Ecological Assessment – Aquatic Ecology

Mahinerangi Wind Farm Stage 2

Tararua Wind Power Limited

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	17 September 2025	Ben Ludgate	Keren Bennett	Ben Ludgate

Basis of Report

This report has been prepared by SLR Consulting New Zealand (SLR) on the instructions of our Client, in accordance with the agreed scope of work. It is intended to support the Client's application under the Fast Track Approvals Act 2024 and may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application. While SLR has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

Executive Summary

Introduction

Tararua Wind Power Limited (TWP) is progressing Stage 2 of the Mahinerangi Wind Farm (MWF), which is to be known as "Puke Kapo Hau" ("the Project", "Puke Kapo Hau" or "MWF Stage 2"), through a substantive application under the Fast-track Approvals Act 2024. Resource consents for the MWF were granted by the Environment Court in 2009. The MWF currently has 12 Vestas V90-3MW turbines, commissioned in 2011 (Stage 1). Stage 2 is proposed to be the final stage and will consist of 44 turbines. Changes to the number of turbines, and other changes associated with the windfarm layout, will require variations to existing consent conditions. Stage 2 also includes a new transmission line, substation and a Battery Energy Storage System (BESS), which will require new consents. TWP also seek a range of water and discharge permits and regional council land use consents required for the construction of Stage 2, including for installation of a new culvert (to replace an existing culvert) in a headwater tributary of Lee Stream.

To inform the application and the detailed design development of the MWF Stage 2, SLR Consulting was engaged to assess aquatic habitat and fauna, assess actual and potential adverse effects of the MWF construction on identified aquatic values, and provide recommendations on avoidance, remedy, mitigation and offsetting/compensation together with monitoring measures.

Survey Methods

A desktop assessment of existing information, and site visits in January and May 2025, were undertaken to collect information regarding the current water quality and aquatic ecology values supported within the catchments that drain Stage 2 of the MWF: Lammerlaw Stream, Broad Stream, Black Rock Stream, Canton Stream, and Lee Stream. Survey methods included assessments of water quality, instream habitat, benthic macroinvertebrates, and fish (including collection of an environmental DNA (eDNA) sample).

Aquatic Habitat and Fauna

Stream habitat assessments revealed habitat quality is limited by surrounding land use and effects of existing land use activities (e.g., reduced riparian vegetation, stock activity) and by small stream sizes. The streams are all small first or second order streams and diversity of cover for fish and macroinvertebrates and diversity of riparian vegetation increases as stream size increases down the catchment.

Water quality in the streams is generally high, with healthy dissolved oxygen concentrations suitable to support diverse communities, particularly fish, and low concentrations of suspended solids.

Benthic macroinvertebrate communities in the streams draining the MWF contained highly diverse communities, with community health indices indicative of a range from 'Poor' to 'Excellent' quality conditions, which would be influenced by existing land use in the catchments (e.g., grazing, pasture), and potential effects of these activities on the streams (e.g., sedimentation from stock access). Kōura, freshwater crayfish, classified as 'At Risk – Declining', were found in the Black Rock Stream and Broad Stream catchments, and it is expected that kōura are present throughout the five major catchments draining to the east and south of the MWF Stage 2 where suitable habitats exist.

The fish community in the streams draining the MWF comprise the non-migratory Eldon's galaxias, which is classified as 'Threatened – Nationally Endangered'. Due to the small size of the streams in the headwaters, some areas in the upper headwaters are unlikely to be able to support fish populations with large areas only supporting limited surface water

amongst vegetation. In these streams, the fish communities would reside in suitable and stable habitats further downstream.

Assessment of Actual and Potential Effects on Aquatic Ecology Values

Construction Activities: Erosion and Sediment Control

Construction activities, and sediment and erosion control, will be undertaken in accordance with the Earthworks and Construction Management Plan (ECMP). The methods and techniques for sediment control will be in accordance with Auckland Council's GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (Guideline Document 2016/005), which Otago Regional Council has adopted.

Construction activities undertaken in accordance with the ECMP, including management of water at works sites, will be undertaken away from watercourses due to the design of the MWF components to avoid watercourses (except for at two sites, one where a road/track crosses wetland 43, and one in a Lee Stream tributary where avoidance of the watercourse is not practicable) and will therefore avoid or minimise any adverse effects on the ecological values of the watercourses.

Internal Access Road/Track Network

Construction of the internal access roads/tracks will require earthworks which will be undertaken in accordance with the ECMP.

The road/track network has been aligned on ridgelines and to avoid gullies and steep areas and therefore are distanced from watercourses (except at one site in a Lee Stream tributary where avoidance of the crossing is not practicable). The drainage system for all access tracks will manage stormwater effectively using a combination of graded surfaces, roadside swales, cross culverts, and erosion control measures and will ensure that water is directed efficiently off the tracks, ensuring surface runoff follows existing flow paths and maintains delivery of these flows to gullies and associated wetlands.

Construction of the roads/tracks in accordance with the ECMP and management of stormwater from the roads/tracks to maintain existing flow paths will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and continued use of the road network in the MWF.

Turbine Platform/Hardstand Areas

The hardstand areas for turbines (area of approximately 1,855 m^2 which will be established adjacent to each of the turbines) are located on ridgelines and distanced from gullies and steep areas which drain towards wetlands and ultimately to flowing watercourses. This separation from gullies and wetlands provides isolation from watercourses. Construction of the hardstand areas, in accordance with the ECMP, and management of stormwater from the hardstand areas to maintain existing flow paths, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and use of the hardstand areas.

Substation, BESS, Operations/Maintenance Facility, and Concrete Batching Plant

These facilities will include buildings, sealed parking areas, and hardstand areas, and require management of stormwater and fire suppression water (at the BESS), and wastewater generated at the operations/maintenance facility.

For the operations/maintenance facility, stormwater run-off from roofed areas and the sealed parking area will be conveyed to a rainwater collection system and discharged to ground, with wastewater generated from the facility treated on-site.

For the concrete batching plant, bunds will be constructed around the perimeter of the plant to capture and direct runoff to sumps for collection and chemical treatment (if required).

For the BESS, provision for fire suppression water will be accommodated through an onsite storage tank with a booster pump supplying hydrants located on the BESS platform. Stormwater will be managed using an impervious surface to prevent any discharge of stormwater to the ground, with runoff directed to a manhole and then via sumps and pipes to a stormwater detention basin. Outflow from the detention basin will be controlled and will discharge to the adjacent land via a pipe and a rock lined swale/outlet apron (for energy dissipation). Fire suppression water runoff, generated during a firefighting operation, will be managed using the same stormwater system except the potentially contaminated water will be captured and stored to prevent contaminated water from discharging to the environment. The stored contaminated water will be removed from site.

These facilities are located on ridgelines and distanced from gullies and steep areas which drain towards wetlands and ultimately to flowing watercourses. This separation from gullies and wetlands provides isolation from watercourses. Construction of the facilities, in accordance with the ECMP, management of stormwater and fire suppression water runoff at the BESS, and containment and treatment of runoff from the concrete batching plant, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and operation of the facilities.

Transmission Line Corridor

The access road associated with the Transmission Line Corridor will be approximately 6 km long, will utilise existing farm tracks where practicable, including existing culverts at watercourse crossings, follows existing fence lines (and edge of paddocks) and avoids wetlands, including a 10 m setback where practicable. A 4.5 m wide track will be formed to the transmission line structures and temporary hardstands will be formed adjacent to the structures.

As the access tracks and culverts already exist, and no construction activities associated with the access tracks are required within or adjacent to the watercourses, continued use of these existing tracks for access along the Transmission Line Corridor will not have any adverse effects on the ecological values of the watercourses.

The structures (towers/pylons) and temporary hardstands will be located well away from wetlands and watercourses. Construction activities associated with the structures, in accordance with the ECMP, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction activities.

Surplus Fill Disposal

Excess fill from construction activities at the MWF will be placed in identified Surplus Fill Disposal (SFD) sites which are located on broad ridgeline features with gently to moderately sloping ground <15% gradient and away from gullies and watercourses.

Construction of the SFDs in accordance with the ECMP and management of surface water (i.e., no impoundment or diversion of water associated with the SFDs) will avoid or minimise any adverse effects on the ecological values of the nearby or receiving watercourses from the SFDs.

Culverts – Overland Flow Paths

Culverts are required for access road/tracks to convey stormwater and surface water associated with overland flow paths. The installation of culverts will include preparation, laying of pipe culverts, construction of headwall and backfilling/compaction. The road/track network has been aligned on ridgelines, positioned to avoid gullies and steeper terrain and therefore away from watercourses, and to maintain a 10 m setback from mapped wetlands, where practicable. The culvert outlets will be specifically designed to provide energy dissipation to mitigate erosion effects.

Construction of the roads/tracks and installation of the culverts in accordance with the ECMP, maintenance of existing flow paths, and use of energy dissipation at culvert outlets will avoid or minimise any adverse effects on the ecological values of the watercourses.

Culverts – Watercourse

An access road/track network crossing of a headwater tributary of Lee Stream, where avoidance of the crossing is not practicable, will require construction of a new culvert to replace an existing culvert associated with a farm track crossing. This new culvert is one of only two components of the MWF Stage 2 that cannot avoid a watercourse; the other site is a track crossing at wetland 43.

Fish passage will be provided for at the new culvert, which will be a box culvert, with civil engineering design undertaken in line with fish passage best principles, adopted from the New Zealand Fish Passage Guidelines Version 2.0. The design will preserve the current grade of the stream and the culvert will be embedded in the streambed material such that the natural streambed can establish through the culvert. The new culvert will provide positive fish habitat effects with the creation of a meandering channel with natural bed substrate distributed along the base of the culvert and substrate to be shaped to ensure a deeper, low flow channel is maintained to avoid creating low flow barriers for Eldon's galaxias.

During culvert construction, the stream will be temporarily diverted and disturbance of the bed of the watercourse will be required. Installation of the culvert will be undertaken during dry/low flow periods between January and March, which will avoid the spawning period for Eldon’s galaxias (October to November) and subsequent hatching of eggs about a month or so later. Recovery of galaxias from areas of the stream that are to be affected by construction works, prior to works commencing, and relocation to suitable habitats, preferentially upstream of the culvert, is recommended (details in the Fish Recovery Plan). As Eldon’s galaxias are non-migratory and therefore do not undertake extensive migrations as part of their life cycle, the temporary diversion of water around the works site will not adversely affect the fish present in the stream. Construction works and installation of the culvert in accordance with the ECMP sediment controls will avoid or minimise any adverse effects of sediments on the ecological values of the watercourse.

Given the length of the new culvert compared to the shorter existing culvert, any reduction in habitat will be offset/compensated for by fencing and planting in the lower reaches of the true right branch of the stream upstream of the culvert (details in the Wetland and Aquatic Compensation Plan). The area to be fenced includes a 50 m length of the stream currently supporting potential habitat for Eldon’s galaxias. Protection and enhancement of habitat for this 'Threatened – Nationally Endangered' fish species will include direct transfer of snow tussock to be planted along the stream margins. The QEII Open Space Covenant, created at the “Scrappy Pines Block” in accordance with the consent conditions for the MWF, also provides protection of stream habitats within a snow tussock grassland; Eldon’s galaxias and freshwater crayfish have been found during surveys in the lower reaches of this stream.

Freshwater Fisheries Activities (Fast-track Approvals Act 2024)

The Fast-track Approvals Act 2024 provides for activities for which an approval would otherwise be required under Freshwater Fisheries Regulations. The new culvert to be installed in the Lee Stream tributary comprises an ‘activity that impedes fish passage temporarily’, the works required to install the culvert will not persist for more than three months, and the works will be timed to not occur during the spawning season for native fish). The installation of the new culvert in the Lee Stream tributary therefore constitutes a 'standard freshwater fisheries activity' and the required information, of relevance to the culvert (structure or fish facility), is provided.

Positive Effects

Changes to MWF Stage 2 from the consented layout include the removal of the Thomas Block, which will have positive benefits for aquatic ecology. Positive benefits are due to the reduction in the number of watercourses crossed by access roads (i.e., reduction in the number of new culverts that need to be installed in watercourses), and due to the removal of four turbines identified in the consent layout for the MWF in the Thomas Block for Stage 2. Avoidance of the Thomas Block will reduce the land area required for excavation and construction activities, will reduce risks of sediment runoff to watercourses, and reduce areas where stormwater management would be required.

Monitoring

Monitoring associated with construction activities and stormwater/surface run-off near wetlands will be undertaken as outlined in the ECMP. Monitoring of streams and watercourses is not required due to the isolation of the MWF sites from watercourses and the mechanisms in place to avoid effects.

The installation of the new box culvert in the Lee Stream tributary is one of only two components of the MWF Stage 2 that cannot avoid a watercourse (the second place is the track at wetland 43 which will be managed by the Rehabilitation Management Plan); monitoring of suspended sediment concentrations (in the water column) is recommended in the stream upstream and downstream of the new box culvert immediately prior to instream works commencing (to establish 'baseline' conditions), during the culvert installation works, and following completion of the installation works. This monitoring will ensure sediment and construction controls are effective, with immediate review and amendments of sediment control mechanisms if required. This monitoring will be described in more detail in the Water Quality Monitoring Plan.

The recommended fencing and planting upstream of the new culvert in the Lee Stream tributary will require monitoring to ensure the fencing is effective at excluding stock, and for monitoring survival of the plants to determine maintenance requirements. This monitoring will be described in detail in the Rehabilitation Management Plan.

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Acronyms and Abbreviations

BESS	Battery Energy Storage System
CFFA	Complex Freshwater Fisheries Activities
DO	Dissolved Oxygen
DRP	Dissolved Reactive Phosphorus
ECMP	Earthworks and Construction Management Plan
eDNA	Environmental DNA
EPT	Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)
MALF	Mean Annual Low Flow
MCI	Macroinvertebrate Community Index
MfE	Ministry for the Environment
MWF	Mahinerangi Wind Farm
NZFFD	New Zealand Freshwater Fish Database
NZTCS	New Zealand Threat Classification System
ORC	Otago Regional Council
PNAP	Protected Natural Areas Programme
QMCI	Quantitative Macroinvertebrate Community Index
RAP	Recommended Area for Protection
SFD	Surplus Fill Disposal
SFFA	Standard Freshwater Fisheries Activities
SQMCI	Semi Quantitative Macroinvertebrate Community Index
TN	Total Nitrogen
TSS	Total Suspended Solids
TWP	Tararua Wind Power Limited
WTG	Wind Turbine Generator

1.0 Introduction

Tararua Wind Power Limited (TWP), a fully owned subsidiary of Mercury NZ Limited, is progressing Stage 2 of the Mahinerangi Wind Farm (MWF), which is to be known as "Puke Kapo Hau" ("the Project", "Puke Kapo Hau" or "MWF Stage 2"), through a substantive application under the Fast-track Approvals Act 2024. Resource consents for the MWF were granted by the Environment Court in 2009.

The MWF is located on the eastern foothills of the Lammermoor Range, situated approximately 5 km north of Lake Mahinerangi and approximately 50 km west of Dunedin. The west and north-western boundary of the MWF is bounded by the Te Papanui Conservation Park and Black Rock Scientific Reserve.

The MWF currently has 12 Vestas V90-3MW turbines (wind turbine generator, WTG), commissioned in 2011 (Stage 1). Stage 2 is proposed to be the final stage and will consist of 44 turbines with a maximum tip height of 165 m. Changes to the number of turbines, and other changes associated with the windfarm layout, will require variations to existing consent conditions. Stage 2 also includes a new 110 kV transmission line, substation and a Battery Energy Storage System (BESS), which will require new consents. TWP also seek a range of water and discharge permits and regional council land use consents required for the construction of Stage 2, including for installation of a new culvert (to replace an existing culvert) in a headwater tributary of Lee Stream near Bottle Rock.

Figure A below shows the consented layout of the MWF and Figure B below shows the proposed layout of Stage 2. The main differences between the consented layout and the proposed layout are summarised in Table 1 below. Although the resource consents do not specify what turbines must be constructed, 100 x 2 MW turbine or 67 x 3MW options were considered as options at the time. Those types of turbines are not readily available, and a realistic and non-fanciful turbine has been selected which could be constructed under the land use consent for the purpose of clause 23 of Schedule 5 to the Fast-track Approvals Act and s127 of the Resource Management Act 1991.

Table 1: Main differences between the consented and proposed layout.

Attribute	Consented layout	Realistic 2025 equivalent of consented layout	Proposed layout
Turbine locations	100	78	54
Turbines (built)	100	47	44
Rotor tip height	145	145	165
Turbine capacity	Not specified	3.45 MW	4.3 MW
Maximum installed generation capacity	200 MW	198 MW	226 MW
Transmission line			New application
Thomas Block	Included	Included	Excluded

To inform the application and the detailed design development of the MWF Stage 2, SLR Consulting (SLR) was engaged to:

- Assess aquatic habitat and fauna.

- Assess the actual and potential adverse effects of the MWF construction on the identified aquatic values.
- Provide recommendations on avoidance, remedy, mitigation and offsetting/compensation together with monitoring measures.

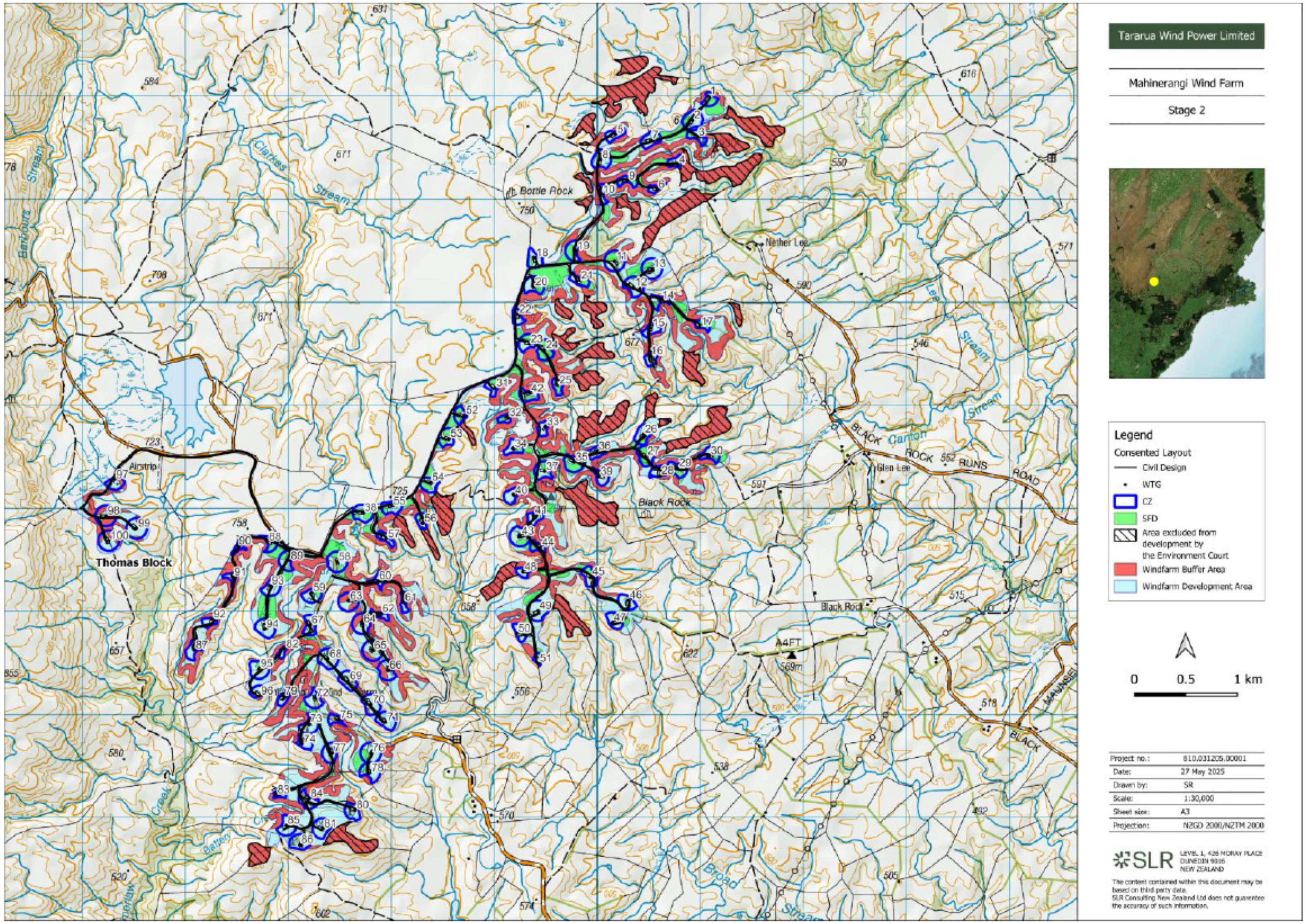

Figure A: Consented layout of the MWF.

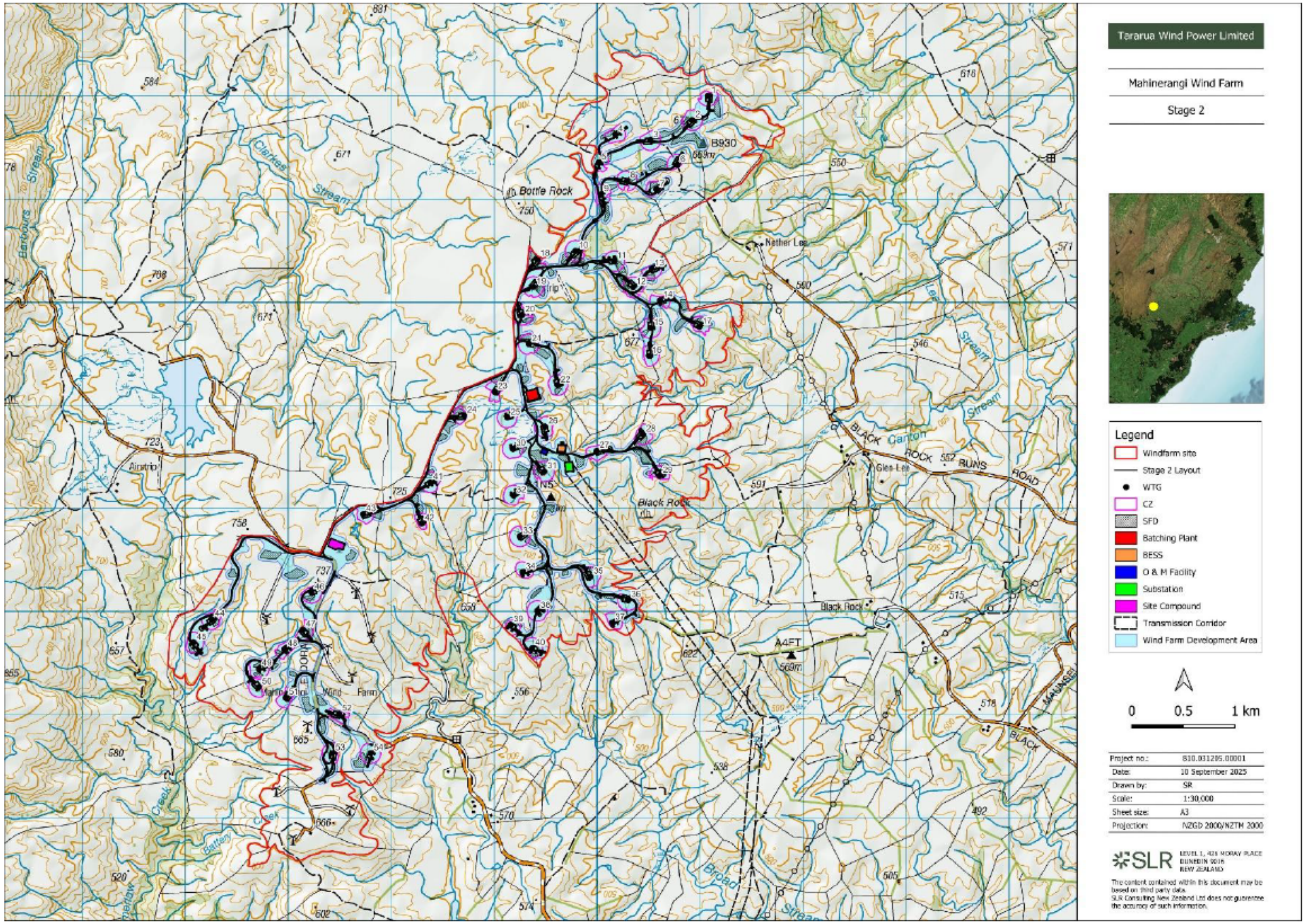

Figure B: Proposed layout of Stage 2 of the MWF.

2.0 Methods

A desktop assessment was initially undertaken, using electronic databases (e.g. New Zealand Freshwater Fisheries Database (NZFFD)) and existing literature (e.g. Kingett Mitchell 2006, which was prepared for the MWF consent applications), to gain information on freshwater values pertaining to the area within and surrounding the MWF Stage 2.

Site visits were undertaken on 21, 24, and 29 January 2025 to complete field assessments at sixteen sites located within the headwaters of the five major catchments draining to the east and south of the MWF Stage 2 (Figure C):

- Lammerlaw Stream, a tributary of Lake Mahinerangi (2 sites);
- Broad Stream, a tributary of Lee Stream (3 sites);
- Black Rock Stream, a tributary of Lee Stream (3 sites);
- Canton Stream, a tributary of Lee Stream (2 sites); and
- Lee Stream, a tributary of the Taieri River (6 sites).

General site locations were selected prior to the site visits by reviewing existing information (e.g., to determine where previous fish records were located) and aerial photographs of the area (e.g., to determine potential habitat types expected at each site), and were selected to be representative of the range of instream habitats present within each catchment and within areas where flowing surface water would be expected (i.e., sites were located within areas with defined channels that could support aquatic values). Sites were not assessed in catchments draining the Thomas Block, located to the west of the MWF, as this area is not included in the Stage 2 project.

The site visits were undertaken to collect relevant information regarding the current water quality and aquatic ecology values supported within the catchments that drain Stage 2 of the MWF. The methods for these field assessments are described below.

Instream habitat was assessed according to the National Rapid Habitat Assessment Protocol Development for Streams and Rivers (Clapcott 2015), with a 'habitat quality score' (between 1 and 10) calculated per site. This assessment includes observations of benthic algae (periphyton), aquatic plants (macrophytes), bed substrate, bank stability, and riparian vegetation. Photographs of the waterways and surrounds were taken and included in this report.

Basic water quality measurements (dissolved oxygen, conductivity, pH, and temperature) were taken using a handheld YSI water sampling and monitoring field meter.

Benthic macroinvertebrates were surveyed at 13 sites, spread across the catchments, to provide an indication of community diversity and to characterise the quality of the habitat. At each of these sites, one composite macroinvertebrate sample was collected by kick-net sampling following Ministry for the Environment's (MfE) protocols for sampling macroinvertebrates in wadeable streams (Stark *et al.* 2001). Benthic macroinvertebrates in each sample were identified and enumerated in SLR's Dunedin laboratory to provide information on abundance of individual taxa and community health using commonly accepted stream health metrics (i.e., Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) taxa, %EPT taxa, Macroinvertebrate Community Index (MCI), and Semi Quantitative MCI (SQMCI)). The level of taxonomy was commensurate with that recommended in MfE protocols. Macroinvertebrates were also identified to determine if any taxa listed as 'Threatened' or 'At Risk' in Grainger *et al.* (2018) were recorded.

Conditions during the site visits were either suitable to observe fish present at some sites, or to capture fish using a kicknet or handnet, or there was insufficient water to effectively sample for fish. Given the known distribution of fish throughout the catchments, from previous survey records, further sampling was not considered necessary to understand the distribution of fish throughout the catchments.

To assist with determining fish passage requirements at the site of a new (replacement) culvert in the Lee Stream catchment (at site Lee F on Figure C), where instream works will be required for installation of the culvert and where fish had previously been recorded, an environmental DNA (eDNA) sample was collected on 21 March 2025 (and processed by Wilderlab in Wellington). As the eDNA sampling was used for confirmation of a previous fish record, and the watercourse was very small, an individual sample was collected and a basic analysis panel (which, from Wilderlab website, '…*is tailored to provide a low-cost snapshot of aquatic animal diversity, enabling detection of all native and introduced freshwater fish commonly targeted for stream condition assessments*') was undertaken.

An additional one-day site visit was also undertaken to the site of the new (replacement) culvert in the Lee Stream catchment on 2 May 2025 when ten sites (including upstream and downstream of the existing culvert (Figure D)) were assessed for water quality, instream habitat, and/or benthic macroinvertebrates, using the methods described above. This additional sampling was required due to the absence of surface water at this site during the January 2025 site visits, and the need to fully understand the freshwater ecological values in the watercourse in the vicinity of the culvert.

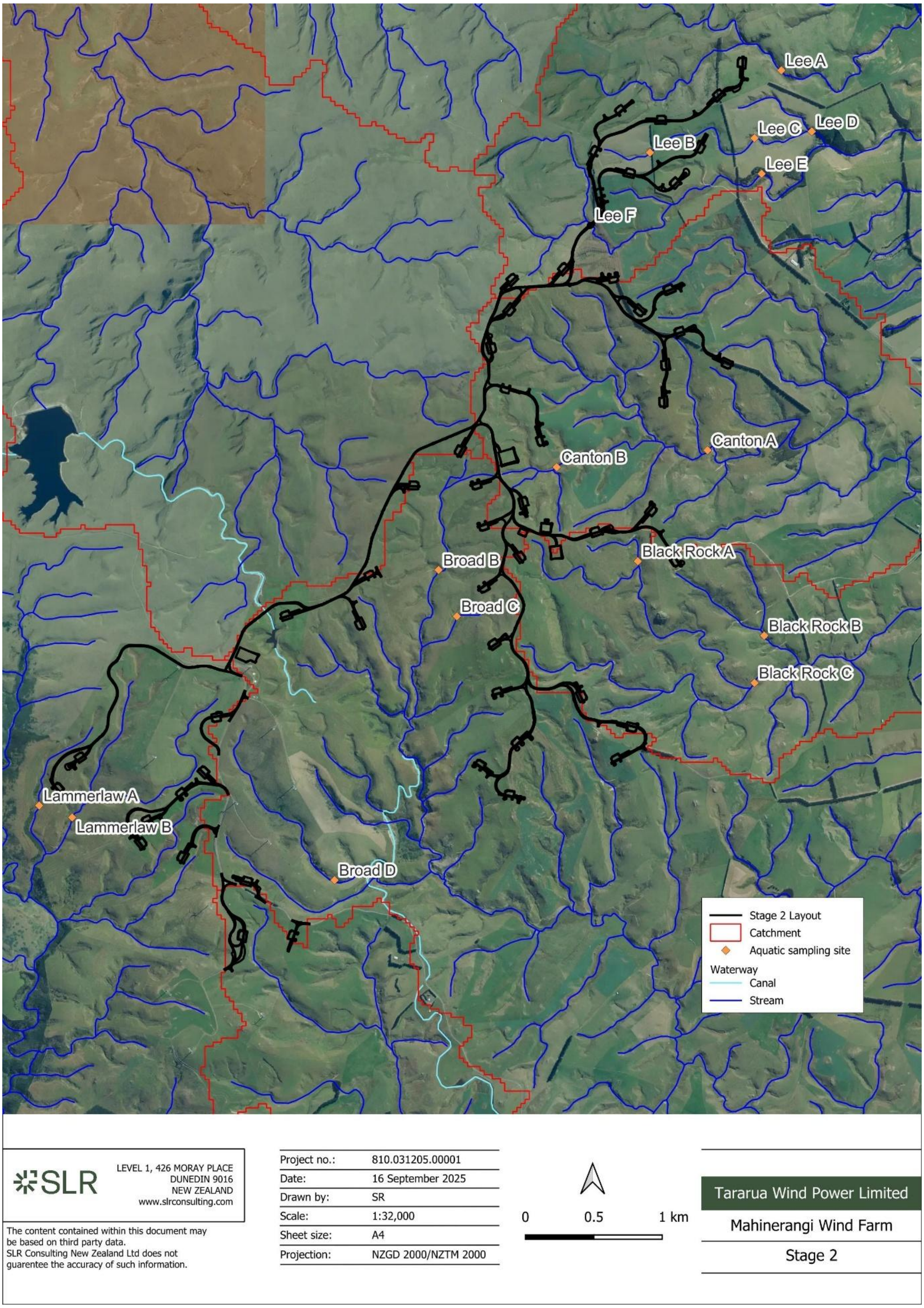

Figure C: Location of aquatic sampling sites, January 2025.

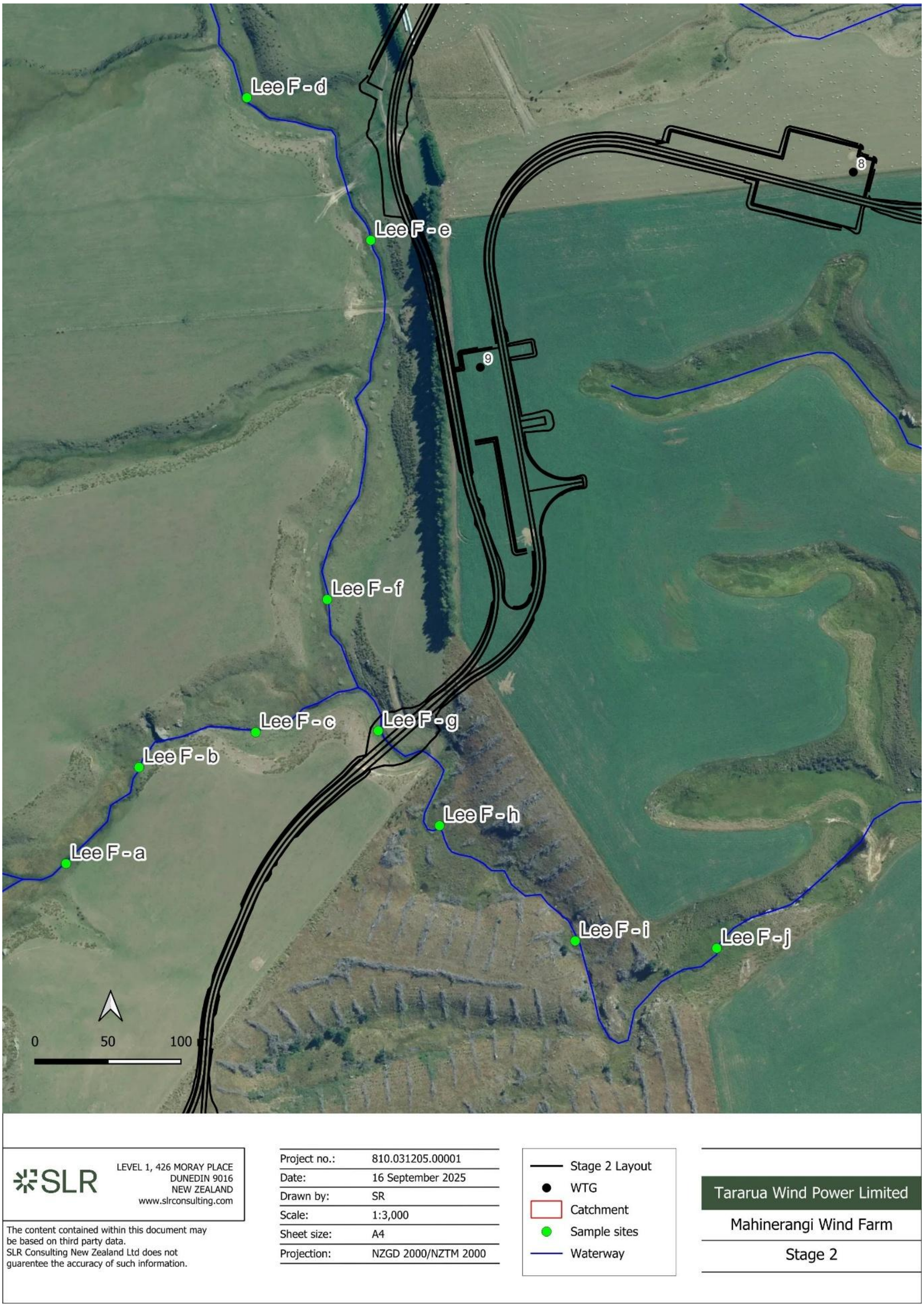

Figure D: Location of additional aquatic sampling sites in the vicinity of the proposed culvert in the upper Lee Stream tributary (Lee F on Figure C), May 2025.

3.0 Ecological Context

The MWF Stage 2 is located on the border between the "wet south east" environmental zone and the "dry grassland" vegetation zone of Waipori Ecological District in Lammerlaw Ecological Region, with approximately 800-1,000 mm of annual rainfall (Carter 1994). Prior to the arrival of Europeans, the dominant vegetation type in the ecological district would have been low- to mid-altitude short and tall tussock grassland (with narrow-leaved snow tussock *Chionochloa rigida*, copper tussock *Chionochloa rubra* subsp. *cuprea*, and hard tussock *Festuca novae-zelandiae*), which has now been mostly converted to pasture up to about 600 m asl (McEwen 1987).

The majority of the MWF Stage 2 within the headwaters of the Lee Stream catchment is at about 675-700 m asl. West of the main access road along the paper road portion of Eldorado Track, gullies are part of the Deep Stream catchment. Gullies are generally shallow and broad in the upper reaches, becoming further incised downstream.

Most of the MWF site, in the process of conversion to farmland, has been burnt and grazed, and some parts cultivated, but prior to 1840 would have been similar to the adjacent Black Rock Scientific Reserve which lies outside the MWF area to the west of Turbine 12 (constructed during Stage 1) and immediately adjacent to the proposed access road to Stage 2 of the MWF (Figure E). The reserve consists of "gently rolling ridges covered in a narrow-leaved snow tussock (*Chionochloa rigida*) association, substantially intact or in various stages of degradation, and shallow gullies containing *Sphagnum* bog and minor grassland communities" (Bulloch 1973).

Te Papanui Conservation Park, which is dominated by snow tussock grassland and contains bogs and tarns, is located c.4 km to the west of the MWF Stage 2 (Figure E). Following completion of the Stage 1 development, a QEII Open Space Covenant was created in accordance with the consent conditions for the MWF over an area formerly referred to as the "Scrappy Pines Block"[1]. The QEII covenanted area predominantly contains snow tussock grassland and is located in the southern part of the MWF (Figure E).

A Marginal Strip is also located alongside the Lammerlaw Creek to the southwest of the Wind Farm Site (Figure E).

Recommended Area for Protection (RAP) 9 Black Rock from the Protected Natural Areas Programme (PNAP) report for Waipori Ecological District (Carter 1994) is located west of the consented turbine site 39 (Figure E). The consented Wind Farm Layout Plan (BMP W07190/1) identified the RAP as an "Area excluded from the development by the Environment Court" (see Figure A). This RAP was described as containing representative silver beech (*Lophozonia menziesii*) forest that is much reduced in extent in the ecological district and shrubland of *Coprosma dumosa*, tauhinu (*Ozothamnus vauvilliersii*), *Veronica odora*, and bracken (*Pteridium esculentum*).

[1] See Condition 14, Land use consent RM1409

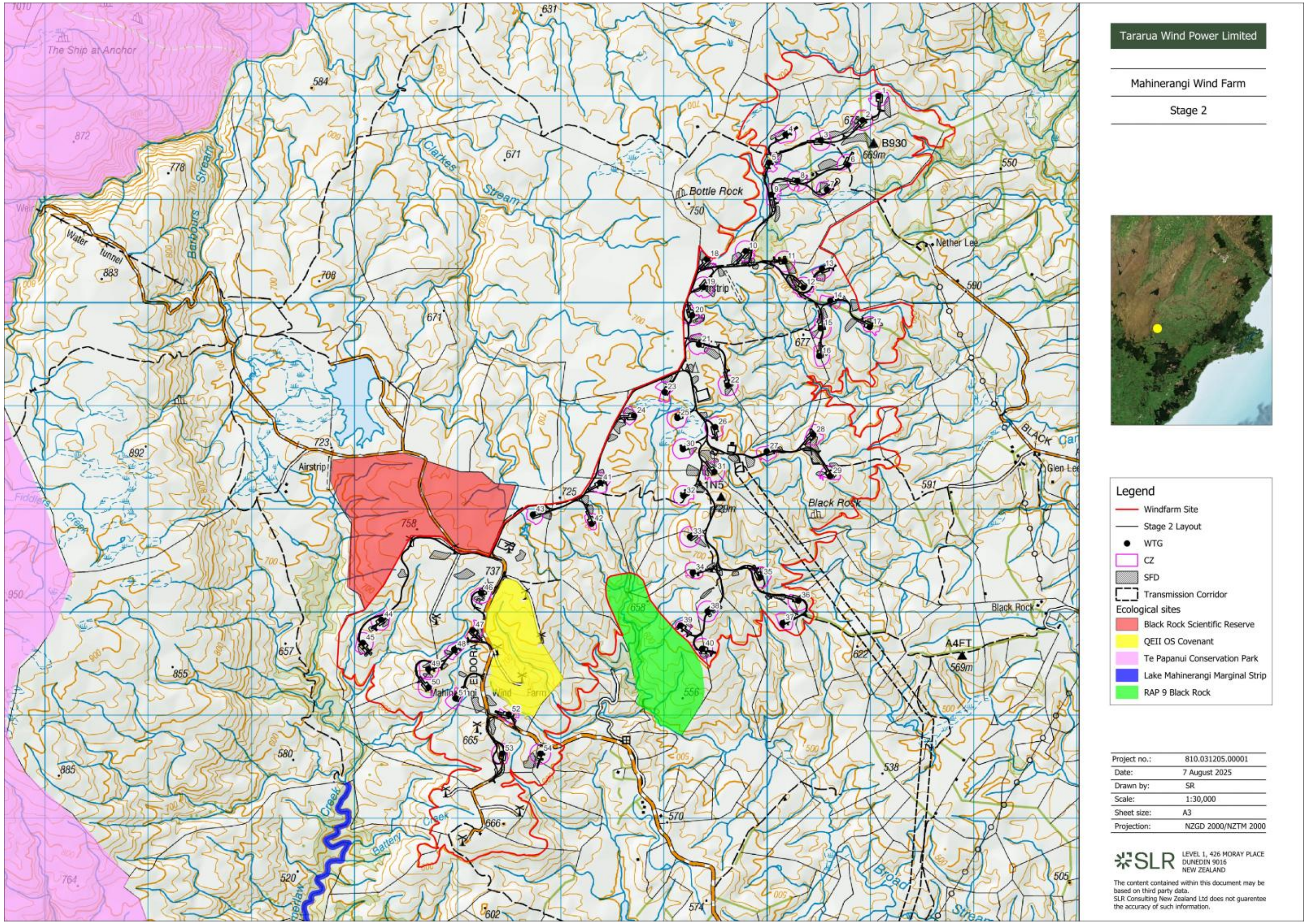

Figure E: Ecological sites near the MWF.

4.0 Aquatic Habitat and Fauna

4.1 Stream Habitat

4.1.1 Existing Information

The streams and riparian habitats within the general area of the MWF have been described in several reports (e.g., Ryder Consulting 2000, 2001, 2002; Riley *et al.* 2003; Kingett Mitchell 2006) and are characterised by low-gradient upper reaches with wetland margins and narrow channels. The first-to-second order streams typically feature gravel substrates and substantial vegetated wetland margins. In steeper sections, riparian vegetation includes a variety of woody shrubs that provide significant shading and habitat cover. However, in grazed areas, stock damage along riparian margins is common, leading to increased bank slumping, erosion, and sediment inputs into the wetlands and flowing waterways. Erosion, pools and flow impediments were also frequently observed near farm track culverts, further exacerbating sedimentation and altering stream flow patterns. As the streams progress downstream, the substrate transitions to coarser materials such as coarse gravel, cobbles, boulders, and bedrock. Most non-pasture streams have a variety of hydrological characteristics and flow through steep gorge sections, often with cascades and waterfalls.

4.1.2 2025 Surveys

Stage 2 Stream Sites, January 2025

Rapid Habitat Assessment was completed at 16 stream sites (see Figure C) in January 2025 to evaluate stream conditions (Table 2). There was generally great variation within and between catchments, often depending on the intensity of local stock activity and distance down the catchment. Canton A and Broad C were the highest scoring sites, with clean mixed substrates and a variety of invertebrate and fish habitats among pools, riffles, and runs (Photo 1). In contrast, low scoring sites included Black Rock A and Lee F which were modified as a result of farming practices and had little variation in hydrological characteristics and were dominated by grasses with little surface water (Photo 2).

Overall, results from the habitat assessments reveal the diversity of habitat conditions in streams in the different catchments, which is indicative of the surrounding rural land use and potential for effects of existing land use activities in some catchments (e.g., reduced riparian vegetation, stock activity). However, as the streams are all small first or second order streams, high diversity of habitat is not expected with diversity of cover for fish and macroinvertebrates and diversity of riparian vegetation increasing as the stream size increases down the catchment.

Table 2: Habitat assessment scores from stream sites, January 2025. Maximum score is 100, with lower scores reflecting lower quality habitat conditions.

Site	Habitat score
Lee A	66.5
Lee B	32
Lee C	39.5
Lee D	59
Lee E	73
Lee F	43
Canton A	89
Canton B	65.5
Broad A	70.5
Broad B	63.5
Broad C	92
Black Rock A	29.5
Black Rock B	57.5
Black Rock C	55
Lammerlaw A	46.5
Lammerlaw B	67

Photo 1: Highest scoring sites - Canton A (left) and Broad C (right). Photos taken January 2025.

Photo 2: Low scoring sites - Black Rock A (left) and Lee F (right). Photos taken January 2025.

Lee Stream Tributary: May 2025

Rapid Habitat Assessment was completed at an additional eight stream sites within the vicinity of a new (replacement) culvert in the Lee Stream catchment (site Lee F on Figure C) in May 2025 to evaluate stream conditions (Table 3). The sites were located in the true left and true right branches of the stream upstream of the existing culvert (two sites in each branch), in the main channel immediately upstream of the existing culvert (one site), and at three sites downstream of the existing culvert (see Figure D).

Sites upstream of the existing culvert were generally low scoring, with the lowest habitat scores at both true left branch sites and in the upper reaches of the true right branch. These sites were dominated by vegetation, bed substrates of soft sediments, and had low velocity water in run habitats (Photo 3).

Habitat quality was higher in the lower reaches of the true right branch with bed substrates of gravels and cobbles and a variety of invertebrate and fish habitats among small pools, riffles, and runs (Photo 4). Downstream of the culvert, habitat quality was higher, with an extensive wetland area present where the stream flows beneath tussocks and grasses (‘Lee F – h’) before becoming more confined in a channel with a series of riffles, runs and pools (‘Lee F – i’). Instream habitat was more diverse in this area with a range of bed substrates, macrophyte beds, and woody debris providing habitat and cover for macroinvertebrates and fish.

Overall, results from the habitat assessments in the upper Lee Stream catchment reveal the diversity of habitat conditions within a short section of stream. Existing habitat quality is limited by the surrounding land use and effects of existing land use activities (e.g., reduced riparian vegetation, stock activity) and by the small stream size. Also, works undertaken within the channel would limit instream habitat diversity and quality due to removal of bed substrates and plant beds from the channel and by homogenisation of the channel (e.g., straightening of the channel, removal of hydrological variation by excavating to a standard depth). In this stream, and as seen in other streams surveyed in 2025, habitat quality improves with distance downstream, with increasing diversity of cover for fish and macroinvertebrates.

Table 3: Habitat assessment scores from additional stream sites in a Lee Stream tributary, May 2025. Maximum score is 100, with lower scores reflecting lower quality habitat conditions.

Site	Habitat score
‘Lee F – a’ (upstream of culvert, true right, upper)	30
‘Lee F – c’ (upstream of culvert, true right, lower)	52
‘Lee F – d’ (upstream of culvert, true left, upper)	28
‘Lee F – f’ (upstream of culvert, true left, lower)	29
‘Lee F – g’ (upstream of culvert, main channel)	45
‘Lee F – h’ (downstream of culvert, main channel)	54
‘Lee F – i’ (downstream of culvert, main channel)	64
‘Lee F – j’ (downstream of culvert, main channel)	45

Photo 3: Low scoring sites upstream of an existing culvert in Lee Stream tributary- 'Lee F – a' (true right branch, upper section) (top photo) and 'Lee F – f' (true left branch, lower section) (bottom photo). Photos taken May 2025.

Photo 4: Higher scoring sites in the vicinity of an existing culvert in Lee Stream tributary- 'Lee F – c' (upstream of culvert, true right branch, lower section) (left photo) and 'Lee F – i' (downstream of culvert) (right photo). Photos taken May 2025.

4.2 Water Quality

4.2.1 Existing Information

Previous water quality reviews for Stage 1 of the MWF in Kingett Mitchell (2006) were based on Otago Regional Council (ORC) monitoring at their site at Lee Stream at State Highway 87 (now discontinued and unavailable), located well downstream of the MWF, as well as on short-term investigations by Ryder Consulting (2002) and Riley *et al.* (2003). Ryder Consulting assessed Lammerlaw Stream and two adjacent streams, while Riley *et al.* studied tributary catchments of Deep Stream, Lee Stream, and Lammerlaw Stream.

ORC data, reported by Kingett Mitchell (2006), indicated that Lee Stream generally had good water quality, with neutral pH, dissolved oxygen (DO) levels near 100% saturation, and high water clarity (black disc distance >3 m). However, stream temperature fluctuated widely due to minimal canopy shading, with warmer temperatures (>13°C) common in spring and summer. Dissolved reactive phosphorus (DRP) concentrations in Lee Stream were relatively low (median 0.012 g/m^3) for an agricultural catchment. Total nitrogen (TN) and nitrate-N concentrations were often substantial, with medians of 0.52 g/m^3 and 0.14 g/m^3 respectively. Moreover, faecal indicator bacteria, including *E. coli* and faecal coliforms, often surpassed thresholds for recreational and stock water quality, suggesting occasional contamination. In contrast, both Ryder Consulting (2002) and Riley *et al*. (2003) reported low nutrient levels, high water clarity, and minimal inorganic matter in other streams near the MWF. However, Riley *et al*. (2003) noted increasing sediment loads in pasture streams, likely resulting from stock damage and bank erosion.

4.2.2 2025 Surveys

Stage 2 Stream Sites, January 2025

Water quality from spot sampling was recorded at stream sites in January 2025, and samples were analysed for suspended solids (TSS) to determine potential sediment loads within the different catchments. Results from this sampling indicates the variety of conditions found in the catchments, with DO ranging from 68 to 144%, pH from 6.24 to 7.56, and TSS from <3 to 123 g/m^3 (with one higher value due to thick vegetation restricting access to flowing water) (Table 4). Overall, water quality in the streams is generally high, with healthy DO suitable to support diverse communities, particularly fish, and low concentrations of TSS.

Table 4: Water quality parameters from stream sites, January 2025.

Site	Conductivity (µS/cm)	DO (%)	DO (mg/L)	Temperature (°C)	pH	Turbidity (NTU)	TSS (g/m^3)
Lee A	57.2	97.3	9.17	14.7	7.49	4.7	9
Lee B	52.6	143.5	13.75	13.5	6.35	8.6	20
Lee C	94.3	78.7	7.08	16.9	6.88	260	1,250 [1]
Lee D	83.3	95.4	9.16	13.9	7.56	9.1	19
Lee E	54.0	94.3	8.51	16.6	7.28	2.7	3
Lee F	52.3	91.6	7.86	18.7	7.02	NA [2]	NA [2]
Canton A	43.9	102.7	9.84	14.1	6.94	1.5	<3
Canton B	48.2	93.3	8.97	13.2	6.69	1.92	5
Broad A	30.8	90.2	8.75	13.0	6.24	2.1	3
Broad B	35.5	82.8	7.94	13.5	6.27	7.7	18
Broad C	39.9	98	9.34	14.1	7.13	0.66	<3
Black Rock A	44.5	68.4	6.27	15.6	6.34	48	123
Black Rock B	48.6	100.2	9.63	14.2	7.25	1.78	<3
Black Rock C	52.2	101	9.23	16.4	7.26	2.1	<3
Lammerlaw A	44.8	94.9	9.17	13.4	6.89	9.4	23
Lammerlaw B	45.1	99.1	10.02	11.7	6.82	1.58	<3

[1] High value likely due to thick vegetation restricting access to flowing water.
[2] Very little water movement through vegetation, so sample collection not possible.

Lee Stream Tributary: May 2025

Water quality was recorded at four additional stream sites within the vicinity of a new (replacement) culvert in the Lee Stream catchment in May 2025. Results from this spot sampling (Table 5) indicates similar water quality conditions throughout the sites, with water quality also similar to that found in streams sampled in January 2025 (Table 4). Notably, DO was high and suitable to support fish and turbidity was low. The only notable difference was lower water temperatures in May than in January, as expected given the different seasons in which the sampling was undertaken.

Table 5: Water quality parameters from stream sites in a Lee Stream tributary, May 2025.

Site	Conductivity (µS/cm)	DO (%)	DO (mg/L)	Temperature (°C)	pH	Turbidity (NTU)
'Lee F – b' (upstream of culvert, true right, middle)	40.5	98.2	10.3	9.6	6.79	1.96
'Lee F – e' (upstream of culvert, true left, middle)	42.9	103.7	10.88	9.7	6.9	1.8
'Lee F – i' (downstream of culvert, main channel)	42.4	94.4	10.22	8.4	6.72	2.18
'Lee F – j' (downstream of culvert, main channel)	45.1	97.6	10.84	7.4	6.69	1.58

4.3 Benthic Macroinvertebrates

4.3.1 Existing Information

Freshwater macroinvertebrate surveys within and near the MWF, based on earlier studies by Riley *et al.* (2003) and Ryder Consulting (2000, 2001, 2002) and summarised by Kingett Mitchell (2006), reported healthy and diverse macroinvertebrate communities in Deep Stream, Lammerlaw Stream, and Lee Stream. Ryder Consulting recorded taxa richness ranging from 7 to 20 species, with only one upper stream reach showing fewer than 10 taxa. Pollution-sensitive taxa, including Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT taxa), dominated the fauna, indicating good water quality.

Riley *et al.* (2003) assessed the effects of land use in the catchments of Deep Stream, Lee Stream, and Lammerlaw Stream. They observed pollution-sensitive stonefly taxa (*Austroperla*, *Megaleptoperla*, and *Zelandoperla*) and mayflies (*Coloburiscus*) without any reduction in abundance in pasture areas. *Deleatidium* mayflies were more abundant in pasture streams compared to tussock streams, likely due to increased nutrient levels and light availability. Taxa richness ranged from 10 to 32 species, with richer macroinvertebrate communities found in pasture streams (primarily in the Lee Stream catchment) than in tussock streams (mainly in the Deep Stream catchment).

Macroinvertebrate Community Index (MCI)[2] scores were consistently high (>100), reflecting good stream health. Riley *et al.* (2003) reported MCI scores ranging from 107 to 114, with Quantitative MCI (QMCI) scores increasing from tussock to grazed pasture streams, attributed to enhanced stream productivity without significant impacts on the biota.

In contrast, macroinvertebrate communities in small headwater streams sampled by Kingett Mitchell (2006) were dominated by *Potamopyrgus* snails, with oligochaetes, dipteran larvae,

[2] Interpretation of MCI and SQMCI/QMCI scores, from Stark and Maxted (2007): MCI: Poor < 80, Fair 80 – 99, Good 100 – 119, Excellent ≥ 120; SQMCI/QMCI: Poor < 4.00, Fair 4.00 – 4.99, Good 5.00 – 5.99, Excellent ≥ 6.00.

and occasional damselfly and dragonfly larvae, present. EPT taxa were rare, reflecting the unique wetland peat bog habitats rather than poor water quality.

Although none of the studies documented kōura (freshwater crayfish), abundant populations have been observed in Canton Stream and Broad Stream (Kingett Mitchell 2006).

Overall, the surveys characterised streams within and near the MWF as moderately to highly healthy pasture streams with good water quality and diverse macroinvertebrate communities. However, a more recent representation of MWF macroinvertebrate communities was necessary.

4.3.2 2025 Surveys

Stage 2 Stream Sites, January 2025

Freshwater macroinvertebrate communities, sampled in January 2025, were very diverse, with a total of 75 different taxa found across the five catchments sampled (Table 6; raw data tables in Appendix B). Diversity per site ranged from 20 to 39 and was therefore higher than the national median of 18 taxa per site, as determined by Scarsbrook *et al.* (2000) from invertebrate samples collected from 66 sites throughout New Zealand. Diptera (true flies) and Trichoptera (caddisflies) were the most diverse Orders found, with diversity of sensitive EPT taxa (excluding Hydroptilidae, which are relatively tolerant to degradation) ranging from 3 to 16 per site; the national median, determined by Scarsbrook *et al.* (2000), is eight taxa per site. MCI scores ranged from 89 (indicative of ‘Fair’ quality conditions) to 125 (‘Excellent’ quality conditions), while SQMCI scores (which are equivalent to QMCI) ranged from 3.7 (‘Poor’ quality conditions) to 6.8 (‘Excellent’ quality conditions).

Overall, results from January 2025 sampling of macroinvertebrate communities were consistent with results from previous sampling in the same general area. That is, streams draining the MWF contained highly diverse communities, with community health indices indicative of a range from ‘Poor’ to ‘Excellent’ quality conditions, which would be influenced by existing land use in the catchments (e.g., grazing, pasture), and potential effects of these activities on the streams (e.g., sedimentation from stock access).

Table 6: Freshwater macroinvertebrate results from stream sites, January 2025.

Site	Number of taxa	Number of EPT taxa (excl. Hydroptilidae)	% EPT taxa (excl. Hydroptilidae)	MCI score	SQMCI score
Lee A	32	10	31	106 'Good'	6.5 'Excellent'
Lee D	23	11	48	125 'Excellent'	4.4 'Fair'
Lee E	20	10	50	117 'Good'	6.8 'Excellent'
Canton A	28	13	46	118 'Good'	5.2 'Good'
Canton B	21	7	33	105 'Good'	4.4 'Fair'
Broad A	27	9	33	102 'Good'	4.0 'Fair'
Broad B	29	4	14	91 'Fair'	3.9 'Poor'
Broad C	29	9	31	103 'Good'	4.7 'Fair'
Black Rock A	21	3	14	89 'Fair'	3.7 'Poor'
Black Rock B	23	6	26	94 'Fair'	5.5 'Good'
Black Rock C	23	12	52	121 'Excellent'	6.3 'Excellent'
Lammerlaw A	28	8	29	100 'Good'	4.8 'Fair'
Lammerlaw B	39	16	41	110 'Good'	3.9 'Poor'

Lee Stream Tributary: May 2025

Freshwater macroinvertebrate communities found in May 2025 upstream and downstream of an existing culvert (the site of a new (replacement) culvert) in the Lee Stream tributary were very diverse, with a total of 39 different taxa found across the two sites sampled (Table 7; raw data table in Appendix C). Diversity per site ranged from 27 to 29 and was therefore higher than the national median of 18 taxa per site, as determined by Scarsbrook *et al.* (2000). Diptera (true flies) and Trichoptera (caddisflies) were the most diverse Orders found, with the site upstream of the culvert dominated by *Potamopyrgus* snails, oligochaete worms, ostracods (seed shrimps) and Collembola (springtails, which can be common along margins of freshwater habitats), while the downstream site contained amphipods (*Paraleptamphopus*) and ostracods and a range of other taxa at lower abundance. The sites contained ten and eight EPT taxa (excluding Hydroptilidae) respectively, which is higher than or similar to the national median of eight taxa per site. MCI scores were 97 and 99 ('Fair' quality conditions) and SQMCI scores were 4.1 and 4.4 ('Fair' quality conditions).

Overall, results from May 2025 sampling of macroinvertebrate communities upstream and downstream of the culvert in the Lee Stream tributary were similar to results from sampling at other sites in the Lee Stream catchment and in other nearby catchments.

Table 7: Freshwater macroinvertebrate results from stream sites in a Lee Stream tributary, January 2025.

Site	Number of taxa	Number of EPT taxa (excl. Hydroptilidae)	% EPT taxa (excl. Hydroptilidae)	MCI score	SQMCI score
Lee F – g (upstream)	27	10	37	97 'Fair'	4.1 'Fair'
Lee F – i (downstream)	29	8	28	99 'Fair'	4.4 'Fair'

Conservation Status of Freshwater Macroinvertebrates

Of the diverse range of freshwater macroinvertebrate taxa collected from aquatic habitats in January and May 2025, several taxa were found (identified by SLR to family or genus using the larval stages present in the freshwater samples) that have particular species (i.e., specimens identified to species level, generally using adult specimens) included in Grainger *et al.* (2018). Grainger *et al.* (2018) lists the conservation status of New Zealand freshwater invertebrates that have been assessed using the New Zealand Threat Classification System (NZTCS).

Kōura, freshwater crayfish (*Paranephrops* sp.), were found in samples (and observed during surveys) at Black Rock A and B and at Broad A and C (Photo 5). *Paranephrops zealandicus* is the species that is distributed along the eastern side of the South Island and on Stewart Island and is therefore the species present at these sites and is classified as 'At Risk – Declining' (Grainger *et al.* 2018). Kingett Mitchell 2006) noted that abundant kōura populations have been observed in Canton Stream and Broad Stream, and surveys throughout Broad Stream and tributaries have also observed kōura (B. Ludgate, pers. obs.). It is expected that kōura are present throughout the five major catchments draining to the east and south of the MWF Stage 2, where suitable habitats exist. Kōura inhabit waterways in native and exotic forests as well as pastoral areas and favour pools and slow-moving or still waters, where deep habitats such as stream pools can offer refuge from terrestrial predators and accumulate leaves and other food sources.

Photo 5: Kōura at Black Rock B (left) and Broad A (right). Photos taken January 2025.

Two caddisfly genera (*Oeconesus* and *Philorheithrus*) were found in freshwater macroinvertebrate samples collected from multiple catchments: *Oeconesus* was found at Lee F, Broad A, Black Rock C, and Lammerlaw A, while *Philorheithrus* was found at Lee A, Lee D, Lee E, Canton A, Canton B, and Lammerlaw B. Grainger *et al.* (2018) includes the species *Oeconesus angustulus*, which is classified as 'Threatened – Nationally Critical' and is known from a tributary of Lee Stream (Ward 1997), and *Philorheithrus harunae*, which is classified as 'At Risk – Naturally Uncommon' and is known from headwater streams of the Lammermoor and Rock and Pillar Ranges above 1,100 m (Henderson and Ward 2006). The specimens collected by SLR (and identified to genus only due to the absence of identification keys for larval stages of these species) in 2025 from various catchments could therefore include the species listed in Grainger *et al.* (2018).

Other aquatic genera found in samples from the stream sites, which have particular species listed in Grainger *et al.* (2018) as Data Deficient or At Risk, include the caddisfly *Pycnocentria*, the stoneflies *Taraperla* and *Zelandobius*, the amphipod *Chiltonia*, the beetles *Homalaena, Hydora* and *Orchymontia*, and the snail *Meridiopyrgus*.

With the wide distribution of these genera across the various catchments draining to the east and south of the MWF Stage 2, it is expected that these genera, and therefore also the particular species included in Grainger *et al.* (2018), if present, are locally widespread throughout the waterways in the vicinity of the MWF given the similar habitats that exist in the many small headwater streams.

4.4 Fish

4.4.1 Existing Information

Survey records in the NZFFD indicate there has been locally intense fish sampling undertaken in the major branches of the upper Lammerlaw Creek, Broad Stream, and Clarkes Stream, but limited surveys have been undertaken in upper headwaters closest to the MWF (Figure F). Specifically, western catchments contained spatially sporadic distributions of native Eldon's galaxias (*Galaxias eldoni*), kōaro (*Galaxias brevipinnis*), and introduced brown trout (*Salmo trutta*), whereas the eastern catchments contained consistent presence of Eldon's galaxias. Kingett Mitchell (2006) included an additional record, not in the NZFFD, for Eldon's galaxias at a site in the upper Lee Stream catchment (c.800 m east of Bottle Rock).

Kōaro are native to New Zealand and are one of five migratory galaxiid species that make up the New Zealand whitebait catch. They are categorised as 'At Risk – Declining' (Dunn *et al.* 2018). Kōaro spawn in late autumn to winter, with eggs laid on bankside partially submerged gravels. Once hatched, the larvae are swept down to lakes or the sea to feed and grow before returning inland as post-larval 'whitebait'. Both juveniles and adults are skilled climbers and will migrate far inland. Kōaro have an affinity for fast-flowing stream sections like riffles.

Eldon's galaxias (Photo 6) is a non-migratory fish endemic to the Otago region, with a highly fragmented range primarily in the lower and mid tributaries of the Taieri River catchment. Due to its restricted distribution and declining population, Eldon's galaxias is classified as 'Threatened – Nationally Endangered' (Dunn *et al.* 2018). This species generally favours riffle habitats but can also be found in pools, inhabiting a variety of streams from high-altitude tussock-lined channels to lowland forested streams. It often resides upstream of large waterfalls that limit salmonid distribution but also resides in very small headwater streams where there is unsuitable habitat for larger trout. Spawning occurs in mid-spring, with larvae hatching roughly a month later.

Brown trout are an introduced sports fish species that often outcompetes and predates upon native fish like Eldon's galaxias. Brown trout spawn in autumn to winter, creating nests in gravel beds ("redds") of freshwater streams and rivers, where their eggs incubate and hatch into alevins, then fry, and eventually mature into adults that can live up to 20 years. They inhabit cool, oxygen-rich waters and may migrate between freshwater and coastal environments.

[redacted]

Figure F: Fish records in the vicinity of the MWF from the NZFFD and the 2025 survey.

4.4.2 2025 Surveys

[redacted], January 2025

[redacted]

[redacted]

Photo 6: Eldon’s galaxias juveniles at Canton A (left) and adults at Lee E (right). Photos taken January 2025.

[redacted]: May 2025

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Photo 7: [redacted]

4.5 Ecological Significance Assessment

[redacted] based on the criteria in APP2 – Significance criteria for indigenous biodiversity in the proposed Otago Regional Policy Statement 2021, determines that the stream is 'significant' given the presence of the

'Threatened – Nationally Endangered' Eldon's galaxias and habitat for this fish species. This significance will also apply to all waterways supporting Eldon's galaxias and habitat for this fish species within the MWF Stage 2. The significance of these waterways is also recognised by the existing consents for the MWF which include 'high ecological value areas' which consist of, among other values, 'waterbodies in the first order streams with resident Eldon's galaxias'. [redacted]

5.0 Assessment of Actual and Potential Effects on Aquatic Ecology Values

5.1 Wind Farm Components

The specific components of the MWF are described in detail in the Assessment of Effects document (Mitchell Daysh) and in the Civil Engineering Assessment (Riley Consultants) and the layouts and access tracks are indicated on Figure B.

Components of the MWF that introduce the potential for adverse effects on aquatic values during their construction and/or operation are listed below and are discussed in the following sections:

- Construction activities, and associated sediment and erosion control, associated with the components below.
- Internal access roads/tracks, approximately 37 km in length, and an underground electrical transmission and fibre network.
- Turbine platform/hardstand areas (for 44 turbines).
- A substation (approximately 3,850 m^2) located within the MWF.
- A BESS (hardstand platform approximately 4,200 m^2), located within the MWF.
- An operations/maintenance facility (approximately 2,200 m^2, including approximately 700 m^2 of buildings).
- A concrete batching plant (approximately 10,600 m^2 platform) located within the MWF.
- An overhead transmission line corridor, approximately 6 km long and featuring up to 25 pole/tower structures, and access tracks to each structure location.
- Surplus fill disposal within the MWF.
- Culverts along internal access roads/tracks and one culvert within a permanent watercourse (Lee Stream tributary).

It is noted that many of the listed components are authorised by the existing land use consent. Potential adverse effects of construction and operation of the above structures and facilities on watercourses and aquatic values include sediment discharges (from construction activities, stormwater runoff, and erosion), contamination of water (by chemicals), introduction of pests, direct disturbance of watercourses, and impeding or preventing fish passage.

The presence of construction machinery on site presents a risk of contaminants (e.g., diesel, lubricants) entering watercourses, with the potential to harm aquatic life. Machinery brought to the site from elsewhere may also spread pest species.

Sediment discharge to watercourses is possible from soil exposure during construction activities (e.g., roads, culvert installation) especially through surface runoff during high rainfall and when works are required in and adjacent to waterways. Sediment discharges can affect water quality and downstream macroinvertebrate and fish communities by altering the water's chemical and physical properties and affecting periphyton, a food source for invertebrates. Moreover, increased sedimentation can fill refuges and interstitial gaps between boulders and coarse gravels which are key refuges and spawning grounds for macroinvertebrates and fish.

For the components of the MWF Stage 2 listed above, the installation of a new culvert in a Lee Stream tributary is one of only two components (the second being a track at wetland 43) that cannot avoid a watercourse due to the instream works required within the watercourse.

Potential effects associated with the construction and operation of the different structures/facilities for MWF Stage 2 are addressed in the following sections.

5.2 Construction Activities: Erosion and Sediment Control

Riley Consultants Civil Engineering Assessment (2025) details the general principles for sediment and erosion control during the construction of the MWF Stage 2. The Earthworks and Construction Management Plan (ECMP) will provide site specific details, and all construction activities that will require earthworks will be undertaken in accordance with the ECMP. The methods and techniques for sediment control will be in accordance with Auckland Council's GD05 Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region (Guideline Document 2016/005), which ORC has adopted.

The general principles to be applied to the ECMP as it relates to erosion and sediment control measures are as follows:

- Regular liaison between the Contractor(s), Engineer to Contract and the Regulatory Authorities' Representatives.
- Diversion of clean water away from the work site, where practicable.
- Minimise disturbance to the areas necessary to complete the construction activities.
- Avoid/control dust emissions through the use of appropriate dust mitigation measures.
- Where practicable, intercept and treat all sediment laden water from the work area prior to discharging into the downstream environment, particularly earthwork areas upslope of sensitive receiving environments such as wetlands.
- Implement measures to prevent construction traffic exiting the construction areas onto public roads/tracks with sediment and other materials attached to the undercarriage and tyres (i.e., wheel wash).
- Inspect the erosion and sediment control measures regularly and undertake any maintenance necessary to maximise the potential to retain sediment on the site.
- In the event of forecast for heavy rain, stabilise the site as far as practicable and close the works down.
- Ongoing assessment of the erosion and sediment control measures and, if required, adjust as the work progresses.

Construction activities undertaken in accordance with the ECMP, including management of water at the works sites, will be undertaken away from watercourses due to the design of the MWF components to avoid watercourses (except for one site in the Lee Stream tributary where avoidance of the watercourse is not practicable; this crossing and required culvert is discussed below in Section 5.8).

Construction activities in the MWF undertaken in accordance with the ECMP will therefore avoid or minimise any adverse effects on the ecological values of the watercourses.

5.3 Internal Access Road/Track Network

The land use consent provides for 12 m wide carriageways during construction of the MWF, which are to be reduced to 5 m in width once the wind farm is commissioned. Overall, the internal access roads/tracks will not exceed 37 km in length within the Windfarm Development Area.

The alignment of the roads/tracks for Stage 2 has been completed considering:

- Alignment along existing farm tracks where practicable and/or following ridgelines.
- Avoiding gullies and steeper terrain, and maintaining a 10 m setback from mapped wetlands, where practicable.
- Avoiding other ecological sensitive areas such as snow tussock grassland, where practicable.

Construction of the roads/tracks will require earthworks which will be undertaken in accordance with the ECMP. Construction activities and sediment and erosion control are discussed in Section 5.2.

The drainage system for all access tracks will manage stormwater effectively using a combination of graded surfaces, roadside swales, cross culverts, and strategically placed erosion control measures such as riprap lining, planting, and check dams. The drainage system will ensure that water is directed efficiently off the tracks, maintaining their durability and reducing maintenance needs while ensuring surface runoff follows existing flow paths and maintains delivery of these flows to gullies and associated wetlands.

The key principles employed in the stormwater management of the wind farm tracks include:

- Conservation of pre-development flow paths, with particular attention to maintaining the pre-development catchments which contribute to the adjacent wetlands. This requires additional culverts and drain outlets.
- Where practicable, allow stormwater to sheet flow from access tracks across the natural topography.
- Where stormwater is collected, mitigation of potential erosion along drains and at outlets with energy dissipation. This will be achieved through rock lined channels along steep gradients and rock aprons at culvert outlets.
- Protection of proposed infrastructure from erosion or overtopping with adequately sized culverts to convey flow beneath the fill embankments.

The alignment of the roads/tracks avoids crossing of watercourses except at the track at wetland 43 (which will be managed by the Rehabilitation Management Plan) and one site in the Lee Stream tributary where avoidance of the crossing is not practicable. This crossing, which has an existing culvert that will be upgraded as a result of the works, is discussed below in Section 5.8. Other culverts associated with the roads/tracks at the MWF, at overland flow paths, are also discussed in Section 5.8.

The road/track network has been aligned on ridgelines and to avoid gullies and steep areas, and therefore their location is distanced from watercourses with the exception of the Lee Stream tributary culvert, discussed below. Construction of the roads/tracks in accordance with the ECMP and management of stormwater from the roads/tracks to maintain existing flow paths will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and continued use of the road network in the MWF.

5.4 Turbine Platform/Hardstand Areas

A permanent hardstand area of approximately 1,855 m^2 will be established adjacent to each of the turbines to enable assembly and erection of the tower, nacelle and blade components by a specialist crane on a flat surface.

The key principles employed in the stormwater management of the hardstands include:

- Conservation of pre-development flow paths, with particular attention to maintaining the pre-development catchments which contribute to the adjacent wetlands. This requires additional culverts and drain outlets.
- Where practicable, allow stormwater to sheet flow from access tracks across the natural topography.
- Where stormwater is collected, mitigation of potential erosion along drains and at outlets with energy dissipation. This will be achieved through rock lined channels along steep gradients and rock aprons at culvert outlets.
- Protection of proposed infrastructure from erosion or overtopping with adequately sized culverts to convey flow beneath the fill embankments.

The hardstand areas for the turbines are located on ridgelines and distanced from gullies and steep areas which drain towards wetlands and ultimately to flowing watercourses. This separation from gullies and wetlands provides isolation from watercourses. Construction of the hardstand areas, in accordance with the ECMP, and management of stormwater from the hardstand areas to maintain existing flow paths, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and use of the hardstand areas.

5.5 Substation, BESS, Operations/Maintenance Facility, and Concrete Batching Plant

The MWF Stage 2 will include a substation, BESS, operations/maintenance facility and a concrete batching plant (see Figure B). These facilities will include buildings, sealed parking areas, and hardstand areas, and require management of stormwater and fire suppression water (at the BESS). Wastewater generated at the operations/maintenance facility will also require management.

Stormwater run-off from roofed areas within the operations/maintenance facility and the sealed parking area will be conveyed to a rainwater collection system and discharged to ground. Wastewater generated from the facility will be treated on-site using a septic tank with a drip field, with the tanks emptied as required and waste taken off site and only water dripped into the field.

The concrete batching plant, likely to comprise dual batching plants, will be set up on site during construction to supply the volume of concrete required to construct the turbine foundations. Around the perimeter of the concrete batching plant, bunds will be constructed to capture and direct runoff (which could influence the pH and water quality characteristics) to sumps where water will be collected and chemically treated (if required). The perimeter controls will be maintained for the duration of the batching plant operation.

For the BESS, provision for fire suppression water will be accommodated through an onsite storage tank with a booster pump supplying hydrants located on the BESS platform.

Stormwater will be managed at the BESS by using an impervious surface to prevent any discharge of stormwater to the ground. The platform will be contoured to direct runoff to a stormwater collection manhole located at the corner of the platform, and then via sumps and pipes to a stormwater detention basin located next to the platform. The manhole will feature a submerged outlet. Outflow from the detention basin will be controlled via a t-bar decant and overflow manhole and will discharge to the adjacent land via a pipe and a rock lined swale/outlet apron (for energy dissipation). The decant will limit discharge from the basin to pre-development levels for the 10yr ARI 24hr rainfall event.

Fire suppression water runoff, which is generated during a firefighting operation, at the BESS will be managed using the stormwater system described above. As fire suppression water runoff is potentially contaminated, the detention basin will be lined with high-density polyethylene (to prevent soakage of contaminated water into the ground) and will be used to capture and store the contaminated water. The detention basin will be sized appropriately to store the required fire water volume (288 m^3), which will make the basin significantly larger than that required to provide stormwater attenuation. The outlet from the detention basin will have a readily accessible isolation valve which will be manually shut off in the event of a fire to prevent contaminated water from discharging to the environment. The stored contaminated water will then be removed from site in a timely manner.

The substation, BESS, operations/maintenance facility and a concrete batching plant are located on ridgelines and distanced from gullies and steep areas which drain towards wetlands and ultimately to flowing watercourses. This separation from gullies and wetlands provides isolation from watercourses. Construction of the facilities, in accordance with the ECMP, management of stormwater and fire suppression water runoff at the BESS, and containment and treatment of runoff from the concrete batching plant, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction and operation of the facilities.

5.6 Transmission Line Corridor

The ‘Transmission Line Corridor’ is aligned on spurs immediately to the south of the substation, crosses a tributary gully of Black Rock Stream, and then is aligned southeast along the plateau between Black Rock Stream and Broad Stream (see Figures B and G). The corridor then turns southwest across the Broad Stream valley and along a spur to the grid access point adjacent to Eldorado Track.

The access road associated with the Transmission Line Corridor will be approximately 6 km long and will be accessed by an existing farm track and utilise existing farm tracks where practicable, including existing culverts where the tracks cross watercourses. The route follows existing fence lines (and edge of paddocks) and avoids wetlands, including a 10 m setback where practicable (Figure G). A 4.5 m wide track will be formed to the transmission line structures (towers/pylons) and temporary hardstands will be formed adjacent to the structures. The tracks will be designed for construction vehicles, including a mobile crane and component deliveries.

As the access tracks and culverts already exist, and no construction activities associated with the access tracks are required within or adjacent to the watercourses, continued use of these existing tracks for access along the Transmission Line Corridor will not have any adverse effects on the ecological values of the watercourses.

The structures (towers/pylons) and temporary hardstands will be located well away from wetlands and watercourses. Construction activities associated with the structures, in accordance with the ECMP, will avoid or minimise any adverse effects on the ecological values of the watercourses from the construction activities.

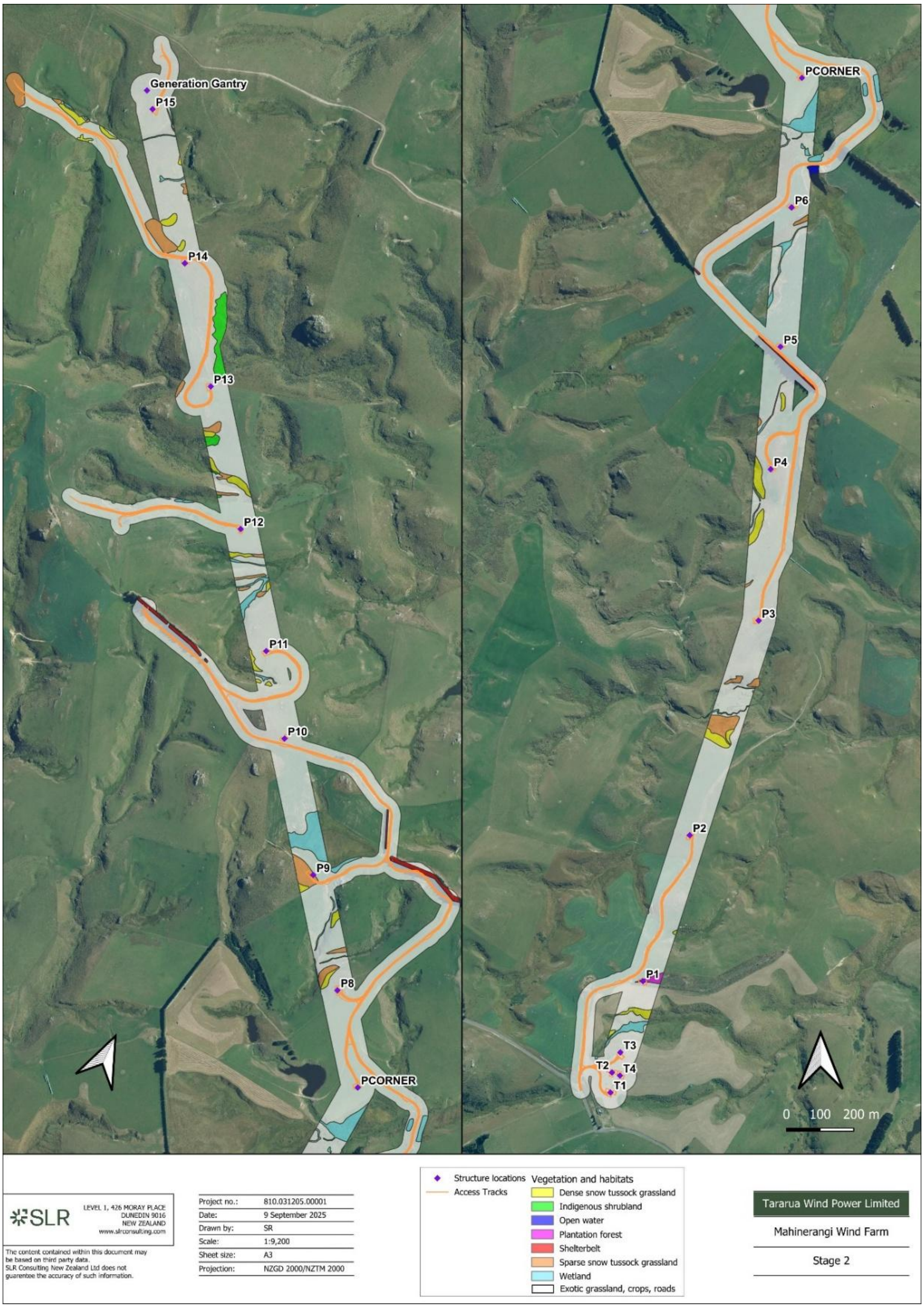

Figure G: Vegetation and habitats within the Transmission Corridor and alongside associated access tracks. Watercourses within the corridor identified as open water or wetland.

5.7 Surplus Fill Disposal

Excess fill from construction activities at the MWF will be placed in identified SFD sites. The land use consent already provides for SFD in identified locations and Riley (2025) identify changes to the SFDs for Stage 2. SFDs are located on broad ridgeline features with gently to moderately sloping ground <15% gradient. Key principles for SFDs include:

- No disposal shall take place within gullies/wetlands and SFDs will maintain a minimum 10 m setback from wetland extents.
- No disposal shall take place into any permanent or intermittent rivers or streams.
- SFDs will avoid other ecological sensitive areas such as snow tussock grassland, where practicable.
- SFDs shall be contoured in such a way that they do not impound water nor divert runoff to adjacent catchments.
- SFD sites shall be rehabilitated to establish vegetated coverage as soon as possible to minimise the potential for sediment loss.

SFD sites have been identified on ridgelines, away from gullies and watercourses. Construction of the SFDs in accordance with the ECMP and management of surface water (i.e., no impoundment or diversion of water associated with the SFDs) will avoid or minimise any adverse effects on the ecological values of the nearby or receiving watercourses from the SFDs.

5.8 Culverts

5.8.1 Overland Flow Paths

The installation of culverts at the MWF is required to convey stormwater and surface water associated with the internal access road/track network. A total of 99 culverts associated with overland flow paths have been identified by Riley (2025) for the MWF Stage 2. These culverts will be sized appropriately to convey the required water volumes; the minimum diameter culvert will be 300 mm. Culvert lengths range from 6.37 m to 42.98 m. The installation of culverts will include (bed) preparation, laying of pipe culverts, construction of headwall and backfilling/compaction.

The road/track network has been aligned on ridgelines and positioned to avoid gullies and steeper terrain, and to maintain a 10 m setback from mapped wetlands, where practicable. The overland flow path culverts are therefore located away from watercourses.

The key principles employed in the stormwater management of the wind farm tracks, of direct relevance to the culverts, include:

- Conservation of pre-development flow paths, with particular attention to maintaining the pre-development catchments which contribute to the adjacent wetlands. This requires additional culverts and drain outlets.
- Where stormwater is collected, mitigation of potential erosion along drains and at outlets with energy dissipation. This will be achieved through rock lined channels along steep gradients and rock aprons at culvert outlets.
- Protection of proposed infrastructure from erosion or overtopping with adequately sized culverts to convey flow beneath the fill embankments.

The culvert outlets will be specifically designed to provide energy dissipation to mitigate erosion effects. Riley (2025) anticipates this will be achieved through rock rip-rip aprons, designed in accordance with Auckland Council's TR2013/080 - Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices.

Construction of the roads/tracks and installation of the culverts in accordance with the ECMP, maintenance of existing flow paths, and use of energy dissipation at culvert outlets will avoid or minimise any adverse effects on the ecological values of the watercourses.

5.8.2 Watercourse Culvert

New Culvert Specifications and Installation

The internal access road/track network avoids crossing of all watercourses except at two sites, one site being in a Lee Stream tributary where avoidance of the crossing is not practicable (the second place is the track at wetland 43 which will be managed by the Rehabilitation Management Plan). The crossing was contemplated in the consents and the general location is identified as "D -Development within constrained area" on the Wind Farm Layout Plan (BMP W07190/1) referenced in the condition 25(i)). This crossing is of a headwater tributary of Lee Stream and is necessary to access the group of wind turbines on the north-eastern spur (Figure H). An existing farm track crossing is present at this site but is insufficient for construction access requirements. The construction of a new culvert in this Lee Stream tributary is the only component of the MWF Stage 2 that cannot avoid a watercourse.

Fish passage will be provided for at the new culvert, which will be a box culvert. Civil engineering design for the new culvert has been undertaken in line with fish passage best principles, adopted from the New Zealand Fish Passage Guidelines Version 2.0 (Fish Passage Guidelines). The design will preserve the current grade of the stream (1% grade in the culvert, compared with 1.2% grade downstream and 0.6% grade upstream) and the culvert is to be embedded in the streambed material with the creation of a meandering channel and with natural streambed distributed throughout the culvert, effectively allowing the existing stream to be simulated within the culvert. The culvert will comprise a box culvert with a length of 34.62 m and with some riprap for stability.

During culvert construction, the Lee Stream tributary will be temporarily diverted and disturbance of the bed of the watercourse will be required to complete the construction activities.

Riley (2025) outlines the methods to be used for culvert installation:

Phase 1 (works within the stream):

1. As far as is practical undertake works during dry/low flow periods where no significant rain is forecasted.
2. Construct diversion bunds to divert clean water runoff away from the working area.
3. Construct non-erodible dams (using sand-bags or similar) at the upstream and downstream end of the culvert. Form temporary/isolated stream diversions to direct stream flow around bunded areas. Downstream dam to feature a T-bar decant to drain the works area if required to keep the area dry from groundwater/water leakage.
4. Offline from stream - construct culverts, wingwalls, riprap aprons, place riprap within the culvert as per design.
5. Place and compact backfill material around the culvert to the soffit levels of the pipe/s.
6. Remove diversion bunds, and upstream and downstream dams - allowing flows to pass through the new culvert.

Phase 2 (works adjacent to the stream):

1. Install silt fences around the base of the fill embankment.
2. Continue with backfill over the culvert and forming of the fill embankment.
3. Form sediment control measures for approach tracks (e.g., drop out pits) and commence earthworks to form the tracks.
4. Existing farm track crossing and culvert to be removed and area remediated (undertake works during low-flow dry period).
5. Stabilize the earthworks area and remove sediment controls.

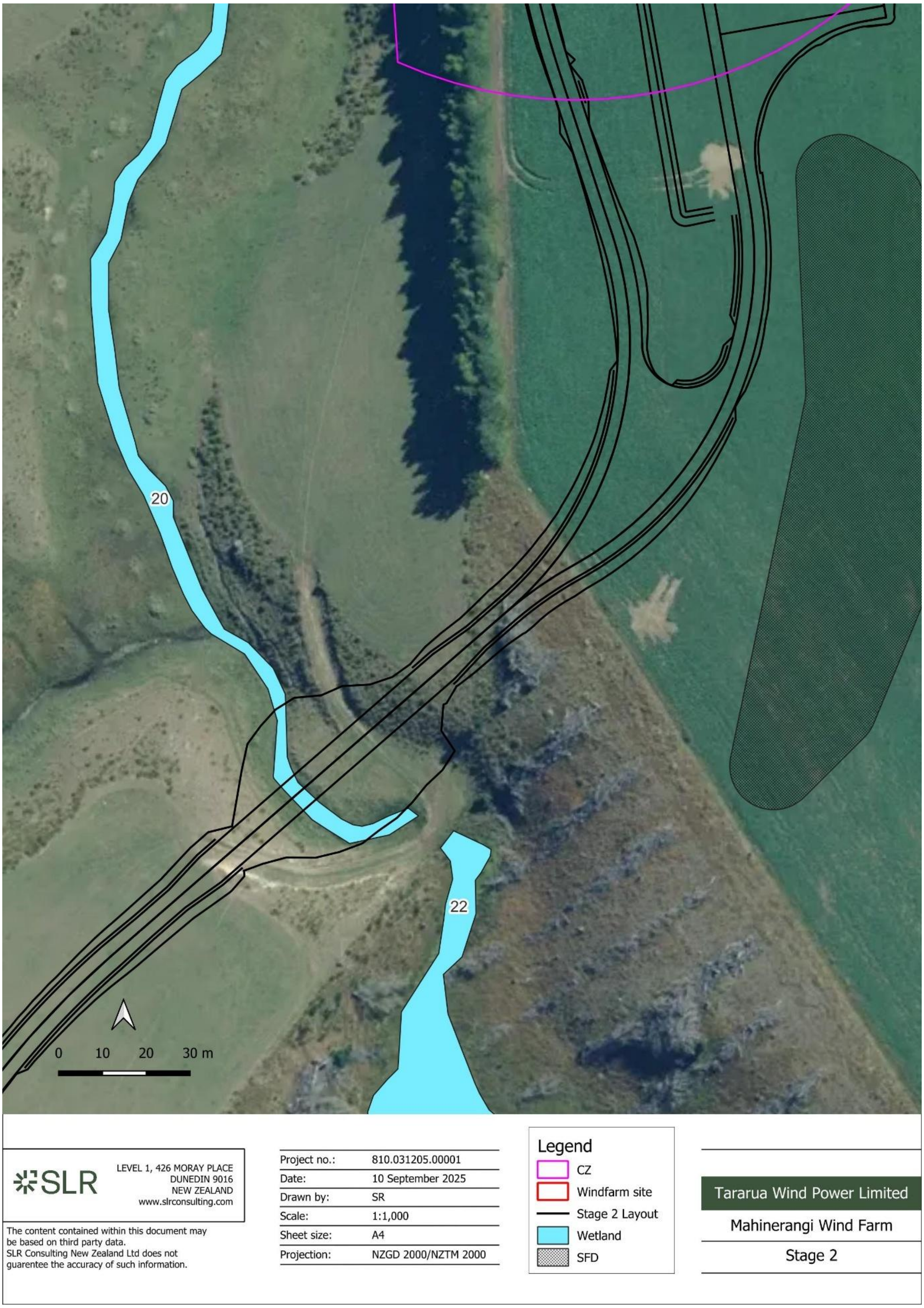

Figure H: Location of the new culvert required in the Lee Stream tributary headwater.

Watercourse Description

The new culvert will be a permanent structure and will replace an existing, smaller culvert located under a farm track approximately 20 m downstream of the new culvert. The stream in the vicinity is unfenced and sits in open pasture (Photo 8) upstream of a former forestry plantation area (now harvested) and wetland (Photo 9). The channel is dominated by instream vegetation (primarily grasses), with bed substrates of soft sediments and fine gravels. Instream habitats comprise runs with low water velocities.

Modelled river flow data from New Zealand River Maps (Whitehead and Booker 2020) shows the flows at the culvert site to be low, with a mean flow of 19.7 L/s, and a mean annual low flow (MALF) of 3.7 L/s. Modelled flows in the two branches of the stream that combine upstream of the culvert are very low, with mean flows of 5.3 L/s and 4.5 L/s and MALF of 1 L/s and 0.9 L/s in the northern and western branches respectively.

During dry periods, such as during the January 2025 survey, the stream can be reduced to minimal amounts of flowing water through vegetation (Photo 10). The stream channel at this culvert and in areas upstream have been historically excavated (evident from discrete clumps of soil distributed along the stream banks), presumably to facilitate flow through existing culverts. The stream habitat is typical of modified first and second order streams flowing through farmland in the Lee Stream and neighbouring catchments.

Photo 8: Lee Stream tributary, immediately upstream of the existing culvert and at the site of the new culvert. Photo taken May 2025.

Photo 9: [redacted], [redacted]

Photo 10: [redacted]

Effects Assessment and Effects Management

Aquatic ecology values supported within the Lee Stream tributary need to be considered when assessing potential effects of this culvert installation. Instream habitat quality is low, with the stream channel dominated by vegetation and bed substrates of soft sediments. Existing habitat quality is limited by the surrounding land use and effects of existing land use activities (e.g., reduced riparian vegetation, stock activity), in addition to excavation works undertaken within the stream channel.

Water quality includes high dissolved oxygen concentrations (suitable to support fish communities) and low turbidity. Macroinvertebrate communities are diverse and community health metric scores are indicative of 'fair' quality conditions.

The non-migratory Eldon's galaxias, classified as 'Threatened – Nationally Endangered', has been recorded upstream of the culvert and is therefore expected to be present throughout the stream in suitable habitats (e.g., riffles, pools). The ‘potential habitat’ for Eldon’s galaxias upstream of the new culvert is a maximum of approximately 3.4 km in length. This is an overestimate as it is based on the length of potential ‘wetted’ bed of the watercourse (assessed by desktop analysis of aerial photographs), but observations in January and May 2025 indicate that extensive areas of the ‘wetted’ bed do not support visible surface water and therefore would not support habitat suitable for Eldon’s galaxias, particularly at the upper ends of the gullies. It is therefore expected that small areas of suitable habitat exist for Eldon’s galaxias in the upper reaches of the catchment, with some areas of small pools that would provide refuge for galaxiids during drier periods when other stream sections would be dry and not suitable to support fish.

The new culvert will provide positive effects by replacing an existing farm culvert, which is an approximately 750 mm diameter circular concrete pipe. The existing culvert has a smaller capacity than the new culvert and therefore would not, at times, convey flood flows and could result in stream flows overtopping the farm track. Ponding on the farm track at the existing culvert was observed by Riley in 2025 when there was restricted flow through the culvert due to vegetation growth in the channel and aggregation of the streambed. Clogging of the channel by sediments and plants would be a long-term issue in a stream of this type, especially in the vicinity of the culvert when the culvert size is small. Historic excavation activities in this stream adjacent to existing farm culverts indicate that maintenance of the stream channel, to ensure continued flow through the culverts, has been undertaken. These activities would have adverse effects on the stream bed and the macroinvertebrate and fish communities of the stream. The new, larger culvert and associated access track will remove any need for future excavations of the stream at this site as it will allow continuity of geomorphic processes (namely the natural movement of sediment and debris).

Vehicle movements on the existing track, especially through ponded water on the track surface, would release sediments directly into the watercourse. With the new culvert and access track, vehicle movements across the stream will be on a contoured access track that will not have any ponding water. The new culvert and access track across the stream will therefore have several positive effects.

Installation of the culvert will be undertaken during dry/low flow periods when no significant rain is forecasted. As the stream can effectively be dry, with minimal surface water visible, in summer (as seen in January 2025), the summer low flow period is best for installation and completion of the required instream works. Eldon’s galaxias spawn in spring (October to November), laying tiny 2 mm eggs during flood flows in streamside vegetation or small ‘caves’ in stream banks and larvae hatch about a month or so later. Therefore, any works between October and November could potentially disturb spawning habitat. The previous regional council consents that have since expired restricted works in watercourses that contain Eldon’s galaxias during the months of September to November (inclusive), to avoid the disturbance of Eldon’s galaxias spawning habitat, and only during that period with the prior approval of the consent authority (see condition 24 to Consent No. 2006.841). Completing the culvert works during a low flow period between January and March is therefore recommended.

Given the presence of Eldon's galaxias in the stream, recovery of galaxias from the new culvert site, in the immediate vicinity of the existing culvert (which will be removed), and in any other areas of the stream that are to be affected by construction works, prior to works commencing, and relocation to suitable habitats, preferentially upstream of the culvert, is recommended. This recovery process will prevent any stranding of fish during the dewatering process to isolate the new culvert site. Details of the methods to be used for the recovery process are set out in the Fish Recovery Plan. As the construction works are to be completed during dry/low flow periods, when minimal surface water is present in the channel and therefore fish passage is not possible, diversion of water away from the works site will not impede fish passage any more than the natural low flows at the time. As Eldon's galaxias are non-migratory and therefore do not undertake extensive migrations as part of their life cycle, the temporary diversion of water around the works site will not adversely affect the fish present in the stream.

Construction works and installation of the culvert in accordance with the ECMP sediment controls will avoid or minimise any adverse effects of sediments on the ecological values of the watercourse.

Following installation of the new culvert, which will be embedded in the stream at the same gradient as the existing channel, bed substrates will be placed through the culvert length and natural bed substrate will also eventually distribute along the base of the culvert (e.g., during higher flow events) which will provide habitat for fish and macroinvertebrates. The substrate placed within the culvert should be shaped to ensure a deeper, low flow channel is maintained to avoid creating low flow barriers for Eldon's galaxias. The new culvert will provide positive fish habitat effects.

Any reduction in habitat for fish in the stream, given the length of the new culvert compared to the shorter existing culvert, will be offset/compensated for by the proposed fencing and planting of a waterway in the catchment upstream of the culvert. This will provide for effects on the stream at the culvert site and improve the value of refuge pool areas for Eldon's galaxias during low flow periods. Details of the area to be fenced and planted are set out in the Wetland and Aquatic Compensation Plan. The area to be fenced and enhanced is in the lower reaches of the true right branch of the stream upstream of the existing culvert, immediately upstream from the confluence with the true left branch (Figure I). This area includes at least a 50 m length of the watercourse currently supporting potential habitat for spawning by Eldon's galaxias (i.e., streamside vegetation and/or small 'caves' in stream banks) and riffle habitat favoured by this species (Photo 11). The stream in this area has bed substrates of gravels and cobbles and a variety of invertebrate and fish habitats among small pools, riffles, and runs, however the banks are exposed to stock and in places have little vegetation cover aside from grazed pasture. Protection, by the exclusion of stock, and enhancement, by planting, will provide for protection and enhancement of habitat for this 'Threatened – Nationally Endangered' fish species.

In addition to the proposed fencing and planting described above, the QEII Open Space Covenant, created at the "Scrappy Pines Block" in accordance with the consent conditions for the MWF, also provides protection of stream habitats within a snow tussock grassland; Eldon's galaxias and freshwater crayfish have been found during surveys in the lower reaches of this stream.

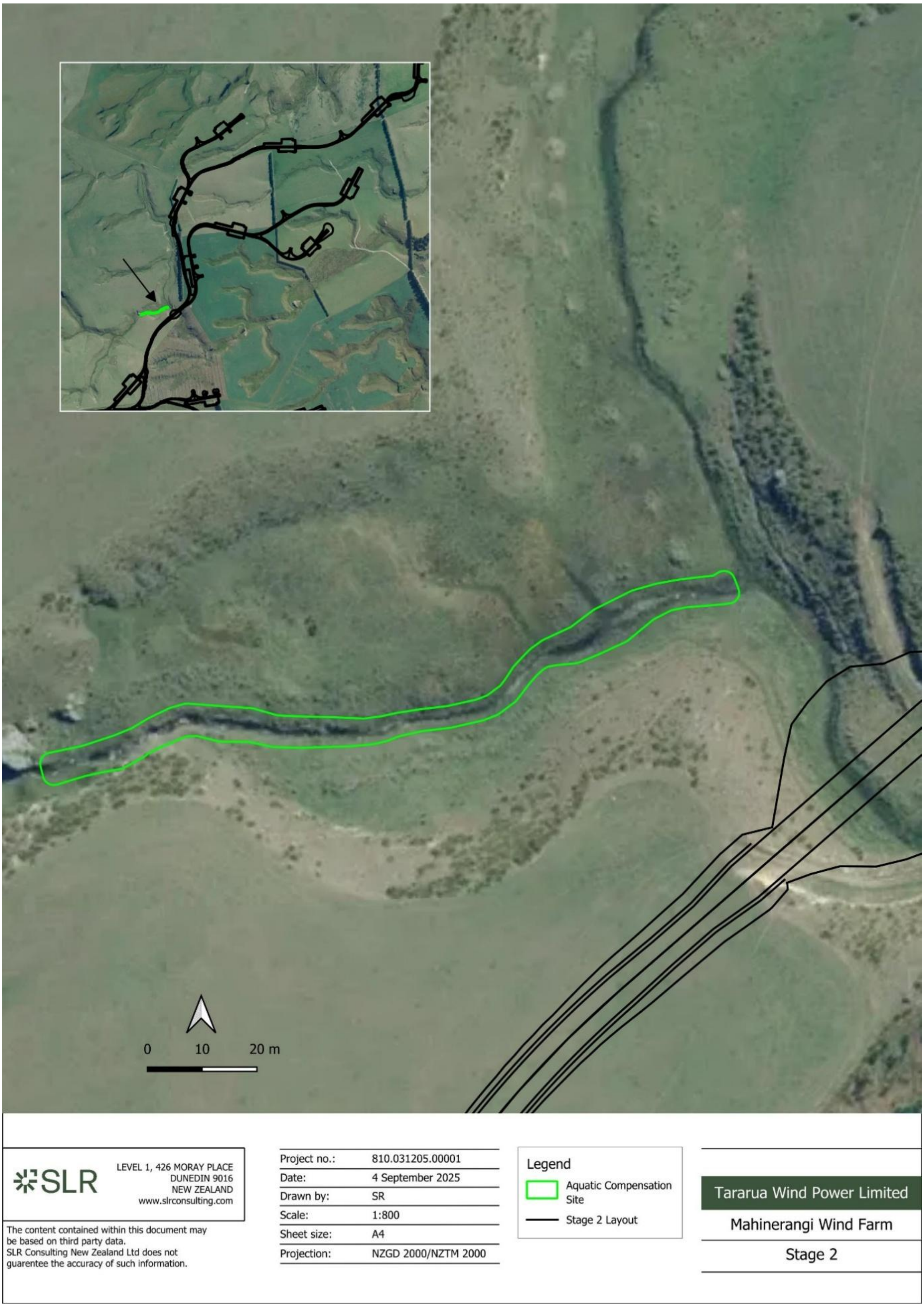

Figure I: Area within Lee Stream tributary to be fenced and planted.

Photo 11: [redacted]

Freshwater Fisheries Activities (Fast-track Approvals Act 2024)

The Fast-track Approvals Act 2024 provides for activities for which an approval would otherwise be required under Freshwater Fisheries Regulations 1983 and differentiates between activities that impede fish passage temporarily ('standard freshwater fisheries activities'; SFFA) and activities that impede fish passage more permanently ('complex freshwater fisheries activities'; CFFA). The new culvert to be installed in the Lee Stream tributary comprises an 'activity that impedes fish passage temporarily' as following installation of the new culvert fish passage will be provided through the culvert. Also, the works required to install the culvert (i.e., active disturbance of the water body) will not persist for more than three months and the works will be timed to not occur during the spawning season for native fish (i.e., works will be outside the period October to November, which is the spawning season for Eldon's galaxias). The installation of the new culvert in the Lee Stream tributary therefore constitutes an SFFA.

Of relevance to the culvert (structure or fish facility), the following information must be provided: a description of the type of structure, and the dimensions, design and placement of the structure, water flows and operating regime; freshwater species and values present (with particular focus on threatened, data-deficient, and at-risk species as defined in the New Zealand Threat Classification System); water quality and quantity in the surrounding habitat; and how the passage of fish will be provided for.

This information has been provided in the sections above.

6.0 Positive Effects of MWF Stage 2

Changes to MWF Stage 2 from the consented layout include the removal of the Thomas Block (see Figure A for location of the Thomas Block). Avoidance of this area will have positive benefits for aquatic ecology due to the reduction in the number of watercourses crossed by access roads, and therefore reduction in the number of new culverts that need to be installed in watercourses, in addition to reduced areas of land disturbance and spoil disposal.

The consented layout for the MWF includes access road crossings of two watercourses draining into Lammerlaw Creek in the Thomas Block. Fish survey records from Lammerlaw Creek include brown trout, an introduced sports fish, in the lower reaches, with the native galaxiid kōaro, categorised as 'At Risk – Declining', recorded further upstream. Stage 2 no longer includes the Thomas Block, meaning, the potential for effects resulting from installation of culverts in these waterways and resultant sediment inputs and direct disturbance of macroinvertebrate and fish habitats will be avoided.

In addition, the removal of the four turbines identified in the consent layout for the MWF in the Thomas Block for Stage 2 will reduce the land area required for excavation and construction activities. This will reduce risks of sediment runoff to watercourses and reduce areas where stormwater management would be required.

7.0 Monitoring

Avoidance and minimisation of adverse effects of construction activities and management of stormwater and surface run-off at the MWF Stage 2 will be achieved by adhering to the ECMP. All components of the MWF Stage 2 (except for two sites, including one culvert, discussed below) are located away from watercourses. Monitoring associated with construction activities and stormwater/surface run-off near wetlands will be undertaken as outlined in the ECMP. However, monitoring of streams and watercourses is not required due to the isolation of the MWF sites from the watercourses and the mechanisms in place to avoid effects.

The installation of the new culvert in the Lee Stream tributary is one of two components of the MWF Stage 2 that cannot avoid a watercourse, with direct disturbance of the bed and banks required. Construction works and installation of the culvert in accordance with the ECMP sediment controls should avoid or minimise any adverse effects of sediments on the ecological values of the watercourse. However, monitoring of suspended sediment concentrations (in the water column) is recommended in the stream upstream and downstream of the culvert immediately prior to instream works commencing (to establish 'baseline' conditions), during the culvert installation works, and following completion of the installation works. This monitoring will include assessments of instream conditions (e.g., observations of visible surface water at each monitoring location) and can be used to determine other factors influencing sediment concentrations/cover at the time of monitoring (e.g., farm activities). The monitoring will ensure sediment and construction controls are effective; should monitoring results indicate increased suspended sediment concentrations that can be attributed to the instream works, an immediate review and amendments of the sediment control mechanisms will be initiated (in conjunction with appropriate site staff and management). This monitoring is described in more detail in the Water Quality Monitoring Plan.

The recommended fencing and planting of a gully site and associated waterway (at least 50 m length of waterway) upstream of the new culvert in the Lee Stream tributary will require monitoring to ensure the fencing is effective at excluding stock, and for monitoring survival of the plants to determine maintenance requirements. This monitoring is described in detail in the Wetland and Aquatic Compensation Plan.

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9.0 Closure

Sincerely,

SLR Consulting New Zealand

[redacted]

Ben Ludgate
Principal Ecologist

[redacted]

Keren Bennett
Technical Director – Freshwater Ecology

Appendix A Authors' qualifications and experience

Ecological Assessment – Aquatic Ecology

Mahinerangi Wind Farm Stage 2

Tararua Wind Power Limited

SLR Project No.: 810.031205.00001

17 September 2025

The contributing authors, in their capacity as authors of this report, have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023. Where this report relies on information provided by other experts, this is outlined within the report.

Name & Role	Qualifications	Experience
Ben Ludgate Principal Ecologist Team Manager Christchurch and Dunedin (Ecology & Marine Science)	MSc., Zoology, University of Otago (2001) BSc., Zoology, University of Otago (1998)	Ben has over 22 years of experience as a consultant freshwater ecologist, initially for Ryder Consulting/Environmental that is now part of SLR. Ben specialises in assessments of water quality, periphyton, macrophytes, and macroinvertebrate and fish communities. Ben has managed ecological surveys and assessments across New Zealand for a range of clients including for renewable energy generation, receiving water monitoring in relation to discharges, and land development. Ben also manages the processing of algae, invertebrate, and fish samples in SLR's Dunedin laboratory.
Keren Bennett Technical Director – Freshwater Ecology	PGDipl. Wildlife Management, University of Otago (1993) BSc., Zoology, Auckland University (1992)	Keren has more than twenty-five years' consulting experience. Her professional experience has involved providing ecological and freshwater management advice to a wide range of stakeholders across New Zealand, including local government, urban developers, iwi, community groups, the transport sector, mining and quarrying sector, and the water, wastewater and renewable energy industries. She has designed, managed and implemented river, stream and wetland surveys, riparian vegetation assessments, fisheries studies, eDNA monitoring, ecological constraints and risk analyses, ecological effects assessments and reporting for a wide variety of audiences. Keren regularly assists local government with peer review and ecological advice associated with land development. She has prepared and presented expert ecological evidence in relation to a range of projects at Council and Environment Court hearings.

Appendix B Freshwater Macroinvertebrate Results, January 2025

Ecological Assessment – Aquatic Ecology

Mahinerangi Wind Farm Stage 2

Tararua Wind Power Limited

SLR Project No.: 810.031205.00001

17 September 2025

ORDER	TAXON	MCI tolerance value	Lee A	Lee D	Lee E	Canton A	Canton B	Broad A	Broad B	Broad C
ACARINA	ACARINA	5	2	2		28	4	80	40	9
ARACHNIDA	*Dolomedes*	5	2					1	10	
COLEOPTERA	Elmidae	6		2	29	24		20		60
	Hydraenidae	8	3			16		20		3
	Hydrophilidae	5		2						
	Liodessus	5								
	Scirtidae	8	5	2		1	11			
COLLEMBOLA	COLLEMBOLA	6	7	8	4		20	100	10	4
CRUSTACEA	Amphipoda	5	5	47	58	8	7		145	
	Cladocera	5								
	Ostracoda	3	3			4	6	20	15	3
	Paracalliope	5	47							
	Paraleptamphopus	5					9		20	
	Paranephrops	5						20		1
DIPTERA	*Aphrophila*	5								1
	Austrosimulium	3	3	2	5		3	100	20	
	Ceratopogonidae	3						20		
	Chironomus	1							5	
	Corynoneura	2							5	1
	Empididae	3				1				
	Ephydridae	4	2							
	Eriopterini	9							5	
	Hexatomini	5								1
	Limonia	6								
	Lobodiamesa	5	2						5	1
	Maoridiamesa	3	2			4	2	20	25	19
	Muscidae	3								
	Nothodixa	4								
	Orthocladiinae	2	18	7	5	40	32	280	100	69
	Paradixa	4							35	4
	Paralimnophila	6								
	Polypedilum	3					14	20	10	4
	Stictocladius	9		3		4		120	10	
	Stratiomyidae	5							1	1
	Tanypodinae	5	8		5	8	20		115	5
	Tanytarsini	3				112	1	40	250	
EPHEMEROPTERA	*Austroclima*	9								
	Coloburiscus	9				1				
	Deleatidium	8	163	52	176	272	1	200		4
	Nesameletus	9	2		2	12				
	Zephlebia	7		2						
HEMIPTERA	*Microvelia*	5	5						80	
	Sigara	5								
MECOPTERA	*Nannochorista*	7	2	5	1				5	
MOLLUSCA	*Potamopyrgus*	4	68	820	19	128	18		5	
	Sphaeriidae	3	2	18						
NEMATODA	NEMATODA	3	2					40		
NEMATOMORPHA	NEMATOMORPHA	3								1
NEMERTEA	NEMERTEA	3	3		3					
ODONATA	*Xanthocnemis*	5								
OLIGOCHAETA	OLIGOCHAETA	1	3			40		600	75	3
PLATYHELMINTHES	PLATYHELMINTHES	3						1	10	
PLECOPTERA	*Austroperla*	9		5				20		
	Cristaperla	8	2	3						
	Megaleptoperla	9	2				1			4
	Taraperla	7		12	5	4	4	180		
	Zelandobius	5	8	2		4		80	65	4
	Zelandoperla	10	2	2	1	4	5			
TRICHOPTERA	*Helicopsyche*	10				48				9
	Hudsonema	6		5	2		2	140	10	14
	Hydrobiosella	9								
	Hydrobiosidae early instar	5								
	Hydrobiosis	5	1	2	1	12	2	40		
	Hydropsyche - Aoteapsyche	4	2			16				
	Oeconesidae	9						1		
	Olinga	9								
	Oxyethira	2	1		1	8	55	40	70	10
	Paroxyethira	2								13
	Philorheithrus	8	1	5	6	20	2			
	Polyplectropus	8	7		1	1		1	1	5
	Psilochorema	8		2	1	4		40	5	3
	Pycnocentria	7				16				
	Pycnocentrodes	5								
	Triplectides	5			4					1
	Zelolessica	10								1
Number of taxa			32	23	20	28	21	27	29	29
Number of EPT taxa (incl. Hydroptilidae)			11	11	11	14	8	10	5	11
Number of EPT taxa (excl. Hydroptilidae)			10	11	10	13	7	9	4	9
% EPT taxa (incl. Hydroptilidae)			34	48	55	50	38	37	17	38
% EPT taxa (excl. Hydroptilidae)			31	48	50	46	33	33	14	31
MCI score			106	125	117	118	105	102	91	103
SQMCI score			6.5	4.4	6.8	5.2	4.4	4.0	3.9	4.7

ORDER	TAXON	MCI tolerance value	Black Rock A	Black Rock B	Black Rock C	Lammerlaw A	Lammerlaw B
ACARINA	ACARINA	5	5		20		1
ARACHNIDA	*Dolomedes*	5	1				10
COLEOPTERA	Elmidae	6			40	3	210
	Hydraenidae	8			1	6	50
	Hydrophilidae	5					
	Liodessus	5	10	1			
	Scirtidae	8					1
COLLEMBOLA	COLLEMBOLA	6	5	1			60
CRUSTACEA	Amphipoda	5	70	2	40	85	40
	Cladocera	5	5				
	Ostracoda	3	280	4	60	1	
	Paracalliope	5					
	Paraleptamphopus	5					
	Paranephrops	5	10				
DIPTERA	*Aphrophila*	5					
	Austrosimulium	3				2	50
	Ceratopogonidae	3					
	Chironomus	1		1			
	Corynoneura	2					
	Empididae	3				1	
	Ephydridae	4					10
	Eriopterini	9				1	
	Hexatomini	5					
	Limonia	6				1	1
	Lobodiamesa	5					140
	Maoridiamesa	3			1	74	210
	Muscidae	3				15	1
	Nothodixa	4				4	
	Orthocladiinae	2	10	18	20	93	690
	Paradixa	4	1	4			1
	Paralimnophila	6		1		3	
	Polypedilum	3		1		4	160
	Stictocladius	9			20		
	Stratiomyidae	5		4			
	Tanypodinae	5	50	4		17	
	Tanytarsini	3				7	30
EPHEMEROPTERA	*Austroclima*	9		2			1
	Coloburiscus	9					50
	Deleatidium	8		24	200	20	230
	Nesameletus	9					
	Zephlebia	7					
HEMIPTERA	*Microvelia*	5	85	27			10
	Sigara	5		2			
MECOPTERA	*Nannochorista*	7				5	
MOLLUSCA	*Potamopyrgus*	4	280	7	12380	1	440
	Sphaeriidae	3	5				
NEMATODA	NEMATODA	3	20				10
NEMATOMORPHA	NEMATOMORPHA	3					10
NEMERTEA	NEMERTEA	3					
ODONATA	*Xanthocnemis*	5	75	1			
OLIGOCHAETA	OLIGOCHAETA	1	45	1	20	2	130
PLATYHELMINTHES	PLATYHELMINTHES	3					
PLECOPTERA	*Austroperla*	9			1		50
	Cristaperla	8					
	Megaleptoperla	9	1		20		
	Taraperla	7			1		1
	Zelandobius	5	5	9			
	Zelandoperla	10					20
TRICHOPTERA	*Helicopsyche*	10			640		
	Hudsonema	6	15	2	20	4	1
	Hydrobiosella	9				1	10
	Hydrobiosidae early instar	5				2	20
	Hydrobiosis	5		1	1	1	1
	Hydropsyche - Aoteapsyche	4				1	190
	Oeconesidae	9			1	1	
	Olinga	9					1
	Oxyethira	2	45	3	20	4	10
	Paroxyethira	2					
	Philorheithrus	8					10
	Polyplectropus	8		1	1		
	Psilochorema	8			20	7	20
	Pycnocentria	7			60		90
	Pycnocentrodes	5			1220		1
	Triplectides	5					
	Zelolessica	10					
Number of taxa			21	23	23	28	39
Number of EPT taxa (incl. Hydroptilidae)			4	7	13	9	17
Number of EPT taxa (excl. Hydroptilidae)			3	6	12	8	16
% EPT taxa (incl. Hydroptilidae)			19	30	57	32	44
% EPT taxa (excl. Hydroptilidae)			14	26	52	29	41
MCI score			89	94	121	100	110
SQMCI score			3.7	5.5	6.3	4.8	3.9

Appendix C Freshwater Macroinvertebrate Results, May 2025

Ecological Assessment – Aquatic Ecology

Mahinerangi Wind Farm Stage 2

Tararua Wind Power Limited

SLR Project No.: 810.031205.00001

17 September 2025

ORDER	TAXON	MCI tolerance value	Lee F - g (upstream)	Lee F - I (downstream)
ACARINA	ACARINA	5		57
ARACHNIDA	*Dolomedes*	5		1
COLEOPTERA	Elmidae	6	1	
COLLEMBOLA	COLLEMBOLA	6	7200	57
CRUSTACEA	Amphipoda	5	1200	371
	Cladocera	5	1	29
	Isopoda	5		1
	Ostracoda	3	2200	1000
	Paraleptamphopus	5	200	2600
DIPTERA	*Aphrophila*	5	1	
	Austrosimulium	3	1	29
	Chironomus	1	1	1
	Maoridiamesa	3		1
	Orthocladiinae	2		229
	Paralimnophila	6		1
	Polypedilum	3		29
	Tanypodinae	5	1	29
EPHEMEROPTERA	*Austroclima*	9	1	1
	Deleatidium	8	200	200
HEMIPTERA	*Sigara*	5	200	1
HIRUDINEA	HIRUDINEA	3	1	
MECOPTERA	*Nannochorista*	7		29
MOLLUSCA	*Potamopyrgus*	4	36000	229
	Sphaeriidae	3	400	
NEMERTEA	NEMERTEA	3		1
ODONATA	*Xanthocnemis*	5	400	
OLIGOCHAETA	OLIGOCHAETA	1	2000	57
PLATYHELMINTHES	PLATYHELMINTHES	3	1	
PLECOPTERA	*Megaleptoperla*	9	1	1
	Taraperla	7	1	
	Zelandobius	5	1	229
TRICHOPTERA	*Hudsonema*	6	400	29
	Hydrobiosidae early instar	5	200	
	Hydrobiosis	5	1	1
	Hydropsyche - Aoteapsyche	4	1	
	Oeconesidae	9		1
	Oxyethira	2		114
	Polyplectropus	8		171
	Pycnocentrodes	5	1	
Number of taxa			27	29
Number of EPT taxa (incl. Hydroptilidae)			10	9
Number of EPT taxa (excl. Hydroptilidae)			10	8
% EPT taxa (incl. Hydroptilidae)			37	31
% EPT taxa (excl. Hydroptilidae)			37	28
MCI score			97	99
SQMCI score			4.1	4.4

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