



FRESHWATER MANAGEMENT PLAN

NZ Transport Agency Waka Kotahi
Mill Road Stage 1

SEPTEMBER 2026

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QUALITY REVIEW AND APPROVAL RECORD

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GLOSSARY

Specific terms	
EclA	Ecological Impact Assessment
eDNA	Environmental DNA
ESCP	Erosion and Sediment Control Plan
FMP	Freshwater Management Plan
FPAT	Fish Passage Assessment Tool
KPI	Key Performance Indicator
LMP	Lizard Management Plan
NES-F	National Environmental Standards for Freshwater
NFCRP	Native Fish Capture and Relocation Plan
NZTA	NZ Transport Agency
RMA	Resource Management Act 1991
SEV	Stream Ecological Valuation
SEVm-P	Potential Stream Ecological Value at Mitigation site
SQEP	Suitably Qualified and Experienced Person
MCI	Macroinvertebrate Community Index (SB: soft-bottom, HB: Hard-bottom)
EPT	Ephemeroptera, Plecoptera, and Trichoptera. This is a grouping of taxa that are sensitive to water pollution and used as biological indicators.
General terms	
Biodiversity	The variety of life on Earth at all its levels, from genes to ecosystems, and can encompass the evolutionary, ecological, and cultural processes that sustain life
Ecology	The study of the relationships between living organisms, including humans, and their physical environment.

1. Introduction

1.1 Overview of Works

Stage 1 of the Mill Road Project ('the Project') traverses numerous watercourses across the Puhinui and Papakura catchments (Figure 1-1). Many of these watercourses are headwater watercourses that are classified as 'intermittent', with water ceasing to flow for some parts of the year. As part of the Project, numerous direct effects on freshwater habitats are unavoidable, including the upgrade/installation of 9 culverts within intermittent or permanent watercourses, four stream reach diversions, installation of numerous areas of scour protection, the construction of two bridges, and the partial or total reclamation of 14 wetlands. A full description of effects on freshwater habitat is detailed in the Freshwater Ecological Impact Assessment (EcIA).

This Freshwater Management Plan (FMP) forms part of the ecological management framework for the Project. It has been prepared to support implementation of the freshwater ecology management requirements for the Project and to provide a practical framework for construction, restoration, monitoring, reporting, and close-out.

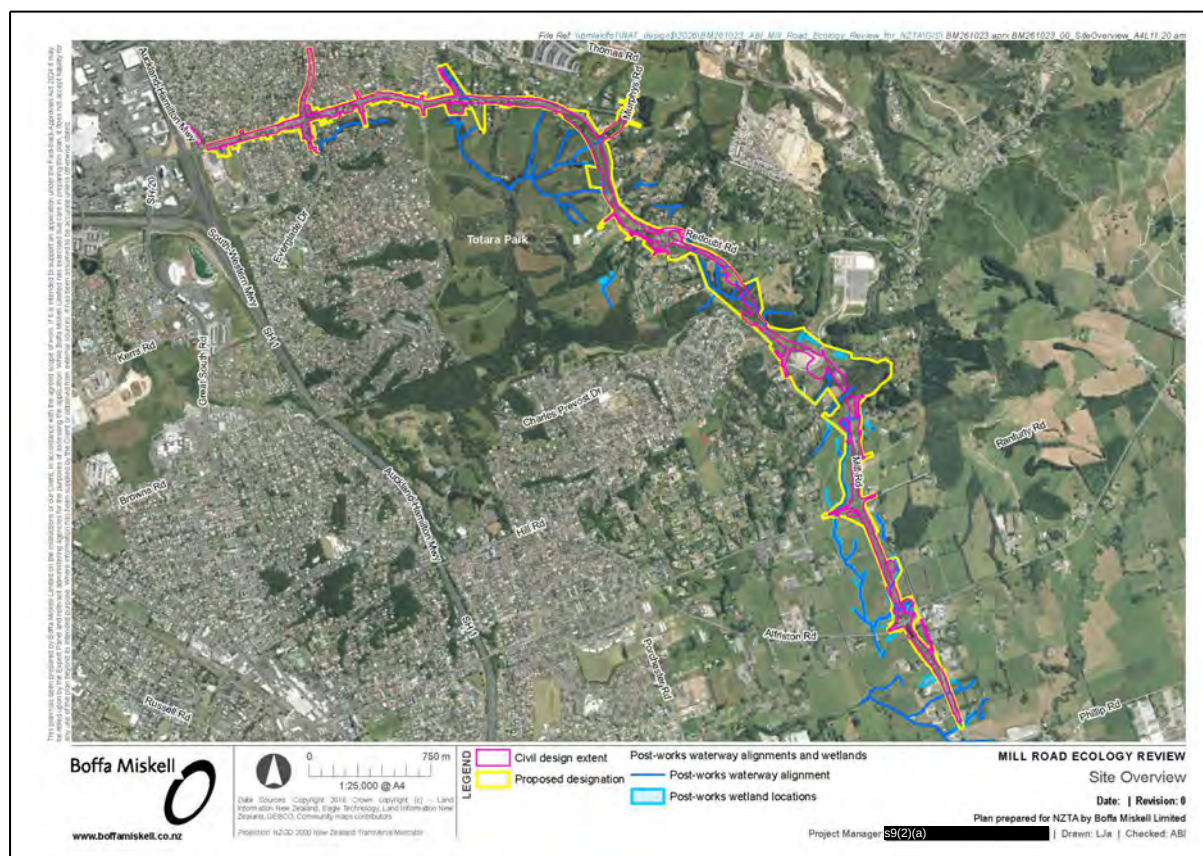


Figure 1-1 Extent of Mill Road Stage 1.

1.2 Objective and Scope

The objective of this FMP is to, as far as practicable, manage residual adverse effects on streams, wetlands, and freshwater ecological values associated with construction of the Project.

This FMP does not address effects on terrestrial habitats and fauna, which are set out in the Terrestrial Management Plan (TMP), or effects on native freshwater fish, which are detailed in the Native Fish Capture and Relocation Plan (NFCRP).

The contents of this plan cover:

- Stream diversion and stream daylighting design objectives and protocols.
- Wetland creation design objectives and protocols.
- Restoration planting of stream and wetland riparian habitat, and wetland habitat.
- Biodiversity outcome monitoring, compliance reporting and close-out reporting over the 10-year management period.

1.3 Freshwater ecological values and effects requiring management

The residual effects on freshwater ecological values that require management are spread across the alignment where culverts and stream diversions are proposed, and at the proposed restoration site in Tōtara Park. Works requiring management are outlined below in Table 1-1.

Table 1-1: Works requiring management of freshwater as part of the Project.

Ecological value or feature	Habitat type or species	Ecological value	Impact or relevance to management
Permanent Stream Diversion	Watercare Bush / Puhinui Gully SEA_T_4570	High	Approximately 126 m of stream diversion across two tributaries (S12, S13); requires diversion design, fish salvage, streamworks, restoration, pest plant control, and monitoring.
Permanent Stream Diversion	Within pastoral landscape at 174 Mill Road and 1 Wastney Road.	Low	Approximately 267 m of stream diversion across two tributaries (S20, DS05); requires diversion design, fish salvage, streamworks, restoration, pest plant control, and monitoring.
Temporary Stream diversions	Stream habitats across the alignment, as required.	Low to High	May be required at streamworks locations.
Stream Daylighting	Piped stream (TR01) in Tōtara Park	-	246 m of currently piped channel to be daylighted; requires design, streamworks, restoration, pest plant control and monitoring.
Wetland creation	Pastoral landscape in Tōtara Park (TR01W) and 2 Wastney Road (S20W).	-	Approximately 0.267 ha of natural inland wetland habitat creation across two areas; requires groundwater investigations, design, planting, buffer/riparian planting, pest plant control, and monitoring.
Stream and Wetland Restoration	116 Ranfurly Road (S17), 2 Wastney Road (S21), 38 Mill Road (PW01, MW33, MW44).		Approximately 223 m of stream/wetland complex, and 0.29 ha of wetland habitat restoration, including 10 m riparian buffer; requires planting, pest plant control and monitoring.
Freshwater Fauna	Native species including shortfin and longfin eel, banded kokopu, koura, common bully, redfin bully.	Low to High	Managed through the NFCRP. Culvert installation with fish passage – requires monitoring to assess the success of fish passage provision.

1.4 Roles and responsibilities

Table 1-2 presents the roles and responsibilities of the team delivering this FMP.

Table 1-2 Roles and responsibilities for implementation of the FMP

Role	Responsibility
Environmental Manager	• Overall implementation of and compliance with FMP • Facilitating a Project start-up meeting with the Project Ecologist and relevant contractors prior to commencement of works; • Inviting Mana Whenua to participate in and support any ecological monitoring to ensure appropriate exercise of kaitiakitanga responsibilities and that cultural concerns are addressed; • Maintaining clear lines of communication with the Project Ecologist(s), Site Manager (s) and contractors regarding works schedule and any changes; • Ensuring contractors understand ecological constraints; • Maintaining records and coordinating reporting to the relevant consent authority.
Site Manager/Construction Manager	• Reading and understanding the FMP requirements; • Facilitating a Project start-up meeting with the Project Ecologist and relevant contractors prior to commencement of works; • Coordinating timing and access with ecologists to ensure no streamworks is undertaken without appropriate ecological management.
Project Ecologist	• An ecologist that meets the requirements of a Suitably Qualified and Experienced Person (SQEP), as per the NZTA Ecological Impact Assessment Guidelines (2023) for the relevant task. • Overall ecological implementation across the Project and associated advice. • Responsibility for ecological management. • Coordination of specialist ecologists • Review of monitoring outcomes and the preparation of annual and close-out reporting.
Specialist Ecologist(s)	• Must meet the requirements of a SQEP for freshwater tasks. • Oversees and facilitates the implementation and compliance monitoring and reporting of the FMP.
Supporting Ecologist(s)	• Assisting Project Ecologist or Technical Lead Ecologist(s) with implementing this FMP as required.
Contractor(s)/Restoration Contractor	• Must understand the FMP requirements. • Undertakes site preparation, planting, pest plant control, replacement planting, maintenance and assisting with restoration monitoring and reporting.
Mana Whenua	• In accordance with the Cultural Management Plan for the Project and NZTA's commitment to ongoing engagement, Mana Whenua shall be involved in the implementation of the FMP, to advise on design and methodology, cultural protocols, requirements and procedures, cultural monitoring, and the exercise of tikanga, as appropriate.

2. Streamworks Management

2.1 Permanent Stream Diversions

The Project requires four permanent stream diversions in order to remedy and offset a portion of the impacts on, and loss of, watercourses within the Project area. Detailed stream diversion drawings for each reach must be consistent with the Stream Diversion Design Principles specified in this FMP and developed in conjunction with the Project Ecologist.

A total of 393 m of permanent stream diversion will be created across four streams. Two of the diversions are located within the Puhinui Gully SEA and are located under the proposed bridge. The remaining two diversions are located within grazed pasture within the Papakura Catchment. Maps of the proposed diversion locations are provided in **Appendix A** and include:

- S12 – Puhinui Gully: Approximately 34 m of stream diversion of the permanent channel located within the SEA to make way for bridge abutments.
- S13 – Puhinui Gully: Approximately 92 m of stream diversion of the channel located within the SEA to make way for bridge abutments.
- S16/DS05 – 174 Mill Road: Approximately 171 m diversion channel will be created taking flow from channel S16 and realigning approximately 78 m of DS05.
- S20 – 2 Wastney Road: Approximately 96 m diversion of S20 to allow the creation of the roundabout.

Detailed ecological assessments for each stream are provided in the Freshwater EclA. However, a brief summary is provided in Table 2-1 below.

Table 2-1 Location, extent management and restoration description for permanent diversion channels

Site	Location	Ecological Value	Existing Habitat
S12	Puhinui Gully SEA	High	Permanent soft-bottomed stream with high ecological value. SEV score was 'good'. At Risk longfin eel and banded kokopu present. Kōura also present. Established mixed broadleaf riparian margin.
S13		High	Permanent predominantly soft-bottomed stream with areas of bedrock. SEV score was 'fair'. At Risk longfin eel, redfin bully, and banded kokopu present. Kōura also present. Established mixed broadleaf riparian margin.
S16/DS05	Pastoral Farmland	Low	Intermittent/ephemeral soft bottom streams with low ecological value. SEV score was 'poor'. Poor riparian margin with that is highly modified, with predominantly overgrown pasture grass and exotic shrubs in places.
S20		Low	Intermittent soft bottom stream with low ecological value. SEV score was 'fair'. Poor riparian margin with overgrown pasture grass and predominantly exotic shrubs in places

2.1.1 Pre-Design Survey

A pre-design ecological and hydrological assessment shall be undertaken to measure detailed stream attributes to inform the detailed design of each stream. Attributes to record shall include, but are not limited to, channel morphology, hydrology and flow regime, and instream structures and complexity. These attributes should be measured at transects every 10 m along each reach to ensure variations

across the reach are captured. These should be undertaken by a suitability qualified Freshwater Ecologist and a Hydrologist.

2.1.2 Stream Diversion Design Principles

The stream diversions are to be ecologically functioning diversions that reflect, as much as practicable, the existing stream habitat and function of the stream. The diversions must be fit for purpose and shall endeavour to maintain or improve the ecological values of the stream to be lost. The new diversion channels must provide appropriate aquatic habitat for fish, macroinvertebrates and aquatic plants while conveying water.

The below principals are a guideline for the design and construction of the diversions.

Final design of the stream is to include cross-sectional profiles, substrate composition, longitudinal profiles and estimated baseflows.

2.1.2.1 Channel Meander

The diversion channel should mimic and improve upon, as much as practicable, the natural meanders of the section of stream being diverted. Where appropriate, the addition of boulders, submerged logs and other habitat features to aid in meander creation should be included.

2.1.2.2 Habitat Diversity and Channel Complexity

Habitat diversity and channel complexity must at a minimum replicate the channel being diverted. Where practicable, it should be improved through the creation of natural features such as runs, riffles and small and large pools. These features can be created utilising natural substrates, such as rocks, logs and large boulders.

The extent of habitat created should at a minimum replicate existing habitat. The creation of habitat within S12, S13 and S16/DS05 should seek to improve upon existing habitat. The creation of habitat within S20 may be more limited as the high sediment load and natural slow run of the existing channel may result in features becoming smothered with fine sediments. Notwithstanding this, the creation of habitat features within S20 will increase stream heterogeneity and stability.

The stream design should ensure that there is a baseflow, or a low-flow, channel, a bank full channel and a suitable floodplain area. The creation of the baseflow channel aims to maintain flowing water as much as practicable during dry conditions, notwithstanding the intermittent nature of some of the channels. A baseflow channel will provide refugia for fish and for fish movement during drier periods.

2.1.2.3 Stream depth, wetted width, and velocity

Stream depth and wetted width affect the total area that that can be utilized by aquatic biota, and the volume of water conveyed during normal base flows. Stream widths, depths and flows should mimic, as much as practicable, that of the stream to be diverted. Water velocities can affect macroinvertebrates, fish and macrophyte establishment as individual species have differing flow preferences. The diversion channels should initially seek to replicate base flow velocities in existing channels.

Fish passage should be maintained throughout the channel through sufficient water depth and velocity, where seasonal fluctuations in water flow are sufficient.

A suitably qualified Hydrologist should help guide stream design to ensure the stream design allows for sufficient water flow to maintain ecological functionality.

2.1.2.4 Riparian Vegetation

Riparian vegetation is integral to the ecological success of the stream diversions. The final stream design must allow for the planting of riparian vegetation close to and extending over the water surface to create sufficient stream edge habitat. This will provide shading to the water surface, detritus in the form of fallen leaves and potential habitat for fish and macroinvertebrate species.

All stream diversions are to undergo riparian planting, with a minimum of 10 m of planting either side of the channel. Riparian planting is to be consistent with the riparian restoration detailed in Section 3 below and the Planting Plan in **Appendix C**.

2.1.3 Construction Method

The final construction methods for each diversion channel will be finalized in consultation with the Project Ecologist, Site Manager, Construction Manager and Machine Operator.

Table 2-2 below describes the guiding methods for the construction of permanent diversion channels for the Project.

Table 2-2 General construction principals and indicative process for permanent diversion of streams.

Stage		Process
Stage 1	Pre-construction	Detailed design of stream diversion provided to Construction Manager.
		All instream works must be in accordance with the relevant Erosion and Sediment Control Plan (ESCP).
		A pre-construction site visit must be undertaken by the Project Ecologist, Site Manager, Construction Manager and Machine Operator.
		The final stream design must be completed. The pre-construction meeting should discuss the construction methods taking into account the final design and conditions. The meeting should discuss, but not be limited to: • Construction method to ensure stream design is adhered to. • Timing of construction, including stream livening, fish salvage and key inspections by Project Ecologist.
Stage 2	Offline diversion channel creation	The offline channel must be created prior to any reclamation of the original channel. Erosion and sediment controls must be in place prior to stripping topsoil.
Stage 3	Diversion channel creation and inspection	Following the completion of the diversion channel, it must be inspected by the Project Ecologist and Site Manager to allow any design refinements. Ecological sign off by the Project Ecologist must be complete prior to the livening of the diversion and reclamation of the original channel.
Stage 4	Fish salvage	Prior to livening on the new channel and reclamation of the original channel, fish salvage should be undertaken in accordance with the NFCRP.
Stage 5	Channel livening	Channel livening should occur when there is no immediate rain forecast and when stream is in low flow. During the low flow period, pump equipment and dam to be removed resulting in new 'live' diversion channel. Fish exclusion nets may be removed once channel is claimed.

Stage 6	Post – Construction	First flush to be monitored for water quality, erosion and sediment discharges Restoration planting of riparian margins of the diversion. As per Section 3. Post-construction ecological outcome monitoring to occur as outlined in Section 5.
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2.2 Temporary Stream Diversions

Temporary stream diversions will be required at several streamworks locations during the construction phase and may be in place for up to three months, or longer where necessary.

Detailed streamworks methodologies for temporary diversions must be consistent with this FMP and the following principles:

- Temporary clean water diversion channels are to be constructed and stabilised offline, before livening.
- Where practicable, temporary diversions should be used during periods of low flow during summer conditions. In some cases, streamworks locations may contain no water during this season.
- Temporary diversions must be stabilised by lining with geotextile fabric, or similar, to reduce erosion.
- If required, erosion protection measures shall be installed at upstream and downstream tie-in points on the existing channel.
- Temporary diversions shall, where practicable, provide fish passage for streamworks locations in which there is upstream habitat present.

2.3 Stream Daylighting

Daylighting of a piped stream within Tōtara Park forms part of the mitigation of residual effects on streams for the Project. The objective of daylighting is to return the watercourse to an ecologically functioning stream. Approximately 246 linear m of stream at TR01 Tōtara Park (refer to **Appendix A** for Location Map) is proposed to be daylighted as shown in Figure 2-1.



Figure 2-1 Historical imagery of TR01 dated from the 1950s. Site location shown in red (source Auckland Council GeoMaps)

Historical imagery shows the stream was likely piped prior to the 1950s (Figure 2-1). Consequently, the reference condition of this stream is unknown. When designing the daylighted channel, adjacent intermittent tributaries within the wider Tōtara Park have been used alongside best practice methods.

2.3.1 Daylighting Principles

The Stream Diversion Design Principles described in Section 2.1.2 shall be used for the design of the daylighted stream channel, with adjacent intermittent tributaries within Tōtara Park used as reference streams.

Assumptions about the ecological attributes of the daylighted channel have been made to calculate the assumed SEVm-P score as part of the offset mitigation for the Project. These assumptions are detailed in Appendix H of the Freshwater EclA. Some key assumptions are:

- The channel will be an average of 1 m wide.
- The SEVm-P is 0.591.

The detailed stream channel design for the daylighted channel must be consistent with the Stream Diversion Design Principles specified in this FMP and shall be developed in conjunction with the Project Ecologist. The stream design must be informed by a hydrological assessment of the currently piped stream, to ensure the stream is designed to have sufficient hydrological connection to surface and/or groundwater flows to sustain an ecologically functioning stream.

2.3.2 Construction Methodology

Table 2-3 below describes the indicative process for stream daylighting within intermittent stream habitat. The final construction method is to be finalised between the Project Ecologist and Construction Manager.

Table 2-3 General construction principals and indicative process for stream daylighting.

Stage		Process
Stage 1	Pre-construction	Detailed design of stream diversion provided to Construction Manager. All instream works must be in accordance with the relevant ESCP.
		A pre-construction site visit must be undertaken by the Project Ecologist, Site Manager, Construction Manager and Machine Operator. The final stream design must be completed and available. The pre-construction meeting should discuss the construction methods considering the final design and conditions at the time. The meeting should discuss, but not be limited to: • Construction methodology to ensure stream design adhered to. • Protocols if fish are discovered during daylighting. • Timing of construction, including stream livening and key inspections by Project Ecologist.
Stage 2	Temporary Stream Diversion	Prior to any major instream works, the water entering the piped stream must be diverted around the works area. This will be undertaken by creating a clean water diversion bund around the streamworks area. This will take water from the existing upstream stormwater outlet, to below the streamworks area. This clean water diversion bund and associated channel must be constructed and stabilised before any daylighting streamworks commences. The lower end of the works area should have fish exclusion net installed, to prevent fish moving up into the daylighted channel prior to completion.
Stage 3	Daylighting / channel creation	Erosion and sediment controls must be in place prior to the stripping topsoil. The creation of the channel should follow the existing flow path. As the channel is created, the area should be progressively stabilised to minimise exposed working areas.
Stage 4	Diversion channel inspection	Following the completion of the daylighted channel, it must be inspected by the Project Ecologist and Site Manager to allow any design refinements. Ecological sign off by the Project Ecologist must be complete prior to the livening of the channel.
Stage 5	Channel livening	Channel livening should occur when there is no immediate rain forecast. The upstream clean water diversion should be removed, allowing water to flow through the new daylighted channel. The lower fish exclusion net must be removed.

Stage 6	Post – Construction	Restoration planting of riparian margins of the diversion. As per Section 3. Post-construction ecological outcome monitoring to occur as outlined in Section 5.
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2.4 Wetland Creation

Two wetlands are to be created as part of the management of residual effects of the Project. The wetlands are to function as natural inland wetlands, as opposed to water treatment devices, providing ecologically functioning wetland habitat.

This section sets out specifications for the design, construction, and maintenance of the constructed natural inland wetlands. Detailed wetland design and engineering must be consistent with the Wetland Design Principles specified in this FMP and developed in conjunction with the Project Ecologist, Project Engineer, and a Landscape Architect.

A total of 0.267 ha of natural inland wetland habitat will be created across two areas. Maps of the wetland creation locations are provided in **Appendix A**. The locations are:

- 2 Wastney Road (S20) – A 0.053 ha wetland to be created adjacent to the S20 stream diversion. This area is currently grazed pasture.
- Totara Park (TW01) – A 0.214 ha wetland to be created adjacent to the TR01 daylighted channel. This area is currently grazed pasture.

2.4.1 Wetland Design Principles

The constructed wetlands are to be ecologically functional natural inland wetlands that provide improved habitat relative to that which is being lost. The final design of the wetlands must be consistent with the following principles:

- Groundwater and hydrological monitoring and/or modelling must be undertaken by a suitably qualified Hydrologist prior to construction to characterize the source, volume, quality and variability of the inflow to the constructed wetlands. The design of the constructed wetlands must ensure adequate hydrology to maintain an ecologically functional natural inland wetland. Given the intermittent nature of adjacent watercourses, the wetlands may be intermittent in nature, with seasonal fluctuations in water levels.
- Both wetlands are located next to streams, and hydrological monitoring must ensure that the creation of wetlands will not reduce ecological functionality of adjacent streams.
- The final design should incorporate areas of different hydrology within the wetlands; with lower areas that create shallower water habitats, and higher margins which are positioned above the shallow water, but with saturated soils in the root zone. This provides a variety of habitats for indigenous plant species.
- Planting of the wetlands must be consistent with the Planting Plan in Appendix C. Once the wetlands are constructed, they are to be inspected by the Project Ecologist and/or the Landscape Architect to finalise the location of planting zones and plants. Plants must be eco-sourced from the Hunua or Manukau Ecological Districts.
- The wetlands are to be fenced off with fencing suitable to exclude stock.

2.4.2 Construction Methodology

The final construction methods for each of the wetlands should be finalized in consultation with the Project Ecologist, Site Manager, Construction Manager, and Machine Operator.

Table 2-4 below describes the guiding methods for the construction of wetlands for the Project.

Table 2-4 General construction principals and indicative process for construction of wetlands.

Stage		Process
Stage 1	Pre-construction	Monitoring undertaken by suitably qualified hydrologist to ensure final design will support a natural inland wetland. Detailed design of the wetland provided to Construction Manager. All works must be in accordance with the relevant ESCP.
		A pre-construction site visit must be undertaken by the Project Ecologist, Site Manager, Construction Manager and Machine Operator. The final wetland design must be completed and available. The pre-construction meeting should discuss the construction methods considering the final design and conditions at the time. The meeting should discuss, but not be limited to: • Construction methodology to ensure wetland design adhered to. • Timing of construction, including stream livening and key inspections by Project Ecologist.
Stage 2	Wetland Creation	Erosion and sediment controls must be in place prior to the stripping topsoil as both wetlands are located next to streams / streams to be daylighted.
Stage 3	Pre-planting Inspection	Following the completion of construction of the wetland, it shall be inspected by the Project Ecologist, Landscape Architect and Site Manager to inspect the hydrology of the wetland and ascertain if it meets the detailed design. Any refinements must be undertaken prior to planting.
Stage 6	Post – Construction	Planting of the wetlands and buffer planting and fencing. Planting of the wetland should be undertaken between April and October. Planting maintenance to be undertaken as per Section 3.4. Ecological outcome monitoring to occur as described in Section 5.

3. Stream and Wetland Planting

The project will result in unavoidable impacts to stream and wetland habitat for which residual impacts need to be offset. This section describes the methodology for stream and wetland planting to ensure effects are appropriately mitigated.

This stream and wetland planting section consolidates the planting associated within stream and wetland riparian restoration, stream diversions, stream daylighting, and wetland creation, as the planting and methods for each are the same.

The SEV and ECR were used to calculate the quantum of restoration required to offset for effects on streams, which is detailed in the Freshwater EclA.

3.1 Restoration Locations

A combination of restoration activities is required to ensure successful mitigation of residual effects. Table 3-1 below outlines the restoration activities for the Project. Many of the wetlands present within the impact catchments, particularly the Papakura catchment, are riparian wetlands that are associated with streams. Consequently, restoration sites include stream-wetland complexes where restoration includes both wetland and stream riparian planting.

Descriptions of the current ecological values and photographs of the sites are provided in **Appendix B**.

Table 3-1 Location, extent and restoration description for the Project.

Location	Type	Length (m)	Area (ha)	Restoration description
Stream Riparian Planting (10 m buffer)				
116 Ranfurly Road (S17)	Stream-wetland complex	349 m	-	Restoration of riparian margin within grazed pasture.
2 Wastney Road (S21)	Stream-wetland complex	223 m	-	Restoration of riparian margin within grazed pasture.
Tōtara Park (TR01)	To-be-daylighted stream with wetland fringes.	246 m	-	The existing stream is currently piped and will be daylighted, including contouring of the stream banks. These, and the riparian margin, will then be restored.
Restoration of Wetlands and their Riparian margins (10 m buffer planting)				
116 Ranfurly Road (S17)	Stream-wetland complex	-	0.267 ha	Restoration of riverine wetland currently dominated by low-value exotic species.
2 Wastney Road (S21)	Stream-wetland complex	-	0.133 ha	Restoration of riverine wetland currently dominated by low-value exotic species.
Tōtara Park (TR01)	Constructed wetland	-	0.214 ha	Creation of a natural inland wetland and planting within the wetlands and its riparian margin.
38 Mill Road (PW01, MW33 and MW34)	Degraded natural inland wetlands	-	0.289 ha	Restoration of wetlands currently dominated by low-value exotic species.
2 Wastney Road (S20)	Constructed Wetland	-	0.053 ha	Creation of a natural inland wetland and planting within the wetlands and its riparian margins.

Location	Type	Length (m)	Area (ha)	Restoration description
Stream Diversion Riparian Restoration				
Puhunui Gully (S12)	Stream diversion	33.84 m	-	Restoration of riparian margin following diversion of stream, within SEA.
Puhunui Gully (S13)	Stream diversion	91.54 m	-	Restoration of riparian margin following diversion of stream, within SEA.
174 Mill Road (S16/DS05)	Stream diversion	171.1 m	-	Restoration of riparian margin following of diversion of stream, within grazed pasture.
2 Wastney Road (S20)	Stream diversion	96.31 m	-	Restoration of riparian margin following of diversion of stream, within grazed pasture.

3.2 Riparian and Wetland Planting Principles

The objective of riparian planting of streams and riparian wetlands is improvement in aquatic habitat values, including improved water quality parameters, increased shading, reduced bank erosion, and increased habitat complexity. The following principles are to be followed:

- A minimum average 10-meter riparian width, from the edge of the stream channel or wetland, is to be planted.
- Planting shall generally occur during the standard planting season from April to October unless otherwise approved by the Project Ecologist.
- All plants used should be eco-sourced from the Manukau and/or the Hunua Ecological District, to ensure they are well suited to the conditions.
- All plant specimens from the *Myrtaceae* family must be free of myrtle rust.
- The riparian planting must be designed to achieve an average of 80% shading of the stream channel and 90% canopy closure at 10 years after the completion of planting of the stream reach.
- Wetland planting should achieve 90% survival rates at 10 years after the completion of planting.
- Planting shall be completed in general accordance with the planting plans in **Appendix C**.
- All planting shall be fenced off from livestock to prevent browsing.

3.3 Planting Methods

Prior to restoration planting the site must be prepared to ensure successful planting.

3.3.1 Site preparation

Before planting, pest plant control shall reduce competitive pasture grasses and woody pest plants to a level that allows planting to proceed without high risk of native plant loss. Areas dominated by kikuyu, blackberry, tradescantia, privet, woolly nightshade, gorse, or climbing vines may require staged control and follow-up treatment before planting. Planting shall not proceed where pest plant abundance is likely to prevent native plant establishment unless the Project Ecologist approves a staged planting and maintenance approach with sufficient follow-up control.

Exotic and pest plant species are to be removed as part of the riparian restoration works. Pest plants are defined as those species requiring control or eradication by *The Auckland Regional Pest Management Plan 2020-2030* (Auckland Council, 2020).

Table 3-2 lists the typical pest plant species within the Project area that require sustained control. All stream restoration and wetland planting that is located within rural areas shall be fenced, with fencing to be set back a minimum of 1 m from the edge of restoration planting.

Table 3-2: Common pest plant species that may be encountered and are required to be controlled

Species	Scientific Name	Control Methods
Arum lily	<i>Zantedeschia aethiopica</i>	Dig out tubers; cut and stump larger plants and paint stems.
Barberry	<i>Berberis glaucocarpa</i>	Physically remove small plants; targeted herbicide treatments for larger, established shrubs
Blackberry	<i>Rubus fruticosus</i> agg.	Dig out small patches; dispose of crowns and rhizomes; spray regrowth once stems are long enough and have fully developed leaves.
Climbing asparagus	<i>Asparagus scandens</i>	Dig out the root crown and rhizomes completely, or apply herbicide to cut stems during active growth in spring and early summer.
Gorse	<i>Ulex europeaus</i>	Cut and stump paint; follow up seedlings and regrowth.
Japanese honeysuckle	<i>Lonicera japonica</i>	Dig out small plants; cut and stump paint larger plants; spray where appropriate during active growth.
Privet (tree, Chinese and common)	<i>Ligustrum lucidum</i> , <i>L. sinense</i> and <i>L. vulgare</i>	Pull or dig seedlings; cut and stump paint larger stems; drill and poison large stems where required.
Tradescantia	<i>Tradescantia fluminensis</i>	Rake and hand pull from infestation edges toward the centre; avoid spreading fragments; spray larger areas where required.
Woolly nightshade	<i>Solanum mauritianum</i>	Pull and dig seedlings; cut and stump paint larger plants.

3.3.1.1 Lizard Management

All indigenous lizards are fully protected under the Wildlife Act 1953. Therefore, it is an offence to kill or injure indigenous lizards. There is the potential for copper skink to be present within the riparian margins of streams and wetlands. The Lizard Management Plan (LMP) for the Project (NZTA, 2026) includes specific provisions for vegetation removal where there is the potential to harm lizards. The Contractor should take note of these provisions prior to vegetation removal and should consult with the Project Ecologist if vegetation removal is going to occur to ensure appropriate lizard management protocols have been implemented.

3.3.2 Planting requirements

Planting plans are included in **Appendix C**. The species selected for the planting plans were guided by: Te Whakaoranga o Te Puhinui¹, and Te Haumanu Taiao: Restoring the natural environment in Tāmaki Makaurau².

¹ <https://www.audo.co.nz/projects/te-whakaoranga-o-te-puhinui/>.

² <https://www.tiakitamakimakaurau.nz/media/dzwilya2/te-haumanu-taiao-restoring-natural-environment-t%C4%81maki-makaurau.pdf>

Planting shall be undertaken by personnel experienced in native revegetation. Plants shall be set out before planting so that species distribution, spacing, and density can be checked by the Restoration Contractor and, where required, the Project Ecologist. Species shall be distributed to reflect site conditions.

Planting lists are provided in Table 3-3 and Table 3-4 below. Full planting lists including size, spacing and ratios are provided in **Appendix D**.

Table 3-3 Riparian restoration plant species.

Stream Riparian Mix			
Māori / Common Name	Botanical Name	Māori / Common Name	Botanical Name
Stream Edge			
Toetoe	<i>Austroderia fulvida</i>	Pūkio	<i>Carex virgata</i>
Kiokio	<i>Blechnum novae-zelandiae</i>	Putaputawētā	<i>Carpodetus serratus</i>
Forest sedge	<i>Carex dissita</i>	Ti kōuka/cabbage tree	<i>Cordyline australis</i>
Rautahi	<i>Carex geminata</i> ; <i>C. lessoniana</i>	Koromiko	<i>Veronica stricta</i> var. <i>stricta</i>
Back Wetland			
Toetoe	<i>Austroderia fulvida</i>	Ti kōuka/cabbage tree	<i>Cordyline australis</i>
Kiokio	<i>Blechnum novae-zelandiae</i>	Giant umbrella sedge	<i>Cyperus ustulatus</i>
Forest sedge	<i>Carex dissita</i>	Mānuka	<i>Leptospermum scoparium</i>
Rautahi	<i>Carex geminata</i> ; <i>C. lessoniana</i>	Harakeke/flax	<i>Phormium tenax</i>
Pūkio	<i>Carex virgata</i>	Patē	<i>Schefflera digitata</i>
Flood Area			
Toetoe	<i>Austroderia fulvida</i>	Ti kōuka/cabbage tree	<i>Cordyline australis</i>
Kiokio	<i>Blechnum novae-zelandiae</i>	Mānuka	<i>Leptospermum scoparium</i>
Forest sedge	<i>Carex dissita</i>	Māhoe	<i>Melicytus ramiflorus</i>
Rautahi	<i>Carex geminata</i> ; <i>C. lessoniana</i>	Harakeke/flax	<i>Phormium tenax</i>
Pūkio	<i>Carex virgata</i>	Koromiko	<i>Veronica stricta</i> var. <i>stricta</i>
Putaputawētā	<i>Carpodetus serratus</i>		
Dry Slope			
Toetoe	<i>Austroderia fulvida</i>	Houhere/lacebark	<i>Hoheria populnea</i>
Kiokio	<i>Blechnum novae-zelandiae</i>	Kānuka	<i>Kunzea robusta</i>
Forest sedge	<i>Carex dissita</i>	Mānuka	<i>Leptospermum scoparium</i>
Rautahi	<i>Carex geminata</i> ; <i>C. lessoniana</i>	Māhoe	<i>Melicytus ramiflorus</i>
Pūkio	<i>Carex virgata</i>	Māpou	<i>Myrsine australis</i>
Putaputawētā	<i>Carpodetus serratus</i>	Harakeke/flax	<i>Phormium tenax</i>
Karamū	<i>Coprosma robusta</i>	Kōhūhū	<i>Pittosporum tenuifolium</i>
Ti kōuka/cabbage tree	<i>Cordyline australis</i>	Ribbonwood	<i>Plagianthus regius</i> subsp. <i>Regius</i>
Giant umbrella sedge	<i>Cyperus ustulatus</i>	Patē	<i>Schefflera digitata</i>
Porokaiwhiri	<i>Hedycarya arborea</i>	Koromiko	<i>Veronica stricta</i> var. <i>stricta</i>

Table 3-4 Wetland plant species.

Wetland Mix			
Māori / Common Name	Botanical Name	Māori / Common Name	Botanical Name
Oioi	<i>Apodasmia similis</i>	Sharp Spike Sedge	<i>Eleocharis acuta</i>
Jointed Twigrush	<i>Baumea articulata</i>	Wiwi	<i>Ficinia nodosa</i>
Purei	<i>Carex secta</i>	Baumea	<i>Machaerina rubiginosa</i>
Pukio	<i>Carex virgata</i>	Pakihi Rush	<i>Machaerina teretifolia</i>
Ti Kouka	<i>Cordyline australis</i>	Harekeke	<i>Phormium tenax</i>
Upokotangata	<i>Cyperus ustulatus</i>		

Planting shall occur during the standard planting season from April to October (inclusive) unless otherwise approved by the Project Ecologist. Plant stock shall be healthy, vigorous, pest and disease free, not root-bound, well rooted with active new root growth, true to form, and suitable for the site conditions.

Plant holes shall be deep and wide enough to allow the root ball to be placed without compression or folding, with the plant collar approximately 1 cm below ground level. Grass and competing vegetation shall be cleared from around planting holes. Fertiliser tablets may be used where specified. Plants shall be firmed in to remove voids and reduce waterlogging risk. Bamboo stakes or other markers may be used to assist maintenance and monitoring.

3.3.2.1 Planting Programme

The stream and wetland planting programme shall be staged to align with streamworks. Planting should be completed within two suitable planting seasons following completion of streamworks in each relevant location, unless otherwise agreed by the Project Ecologist.

Maintenance, pest plant control, and monitoring shall continue for the 10-year management period from the completion of each relevant stage of stream and wetland planting. A guiding implementation programme is provided in Table 3-5.

Table 3-5 Stream and wetland planting implementation programme.

Activity	Indicative timing	Implementation requirement
Site preparation inspection	December to February before planting	Confirm pest plants, fencing, access, soil moisture, slope, aspect, and ecological features.
Pre-planting pest plant control	Summer to early autumn before planting	Control pest plants to a low level before planting and complete follow-up control where regrowth occurs.
Stock exclusion fencing	Before planting where required	Install permanent or temporary stock-proof fencing to protect planting areas.
Undertake planting	April to October	Undertake planting.
Maintenance	Years 1 to 10	Undertake replacement planting, plant releasing, pest plant control, pest animal control (within areas specified in TMP), watering where required, and remedial actions.
Outcome monitoring	Years 3, 6, and 10	Assess trajectory against performance standards and identify remedial actions if required.

3.4 Post-Planting Maintenance

Post-planting maintenance shall occur following practical completion of the stream and wetland planting for the 10-year management period to support plant establishment. During the first 12 months following planting, a minimum of six maintenance visits must be undertaken. Visit timing shall respond to pest plant growth, plant stress, drought risk, and replacement planting needs. After the first year, the maintenance frequency may be reduced where plant losses are less than 10% and pest plant competition is controlled. Any reduction in maintenance frequency shall be approved by the Project Ecologist.

Plants that do not survive shall be replaced during the next suitable planting season with the same species or another appropriate species from the relevant planting list. Replacement planting shall be undertaken where plant loss creates gaps, reduces canopy closure, reduces pest plant suppression, or prevents performance standards from being achieved.

Post-planting pest plant control shall occur as part of post-planting maintenance at least twice per year during Years 1 to 3, once in spring and once in autumn, with additional visits where pest plant growth threatens planting success. From Years 4 to 10, pest plants shall be controlled annually or more frequently where required to maintain performance standards.

Maintenance actions that might be required include replacement planting, plant releasing³, pest plant control, watering where required, and remedial actions.

3.4.1 Pest Animal Control

Pest animal control shall apply to the riparian and wetland planting areas where they form part of the terrestrial restoration package. Accordingly, pest animal control will be undertaken in accordance with the TMP, as detailed in Section 6.11 therein.

3.5 Key Performance Indicators

The following key performance indicators (KPIs) shall be used to assess whether planting has been implemented correctly and is progressing towards the required ecological outcomes.

The KPIs are:

- Planting shall be 100% complete at practical completion for each relevant location.
- Plant losses shall not exceed 10% at the end of the defects liability and maintenance period for each relevant location, unless the Project Ecologist confirms that losses are minor, dispersed, and do not compromise ecological function.
- Riparian planting shall show a positive trajectory toward at least 90% canopy coverage of the ground within 10 years.
- Riparian planting shall show a positive trajectory toward at least 80% shading of stream surface.

The Ecological Outcome Monitoring will be assessed by the Project Ecologist to determine if the KPIs are currently, or likely to be achieved within the 10-year maintenance period (See Section 5.2.2 monitoring frequency). If they are not, the Project Ecologist shall develop, with the Restoration Contractor, a remedial planting and maintenance plan with measures to remediate the issues identified and ensure successful implementation of the proposed restoration and enhancement within the 10-year management period.

The remedial actions will be outlined in the remedial planting and maintenance plan, and will be dependent on the issues identified, but may include:

- Replacement planting shall be undertaken where plant losses create persistent gaps, expose soil, reduce habitat connectivity, increase pest plant risk, or prevent ecological targets being achieved.

³ The clearing of competing grass, weeds, and unwanted vegetation from around plantings.

- Increased maintenance frequency, including additional release weeding, plant checks, and targeted remedial works during high-growth periods.
- Revise pest plant control methods and/or intensify pest plant maintenance, including additional control rounds, changes to herbicide follow-up treatment, targeted control of problem areas, and treatment of seedling recruitment.
- Improve site conditions, watering during dry establishment periods, or addressing erosion of inundation.

3.6 Stream and Wetland Planting Reporting

3.6.1 Planting completion and compliance report

A compliance confirmation report shall be prepared within 30 working days of completion of each relevant planting location by the Restoration Contractor and submitted to Auckland Council. The report shall confirm planting species and number of plants installed, area and location of planting, whether planting matched the approved species matrix and density, pest plant control completed before planting, stock fencing completed where required, and photographs of completed works.

3.6.2 Annual reporting

An annual report shall be prepared detailing the following for the stream and wetland planting undertaken. The report shall cover the period from 1 May to 30 April and shall be submitted to Auckland Council by the end of June;

- areas planted;
- species and numbers planted;
- pest plant control completed;
- replacement planting undertaken;
- watering or drought response;
- stock fencing installed or maintained;
- monitoring results;
- plant survival;
- canopy closure trajectory;
- pest plant issues;
- any incident and corrective actions; and
- any recommendations for works for the following year.

3.6.3 Close-out report

A final close-out summary of all stream and wetland planting shall be included in the final close-out report at the end of the 10-year management period for the relevant location. The close-out summary shall assess whether performance standards have been achieved, identify any outstanding remedial actions required to meet finite obligations, and provide an evidence-based conclusion on the performance of the restoration and enhancement package.

4. Fish Passage

An assessment of fish passage is required at all new culverts (where fish passage has been provided for), stream diversion and stream daylighting sites following completion of construction.

In-stream structures, such as culverts, are required to provide for the same fish passage upstream and downstream that would have existed without the structure. To facilitate fish passage, the design was developed in accordance with the New Zealand Fish Passage Guidelines (Franklin et al., 2018).

Monitoring of fish passage will be undertaken during the 10-year monitoring period

4.1 Monitoring Locations

Monitoring, as described below in 4.2, will be undertaken at each of the location listed in Table 4-1, in different capacities. For further details on culverts refer to Appendix G of the EclA. Monitoring includes the culvert and any associated riprap.

Table 4-1 : Locations / instream structures requiring fish passage monitoring.

Culvert / Diversion Name	Address	Stream	Fish Passage Structure	Fish Species ¹
MM04	174 Mill Rd	S16/ DS05	Spoiler Baffles / Spat Rope	Shortfin eel
MM04B	116 Ranfurly Rd 2 Wastney Rd	S17/ S18	Spoiler Baffles / Spat Rope	Shortfin eel
MM05	2 Wastney Rd	S21	Streambed	Shortfin eel
MM06	2 Wastney Rd	S20	Streambed	Shortfin eel
MM10	333 Mill Rd 356 Mill Rd	S22	Streambed	Shortfin eel
S12	Puhinui Gully	S12	Diversion	Common bully, banded kōkopu, shortfin eel, longfin eel
S13	Puhinui Gully	S13	Diversion	
S16/DS05	174 Mill Road	S16/DS05	Diversion	Shortfin eel
S20	2 Wastney Road	S20	Diversion	Shortfin eel

Note: ¹ fish species assumed to be present and requiring passage through the structure/channel. Based off results of fish surveys detailed in the Freshwater EclA.

The fish communities/species that fish passage is to provide for has been taken from the Freshwater EclA. Further pre-construction baseline fish community/species information will be obtained during fish salvage associated with each structure/channel.

4.2 Survey Methods

Following completion of construction and livening of the channel, visual fish passage assessments are to be undertaken to assess if there are any visible fish passage issues. Over the first year following livening, fish passage assessment should be undertaken quarterly to assess passage for different flow conditions. Surveys shall then be conducted once a year at Years 3, 6 and 10.

During monitoring, the following assessments will be undertaken:

- Fish Passage Assessment Tool (FPAT) (NIWA, 2018)
 - o Where culverts exist, FPAT completed.

- Photographs
 - o Clear photographs are to be collected of each culvert, or the proposed culvert location. The photopoint should be geolocated to be used for future monitoring.
- General Observations
 - A visual inspection by a suitably qualified Freshwater Ecologist on the provision of fish passage through the feature for freshwater fish. Anticipated fish species that the assessment is based on to be informed by the EcIA and any available recent data including; eDNA, NZFFD or fish salvage results.
 - Any physical issues (e.g. high velocity, shallow water depth) for the culvert, riprap or diversion channel are to be noted and any suggestion actions.
 - Where a fish passage impediment is identified, its severity will be classified as minimal, partial, substantial, or total and will require trigger monitoring as detailed in section 4.3.

4.3 Trigger Monitoring

If visual assessments determine that there is a potential or actual fish passage impediment, then it will trigger further assessment through the collection of eDNA.

eDNA is to be collected both upstream and downstream⁴ of the potential impediment. Results should be analyzed by the Project Ecologist alongside fish data from the Freshwater EcIA and other databases.

If a fish passage impediment is confirmed, a Fish Passage Remediation Plan (FPRP) will be developed by the Project Ecologist in consultation with the Environment Manager and relevant Project Team members. The FPRP must describe measures to remediate the issues identified and ensure successful fish passage within the 10-year monitoring period. This may include measures such as such as retrofitting of baffles or spat rope, or revision of the design of the structure and/or channel. The FPRP may require extra monitoring as a result of the impediment.

4.4 Reporting

A brief annual monitoring report will be prepared following each monitoring year and submitted to Auckland Council. For the first-year post-livening reporting will incorporate each quarterly assessment. The report will include:

- eDNA results, if required, and interpretation
- FPAT results
- Photographic records
- Any structural or functional issues identified that indicate that the provision of fish passage has been reduced, and the accompanying fish passage remedial plan.

⁴ Downstream eDNA must be collected sufficiently downstream of the culvert to capture possible native fish species that may be resident below the culvert. No natural, or other, fish passage impediments are to be present between the eDNA collection site and the culvert.

5. Performance Criteria and Ecological Outcome Monitoring

This section sets out the performance criteria and monitoring required to assess whether the effects management package is delivering the intended ecological outcomes of the 10-year management period. This is not a stand-alone management response but a mechanism for monitoring and evaluating the implementation and effectiveness of stream diversions, daylighting, wetland creation, and stream and wetland planting, and their associated maintenance obligations.

5.1 Performance criteria

Table 5-1 summarises the performance criteria to assess whether the ecological outcomes have been achieved.

Table 5-1 Assessment attribute, metrics/protocols, and the performance criteria for each of the mitigation and offsetting measures.

Assessment attribute	Metric/protocol	Performance criteria
Diversions		
Riparian Planting	Visual assessment	Canopy cover achieves an average of 90%, and 80% stream shade
Stream channel conveyance, hydrologic functionality and geomorphic processes	Visual assessment	Channel conveyance, hydrological functionality and geomorphic processes of the reach are stable, with few ongoing issues such as erosion hotspots, excessive sedimentation or loss of habitat features.
Macro-invertebrates	Taxa Numbers, MCI-sb, EPT, %EPT	S12, S13 Diversion: ≥ Band B. S20 diversion: ≥ Band D.
Native Fish Communities	Fish IBI, taxa abundance and diversity.	No reduction in taxa diversity.
Daylighting		
Riparian Planting	Visual assessment	Canopy cover achieves an average of 90%, and 80% stream shade
Ecological function	SEV survey (Neale et al., 2011)	SEV score to be no less than 10% of the predicted SEVm-P score of 0.591.
Stream channel conveyance, hydrologic functionality and geomorphic processes	Visual assessment	Channel conveyance, hydrological functionality and geomorphic processes of the reach are stable, with few ongoing issues such as erosion hotspots, excessive sedimentation or loss of habitat features.
Wetland Creation		
Wetland hydrology	Wetland delineation tool (Ministry for the Environment, 2022)	Meet the definition of Natural Inland Wetland
Wetland planting and canopy cover	Visual assessment	Wetland planting should achieve a 90% survival rate of native vegetation and a ≥90% native canopy cover

Assessment attribute	Metric/protocol	Performance criteria
Stream and wetland planting (Restoration)		
Wetland condition	WCI (Clarkson et al., 2004)	Wetland condition is maintained or improved
Planting	Visual assessment	Canopy cover achieves an average of 90%. Streamside planting has an average stream channel shade of 80%.
Fish passage		
Fish Passage	Fish Passage Assessment Tool (FPAT) (NIWA, 2018), or eDNA if triggered	No impediment to assumed fish species.

5.2 Ecological Outcome Monitoring

Overall ecological outcome monitoring is to be undertaken at Years 1, 3, 6, and/or 10 following completion of each stage, to assess trajectory towards meeting performance criteria. Other ecological attributes have additional monitoring and reporting requirements as detailed in Table 5-2 to Table 5-5.

Section 7 describes contingency measures and triggers where monitoring shows that outcomes are unlikely to be achieved within the 10-year period. Final close-out reporting outlining completion of requirements is based on whether performance standards and ecological outcomes have been achieved. The close-out report shall detail any final remedial works required.

5.2.1 Stream diversions and daylighted channel

Monitoring of the stream diversion and daylighted channels is required to assess the ecological functionality relative to the pre-diversion channel, or for the daylighted channel, adjacent intermittent channels within the catchment. Monitoring requirements for stream diversions and daylighting channels are summarised in Table 5-2.

Monitoring of the streams' hydrology is essential in the first three years, with ongoing monitoring required to inform maintenance activities to prevent adverse effects, such as scour and erosion, debris blockage, destruction of instream features or re-routing of the channel. Inspections should also be undertaken following large rain events. Immediate remedial actions may include the clearance of debris; placement of rocks/boulders to re-divert flows or provide armouring; reestablishment of habitat features; and/or increased riparian planting.

Table 5-2: Ecological monitoring components, purpose, and frequency

Monitoring attribute	Method	Protocol	Frequency
Riparian Planting	Visual inspections	-	Year 1: 6 monitoring rounds Thereafter monitoring frequency can reduce as per Section 3.5.
Pest plant monitoring	Visual inspections	-	Year 1-3: twice a year Year 4-10: Annually
Stream channel conveyance, hydrologic functionality and geomorphic processes	Visual inspections by a hydrologist and/or ecologist.	-	Immediately post-livening; Year 1 – 2: every 3 months. Year 3 – 5: every 6 months.

Monitoring attribute	Method	Protocol	Frequency
			Year 6 – 10: Annually. Also following high rainfall events.
Macro-invertebrates	Benthic Macro-invertebrates Taxa Numbers, MCI-sb, EPT, %EPT	National Environmental Standards for Macroinvertebrates (NEMS 2022b), (NOF Table 14)	Years 1, 3, 6 and 10.
Native Fish Communities	eDNA.	Wilderlab; Joy et al (2013).	Years 1, 3, 6 and 10.
SEV surveys (specific for TR01 daylighting)	SEV	Stream Ecological Valuation surveys.	Years 1, 3, 6 and 10.

5.2.2 Stream and Wetland Planting (restoration)

Monitoring of planting maintenance is required annually to assess the plant survival and establishment and identify any plant failure or gaps. The maintenance report should provide recommendations to remedy planting failure or gaps. Table 5-3 summarises the monitoring requirements and frequency for restoration planting for streams and wetlands.

Ecological Outcome Monitoring should be undertaken at Year 3, 6 and 10. Monitoring may cease if performance criteria for ecological outcomes are met.

If by Year 6 monitoring indicates that canopy closure and/or stream shade is not on trajectory to reach 90% and 80%, respectively, then a Remedial Planting and Maintenance Plan must be prepared within one month. The response shall specify infill locations, species, numbers, pest plant control, watering if required, and the monitoring date for checking effectiveness.

Table 5-3: Purpose, protocol, and frequency of ecological monitoring for stream and wetland restoration planting.

Monitoring attribute	Purpose	Protocol	Frequency
Planting Maintenance monitoring	Assess plant survival and establishment Identify planting failure or gaps.	Visual inspection	Year 1: 6 monitoring rounds Thereafter monitoring can reduce frequency as per Section 3.5.
Pest plant monitoring	Assess pest plant pressure on native plantings and identify maintenance requirements	Visual inspection	Year 1-3: twice a year Year 4-10: Annually
Ecological outcome monitoring	Assess planting against performance criteria	Canopy cover assessment	Year 3, 6, and 10.
Wetland specific criteria			
Wetland condition	Assess wetland condition has maintained or improved	WCI	Year 3, 6, and 10.

5.2.3 Created Wetlands

Monitoring of created wetlands is required to determine the extent to which they are developing into ecologically functioning wetlands with good hydrological connection to groundwater and a community of wet-adapted plants. In addition to plant maintenance, described in Section 3.5, monitoring for ecological functionality should be undertaken.

Further monitoring on the overall health of the wetland shall be conducted by undertaking the Wetland Condition Index assessment at Year 3 and Year 5 at all constructed wetlands. Methods should follow Clarkson et al (2004). Wetland Condition Index assessment captures a holistic assessment of the ecological condition, health, and emergent properties of the wetland systems. This will provide an in-depth assessment of changes occurring in the wetlands and will help in identifying what components of the wetland are performing well and what needs to be addressed through further work.

Table 5-4: Purpose, protocol, and frequency of ecological monitoring for created wetlands.

Monitoring attribute	Purpose	Protocol	Frequency
Planting Maintenance monitoring	Assess plant survival and establishment Identify planting failure or gaps.	Visual inspection	Year 1: 6 monitoring rounds Thereafter monitoring frequency can reduce as per Section 3.5.
Pest plant monitoring	Assess pest plant pressure on native plantings and identify maintenance requirements	Visual inspections	Year 1-3: twice a year Year 4-10: Annually
Wetland success	To confirm created wetland meets the definition of a NIW	Wetland delineation protocols	Years 1, 3, 6 and 10.
Wetland Hydrology	To assess that wetland hydrology has stabilised via dominance of OBL or FACW vegetation.	Wetland delineation protocols	Years 1, 3, 6 and 10.
Wetland planting success	To confirm wetland planting is on track or has achieved 90% survival rate of native vegetation and a ≥90% native canopy cover	Visual assessment	Years 1, 3, 6 and 10.

5.3 Summary of monitoring requirements

Table 5-5 summarises the monitoring requirements for the freshwater remediation and offsetting works.

Table 5-5: Summary of ecological monitoring components, purpose, and frequency

Monitoring component	Purpose	Indicative frequency
Diversions and daylighting		

Monitoring component	Purpose	Indicative frequency
Hydrologic functionality and integrity of stream diversion and daylighted reaches	Confirmation, following livening, of hydrological functionality of and water conveyance in reaches.	Immediately post-livening; Year 1 - 2 every 3 months. Year 3 - 5 every 6 months. Year 6 - 10: Annually Also following high rainfall events.
Stream planting maintenance, survival, and condition	Confirm planting establishment, failures, gaps, and replacement planting requirements.	Year 1: 6 monitoring rounds Thereafter monitoring can reduce frequency as per Section 3.5.
Ecological functionality of stream diversion and daylighted reaches	Monitoring of ecological parameters as described in Table 5-2 to assess ecological condition of the reaches.	Years, 1, 3, 6 and 10.
Stream and wetland planting		
Stream and wetland planting maintenance, survival and condition	Confirm planting establishment, failures, gaps, and replacement planting requirements.	Year 1: 6 monitoring rounds At least annually, with higher frequency during early establishment as specified in the Section 3.5.
Stream and wetland planting ecological objectives	Confirm if planting is on the trajectory to or has reached 90% canopy cover and 80% stream shade. At Year 10 plants should have a 90% survival rate.	Years 1, 3, 6 and 10.
Wetland creation		
Planting maintenance, survival and condition	Confirm planting establishment, failures, gaps, and replacement planting requirements.	Year 1: 6 monitoring rounds At least annually, with higher frequency during early establishment as specified in the Section 3.5.
Wetland function	Confirm created wetland is function as an ecological stable wetland with wetland hydrology and vegetation as specified in Table 5-4.	Years 1, 3, 6 and 10.
Fish passage		
Fish Passage	Assess culverts, riprap, diversion and daylighted channels for fish passage.	Immediately post-livening Year 1: Quarterly Year 3, 6 and 10 as specified in Section 4.
Final close-out report		
Close-out assessment	Confirm whether the ecological outcomes required by the management plans have been achieved.	End of the 10-year management period.

6. Reporting

Reports will be prepared to document the results of the monitoring as per Section 5.2. Table 6-1 summarises the reporting required as a result of the monitoring, and the frequency of the reporting.

Where monitoring of different works and/or attributes coincide, the reporting can be consolidated into one report with clear identification of what works, and attributes have been monitored.

Table 6-1: Summary of the reporting requirements following completion of staged works and monitoring.

Reporting	Frequency
General reporting	
Ecological management reporting	Annually as per Section 6.1
Ecological outcome close-out report	Year 10
Diversions and daylighting	
Hydraulic functionality	Immediately post livening After high rainfall events Year 1: every 2 months Year 2-3: Every 6 months Thereafter annually until close-out report.
Ecological functionality	Years 1, 3, 6, and 10.
Stream and wetland plantings	
Planting maintenance report	Annually until performance criteria are met or close-out report is completed
Stream and wetland planting ecological objectives	Year 1, 3, 6, and 10 Will cease after the final close-out report.
<i>Provisional Item (See Section 5.2.2): Remedial Planting and Maintenance Plan</i>	Year 6
Wetland creation	
Planting maintenance report	Annually until performance criteria are met or final close-out report is complete
Wetland planting and hydrology performance	Year 1, 3, 6, and 10
Wetland condition	Year 3 and 5
Fish passage	
Fish passage assessment	See Section 4.4

6.1 Annual reporting requirements

Annual ecological management reporting shall summarise works completed, including the installation of any culverts, riprap, diversions or daylighting, stream and wetland planting progress, pest plant control, monitoring results, non-compliances, adaptive responses and recommended actions for the following year. Reporting should also incorporate the results of any fish salvage as per the NFCRP.

A final close-out report shall be prepared at the end of the 10-year management period. The close-out report shall assess whether the ecological outcomes and performance standards specified in the management plans have been achieved, identify any remaining remedial actions required to meet those finite obligations, and provide an evidence-based conclusion on the performance of the freshwater ecological management package.

7. Monitoring and Contingency Response

Monitoring as detailed in Section 5 is undertaken to assess whether the Project is progressing towards the specified outcomes within the 10-year monitoring period. Where monitoring shows that the expected outcomes or performance standards are unlikely to be achieved within that period, contingency measures may be implemented.

Contingency measures should be practical, proportionate, and focused on achieving the specified outcomes within the existing monitoring period. Any actions are to be developed and agreed upon in consultation with the Project Ecologist.

If monitoring indicates that performance criteria are unlikely to be achieved within the 10-year management period, the Project Ecologist shall identify proportionate remedial actions. These actions may include additional pest plant control, replacement planting, enrichment planting, changes to plant maintenance frequency, stream habitat creation or retrofitting of fish passage devices. Responses shall be directed toward achieving the specified performance standards within the existing management period. Table 7-1 summarises the ecological outcomes, triggers, and potential contingency responses.

Table 7-1: Ecological outcomes, deliverable targets, triggers, and potential contingency responses

Outcome	Deliverable targets	Trigger for response	Potential response
Stream diversions act as ecologically functioning streams and replicate or improve ecological values of original stream.	Streamworks complete, planting complete, positive trajectory towards meeting ecological attributes by year 10.	Stream diversion reaches are unlikely to achieve, or do not achieve, the key monitoring thresholds detailed in Table 5-1.	Design of the diversion channel is to be reviewed, with potential for physical works to improve stream habitat. This may include the recontouring of banks, armouring or placement of rocks and/or logs. The key targets are to be reviewed for the specified reach in consideration of catchment wide factors that may be unduly influencing their performance.
Daylighted stream acts as an ecologically functioning stream, with ecological value similar to that estimated.	Streamworks completed, planting complete, positive trajectory towards meeting at least 90% of SEVm-P by Year 10.	Monitoring results are not on trajectory to be within 10% of the predicted SEVm-P score of 0.591.	Design of the diversion channel is to be reviewed, with potential for physical works to improve stream habitat. This may include the recontouring of banks, armouring or placement of rocks and/or logs. The key targets are to be reviewed for the specified reach in light of catchment wide factors that may be unduly influencing their performance.

Outcome	Deliverable targets	Trigger for response	Potential response
Created wetlands act as ecological functioning wetlands.	Streamworks completed, planting complete, positive trajectory towards maintaining population of OBL and FACW plant species.	If created wetlands fail to maintain hydrology; are not maintaining a population of OBL or FACW plant species; or they fail to meet the definition of a NIW.	Design of the wetland will need to be reviewed and remedied by design engineers.
Stream/wetland complexes planting has established	Planting completed, positive trajectory towards average stream shade of 80% and 90% canopy closure (riparian) by Year 10.	Any of the following occur: - plant survival below 90% after the first full growing season; - persistent unplanted or failed gaps greater than 25 m²; - pest plant cover suppressing more than 10% of planted stems in a monitored area; - monitoring indicates canopy closure is not on trajectory to reach 90% cover by Year 10.	Prepare a remedial planting and maintenance plan within one month. The response shall specify infill locations, species, numbers, pest plant control, watering if required, and the monitoring date for checking effectiveness.
Streamworks undertaken and fish passage maintained	Streamworks undertaken with feature constructed to be consistent with design.	Visual assessments indicate that there may be a potential fish passage issue for known species within the reach. Structures within the stream, or diversion/daylighting channels, are presenting a significant fish passage barrier that cannot be remedied through regular maintenance.	Further assessments by means of eDNA to be undertaken to further assess passage. Preparation of a FPRP. The design of the structure and/or channel will need to be revised. Physical works may be required to remediate such as retro fitting of baffles or spat ropes.
Ecological obligations are closed out within the defined management period	Year 10 monitoring and final reporting demonstrates that performance standards and finite remedial actions have been completed.	Final monitoring identifies outstanding finite obligations.	Define final remedial action by type, location, timing, reasonability, and completion criteria.

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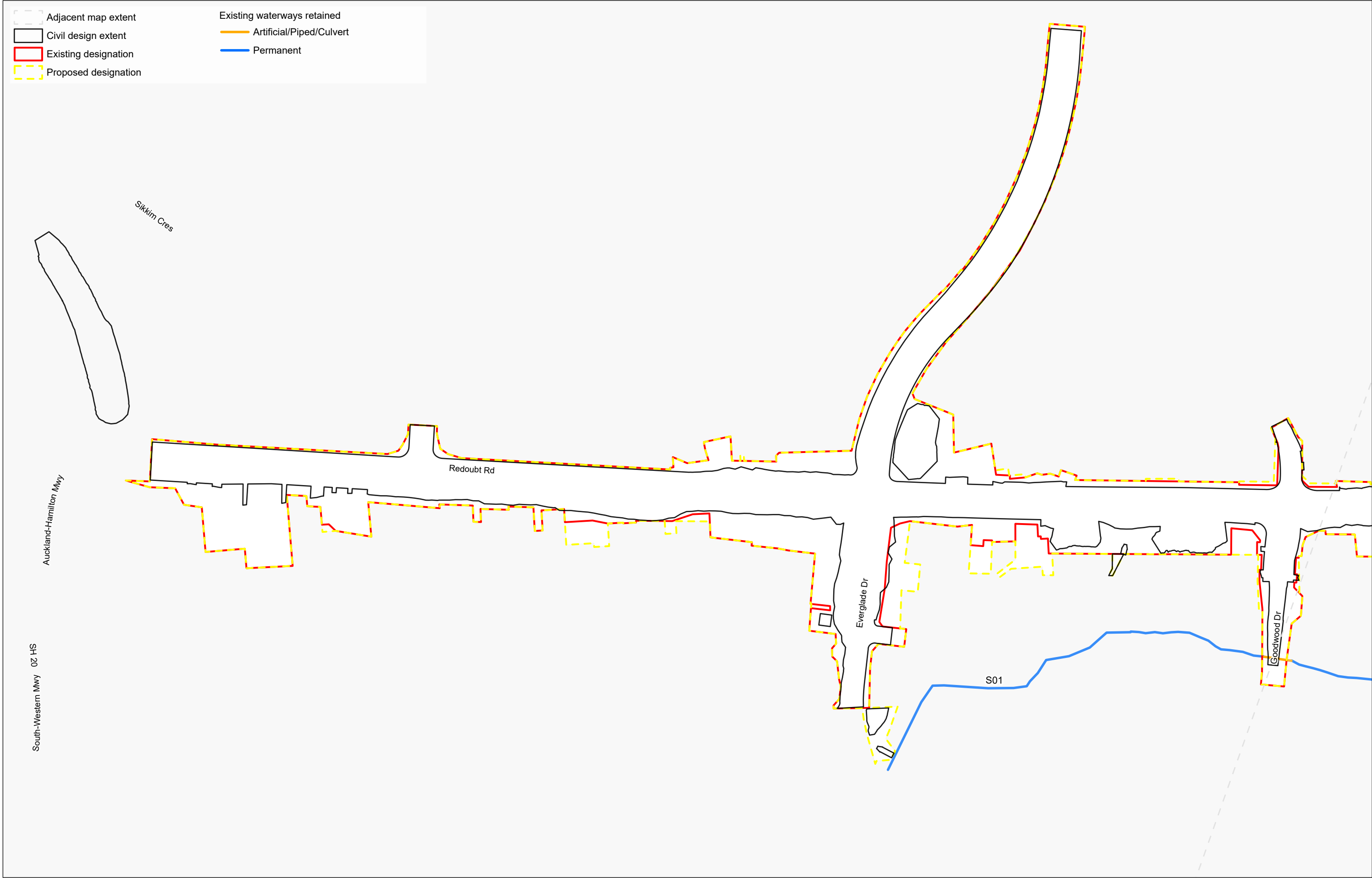
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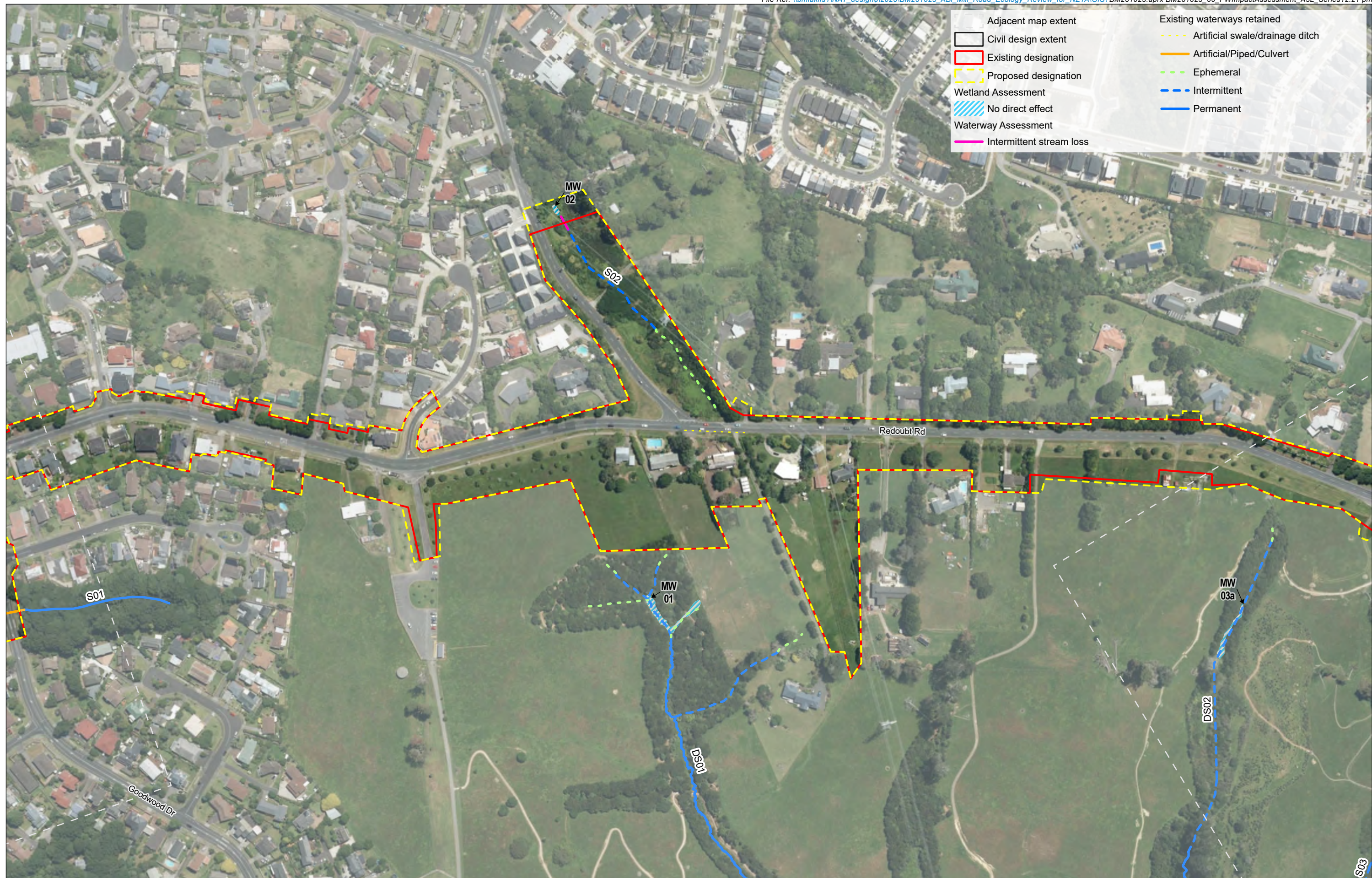
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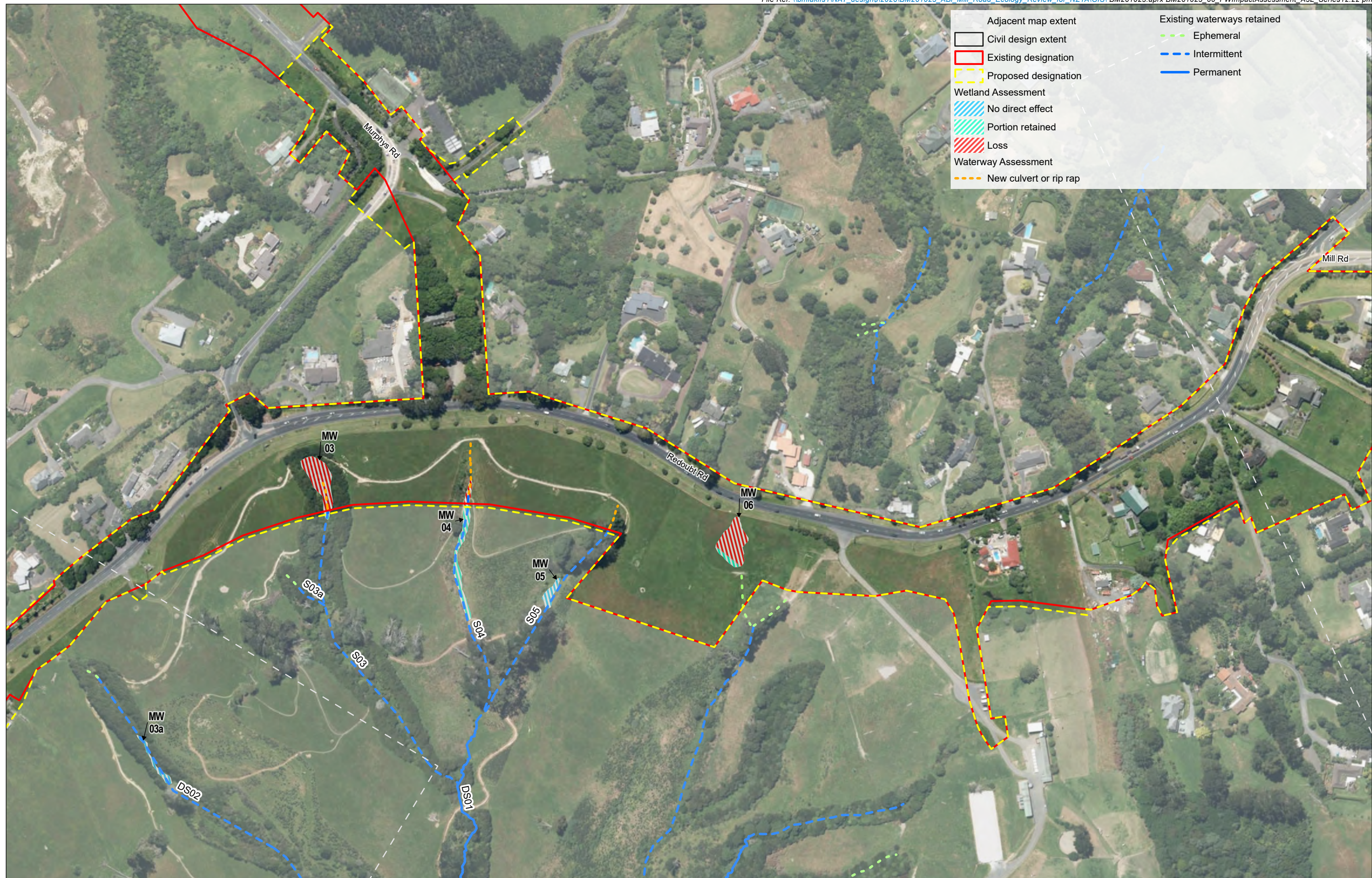
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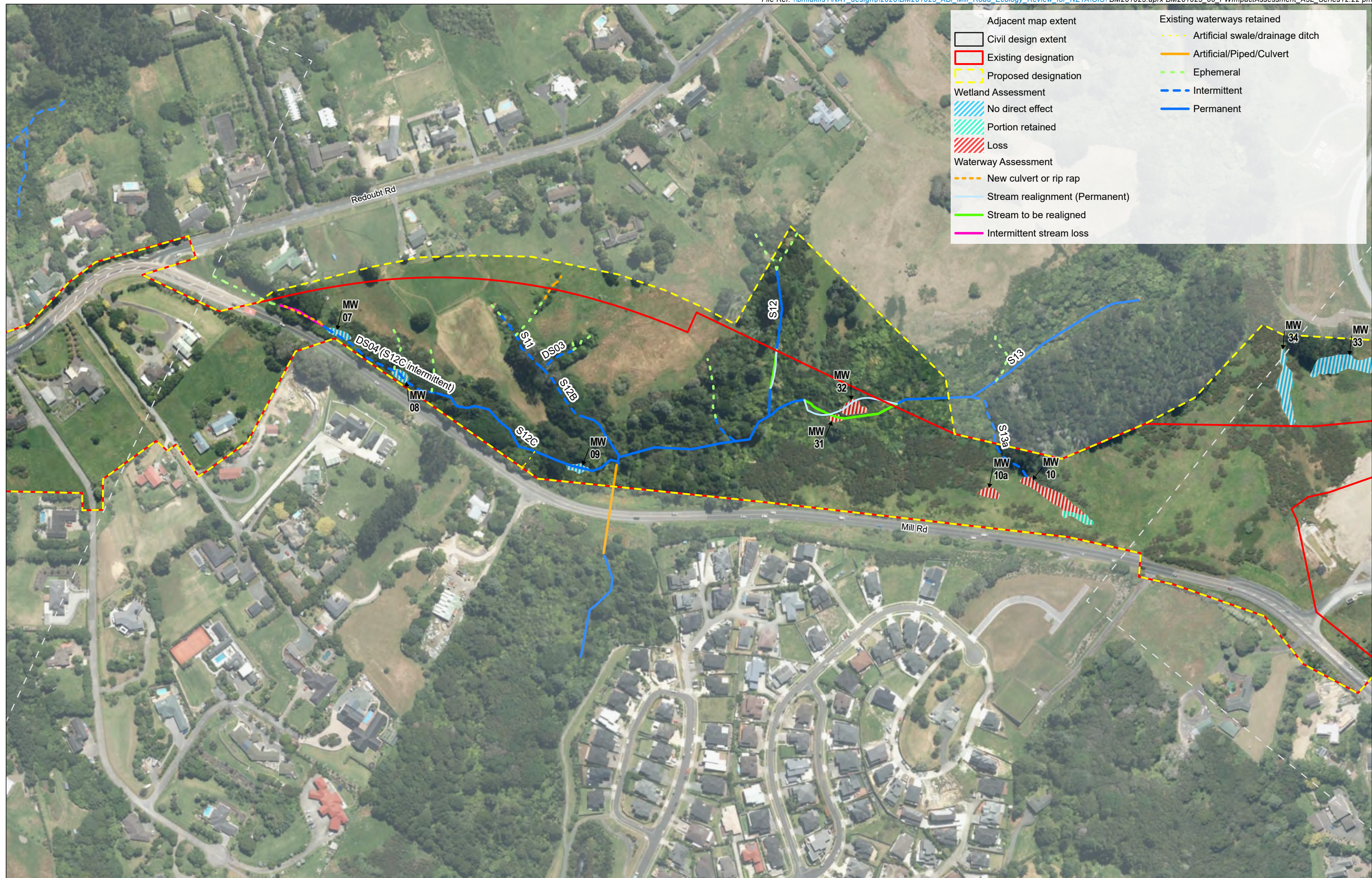
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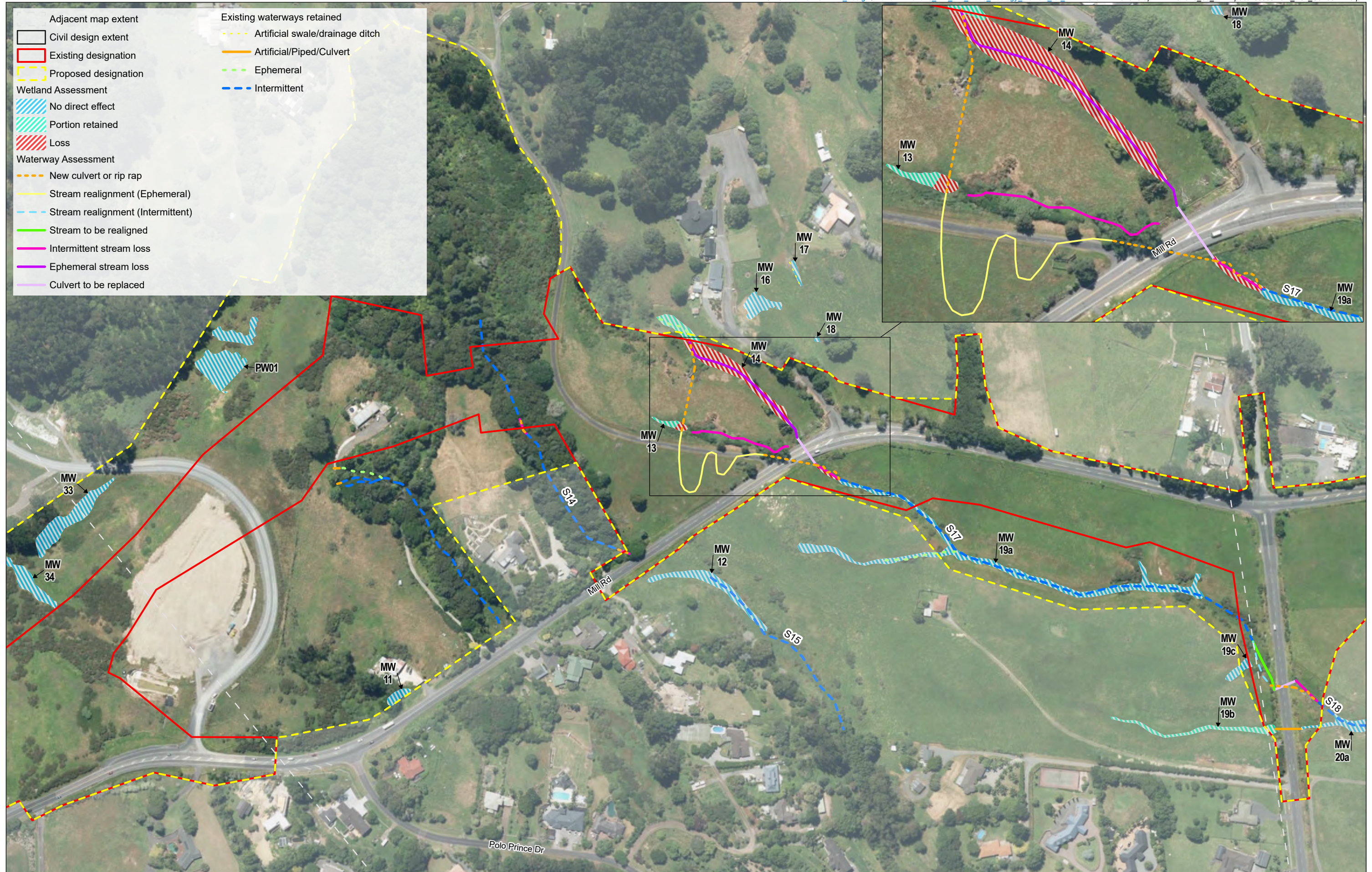
APPENDIX A Site Maps

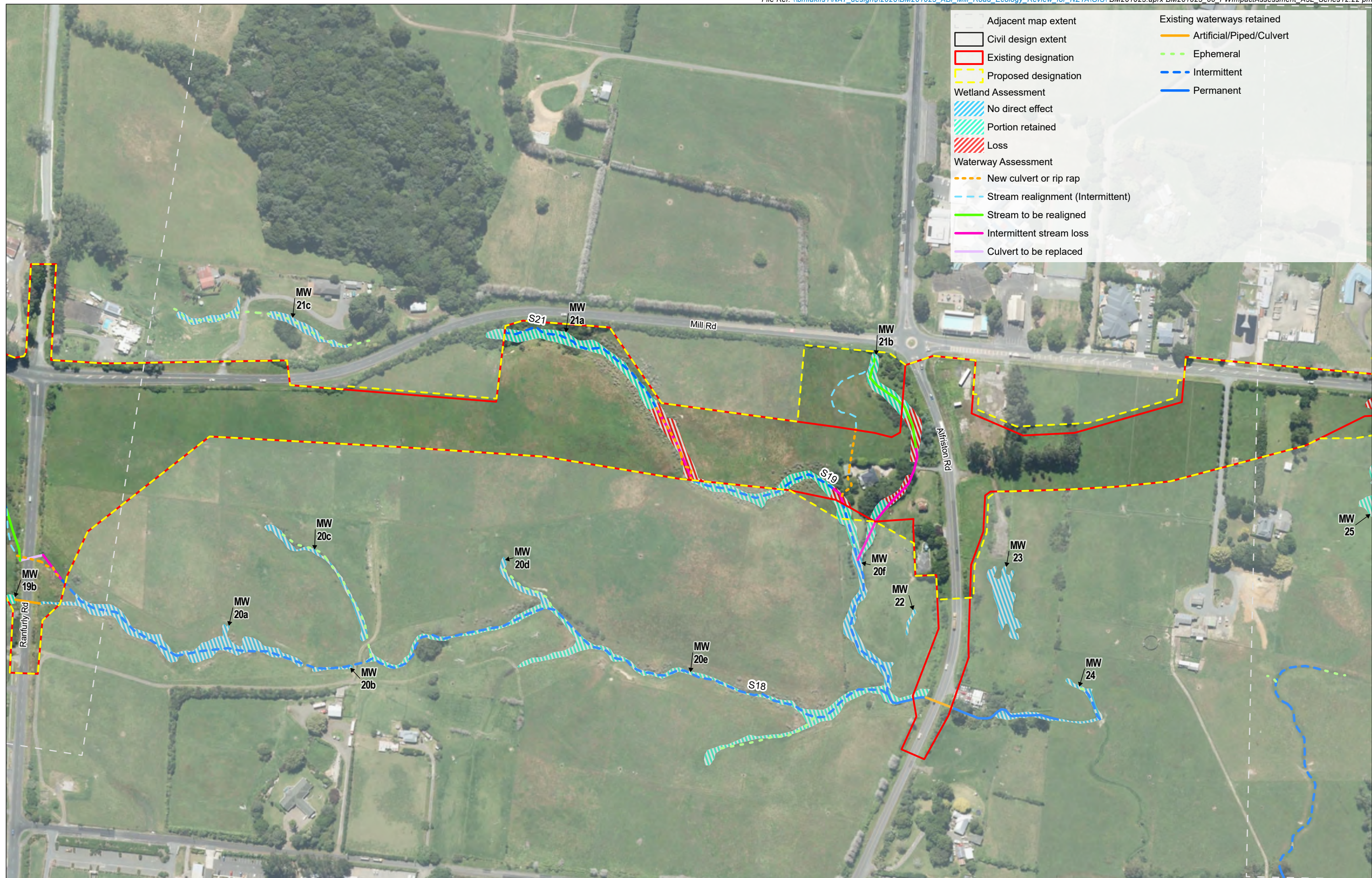




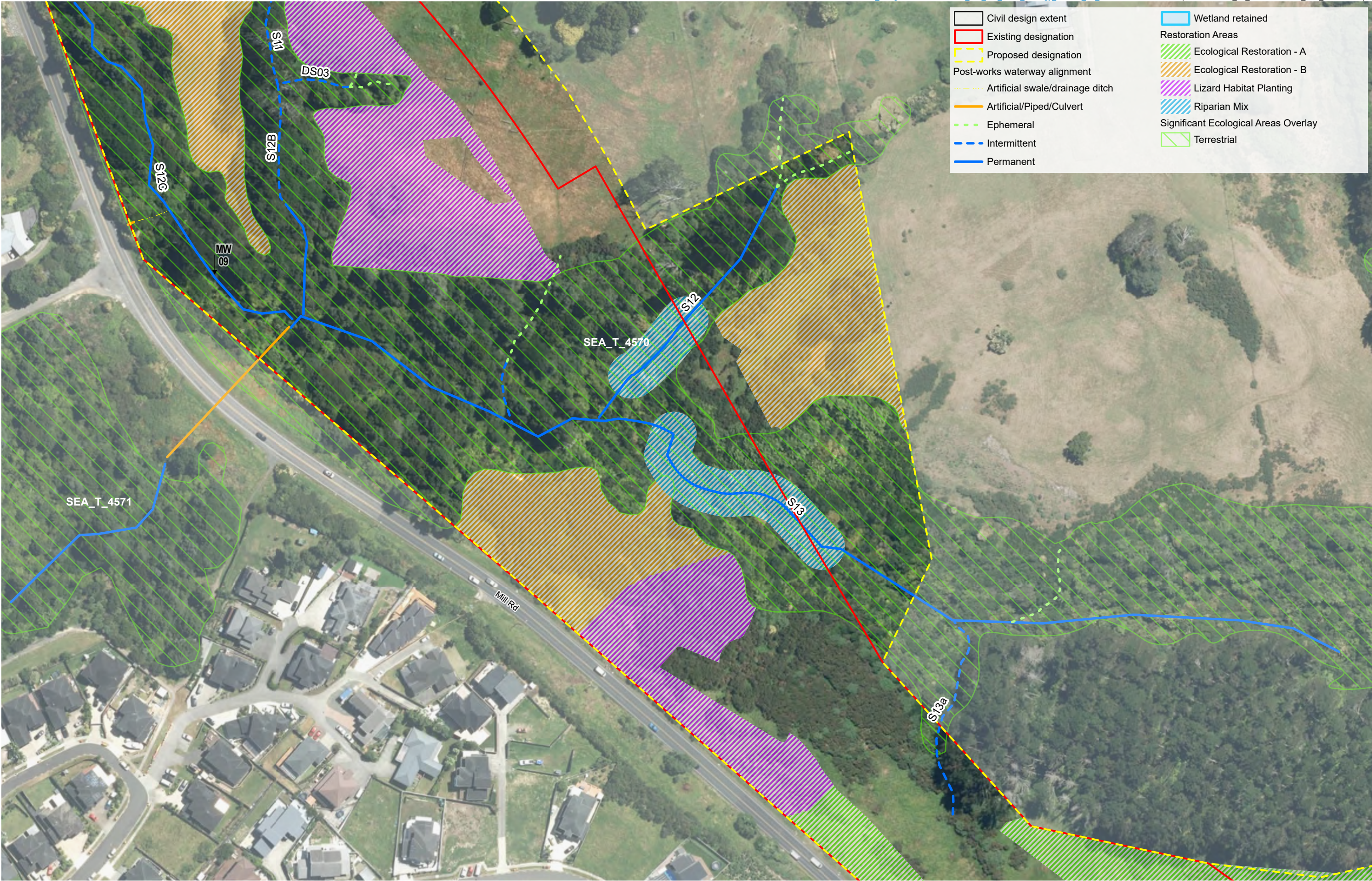


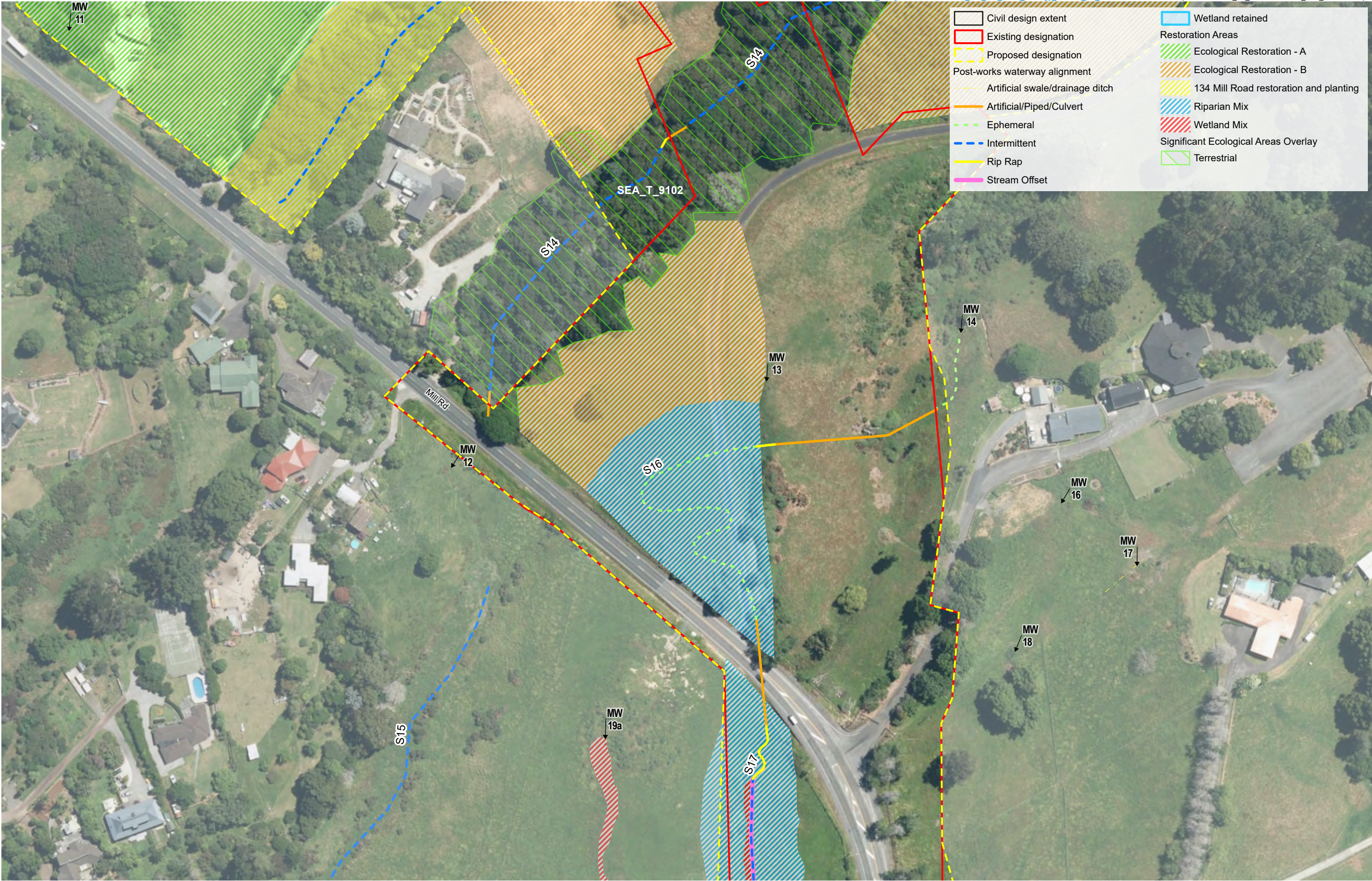




















APPENDIX B Restoration Site Descriptions

Location	Site photo
Photo ID: S21/MW21 at 2 Wastney Road (within Designation) Restoration Type: Stream and wetland Location: proposed restoration site Steam S21 at 2 Wastney Road. The stream is a stream-wetland complex within open pasture. <i>SEVm-P =0.629</i>	
Photo ID: S17/ MW19 at 116 Ranfurly Road Restoration Type: Stream and wetland Location: proposed restoration site Steam S17 at 116 Ranfurly. The stream is a stream-wetland complex within open pasture. <i>SEVm-P =0.577</i>	

Photo ID: TR01

Location: Tōtara Park restoration site

Restoration Type: Stream Daylighting

Description: Stream and Wetland.

Broken piped network at TR01. Evidence of stream flow suggestive of intermittent stream channel. Pipe is broken in several locations throughout the stream where the stream may intermittently flow above ground before returning to pipe.

Approximately 246 linear m of stream is proposed to be daylighted.

$SEVm-P = 0.591$



Photo ID: TW01

Location: Tōtara Park restoration site

Restoration Type: Constructed wetland

Description: Wetland to be situated within the fringes of TR01. Currently overland flow resulting in some exotic wet tolerate plant presence, including *Ranunculus repens* and *Juncus effuses*. Primary hydrological indicators present. Wetland to be expanded and restored.



Photo ID: PW01

Restoration Type: Wetland

Location: proposed wetland restoration site by 38 Mill Road/Watercare. Wetland is exotic dominated by *Juncus effuses*, *Ranunculus repens*, *Carex uncinata* and *Dactylis glomerata*.



Photo ID: MW33

Restoration Type: Wetland

Location: proposed wetland site by 38 Mill Road/Watercare. Wetland is exotic dominated by *Ranunculus repens*, *Juncus effusus*, and *Holcus lanatus*.



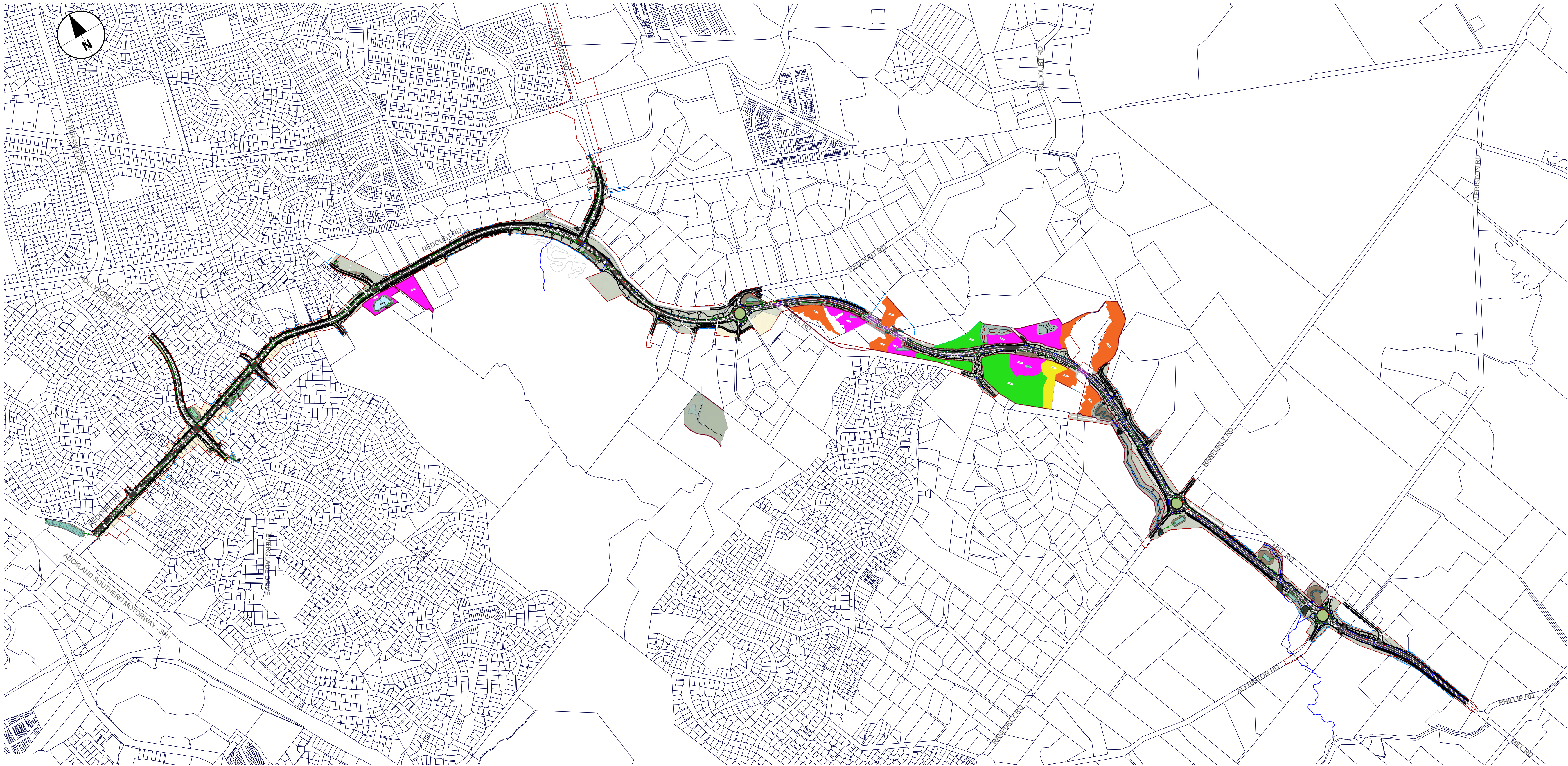
Photo ID: MW34

Restoration Type: Wetland

Location: proposed wetland site by 38 Mill Road/Watercare. Wetland is exotic dominated by *Juncus effusus*, *Ranunculus repens*, *Holcus lanatus*, and *Carex divulsa*.



APPENDIX C Planting Plans



This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system to ISO 9001:2000.

CONSULTANT

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 **NZ TRANSPORT
AGENCY**
WAKA KOTAHI

PROJECT

Mill Road – Stage 1
Consenting Design

**Roads of
National
Significance**

REGISTRATION

FOR CONSENT

PROJECT MANAGEMENT INITIALS

MBe/DH/SLa	ACH	TLi
DESIGNER	CHECKED	APPROVED

PROJECT DATA

DATUM	AUK46	SURVEY	NZTM
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ISSUE/REVISION

G	24.08.26	100% CONSENTING DESIGN
F	04.02.26	100% CONSENTING DESIGN
E	16.12.25	100% CONSENTING DESIGN
D	18.11.25	100% CONSENTING DESIGN
C	19.09.25	100% CONSENTING DESIGN
B	21.07.25	50% DEVELOPED DESIGN
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60755376

SHEET TITLE

Mill Road RoNS Stage 1 FTA
COVER SHEET

SHEET NUMBER

60755376-SHT-LD-0000

GENERAL NOTES:

Landscape preparatory works drawings capture landscape related features and works only. Drawings to be read in conjunction with other disciplines/ consultants' drawings.

Determine exact location and depth of all underground services prior to commencement of demolition works and ensure use of heavy machinery does not cause damage to these services.

Refer to Engineer's Drawings for all required works, including existing services, road alignment, earthworks and stormwater design.

All redundant infrastructure (such as street furniture, footpaths, kerb and channel, road signs and pavement) on the portion of roads that are closed are to be physically removed and replaced with appropriate landscape treatment. All removed elements should be recycled or reused where possible.

The contractor shall endeavor to retain existing farm fences within the designation where they align within the proposed new farm-style fencing, where practicable and subject to fence condition and compatibility with works.

Where stock-proof fencing is required this should be replaced like for like in consideration of existing land uses.

Inspect and document all items to be retained, relocated or removed for existing damage prior to works commencing. Notify the Contract Administrator of any damage and liaise with relevant authority, stakeholders or company to arrange for the damage to be repaired.

Any damage present during the works or on completion, which has not been notified to the Contract Administrator and agreed on site before works commencing shall be made good by the Contractor at their own expense.

All existing trees retained to be adequately protected during works. The methodology to be reviewed and approved by Project Arborist.

All planting to be in accordance with 'Standardised Designs: NZTA Standardised design solutions for use on State Highway Roads of National Significance May 2025 Version 3.0 (RoNS)' and 'NZTA p3 Standard Specification for Highway Landscape Treatments (NZTA P39: 2013)' unless otherwise stated.

Content referred to in NZTA P39: 2013 includes:

- Quality Control; Inspections and Reporting
- Site Preparation
- Plant Pest Control and Animal Pest Control
- Plant Propagation
- Topsoil Supply
- Planting
- Grassed Surfaces
- Hydro-seeding grassed (& specialist) surfaces
- Irrigation (Design and Build)
- Defects Liability And Maintenance
- Maintenance Only

Location specific details of site preparation, planting, maintenance operations, weed and pest control measures, planting methodology and mulching shall refer to NZTA P39: 2013 and RoNs in conjunction. The RoNS standards takes precedence in the following areas:

- Highway planting mulch depths:
75mm mulch (stringy rather than bark)
- Highway planting (engineered slopes / soils) topsoil depths:
250mm with ripped subsoil surface
- Mown grassland (including hydroseeded areas):
100mm topsoil
- All planted and grassed areas to receive soil testing

Noted: Good soil depths contribute to good plant establishment. Where possible good, reused site soils and imported soils to be above the minimum where possible. To mitigate plant loss during long periods of drought.

Mulching not to be used in areas indicated as Lizard Habitat as mulching reduces habitat suitability for ground-dwelling lizards and invertebrates.

Landscape architect to approve sample of imported topsoil.

Contractor to refer to the Typical Engineered soils / slope approach (Figure 18) in RoNs, which captures mulch or matting, topsoil, ground preparation, slope system planting, highway edge planting, wetlands and swales.

The Contractor shall take particular notice of the plant supply and watering requirements set out by the NZTA P39: 2013 Specification clause G-3.11 and 3.14. No plants are to be delivered to site more than three days before planting. Any plants not used within three days of being delivered on site are to be donated to a local school or charity.

Retain all existing native vegetation where possible. Intersperse proposed planting under the canopy of retained vegetation to avoid a delineated line. The Contractor shall seek advice from Principal Engineer's Landscape Architect giving at least 48 hours notice through Engineer on alternative planting location of any excess plants as a result of retaining existing vegetation.

Contractor to read the Landscape Planting Plans in conjunction the ecological documents prepared by AECOM, including the Habitat Restoration and Enhancement Management Plan, Freshwater Management and Monitoring Plan, Lizard Management Plan and Terrestrial Management Plan.

Felled trees and logs to be used as woody debris in ecological areas and stream diversions where possible. Logs to be pinned and secured on site. Placement to be determined with site landscape architect and ecologist.

Native species to be sourced through eco-sourcing where from the Manukau Ecological District. Via the Project Partnership Plan and client commitment for social and environmental outcomes, engagement of a local Mana Whenua iwi base nursery for the plant supply is preferred.

The Contractor shall supply a methodology for eco-sourcing from each plant supplier for the approval from the Engineer prior to any plants being delivered to site, and post supply shall provide a producer statement stating that the approved methodology has been complied with. Final sign off from mana whenua representatives are required.

All planting shall be undertaken in accordance with the planting schedule. Any changes to this schedule are to be agreed with the Principal Engineer's Landscape/Urban Design Advisor. Final sign off of plant species from mana whenua representatives are required.

All planting shall in installed at the appropriate timing reflecting the planting typology, in accordance with NZTA P39: 2013, unless otherwise stated in the ecological documents prepared by AECOM.

- Section E: Plant Propagation - installed within the planting season beginning 1st April and ends 1st September
- Section G: Planting - Work shall only be undertaken when the weather is suitable, ie. mild, dull and moist, and when the ground is moist and workable. All planting operations shall be suspended during periods of severe frosts, waterlogging, drought or persistent drying winds.
- Section G: Planting - Item 5.4.2 Wetland & Swale Planting: Timing of Operations - Wetland and Swale plantings shall be carried out in spring (August through to Late October) when plants are emerging from dormancy and the water temperature is starting to rise. Timing of planting associated with stormwater devices should also align with the device coming on line. All strength testing of stormwater devices shall be carried out prior to planting to avoid damage to the plants.

The Contractor shall provide the Engineer with a schedule of landscape works, indicating which month/year each section of planting is to be undertaken.

Engineer's Landscape architect to inspect plants at nursery to approve sample selections, 10 days' notice shall be provided given to arrange visit.

Species to be planted in a 'quincunx' arrangement, in clusters of 7, 11 or 15, in accordance with the plant spaces identified in the species table, unless otherwise noted on the plans. Avoid repeating patterns of plants.

All planting shall have a minimum set back of 1m from Shared Used Path. All mānuka and kānuka to be set back 2m from the margins of planted areas to prevent weed intrusion as canopy matures. All toetoe, flax and non-upright form plants to be set back 1.5m from Shared Used Path. All Cordyline australis to be set back 2.5m from SUP. All tree species with a mature height of > 5m to be positioned at a minimum distance of 2m from any adjacent underground services. The Contractor is to confirm underground service locations prior to undertaking any planting work.

Consideration should be made on site for planting specified around stormwater channels. Landscape contractor shall not plant dense or large plants in the channels as this will block the function of the stormwater asset. Engineer's Landscape architect to approve site set out in these areas.

Planting and vegetation to be kept clear of pits/chambers and equipment so they do not obstruct or restrict opening of lids etc or restrict functionality of equipment.

Allow a minimum of 2m offset to adjacent property for tree planting where space allows.

Any areas affected by earthworks due to temporary works that aren't shown in these drawings shall be hydroseeded with Option B Woody / Native vegetation as per NZTA P39: 2013 Specifications.

Irrigation not required. Section of NZTA P39: 2013 to be omitted from landscape specification requirements.

Planting to maintained for a period of 5 years from date of completion. Responsibility of maintenance is a per the project contract documents. Final sign off from mana whenua representatives required as a hold point. Maintenance visits shall be undertaken as required to achieve plant establishment. Generally, maintenance required under a contract shall be on a decreasing scale.

- In the first year, 6 - 8 maintenance visits per year
- In the second year, 4 - 6 maintenance visits per year
- In the third, fourth and fifth year, 4 maintenance visits per year.

The Contractor shall undertake maintenance visits at the frequency set out and shall carry out maintenance specified P39:2013 3, 3.1, 4, 5 & 6. In addition the Contractor shall make a full inspection of the works and present a Maintenance Report to the Principal 4 times per annum.

Handover of any of the maintenance responsibilities shall be agreed with the Engineer. With the remaining maintenance requirements to be documented in the asset owner manual. (To ensure the requirements outlined above are met).

Working assumptions have been made around land or areas where property is being acquired for the development of the road within the designation boundary, with residual land hatched as 'Reinstatement Treatments' which occurs mostly within the urban section of The Project.

- Boundary treatments have been added to the logical interface that would be considered the corridor edge to delineate a consistent urban corridor.
- Where partial acquisition occurs i.e. for construction works only, negotiations with property owners to determine the reinstatement planting required. These plantings to be maintained by those property owners where they will have ownership.
- Where land area is large enough to go back to market; to be sold as a development sites, temporary or low-cost treatments to be added such as hydro seed turf.

The Contractor to refer to the UDLMP for urban and landscape elements such as;

- Bridge environments
- Retaining walls
- Noise walls and screens
- Road furniture- Boundary treatment fences
- Planting strategy and palette
- Cut / fill + soil strategy
- Culverts, stream diversions, swales and stormwater wetlands

This drawing is confidential and shall only be used for the purpose of this project. The signing of this title block confirms the design and drafting of this project have been prepared and checked in accordance with the AECOM quality assurance system to ISO 9001-2000.

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CLIENT



PROJECT



REGISTRATION

FOR CONSENT

PROJECT MANAGEMENT INITIALS		
MBe SLa	SLa	TLi
DESIGNER	CHECKED	APPROVED
PROJECT DATA		
DATUM	AUK46	SURVEY NZTM

ISSUE/REVISION		
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D	18.11.25	100% CONSENTING DESIGN
C	19.09.25	100% CONSENTING DESIGN
B	12.09.25	100% CONSENTING DESIGN
A	21.07.25	50% CONSENTING DESIGN
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SHEET TITLE

Mill Road RoNS Stage 1 FTA OUTLINE SPEC

SHEET NUMBER

60755376-SHT-LD-0050