



Waimauku West Plan Change

Preliminary Stormwater Management Plan

Halberd Holdings Ltd

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→ **The Power of Commitment**



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Executive summary

The preliminary Stormwater Management Plan (SMP) for the Waimauku West Development outlines a comprehensive strategy to support a 1,500 – 2,020-lot residential development, with commercial and industrial zones proposed on south – eastern part of the site.

The Plan addresses Auckland Council zoning and regulatory requirements, emphasizing sustainable stormwater management aligned with the Auckland Unitary Plan (AUP), GD01: Stormwater Management Devices in the Auckland Region (GD01), GD04: Water Sensitive Design for Stormwater (GD04), and the National Environmental Standards (NES).

The existing greenfield site features multiple overland flow paths (OLFPs), flood-prone areas, and significant ecological areas (SEAs), including natural wetlands. Review of the AUP confirms the site does not fall within a recognized SMAF1 or SMAF2 designated area. The development preliminary SMP proposes a water-sensitive design approach to maintain hydraulic neutrality in line with the greenfield development discharge requirements to improve water quality and protect downstream environments such as the Kaipara River and the Waimauku Stream.

Post-development stormwater is proposed to be managed through a treatment train of raingardens, and retention/detention systems, with infrastructure designed to accommodate 10% and 1% AEP flood events. Contaminated land areas identified under HAIL guidelines are recommended to be further investigated, with stormwater systems designed to avoid infiltration in these zones. Development activities are located away from identified significant ecological areas (SEA) and natural wetlands for protection of natural processes, flora and fauna. Overall, the preliminary SMP enables that development to proceed in an environmentally responsible manner, preserving natural hydrology and ecological integrity.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 01 and the assumptions and qualifications contained throughout the report.

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1. Introduction

1.1 Purpose of this report

The purpose of this preliminary Stormwater Management Plan (SMP) report is to outline the stormwater management strategy and requirements to support the Plan Change to Fast Track Referral application.

1.2 Scope and limitations

The scope of the report entails the development of a preliminary SMP for the proposed development in Waimauku West. This preliminary SMP is based on the previously completed work by GHD to identify potential flooding and stormwater challenges in the area associated with the proposed development. Outcomes from the previous study were issued to the client on 20 March 2020 via a letter titled "Waimauku West plan change – stage 1 potential flooding and stormwater challenges associated with development".

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1.3 Assumptions

The content of the report is only for a preliminary Stormwater Management Plan for the purpose of Fast Track Referral Application, and it is assumed that further assessment will be undertaken for a final stormwater management plan will be produced at the substantive consenting stage of the project.

The content of the preliminary Stormwater Management Plan exclusively relies on available information through published publicly available information, Client provided expert reports and information collected during the site-walkover.

The proposed preliminary Stormwater Management Plan has been developed in alignment with the current masterplan for the development (provided by Barker & Associates via email dated 18 August 2025). It is acknowledged that this concept may evolve as further detailed information and site-specific investigations become available.

2. Existing site appraisal

2.1 Summary of data sources

Table 2.1 provides a summary of data sources used in preparing this preliminary SMP.

Table 2.1 Data sources for the Preliminary SMP

Appraisal Item	Source of information
Geotechnical conditions	Geotechnical Appraisal Report for Propose Private Plan Change at 1080 State Highway 16 (Rev A) by CWM Geosciences – AKL2025-0012AB Rev. 0 dated 1 st of April 2025. Preliminary Site Investigation Report by SLR Consulting New Zealand dated 20 th March 2025 – 810.031375.00001 Rev 1.0 Soil and Resource Report by Hanmore Land Management dated 28 th February 2025.
Existing and proposed stormwater (SW) network	Auckland Council GeoMaps, 2025 Plan Change Civil Engineering Report dated 11th April 2025 by CRANGCIVIL Consulting Engineering – 1507 Rev. A
Existing hydrological features	Auckland Council Geomaps, 2025 The findings from the study on Waimauku West Plan Change – Stage 1, including potential flooding and stormwater challenges associated with the proposed development, as summarised in GHD's letter dated 20 March 202 - 1263333
Flooding and flow paths	Auckland Council Geomaps, 2025 The findings from the study on Waimauku West Plan Change – Stage 1, including potential flooding and stormwater challenges associated with the proposed development, as summarised in GHD's letter dated 20 March 2025 - 1263333
Ecological/Environmental Areas	Initial Desktop Ecological Constraints Plan for Waimauku West PPC dated 20 th February 2025 prepared by Viridis Environmental Consultants Environmental Consultants - 10322 Preliminary Ecological Assessment for the Development by Viridis Environmental Consultants Environmental Consultants dated 9 th June 2025 - 10322-005-1 Auckland Council GeoMaps, 2025 Preliminary Site Investigation Report by SLR Consulting New Zealand dated 20 th March 2025 - 810.031375.00001 Rev 1.0
Contaminated Land	Preliminary Site Investigation Report by SLR Consulting New Zealand dated 20 th March 2025 - 810.031375.00001 Rev 1.0
Hydrogeology	Auckland Council GeoMaps, 2025 The findings from the study on Waimauku West Plan Change – Stage 1, including potential flooding and stormwater challenges associated with the proposed development, as summarised in GHD's letter dated 20 March 2025 1263333 Preliminary Site Investigation Report by SLR Consulting New Zealand dated 20 th March 2025 - 810.031375.00001 Rev 1.0
Coastal Inundation	N/A
Stream, river, coastal erosion	Initial Desktop Ecological Constraints Plan for Waimauku West PPC dated 20 th February 2025 prepared by Viridis Environmental Consultants Environmental Consultants - 10322 Auckland Council GeoMaps, 2025
Cultural and heritage sites	Auckland Council GeoMaps, Cultural Heritage Site, 2021

2.2 Location and general information

The location for the proposed development ('the site') is 1080 State Highway 16, Waimauku, West Auckland, as shown in Figure 2-1. The site is divided into two areas by the North Auckland Line railway which runs east to west through the site:

- The northern site area is surrounded by rural land to the north, east and west, and by the Northern Auckland Line railway to the south.
- The southern site area is bordered by the North Auckland Line railway to the north, Waimauku township to the east, State Highway 16 to the south, and rural land to the west.

The topography consists of gentle to moderate grades, with steeper areas located along the northern and eastern boundaries. The land is currently used for pasture and grazing purposes. Existing infrastructure on the site includes a farmhouse, supporting sheds, shelters, and accessways.

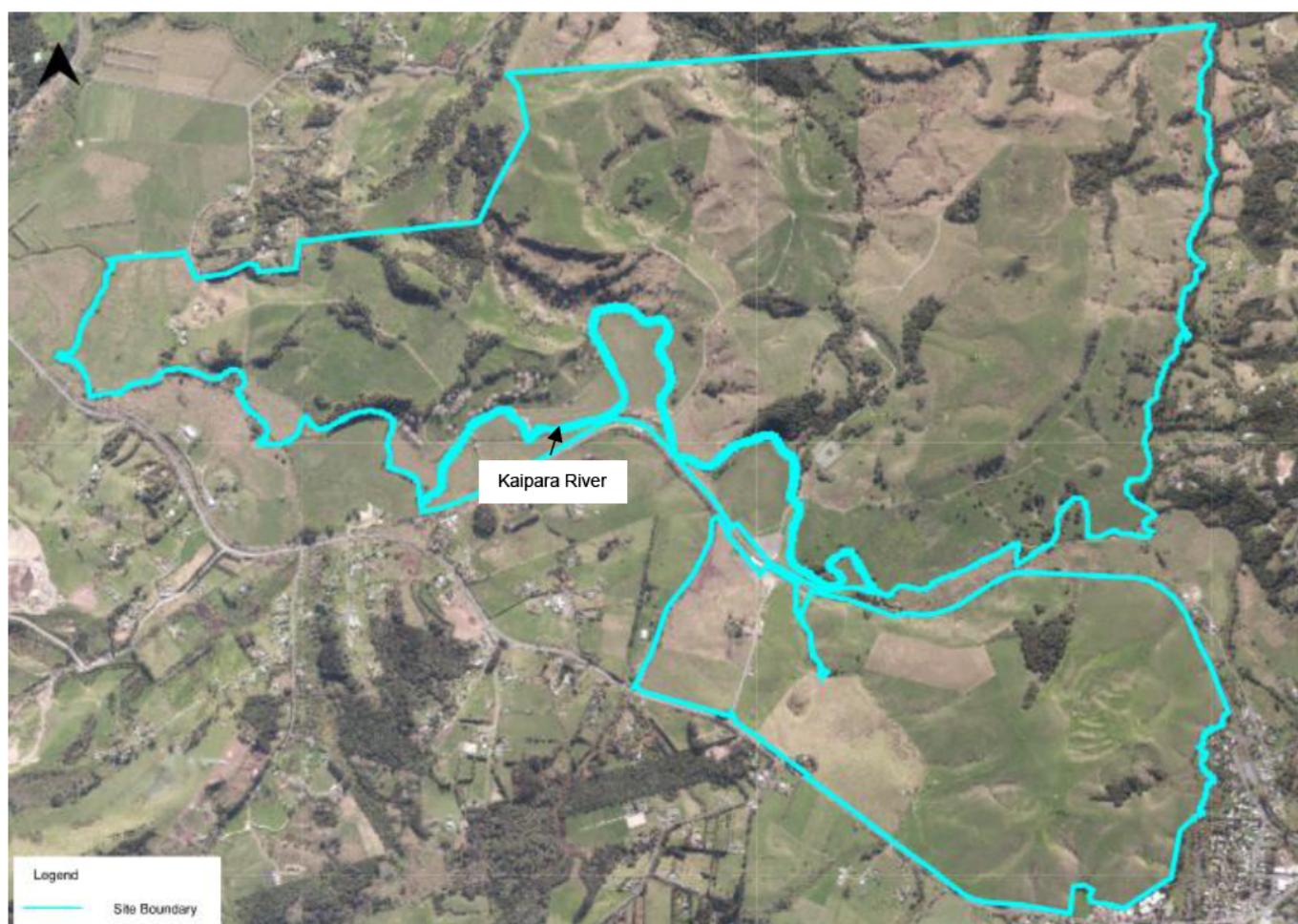


Figure 2-1 Location and property boundary for 1080, State Highway 16 – Auckland Council GeoMaps

The Kaipara River is located within the northern portion of the site and flows east to west. There are multiple overland flow paths (OLFPs) and streams within the site which flow into the Kaipara River, Figure 2-3.

Several stands of remanent native vegetation are present within the site and are classified as Significant Ecological Areas (SEAs). Refer to the Preliminary Ecological Assessment for the Development by Viridis Environmental Consultants Environmental Consultants for details regarding the identified SEAs.

2.3 Topography and geotechnical conditions

The following reports provide detailed information regarding the site's topography and geotechnical conditions:

- Geotechnical Appraisal Report (CMW Geosciences, April 2025)
- Preliminary Site Investigation Report (SLR Consultants NZ, March 2025)
- Solid and Resource Report (Hamore Land Management, February 2025)

Key observations in relation to the preliminary stormwater management plan (SMP) are summarised below:

- The site's topography is characterised as consisting of several steep and gentle ridgelines.
- Gullies within the site show signs of historic landslides.
- Identified steep slope areas are unsuitable for development. Varying slope conditions are visible through the contour map included as Figure 2-2.
- Low-lying alluvial deposits are present in the northwest corner of the site and are considered medium-risk development cost areas due to potentially liquefiable soils and/or soft and organic soils/peat.
- Soil type and profile varies throughout the site. Overall soil drainage varies from well-drained to very poorly drained.
- Available borehole data in proximity to the site indicates static water levels ranging from 0.3 m to 10.5 m below ground level.

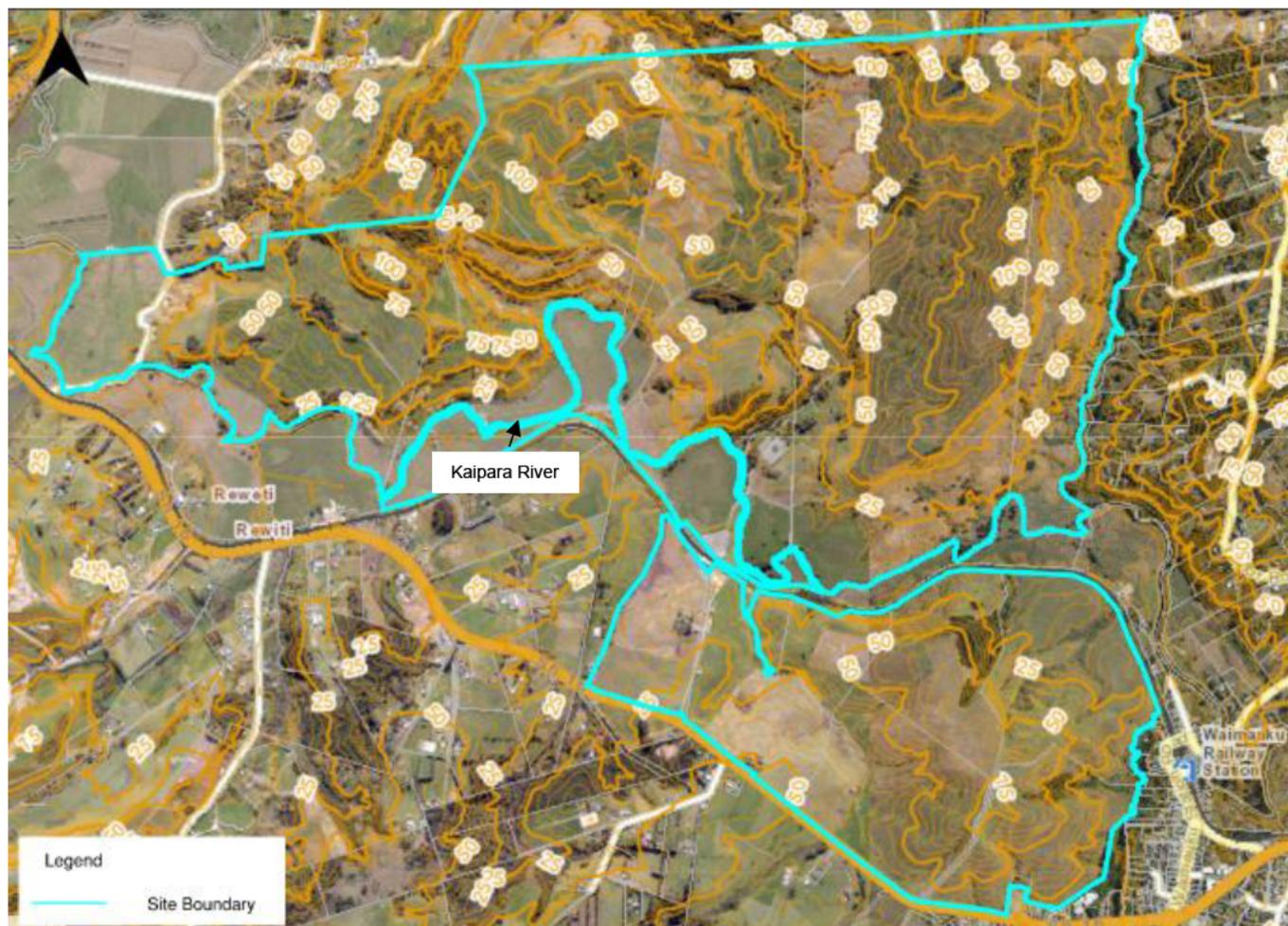


Figure 2-2 Site topography 5m contours – Auckland Council GeoMaps

The observations indicate that the following variables shall be considered in the preliminary SMP and when determining appropriate locations for treatment devices during the detailed stormwater design phase for managing post-development runoff:

- Variable groundwater level
- Diverse soil conditions
- Regions of poor draining soils with high groundwater
- Liquefaction
- Slope instability

2.4 Existing hydrological features, flow paths, and stormwater infrastructure

The intermittent streams, permanent streams and natural wetlands are the main hydrological features within the site boundary, see Figure 2-3. There are four permanent streams within the site:

- **Stream 01:** with a catchment of approximately 3.5 km².
- **Stream 02:** with a catchment of approximately 0.8 km².
- **Stream 03:** with a catchment of approximately 2.4 km² that passes through the centre of the proposed residential and light industry development.
- **Stream 04:** with an approximate catchment of 1.7 km² located in the north-west of the proposed residential and light industry development.

These streams converge into the Kaipara River and flow north to discharge into the Kaipara Harbour.

Minor streams and intermittent flow paths were identified in the northeast to southeast of the site, these are shown in Figure 2-3. During the site walkover on 10th of March 2025, a modified stream with associated on-site ponding was observed in the northwestern area of the site. This walkover was for the southern site area only.

Viridis Environmental Consultants report identified several natural inland wetlands, which shall be approached as per NES requirements. These are discussed later in this report, refer to Section 2.6 and locations are illustrated in Figure 2-5.

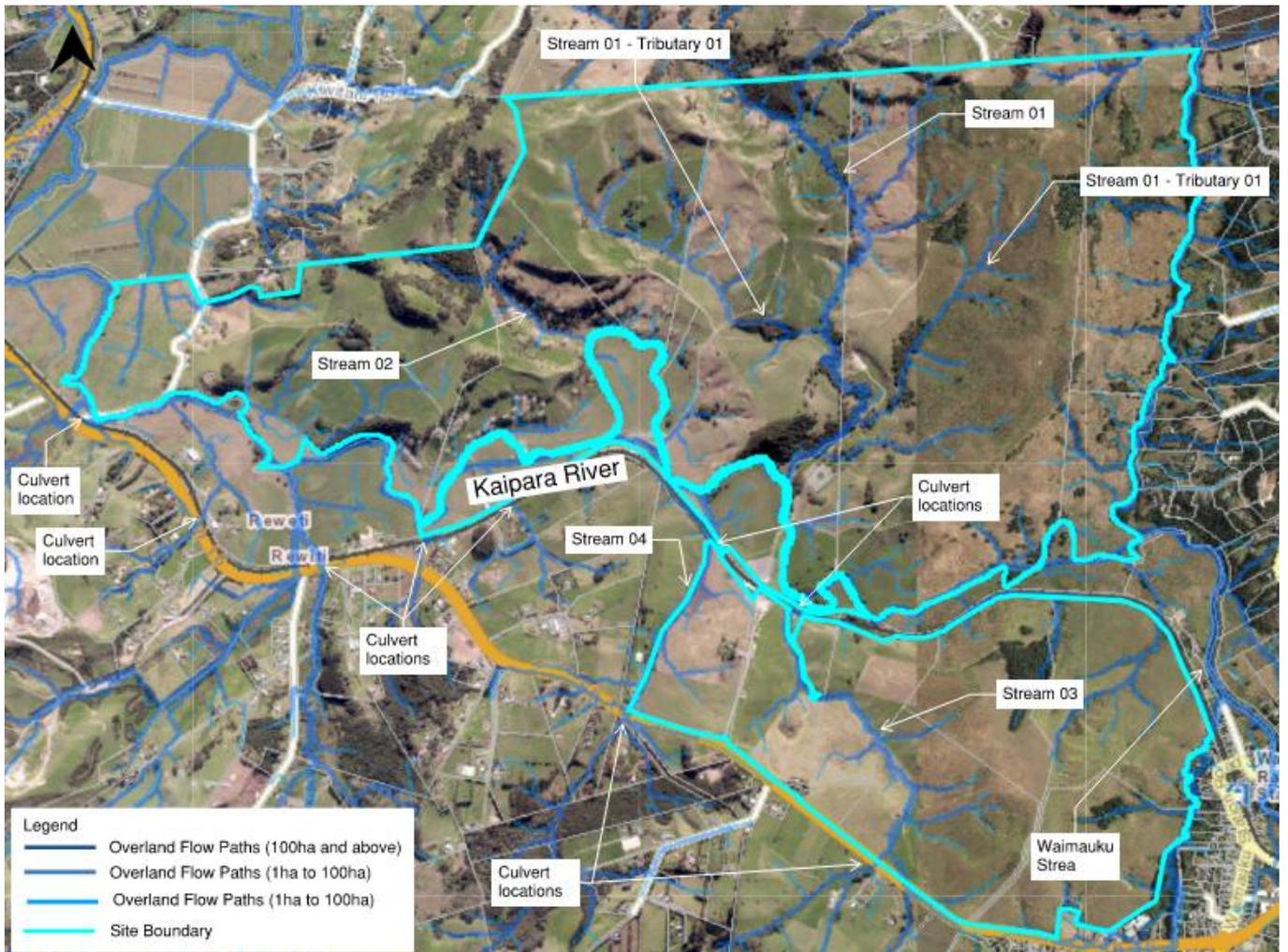


Figure 2-3 Permanent and intermittent flow paths in proximity to site – Auckland Council GeoMaps

Existing culverts on the northern and southern boundaries have been identified as key stormwater assets. Culverts on the northern boundary are located within KiwiRail land parcels and the culverts on the southern boundary are located under State Highway 16.

Due to the size of the culverts there is a potential constraint to overland flow, particularly under conditions of increased flow volumes. The size of these downstream culverts are of importance for the development given that the Kaipara River serves as the immediate receiving environment for stormwater discharge from the site. The culverts beneath the adjacent railway line could be constraints for hydraulic conveyance under changing flow conditions. Culvert capacities and potential risks posed by these constraints are recommended to be assessed as part of the flood modelling process.

Under the Auckland Unitary Plan (AUP), all intermittent and permanent streams (whether modified or not) are subject to stream protection rules. Coupled with the identified flow constraints this requires the preliminary SMP to focus on onsite post-development flow attenuation to maintain pre-development flow.

Review of Auckland Council GIS confirmed that there are no existing public stormwater assets within the site.

2.5 Flooding and aquifers

Flows from the site reaches the Kaipara River, then flows into the Kaipara Harbour and discharges to the ocean. The site is located mid-catchment of the Kaipara River.

Auckland Council Geo Maps indicate that the site is either within or adjacent to flood prone areas with high risk of inundation, refer to Figure 2-4.

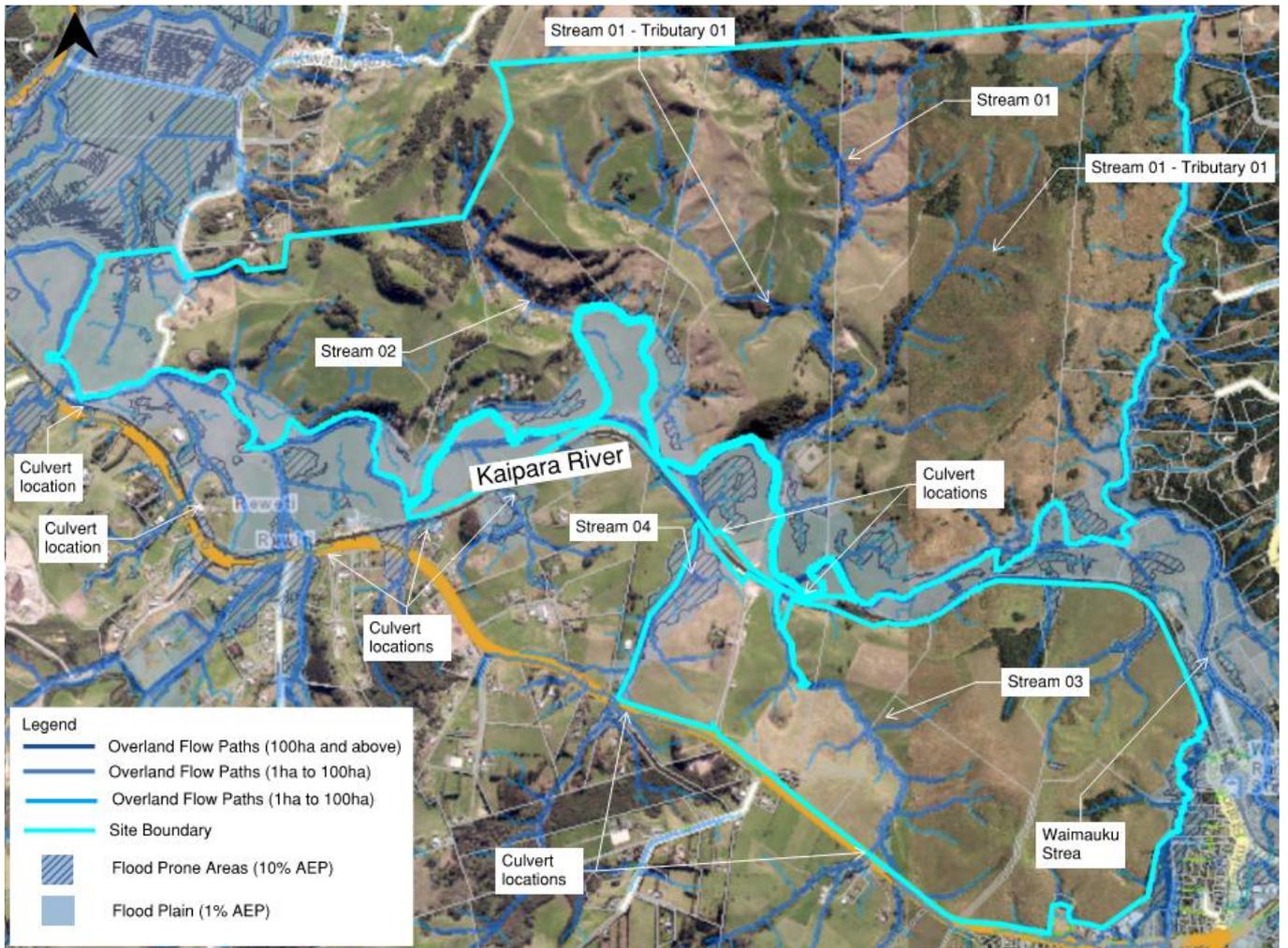


Figure 2-4 Flood plain and flood prone areas in proximity to the site – Auckland Council GeoMaps

With the site located mid-catchment for the Kaipara Stream then a pass forward approach could be possible (no attenuation). This would need to be reviewed and agreed with Auckland Council. The eastern side of the site discharges into a tributary however where flooding is evident and attenuation may be required on this side of the development to not increase the local flood hazard in that area. Similarly, the culverts underneath the railway to the north are likely to be constrained, and attenuation of site runoff may still be necessary to not increase the extent of flooding associated with those culverts.

Flooding requires further investigation through a flood modelling during the preparation of the final stormwater management plan at consenting and detailed design stages.

As outlined in the preliminary site investigation report by SLR Consulting NZ, dated 20 March 2025, the site does not fall under the high-use aquifer management area of the Auckland Unitary Plan. However, Auckland Council's GeoMaps shows that a quality sensitive aquifer partially overlaps the site from the southern boundary. In accordance with regulatory requirements, any surface water runoff from impervious surfaces within this area must undergo treatment prior to discharge to protect groundwater quality.

2.6 Wetlands, contaminated land and cultural heritage sites

The site investigations considered the southern portion of the site and key outcomes are summarised below.

An Initial Desktop Ecological Constraints Plan for the southern site was prepared by Viridis Environmental Consultants (20th February 2025). This document identifies multiple potential natural wetlands and terrestrial sensitive ecological areas (SEA-T) within the southern site. These potential wetlands were later confirmed to be wetlands with ecological significance by the Preliminary Ecological Assessment by Viridis Environmental Consulting dated 9th June 2025.

The site investigation for the southern site identified multiple natural wetlands, as shown in Figure 2-5. These wetlands are formed due to the existing topography of the site and, as per the AUP requirements and National Environmental Standards for Freshwater, these wetlands require protection. The north-east and eastern parts of the site have the heaviest concentration of wetlands alongside the identified SEA-Ts as illustrated in Figure 2-5.

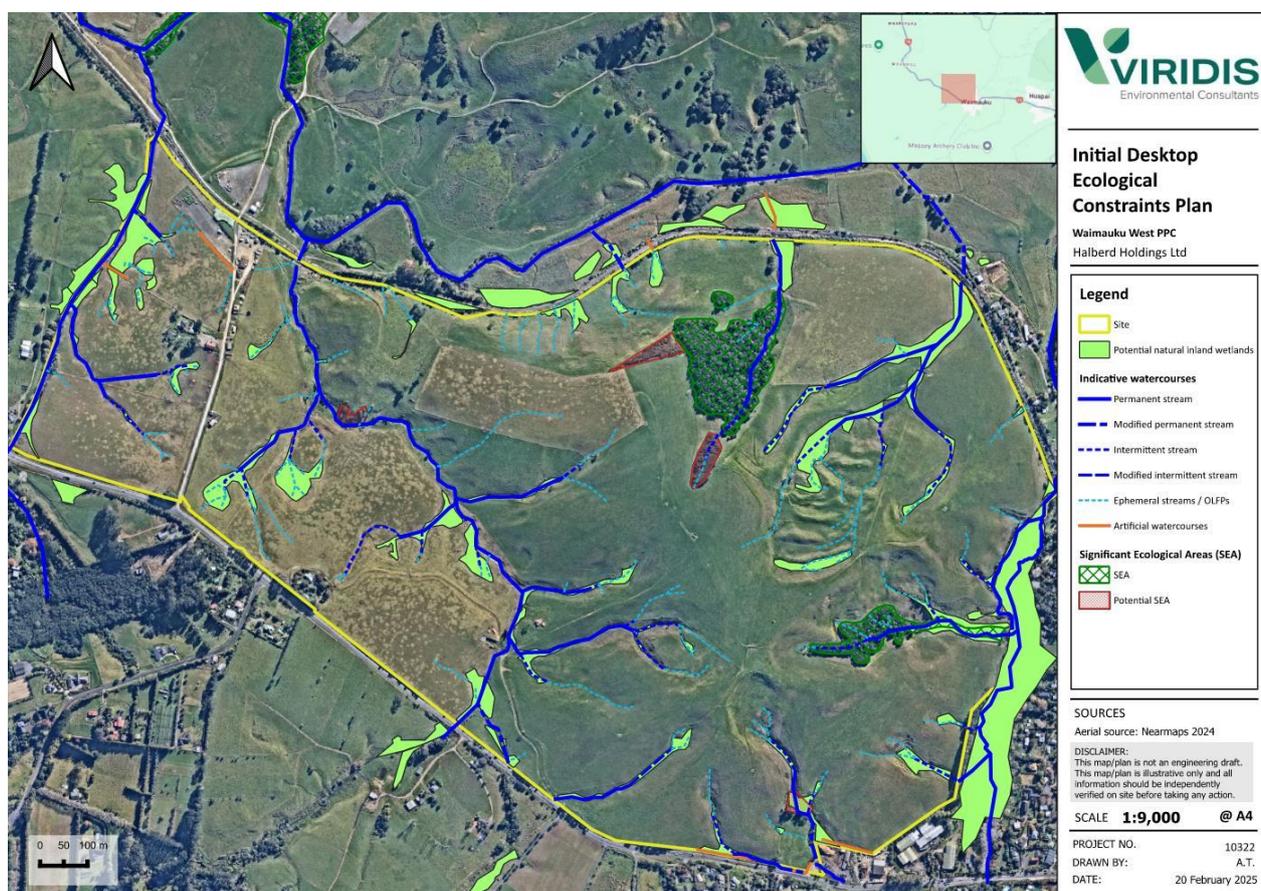


Figure 2-5 Identified ecological features in proximity to the site - Initial Desktop Ecological Constraints Plan by Viridis Environmental Consultants

Under the National Environmental Standards for Freshwater (NES-F), wetland areas are recognised as ecologically sensitive and are afforded strong protection. Activities such as drainage, reclamation, or modification that may reduce the extent or ecological function of these wetlands are generally restricted.

The Preliminary Site Investigation Report (SLR Consulting NZ) indicates HAIL activities are likely to have occurred in western and southern parts of the site, meaning NESCS provisions will apply to future residential development in those areas. However, to evaluate the risk of these contaminants, a Detailed Site Investigation (DSI) is recommended. The preliminary SMP is required to consider existing contaminated landsites locations to minimize mobilisation of contaminants.

Auckland Council Geomaps identify no cultural or heritage sites within the boundary of the site proposed for development.

3. Proposed Development

3.1 Purpose and nature of development

An updated masterplan was prepared for the proposed development shown in Figure 3-1. The proposed development includes a combination of residential and a small area of light industrial development on the southern area of site.

The updated masterplan proposes the subdivision of the site into 1,500 – 2,020 residential lots, ranging in size to accommodate varying housing densities. The development also features a neighbourhood centre, a light industrial area, open space reserves, and a wastewater treatment plant. Lower-density residential zones are predominantly located in the western and southeastern sections of the site, with higher-density development concentrated through the central area.

Urban Design Statement / Waimauku Masterplan

B+A



2.4 Illustrative Masterplan

The illustrative Masterplan presents a vision for urban development of the site. Key landscape and ecological features of the site are maintained whilst facilitating a variety of residential typologies that respond to the market. Depending on detailed design it is estimated that the site could accommodate between 1,500 and 2,020 new residential dwellings. Provision has also been made for two potential school sites (subject to further discussion with MoE), a neighbourhood centres and parks, land for business uses, stormwater management, and recreational trails.

Figure 3-1 Development Extent and Masterplan (Urban Design Statement, Waimauku Masterplan, B+A, 14/08/2025)

4. Stormwater management strategy

4.1 Development summary and planning context

Site specific stormwater management requirements were identified based on Auckland Council's regulatory and stormwater guidelines. **Error! Reference source not found.** provides a summary of relevant regulatory guidelines.

Table 4.1 Requirement for regulatory compliance

Requirement	Relevant regulatory/ design guideline
SMAF hydrology mitigation	Not within SMAF overlay
Stormwater discharge consent	Auckland council regional stormwater network discharge consent (NDC) schedule 04 – Greenfields Development
AUP precinct	Not applicable
Natural hazards	Auckland Unitary Plan Chapter E36
Natural resources of the regional policy statement	Auckland Unitary Plan Chapter B7 National Environmental Standards for Freshwater (NES-F) 2020
High Contaminant Generating Areas	Auckland Unitary Plan Chapter E9
Stormwater Diversion and Discharge	Auckland Unitary Plan Chapter E8
Hydrology in the Auckland region	Guidelines for Stormwater Runoff Modelling in the Auckland Region - Technical Publication 108 (Former Auckland regional council)
Stormwater management device design	Auckland council GD01 Stormwater Management Devices in the Auckland Region Auckland Council TR2013-018 Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices Auckland Council E1 Water quality and integrated management
Application of principles of stormwater management	Auckland council GD04 – Water Sensitive Design for Stormwater
Design and construction of stormwater infrastructure and Flood risk management	Auckland Code of Practice: For land development and subdivision (chapter 4 Stormwater V4) Auckland Council TR2013-018 Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices NZ Building Code, E1 Surface water NZE4404
Stormwater management approach	AUP Stormwater Management Provisions: Technical basis of containment and volume management including AUP E1
Design and construction of stormwater infrastructure	Auckland Code of Practice: For Land Development and Subdivision (Chapter 4 – Stormwater V4) New Zealand Building Code, E1, Surface Water.
Detail on Stormwater Management including Water Sensitive Design, Flood Risk Management, Freeboard allowance etc.	Auckland Code of Practice: For Land Development and Subdivision (Chapter 4 – Stormwater V4) New Zealand Building Code, E1, Surface Water. New Zealand Standard NZS4404 – Land Development and Subdivision Infrastructure.

The preliminary SMP development for the site falls under the Auckland Council Regionwide Stormwater Network Discharge Consent (NDC). Schedule 04 of the NDC outlines factors related to stormwater management in greenfield developments. Based on these requirements, the preliminary SMP focuses on addressing the following areas.

- Water quality
- Stream hydrology (Downstream Water Quantity)
- Erosion Potential
- Flooding 10% AEP
- Flooding 1% AEP

In addition to the above, the preliminary SMP will also consider hydraulic connectivity, contaminated land, asset ownership, implementation, maintenance and other dependencies.

4.2 Stormwater management principles and approach

The primary focus of this preliminary SMP is post-development outcomes for the site so that sustainable stormwater management is integrated into planning, design and delivery. The plan also focuses on safeguarding the receiving environment. This preliminary SMP aligns with the AUP and the objectives for Greenfield developments in NDC Schedule 04.

The proposed stormwater management approach leverages the existing landform and stream network as much as practicable by replicating the natural catchment layout and locating communal treatment devices in most suitable locations of each sub-catchment. This plan has adopted water sensitive design principles as outlined in GD04, see Table 4.2.

Table 4.2 Adopting water sensitive design principles

Water Sensitive Design Principles	Applications
Protect and enhance the values and functions of the natural ecosystem	Use WSD Blue–Green infrastructure and green corridors. Incorporate riparian planting and riprap to reduce stormwater impacts on immediate downstream environments.
Eliminate contaminant generation	Minimise contaminant generation using inert materials.
Address stormwater effects as close to the source point as possible	Minimise the risk of contaminants being mobilised via direct or indirect stormwater drainage
Mimic natural systems and processes for stormwater management	Preserve existing overland flow paths. Enhance gullies with riparian planting, revegetation, and riprap.
Maintain hydraulic neutrality	Preserve balance between generated pre and post development peak surface flows

Appendix A provides a high-level Stormwater Management Toolbox Assessment, focused on identifying hydrological mitigation requirements for the development.

The flow chart below summarises the treatment train for all generated run-off from the impervious areas post-development before it discharges to the existing stream network.

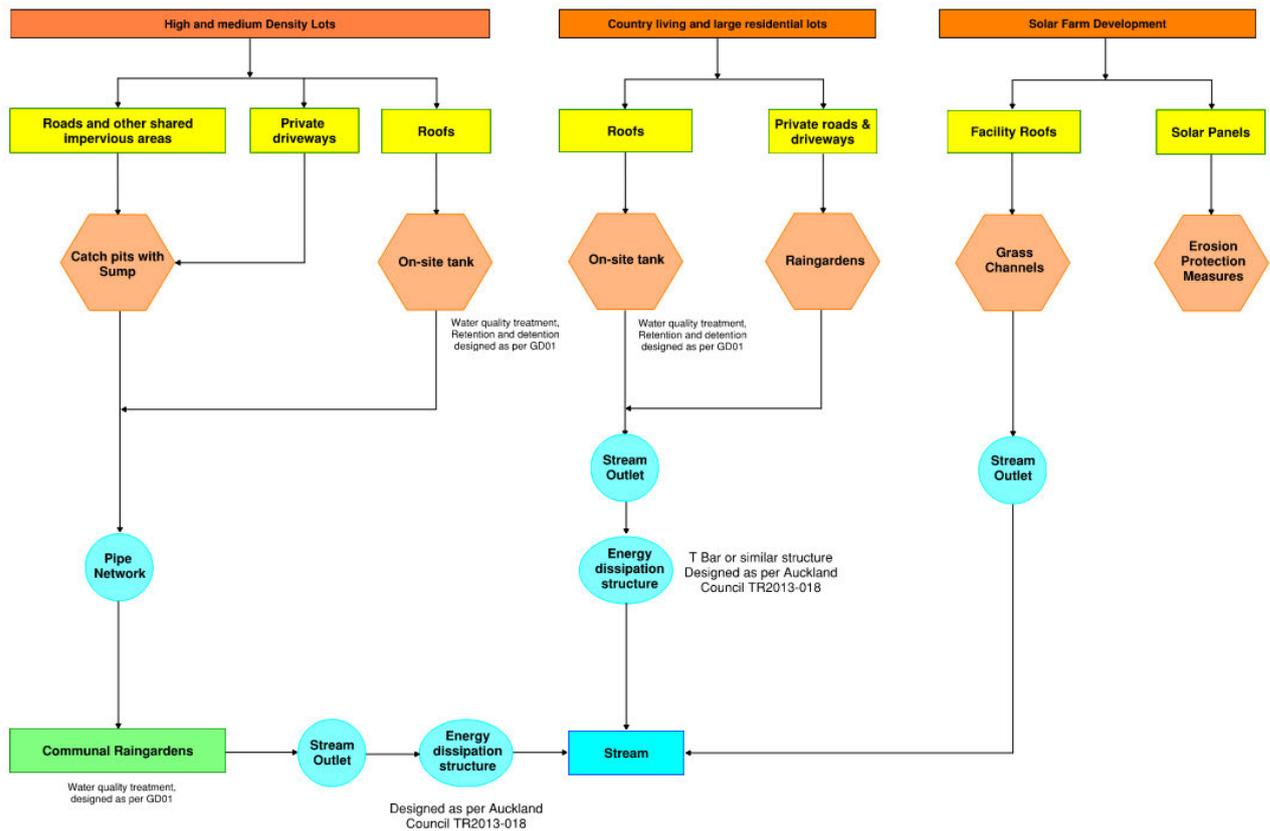


Figure 4.1 Treatment flow for run-off generated from impervious areas

It should be noted that an area of light industrial activity is proposed. Runoff from these areas will require specific treatment to suit the nature of the activity, *prior to discharge to the main piped stormwater network*. After this treatment then flows would enter the piped network, in the same manner as the high and medium density areas noted above.

4.3 Water quality

4.3.1 Residential and Light Industrial Development

The following post-development run-off generation areas, sources, and contaminants were identified for the proposed development. Table 4.3 summarises these post-development impervious areas along with suitable means of treatment.

Table 4.3 Post-development contaminants of concern and their sources

Impervious area	Contaminants / Concerns	Best Practice for Mitigation
Roofs	Copper and Zinc	Inert building material
Driveways	Sediments, Gross pollutants, Hydrocarbons, Metals, Oil and Grease Increased temperature in waterbodies	On-site raingardens
Public roads	Sediments, Gross pollutants, Hydrocarbons, Metals, Oil and Grease Increased temperature in waterbodies	Communal raingardens and or other suitable devices for treatment
Private joals/driveways	Sediments, Gross pollutants, Hydrocarbons, Metals, Oil and Grease	Communal raingardens and or other suitable devices for treatment

As noted earlier, light industrial areas will be treated to manage specific contaminants associated with the site activity prior to discharge to the main piped stormwater network.

It is understood that the proposed site is located in a High-use Stream Management Area, discharging into a sensitive receiving environment, including both immediate downstream concerns and catchment-wide concerns. Primary and wider objectives of this preliminary SMP relating to water quality will enable development to be aligned with regulatory requirements and the broader outcomes for sustainable stormwater management. Water quality objectives under the stormwater management plan include:

- Eliminate or, if not possible, minimise generation and discharge of contaminants.
- Provide at-source treatment for runoff
- Treatment of runoff generated through introduced impervious surfaces, in accordance with GD01, focusing on contaminants.
- Protection of the receiving environment, including immediate downstream environments, already established ecologically sensitive areas and natural wetlands.
- Support the maintenance and improvement of streams and floodplains, with consideration for broader community and environmental outcomes.
- Creating riparian buffer zones to safeguard natural processes, flora and fauna.

4.4 Stream hydrology (Downstream Water Quantity)

4.4.1 Residential and Light Industrial Development:

As part of a WSD approach, retention and detention are to be designed and provided in accordance with greenfield development discharge requirements. The stormwater system will be designed to achieve 5 mm retention and 95th percentile detention on-site. Flows will be dispersed using riprap and/or other energy dissipation systems to minimise erosion risk as applicable.

The raingardens shall be designed to GD01 requirements. Raingardens are expected to provide the water quality mitigation, retention, and detention requirements suitable for the development proposal. All detention and retention locations and treatment devices are recommended to be located away from existing natural wetlands, safeguarding sensitive environments.

Preliminary SMP recommends riparian planting around the identified SEAs, and natural permanent and intermittent streams. This will enable the establishment of a buffer zone and provide protection for natural processes, flora and fauna.

4.5 Flooding

Overall, flood modelling is recommended to support the design process and to assess the impact on the receiving environment (the Kaipara River).

4.5.1 Residential and Light Industrial Development:

A new stormwater network will be designed and sized for 10% AEP events in accordance with the Stormwater Code of Practice (SWCOP).

The preliminary SMP recommends that firstly focus on limiting the risks of flooding by managing the development layout and built structures away from identified flood prone areas. Given the identified constraints on hydraulic conveyance both upstream and downstream of the site, a flood modelling exercise is recommend being carried out before the consenting stage to determine the attenuation requirements of a 10% AEP event.

Development works will be required to adhere to the SWCOP to mitigate flooding concerns associated with 1% AEP events. This includes attenuation of overland flow volumes with consideration for downstream constraints and provision of adequate freeboard when designing structures. Flood risks can be safely managed through appropriate development planning and hydraulic design during the detailed design stage.

4.6 Hydraulic connectivity

As identified in Section 3, the proposed development has multiple hydrological features including permanent and intermittent channels, natural wetlands and ecologically sensitive areas distributed throughout the site.

The preliminary SMP prioritises safeguarding these natural features and maintaining existing hydraulic connectivity between the on-site features and hydrological features immediately upstream and downstream.

4.7 Overland flow path and floodplain management

As per the masterplan, all built structures are situated away from overland flow paths (OLFPs). Most flow paths are aligned with existing stream corridors and do not intersect the development footprint. In cases where minor OLFPs enter the site, these entry points are recommended to be retained and managed appropriately. All OLFPs from the development will be required to discharge into the stream network via riprap-lined channels or other suitable energy-dissipating devices.

OLFPs are contained within road reserves, general reserve areas and JOAL (common access) boundaries. The masterplan has located medium and high-density development away from floodplains. Lot layouts are designed so that the rear boundary aligns with OLFP extents, maintaining sufficient freeboard. Secondary flows are recommended to be conveyed via roads and directed into the stream network.

Existing natural wetlands and sensitive ecological areas have been identified on-site. The preliminary SMP recommends focussing on planning for diversion, retention or treatment of stormwater away from the identified sensitive areas to protect natural processes, flora and fauna while maintaining the base flow requirements. Wetlands are natural flood management features and for supporting the protection and enhancement of these areas implementation of riparian buffer zones are recommended under the SMP as per the requirements of the Natural Environmental Standard for Freshwater (NES-F).

4.8 Contaminated land

Preliminary SMP recommends following the GD04 and GD05 principle of integrating water sensitive design (WSD) principles to reduce the mobilisation of contaminants in identified potentially contaminated areas. This will include redirecting the surface run-off from the contaminated area, emphasizing the importance of preventing infiltration of contaminated groundwater into the stormwater network. No stormwater retention or detention device shall be located within contaminated land (unless remediated beforehand).

4.9 Asset ownership, on-going maintenance, stormwater network implementation and dependencies

Stormwater assets located within the public road and drainage reserves will be vested in Auckland Council at time of compliance. On site tanks and T-bar discharges, will be owned and maintained by the private Lot owners. Public stormwater network will be constructed and vested at each stage of development.

Vested assets will be maintained by Auckland Council. An operations and maintenance plan for each communal device will be provided at time of compliance.

As there is no plan to discharge into an existing council-maintained stormwater network, no dependencies exist for consideration.

5. Risks

Based on available information in relation to the proposed development, several risks were recognised. As additional information becomes available during subsequent consenting and design stages, the final SMP will be developed to manage these risks. Table 5.1 provides a summary of potential risks to stormwater management.

Table 5.1 Risk Register

Identified Risk	Risk Description	Recommendations	Risk level	Time frame for addressing the risk
Slope stability and erosion prone soil	All treatment, retention and detention devices require to be located away from unstable areas	Conduct detailed site investigations – Geotechnical	Moderate	Resource consent and Detailed design phases
Extent of natural hydrological features including wetlands	All development activities are required to be planned with a safe distance away from any identified natural hydrological feature	Conduct detailed site investigations – Environmental	Moderate	Resource consent
Potential HAIL sites/ Contaminated land	Existence of HAIL sites on location and level of contamination	Conduct detailed site investigations	Low	Resource consent and Detailed design phases
Groundwater levels and presence of a sensitive aquifer	Risk of liquefaction and untreated run-off infiltrating into ground water should be assessed	Conduct detailed site investigations – Geotechnical	Low	Resource consent and Detailed design phases
Change in flood plain pre- and post-development	Flood plain is expected undergo changes due to the development, these changes needs to be assessed for flood plain management	Flood modelling	Low	Resource consent and Detailed design phases
Extent of ESA areas	All development activities are required to be planned with a safe distance away from any identified ESAs	Conduct detailed site investigations – Environmental	Low	Resource consent
Unidentified site of cultural and heritage significance	Cultural impact assessment consultation	Engagement with mana whenua	Low	Resource consent

6. Departure from regulatory or design codes

The stormwater management approach for development meets the minimum regulatory or design codes standards and is considered the best practice options (BPO) approach. No departures are proposed at this stage.

7. Conclusion and recommendations

The Waimauku West Development proposes a significant residential and mixed-use development. This document identifies several key challenges including the risk of flooding, the presence of natural wetlands and sensitive habitats, and areas of potentially contaminated land.

In response, the preliminary SMP adopts a water-sensitive design (WSD) approach that emphasizes hydraulic neutrality, water quality treatment, and ecological protection. This preliminary SMP aligns with the AUP and the discharge objectives for Greenfield developments in NDC Schedule 04.

Using the applicable principles of stormwater management from GD04, the preliminary SMP has identified the following approaches and best practice options (BPOs) for the proposed development, see Table 7.1. These will enable management of runoff close to its source and prevent adverse impacts on identified sensitive areas and the downstream receiving environments like the Kaipara River.

Table 7.1 Recommended Approach and BPOs for the preliminary SMP

Requirements	Proposed BPO
Protect and enhance the values and functions of the natural ecosystem	Maintain OLFPs through the development. Incorporate riparian planting and riprap to reduce stormwater impacts on immediate downstream environments.
Maintain hydraulic neutrality	Preserve balance between generated pre and post development peak surface flows
Roads & JOALS	
Water quality treatment for all impervious area	Protection of existing overland flow paths Communal Raingardens for WQ and retention/detention
Water quantity	Stormwater network to be design for 10% AEP event Road OLFP for conveyance of 1% AEP with 3.8-degree climate change
Development Area/ Lots	
Water quality treatment for all impervious area	Inert Building materials
Retention/detention for impervious area	Rainwater Tanks
	On-site Raingarden to treat driveway runoff, for lots discharging to streams Discharge to streams where practical with relevant outlet designs Avoid/minimise constructions in flood prone areas, maintain freeboard above 1% AEP levels

The recommended strategy allows stormwater infrastructure to be integrated with the site's natural features, avoids flood-prone and contaminated areas and aligns with Auckland Council's regulatory framework. As the project progresses to the consenting and detailed design stages, further investigations—particularly geotechnical, ecological, flooding and contamination assessments—will refine the stormwater design during the consenting and detailed design stages.

Appendices

Appendix A

**Stormwater Management Toolbox
Assessment for Residential and Light-
Industrial Development**

Stormwater Management Toolbox Assessment

As the proposed development area is greater than 1,000 m², the unitary plan states that discharge from the impervious area should be managed by a stormwater management device that:

- Reduces contaminants from the impervious area.
- Provides retention of a minimum of 5 mm runoff depth off impervious areas.
- Provides detention (temporary storage) with a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes of the 95th percentile, 24-hour rainfall event minus the retention volume from impervious areas.

Further, as illustrated in Figure A-1 the area is overlapped fully by High-use Stream Management Area and partially by a Sensitive Aquifer Management Area.



Figure A-1 Overlapping acquirer and stream management areas – Auckland Council GeoMaps

Highlighted in orange outlines, Figure A-2 illustrates an abstract from GD01 (Table 10) providing the stormwater mitigation requirements and devices being considered for the development.

The proposed development layout is positioned away from identified SEAs and identified permanent and intermittent flow paths. Given the presence of SEAs, water quality treatment devices will be located as close to the point of generation as possible.

Table 10: Mitigation needed to support Auckland Unitary Plan requirements

Mitigation requirement (Auckland Unitary Plan)	Stormwater management requirement and aim	Devices providing this mitigation
Stormwater management - flow: SMAF 1 and 2: <ul style="list-style-type: none"> Provide retention (volume reduction) of at least 5 mm runoff depth. 	Retention: <ul style="list-style-type: none"> To protect streams and recharge groundwater. 	<ul style="list-style-type: none"> Rainwater tanks (with reuse) Bioretention devices (unlined) Living roofs Pervious paving (unlined) Infiltration devices.
Stormwater management - flow: As per the Greenfield Development Discharge Requirements in GDC Schedule 04	Detention: <ul style="list-style-type: none"> To protect streams. 	<ul style="list-style-type: none"> Pervious pavements Bioretention devices Wetlands Ponds (dry and wet) Rainwater tanks.
Stormwater diversion and discharge: <ul style="list-style-type: none"> Provide detention of 10% AEP Provide detention of 1% AEP. 	Detention: <ul style="list-style-type: none"> To manage and mitigate flood effects and flood risks, including effects on buildings and property. 	<ul style="list-style-type: none"> Rainwater tanks (no reuse) Ponds Wetlands.
Stormwater management – quality: <ul style="list-style-type: none"> Provide treatment of the water quality flow or volume. 	Water quality mitigation: <ul style="list-style-type: none"> To protect water quality. 	<ul style="list-style-type: none"> Bioretention devices Swales Wetlands Ponds (where specific design is agreed with Auckland Council).

Final device selection to be concluded in the consent and preliminary design stage

Figure A-2 Mitigation approach and requirements

Calculation requirements for the design of treatment devices include water quality flow (10mm/hour), retention (5mm run-off depth), detention (95th percentile) and large & extreme storms. Requirements from Table 11 of the GD01 is to be met.

Based on the selective requirements for the location including topology and spatial restrictions, devices for the development are to be selected during consenting and preliminary design stages. Bioretention devices are preferred and proposed to be located to treat sub-catchments as determined by the site topography. As per Figure 6 of GD01, 34mm will be used as the 95th percentile 24-hour rainfall depth during device sizing.

Residential Lots

The residential lots will be required to have optional private on-lot rain tanks. Tanks will be sized for the retention and detention volume. It is proposed that each lot will discharge into the proposed stormwater network or to natural streams via suitable discharge outlets after treatment. Lot type will also influence this decision. Option of direct discharge into streams are predominantly for the larger residential and country living lots, ensuring that base flows in the streams are maintained.

As part of the preliminary SMP, riparian buffer zones are recommended around the identified SEAs, and natural permanent and intermittent streams. Riparian buffer zones are expected to provide protection to natural processes including flora and fauna in the area.

Public Roads

Public roads will be vested to Auckland Transport after commissioning. Swales, pervious pavements, tree pits, and roadside bioretention devices are not suitable or supported due to operational and maintenance concerns in steep roads. Wetlands are also unsuitable for retention. Therefore, communal raingardens are proposed as the preferred stormwater management device in such cases.

Stormwater runoff is collected via catchpits and conveyed through a public trunk main network to the raingardens. The pipe outlets are recommended to include a standard wingwall or bubble-up manhole with a scruffy dome for 10% AEP events, and a low-flow outlet for smaller events. Pre-treatment for gross pollutants is not proposed.

The raingarden provides:

- 5mm retention volume
- Detention volume for the 95th percentile storm (post minus pre-development plus retention)

Treated flows discharge into adjacent natural gully flow paths with riprap protection, eventually joining the main overland flow path running west to east through the site. Any raingardens will be designed to GD01 requirements.

Secondary storm flows are planned to be conveyed along roadways to sag points, where they may require short sections of new open channels to connect to existing gullies. These conveyance channels incorporate velocity-reduction measures such as check dams and natural baffles to manage flow energy. These features will be designed to be visually unobtrusive and blend seamlessly with the surrounding landform.

Private Roads and Driveways

Private roads and driveways will adopt a similar approach for stormwater management. Surface runoff will be collected via grading, kerbs, channels, and catchpits, then discharged into the pipe network. From there, flows will be managed consistent with the approach used for public road runoff.

For large residential lots and country living lots, on-site treatment methods will be used before discharging the water into natural streams or the stormwater network.

Design and location selection of raingardens will be undertaken in the design stage of the project. If the infiltration rate is below 2 mm/day, or if infiltration has the potential to affect slope stability, raingardens may be lined, and the required retention volume will be incorporated into the detention volume. Should the geotechnical assessment identify this as a specific concern, lining of raingardens will be implemented at the relevant locations to mitigate associated risks.

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