From: "Joe Beale" <Joe.Beale@waipanetworks.co.nz>
Sent: Thu, 27 Oct 2022 12:54:58 +1300
To: "Marne Lomas" <Marne.Lomas@waipadc.govt.nz>
Subject: External Sender: 582 Parallel Road - Resource Consent Enquiry
Attachments: Tree Grow Zones.docx

Hi Marne

I have been asked to provide you with some answers to your question regarding the tree clearance issues along Parallel Road.

As the line height varies along the road, based on specific poles having more or less than one set of lines on them, your query on line height will not be a one case fits all answer.
As for the voltage, that can be answered as follows, any where there are two sets of lines on the poles, then the bottom set is 400 volt and the top set is 11,000 volts.

The required clearance from these lines is shown in the attached document, however this does not allow for the required working clearance should the trees require trimming, which is different again.

I hope provides you with the information you require.

Regards

Joe Beale
Projects Planning Team
Cell: 021 1961708
Email: joe.beale@waipanetworks.co.nz
240 Harrison Drive, Te Awamutu, 3800

Electricity (Hazards from Trees) Regulations 2003

- Regulations 15(7) and 19(4) corrected on 6 August 2021 under section 25(1)(j)(iii) of the Legislation Act 2012.

Schedule
Growth limit zones

r 4(1)

Table 1

Distances for spans less than and equal to 150 metres in length

Voltage of conductors other than aerial bundled conductors or conductors insulated by other means	Distance in any direction from any point on conductor (metres)
66 kV or greater	4
50 kV to 66 kV	3
33 kV	2.5
11 kV	1.6
400/230 v	0.5

Voltage of aerial bundled conductors or conductors insulated by other means	Distance in any direction from any point on conductor (metres)
Any voltage where the conductor is an aerial bundled conductor or is otherwise insulated	0.5

Table 2

Distances for spans more than 150 metres in length

Length of span (metres)	Vertical distance from a horizontal plane drawn from any point on conductor (metres)	Horizontal distance from a vertical plane drawn from any point on conductor (metres)
150 to 300	4	D1 = 4 D2 = 8
301 to 500	4	D1 = 7.5 D2 = 15
501 to 700	4	D1 = 15 D2 = 30
Greater than or equal to 701	4	D1 = 25 D2 = 50

Key:

D1 = distance for the 15% of each span at either end of the span

D2 = distance for the centre 70% of each span

From: "Louise Cowan" <louise.cowan@4sight.co.nz>
Sent: Tue, 8 Nov 2022 12:01:21 +1300
To: "Megan Woolley" <Megan.Woolley@waipadc.govt.nz>
Cc: "Quentin Budd" <Quentin.Budd@waipadc.govt.nz>
Subject: External Sender: FW: Wording of location and maintenance of shelterbelts at 582 Parallel Road
Attachments: Ecological Impact Assessment and Mitigation Options_Stream Reclamation_Parallel Rd_Titoki_26092022.pdf

Megan,
Can you please save the email stream provided below into the Council's system.
Regards

Louise Cowan
Principal Planning and Policy Consultant
Mobile: 022 487 3947
4Sight.Consulting

From: Simone Williams <SimoneW@barker.co.nz>
Sent: Tuesday, 8 November 2022 11:58 am
To: Louise Cowan <louise.cowan@4sight.co.nz>
Subject: RE: Wording of location and maintenance of shelterbelts at 582 Parallel Road

Hi Louise,

In double checking the proposed site plan, I do note that there is a 'farm drain' which is now captured under the definitions of ''water body', and has been classified as a "modified ephemeral stream" (with a culvert under Parallel Road) by the Applicants ecologist located to the east of the property located at 598 Parallel Road.

It is acknowledged that the proposed shelterbelt along Parallel Road is likely to be within 5m of this waterbody. The attached ecology report (to investigate into piping options of this water body) confirms there is low ecological value within this portion of the waterbody (see page 13 of attached report).

Can you please capture this additional infringement under Rule 4.4.2.58?

Thanks

Simone

Ngā mihi | Kind regards,

SIMONE WILLIAMS
Senior Planner
027 254 3779
SimoneW@barker.co.nz

barker.co.nz

From: Louise Cowan <louise.cowan@4sight.co.nz>
Sent: Tuesday, 8 November 2022 11:06 am
To: Simone Williams <SimoneW@barker.co.nz>
Subject: RE: Wording of location and maintenance of shelterbelts at 582 Parallel Road

One further question, are you keeping all planting at least 5m from any water body? It appears that way to me from the plan provided but I wanted to double check. Thanks

Louise Cowan
Principal Planning and Policy Consultant
Mobile: 022 487 3947
4Sight.Consulting

From: Simone Williams <SimoneW@barker.co.nz>
Sent: Tuesday, 8 November 2022 10:53 am
To: Louise Cowan <louise.cowan@4sight.co.nz>
Subject: RE: Wording of location and maintenance of shelterbelts at 582 Parallel Road

Hi Louise,

Yes – even though it is at a complying location (and that the proposed hedging can be grown at any height), it is the applicants intention to keep these at no higher than 6m. Yes, and we offer a condition to that effect.

Cheers

Simone

Ngā mihi | Kind regards,

SIMONE WILLIAMS
Senior Planner
027 254 3779
SimoneW@barker.co.nz

barker.co.nz

From: Louise Cowan <louise.cowan@4sight.co.nz>
Sent: Tuesday, 8 November 2022 10:27 am
To: Simone Williams <SimoneW@barker.co.nz>
Subject: Wording of location and maintenance of shelterbelts at 582 Parallel Road

Simone, just a quick question. I realise that the planting is in a complying position, once it is 10 back from the road, 10m from power lines or 5m from waterbodies, but is it the intention of the applicant to keep all of the shelterbelts trimmed to a 6m height? Is this a condition that the applicant has offered? Just wondering considering that a "maximum height" is shown on the site plans?
Thanks

Louise Cowan
Principal Planning and Policy Consultant
Mobile: 022 487 3947
4Sight.Consulting

From: Louise Cowan
Sent: Friday, 4 November 2022 4:09 pm
To: simonew@barker.co.nz
Subject: Wording of location and maintenance of shelterbelts at 582 Parallel Road

Simone, as per our quick discussion on Friday, please see the below:

"At 4m from the eastern internal boundary where adjoining 598 Parallel Road for 10m from the road boundary of Parallel Road, to be maintained to a height of no greater than 6m".

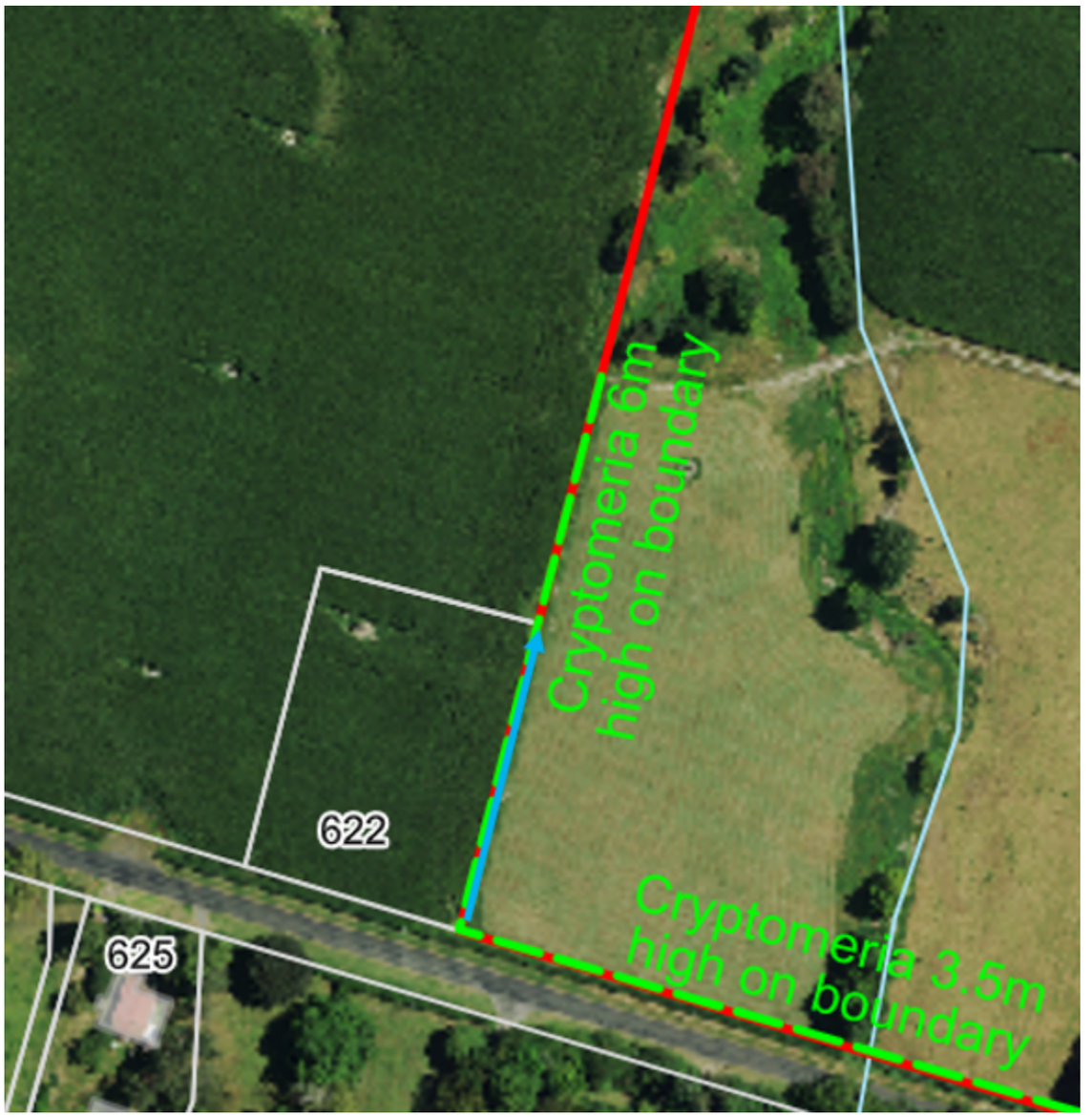
I understand that the plants on the blue line are set back 4m from the boundary with 598 Parallel Road.
What does the 10m refer to?

Is it that the planting starts 10m from Parallel Road, because that's how the sentence from your report reads to me, or that the planting will be 4m from 598 for only the first 10m from Parallel Road, or that the hedge will be trimmed to 6m in height for a length of 10m from Parallel Road, with no restriction on the height of trimming after this?

Sorry just need some clarification around how this works and what specifically you are applying for…

"On the internal boundary with 622 Parallel Road for a distance of 10m from the road boundary with Parallel Road, to be maintained to a height of no greater than 6m."

Same again here please. Can you show what you mean with location of planting.



Thanks

Louise Cowan
Principal Planning and Policy Consultant
Mobile: 022 487 3947

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Tītoki Landcare
SPECIALIST ECOLOGICAL RESTORATION

Ecological Impact Assessment and Mitigation Options: Parallel Rd Kiwifruit farm

September 2022

PROJECT NUMBER	0056			
PROJECT NAME	Ecological Impact Assessment and Mitigation Options: Parallel Rd Kiwifruit farm			
PROJECT ADDRESS	582 Parallel Road, Kaipaki			
PREPARED FOR	Kiwifruit Investments Limited			
AUTHOR/S	Brenda Bartels			
REVIEW	**Technical**	**QA**	**Version**	**Date to client**
	Adam Purcell	Adam Purcell	0.1	14/09/2022
	Adam Purcell	Adam Purcell	0.2	21/09/2022
	Adam Purcell	Adam Purcell	1.0	26/09/2022

This report should be cited as: 'Tītoki Landcare. (2022). *Ecological Impact Assessment and Mitigation Options: Parallel Rd Kiwifruit farm*. Prepared for Kiwifruit Investments Ltd.'

TĪTOKI LANDCARE LTD | 115 KINGSLEY ST, CAMBRIDGE 3432, NZ | P: 07 808 0431

Contents

Figures

Tables

Executive Summary

Tītoki Landcare Ltd has been engaged by Kiwifruit Investments Ltd to undertake an ecological impact assessment (EcIA) to pipe approximately 205 m of a highly modified ephemeral stream at 582 Parallel Road, Kaipaki and provide potential mitigation options to balance potential and actual ecological impacts.

The piping of the 205 m of stream will result in the reclamation of 114.8 m^2 of streambed. A Stream Ecological Valuation (SEV) assessment has been completed and Environmental Compensation Ratios (ECR) have been calculated for two mitigation packages to quantify the area of restoration required relative to the amount lost to maintain a 'no net loss' in ecological function as a result of the activity.

Description and ecological value

The impact stream is located in the headwaters of a tributary of the Mangawhero Stream. The stream itself has been heavily modified and straightened. A depression is present around the stream, with a gently sloping bank leading to the wide flat base of the depression and the highly incised stream. The vegetation within the depression and the majority of the watercourse is currently weedy pasture. The soft bottomed macroinvertebrate community index (MCI-sb was relatively low (85) although the QMCI-sb was higher (5.95), one shortfin eel was captured in the most downstream reach of this stream, immediately below a perched culvert. The ecological value of this reach was assessed as **low** with a Stream Ecological Valuation (SEV) of 0.309.

The ecological values associated with terrestrial vegetation and fauna habitat is **very low**, with only common exotic bird species recorded and weedy pasture vegetation.

No wetland habitat will be impacted as a result of the activity, and downstream wetland habitat will be enhanced as part of the mitigation package.

Effects Assessment

A summary of the ecological effects and overall level of effect before and after mitigation measures is provided in the table below.

Stream reclamation is the greatest ecological effect of the proposal and enhancement of ephemeral stream habitat has been assessed to provide the onsite mitigation/offset required for the reclamation of 114.8 m^2 of the impact reach. The mitigation reaches will be planted with a 10 m wide riparian buffer on both stream banks. Two mitigation options are presented:

Option 1
A downstream mitigation site (SEVm-DS) is located immediately downstream of the impact reach and a second mitigation site (Eastern gully [SEVm-E]) is located on the opposite side of the property in a separate arm of the same gully system. A total of 409 m^2 of stream bed (including connected floodplain/historic streambed) and restoration of 123 m^2 of wetland habitat is proposed. Part of the wetland restoration is in addition to the required mitigation and given that wetlands are an underrepresented habitat and are protected in current legislation this is seen as a biodiversity gain for the project.

Option 2

Mitigation is proposed downstream of the impact reach (SEVm-DS) and in a newly created section of watercourse. The proposed restoration includes 209.5m^2 of streambed, 115 m^2 of connected floodplain and 123 m^2 of wetland. The wetland restoration is in addition to the required mitigation and given that wetlands are an underrepresented habitat and are protected in current legislation this is seen as a biodiversity gain for the project.

Ecological effect	Magnitude of effect	Ecological value	Level of effect without mitigation	Overall level of effect after mitigation
Stream reclamation	Very high	Low	Moderate to high	Low
Construction effects resulting in increased sediment transport	Moderate	Low	Low to moderate	Low
Impacts to freshwater fauna	Moderate	Low	Low to moderate	Low
Impacts to terrestrial vegetation and fauna	Very low	Very low	Very low	n/a

Recommendations

It is considered that if the proposed works are carried out in accordance with the identified methodologies and either mitigation package is implemented in full, the effects of the development on ecological values within the site will be adequately mitigated or offset. To ensure the ecological effects of the proposed development are adequately mitigated, the following measure are recommended:

- Any constructed stream used for mitigation will be designed to have variable widths, depths, diverse habitat types (e.g., run and pool) and substrate (e.g., wood).
- A detailed streamworks methodology will be provided which includes erosion and sediment controls specific to streamworks;
- Fish relocation is undertaken prior to the commencement of streamworks;
- Streamworks is to be undertaken during summer months to avoid as far as practicable adverse effects on the streams; and
- Requirement for enhancement planting to be undertaken within the planting season following works commencing.

1 Introduction

Tītoki Landcare Ltd has been engaged by Kiwifruit Investments Ltd to undertake an ecological impact assessment (EcIA) for the proposed reclamation and piping of 205 m of a modified ephemeral stream (114.8 m^2 stream bed area) at 582 Parallel Road, Kaipaki. The stream is in the headwaters of the Mangawhero Stream catchment with no available habitat upstream.

The site and stream have been heavily modified with the stream being confined within a steep sided, narrow excavated channel to form the current shape. The property is being developed into a kiwifruit farm and the development of the kiwifruit farm will result in permanent stream loss (Figure 1).

Figure 1: Impact reach proposed to be piped and reclaimed.

2 Ecological assessment methods

2.1 Desktop assessment

Relevant source materials for the property were reviewed to gather information on the property and its context within the wider landscape. The following resources were reviewed as part of our desktop assessment:

- Aerial imagery (including historic) of the project area sourced from Land Information New Zealand, Google Inc., and Retrolens to investigate the change in vegetation at the site over time.
- NIWA Freshwater fish database
- Department of Conservation Bioweb Database.
- eBird database.
- iNaturalist database.
- Significant natural areas of the Waikato District: terrestrial and wetland ecosystems (Kessels Ecology, 2018).

2.2 Field survey

Tītoki Landcare ecologists visited the site on the 6 May.The entire reach of the watercourse was walked and was completely dry. Additional site visits were undertaken on 20 July and 31 August 2022.

During the site visits, qualitative information was collected regarding the type and distribution of vegetation and fauna habitat across the property. Any indigenous plant species encountered were recorded. Any bird species observed (seen or heard) was recorded. Any habitat considered suitable for indigenous herpetofauna or bats was noted.

2.2.1 Stream assessment

Stream ecological valuations (SEV) were carried out at three sites on the property, the impact site (SEVi) and two potential compensation sites, one located downstream of the impact site (SEVm-DS) and the other in the eastern gully (SEVm-E) (see Figure 3 for locations). All sites were intermittent (defined as ephemeral in the Waikato Regional Plan), and assessments were undertaken following the methodology and proposed timing (between July and October) for intermittent streams (Neale *et al*., 2016).

Standardised, qualitative stream habitat information was collected for the impact site following the Rapid Habitat Assessment (RHA) methodology. These assessments provide a habitat quality score for each of the stream reaches which indicate general stream condition (Clapcott 2015).

Macroinvertebrate and fish surveys were undertaken at the impact site. Macroinvertebrate sampling was undertaken according to the soft-bottom protocol C2 (Stark *et al*., 2001). Samples were preserved in ethanol and sent for taxonomic identification. Samples were processed according to protocol P2, 200 fixed count by an invertebrate taxonomist (Raw data is available in Appendix 2).

Fishing was undertaken using Gee's minnow traps and fyke nets over a 150 m reach of the impact site following the general principles of the standard fish survey methodology (Joy *et al*., 2013). The stream was relatively shallow and narrow and therefore only two mini fyke

nets were set along with 12 Gee's minnow traps. All traps and nets were set unbaited and were set in the evening of the 30 August 2022 and retrieved the following morning.Any fish species captured were measured to the nearest millimetre before being released back to the point of capture.

2.2.2 Wetland assessment

During the site visit in July, wetland delineation assessments were carried out to determine the position of any wetlands on the property following the methodology of Clarkson (2013) and Fraser *et al.* (2018) and using the 2021 wetland plant list (Clarkson *et al.,* 2021).

2.2.2.1 Wetland definitions

Natural wetlands are defined using the definitions provided in the Resource Management Act (RMA) 1991 and NPS-FM. These are as follows:

The RMA (1991) description of a wetland '*includes permanently or intermittently wet areas, shallow water, and land margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.'*.

NPS-FM definition of a natural wetland - '*a wetland (as defined in the Resource Management Act (1991) that is not:*

a) a wetland constructed by artificial means (unless it was constructed to offset impacts on, or restore, an existing or former natural wetland); or

b) a geothermal wetland; or

c) any area of improved pasture that, at the commencement date, is dominated by (that is more than 50% of) exotic pasture species and is subject to temporary rain-derived water pooling'.

<u>Proposed amendments</u> to the NPS-FM definition of a 'natural wetland'[1] – '*a wetland (as defined in the Act) that is not:*

a) a deliberately constructed wetland, other than a wetland constructed to offset impacts on, or to restore, an existing or former natural wetland as part of giving effect to the effects management hierarchy; or

b) a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body; or

c) a geothermal wetland; or

d) a wetland that:

(i) is within an area of pasture; and

(ii) has ground cover comprising more than 50% exotic pasture species (as identified in the National List of Exotic Pasture Species (see clause 1.8)); and

(iii) is not known to contain threatened species.

[1] Ministry for the Environment. 2022. Managing our wetlands: Policy rationale for exposure draft amendments 2022. In support of amendments to the NES-F and NPS-FM in the 2022 exposure draft.

2.2.2.2 Wetland delineation

Vegetation classified using the vegetation tool[2] for wetland delineation in New Zealand defines wetland areas based on the proportion of hydrophytic (or wetland) vegetation within 2 m x 2 m plots. Plant species fall under the following wetland plant categories:

- Obligate (OBL): plant species that occur almost always in wetlands (estimated probability greater than 99 % in wetlands).
- Facultative Wetland (FACW): plant species that occur usually in wetlands (67 % to 99 %).
- Facultative (FAC): plant species equally likely to occur in wetlands or non-wetlands (34 % to 66 %).
- Facultative Upland (FACU): plant species that occur occasionally in wetlands (1 % to 33 %).
- Upland (UPL): plant species that rarely occur in wetlands (less than 1 %).

To pass the rapid test the vegetation present within the 'wetland' area across all strata must be dominated by species that are classified as OBL or FACW species (Figure 2). To pass the dominance test the most abundant plant species that immediately exceed 50 % of the total cover for each stratum, plus any additional species comprising 20 % or more of the total cover for the stratum must be OBL, FACW, or FAC. The prevalence test assigns a weighted index score for the species present, with score less than 3 indicating wetland vegetation. Areas can be excluded as natural wetlands if they are classified as 'artificial' or 'improved pasture'.

[2] Clarkson, B. 2014. A vegetation tool for wetland delineation in New Zealand. Landcare Research.

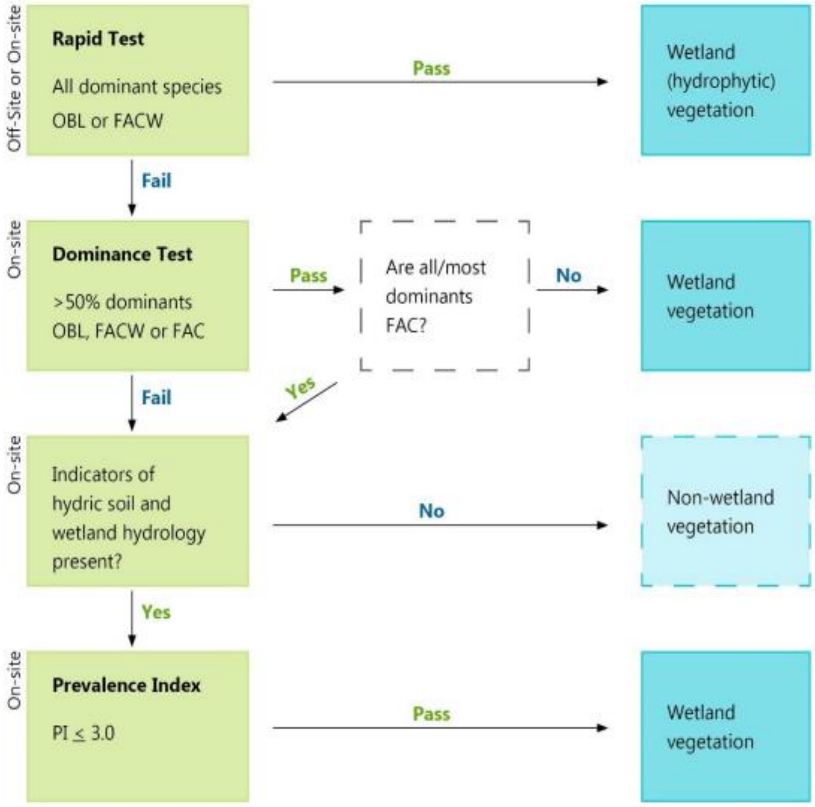

Figure 2: Flow chart to determine wetland vegetation. FAC=Facultative and OBL=obligate wetland.

2.3 Ecological Impact Assessment

The assessment of ecological effects was undertaken in general accordance with the Ecological Impact Assessment (EcIA) guidelines produced by the Environment Institute of Australia and New Zealand (Roper-Lindsay *et al.*, 2018). The EcIA approach follows the steps outlined below:

Step 1: Ecological values within the site are assigned a value of very high, high, moderate, low, or negligible based on assessments of the ecosystems within the site. Sites are assigned an ecological value based on four attributes: representativeness, rarity/distinctiveness, diversity and pattern, and ecological context. More information on the components of each of these attributes is provided in Appendix 1 Table 1. The national threat status[3] of individual plant and animal species present or likely present on the site are used to determine potential ecological values of the site. Examples of characteristics that would trigger each of the different values of very high, high, moderate, low or negligible are provided in Appendix 1 Table 2.

The overall value of a site is produced based on a combined score of the four attributes as outlined in Appendix 1 Table 3.

[3] As classified in th NZ Threat Classification System database

Step 2: The magnitude of effects on ecological values is assigned as either very high, high, moderate, low or negligible based on the criteria provided in the EcIA guidelines (Appendix 1 Table 4). The assignment of the magnitude of effect is based on:

- The size of the expected area impacted (i.e. the site boundary);
- The amount of habitat loss/gain and/or modification versus local availability;
- The intensity of the effect (e.g. the conversion of wetland to pasture, pond or pavement); and
- The duration of the effect (e.g. permanent, medium-long term, short-term etc.) (Appendix 1 Table 5).

Step 3: The overall level of effect is determined using a matrix based on the combination of ecological values and the magnitude of effects on these values (Appendix 1 Table 6). Overall level of effect categories include positive, negligible, very low, low, moderate, high and very high. We used the overall level of ecological effect to determine if effects management (mitigation) is required.

Ecological mitigation and management recommendations are provided to manage any moderate or high adverse effects that are identified.

3 Site ecological context

The property at 582 Parallel Road covers c. 35.3 ha of land south of Hamilton city within the Hamilton Ecological District. The property is within 2 km of the Waikato River and is flat land intersected by tributaries to the Mangawhero Stream and their gullies. Parts of the property fall within a significant natural area (SNA): WP344, Mangawhero Stream riparian margin (Figure 3).

Singers & Rogers (2014) classify the land as being historically covered in Kahikatea-pukatea-tawa forest (WF8). The property is now largely surrounded by exotic pasture and exotic-dominated gully systems. The property is located within 2.5 km of Moanatuatua Scientific Reserve (Figure 3), a 140 ha remnant of restiad peatland that once blanketed low lying areas of the Hamilton Ecological District. Several Threatened plants have been recorded within 5 km of 582 Parallel Road (Table 1); however, these species are all peat bog specialists found at Moanatuatua Scientific Reserve and they are not suited to conditions at 582 Parallel Road.

Table 1. List of threatened plant species recorded within 5 km of the property.

Common name	Scientific name	Conservation status[4]	Distance from site (km)
Bog clubmoss	*Brownseya serpentina*	Threatened – Nationally Vulnerable	2.5
Bladderwort	*Utricularia delicatula*	At Risk – Relict	2.5
Bamboo rush	*Sporadanthus ferrugineus*	At Risk – Relict	2.5

[4] As classified in de Lange *et al*. (2018).

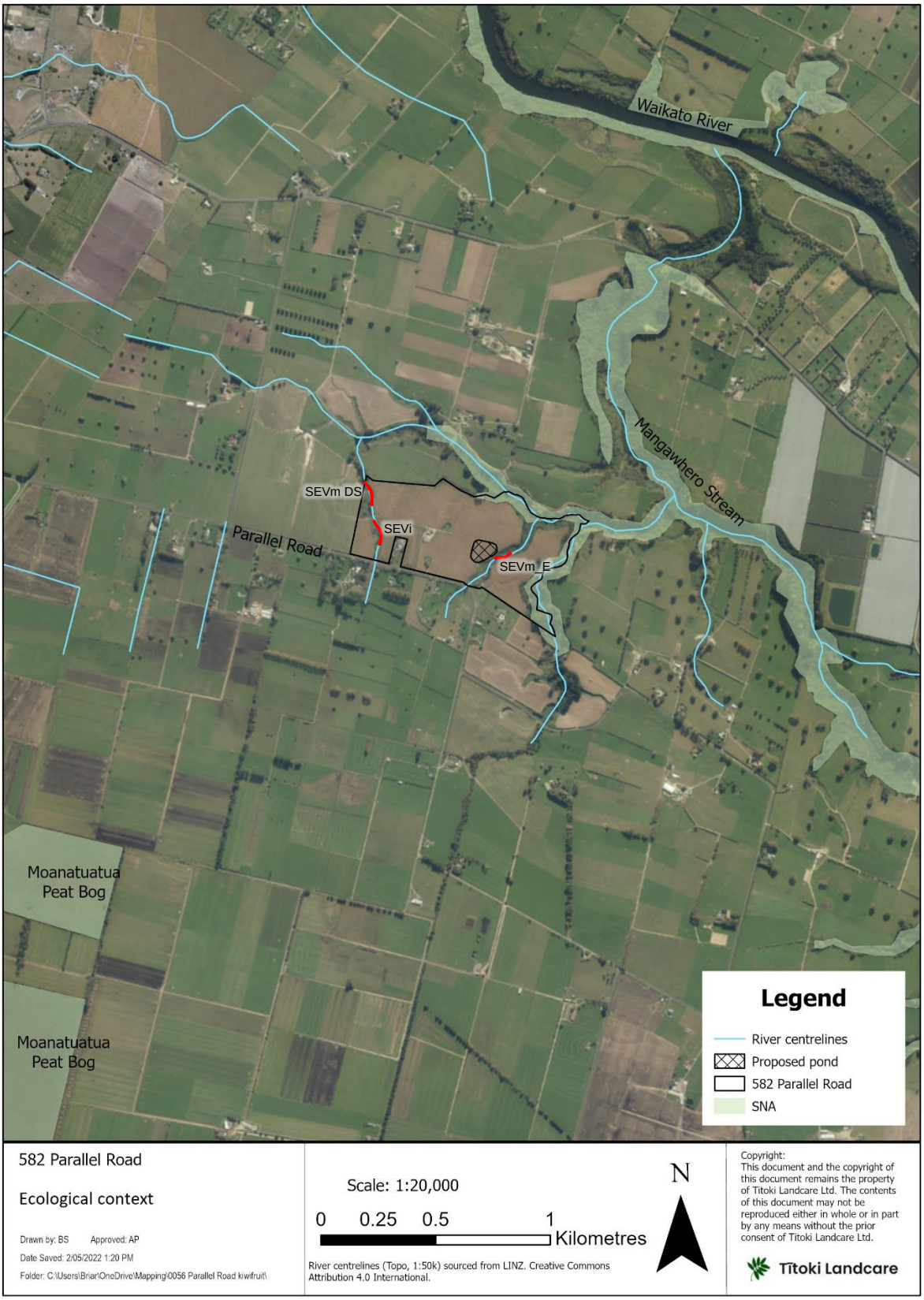

Figure 3. Site ecological context map. The red lines show the SEV reaches. SEVi is the impact site and the other two sites are mitigation/enhancement reaches.

4 Relevant Planning Documents

4.1 Vision and strategy for Waikato River

The Vision and Strategy for the Waikato River (Te Ture Whaimana o te Awa o Waikato) recognises the significance of the Waikato River to Waikato-Tainui, with the vision, objectives, and strategies applicable to Waikato River tributaries and catchment.

Through case law, the Vision and Strategy is acknowledged as the primary, direction-setting document for the Waikato River. Case law indicates that activities which are subject to the V&S are required to provide for the protection and restoration of the Waikato River, and that this will require "betterment" to an extent proportionate with the scale of the activity and its effects.

As detailed in the Waikato-Tainui Environmental Plan (WTEP), an enhancement approach requires a holistic approach to the whole environment, which aims for positive ecological and social outcomes.

This proposal will result in the restoration of ephemeral stream and wetland habitat which is of higher ecological value than the stream to be lost. The restoration of wetland habitat is not a specific mitigation requirement and is therefore considered to result in betterment.

4.2 National Policy Statement for Freshwater Management 2020

The NPS-FM came into force on 3 September 2020 and among other things, introduced a requirement to recognise and give effect to te Mana o te Wai. The NPS-FM introduces a hierarchy of management priorities which places the health and wellbeing of waterbodies and freshwater ecosystems first; health needs of people (including drinking water) second, and other uses that enable people and communities to provide for their social, economic and cultural wellbeing third.

As part of the NPS-FM, it is a requirement in Subpart 3.24 Rivers that every regional council must include the following policy (or words to the same effect) in its regional plan(s) 'The loss of river extent and values is avoided…'.

To this effect Policy 3.A.3: Rivers in the Waikato Regional Plan (WRP) states that:

'*The loss of river extent and values is avoided, unless the council is satisfied:*

(a) that there is a functional need for the activity in that location; and

(b) the effects of the activity are managed by applying the effects management hierarchy.

For the purposes of this policy functional need, effects management hierarchy and loss of value have the same meaning given by the National Policy Statement for Freshwater Management 2020.

The NPS-FM and WRP also state in Policy 3.A.2: Natural inland wetlands that:

'The loss of extent of natural inland wetlands is avoided, their values are protected, and their restoration is promoted'.

In relation to this proposal, the loss of a section of highly modified ephemeral watercourse will result in the restoration of ephemeral stream and wetland habitat which is of higher ecological value than the stream to be lost. The restoration of wetland habitat is covered in the Policy wording in 3.A.2.

4.3 National environmental standards for freshwater

Reclamation of rivers is covered in subpart 2 Regulation 57 of the NES-F and is a discretionary activity '*Reclamation of the bed of any river is a discretionary activity'*.

5 Ecological characteristics of site

5.1 Freshwater Ecology

5.1.1 Impact site description

The impact reach has had a history of modification having been artificially straightened and deepened at least twice in the past dating back to c. 1953 (see Retrolens imagery in Appendix 3). The channel itself is uniform and narrow with an average channel width of 0.59 m (median 0.56 m) and an average channel depth just under 10 cm. Depths in this reach range from 1 cm to 30 cm. The incised channel is present along the base of a 2-4 m wide depression in the topography, and although this forms a floodplain area, the incised channel is completely disconnected from its floodplain. The riparian margins are comprised of pasture grasses and herbs including Yorkshire fog (*Holcus lanatus*), buttercup (*Ranunculus repens*), ryegrass (*Lolium* sp.), prairie grass (*Bromus catharticus*) dock (*Rumex obtusifolius*) and couch (*Elytrigia repens*).

The section of the stream downstream of Parallel Road which is proposed to be reclaimed has rooted terrestrial vegetation (predominantly Yorkshire fog with some buttercup along much of the channel (61%) (Figure 4). In deeper sections of water (Figure 5), macrophyte growths are present including *Glyceria* sp, duckweed (*Lemna minor*) and starwort (*Callitriche stagnalis*). Long green and brown filamentous algae and iron floc were also present in the stream.

Upstream of the road culvert beneath Parallel Road, a depression in the topography was present which was dry during the site assessment in July and August with rooted terrestrial vegetation present. This area had no clearly defined channel (with either a bank or bed) and is best described as an overland flow path. However, historic imagery appears to show a more defined channel in the past (see Retrolens imagery in Appendix 3).

The SEV score for the stream was 0.309 and the RHA score for the site was 29 out of a possible score of 100. With the site having low scores for invertebrate habitat and abundance and fish habitat and cover, with a limited variety of substrates available for cover. These scores indicate low ecological value and functioning.

Figure 4: Most of the channel was overgrown with rooted terrestrial vegetation with shallow water.

Figure 5:Standing water present upstream of the culvert.

5.1.2 Macroinvertebrates

A single composite macroinvertebrate sample was collected at the impact site. No sensitive EPT taxa (mayflies, stoneflies, or caddisflies) were present, with a total of 10 taxa recorded. Many of the species recorded were tolerant species commonly found in lowland watercourses (Table 2).

The sample was dominated by beetles with Scirtidae comprising 43 % of the sample, this species has a soft bottomed (sb) tolerance score of 6.4 and are common in vegetation covered streams.

The MCI-sb (Macroinvertebrate Community Index) was 85 indicating fair water quality while the QMCI-sb (Qualitative Macroinvertebrate Community Index) score indicated good quality or possible mild pollution (Stark & Maxted, 2007).

Table 2: Mean aquatic macroinvertebrate metrics calculated from the SEVi modified watercourse at 582 Parallel Road on the 30 August 2022.

Metric	Impact reach
Taxa richness	10
EPT taxa richness	0
% EPT	0
% EPT taxa	0
Number of individuals	203
MCI-sb	85
QMCI-sb	5.95

(Excluding Hydroptilidae for EPT indices)

5.1.3 Freshwater fish

A fish survey was undertaken at the impact site only, where one shortfin eel (*Anguilla australis*) (420 mm in length) was captured downstream of the farm track and culvert (Figure 6). No fish were captured upstream of the culvert which was perched and likely poses a barrier to fish migration. It is likely that the downstream section of the impact site (c.10m) provides temporary habitat for shortfin eels for parts of the year when water is present.

The FFDB shows that there have been historic records for five species in the main stem of the Mangawhero Stream, downstream of the site. Longfin eel *(Anguilla dieffenbachi*), shortfin eel, giant kokopu (*Galaxias argenteus*), Cran's bully (*Gobiomorphus basalis*) and koura (*Paranephrops*) have been recorded. Of these species both longfin eel and giant kokopu have a conservation status of At Risk – Declining (Dunn *et al*., 2018).

Figure 6: Shortfin eel captured in the impact reach downstream of the farm track and culvert.

5.2 Wetland Delineation

A wetland delineation assessment was carried out to determine whether the flat depression areas adjacent to the impact reach proposed to be piped contained areas defined as natural wetlands in accordance with the NPS-FM. This area contained areas of rank grass that had not been grazed by stock since the conversion of the majority of the property into a kiwifruit

orchard. Grass species, in particular, Yorkshire fog dominated the area with patches of creeping buttercup present in places.

Ten 2 m x 2 m vegetation plots were assessed approximately 20 m apart on alternating sides of the watercourse from Parallel Road to immediately downstream of the farm track and culvert. The plots were located on the lowest parts of the riparian zone, 1 m from the top of the watercourse channel (Figure 7). No natural wetlands were present along the riparian zone of the impact reach following the Wetland Delineation methodology. Plots 4-8 had greater than 50% pasture species (identified on the Nation Pasture Species list) and therefore have been classified as improved pasture. Plots 1, 9 and 10 passed the dominance test but failed the prevalence test and did not have hydric soils or hydrology indicators (Table 3).

Two wetland areas were identified further downstream, with the proposed works being greater than 10 m from the wetland extent (see 10 m buffer areas in Figure 7).

Photos of the plots are provided in Appendix 4 and the raw data for the delineation plots is available in Appendix 5.

Figure 7: Wetland delineation vegetation plots. Downstream wetlands are shown in green and blue with 10m buffers.

Table 3. Summary of wetland delineation assessment results.

Plot number	Improved pasture	Dominance test met	Prevalence met	Hydric soils	Hydrology indicators
Plot 1	No	Yes	No	No	No
Plot 2	No	No	No		
Plot 3	No	No	No		
Plot 4	Yes				
Plot 5	Yes				
Plot 6	Yes				
Plot 7	Yes				
Plot 8	Yes				
Plot 9	No	Yes	No	No	No
Plot 10	No	Yes	No	No	No

5.3 Terrestrial Ecology

5.3.1 Plant species and vegetation

The vegetation adjacent to the proposed reclamation site is comprised of pasture herbs and species as described in the site description in Section 5.1.1. A detailed list of the species present is also provided in the wetland delineation plot assessment in Appendix 5.

5.3.2 Fauna and fauna habitat

5.3.2.1 Fauna

Four bird species were observed on the property during the site visits, all of which are introduced species (

Table 4). No At Risk or Threatened bird species were observed. No lizard species or bats were observed but no field surveys for their presence were undertaken.

A desktop assessment found records of 25 native bird species within 5 km of the property, including five species classified as At Risk or Threatened (

Table 4) (Robertson *et al*., 2021).

Copper skink (*Oligosoma aeneum*) have been recorded within 5 km of the property and are classified as At Risk – Declining (Hitchmough *et al*., 2021).

In 2015, low levels of long-tailed bat (*Chalinolobus tuberculatus*) activity were recorded at a location approximately 3.5 km away along the Waikato River near Hooker Road (DOC BioWeb Database). Long-tailed bats, which are classified as Threatened – Nationally Critical (O'Donnell *et al.*, 2018), are known to forage and commute along the Waikato River and its tributaries.

Table 4. Introduced birds recorded onsite and native bird species recorded within 5 km of the property.

Common name	Scientific name	Conservation status[5]	Distance from site (km)
Myna	*Acridotheres tristis*	Introduced and Naturalised	Observed onsite
Goldfinch	*Carduelis carduelis*	Introduced and Naturalised	Observed onsite
Greenfinch	*Carduelis chloris*	Introduced and Naturalised	Observed onsite
Sparrow	*Passer domesticus*	Introduced and Naturalised	Observed onsite
Kererū	*Hemiphaga novaeseelandiae*	Not Threatened	4
Pukeko	*Porphyrio melanotus*	Not Threatened	4
NZ scaup	*Aythya novaeseelandiae*	Not Threatened	4
Australasian shoveler	*Spatula rhynchotis*	Not Threatened	4
Black swan	*Cygnus atratus*	Not Threatened	4
Grey duck	*Anas superciliosa*	Threatened – Nationally critical	4
Black shag	*Phalacrocorax carbo*	At Risk – Naturally uncommon	2.5
Grey teal	*Anas gracilis*	Not Threatened	4
Pied stilt	*Himantopus himantopus*	Not threatened	4
Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	4
Fantail	*Rhipidura fuliginosa*	Not Threatened	4
Grey warbler	*Gerygone igata*	Not Threatened	4
Little shag	*Phalacrocorax melanoleucos brevirostris*	Not Threatened	2
Sacred kingfisher	*Todiramphus sanctus vagans*	Not Threatened	4
Silvereye	*Zosterops lateralis*	Not Threatened	4
Spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened	4
Welcome swallow	*Hirundo neoxena*	Not Threatened	4
White-faced heron	*Egretta novaehollandiae*	Not Threatened	4
Paradise shelduck	*Tadorna variegata*	Not Threatened	4
Swamp harrier	*Circus approximans*	Not Threatened	4
Morepork	*Ninox novaeseelandiae novaeseelandiae*	Not Threatened	4
Shining cuckoo	*Chrysococcyx lucidus lucidus*	Not Threatened	4
New Zealand pipit	*Anthus novaeseelandiae novaeseelandiae*	At Risk – Declining	4
Spotless crake	*Porzana tabuensis*	At Risk – Declining	4
New Zealand dabchick	*Poliocephalus rufopectus*	At Risk – Recovering	4

[5] As classified in Robertson *et al*. (2021).

6 Ecological value assessment

The overall ecological value of the impact reach is **low.** The impact reach is a highly modified ephemeral stream with steeply incised banks, no connectivity to floodplains and a lack of instream habitat for macroinvertebrates and fish. Shortfin eel were the only fish species captured and were restricted to the lower portion of the reach downstream of the perched farm track culvert. The SEV score for the impact reach was 0.309, indicative of low ecological value and function.

The ecological values associated with terrestrial vegetation and fauna habitat is very low.

Justification for these ecological values are provided in Table 5.

Table 5: Assigning ecological value to the Impact reach using EIANZ criteria.

Freshwater ecological value			
Representativeness	**Rarity/Distinctiveness**	**Diversity & pattern**	**Ecological Context**
Low-moderate – The impact reach is a highly modified first order intermittent stream with no upstream habitat. Modification has resulted in straightening and deepening the watercourse over the entire length resulting in full floodplain disconnection. A culvert beneath a farm track in the lower reaches poses a full barrier to fish migration.	Low – A culvert beneath a farm track in the lower reaches poses a full barrier to fish migration with one shortfin eel captured downstream of the culvert. The reach does not have any distinctive features.	Low – The impact reach provides habitat for shortfin eel in the downstream 10 m of stream length. Invertebrate community indicative of poor stream health (MCI-sb = 85) although the QMCI-sb is higher (5.95).	Low – The impact reach had an SEV score (0.309) indicative of low ecological value and function. Instream and riparian habitat is of low quality.
Terrestrial ecological value			
Representativeness	**Rarity/Distinctiveness**	**Diversity & pattern**	**Ecological Context**
Negligible - dominated by exotic weeds and therefore not representative of the vegetation that would have naturally occurred here. Only exotic bird species observed onsite.	Low - because it is not a naturally occurring vegetation type but can still be used as habitat by native birds and potentially long-tailed bats for commuting. The site may contain suitable nesting habitat for pipits but is unlikely utilised due ongoing disturbance from people and vehicles at the site.	Very low - because the vegetation is dominated by exotic plant species and is unlikely to provide habitat for some native birds.	Low - because although vegetated, it is low quality habitat for indigenous fauna and provides little connectivity or buffering to other habitats.

7 Assessment of Ecological Effects

7.1 Magnitude and level of ecological effect without mitigation or offset

This section assesses the effects of reclamation of the impact stream and follows the approach outlined in the Ecological Impact Assessment Guidelines (EcIAG) (Roper-Lindsay *et al*., 2018) published by the Environment Institute of Australia and New Zealand (EIANZ).

The SEV for the current ecological value of the impact reach is 0.309 (or 0.306 excluding fauna), indicative of **low** ecological value and function. The potential value of the impact stream is 0.42 indicative of **low to moderate** ecological value and function.

The current ecological value of terrestrial vegetation and fauna habitat is considered to be **very low** with rank pasture grass and herbs in the area to be reclaimed.

Ecological effects of the stream reclamation include:

- Loss of stream habitat
- Construction effects resulting in increased sediment transport during streamworks
- Effects on freshwater fauna
- Effects of terrestrial vegetation and fauna habitat

7.1.1 Assessing the effects of stream habitat loss

The proposed activity involves the piping and reclamation of 205 m (114.8 m^2 stream bed area) of a modified ephemeral stream. The proposed works will result in the irreversible loss of aquatic habitat, and this has been identified as the most significant of the potential effects of the proposed activities at this site.

Table 6 provides a summary of the current (SEVi-C), potential (SEVi-P) and impact (SEVi-I) values for the impact reach. The current low value is driven by a lack of riparian margins, channel modification, no connectivity to the riparian zone, and poor instream habitat heterogeneity.

Note that a value of 0 has been assigned after the impact of stream reclamation as there will be no available habitat upstream following piping of the impact reach. The SEV calculation summary and assumptions applied when modelling the potential scores are provided in Appendix 6.

Table 6: Summary of the current and potential SEV scores, median width and area to be reclaimed in the impact reach.

SEV score	Impact reach
SEVi-C	0.306
SEVi-P	0.379
SEVi-I	0
Median width (m)	0.56
Reclamation length (m)	205
Reclamation area (m^2)	114.8

7.1.1.1 On-site mitigation/offset sites

Onsite mitigation is proposed in two ephemeral (WRP definition) reaches of the Mangawhero Stream. The downstream mitigation site (SEVm-DS) is located immediately downstream of the impact reach and the Eastern gully (SEVm-E) is located on the opposite side of the property.

SEVm-DS is located immediately downstream of the impact reach.This site had a median wetted width of 0.91 m and an average depth of 14.4 cm (Figure 8). The riparian vegetation was comprised of rank grass and pasture herbs, with a row of exotic trees approximately 10 m from the stream edge on the true right bank. This section of the stream has been modified and excavated in the past. Even so, connectivity to the floodplain is present along the true left bank for part of the reach (which is included in the mitigation area calculation). There is also a seepage area in an adjoining depression which contains approximately 135 m^2 of wetland habitat. The current and potential SEV scores were 0.42 and 0.61 (excluding IFI and FFI[6]), respectively. Current ecological value and functioning is low to moderate.

The second mitigation site is located in the Eastern gully (SEVm-E). This stream had a median wetted width of 0.74 m and an average depth of 7.1 cm (Figure 9). This stream is located along the flat base of a steep gully. The stream meanders along the gully base in a defined channel which is connected to the floodplain. The steep gully is largely inaccessible and is overgrown with weeds and is dominated by blackberry (*Rubus fruiticosus* agg.), Himalayan honeysuckle (*Leycesteria formosa*), grey willow (*Salix cinerea*) and Chinese privet (*Ligustrum sinense*). The current and potential SEV scores were 0.68 and 0.84 (excluding IFI and FFI) respectively. Current ecological value and functioning is moderate.

[6] IFI = invertebrate fauna intact, and FFI = fish fauna intact are functions of the SEV method which are excluded from modelling calculations as required by the SEV methodology.

Figure 8: Downstream mitigation site (SEVm-DS).

Figure 9:Eastern gully mitigation stream (SEVm-E).

7.1.1.2 Onsite mitigation package

To define the quantum of stream enhancement and/or restoration required to mitigate or offset the effects of the reclamation, an environmental compensation ratio (ECR) can be calculated.

The ECR formula below requires a SEV score to be calculated for both the impact and proposed mitigation sites.

ECR = [(SEVi-P – SEVi-I) / (SEVm-P – SEVm-C)] x 1.5

Where: SEVi-P is the potential SEV value for the site to be impacted.

SEVi-I is the predicted SEV value of the stream to be impacted after impact.

SEVm-C is the current SEV value for the site where environmental compensation is applied.

SEVm-P is the potential SEV value for the site where environmental compensation is applied.

Potential SEV scores were modelled on the basis of the streams being retained as they are, with 10 m riparian margins (Figure 10; SEV assumptions are provided in Appendix 6).

ECR's have been calculated based on the area of streambed proposed to be impacted. The calculations in Table 7 have been applied to determine the 'stream bed area required' to be enhanced to achieve a no-net-loss outcome. The two lines in the table sequentially calculate the amount of offsetting provided by the riparian planting enhancement at the two mitigation sites. The residual streambed area is taken as the new impact area for the following SEV/ECR row (notes relating to the calculations are provided as table notes).

Option 1

Overall, 123 m^2 of streambed habitat restoration and an additional 115 m^2 of stream floodplain is in the downstream reach (SEVm-DS) and 222 m^2 of streambed restoration is required in the Eastern gully (SEVm-E) to offset the effects of streambed reclamation of 114.8 m^2 in the impact reach. The inclusion of 115 m^2 of hydrologically connected floodplain into the streambed calculation is considered appropriate as this area is likely to have naturally been an ephemeral watercourse prior to modification as a result of cattle pugging and channel excavation (which have changed the landform and diverted water flows). Currently, this area is best described as an induced wetland (and considered a natural wetland in the NPS-FM, 2020a) which is a protected (NES-FM 2020b) and nationally and regionally under-represented habitat type.

In addition to this, the proposal includes the restoration of another wetland area on the western bank of the downstream reach (123 m^2). Restoration of 37 m^2 is part of the mitigation package, however, full restoration of this area is recommended for the reasons stated above.

While wetland restoration is not 'like for like' habitat this could be considered 'trade-up' offsetting whereby wetland habitat which is regionally rare habitat (compared to historic extent) and could be used to offset stream reclamation. The Guidance on Good Biodiversity Offsetting in New Zealand (GGPBO) states that "*an overall net gain could be deemed to have been achieved if the biodiversity being lost is of low value and the biodiversity being gained is clearly of a much higher value and the amount gained is reasonably of the same or greater magnitude*". However, an accounting method has not been applied.

Option 2

Overall, 123 m^2 of streambed habitat restoration is required in the downstream reach (SEVm-DS) and 86.8 m^2 of restoration in the created channel to offset the reclamation of 114.8 m^2 in the impact reach. The restoration of these areas will also include 115 m^2 of hydrologically connected floodplain which has not been included in the calculation. Currently, this area is best described as an induced wetland (and considered a natural wetland in the NPS-FM, 2020a) which is a protected (NES-FM 2020b) and nationally and regionally underrepresented habitat type. In addition to this, the proposal includes the restoration of another wetland area on the western bank of the downstream reach (123 m^2) (orange area in Figure 11).

A summary of the mitigation/offset areas to be restored is provided in Table 8.

The magnitude of effects associated with the proposed loss of aquatic habitat is considered to be **very high** due to the permanent reclamation of stream and irreversible loss of aquatic habitat. The overall level of ecological effect, without mitigation measures being proposed is considered to be **moderate to high** based on the ecological values and magnitude of effects. To mitigate the adverse effects of aquatic habitat loss as identified by the proposed activities, a mitigation assessment has been prepared in accordance with the SEV and ECR methodology. It is considered that ecologically, the proposed mitigation package reduces the overall level of effect to **low**.

Table 7: SEV/ECR Calculations to determine mitigation requirements.

Option 1

Impact				Mitigation						ECR		Residual		
SEVi-P	length (m)	Median width (m)	Impacted stream-bed area (m^2)	Reach	Median width (m)	Length (m)	SEVm-P	SEVm-C	Streambed area avaliable (m^2)	ECR	Area required (m^2)	Residual area (m^2)	Resdual of original (%)	Impact stream area (m)
0.38	205	0.56	114.8	SEVm-DS	0.91	135	0.57	0.42	122.85	3.974	456.2	333	27%	30.91
			83.89	SECm-DS FP			0.57	0.42	115	3.974	333.3	218	34%	28.94
			54.95	SEVm-E	0.74	300	0.8	0.68	222	4.865	267.3	45	83%	45.63
			9.32				0.57	0.42	123	3.974	37.0	-86	332%	30.95
			-21.63											

Option 2

Impact				Mitigation						ECR		Residual		
SEVi-P	length (m)	Median width (m)	Impacted stream-bed area (m^2)	Reach	Median width (m)	Length (m)	SEVm-P	SEVm-C	Streambed area avaliable (m^2)	ECR	Area required (m^2)	Residual area (m^2)	Resdual of original (%)	Impact stream area (m)
0.38	205	0.56	114.8	SEVm-DS	0.91	135	0.57	0.42	122.85	3.974	456.2	333	27%	30.91
			83.89	SEV-created	0.56	155	0.55	0	86.8	1.03	86.4	0	100%	84.27

The standard SEV/ECR formula is applied to determine the 'stream bed area required' to be enhanced to achieve a no-net-loss outcome.

The 'streambed area available' is subtracted from the stream bed area required to derive the 'residual area'.

The residual area is converted to a percentage of the 'Impacted Stream Area'.

The 'conversion impact stream area' represents the area of the original stream bed not addressed.

The conversion impact stream area is then taken as the new impact area and the SEV/ECR formula followed

Table 8: Summary of areas to be lost and restored.

Option 1

Mitigation/offset summary	Area (m^2)
Streambed loss	114.8
Stream bed restoration (+ connected floodplain with standing water)	344.8 (+115) 459.8 total
Recommended wetland restoration*	123

*In reality this is likely to be higher as areas in the eastern gully also support floodplain wetlands.

Option 2

Mitigation/offset summary	Area (m^2)
Streambed loss	114.8
Stream bed restoration	209.5
Connected floodplain restoration	115
Recommended wetland restoration*	123

Figure 10: Option 1: Proposed mitigation showing a 10 m buffer. Downstream SEVm-DS also includes 115 m^2 of adjoining floodplain habitat and an additional wetland area. Blue wetland area is recommended for restoration.

Figure 11: Option 2: Proposed mitigation showing a 10 m buffer. Downstream SEVm-DS also includes 115 m^2 of adjoining floodplain habitat and an additional wetland area. Orange area shows the indicative created channel and buffer.

7.1.2 Construction effects resulting in increased sediment transport

Specifically, regarding streamworks, there is the potential for instreamworks to result in an uncontrolled discharge of sediment laden water during construction.

Management of sediment is critical for protecting ecological and water quality values. Earthworks and the associated temporary creation of bare earth surfaces can result in increased sediment transport into streams and other aquatic environments, which can have negative impacts on aquatic biota and plants.

During construction, care will be needed to prevent sediment from directly discharging into waterways. Erosion and sediment control measures should be adopted in accordance with Waikato Regional Council best practice guidelines. Monitoring during construction will ensure that any potential erosion problem areas are identified at an early stage. Appropriate contingency measures can then be undertaken quickly.

Streamworks have the potential to result in the uncontrolled discharge of sediment laden water to the streams, which could alter instream habitat and fauna, therefore the potential magnitude of effect is **moderate**. The overall level of ecological effect, without mitigation measures being proposed is considered to be **moderate** based on the combined ecological values and magnitude of effects. The implementation of a comprehensive streamworks methodology and sediment control measure, is considered sufficient to reduce the potential magnitude of effects to **low,** resulting in a **low** overall level of effect.

7.1.3 Impacts on freshwater fauna

The proposed activity has the potential to impact on native fish species present in the watercourses through injury or mortality (fish surveys indicate that fish are only present in the lower 10 m of the impact reach). Although streamworks will be undertaken in summer months when stream flows are expected to be low or absent, there is potential for native fish species to be present.

We recommend fish recovery and relocation is undertaken prior to streamworks commencing as a condition of consent. Native fish will be captured in accordance with the New Zealand Freshwater Fish Sampling Protocols, with traps and nets set with a minimum of 9 fykes and 18 Gee minnow traps per 150 m dependent on water levels[7]. Electrofishing may alternatively be used if conditions are appropriate. Fish shall be relocated to suitable reaches downstream of the site.

Any fish caught and relocated will be processed and data recorded to be entered into the NIWA NZFFD. Fishing will take place in accordance with an MPI fishing permit.

Any pest fish caught will be humanely euthanised on site, such as being exposed to clove oil. All equipment will be cleaned before use on site and cleaned after use on site to avoid and minimise the risk of spreading aquatic weeds.

The proposed development has the potential to impact on aquatic fauna through removal of habitat and direct mortality, however, most of the impact reach is inaccessible and therefore the potential magnitude of effects is **moderate**. The overall level of ecological effect, without mitigation measures being proposed is **low to moderate** based on the combined ecological

[7] Joy et al. (2013). New Zealand Freshwater Fish Sampling Protocols. Part – wadeable rivers and streams.

values and magnitude of effects. Undertaking fish recovery and relocation prior to instream works is considered sufficient to reduce the overall level of effect to **low**.

7.1.4 Impacts of terrestrial vegetation and fauna

The proposed area for the stream reclamation is currently weedy pasture. The weedy pasture has low ecological value because it is dominated by exotic weeds, is low quality habitat for indigenous fauna and provides little connectivity or buffering to other habitats. The loss of this habitat is assessed as having a **very low** magnitude of the effect. A very low magnitude of effect and low ecological value results in a **very low** level of effect**.**

With vegetation removal and earthworks there is inherent risk to fauna. This weedy pasture vegetation has been assessed as potential nesting habitat for pipits, but this is considered highly unlikely due ongoing disturbance from people and vehicles at the site. The magnitude of the potential harm or disturbance to indigenous wildlife within the weedy pasture areas is therefore considered **low**. A low magnitude of effect on high value pipits is assessed as a **low** level of effect.

7.2 Summary of effects and recommendations

It is considered that if the proposed works are carried out in accordance with the identified methodologies and the mitigation package is implemented in full, the effects on ecological values within the site will be adequately managed? (Table 9).

To ensure the ecological effects of the proposed development are adequately mitigated, the following measure are recommended:

- Any new stream constructed for mitigation will be designed to have variable widths, depths, diverse habitat types (e.g., run and pool) and substrate (e.g., wood);
- A detailed streamworks methodology provided which includes erosion and sediment controls specific to streamworks;
- Fish recovery and relocation is undertaken;
- Streamworks to be undertaken during summer months to avoid as far as practicable adverse effects on the streams; and
- Requirement for enhancement planting to be undertaken within the planting season following works commencing.

Table 9. Summary of ecological effects due to stream reclamation.

Ecological effect	Magnitude of effect	Ecological value	Level of effect without mitigation	Level of effect after mitigation
Stream reclamation	Very high	Low	Moderate to high	Low
Construction effects resulting in increased sediment transport	Moderate	Low	Low to moderate	Low
Impacts to freshwater fauna	Moderate	Low	Low to moderate	Low
Impacts to terrestrial vegetation and fauna	Very low	Very low	Very low	n/a

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Appendices

Appendix 1 Table extracts from the EIANZ ecological impact assessment guidelines

Appendix 1 Table 1. Ecological values assigned to habitats.

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

Appendix 1 Table 2. Ecological values assigned to species.

Value	Species values
Very high	Nationally Threatened - Endangered, Critical or Vulnerable.
High	Nationally At Risk – Declining.
Moderate	Nationally At Risk - Recovering, Relict or locally uncommon or rare

Value	Species values
Low	Not Threatened Nationally, common locally
Negligible	Exotic species, including pests

Appendix 1 Table 3. Overall ecological value scoring for sites or areas based on the four matters in Appendix 1 Table 1

Value	Description
Very High	Area rates High for 3 or all of the four assessment matters listed in Appendix 1 Table 1. Likely to be nationally important and recognised as such.
High	Area rates High for 2 of the assessment matters, Moderate and Low for the remainder, or Area rates High for 1 of the assessment maters, Moderate for the remainder. Likely to be regionally important and recognised as such.
Moderate	Area rates High for one matter, Moderate and Low for the remainder, or Area rates Moderate for 2 or more assessment matters Low or Very Low for the remainder Likely to be important at the level of the Ecological District.
Low	Area rates Low or Very Low for majority of assessment matters and Moderate for one. Limited ecological value other than as local habitat for tolerant native species.
Negligible	Area rates Very Low for 3 matters and Low or Very Low for remainder.

Appendix 1 Table 4. Criteria for describing magnitude of effect.

Magnitude	Description
Very high	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

[1]Baseline conditions are defined as 'the conditions that would pertain in the absence of a proposed action' (Roper-Lindsay *et al*., 2018).

Appendix 1 Table 5. Timescale for duration of effects.

Timescale	Description
Permanent	Effects continuing for an undefined time beyond the span of one human generation (taken as 25 years)
Long-term	Where there is likely to be substantial improvement after a 25 year period (e.g. the replacement of mature trees by young trees that need > 25 years to reach maturity, or restoration of ground after removal of a development) the effect can be termed 'long term'
Temporary[1]	Long term (15-25 years or longer – see above) Medium term (5-15 years) Short term (up to 5 years) Construction phase (days or months)

[1]Note that in the context of some planning documents, 'temporary' can have a defined timeframe.

Appendix 1 Table 6. Matrix for determining overall levels of ecological effects based on ecological value and magnitude of effect.

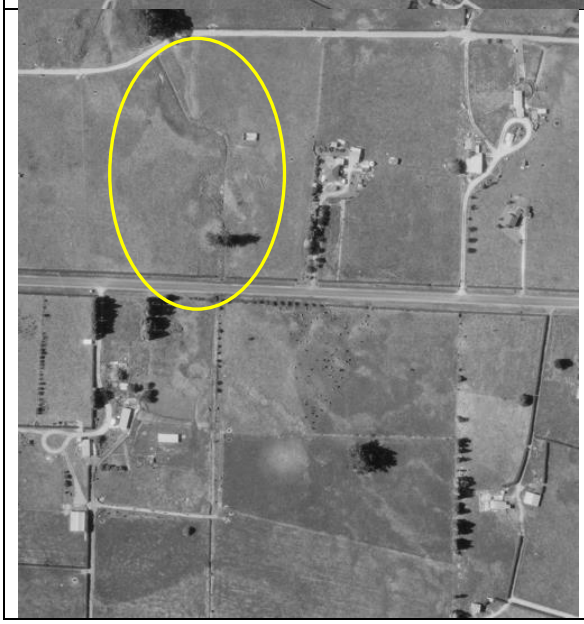
Ecological value / Magnitude	Very high	High	Moderate	Low	Negligible
Very high	Very high	Very high	High	Moderate	Low
High	Very high	Very high	Moderate	Low	Very low
Moderate	High	High	Moderate	Low	Very low
Low	Moderate	Low	Low	Very low	Very low
Negligible	Low	Very low	Very low	Very low	Very low

Appendix 2 Raw macroinvertebrate results

Sample No.			Parallel Rd
Site Name			30.08.22
Taxa	MCI	MCI-sb	
	score	score	
Caddisfly Oxyethira	2	1.2	6
Beetle Berosus	5	0.0	4
Beetle Hydrophilidae	5	8.0	48
Beetle Scirtidae	8	6.4	88
True Fly Chironomus	1	3.4	14
Crustacea Paraleptamphopus	5	0.0	10
SPIDERS Dolomedes	5	6.2	2
Mollusc Potamopyrgus	4	2.1	4
Mollusc Sphaeriidae	3	2.9	1
OLIGOCHAETES	1	3.8	26

Appendix 3: Historic imagery (retrolens and google earth)

	Retrolens image from 21/08/1953. Circled area shows the subject site which shows the watercourse has been excavated in the past.
	Retrolens image from 9/9/57

	Retrolens image from 4/74
	Retrolens image 25/10/79
	Retrolens image 3/2/83

Google Earth image dated 02/2018

Google Earth image dated 04/2018

Appendix 4 Wetland delineation photos

Location	photo
Plot 1	
Plot 2	
Plot 3	
Plot 4	

Plot 5	
Plot 6	
Plot 7	
Plot 8	

Plot 9	
Plot 10	

Appendix 5 Wetland delineation assessment results

Species+A1:K41	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10
BIDfro										3
Erodium sp		1								
FUMmur		1				5				
HYPrad		1								
Lamiaceae sp		1								
Malva sp		1								
POAann		1								
Sonchus sp		1								
RUMobt	5	2	5		5	2	2		3	1
BROcat	10	5				3	3	2		
CERfon		5								
Chenopodium sp		5								
LOLmul		5	4	20	50	3		27	7	10
HOLlan	35	15	10	35	15	80	77	25	35	1
STEmed		35								
Periscaria sp	10				2				2	
RANrep	25		6	10	23	3	5	35	46	73
CIRvul							6			
CONsum					1					
Dandelion				1				2		
ELYrep			75	19						
Latuca sp							6			
LYCeur									2	
RUBfru						4	1			
Thistle - cali					1					
Thistle - dead									2	
Poa sp (annua?)										10
RUMcri	5									
TRIrep				15	3			7	3	2
Yes+2:29								2		
Bare ground	10	21								
Total	100	100	100	100	100	100	100	100	100	100
% improved pasture	0	41	0	70	68	86	80	61	38	2
Improved pasture?	no	no	no	yes	yes	yes	yes	yes	no	no
No. dominant species	2	1	1						2	1
Total dominant specie	2	2	1						2	1
% OBL/FACW/FAC	100	50	0						100	100
Prevalence	3.1	4.1	3.78						3.00	3.03
Prevalance met?	NO	NO	NO						NO	NO
Hydric soils	NO	NO							NO	NO

Appendix 6 SEV summary calculations and assumptions

Variable (code)	SEVi_C	SEVi_P	SEVm_C_DS	SEVm_P_DS	SEVm-C_E	SEVm_P_E	SEVcreated_P
Vchann	0.10	0.10	0.10	0.10	1.00	1.00	0.50
Vlining	0.80	0.80	0.80	0.80	0.80	0.80	0.70
Vpipe	1.00	1.00	1.00	1.00	1.00	1.00	1.00
=	**0.33**	**0.33**	**0.33**	**0.33**	**0.93**	**0.93**	**0.57**
Vbank	0.00	0.00	0.62	0.62	1.00	1.00	0.40
Vrough	0.50	0.96	0.50	0.96	0.78	0.96	0.68
=	**0.00**	**0.00**	**0.31**	**0.60**	**0.78**	**0.96**	**0.27**
Vbarr	0.00	0.00	1.00	1.00	1.00	1.00	1.00
=	**0.00**	**0.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Vchanshape	0.20	0.20	0.20	0.20	1.00	1.00	0.60
Vlining	0.80	0.80	0.80	0.80	0.80	0.80	0.70
=	**0.60**	**0.60**	**0.60**	**0.60**	**0.87**	**0.87**	**0.67**
Hydraulic function	**0.23**	**0.23**	**0.56**	**0.63**	**0.90**	**0.94**	**0.63**
Vshade	0.80	1.00	0.52	0.90	0.58	0.90	0.68
=	**0.80**	**1.00**	**0.52**	**0.90**	**0.58**	**0.90**	**0.68**
Vdod	0.50	0.50	0.50	0.50	0.50	0.50	0.50
=	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**
Vripar	0.00	0.50	0.10	0.50	0.15	0.50	0.50
Vdecid	0.92	0.92	1.00	1.00	0.39	1.00	1.00
=	**0.00**	**0.48**	**0.10**	**0.50**	**0.10**	**0.50**	**0.50**
Vmacro	0.21	1.00	0.41	1.00	1.00	1.00	1.00
Vretain	0.20	0.20	0.20	0.20	1.00	1.00	0.60
=	**0.20**	**0.20**	**0.20**	**0.20**	**1.00**	**1.00**	**0.60**
Vsurf	0.89	0.81	1.00	1.00	1.00	1.00	0.64
Vripfilt	0.60	0.80	0.60	0.80	0.60	0.80	0.80
=	**0.74**	**0.81**	**0.80**	**0.90**	**0.80**	**0.90**	**0.72**
Biogeochemical function	**0.45**	**0.60**	**0.42**	**0.60**	**0.60**	**0.76**	**0.60**
Vgalspwn	0.00	0.00	0.70	0.70	1.00	1.00	1.00
Vgalqual	0.00	0.00	0.25	0.75	0.75	1.00	0.75
Vgobspwn	0.10	0.10	0.10	0.10	0.10	0.10	0.10
=	**0.05**	**0.05**	**0.14**	**0.31**	**0.43**	**0.55**	**0.43**
Vphyshab	0.30	0.53	0.44	0.63	0.56	0.68	0.54
Vwatqual	0.25	0.38	0.18	0.35	0.20	0.35	0.30
Vimperv	0.90	0.90	0.90	0.90	0.90	0.90	0.90
=	**0.44**	**0.58**	**0.49**	**0.63**	**0.55**	**0.65**	**0.57**
Habitat provision function	**0.24**	**0.32**	**0.31**	**0.47**	**0.49**	**0.60**	**0.50**
Vfish	0.33						
=	**0.33**						
Vmci	0.55						
Vept	0.23						
Vinvert	0.20						
=	**0.33**						
Vripcond	0.20	0.80	0.20	0.80	0.62	0.80	0.32
Vripconn	0.00	0.00	0.40	0.40	1.00	1.00	0.50
=	**0.00**	**0.00**	**0.08**	**0.32**	**0.62**	**0.80**	**0.16**
Biodiversity function	**0.22**						
SEV score	**0.309**						
SEVscore (minus FFI and IFI)	0.306	0.379	0.423	0.566	0.680	0.797	0.555

SEV Assumptions					
Function category	**Variable**	**SEVi-P**	**SEVm-DS-P**	**SEVm-E-P**	**SEV created channel**
Hydraulic	Vchann	No change	No change	No change	Natural channel, but evidence of channel incision from flood flows
	Vlining	No change	No change	No change	Created channel with assumed lining of unnatural fine sed loading and possiblypermeable lined in places.
	Vpipe	No change	No change	No change	Assume no pipes
	Vbank	No change	No change	No change	Assume floodplain present, but connectivity to the full floodplain is restricted by modification
	Vrough	Full riparian planting assumes late succession with grasses and sedges on lower bank.	Full riparian planting assumes late succession with grasses and sedges on lower bank.	Full riparian planting assumes late succession with grasses and sedges on lower bank.	Full riparian planting assumes late succession with grasses and sedges on lower bank.
	Vbarr	No change	No change	No change	No barrier - culvert under farm track currently poses a barrier
	Vchanshap	Autopopulated	Autopopulated	Autopopulated	Autopopulated
Biogeochemical	Vshade	Assume all cross sections very high shading. Steep banks mean shading is already relatively high	Assume all cross sections have high to very high shading.	Assume all cross sections have high to very high shading.	Assume all cross sections have moderate to very high shading (bank gradient lower).
	Vdod	No change	No change	No change	No change
	Vripar	Increase to 0.5 assuming riparin planting 10m on both banks.	Increase to 0.5 assuming riparin planting 10m on both banks.	Increase to 0.5 assuming riparin planting 10m on both banks.	Increase to 0.5 assuming riparin planting 10m on both banks.
	Vdecid	No change	No change	No change	No change
	Vmacro	Assume no macrophytes based on shading.	Assume no macrophytes based on shading.	Assume no macrophytes based on shading.	Assume no macrophytes based on shading.
	Vretain	Autopopulated	Autopopulated	Autopopulated	Autopopulated
	Vsurf	No change	No change	No change	Assume similar to SEVi-C
	Vripfilt	Assume high filtering activity due to riparian vegetation.	Assume high filtering activity due to riparian vegetation.	Assume high filtering activity due to riparian vegetation.	Assume high filtering activity due to riparian vegetation.
Habitat	Vgalspwn	No change	No change	No change	Assume bank gradients are low along banks
	Vgalqual	No change bank slope is unsuitable.	Improvement due to vegetation	Improvement due to vegetation	Assume medium based on vegetation type.
	Vgobspwn	Autopopulated	Autopopulated	Autopopulated	Autopopulated
	Vphyshab	Increase due to shading which will shade macrophytes and increase habitat diversity and abundance.	Increase due to shading which will shade macrophytes and increase habitat diversity and abundance.	Increase due to shading which will increase habitat diversity and abundance.	Asusme designed instream factors and vegetation integrity is moderate to good and shade c.60%
	Vwatqual	Assume improvement from minimal to partial based on riparian enhancement	Assume improvement from minimal to partial based on riparian enhancement	Assume improvement from minimal to partial based on riparian enhancement	Assume partial based on riparian enhancement
	Vimperv	No change	No change	No change	No change
Biodoversity	Vfish	Excluded	Excluded	Excluded	Excluded
	Vmci	Excluded	Excluded	Excluded	Excluded
	Vept	Autopopulated	Autopopulated	Autopopulated	Autopopulated
	Vinvert	Autopopulated	Autopopulated	Autopopulated	Autopopulated
	Vripcond	Autopopulated	Autopopulated	Autopopulated	Autopopulated
	Vripconn	No change	No change	No change	Assume channel connectivity to riparian zone is improved with created channel.