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| TO: | Winton | Date: | 21 November 2025 |
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**SUNFIELD FAST TRACK APPLICATION – STREAM ECOLOGICAL ASSESSMENT**

## Introduction

Bioresearches were engaged by Winton to respond to additional queries from Auckland Council as it relates to the fast track application for Sunfield.

*"Has the applicant demonstrated, through recognised modelling, that the proposed stream diversion and culverting will achieve no net loss of ecological values, particularly given the dual stormwater management function of the diversion channel?*

***Note:*** *Biodiversity enhancements may be constrained in areas that also serve stormwater management functions. No modelling has been provided to demonstrate the ecological or biodiversity values that would be achieved along the proposed diversion channel. It is recommended that modelling be undertaken using a recognised methodology, such as Auckland Council's Stream Ecological Valuation (SEV) and Ecological Compensation Ratio (ECR), to quantify expected ecological outcomes and confirm compliance with proposed consent conditions requiring an overall net gain."*

## Methodology

A detailed assessment of the streams was undertaken using the Stream Ecological Valuation (SEV) methodology (Auckland Council Technical Report 2011/009) on 7 November 2025. Two SEVs were undertaken within representative reaches of the modified permanent streams in the Sunfield site (). SEV methodology (Storey et al., 2011; Neale et al., 2016) enables the overall function of the stream to be assessed and compared to the quality of other streams in the Auckland Region. The SEV assessment involves the collection of habitat data which gives a score between 0 (low quality) and 1 (high quality) for each of a number of attributes which are weighted in terms of their contribution to overall stream value. These attributes are then combined to give an overall SEV score, also on a scale of 1 to 1.



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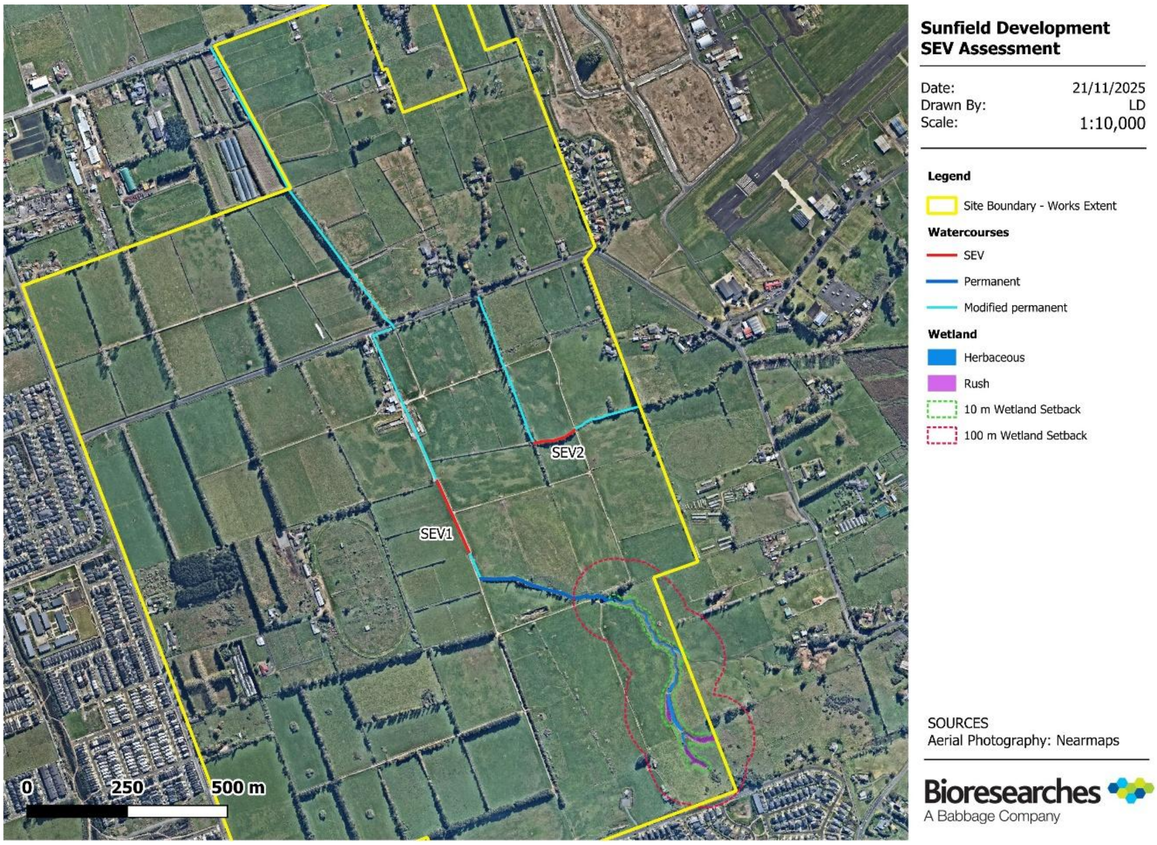


***Figure 1. Location of the representative SEVs within the Sunfield project area***

The Stream Ecological Valuation (SEV) methodology combined with the calculation of the Environmental Compensation Ratio (ECR) is a transparent, well-recognised methodology for calculating the quantum of offset required for stream loss, and is the preferred method of stream offset under the AUP (Storey *et al.,* 2011). Although the methodology was originally developed in Auckland, it has been reviewed by NIWA for use in Wellington, Hawke's Bay and Southland, and is considered applicable without modification to most stream and river types in those regions. (Storey *et al.,* 2011).

For permanent and intermittent streams, SEV scores can be utilised to calculate environmental compensation for any loss or modification to natural stream habitat by using the Environmental Compensation Ratio (ECR; Storey *et al.*, 2011). The ECR considers the SEV values of both the affected or impacted stream/s and the proposed restoration site stream/s, and determines any differential between the scores to provide a ratio for compensation which will result in "no net loss of area weighted stream function" (Storey *et al*., 2011). The SEV score used in the ECR calculation does not include two biotic functions relating to fish and macroinvertebrates due to the difficulty of predicting changes to these communities (Storey *et al*., 2011). As such, these indices were not collected during the SEV.

The ECR equation is calculated as follows:

$$ECR = [\ (SEVi\text{-}P - SEVi\text{-}I) / (SEVm\text{-}P - SEVm\text{-}C)\ ] \times 1.5$$

Where:

- SEVi-P and SEVi-I are the potential SEV value and SEV value after impact, respectively, for the site to be impacted (i.e. the existing watercourses).
- SEVm-C and SEVm-P are the current and potential SEV values, respectively, for the site where the environmental compensation (mitigation) works are to be applied (i.e. the diversion channels).
- 1.5 is a multiplier that allows for the delay in achieving compensation benefits.

The ECR calculations are, unavoidably, carried out using a number of assumptions. The ‘Potential’ SEV scores are calculated by altering parameter scores assuming best practice riparian restoration of the stream has taken place and is well established to a level providing at least 70% shade to the stream bed.

Calculation of the ‘Impact’ SEV scores would assume an outcome as proposed, with the full length of the stream being lost. Calculation of the ‘Potential’ score for a restoration site will assumed native riparian restoration of a 10m margin and the removal of barriers to fish passage, and re-grading an contouring of the stream channel to remove bank incision.

## Stream habitat values

Table 1 presents the SEV scores, and predicted SEV scores for the existing natural watercourses and the proposed diversion channels.

***Table 1 Current and predicted SEV scores for the existing and proposed watercourses.***

| Function | SEVi-C | | SEV-i-P | | SEVm-P | |
|---|---|---|---|---|---|---|
| | **SEV1** | **SEV2** | **SEV1** | **SEV2** | **Main channel** | **Swale 13** |
| NFR | 0.33 | 0.34 | 0.37 | 0.36 | 0.70 | 0.70 |
| FLE | 0.1 | 0.10 | 0.13 | 0.13 | 0.80 | 0.80 |
| CSM | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| CGW | 0.60 | 0.69 | 0.67 | 0.76 | 0.70 | 0.70 |
| WTC | 0.08 | 0.72 | 0.68 | 0.72 | 0.60 | 0.60 |
| DOM | 0.34 | 0.60 | 0.60 | 0.68 | 1.00 | 1.00 |
| OMI | 0.01 | 0.05 | 0.50 | 0.50 | 0.60 | 0.60 |
| IPR | 0.20 | 0.44 | 0.20 | 0.44 | 0.60 | 0.60 |
| DOP | 0.67 | 0.35 | 0.58 | 0.47 | 0.84 | 0.84 |
| FSH | 0.05 | 0.05 | 0.05 | 0.05 | 0.43 | 0.43 |
| HAF | 0.16 | 0.43 | 0.53 | 0.55 | 0.62 | 0.62 |
| RVI | 0.0 | 0.05 | 0.08 | 0.08 | 0.70 | 0.70 |
| **SEV Score** | **0.30** | **0.40** | **0.45** | **0.48** | **0.72** | **0.72** |

These scores are then transferred to ECR calculation, where the SEVi-I score is 0 as the existing stream channels will be removed/diverted, whereas the SEVm-C score for the diversion channels is 0, as these do not currently exist. Table 2 presents the ECR scoring. Assumptions for predicting the potential score (SEVi-P) is presented in the appendices.

***Table 2. ECR parameter and score for stream values.***

| | SEVi-C | SEVi-I | SEVi-P | SEVm-P | SEVm-C | ECR |
|---|---|---|---|---|---|---|
| SEV1 | 0.30 | 0 | 0.45 | 0.72 | 0 | 0.94 |
| SEV2 | 0.40 | 0 | 0.48 | 0.72 | 0 | 1.00 |

An ECR of 0.61 was calculated for SEV1, and 0.94 for SEV2, which would equate to the loss of stream values associated with 1 m of stream length in SEV1 requiring 0.94 m of stream length on the diversion channel to ensure stream values are retained. Similarly, SEV2 has an ECR score of 1.00, indicating no loss of ecological values. It is important to note these are based on the potential value of the existing watercourses, rather than their current state indicating an overall net-gain would be achieved. When replacing SEVi-P with SEVi-C values, the ECR scores is 0.63 (SEV1) and 0.83 (SEV2).

This significant uplift in SEV values of the SEVi-P and the SEVm-P is due to channel bank conditions which would not be practicably remediated during enhancement works as the severity of channel incision, reduction in connectivity to the floodplain and channel shape (being artificially straightened and deepened, and incised) could not be fixed without extensive streamworks. This then transfers to riparian connectivity and galaxiid spawning. Conversely, the diversion channel, which will have a greater bank width than the existing channels, will be constructed to have lower sloping banks (~5°) which will have greater connectivity to the floodplain and the riparian yard, low channel incision and an increase in galaxiid spawning habitat.

As such, this can be interpreted the new diversion channels will not result in the loss of stream values considering their dual purpose for stormwater. How the diversion channels will provide an increase in


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aquatic habitat quality is described below with respect to each SEV function. Factors such as substrate and velocity are difficult to estimate, therefore some assumptions have been made, largely based of the existing ecological values present within the Awakeri Wetlands adjacent to the site.

Velocity is likely to be increased in comparison with the existing stream conditions where dense macrophyte growth within the stream channel has resulted in choking of the stream bed were velocity was very low to stagnant. Therefore, the diversion channels will contain an increased degree of flow. As a conservative measure, substrate has been largely kept consistent with what is currently present, however an increase in woody debris and small gravels, which can be placed during the construction of the channel, has been increased. Similarly, channel lining has conservatively been assessed to contain an "unnatural loading of fine sediment". Whilst the stream channels will have a gravel lining, this was not considered to be an artificial permeable lining (e.g. gabion baskets) as the gravel lining will not limit riparian connectivity, allow for some movement of substrates during higher flow events creating variation in substrate deposits. The unnatural loading was applied to allow for settlement of sediments over time, as would be expected from an urban watercourse with stormwater inputs. Macrophyte presence for the new diversion channel has been predicted based of macrophyte presence within the Awakeri Wetlands, wherein between 0% to 30% of the stream bed is covered by below-surface macrophytes, and 5% to 20% of the stream channel contains surface reaches and bankside macrophytes.

The proposed culverts and road crossings within the new channel will be designed and installed within the permitted guidelines under the NES-F, and therefore do not constitute a barrier to fish passage.

Riparian vegetation estimates have been based on the planting palettes completed by Studio Pacific, and under the assumption 'Forest Planting' will be carried through the riparian margins, as recommended in Bioresearches 2025[1]. As such this results in approximately 50% of the riparian yard containing diverse indigenous wetland species including oioi (*Apodasmia similis*), toetoe (*Cortaderia fulvida*), kiokio (*Blechnum minus*). purei (*Carex secta* & *Carex virgata*), and kuta (*Eleocharis sphacelata*); and 50% of the riparian yard containing cabbage tree (*Cordyline australis*), karaka (*Corynocarpus laevigatus*), kohekohe (*Dysoxyllum spectabile*), rewarewa (*Knightia excelsa*) and pūriri (*Vitex lucens*). This would correlate to a moderate to high filtration capacity of the riparian yard, which has full connectivity with the 20 m riparian yard.

The contouring of the diversion channels will allow for a lower gradient to be present, drastically increasing connectivity to the floodplain, riparian zone connection and potentially galaxiid spawning habitat availability. Channel cross sections show gently sloping banks (~5°) which will have a subsequent abundance of low growing vegetation. This is a significant uplift when compared to the current channel conditions where steep bank slopes fall under the "unsuitable" category for galaxiid spawning and are highly incised with no floodplain connectivity and are within artificially straightened and deepened channels. This increase in channel shape function (being lower gradient and retain high connection) is considered to be an improvement on the current ecological conditions.

Species expected to be within the surrounding area, as informed by records from the New Zealand freshwater fish database are mainly restricted to eels (*Anguilla* sp) and banded kōkopu (*Galaxias fasciatus*), which are species which often inhabit slower flowing stream reaches, pools, back waters and debris dams[2]. The running of stormwater channels within the stream diversions is likely to have hydrological heterogeneity and habitat features of slow runs, deep pools, minor eddies and backwaters,

[1] Bioresearches (2025). Sunfield Development - Ecological Assessment. Prepared for Winton

[2] Jowett, I.G.; Richardson, J. (2008). Habitat use by New Zealand fish and habitat suitability models. NIWA Science and Technology Series No.55. 148 p.

however undercut banks are unlikely to be initially present but may form over time. This hydrological regime will not result in the displacement of species adapted to faster flowing waters, riffles and rapid such as bullies (*Gobiomorphus* sp.), torrentfish (*Cheimarrichthys fosteri*) as these species are not present within the existing catchment.

Overall, it is considered the creation of the diversion channels will not result in a reduction in freshwater ecological values, considering the dual use as stormwater conveyance channels, rather a gain in ecological values will be achieved.

## APPENDICES

***Table 3. SEV assumptions in predicting the potential value for existing streams.***

| Function and Variable | Impact streams |
|---|---|
| *Hydraulic* | |
| **Vchann** | No change predicted due to existing channel shape. |
| **Vlining** | Decrease in heavy load of silt and natural stream channel returning |
| **Vpipe** | No change. |
| **Vbank** | No change. |
| **Vrough** | Changed to reflect riparian margins, with regenerating indigenous vegetation and fenced, to 10m on both banks. |
| **Vbarr** | No change |
| **Vchanshape** | No data entry required. |
| *Biogeochemical* | |
| **Vshade** | Increased to reflect change in riparian margins. |
| **Vdod** | Increase with increased shade and reduction in macrophytes. |
| **Vveloc** | Removal of still cross sections due to reduction in macrophytes and damming debris |
| **Vdepth** | No change. |
| **Vripar** | Changed to reflect riparian margins 10 m on each bank. |
| **Vdecid** | Increase in deciduous canopy cover |
| **Vmacro** | Reduction in macrophytes with increased shading |
| **Vretain** | No data entry required. |
| **Vsurf** | Increase in wood component and small gravels but reduction of macrophytes. |
| **Vripfilt** | Changed to reflect riparian margins. |
| *Habitat provision* | |
| **Vgalspwn** | No change due to topography and bank condition |
| **Vgalqual** | No change due to topography and bank condition |
| **Vgobspawn** | No data entry required |
| **Vphyshab** | Increase in parameters associated with riparian planting. |
| **Vwatqual** | No change. |
| **Vimperv** | No change. |
| *Biodiversity* | |
| **Vfish** | Removed for ECR. |
| **Vmci** | Removed for ECR. |
| **Vept** | Removed for ECR. |
| **Vripcond** | No data entry required |
| **Vinvert** | Removed for ECR. |
| **Vripconn** | Changed to reflect riparian margins. |