial District (ED) and Western Northland Ecological Region (McEwen, 1987).The Ecological District is composed of coastal hill country with moderately to deeply incised valleys. The coastline is steep and rocky, including pocket gravel beaches, some sand beaches, the harbour itself, and common nearshore islets and rock stacks (Conning, 1999). In the past, much of the district was dominated by broadleaf–podocarp–kauri (*Agathis australis*) forest which has been extensively logged. Along the coast, broadleaf forest (including pōhutukawa) occurred on cliffs and in valleys behind small sandy beaches. Pōhutukawa and estuarine wetlands including mangrove (*Avicennia marina*) forests would have been much more plentiful than at the present time, and freshwater wetlands likely occurred in the coastal valleys grading into the saltwater influence (Conning, 1999).

The Whangaroa area has been influenced by human settlement for hundreds of years, with more intensive development since European settlement nearly 200 years ago (Conning, 1999). Currently, the district is predominantly rural with farming and fruit growing, oyster farming, commercial fishing, forestry and tourism as important industries (Short et al., 2022).

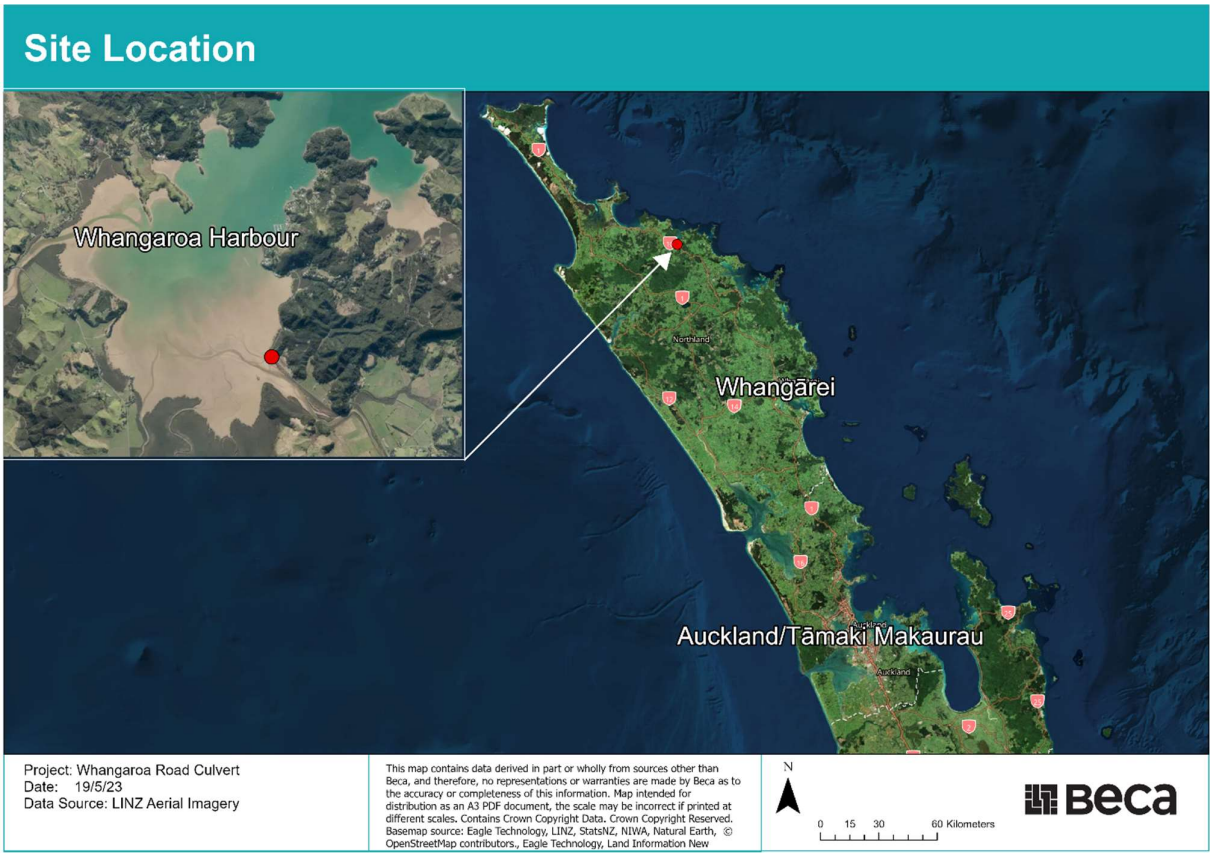


Figure 2. Site location within the surrounding landscape.

3 Methodology

The assessment was undertaken using the following methodology:

3.1 Desktop review

A desk-based study was undertaken using ecological information from the following sources:

- Northland Regional Council (NRC) and Far North District Council (FNDC) data and geospatial layers
- New Zealand Freshwater Fish Database (NZFFD; Sotffels, 2022)
- iNaturalist New Zealand database;
- eBird database (eBird, 2023)
- Google Earth and Land Information New Zealand (LINZ) aerial imagery;
- Freshwater Ecosystems of New Zealand (FENZ) geospatial layers of estimated historic and current extent of wetlands in New Zealand (Leathwick et al., 2010); and
- Other publicly accessible reports or information

3.2 Field Investigations

A site visit was undertaken on the 18th of May 2023. The weather during the site visit was fine and 263.8mm of rain had accumulated in the two weeks prior to the site visit (Kerikeri Ews; NIWA, 2023). The last significant rainfall event prior to the site visit was on the 10th of May with 49.6mm of rain falling.

3.2.1 Watercourse Classification and Habitat Assessments

Following the desktop review and field investigations, watercourse classification was completed based on the definitions from the RMA and Proposed Regional Plan for Northland Appeals Version (8 December 2022) (PRP-AV). Watercourse classification assessments are best undertaken during the wet season between July and October, when ecological functioning can be most accurately assessed (Auckland Council, 2021).

Qualitative instream and riparian assessments were also completed to record characteristics of freshwater habitats and assess their baseline condition. Data collected included: bank and channel modification, stream bank erosion, streambed substrate composition, channel shade and riparian vegetation.

3.2.2 eDNA sampling

Four eDNA samples were taken at the site on the 19th of May 2023 between 11 and 12am. These locations are shown on Figure 3. Wetland eDNA kits with 5 micron filters were used as these are less prone to clogging and are recommended for estuarine environments. Multi-species analyses by DNA metabarcoding were undertaken on eDNA samples by Wilderlab Ltd to produce a list of all DNA sequences detected within a broad taxonomic group (e.g. fish, insects, birds, mammals) and the number of times each appears in the sample. These DNA sequences are then compared against a reference database to assign species names and characterise the community as a whole. One upstream sample (eDNA1) was subject to comprehensive analysis which includes plants, algae, freshwater mussels/kākahi, bacteria, and phytoplankton.

3.2.3 Avifauna surveys

One bird count was undertaken with one observer walking a short 67 m transect at low tide (~12pm) from the culvert to beyond the mangroves and scanning the harbour (see Figure 3). All shorebird species sighted were identified and recorded along with behaviour at the time of observation.

Figure 3. Locations of eDNA samples and avifauna count undertaken on site.

3.3 Assessment of ecological effects

A desktop 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).

The EIANZ guidelines set out a methodology to assign ecological value to species and ecosystems based on four assessment criteria which are consistent with significance assessment criteria set out in the Proposed National Policy Statement for Indigenous Biodiversity (2019) Appendix 1: Criteria for identifying significant indigenous vegetation and significant habitat of indigenous fauna. These are reproduced in this report as Appendix 1 Tables 1.1-1.4. In summary:

- Attributes are considered when considering ecological value or importance. They relate to matters such as representativeness, the rarity and distinctiveness, diversity and patterns, and the broader ecological context.
- Determining Factors for valuing terrestrial species; terrestrial species span a continuum of very high to negligible, depending on aspects such as whether species are native or exotic, have threat status, and their abundance and commonality at the site impacted
- Ecological Values are scored based on an expert judgement, qualitative and quantitative data collected.

Once ecological values have been identified and valued, the severity of potential impacts is assessed by determining the change from baseline ecological values likely to occur as a result of the proposal/project along the lines of a magnitude of effect as determined by the criteria set out in Appendix 1:Table 1.5.

Finally, once these two factors have been determined (the ecological value and the magnitude of effect), an overall level of effect on each of the identified ecological values is assessed (Table 1.6).

The overall level of effect is used to determine if mitigation is required. Effects assessed as ‘Moderate’ or greater warrant efforts to avoid, remedy and/or mitigate them.

4 Ecological Features and Values

4.1 Watercourse 1

The culvert and tidal flap gate are located along an unnamed watercourse referred to in this report as Watercourse 1, where it flows under Whangaroa Road and into the Coastal Marine Area (CMA). Although the watercourse has been straightened along the roadside, it is considered to be a permanent stream rather than an artificial drain as it has natural upstream sections within its wider catchment. The stream drains a catchment of approximately 142 ha, which is sufficient to maintain a permanent flow base.

Another small unnamed watercourse discharges to Watercourse 1 just upstream of the culvert. Little water was present at the time of the site visit but the watercourse had a defined channel and has been assessed to be intermittent in nature, based on contour information for the upstream catchment. The upstream extent and alignment of the watercourse was not able to be ground truthed due to absence of landowner access.

Upstream of the culvert, Watercourse 1 is approximately 4m wide and 45-55cm deep in the centre of the channel. The substrate is primarily silt/mud but also includes some gravels and cobbles. There is little shading by the culvert, but upstream of the culvert there is moderate shading provided by pampas and mangroves. Habitat consists primarily of run, which is typical of lowland stream and river systems. The true right bank is approximately 0.4-1m high and undercut but generally stable. Riparian vegetation consists mostly of pampas (*Cortaderia selloana*), with scarce sea rush (*Juncus krausii),* and planted banana palms (*Musa* sp.). Closest to the culvert, vegetation is more diverse and consists of a mixture of native woody vegetation, native ground cover, and exotic weeds. On the true left, banks are steep (~70°) and approximately 3m hight, with a narrow riparian margin between the road edge. Vegetation consists of *Geranium* sp., Yorkshire fog (*Holcus lanatus*), wild carrot (*Daucus carota*), moss, fireweed (*Senecio bipinnatisectus*), *Setaria pumila*, *Oxalis* sp., *Isolepis* sp., sparse tōtara (*Podocarpus totara*) saplings, rank grass and mature mangroves (*Avicennia marina*) further upstream.

Downstream of the culvert, the tidal channel is approximately 1.4m wide and 50cm deep at low tide, with 1m banks. The stream is bordered by mudflats and mature mangroves. The floating particle method (measurement of the distance a floating particle travels in a fixed time) was used to provide an approximate estimate of water velocity coming out of the tidal flap gate at outgoing (almost low) tide, and this was roughly 0.2m/second. This is consistent with the fish passage guidelines which recommend water velocity should be maintained at less than 0.3m/s to allow for the passage of fish, although this estimate is only approximate, and velocities likely exceed 0.3m/s during periods of higher flows. Further, the tidal flap gate will present a physical barrier to fish passage at high tide, when closed.

eDNA sampling detected a good diversity of freshwater and marine species (see Section 4.2), including At Risk species. As samples were taken on the outgoing tide, results indicate partial fish passage is occuring with species able to pass through the flap gate periodically, although a barrier is expected to form when the flap gates close completely. Alternatively results may be the result of water exchange occuring earlier in the day during the incoming tide. As a precautionary approach and on the basis of these results, it has been assumed native fish species detected are present both above and below the culvert.

Watercourse 1 is assessed as having **Moderate** ecological value (see Table 1 for scoring and justification). The watercourse contains fragments of its former values (particularly in terms of habitat values for native fauna) but has undergone significant modification.

Table 1. Scoring and justification for assigned ecological value assigned to Watercourse 1

Matter	Rating	Justification
Representativeness	Moderate	Stream channel and morphology modified and straightened with natural meander remaining in headwaters. Stream banks highly modified due to presence of road. Mixed native-exotic riparian vegetation. Mostly herbaceous. Low shading. High diversity of fish species, although pest fish (mosquitofish) are present. IBI score of 50 (excellent).
Rarity/Distinctiveness	High	Habitat for At Risk and common native fish species.
Diversity and Pattern	Low	Mostly run habitat. Limited habitat diversity and complexity due to modification of channel, although undercut banks and overhaning vegetation provide some habitat value.
Ecological context	Moderate	Important connection between upstream habitat and the harbour for diadromous fish species although fish passage and connectivity with CMA likely restricted by tidal flap gate. Catchment includes modified pasture and wetland vegetation, and forested headwaters.
		Overall value: Moderate

Watercourse 1 upstream of the culvert

Watercourse 1 upstream of the culvert

Small unnamed watercourse at confluence with Watercourse 1

Watercourse 1 downstream of the culvert

Watercourse 1 downstream of the culvert

Watercourse 1 downstream of the culvert

Figure 4. Photos of Watercourse 1 taken on 18th May 2023.

4.2 Freshwater fauna

No freshwater fish records are available for the subcatchment that drains through the culvert but NZFFD records (1990-2023) from other watercourses that drain to the harbour within 5km of the site include At Risk – Declining īnanga (*Galaxias maculatus*) and giant bully (*Gobiomorphus gobioides*), along with Not Threatened native species such as shortfin eel (*Anguilla australis*), banded kokopu (*Galaxias fasciatus*), common bully (*Gobiomorphus cotidianus*), redfin bully (*Gobiomorphus huttoni*), and common smelt (*Retropinna retropinna*). A full list of species records is included in Appendix 3.

eDNA sampling detected a range of freshwater and marine species (see Figure 5-6, and Appendix 2) including At Risk giant bully (*Gobiomorphus gobioides*), īnanga (*Galaxias maculatus*), and longfin eel (*Anguilla dieffenbachii*). Of the freshwater species detected, only longfin eel was not detected upstream of the culvert. As samples were taken on the outgoing tide, results could indicate partial fish passage is occuring. Alternatively they may be the result of water exchange occuring earlier during the incoming tide. Nevertheless, these results indicate there is potential upstream habitat for a number of native fish species.

The IBI (index of biological intergrity) was calculated using the Auckland regional calculator (access to NRC IBI Excel is not currently public) and returned a score of 50. This is equivalent to ‘excellent diversity’, although this score may not be fully representative for the Northland region.

Based on the eDNA sample results, the fish values of the site within the various watercourses are **High** based on the presence of At Risk indigenous species.

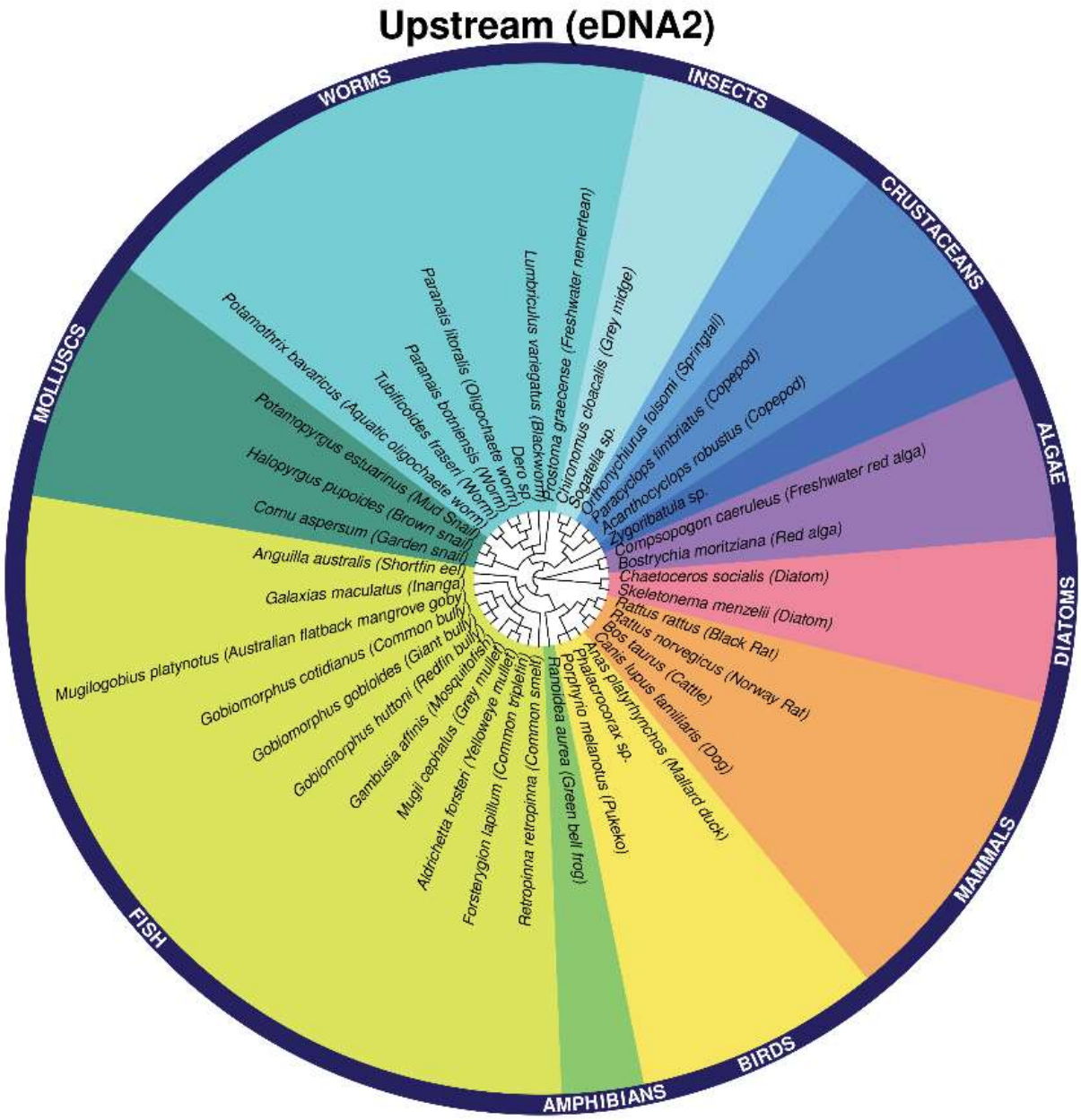


Figure 5. Summary of eDNA results from the two samples taken upstream of the culvert (Source: Wilderlab Ltd).

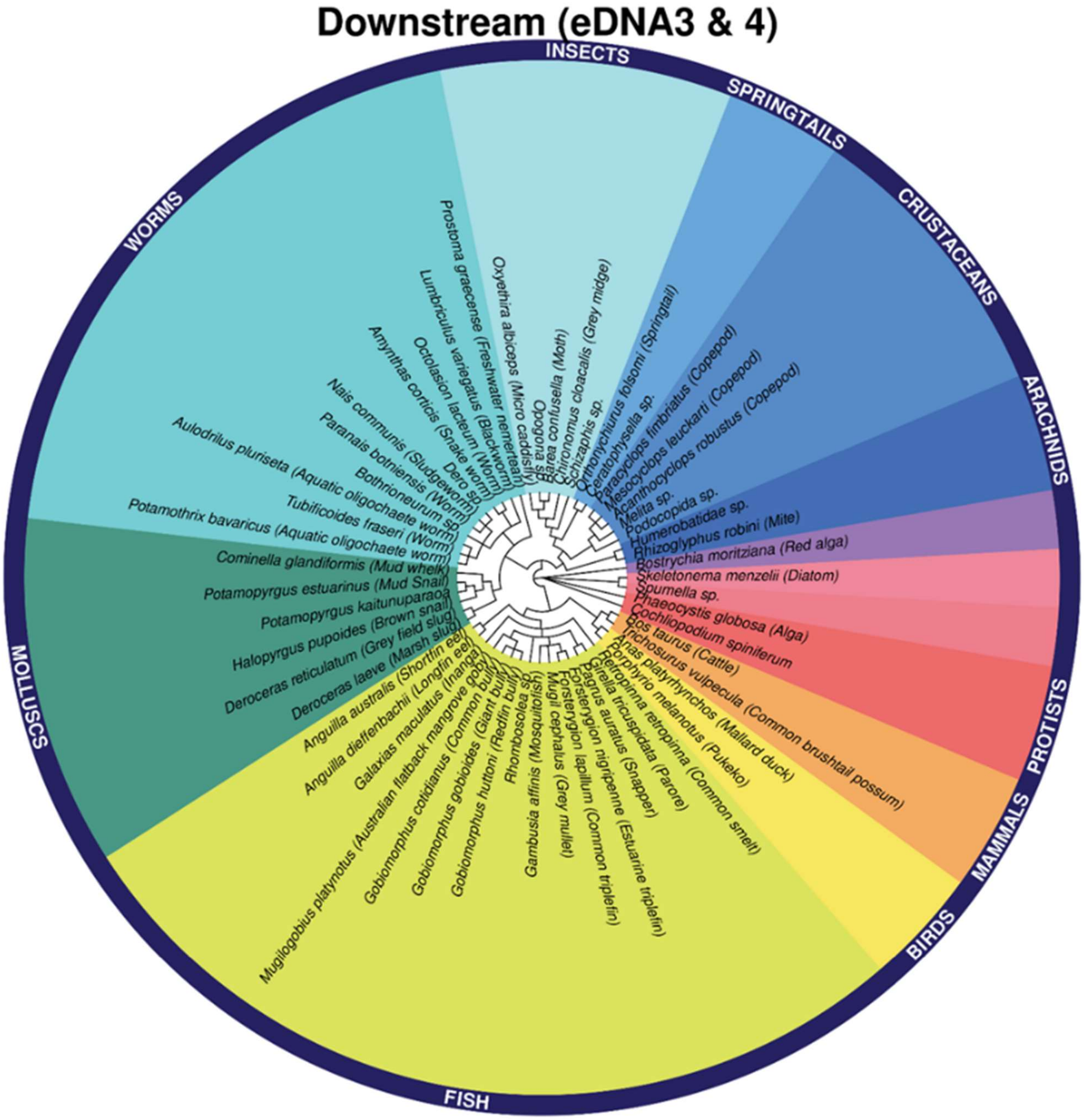


Figure 6. Summary of eDNA results from the two samples taken downstream of the culvert (Source: Wilderlab Ltd).

4.3 Vegetation

Vegetation within the works footprint upstream of the culvert consists of a grassy roadside verge on the true left of the culvert consisting of rank grass and herbaceous weeds with a few scarce tōtara seedlings, and young native woody and herbaceous vegetation with weed species interspersed. on the true right.

Vegetation within the works footprint downstream of the culvert consists of mature mangroves, small pōhutukawa, and a potentially a small amount of other young native vegetation on the edge of the works footprint. Pōhutukawa are in the Myrtaceae family and are at risk of infection by myrtle rust (*Austropuccinia psidii*). As such, the threat status of the species present has been elevated as a precautionary measure based on the potential threat posed by myrtle rust (see de Lange et al., 2018), although the species remains regionally common. On this basis, a High rating for Rarity/Distinctiveness was not considered justified.

Herbaceous road verge vegetation consists primarily of exotic weeds and is assessed as having **Very Low** ecological value.

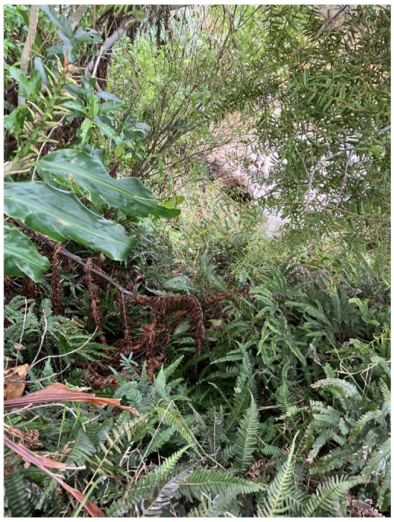
Other vegetation within the works footprint is assessed as having **Low** ecological value (see Table 1 for justification)

A list of species observed on Site is included in Appendix 3.

Table 2. Scoring and justification for assigned ecological value assigned to vegetation within the works footprint (excluding herbaceous road verge vegetation).

Matter	Rating	Justification
Representativeness	Low	Indigenous species dominant but weed species present. Vegetation somewhat typical or characteristic of what would naturally occur on the site, but generally in early stages of succession apart from mature mangroves.
Rarity/Distinctiveness	Low	No rare/distinctive vegetation and habitats present other than Myrtaceous species which are locally and nationally common but classified as Threatened due to myrtle rust
Diversity and Pattern	Low	Construction of the road and modification has disrupted the natural gradient from coastal forest to mangroves. Natural diversity somewhat compromised due to edge effects within the works footprint.
Ecological context	Moderate	Located between two sites identified during the Protected Natural Areas Programme (PNAP; Conning, 1999). With the exception of the road and small-scale residential development, the wider area retains good connectivity from the surrounding forested hills to the harbour.
		Overall value: Low

Vegetation to the north west of the culvert



Vegetation to the north west of the culvert

Vegetation to the south of the culvert

Vegetation adjacent to the south of the culvert

Figure 7. Photos of Vegetation adjacent to the culvert on Site taken on 18th May 2023

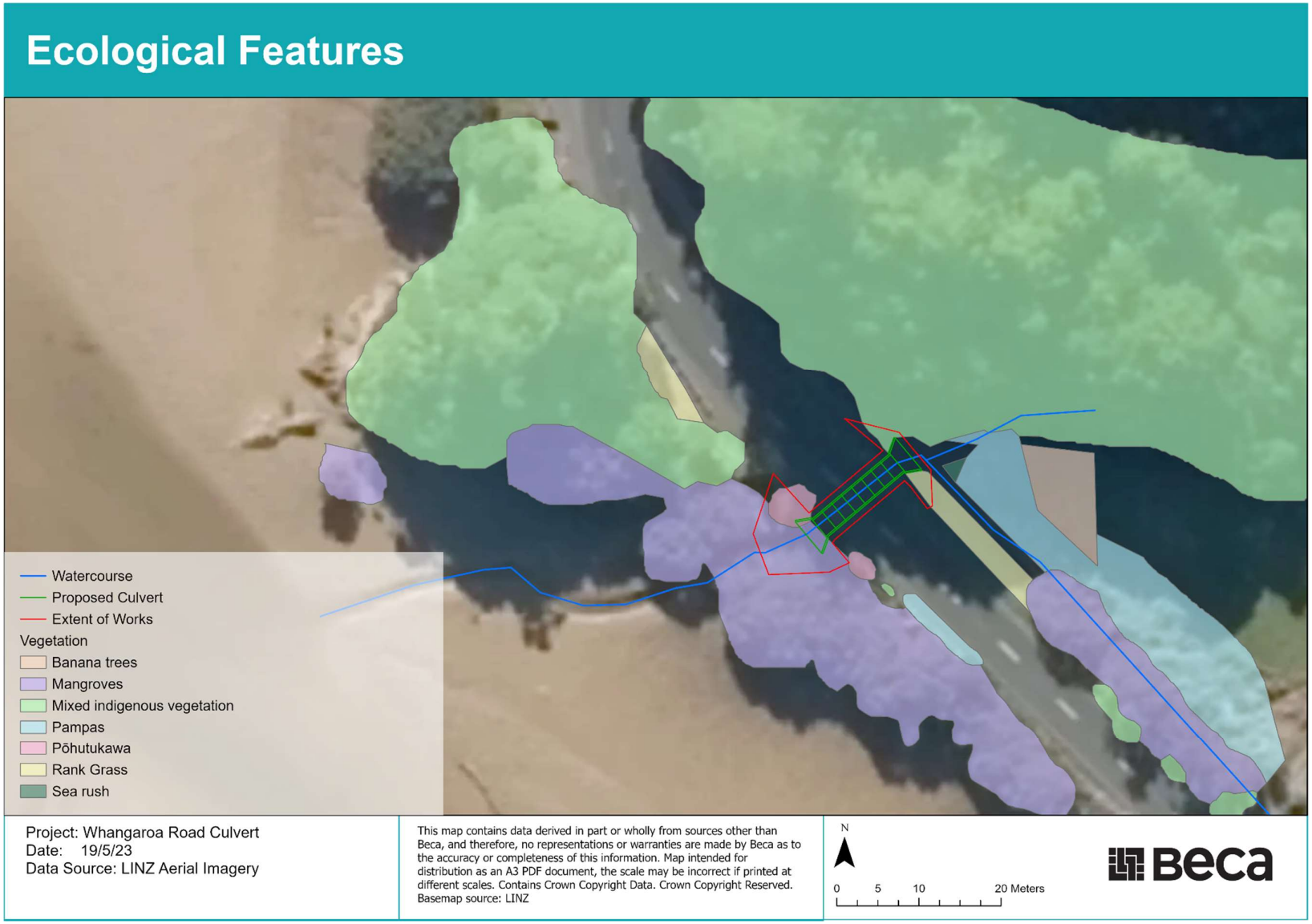


Figure 8. Ecological features within the zone of influence. Note that mapping is approximate only and does not represent an exact surveyed extent.

4.4 Avifauna

Vegetation within the works footprint is expected to provide foraging and roosting habitat for native and exotic passerine birds, while the adjacent harbour and associated coastal wetlands provides valuable habitat for a range of coastal birds including a number of Threatened and At Risk species (see Table 3). Apart from a single kōtare flying overhead, birds observed on site were sighted a considerable distance from the works footprint in the harbour. The works footprint is unlikely to provide any important habitat for coastal species of conservation concern, with the possible exception of little blue penguin/kororā (*Eudyptula minor;* At Risk - Declining).

The Whangaroa Harbour Significant Ecological Estuarine Area Assessment Sheet for Wading and Aquatic Birds (Northland Regional Council, n.d.) notes that kororā feed and nest within the harbour. The existing rock armour adjacent to the culvert does provide potential kororā nesting habitat (Figure 9). Kororā breed in a wide variety of burrow types including crevasses in rocky shorelines and rock revetments. No signs of kororā (i.e. penguin scat / guano) were observed on site, but the timing of the site visit did not coincide with the egg laying and chick rearing stage of the kororā breeding season, or the moulting season when active burrows are more likely to be occupied. As the site visit took place at low tide, it is also not clear whether rock remains exposed during high tide. As kororā are afforded absolute protection under the Wildlife Act 1953, a precautionary approach should be adopted and any risk of injury and/or mortality must be managed accordingly.

A full list of avifauna species recorded within 3km of the site in the past 10 years is included in Appendix 3.

Should kororā be found to be present, the works footprint would have **High** avifauna values. If kororā are not present, the works footprint is considered to have **Low** avifauna values based on the presence of common native and exotic species.

The Whangaroa harbour is considered to have **Very High** avifauna values based on the presence of Threatened and At Risk species.

Figure 9. Rock armour adjacent to culvert.

Table 3. Avifauna species recorded during the site visit, and eBird records within 3km of the site from the past 10 years (eBird, 2023). Conservation status assigned according to Robertson et al., (2021).

Common name	Scientific Name	Conservation Status	Source
Australasian bittern	*Botaurus poiciloptilus*	Threatened – Nationally Critical	eBird
Reef heron	*Egretta sacra*	Threatened - Nationally Endangered	eBird
Grey duck	*Anas superciliosa*	Threatened – Nationally Vulnerable	eBird
Caspian tern	*Hydroprogne caspia*	Threatened – Nationally Vulnerable	eBird
Northern New Zealand dotterel	*Charadrius obscurus*	Threatened - Nationally Increasing	eBird
Little Shag	*Microcarbo melanoleucos*	At Risk - Relict	eBird
Black shag, black cormorant	*Phalacrocorax carbo*	At Risk - Relict	eBird, observed on site
Red billed gull	*Chroicocephalus novaehollandiae*	At Risk - Declining	eBird, observed on site
Banded rail, moho-pereru	*Gallirallus philippensis*	At Risk - Declining	eBird
Fernbird	*Poodytes punctatus*	At Risk - Declining	eBird
White-fronted tern	*Sterna striata*	At Risk - Declining	eBird
Variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	eBird
Pied shag	*Phalacrocorax varius*	At Risk - Recovering	eBird, observed on site
Little black shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon	eBird
Royal spoonbill	*Platalea regia*	At Risk - Naturally Uncommon	eBird, observed on site

4.5 Whangaroa harbour

The Whangaroa harbour is a deep and sheltered estuarine embayment some 8km long and covers 19km² of which ~25% are mudflats (Short et al., 2022).

Whangaroa Harbour is home to many plant and animal species, including large marine species (e.g., dolphins, turtles), fish (e.g., snapper, kingfish, stingrays), invertebrates (e.g., scallops, crustaceans), shorebirds (e.g., New Zealand dotterel, banded rail) and seabirds (e.g., gannets, seagulls).

The harbour provides high-quality estuarine habitat for birds including threatened and regionally significant species (see Section 4.4) and the best example of estuarine habitat in the ecological district (Northland Regional Council, n.d.). The harbour also provides a migratory pathway for diadromous fish species (see Section 4.2) and is home to a number of marine fish (e.g snapper, stingrays etc) and invertebrates (e.lg. scallops, crustaceans).The ecological significance of the Harbour is assessed as Low-Moderate with locally important concentrations of some species (Northland Regional Council, n.d.)

Despite its ecological values, Whangaroa Harbour is subject to a number of ecological pressures including, sediment, nutrient and contaminant runoff, and habitat modification.

Whangaroa Harbour is considered to have **High** ecological value.

5 Assessment of Ecological Effects

The effects assessed are associated with the temporary effects arising from the construction phase as well as the longer-term effects once the replacement culvert has been installed. The assessment of ecological effects has been undertaken in accordance with the EIANZ guidelines (Roper-Lindsay et al., 2018). Level of effects are assessed as the product of the magnitude (determined according to the duration of effects, the degree of change that will be caused and the extent of potential impact), and the ecological values impacted. The key effects assessed, and the associated magnitude are described in detail below.

5.1 Key Ecological Effects Overview

5.1.1 Construction phase effects (temporary) include:

- Potential injury and/or mortality of aquatic fauna;
- Disturbance of native avifauna;
- Earthworks leading to potential erosion and deposition of suspended sediments into receiving environments;
- Vegetation clearance

5.1.2 Operational phase effects include:

- Ongoing loss of connectivity/prevention of fish passage

5.2 Construction phase effects

5.2.1 Potential injury and/or mortality of native fauna;

Construction activities and clearance of vegetation have the potential to cause direct injury or mortality to native wildlife such as kororā and fish.

i. Kororā

The rock wall adjacent to the culvert provides potential habitat for At Risk kororā.

There is a chance that construction works will cause injury and/or mortality of kororā without adequate management if they are present; particularly if works should occur within the breeding season.

The magnitude of this effect is not able to be assessed in the absence of survey data confirming presence or absence. Nevertheless, as all native fauna is protected under the Wildlife Act, measures to avoid injury/mortality are required and recommendations for management and mitigation have been made to address these issues and ensure the overall level of effect is **Low**.

Value:	High (potential)	
Level of effect prior to management	**Magnitude**: N/A	**Overall level of effect**: N/A
Proposed management	Pre-works kororā survey Preparation of a kororā management plan if confirmed to be present. (see Section 6.1.2).	
Level of effect following management	**Magnitude**: Negligible	**Overall level of effect**: Low

ii. Native fish

Construction activities that disturb the stream bed, banks, or in-stream habitat have the potential to result in disturbance and/or mortality of native freshwater fish, including At Risk species. This includes the establishment of a dry works area for culvert replacement.

The risk of injury or mortality of native fish in the impacted reach of the river is considered a **Low** magnitude of unmitigated effect as the works affect a limited footprint over a temporary timescale and is not expected to have a detectable change in the local fish population.

Regardless the risk of harm to native fish remains, therefore management will be required in accordance with Section 70(1) of the Fisheries Regulations 1983.

Value:	High	
Level of effect prior to management	**Magnitude**: Low	**Overall level of effect**: Low
Proposed management	Fish salvage and relocation (see Section 6.1.1).	
Level of effect following management	**Magnitude**: Negligible	**Overall level of effect**: Low

5.2.2 Disturbance of native avifauna;

Vegetation at the site provides potential habitat for common native and passerine birds, while the harbour provides habitat for a number of species of conservation concern. If any birds are in the vicinity of works, they may be disturbed by noise associated with the movement of vehicles, plant, and construction workers within the works footprint during the construction period. Given the small footprint of works, temporary nature of works, existing level of background noise associated with the road, and extent of available alternative habitat in the surrounding area, this is not expected to be more than a minor shift in baseline conditions and is assessed as a **Negligible** magnitude of effect.

Value:	Low (terrestrial species) High – Very High (coastal species)	
Level of effect prior to management	**Magnitude**: Negligible	**Overall level of effect**: Low – Very Low
Proposed management	None required	

5.2.3 Earthworks leading to potential erosion and deposition of suspended sediments into receiving environments;

Proposed works have the potential to cause deposition of suspended sediments into the watercourse and harbour without adequate erosion and sediment control measures.

In the absence of effects management measures, the potential magnitude of effect is expected to be **Moderate**, resulting in a partial change in existing baseline condition and temporary reduction in habitat quality for aquatic life. Although with best practice erosion and sediment control, this can be managed to low overall level of effect.

Value:	High	
Level of effect prior to management	**Magnitude**: Moderate	**Overall level of effect**: High
Proposed management	Best practice erosion and sediment control (see Section 6.2).	
Level of effect following management	**Magnitude**: Low	**Overall level of effect**: Low

5.2.4 Vegetation clearance

Proposed works will require a small amount of vegetation clearance at the site (see Table 4 and Figure 8). It is not clear whether mangroves will need to be cleared, or just trimmed to allow for works.

Vegetation clearance is assessed as a **Negligible** magnitude of effect, resulting in a very slight shift from existing baseline conditions due to the small extent of clearance, located on the edge of existing vegetation. Should mangroves be cleared, they are expected to naturally recolonise, although there will be a lag time in restoration of ecological values.

Value:	Low – Very Low	
Level of effect prior to management	**Magnitude:** Negligible	**Overall level of effect**: Very Low
Proposed management	None required	

Table 4. Approximate vegetation clearance areas.

Type	Area (m2)
Pohutukawa	16.5
Mangroves	56.7
Mixed indigenous vegetation	6.2
Rank Grass	7.3
Total	**86.8**

5.3 Operational phase effects

5.3.1 Ongoing loss of connectivity/prevention of fish passage (loss of potential value)

The existing tidal gate is a partial barrier to fish passage and replacement will result in continued poor connectivity with upstream habitat (particularly during the incoming tide when fish are moving upstream). This will result in a limiting effect on the potential indigenous biodiversity values upstream of the culvert and may impact spawn and reproductive success of certain species, such as īnanga.

The NPS-FM requires any new structures within waterways (or alteration of existing structures) to maintain or improve fish passage; unless there is a need to exclude certain fish species in order to protect desired fish species, those species' life stages, or a certain habitat. The NPS-FM provides direction to the NES-F, which prescribes rules and regulations (of which Regulation 74 is relevant to passive flap gates) to meet those policies.

This prevention of fish passage and loss of potential indigenous biodiversity values is assessed as a **Low** magnitude of effect, as there is current evidence of some fish passage occurring prior to the closing of the tidal gates, thus enabling intermittent access to upstream habitat.

Nevertheless, it is recommended that a fish friendly tide gate is installed to reduce ongoing adverse effects, and loss of potential value. In particular, fish passage improvements may allow At Risk longfin eel to access upstream habitat and allow access to potential spawning habitat for īnanga upstream. This installation of a fish friendly tide gate will result in an improvement to the status quo.

Value:	High	
Level of effect prior to management	**Magnitude**: Low	**Overall level of effect**: Low
Proposed management	Installation of "fish friendly" tide gate (see Section 6.3).	
Level of effect following management	**Magnitude**: Positive	**Overall level of effect**: Net Gain

6 Effects Management

6.1 Fauna management

6.1.1 Fish salvage

Protocols to avoid injury/mortality of native fish should include fish rescue and relocation in areas where standing water is present prior to the commencement of works. It is recommended that impacted habitat be isolated (using stop-nets) and fish present be caught and translocated to a suitable aquatic habitat outside of the works footprint. This will likely involve a combination of trapping, slow dewatering and sorting through dewatered materials to capture and relocate fish outside of the works zone. The stop-nets should be retained within the stream until the works are completed, to ensure that no fish re-colonise.

6.1.2 Kororā survey

Prior to works a kororā survey should take place within and adjacent to the works area to the south of Whangaroa road at high tide to assess kororā habitat and presence and subsequently inform the assessment of potential effects on kororā and any management recommendations.

If kororā are present and will be directly impacted by works, a kororā management plan should be prepared including a management methodology, to avoid and / or minimise any adverse effects on kororā from the proposed works.

6.2 Erosion and Sediment Controls

Sediment controls will be put in place to prevent sediment laden runoff entering the receiving environment in accordance with industry best practice guidelines following Auckland Council GD05 - Guidance for Erosion and Sediment Control.

6.3 Installation of “fish-friendly” tide gate

To improve connectivity and fish passage, a “fish friendly” tide gate design should be implemented.

“Fish friendly” tide gates rely on a counterweight or float system to control the opening and closing of the gate based on the water surface elevation outside of the gate. In effect, they hold the gate open for a longer period compared to a standard passive gate design, and are the recommended minimum standard for all new and replacement tide gates (Franklin et al., 2018)

To optimise fish passage, the objective should be to maximise the duration and aperture that the gate is open, particularly on the incoming tide when most juvenile fish are moving upstream (Franklin et al., 2018). This will also facilitate greater hydrological exchange and help to reduce the habitat impacts upstream of the gate.

The optimum timing and duration of opening will be site specific, and constrained by the specified protection levels (i.e. level of flood protection) of the infrastructure.

7 Conclusion

Construction phase and operational adverse effects considered as a result of the proposed culvert replacement include:

- Potential injury and/or mortality of aquatic fauna
- Disturbance of native avifauna
- Earthworks leading to potential erosion and deposition of suspended sediments into receiving environments
- Vegetation clearance
- Ongoing loss of connectivity/prevention of fish passage

Proposed measures to address these effects include:

- Fish salvage and relocation
- Kororā survey and preparation of a kororā management plan if they are confirmed to be present
- Implementation of erosion and sediment controls
- Installation of a “fish friendly” tide gate

The overall ecological effect of the proposal is considered to be **Very Low** assuming the recommended mitigation measures are implemented. Once construction is complete, replacement of the tide gate is likely to result in **Positive** ecological effects due to improved connectivity with the upstream catchment during incoming tides.

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9 Limitations

This report has been prepared by Beca Ltd solely for Far North District Council (the client). This report is prepared solely for the purpose of the assessment of potential ecological effects of the proposed works (Scope). The report has been prepared to support a resource consent application and may be used by the Client and others in subsequent processes to consider the application to which the assessment pertains. The contents of this report may not be used by the Client for any purpose other than in accordance with the stated Scope.

This report is confidential and is prepared solely for the Client. Beca accepts no liability to any other person for their use of or reliance on this report, and any such use or reliance will be solely at their own risk.

This report contains information obtained by inspection, sampling, testing or other means of investigation. Unless specifically stated otherwise in this report, Beca has relied on the accuracy, completeness, currency and sufficiency of all information provided to it by, or on behalf of, the Client or any third party, including the information listed above, and has not independently verified the information provided. Beca accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the information provided.

The contents of this report are based upon our understanding and interpretation of current legislation and guidelines (“Standards”) as consulting professionals and should not be construed as legal opinions or advice. Unless special arrangements are made, this report will not be updated to take account of subsequent changes to any such Standards.

This report should be read in full, having regard to all stated assumptions, limitations and disclaimers.

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Appendix 1 – Ecological Impact Assessment (EIANZ methodology)

Appendix 1: 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).
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.

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 are 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

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Appendix 2 – eDNA results from Wilderlab Ltd)

Appendix 2: eDNA results from Wilderlab Ltd.

Scientific name	Rank	Common name	Group	eDNA2 (upstream)	eDNA3 (downstream)	eDNA4 (downstream)
Gobiomorphus gobioides	species	Giant bully; tītarakura; tīpokopoko	Fish	13608	7047	6290
Gobiomorphus cotidianus	species	Common bully; tīpokopoko; toitoi	Fish	4746	8221	8731
Anguilla australis	species	Shortfin eel; tuna; hao; aopori; hikumutu	Fish	2680	3888	3068
Retropinna retropinna	species	Common smelt; ngaore; paraki; pōrohe	Fish	2706	3047	2302
Acanthocyclops robustus	species	Copepod	Crustaceans	1094	127	3573
Gobiomorphus huttoni	species	Redfin bully	Fish	32	2262	2369
Gambusia affinis	species	Mosquitofish	Fish	1569	1450	811
Porphyrio melanotus	species	Pukeko; pūkeko	Birds	653	263	913
Bostrychia moritziana	species	Red alga	Red algae	20	1581	0
Mugilogobius platynotus	species	Australian flatback mangrove goby	Fish	385	224	181
Trichosurus vulpecula	species	Common brushtail possum; paihamu; paihama	Mammals	0	356	0
Lumbriculus variegatus	species	Blackworm	Worms	84	94	146
Anas platyrhynchos	species	Mallard duck; rakiraki	Birds	41	19	214
Potamopyrgus estuarinus	species	Mud Snail	Molluscs	126	0	144
Forsterygion lapillum	species	Common triplefin	Fish	60	158	6
Potamothrix bavaricus	species	Aquatic oligochaete worm	Worms	16	106	34
Paranais botniensis	species	Worm	Worms	34	52	49
Tubificoides fraseri	species	Worm	Worms	45	54	35
Girella tricuspidata	species	Parore; ngāoheohe; kopīpiro; parore	Fish	0	116	0
Cornu aspersum	species	Garden snail	Molluscs	115	0	0
Paracyclops fimbriatus	species	Copepod	Crustaceans	23	16	67
Forsterygion nigripenne	species	Estuarine triplefin	Fish	0	99	0
Chironomus cloacalis	species	Grey midge	Insects	30	14	51
Bos taurus	species	Cattle; kau	Mammals	21	51	13
Mugil cephalus	species	Grey mullet; kanae; kanae raukura	Fish	25	40	13
Skeletonema menzelii	species	Diatom	Diatoms	50	14	12
Aldrichetta forsteri	species	Yelloweye mullet; kātaha; aua; kātaka	Fish	67	0	0

Scientific name	Rank	Common name	Group	eDNA2 (upstream)	eDNA3 (downstream)	eDNA4 (downstream)
Orthonychiurus folsomi	species	Springtail	Springtails	17	20	27
Rattus rattus	species	Black Rat; hinamoki; inamoki; kiore	Mammals	61	0	0
Galaxias maculatus	species	Inanga; īnanga	Fish	42	0	14
Oxyethira albiceps	species	Micro caddisfly	Insects	0	0	51
Pagrus auratus	species	Snapper; tāmure	Fish	0	0	39
Halopyrgus pupoides	species	Brown snail	Molluscs	13	6	14
Cochliopodium spiniferum	species		Amoebae	0	0	29
Anguilla dieffenbachii	species	Longfin eel; tuna; kūwharuwharu; reherehe; kirirua	Fish	0	0	27
Prostoma graecense	species	Freshwater nemertean	Other	10	0	16
Octolasion lacteum	species	Worm	Worms	0	0	22
Aulodrilus pluriseta	species	Aquatic oligochaete worm	Worms	0	0	20
Canis lupus familiaris	subspecies	Dog; pero	Mammals	17	0	0
Humerobatidae sp.	species		Mites and ticks	0	16	0
Nais communis	species	Sludgeworm	Worms	0	6	6
Rattus norvegicus	species	Norway Rat; kiore; pouhawaiki; pou o hawaiki; kaingarua; maungarua	Mammals	10	0	0
Mesocyclops leuckarti	species	Copepod	Crustaceans	0	10	0
Deroceras laeve	species	Marsh slug	Molluscs	0	0	8
Cominella glandiformis	species	Mud whelk	Molluscs	0	8	0
Rhizoglyphus robini	species	Mite	Mites and ticks	0	7	0
Ranoidea aurea	species	Green bell frog; poraka; poroka	Amphibians	6	0	0
Compsopogon caeruleus	species	Freshwater red alga	Red algae	6	0	0
Potamopyrgus kaitunuparaoa	species		Molluscs	0	0	6
Amynthas corticis	species	Snake worm	Worms	0	6	0
Barea confusella	species	Moth	Insects	0	6	0
Phaeocystis globosa	species	Alga	Other	0	5	0
Paranais litoralis	species	Oligochaete worm	Worms	5	0	0
Deroceras reticulatum	species	Grey field slug; Grey garden slug	Molluscs	0	5	0
Chaetoceros socialis	species	Diatom	Diatoms	5	0	0
Podocopida sp. BOLD:AAH0896	species		Crustaceans	0	0	5

Scientific name	Rank	Common name	Group	eDNA2 (upstream)	eDNA3 (downstream)	eDNA4 (downstream)
Gobiomorphus	genus	Bullies	Fish	1055	3560	3624
Rhombosolea	genus	Righteye flounders	Fish	0	0	196
Galaxias	genus	Galaxiids	Fish	0	0	158
Dero	genus	Worm	Worms	42	19	16
Anguilla	genus	Eels	Fish	0	64	0
Nais	genus	Sludgeworm	Worms	0	16	32
Melita	genus		Crustaceans	0	45	0
Potamopyrgus	genus	Mud snails	Molluscs	0	35	0
Bothrioneurum	genus	Worm	Worms	0	20	13
Culex	subgenus		Insects	0	28	0
Phalacrocorax	genus	Cormorants; kawau	Birds	22	0	0
Zygoribatula	genus		Mites and ticks	20	0	0
Paranais	genus	Worm	Worms	0	15	0
Amynthas	genus	Worm	Worms	0	5	6
Schizaphis	genus		Insects	0	10	0
Opogona	genus	Fungus moth	Insects	0	8	0
Culex	genus	Mosquito	Insects	0	0	6
Sogatella	genus		Insects	6	0	0
Spumella	genus	Golden-brown alga	Heterokont algae	0	0	5
Ceratophysella	genus	Mushroom springtail	Springtails	0	5	0
Gobiinae	subfamily		Fish	85	0	0
Chaetonotidae	family		Other	0	0	9
Isotomidae	family	Smooth springtails	Springtails	0	6	0
root	no rank	Unidentified	Other	12122	7566	7893
Metazoa	kingdom	Metazoans	Other	633	1167	827
Actinopteri	class		Other	0	430	78
Arthropoda	phylum	Arthropods	Other	113	22	63
Insecta	class	Insects	Other	23	27	43
Annelida	phylum	Annelid worms	Other	19	24	0

Scientific name	Rank	Common name	Group	eDNA2 (upstream)	eDNA3 (downstream)	eDNA4 (downstream)
Florideophyceae	class		Red algae	11	9	0
Boreoeutheria	clade	Placental mammals	Mammals	9	0	6
Chordata	phylum	Chordates	Other	5	0	8
Tubificida	order		Worms	6	0	7
Nemertea	phylum	Bootlace worms	Other	0	12	0
unclassified Ceratophysella	no rank		Springtails	12	0	0
Hymenoptera	order	Hymenopterans	Insects	0	10	0
Eurotatoria	class		Rotifers	0	10	0
Mollusca	phylum	Molluscs	Other	0	0	7
Neoptera	infraclass	Winged insects	Insects	5	0	0
unclassified Sarcoptiformes	no rank		Mites and ticks	5	0	0
Gobiiformes	order	Gobies and sleepers	Fish	5	0	0
Centrarchiformes	order	Sunfishes and others	Fish	5	0	0

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Appendix 3 – Species lists

Appendix 3: Species lists

Table 5. NZFFD records (1990-2023) from other watercourses that drain to the harbour within 5km of Watercourse 1. Conservation status assigned according to Dunn et al., (2018)

Common name	Scientific Name	Conservation Status	Source
Shortfin eel	*Anguilla australis*	Not Threatened	NZFFD (2020)
Banded kokopu	*Galaxias fasciatus*	Not Threatened	NZFFD (1999)
Inanga, whitebait	*Galaxias maculatus*	At Risk - Declining	NZFFD (1999, 2020)
Gambusia, mosquitofish	*Gambusia affinis*	Introduced and Naturalised	NZFFD (1994, 1999, 2020)
Common bully	*Gobiomorphus cotidianus*	Not Threatened	NZFFD (1994, 2020)
Giant bully	*Gobiomorphus gobioides*	At Risk - Declining	NZFFD (1999)
Redfin bully	*Gobiomorphus huttoni*	Not Threatened	NZFFD (1999)
Freshwater shrimp	*Paratya curvirostris*		NZFFD (1994, 1999, 2020)
Common smelt	*Retropinna retropinna*	Not Threatened	NZFFD (1999)

Table 6. Plant species observed within the site. Conservation status assigned according to de Lange et al., (2018) where plants were able to be identified to a species level.

Common name	Scientific Name	Conservation Status	Location
Yorkshire Fog	*Holcus lanatus*	Introduced and Naturalised	Road verge/rank grass
Wild Carrot	*Daucus carota*	Introduced and Naturalised	Road verge/rank grass
Australian fireweed	*Senecio bipinnatisectus*	Introduced and Naturalised	Road verge/rank grass
Yellow bristle grass	*Setaria pumila*	Introduced and Naturalised	Road verge/rank grass
	Oxalis sp.		Road verge/rank grass
	Isolepis sp.	Not Threatened	Road verge/rank grass
Tōtara	*Podocarpus totara*	Not Threatened	Road verge/rank grass, mixed indigenous vegetation
	Geranium sp.		Road verge/rank grass
Manawa, mangrove	*Avicennia marina*	Not Threatened	Mangroves (downstream of culvert)
Pōhutukawa, New Zealand Christmas tree	*Metrosideros excelsa*	Threatened – Nationally Vulnerable	Mixed indigenous vegetation (upstream and downstream of culvert)
New Zealand Flax	*Phormium tenax*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Brush wattle	*Paraserianthes lophantha*	Introduced and Naturalised	Mixed indigenous vegetation (upstream of culvert)
Whiteywood	*Melicytus ramiflorus*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Hangehange	*Geniostoma ligustrifolium*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Rosy maidenhair	*Adiantum hispidulum*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Rasp fern	*Doodia australis*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)

Common name	Scientific Name	Conservation Status	Location
Karamū	*Coprosma robusta*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Koromiko	*Veronica stricta*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Pig fern	*Paesia scaberula*	Not Threatened	Mixed indigenous vegetation (upstream of culvert)
Wild ginger	*Hedychium gardnerianum*	Introduced and Naturalised	Mixed indigenous vegetation (upstream of culvert)
Sticky Snakeroot	*Ageratina adenophora*	Introduced and Naturalised	Mixed indigenous vegetation (upstream of culvert)
Pampas	*Cortaderia selloana*	Introduced and Naturalised	Mixed indigenous vegetation (upstream of culvert)

Table 7. eBird records from within 3km of the site from the past 10 years (eBird, 2023) and species observed on site during the site visit. Conservation status assigned according to Robertson et al., (2021)

Common name	Scientific Name	Conservation Status	Source
Australasian bittern	*Botaurus poiciloptilus*	Threatened – Nationally Critical	eBird
Reef heron	*Egretta sacra*	Threatened - Nationally Endangered	eBird
Grey duck	*Anas superciliosa*	Threatened – Nationally Vulnerable	eBird
Caspian tern	*Hydroprogne caspia*	Threatened – Nationally Vulnerable	eBird
Northern New Zealand dotterel	*Charadrius obscurus*	Threatened - Nationally Increasing	eBird
Little Shag	*Microcarbo melanoleucos*	At Risk - Relict	eBird
Black shag, black cormorant	*Phalacrocorax carbo*	At Risk - Relict	eBird, observed on site
Red billed gull	*Chroicocephalus novaehollandiae*	At Risk - Declining	eBird, observed on site
Banded rail, moho-pereru	*Gallirallus philippensis*	At Risk - Declining	eBird
Fernbird	*Poodytes punctatus*	At Risk - Declining	eBird
White-fronted tern	*Sterna striata*	At Risk - Declining	eBird
Variable oystercatcher	*Haematopus unicolor*	At Risk - Recovering	eBird
Pied shag	*Phalacrocorax varius*	At Risk - Recovering	eBird, observed on site
Little black shag	*Phalacrocorax sulcirostris*	At Risk - Naturally Uncommon	eBird
Royal spoonbill	*Platalea regia*	At Risk - Naturally Uncommon	eBird, observed on site
Shining cuckoo	*Chrysococcyx lucidus*	Not Threatened	eBird
Swamp harrier, Australasian harrier	*Circus approximans*	Not Threatened	eBird
Black swan	*Cygnus atratus*	Not Threatened	eBird
White-faced heron	*Egretta novaehollandiae*	Not Threatened	eBird, observed on site
Grey warbler	*Gerygone igata*	Not Threatened	eBird
New Zealand wood pigeon	*Hemiphaga novaeseelandiae*	Not Threatened	eBird
Pied stilt	*Himantopus leucocephalus*	Not Threatened	eBird, observed on site
Welcome swallow	*Hirundo neoxena*	Not Threatened	eBird
Black-backed gull	*Larus dominicanus*	Not Threatened	eBird, observed on site

Common name	Scientific Name	Conservation Status	Source
Australasian gannet	*Morus serrator*	Not Threatened	eBird
Morepork, New Zealand owl, boobook	*Ninox novaeseelandiae*	Not Threatened	eBird
Tomtit	*Petroica macrocephala*	Not Threatened	eBird
Pukeko	*Porphyrio melanotus*	Not Threatened	eBird
Tūī, parson bird	*Prosthemadera novaeseelandiae*	Not Threatened	eBird
Fantail	*Rhipidura fuliginosa*	Not Threatened	eBird
Paradise shelduck	*Tadorna variegata*	Not Threatened	eBird
New Zealand kingfisher, kōtare	*Todiramphus sanctus*	Not Threatened	eBird, observed on site
Spur-winged plover	*Vanellus miles*	Not Threatened	eBird
Silvereye	*Zosterops lateralis*	Not Threatened	eBird
Myna	*Acridotheres tristis*	Introduced and Naturalised	eBird
Skylark	*Alauda arvensis*	Introduced and Naturalised	eBird
Mallard	*Anas platyrhynchos*	Introduced and Naturalised	eBird
Grey goose, feral goose	*Anser anser*	Introduced and Naturalised	eBird
California quail	*Callipepla californica*	Introduced and Naturalised	eBird
Goldfinch	*Carduelis carduelis*	Introduced and Naturalised	eBird
Yellowhammer	*Emberiza citrinella*	Introduced and Naturalised	eBird
Chaffinch	*Fringilla coelebs*	Introduced and Naturalised	eBird
Chicken	*Gallus gallus*	Introduced and Naturalised	eBird
Australian magpie	*Gymnorhina tibicen*	Introduced and Naturalised	eBird
Wild turkey	*Meleagris gallopavo*	Introduced and Naturalised	eBird
House sparrow	*Passer domesticus*	Introduced and Naturalised	eBird
Common pheasant, ring-necked pheasant	*Phasianus colchicus*	Introduced and Naturalised	eBird
Eastern rosella	*Platycercus eximius*	Introduced and Naturalised	eBird
Starling	*Sturnus vulgaris*	Introduced and Naturalised	eBird
Blackbird	*Turdus merula*	Introduced and Naturalised	eBird, observed on site
Song thrush	*Turdus philomelos*	Introduced and Naturalised	eBird