

Appendix S Freshwater Ecology Memo

Memorandum

Subject: ARL Project - Freshwater Ecology
Memorandum

Reference
No: 1101798

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1 Introduction

WM New Zealand (WMNZ) has engaged Tonkin & Taylor Ltd (T+T) to prepare technical memoranda for the proposed new solid waste management and disposal facility in the Wayby Valley, north of Auckland ('**ARL**' or '**Project**').

The Project will involve constructing, operating, closing and providing aftercare for a new 24 Mm³ landfill facility and associated infrastructure at Wayby Valley, Wellsford. Ngāti Manuhiri are Project partners and will work with WMNZ on the proposed management and mitigation measures. Once landfilling ceases, the land will be returned to Ngāti Manuhiri as tāngata whenua.

The new landfill will be a Class 1 landfill, as defined in the Technical Guidelines for Disposal to Land (WasteMINZ Technical Guidelines)¹, accepting municipal solid waste. This includes residential and commercial waste, construction and demolition waste, some industrial wastes that meet acceptance criteria, and contaminated soils. Following waste settlement, the landfill cap surface will have a maximum height of 205 m RL.

WMNZ landholdings in the Wayby Valley area comprise a total area of 1020 ha, with the landfill footprint being approximately 60 ha. The WMNZ landholdings have been divided into five general areas; the Eastern Block, the Western Block, the Southern Block, the Waiwhiu Tributary Block and the Waiteraire Tributary Block. The proposed works will involve the following:

- **Site access and operation:** Construction of site access roads, weighbridges, and a vehicle wheel wash.
- **Landfill development:** Major earthworks and the installation of environmental management systems, including a landfill lining system and collection networks for leachate, stormwater, and landfill gas (LFG).
- **Leachate and landfill gas management:** A dedicated leachate management system and a LFG treatment facility, including a LFG flare and a LFG waste-to-energy plant.
- **Support infrastructure:** Facilities for site staff, plant maintenance, and water supply.
- **Terrestrial, freshwater and wetland biodiversity measures:** This includes native revegetation, and a weed and animal pest management programme to offset or compensate for residual adverse effects on terrestrial, freshwater and wetland ecology.

This memorandum provides an outline of the initial findings of the assessments of freshwater (stream) ecological effects and has been prepared for inclusion in an application for Ministerial referral of the Project under the Fast-track Approvals Act 2024 ('**FTAA**'). Specifically, this memorandum responds to the requirements under section 3.4 of the Fast-track Approvals Referral

¹ Technical Guidelines for Disposal to Land, WasteMINZ, September 2023, Revision 3.1.

Application Form and section 13(4)(h) of the FTAA. A full description of the draft proposal is included in the accompanying information attached to the application form for the referral.

2 Summary of findings

This memorandum summarises the freshwater ecological effects for the Project, located in the mid–upper Hōteao catchment, ~35 km upstream of the mouth of Te Awa o Hōteao at the Kaipara moana.

Freshwater ecological values were assessed as High to Very High and were primarily characterised by the presence of intact stream system, functions, and riparian vegetation (both pine and native vegetation dominated), the absence of agricultural activities in some localised catchments, and high biotic quality scores. Overall, streams within the Project area were comprised of healthy macroinvertebrate and fish communities and are associated with varying amounts of riparian vegetation cover.

The assessment of potential freshwater ecological effects presented here has been informed by desktop review, project technical reports, and comprehensive field surveys undertaken between 2018 to present. Applying the EIANZ Ecological Impact Assessment Guidelines (EiIAG) framework, most effects on the freshwater environment can be mitigated to an acceptable level without residual adverse effects. However, the Project will result in a substantial loss of stream habitat and ecological function within the WMNZ landholdings. Offset measures are proposed and will address the loss of stream ecological function to a no net loss level.

3 Assessment methodology

The methodology to inform the assessment to date has included desktop assessments (e.g., reviewing public fauna databases and spatial habitat layers) and several site investigations. These have been ongoing since 2018, to initially inform opportunities and constraints, and then through to detailed surveys and ongoing monitoring to inform the effects assessment.

The following desktop-based tasks and assessment have been undertaken to inform the assessment:

- Obtaining faunal data from the New Zealand Freshwater Fish Database, which were compared to field survey results (see below) to provide a local and wider catchment context.
- Reviewing fish passage risk of instream structures within the localised catchments via the Fish Passage Assessment Tool.
- Reviewing river lines via the River Environment Classification layer and habitat types via “*Our Environment*” layers in Manaaki Whenua – Landcare Research Group.
- Auckland Council’s Auckland Unitary Plan – Operative in Part provisions relevant to freshwater ecology, in particular information on Significant Ecological Areas (SEA) and Natural Stream Management Area (NSMA).

Field work to inform the assessment undertaken to date has included:

- Watercourse classification to determine whether a watercourse is either permanent, intermittent, ephemeral or artificial in accordance with the definitions listed within the AUP².
- Freshwater fauna surveys were completed within the Project footprint and immediate receiving environments and include:

² Which adopts the RMA definition of a river.

- Freshwater fish (including kōura)³ and kākahi⁴ surveys.
 - Environmental DNA (eDNA) sampling to supplement the fish and kākahi surveys.
- Macroinvertebrate samples⁵ collected from 28 sites. Results from these samples provided an indication of biotic quality via the Macroinvertebrate Community Index (MCI).
- Stream Ecological Valuations (SEV) at 23 representative sites within the Eastern Block, Southern Block, Western Block, and Waiteraire Tributary Block.
- Baseline water quality surveys within WMNZ landholdings have been undertaken to obtain information on the water quality within the immediate catchments.
- Additional freshwater ecology surveys have been completed on a quarterly basis. This has included sampling of substrate and periphyton composition, and the macroinvertebrate community in streams within the Project site.

Modelling that has been undertaken to inform this assessment has included:

- Using the Ecological Compensation Ratio (ECR) tool to quantify the amount of stream bed area that is to be subject to restoration to address residual adverse effects.
- For all streams where access was restricted, the extent of stream present was modelled using the Auckland Council “Overland Flow Paths” layer. Modelling used estimated slope, geology and contributing catchment size alongside the principles of Wadhwa and Storey (2009)⁶ and Lowe (2016)⁷.

The desktop assessment and field surveys results were used to determine the ecological values at the site. An assessment of the potential ecological effects on those values from the Project was undertaken in accordance with EIANZ guidelines⁸ for this referral application.

4 Site and project context

A general description of the site and surrounding locality is included in the accompanying information as part of the referral application. The following provides an overview of stream catchments of the site and Project which are key to the freshwater ecology assessment. An overview figure showing catchment context and sampling locations is provided in Appendix A.

- Despite the presence of exotic forestry, streams within the proposed Project footprint and the wider Eastern Block have Very High ecological value, due largely to the stable and well shaded stream environments that exist within the advanced stage of the forestry. During forestry harvest activity and in the years following, these ecological values would decrease until the stream systems recover following that disturbance.
- While the Western Block has been modified and subject to degradation through agricultural land use, the biodiversity values within these streams are still moderate and the unvegetated headwaters in particular have high potential for enhancement. The upper catchment of the

³ In general accordance with Joy, M, David, B, & Lake, M New Zealand Freshwater Fish Sampling Protocols: Part 1 – Wadeable Rivers and Streams (NIWA, 2013).

⁴ In general accordance with Catlin, A, Collier, K, Pingram, M, & Hamer, M TR 2016/23: Regional guidelines for ecological assessments of freshwater environments – standardised protocol for adult freshwater mussel monitoring in wadeable streams (Waikato Regional Council, June 2018).

⁵ Per the semi-quantitative method for hard-bottomed (C1) and soft-bottomed streams (C2) in Stark, J D, Boothroyd, I K G., Harding, J S, Maxted, J R, & Scarsbrook, M R Protocols for sampling macroinvertebrates in wadeable streams (MfE, 2001).

⁶ Storey, R, and Wadhwa, S TR2009/028: An Assessment of the Lengths of Permanent, Intermittent and Ephemeral Streams in the Auckland Region (National Institute of Water and Atmospheric Research ("NIWA"), 2009).

⁷ Lowe, M Subject: Stream Delineation Tool – Memorandum from Morpium Environmental Ltd to Wolfgang Kanz (Auckland Council, 2016).

⁸ Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. (2018). Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.

southern sub-catchment was identified as having Very High value due to its high SEV score and macroinvertebrate fauna. The upper northern sub-catchment has relatively intact stream systems, but with an absence of riparian margins contributing to a comparatively lower High value.

- Streams within the Southern Block have Very High ecological values as they are within a NSMA or are connected to the NSMA and have high SEV scores and biotic quality (as indicated via MCI quality classes).
- Streams within the Waiteraire Tributary Block area were assessed as having Very High ecological values due to the onsite values and because they are upstream of the Department of Conservation (DOC) Sunnybrook Reserve (which is also a SEA) and NSMA.
- The ecological values of Te Awa o Hōteio at the WMNZ boundary are High. This is based on Te Awa o Hōteio being recognised as an NSMA and SEA on the boundary of the WMNZ landholdings and an Outstanding Natural Feature (ONF) downstream of SH1.

5 Assessment of potential effects

Based on the proposal and the information available (e.g., the desktop and field assessments), an assessment of potential effects on freshwater ecology (including fauna and habitat) are summarised in the following sections.

5.1 Construction phase (short term effects):

The following points summarise the potential stream ecology effects of the Project during the construction phase. The assessment assumes that standard management measures will be implemented to mitigate the potential effects.

- **Sedimentation from earthworks during site establishment works:** Sedimentation loads may increase over the site establishment period. This may result in the potential smothering of instream habitats, as well as directly impact fauna behaviour and physiology. We have assessed that the magnitude of effect will be low due to the proposed implementation of the Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (GD05) mitigation measures and a comprehensive monitoring and response framework within an adaptive monitoring and management plan as set out within the Erosion and Sediment Assessment Memorandum⁹. A low magnitude of effect results in an overall level of effect ranging from low to moderate.
- **Fish injury and mortality:** Direct habitat impacts on up to 12.2 km of permanent and intermittent stream may affect freshwater fauna. With the implementation of proposed fish recovery protocols the magnitude of effect is low. A low magnitude of effect results in an overall level of effect ranging from low to moderate (depending on the stream catchment).
- **Water quality effects during vegetation clearance:** Potential increase in sediment movement and an increased risk of high biological oxygen demand (BOD) due to organic matter input which can deoxygenate water. These effects are proposed to be managed via Vegetation Clearance Protocols (VCP), including measures around the placement of cleared vegetation, woodchip, and mulch. The implementation of these protocols is expected to result in a low magnitude of effect and are sufficient to mitigate potential effects. A low magnitude of effect results in an overall level of effect ranging from low to moderate (depending on the stream catchment).
- **Fish passage during construction:** Where works occur within stream sections that link to upstream habitat, life cycle behaviours for native fish (including migration) may be

⁹ T+T, July 2026. ARL Project – Erosion and Sediment Control Memorandum. Ref: 1101798.0000

interrupted. To avoid disturbance to migratory fish, in-stream construction works are expected to avoid peak migration season where practicable, or fish passage should otherwise be provided during works in locations where upstream habitats remain. The inclusion of these management measures will result in a very low magnitude of effect and a low overall level of effect (depending on the stream catchment).

5.2 Operational phase (longer term):

The following points summarise the potential effects of the Project during the operational phase (the working landfill). The assessment assumes that standard management measures will be implemented to mitigate the potential effects.

- **Loss of fish passage to upper catchment habitat:** To avoid the loss of fish passage due to stream crossings in the Waiteraire Stream catchment, and upper NSMA catchment and various parts of the Western Block, the current design proposes that bridges are constructed (Waiteraire Stream and the Southern Block) or culverts designed for fish passage where upstream habitat remains. In addition, the removal of existing barriers is proposed and will improve access for catchment fish species to the Western Block and the Waiteraire Stream. Where fish passage is being provided (either via using bridges or specific fish passage designed culverts) it is anticipated that this will result in a negligible magnitude of effect. Current designs show that, in two instances, fish passage may be restricted, however, due to the quality of upstream habitat the magnitude of effect is considered low and no further mitigation is required. A negligible and low magnitude of effect results in a low to moderate overall level of effect (depending on the stream catchment).
- **Water quality (including changes in sediment) and quantity during operation:** New stormwater and leachate contaminants may enter stream environments, and changes to the operational phase flow regime may result in increased stream erosion, without appropriate controls in place.

The implementation of avoidance and minimisation measures are proposed to include controls consistent with "Stormwater Management Devices in the Auckland Region" ("GD01") best practice methods, which may include the use of filter strips, leachate capture and polishing wetlands within the landfill, with any changes to the operational phase flow regime to be managed through a combination of ponds, wetlands, filter strips and the retention of 95th percentile flows. The management of stormwater on the site is detailed in the Operational Stormwater and Water Quality Memorandum¹⁰.

The implementation of these proposed measures will result in a low magnitude of effect, which results in an overall effect ranging from low to moderate depending on different activities, receiving environment and associated controls. Ongoing monitoring of water quality and sediment is proposed via the development of Project specific monitoring plans, which shall include appropriate responses/ actions if exceedances occur.

- **Temperature effects:** Due to an increase in impervious surfaces or stormwater devices with large unvegetated areas, there is a potential for increased water temperature in stream receiving environments. To manage these effects, the use of filter strips and raingardens in the Southern Block and vegetated wetlands in the Eastern Block are proposed to minimise any potential temperature increases. The inclusion of these measures results in a negligible to low magnitude of effects, and the overall effect ranges from very low to low.
- **Change in flow regime:** The modification of baseflows (including through the modification of the local water table) or reduction in surface flows could modify (reduce) available instream habitat and its condition. Any actual effect from a change in flow regime will diminish with

¹⁰ T+T, July 2026. ARL Project – Operational Stormwater and Water Quality Memorandum. Ref: 1101798.0000

distance downstream. To manage any potential changes, compensatory flows are proposed alongside a Baseflow Monitoring Programme (BMP). The BMP will establish baseline flow conditions and provide a basis against which to measure any change and implement appropriate responses (e.g., including appropriate compensatory flow triggers).

With compensatory flow measures in place, the magnitude of effect to a streams flow regime is low (downstream of the confluence with the North and Landfill valleys) and negligible for other streams. With the implementation of the BMP, the magnitude of effect will be at worst, low but more likely negligible, equating to an overall Low level of effect

Any actual effect from a change in flow regime will diminish with distance downstream. This results in an overall level of effect of low to moderate in the reaches immediately downstream of the discharge point and very low to low in the 2 km downstream to the confluence with Te Awa o Hōteu. It also results in a low overall level of effect in the tributaries of the Upper Waiteraire Tributary Block and North Valley.

- **Loss of stream habitat:** Stream reclamation associated with the Project will result in permanent and irreversible loss of habitat at the impact reach within the Project footprint. The current designs indicate that up 12.2 km of permanent and intermittent stream loss which cannot be avoided, minimised or mitigated. Significant offset actions to achieve a no net loss of and at some sites a net gain/positive effect on ecological function outcome are proposed. In summary this comprises riparian planting of degraded permanent and intermittent stream channels within the Hōteu catchment.

5.3 Effects assessment summary

Overall, most identified effects can be managed to a **low** or **very low** level.

The controls and measures proposed for the Project are consistent with and in some instances may exceed what is considered best practice methods. Ongoing monitoring is expected to be undertaken (where deemed necessary) to identify changes in the environment if they occur. This monitoring framework will enable further measures to be implemented to address effects as required.

Where stream habitat loss has resulted in a very high overall level of effect and these residual effects cannot be mitigated further, offset actions are proposed to achieve a **no net loss** of ecological function.

6 Conclusions

Freshwater ecological values were assessed as High to Very High. Overall, streams within the Project area were comprised of healthy macroinvertebrate and fish communities and are associated with varying amounts of riparian vegetation cover.

Short term effects of the Project on the identified freshwater ecological values relate to construction phase activities which could include injury and/or mortality of freshwater fauna, and water quality effects resulting from sedimentation and cut vegetation storage and disposal. Potential operational phase (long term) effects anticipated to occur from the Project include reduced fish passage, water quality effects and changes to flow regime, and loss of stream ecological function and habitat area.

During construction, the most substantial potential effect is sedimentation and fish injury and mortality. Best practice on-site controls are proposed to be implemented to reduce potential sediment discharge, and an adaptive monitoring and management framework will be prepared. Similarly, fish salvage and relocation is proposed to occur throughout the construction phase. The potential effects of both sediment and fish injury and mortality will be restricted to the work areas and a short distance downstream and these effects can be avoided and minimised.

In the long term, the Project will result in the permanent loss of up to 12.2km of permanent and intermittent stream habitat. Where practicable, stream loss will be avoided, however, a very high residual effect remains that will be offset to achieve no net loss of stream ecological function. In summary, the significant offset package involves planting the riparian zone of permanent and intermittent streams within the Hôteo catchment.

Overall, most impacts on the freshwater environment can be managed to an acceptable level without residual adverse effects. Offset measures are proposed and will address the loss of stream ecological function to a no net loss level.

7 Applicability

This technical memorandum has been prepared for the exclusive use of our client WMNZ, with respect to the particular brief given to us, and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that WMNZ will submit this technical memorandum to the Environmental Protection Authority in support of a referral application under the Fast-track Approvals Act 2024 for the works described herein, and that the Environmental Protection Authority will rely on this technical memorandum for the purpose of assessing that application.

Tonkin & Taylor Ltd

Lead Author:

A handwritten signature in blue ink, appearing to read 'Patrick Lees', positioned above a horizontal dotted line.

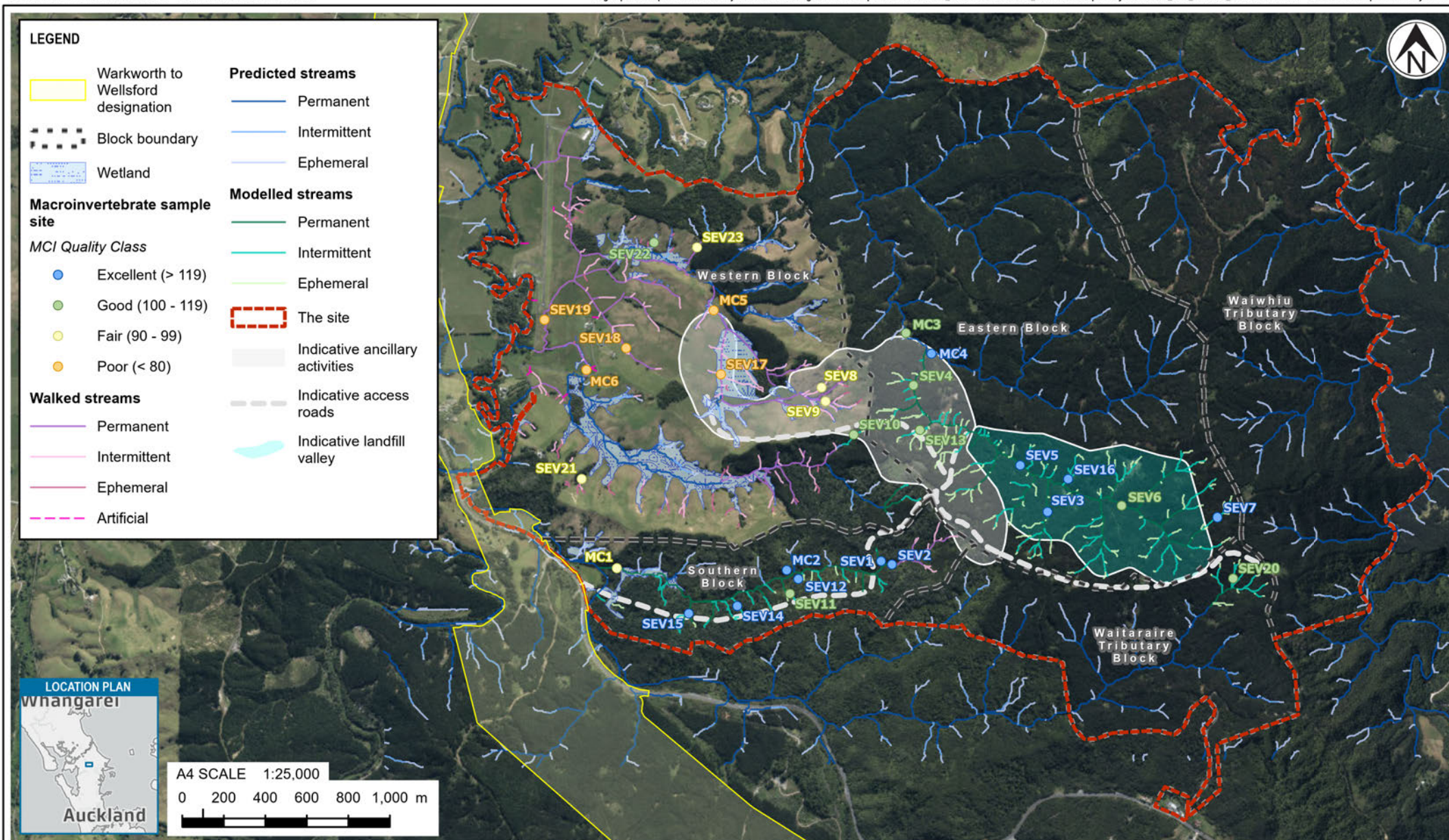
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A handwritten signature in blue ink, appearing to read 'S. Eldridge', positioned above a horizontal dotted line.

Simonne Eldridge
Project Director

Appendix A Catchment context and sample locations

**NOTES:**

1. Eagle Technology, Land Information New Zealand, GEBCO, Community maps contributors, OSM, Stats NZ, LINZ, Eagle, LINZ

REVISIONS

First version
31/07/26

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BY

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PROJECT No.

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DESIGNED

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CLIENT WM NEW ZEALAND

PROJECT ARL FAST TRACK

TITLE MACROINVERTEBRATE SAMPLING LOCATIONS

APPROVED

DATE

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FIG No. FIGURE 1.

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