To

AW Holdings 2021 Ltd
CC/ RCP
James Kirkham

From

Woods
Tony Wang – 3 Waters Engineer

W-REF: P22-194
26 August 2022
Reviewer: Pranil Wadan – 3 Waters Manager

Memorandum

Surf Park Fast Track Referral Application – Preliminary Stormwater Assessment

1. Introduction

AW Holdings 2021 Ltd propose to lodge an application for a referred project under the Covid-19 Recovery (Fast-track Consenting) Act 2020 (the "Act") to utilise the fast-track consenting process via an expert consenting panel. This application relates to the development of approximately 43ha of greenfields land encompassing the properties of 1350 Dairy Flat Highway, Lot 15 DP 65979, and Pt Allot 189 SO 1118A in Dairy Flat, Auckland.

The landholding forms part of a larger land area that is currently zoned Future Urban Zone under the Auckland Unitary Plan Operative in Part (AUP OiP) and in the future will form part of a private plan change (PPC) process to rezone the land from Future Urban to various live residential zones under the AUP.

This will enable quality urban development and well-functioning urban environments north of Auckland. This proposal for a referred project will give effect to the purpose of the Act to promote employment and New Zealand's recovery from the economic and social impacts of Covid-19 through the enabled construction and delivery of a comprehensive development that offers employment opportunities and an accelerated supply of quality housing choice and diversity.

To support the application for a referred project, this memo provides a high-level review of the stormwater aspects of the proposal, including:

- Summary of the proposal and site description,
- High-level stormwater assessment proposal, and
- Overview of works required to achieve the proposal.

2. Site Description and Proposal

The applicant owns 43ha of land at the Dairy Flat Highway, which is currently zoned Future Urban ("FUZ") under the AUP OiP as shown in Figure 1.

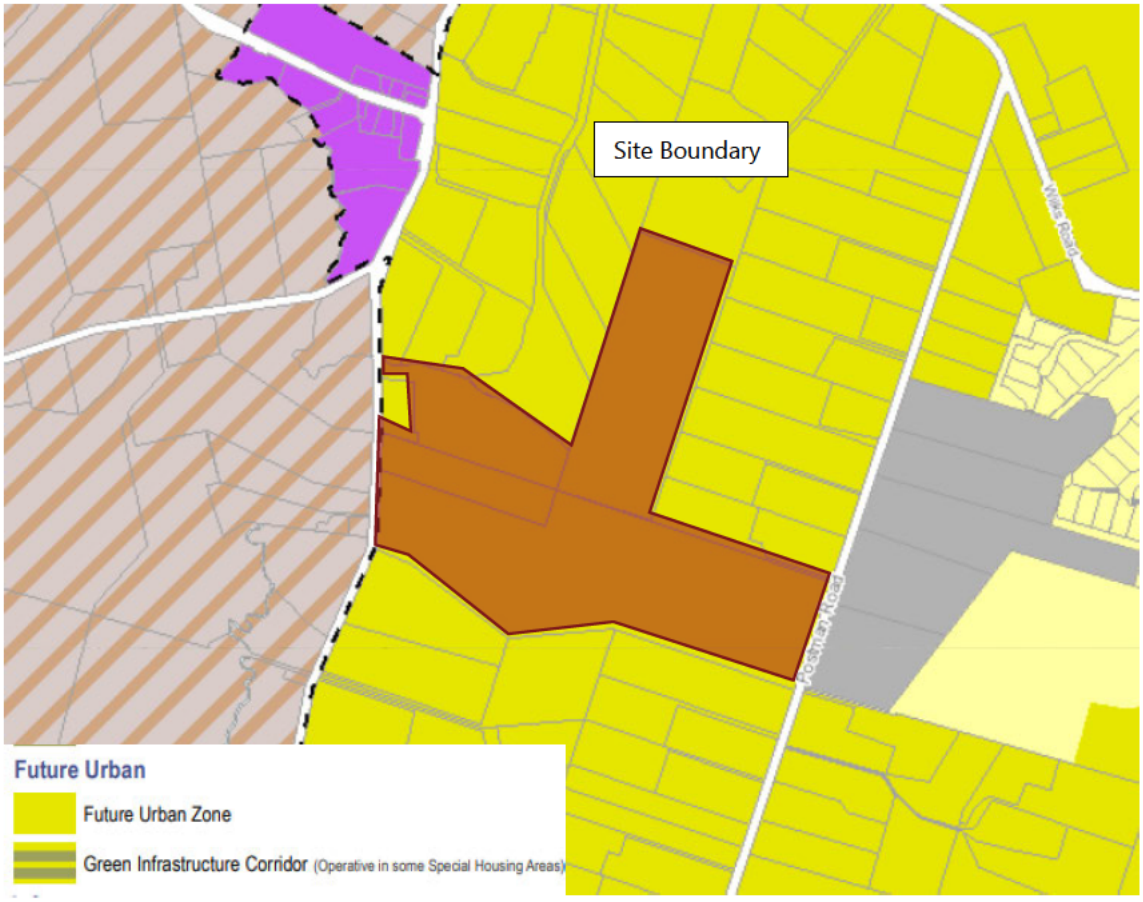

Figure 1: Auckland Unitary Plan Operative in Part

The site currently discharges to three 900mm diameter culverts underneath Dairy Flat Highway, as shown in Figure 2. Information obtained from Auckland Council (AC) Healthy Waters (HW) notes that these assets have yet to be validated via survey.

Culvert information provided by Health Waters is detailed as follows:

- 2 x 900mm diameter culverts at approximately 4.0m from Road Crest,
- 1 x 900mm culvert at approximately 4.6m from Road Crest.

Figure 2: Existing Infrastructure (Source: Auckland Council Geomaps)

2.1. Proposed development

The proposed development occupies an area of approximately 43ha. The proposed development as shown in Figure 3 comprises of a surf academy, short-stay accommodation as well as residential and light industrial development.

The proposed site layout plan is included in Appendix A.

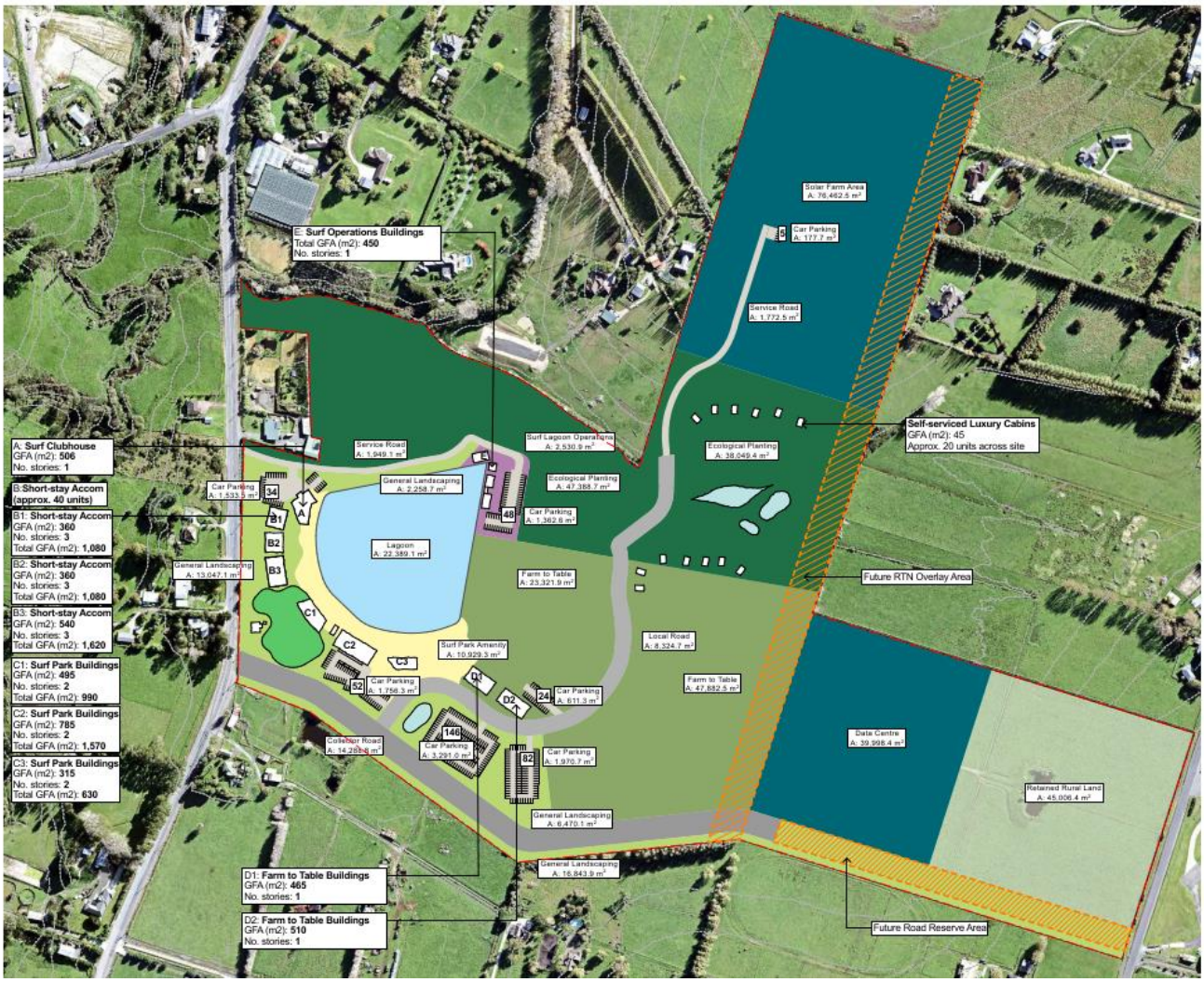

Figure 3: Master Plan (Source: Studiopacific Architecture)

3. Background Analysis

3.1. Watercourses and wetlands

An ecological constraints analysis was prepared by Bioresearches to support the subject application. The analysis identified one permanent stream within the site, as shown in Figure 4. The analysis did not identify any natural wetlands onsite that meet the current definition of a 'natural wetland' under the National Policy Statement for Freshwater Management 2020 (NPS-FM).

Natural wetlands may be present within 100m of the site and as such, any development may trigger the relevant regulations under the NES-FW. However, any potential effects on neighbouring wetlands within 100m can be managed/mitigated effectively through stormwater controls as well as erosion and sediment controls.

Figure 4: Ecological features – (Source: Ecological Constraints Analysis, Bioresearches)

3.2. Geotechnical

Geotechnical assessment is to be prepared to support the subject application.

3.3. Cultural and heritage sites

Cultural/ heritage site assessment (archaeological) is to be prepared to support the subject application.

3.4. Contamination

A site contamination is to be prepared to support the subject application.

3.5. Existing flood hazards

Auckland Council (AC) Geomaps indicates multiple existing Overland Flow Paths (OLFPs) onsite, as shown in Figure 5. OLFP A is shown to enter the site along the northern boundary from 1416 Dairy Flat Highway. OLFP B is shown to enter the site along the eastern boundary from 275 Postman Road. OLFP C and OLFP D are shown to enter the site along the southern boundary from 1320 Dairy Flat Highway and 231 Postman Road, respectively.

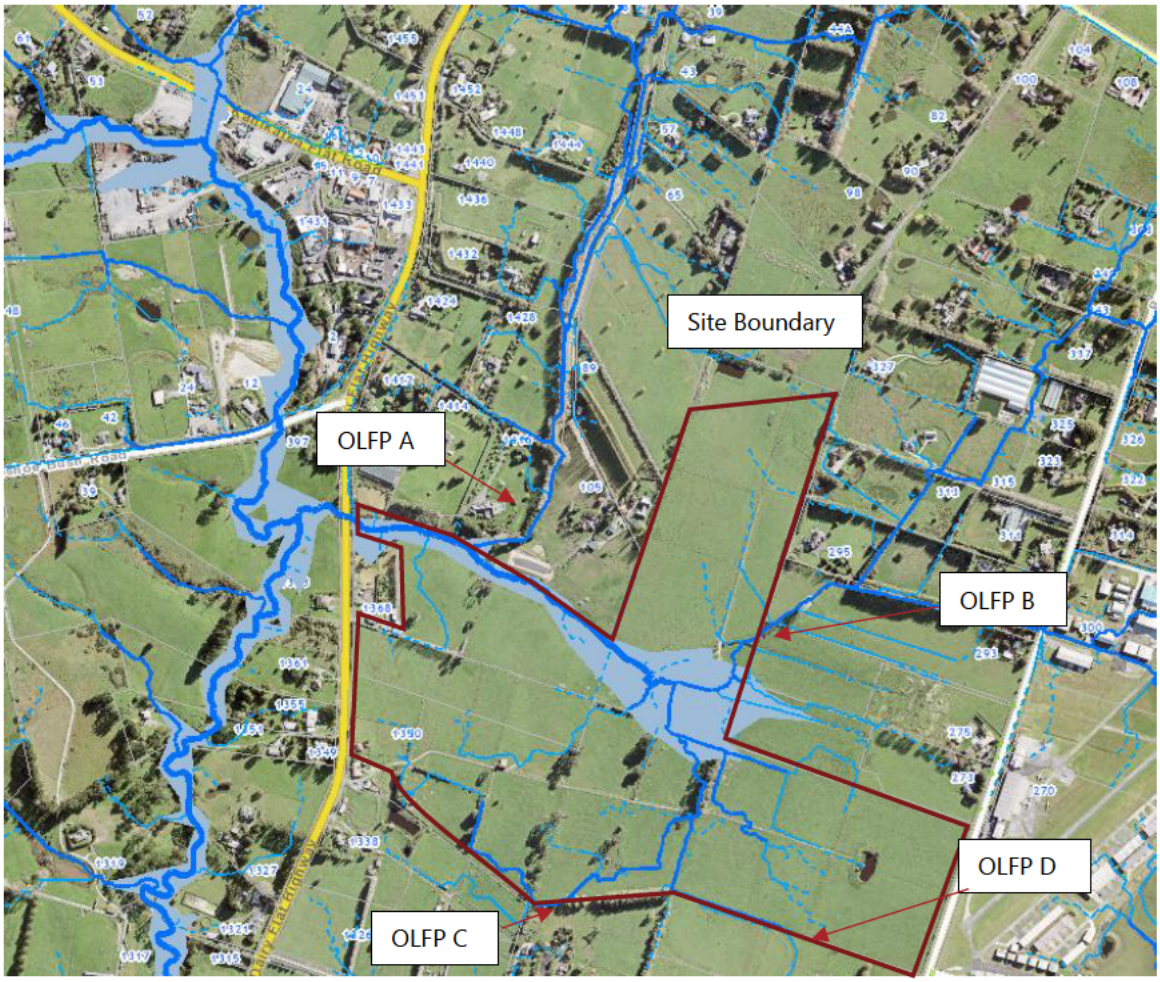

Figure 5: Existing flood risk onsite (Source: AC Geomaps)

3.5.1. Regionwide Rapid flood assessment

The latest flood modelling information for this area has been provided by Healthy Waters. The current Regionwide Rapid flood assessment provided by Healthy Waters is shown in Figure 6 below. The modelled scenario is a 1% AEP + Climate Change (2.1°C) event. It is noted that AC Geomaps showed a smaller floodplain within the subject site and did not align with the Rapid flood assessment results, as previously shown in Figure 5. However, the floodplain shown on AC Geomaps is based on the Rangitopuni-Dairy Flood Modelling and Floodplain mapping dated 2009 and is considered less accurate and outdated.

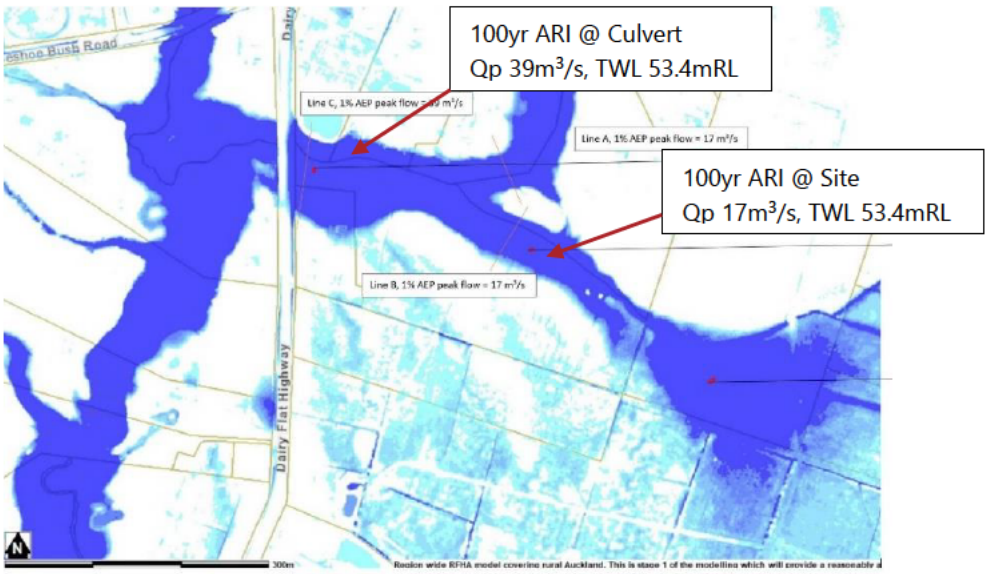

Figure 6: Regional Rapid flood assessment (Source: Health Waters)

4. Flood risk assessment

The current Regionwide Rapid flood assessment provides a 2.1°C climate change uplift factor. A high-level secondary flood risk assessment has been undertaken within the subject site for the 100-year ARI storm events with a 3.8°C climate change uplift factor, with interpolated peak flows.

It is noted that at the time of writing that the Auckland Council Stormwater Code of Practice (CoP) Version 3 has a 2.1°C climate change uplift factor, but it is envisaged that the 3.8°C climate change uplift factor will be included in future CoP publications to align with the Auckland Council climate emergency response, Therefore an assessment using both the 2.1°c and 3.8°c climate change uplifts has been undertaken.

The high-level flood risk assessment and capacity on existing culverts under the Dairy Flat Highway has been undertaken using HEC-RAS, a hydraulics analysis programme by the US Army Corps of Engineers. A uniform roughness of 0.11 has been assumed for the site to calibrate the model results to align with the information received from Healthy Waters. The assumptions for flood risk assessment are summarised in Table 1 below. It is noted this is based on information available on Geomaps with invert level information interpolated based on LiDAR 2016.

Table 1: Model Assumptions

Rainfall event	Peak flow (m^3/s)		Tailwater Level (mRL)	Comments
	Site	Culvert		
100-year - 2.1°C ED	15	33	52	Interpolated
100-year - 2.1°C MPD	17	39	52	Provided by HW
100-year - 3.8°C MPD	22	50	52	Interpolated

4.1. Overland Flow Path and Floodplain Assessment

The modelled floodplain and proposed site layout are shown in Figure 7. The model results demonstrate that the proposed Surf Park is outside the floodplains, and the floodplain is contained within the adjacent watercourse.

It is noted that the watercourse banks adjacent to 1412 to 1416 Dairy Flat Highway are relatively incised. The current masterplan suggests that limited earthworks will be conducted within the floodplain. Thus, the floodplain extent will be comparable for both the pre-development and post-development scenarios.

As shown in Figure 7, there is a wide flood plain within the 1350 Dairy Flat Highway. The proposed development within the floodplain is limited. The floodplain is typically located within land owned by the applicant; therefore, it is considered that the floodplain can be managed onsite.

It is to be noted that there are multiple overland flow paths (OLFPs) in or adjacent to the proposed surf park, as shown in Figure 7. The proposed building is widely scattered; it is considered that these OLFPs would be managed through a result of the development and placement of road corridors and green corridors.

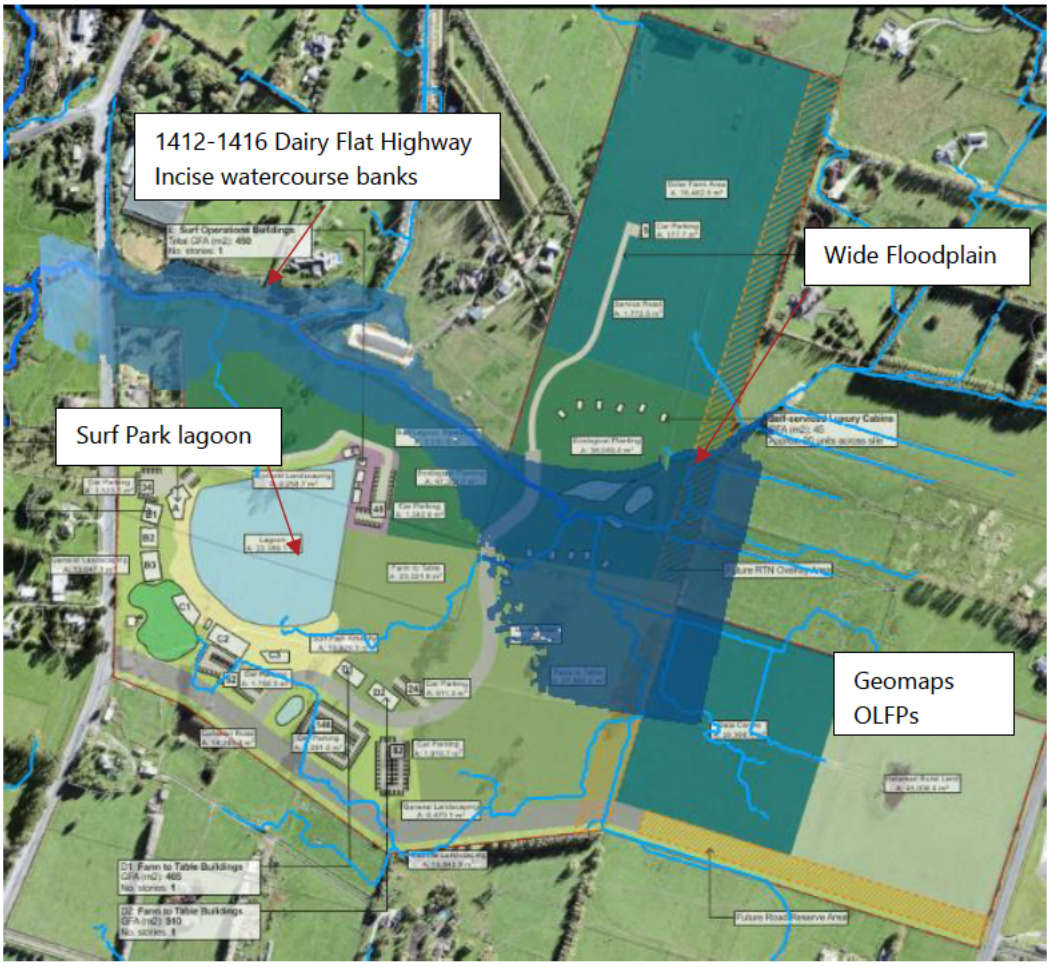

Figure 7: High-level flood plains

4.2. Dairy Flat Culverts

The preliminary assessments indicate that the culverts have limited capacity and is predicted to overtop under existing predevelopment conditions, causing potential flooding on Dairy Flat Highway, as shown in Figure 8.

The culvert assessment has been undertaken based on LiDAR data and culvert information provided by Healthy Waters and is yet to be validated by survey. The assessment is based on the Maximum Probable Development (MPD) scenario which assumes an impervious coverage of 65% and includes the wider contributing catchment,

The assessment indicates that under pre-development conditions there would be 440mm overtopping Dairy Flat Highway in the 100yr 2.1ºc scenario which would increase by 40mm to 480mm in the post development (MPD) scenario. The calculated flood depths over the Dairy Flat Highway are summarised in Table 2.

The MPD impervious coverages used for this assessment exceed what's currently proposed for the site as the calculated impervious coverage inclusive of the surf part lagoon is only 42%. It is noted that given the surf park lagoon will likely have no direct runoff (as it would get captured and reused within the lagoon system) the impervious coverage would reduce to approximately 36%.

It is noted that further detailed analysis is proposed to be undertaken via detailed flood modelling to confirm if the additional flows, as a result of the subject site, would require onsite attenuation (or similar) to mitigate any effects.

All calculations are included in Appendix B.

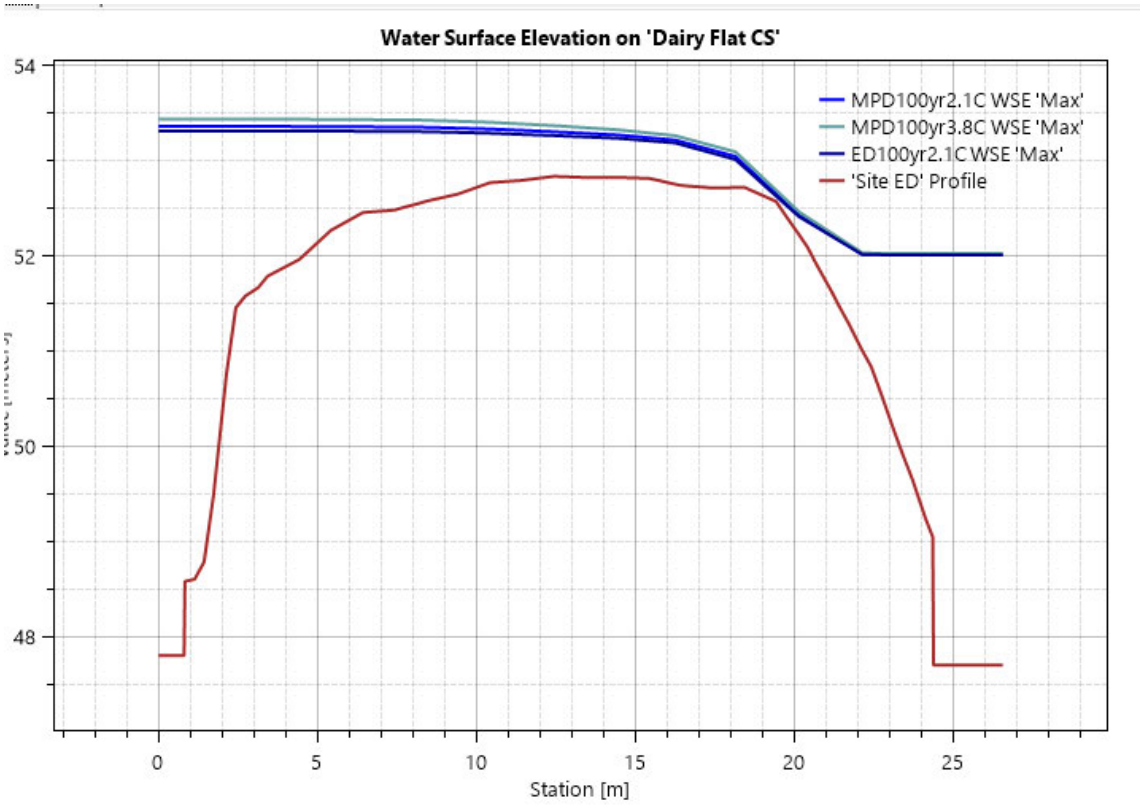

Figure 8: Assessment results overtopping of Dairy Flat Highway

Table 2: Flood Depth over Dairy Flat Highway

Scenario	Rainfall event	Peak flow (m^3/s)	Flood depth over Dairy Flat Highway centreline (mm)
Existing Development	100-year - 2.1°C ED	33	440
Post Development (MPD – 65%)	100-year - 2.1°C MPD	39	480
Post Development (MPD – 65%)	100-year - 3.8°C MPD	50	540

4.2.1. Flood management

It is to be noted that if onsite mitigation devices are required there are multiple potential locations which could accommodate an attenuation basin within the proposed site. The flood effect assessment and attenuation basin design will be undertaken during the detailed design stage.

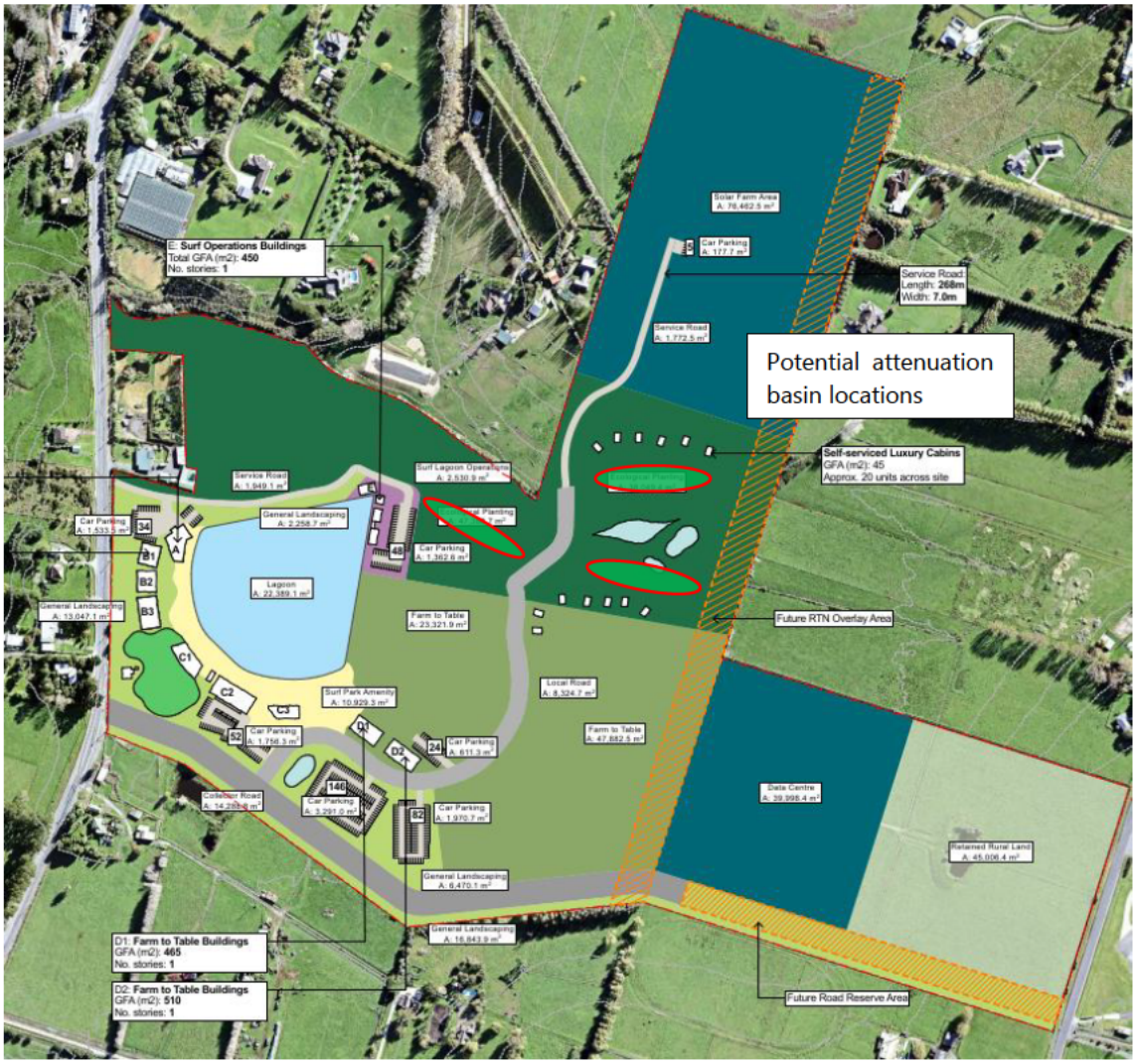

Figure 9: Potential attenuation basin locations

5. Stormwater management requirements

The subject site is classified as a greenfield site under the Regionwide stormwater network discharge consent (NDC).

A summary of how Schedule 4 Greenfields summary is shown in Figure 10.

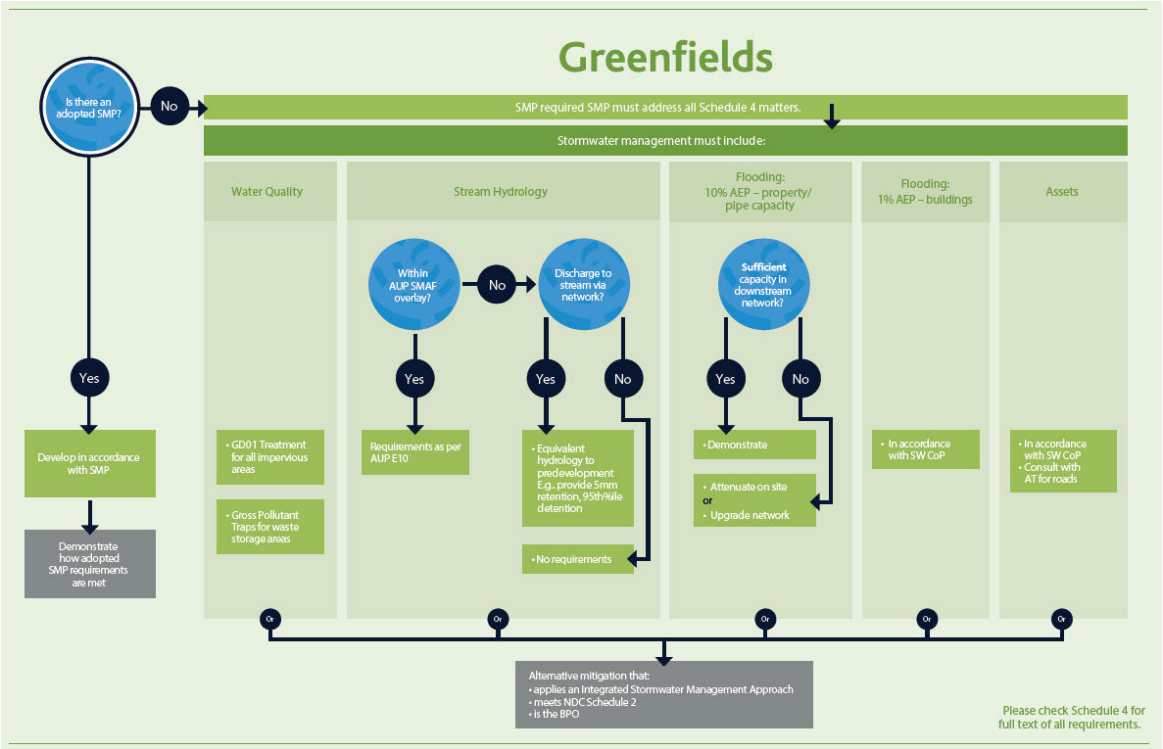

Figure 10: Schedule 4 Greenfields Summary (Source: Auckland Council Regional stormwater network discharge consent)

The requirements are summarised in the following sections.

5.1.1. Water quality

Treatment of impervious areas will be conducted by a water quality device designed in accordance with GD01 for the relevant contaminants.

Stormwater devices for the subject site could be in combination, but not limited to:

- Raingarden
- Grassed/vegetated swale
- Off-line Wetland
- Other equivalent devices

The development is widely scattered, and the stormwater treatment device can be effortlessly accommodated between proposed buildings and carparks, as demonstrated in Figure 11. Once the application has been accepted by the expert consenting panel, the treatment devices will be sized and located appropriately.

Figure 11: Potential treatment locations

5.1.2. Stream Hydrology

The site is not located within a Stormwater Management Area Flow (SMAF) overlay as per the AUP: OiP. However, as the site discharges to a stream, the following is required:

- Achieve equivalent hydrology (infiltration, runoff volume, peak flow) to pre-development (grassed state) levels:
    - Provide retention (volume reduction) of a minimum of 5mm runoff depth for all impervious surfaces; and
    - Provide detention (temporary storage) with a drain down period of 24 hours for the difference between pre-development (grassed state) and post-development runoff volumes from the 95th percentile, 24-hour rainfall event minus the retention volume for all impervious areas.

The proposed intensification will generate additional stormwater runoff and reduce ground recharge. To mitigate the effects, water-sensitive design techniques are proposed. Water efficiency measures being at least one water-sensitive technique for stormwater to be incorporated, connected to, achieved or maintained as part of all impervious areas within the subject plan change area. Water-sensitive devices for the subject site could be in combination but not limited to:

- Raingarden

- Soakage trench
- Rainwater tank for non-potable reuse system
- Pervious pavement or porous concreted used for hardstand areas
- Underground storage tanks with base filtration
- Other equivalent features

These measures are required in addition to any quality and quantity requirements. The locations of potential hydrology location devices are shown in Figure 11. The hydrology mitigation devices will be sized and located appropriately once the application has been accepted by the expert consenting panel.

5.1.3. Flooding – Property/ pipe capacity 10% AEP event

The primary stormwater runoff is conveyed through stormwater networks for up to a 10-year ARI stormwater event. The proposed network will be designed in accordance with the Auckland Council Stormwater Code of Practice.

5.1.4. Flooding – Buildings 1% AEP event

Secondary flows from events greater than a 10-year ARI storm event and up to a 100-year ARI storm will be conveyed along the road corridor, conveyance channels as overland flow paths. Overland flow path alignments will be dependent on the overall built environment, maintaining existing discharge locations where possible.

The overland flow paths should meet the following design criteria:

- Overland flow paths will be designed with sufficient capacity to accommodate the 100-year ARI storm event for the MPD, including climate change, in accordance with the Auckland Council SWCoP.
- They will be unobstructed, with the capacity to safely convey runoff through the development.
- Overland flows follow either road reserves or dedicated green areas. All flow paths are proposed to be located within public areas (roads/parks) where practicable and not over private properties without easement or other approval by Auckland Council.

6. Summary of Findings

The applicant is proposed to lodge an application related to the development of the Stage 1 site. The site is classified as 'Greenfields' under the NDC, therefore, a stormwater management plan will be required. The stormwater management requirements will be in accordance with Schedule 4 of the NDC. The stage 1 assessment concludes there are no significant impediments with respect to stormwater matters, and any required stormwater management devices can be incorporated within the subject site.

7. Next steps

It is proposed that a detailed flood modelling and flood risk assessment will be undertaken once the application has been accepted by the expert consenting panel to ensure any effects are mitigated and managed appropriately, this assessment will include survey data of hydraulic structures such as culverts.