ENVELOPE

STORMWATER MANAGEMENT PLAN

50 Westney Road, Mangere, Auckland
2022

DOCUMENT CONTROL RECORD

CLIENT	Rotokohu Investments Ltd
PROJECT	50 Westney Road, Mangere, Auckland 2022
PROJECT NO.	1636-02
DOCUMENT TYPE	Stormwater Management Plan – Version 3
DATE ISSUED	December 2024
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ISSUE AND REVISION RECORD

DATE OF ISSUE	19 December 2024
STATUS	Final
ORIGINATOR	 Jay Panchani, Civil Engineer
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APPENDICES

EXECUTIVE SUMMARY

Envelope Engineering Ltd has been engaged by Rotokohu Investments Ltd to provide a Stormwater Management Plan (SMP) in relation to a private plan change and resource consent applications for the proposed development at 50 Westney Road in Mangere hereafter known as the 'site'. This SMP has been developed to achieve consistency with the objectives and policies of the Auckland Unitary Plan, as well as Auckland Council's Guideline Documents and industry best practice options.

This SMP sets out good management practices and identifies the mechanisms to be utilised to avoid or mitigate potential adverse effects on the receiving environment associated with stormwater discharge.

The main outcomes of the SMP include:

- The provision of an integrated stormwater management approach.
- The assurance of no/minimal adverse changes to the downstream OLFP and flood risk.
- The mitigation of any adverse effects from stormwater runoff on surface water quality by providing a treatment train approach.

The SMP will achieve the desired outcomes by adopting the following Water Sensitive Design principles:

- Promote inter-disciplinary planning and design.
- Protect and enhance the values and functions of natural ecosystems.
- Address stormwater effects as close to the source as possible.
- Mimic natural systems and process for stormwater management.
- Filtering, Conveyance and Re-use.
- Protect and enhancing the receiving environment.

In order to achieve the outcomes outlined above, the following methodologies are proposed:

- Provide stormwater treatment for all trafficable surfaces at source using treatment devices such as Stormfilter, and Enviropods.
- The proposed pipe network and OLFP between the site and the downstream creek will be sized to cater for the 1% AEP (100-year ARI) flows. Attenuation is not expected to be required (Option 1). If required, this could be provided by tanks located within the site.
- The maintenance and upgrading of erosion protection measures along the OLFP and at the outlet as required.
- Inert building materials to be used to ensure no contaminant discharge from the structures.
- The site is not located within a current SMAF zone but retention is proposed to be provided as a part of the development to reduce water demand associated with the new buildings.

1.0 EXISTING SITE APPRAISAL

This section analyses the existing site conditions and investigations undertaken to date.

1.1 SUMMARY OF DATA SOURCES AND DATES

EXISTING SITE APPRAISAL ITEM	SOURCE AND DATE OF DATA USED
Topography	• Envelope Surveying, 2024
Geotechnical / soil conditions	• Not Available
Existing stormwater network	• Auckland Council GeoMaps • Topography data, Envelope Surveying 2024
Stream, river, coastal erosion	• Auckland Council GeoMaps
Flooding and flowpaths	• Auckland Council GeoMaps
Coastal Inundation	• Auckland Council GeoMaps
Ecological / environmental areas	• Auckland Council GeoMaps
Cultural and heritage sites	• Auckland Council GeoMaps
Contaminated land	• Not Available

1.2 LOCATION AND GENERAL INFORMATION

EXISTING SITE ELEMENT	
Stormwater Management Area	• Not currently but SMAF 1 retention proposed.
Site address	• 50 Westney Road Mangere Auckland 2022
Legal description	• PT ALLOT 74 PARISH OF MANUREWA
Current Land Use	• Residential - Mixed Housing Suburban Zone
Current building coverage	• 4442 m^2 measured from Auckland GIS Map
Historical Land Use	• Unknown

1.3 TOPOGRAPHY

The current site topography, as indicated by the Envelope Surveying report dated May 2024 and accompanying survey plans, reveals that the site is predominantly utilised by the SPCA as its main Auckland base and animal shelter. The facility occupies the northern two-thirds of the site, while the rear third has recently been surfaced and serves as an open-air car park currently utilized for Motorhome parking.

The terrain of the site is generally flat, with only minor gradients ranging between 1% to 2%, primarily descending towards the southeastern corner. Vehicular access is currently available from three access points on Westney Road.

There was a temporary earth bund (1-2m high) around the eastern perimeter of the site. We understand this was installed to mitigate noise issues associated with the previous land use. These bunds have now been removed and a minor swale has been formed. We have carried out a site visit to clarify our understanding of the site levels and stormwater flowpaths as these differ from those identified on Geomaps. We note that Geomaps is based on lidar and therefore has accuracy limitations which can be more evident on very flat sites such as this. Please refer to Appendix 1 which contains the topographical survey, and our assessment of the current stormwater flow catchments present on the existing site. An extract of the catchment plan is shown below in Figure 1.

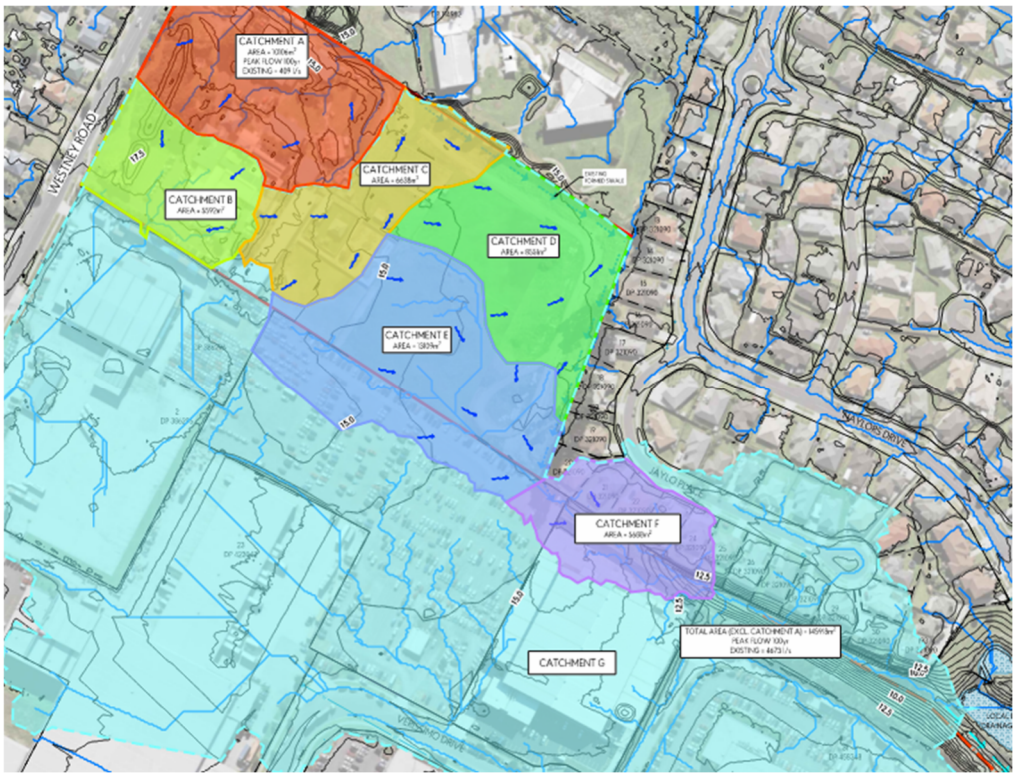

FIGURE 1: Existing Stormwater Catchment Plan.

1.4 GEOTECHNICAL

Currently, no geotechnical investigations have been conducted for the intended redevelopment of the site. These will be undertaken later, as part of the resource consent process for the land use. However, we have sighted reports prepared to support previous developments on the site. We note the identified presence of stiff silty clays and a relatively high groundwater level mean that soakage is unlikely to be a viable primary option for stormwater disposal although may be an option for retention discharge subject to specific soakage testing.

We note that the site is generally flat, and that surrounding land has been developed for a range of buildings from two level dwellings and school buildings to large 10-12m high industrial buildings on land to the south.

Based on surrounding landuse and our site walkover we cannot see any geotechnical issues precluding implementation of this stormwater management plan when developing the site.

1.5 EXISTING DRAINAGE AND STORMWATER INFRASTRUCTURE

There is existing stormwater infrastructure in the northern and western parts of the site close to Westney Road. A closeup extract from Geomaps showing the northern corner of the site in Figure 2 below shows the existing connections to the public network. Other than this pipework, open drains exist across the southern and eastern part of the property which act to direct stormwater towards the southeastern corner of the site.

FIGURE 2: Existing Stormwater Network, Auckland Geomaps.

It appears that the stormwater from all existing buildings, sumps within the driveway and carparking on the site discharge to this system currently. As can be seen in Figure 2 this network crosses Westney Road and then heads Northeast parallel to Westney Road but within private land before crossing Westney Road again and heading through the No. 22 Westney Rd property. The public main is a 225mm diameter up to 22 Westney Road where it increases in size to a 450mm diameter. Figure 3 below shows the public network at 22 Westney Rd.

FIGURE 3: Existing Public Stormwater Drainage (22 Westney Rd)

One notable feature in 22 Westney is a stormwater inlet structure (asset number 2000676404) which collects overland flow from 44 Westney Rd (which currently includes some overland flow from the subject site)

The subject site is at a localised high point along Westney Road so there is no public stormwater infrastructure along much of the street frontage. Another public stormwater network commences at no. 60 Westney Road and heads Southwest as can be seen in Figure 4 below:

FIGURE 4: Existing Public Stormwater Drainage (60 Westney Rd)

The land generally drops in elevation further away from Westney Rd and stormwater from the remainder of the site flows to the south and east. There is an existing stormwater discharge permit that allows stormwater runoff from the southwestern part of the site to be conveyed and discharged at an existing outlet located along the northern boundary of 1 Verissimo Drive on to an existing Overland flow path (OLFP). This has been identified in the topography information as below. From the property file record the outlet pipe is a 375mm pipe. The permitted discharge flow rate to the outlet is 133 L/s. which is valid till 31 December 2025.

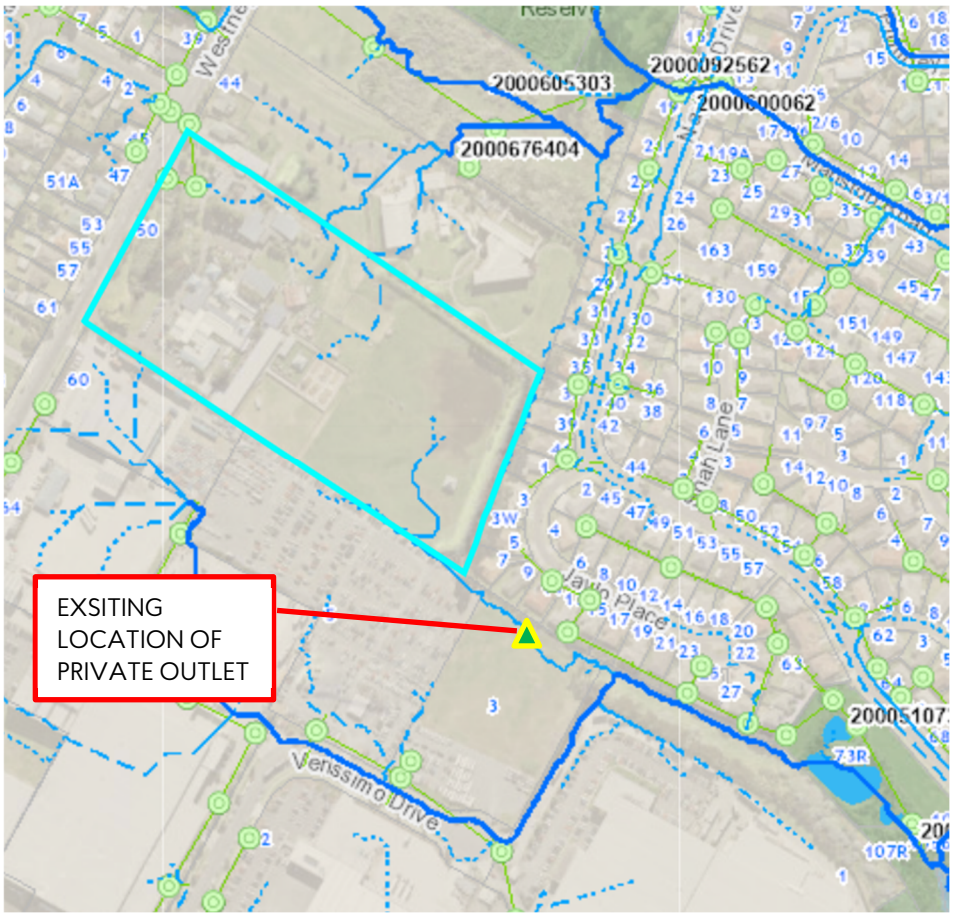

FIGURE 5: Existing location of private outlet, as per existing discharge permit.

The existing outlet has been inspected and is currently partially blocked with overgrown vegetation as shown in Figure 6 below. We have not carried out a CCTV inspection of the pipe but, based on our visual inspection this appears to require some maintenance work.

FIGURE 6: Existing outlet. Photo looking towards outlet (Source Envelope, December 2024)

1.6 RECEIVING ENVIRONMENT

1.6.1 GROUNDWATER

As noted above, geotechnical investigations have not yet been carried out. Due to the relatively flat nature of the site and the absence of previous evidence of soakage devices it is assumed that soakage is not likely to be a suitable method for primary stormwater discharge. This supported by geotechnical investigations carried out in close proximity to the site. Soakage is not proposed as a primary method of stormwater disposal for the development but may be utilised for localised discharge if conditions are suitable.

1.6.2 STREAM AND WETLAND

There is no existing stream or wetlands identified within the site and in the proximity of the subject site based on Auckland Council GIS data. Therefore, no direct effects to any stream and wetland due to the proposed private plan change.

There is an existing treatment and detention marsh pond located approximately 280m away from the site at 73R Naylors Drive Mangere Auckland 2022, as seen below. This is connected to Pukaki Creek. The levels of the existing open channel conveying overland flow from the site is at a similar elevation to this pond and therefore we believe than during moderate to high intensity rain events the open channel flows overtop into the pond.

The site will effectively be discharging to the coast via the land-based discharge and overland flowpath. Stormwater discharges need to be carefully considered to prevent any untreated stormwater discharging to Pukaki Creek.

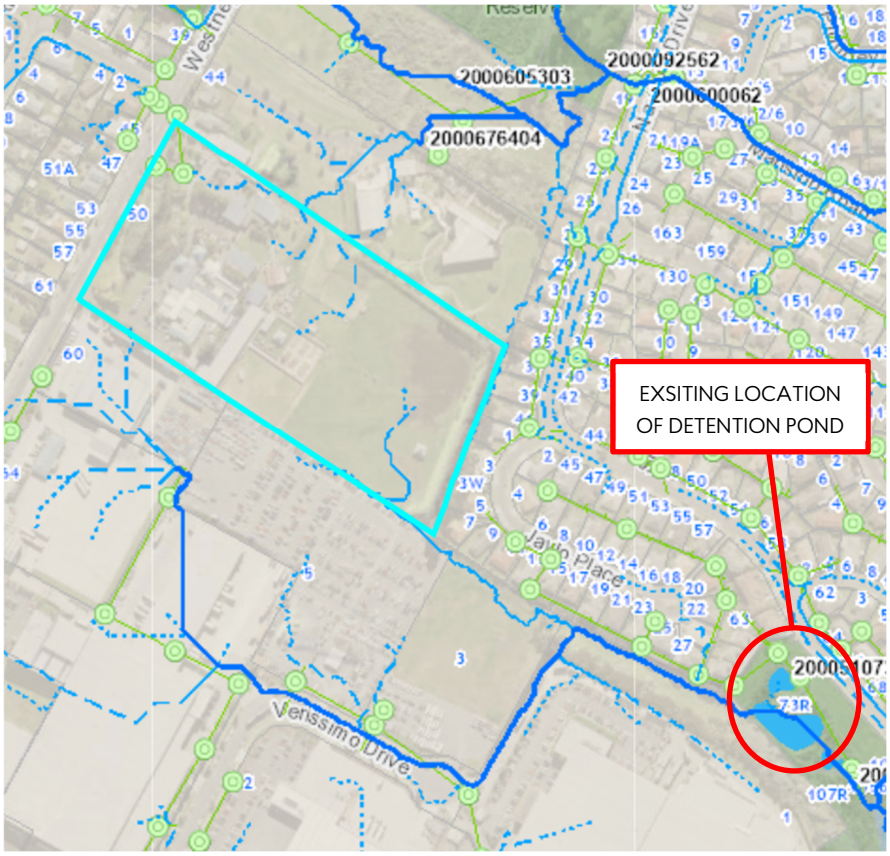

FIGURE 7: Existing Location of Wet Detention Pond.

1.7 EXISTING HYDROLOGICAL FEATURES

There is a small flood prone area identified on Geomaps within the southern corner of the site. Based on our review of the site topography this is due to a small depression that has been formed and is compounded by the previous temporary earth bund placed along the eastern edge of the site. We do not believe this flood prone area is significant and does not need further consideration when planning the site redevelopment. With the bund removed, we do not believe there is a ponding area on the site.

There are several small overland flowpaths indicated on Geomaps. We have studied the topographical survey and visited the site to investigate these in detail. Appendix 1 shows an updated plan of the existing overland flowpaths. These are described in more detailed in Section 1.8 below.

1.8 FLOODING AND FLOWPATHS

Auckland Councils Geomaps shows that the site is affected by Overland flow paths (OLFP) that pass through the northern, eastern and southern portions of the site, refer to Figure 8 below. A southern portion of the site is classed as a Flood Prone Area.[1]. As noted above we do not believe this flood prone area exists on the site. All originate within the site as shown on the Geomaps however the flow paths vary and Appendix 2 has been prepared based on topographical survey and inspection so should be considered more accurate. Subcatchments C, D, and E discharge via the overland flow path in the southern corner of the site. Sub catchment B flows partially through the neighbouring property (no. 60 Westney Rd) before rejoining the flow from the other sub catchments in the same overland flow path (OLFP B).

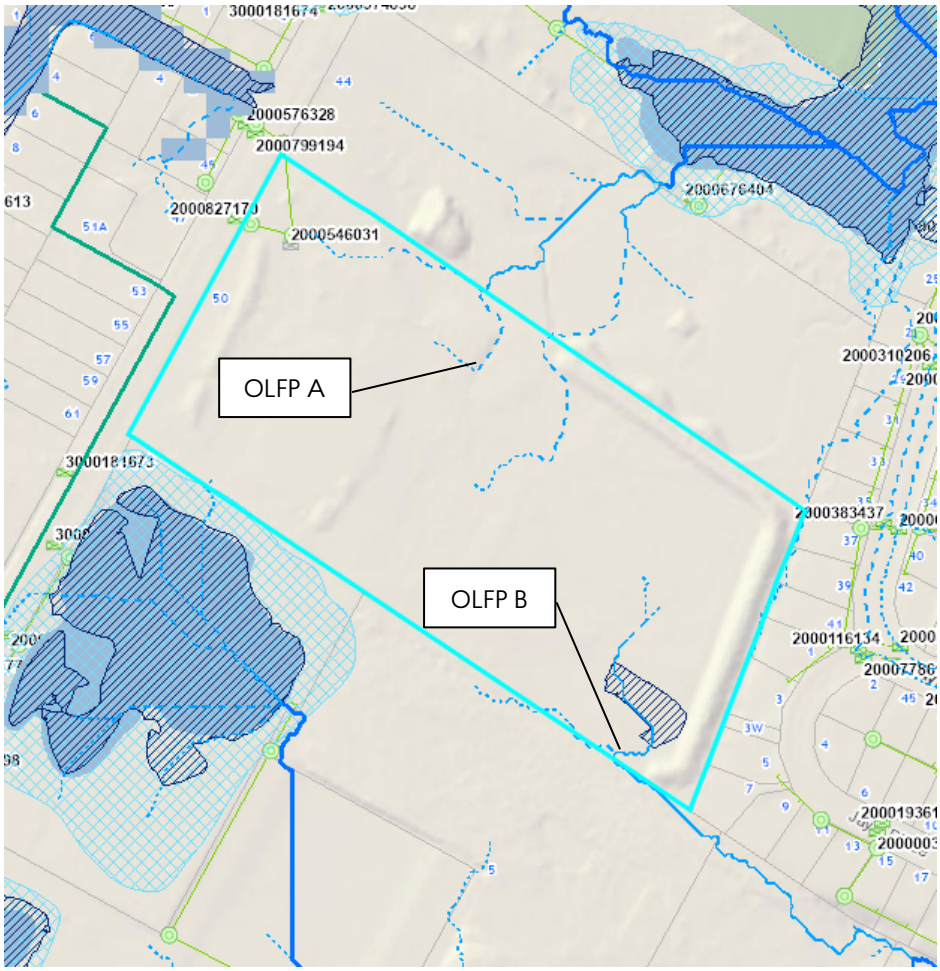

FIGURE 8: Existing OLFP, source Auckland GIS Geo maps.

1 Flood prone areas (FPA) are potential ponding areas that may flood and commonly comprise of topographical depression areas.

Auckland Council's Geomaps shows that the site is subject to the following overland flow paths (OLFP) which affect the site or are in close proximity:

- OLFP A – Consist of three minor OLFP which is within the site and flows through 44 Westney Road in a north-westerly direction and then discharges to a flood plain located in 22 Westney Road. The catchment of the OLFP is slightly smaller than shown on Geomap and is represented by sub catchment A on our plan.
- OLFP B – OLFP which flows towards the southwestern corner of the site, which then passes through 3-5 Verissimo Drive and converges into a major OLFP that flows in south easterly direction and then discharge to a wet detention pond located at 73R Naylors Drive. As noted above this includes sub catchments C, D, and E and is also joined by sub catchments and F downstream from the site.

1.9 COASTAL INUNDATION

The site is not affected by the Coastal inundation zone. The site lies landward of the Auckland Council defined Areas Susceptible to Coastal Instability and Erosion (ASCIE).

1.10 BIODIVERSITY

As per GeoMaps, the site is not situated within a Significant Ecological Area and does not contain any protected 6. The overland flow route to the southwest traverses Open Space – Conservation Zone and then discharges to Coastal Transition Zone and then Coastal Marine Zone.

1.11 CULTURAL AND HERITAGE SITES

Consultation with mana whenua is currently being undertaken to ascertain if there are any significant development constraints i.e., koiwi tangata.

Initial consultation has been undertaken with Ngāti Tamaoho Trust. Ngāti Tamaoho Trust made several suggestions, and these have been integrated into the development proposal where practicable.

Initial consultation has not indicated that the site contains any specific sites of interest to mana whenua.

1.12 CONTAMINATED LAND

A preliminary site investigation (PSI) will be required to be completed prior to submitting resource consents for redevelopment of the site. This SMP must be updated if there are any issues raised during environmental investigations that could affect the management of stormwater within the site or receiving environment.

2.0 DEVELOPMENT SUMMARY AND PLANNING CONTEXT

2.1 REGULATORY AND DESIGN REQUIREMENTS

Based on review of Auckland Council's regulatory and stormwater guidelines, the site-specific stormwater management requirements have been identified. The relevant regulatory guidelines are listed in the Table below, and a summary of the requirements is presented in the sections following.

REQUIREMENT	RELEVANT REGULATORY / DESIGN TO FOLLOW
Unitary Plan – SMAF hydrology mitigation	AUP Chapter E10
Stormwater Discharge and Diversion	AUP Chapter E8
High Contaminant Generating Areas	AUP Chapter E9
Natural Hazards	AUP Chapter E36
Auckland Council Regionwide Network Discharge Consent	Brownfield – Large Development (Schedule 4)
Stormwater Management Devices Design	GD01

REQUIREMENT	RELEVANT REGULATORY / DESIGN TO FOLLOW
Application of Principles of Water Sensitive Design	GD01
Hydrology in the Auckland Region	Brownfield – Large Development (Schedule 4)
Design and Construction of Stormwater Systems	Auckland Code of Practice: For Land Development and Subdivision (Chapter 4 – Stormwater) – v3, January 2022
Outlet Design	Auckland Council's TR2013-018, Hydraulic Energy Management: Inlet and Outlet Design for Treatment Devices – July 2013

3.0 MANA WHENUA: TE AO MAORI AND MATAURANGA

The Private Plan Change process has involved consultation with mana whenua which will continue. This section is in draft and will be updated as iwi consultation progresses. It is noted initial consultation has been undertaken with Ngāti Tamaoho Trust. The following was recommended as a part of the initial consultation.

- We recommend accidental discovery protocols for any artefacts, features, or koiwi that may be found in the area.
- We recommend water tanks for the reuse of the rainwater off the roofs. Rain tanks are pivotal to easing the water shortage in Auckland due to the intensification of housing going on. The issue of where water will come from in the future is not being accounted for with such intense developments around Tāmaki Makaurau.
- We recommend enviropods. cesspits alone are no longer acceptable due to their maintenance issues. If council does not maintain the cesspit, they overflow and end up in our waterway.
- We recommend sediment and silt controls for this project that go over and above GD05 requirements.
- We recommend a planting palette that reflects the original flora and fauna of the area.

These measures have been or will be incorporated into the development plans where practicable.

3.1 IDENTIFICATION AND INCORPORATION OF MANA WHENUA VALUES

It is a key objective that all stormwater management adheres to mana whenua values such that the proposed development does not adversely affect the life-force (mauri) of water. Collection, conveyance, and treatment will be undertaken with their guidance to ensure this valuable and important resource is appropriately managed.

The following practices have been considered during the implementation of this stormwater management plan:

- Restoring the mauri of water by passing all accessway and/or carpark runoff through a treatment device (proposed proprietary device). At this stage there are no development plans for buildings on site, but the future development plans will ensure, all the roofing material will be constructed using inert materials.
- Water conservation by re-use tanks where possible.
- Detention of stormwater to ensure no off-site effects on the wider catchment. We have considered this and provided the OLFP is upgraded between the site and the Pukaki Creek we do not believe there will be any benefit from stormwater detention.
- Ensure no adverse effects happen to the downstream of OLFP B from the proposed private plan change.

4.0 STAKEHOLDER ENGAGEMENT AND CONSULTATION

This section discusses the relevant stakeholders (external to the client) not just for stormwater, but for the project as a whole. This will be continuously updated as negotiation and consents progress.

STAKEHOLDERS	REASON FOR INTEREST	ENGAGEMENT COMPLETED	FEEDBACK AND RESPONSE
Mana Whenua	Early engagement to understand the Mana Whenua values	Letters sent to all relevant mana whenua groups Meeting with Ngāti Tamahao	Ngāti Tamahao Trust provided a written response suggesting several specific design actions to improve the sustainability of the development and improve cultural outcomes.
Auckland Transport	Vehicle access requirements	Not yet at this stage	Integrated Transport Assessment prepared and will form part of plan change request and inform future RC processes.
Auckland Council – Healthy Waters	Proposed stormwater mitigation and extension	Early HW engagement to determine the stormwater discharge methodology	General requirements of HW regionwide stormwater network discharge consent will need to be complied with. Mitigation required as per SMAF and NDC requirements. Further information on the proposed stormwater mitigation and hydrology is outlined in section 6 of this SMP
Watercare	To understand if there are any capacity constraints in the wider Wastewater network	Development consultation application	Watercare have advised that the developed site can connect to the existing 225mm public network on Westney Rd to the southwest of the site.
First Gas and Channel Infrastructure NZ Ltd	Works within or over the existing fuel pipeline	Ongoing consultation	Channel Infrastructure have confirmed that works in proximity to the fuel line (e.g. SW pipe installation) is allowed subject to certain minimum clearances and Construction Methodology processes. The detailed design of any works within the pipeline designation will be shared with and agreed with the asset owner,

5.0 PROPOSED DEVELOPMENT

5.1 GENERAL DEVELOPMENT INFORMATION

The subject property is currently zoned Residential – Mixed Housing Suburban. It serves as the primary Auckland base and animal shelter for the SPCA, occupying the northern portion of the site. The remaining southern section has been recently metalled and functions as an open-air car park, currently used for Motorhome parking.

The purpose of this Stormwater Management Plan (SMP) is to outline how stormwater will be handled for the site based on a proposed rezoning from Residential – Mixed Housing Suburban to Business Light Industry Zone.

5.2 SITE LAYOUT AND URBAN FORM

There is no proposed development plan for the site currently. This will be provided during the RC stage for the land use.

The Business Light Industry zoning would allow up to 100% impervious coverage on the land less any areas of yard setbacks (to the residential and school zones to the north and east). This would be up to approximately 38,500n^2 of impervious. This is an increase of around 14,200m^2 compared to the current zoning which allows up to 60% impervious or 24,300m^2).

6.0 STORMWATER MANAGEMENT

This section sets out the stormwater management approach for the post-development operation of the site. This approach is intended for the sustainable stormwater management and land development and land development within the site. It is also geared towards the protection, restoration, and enhancement of the receiving environment.

6.1 PRINCIPLES OF STORMWATER MANAGEMENT

6.1.1 ORIGINAL PRINCIPLES

Water Sensitive Design Principles Adopted

Guidelines and principles for Water Sensitive Design (WSD) are described as follows:

- Protect and enhance the values and functions of natural ecosystems.
- Address stormwater effects as close to the source as possible.
- Mimic natural systems and process for stormwater management, as much as practicable
- Filtering, Conveyance and Bioretention. This will be incorporated by use of proprietary treatment devices and stormwater attenuation.
- Respecting the receiving environment.

WSD Objectives

The objectives for WSD for stormwater aim to deliver the priorities identified in the Auckland Unitary Plan. These objectives include:

- Valuing our natural heritage
- Sustainably managing natural resources
- Treasuring our coastline, harbours, islands, and marine areas
- Realising quality, compact developments
- Demanding good design in all development
- Optimising, integrating, and aligning network provision and planning
- Protecting, enabling, aligning, integrating, and providing social and community infrastructure for present and future generations

Minimum Stormwater Management Provisions

The stormwater provisions that are applicable to this stormwater management plan are outlined in the following documents:

Auckland Unitary Plan:

- Section E1 – Water Quality and Integrated Management
- Section E8 – Stormwater Discharge and Diversion
- Section E9 – Stormwater Quality – High Contaminant Generating Car Parks and High Use Roads
- Section E36 – Natural Hazards and Flooding

The Code of Practice for Land Development and Subdivision, Chapter 4 – Stormwater (Auckland Council, 2015)

The Auckland Council Guideline Document GD2017/001 (GD01) – Stormwater Management Devices in the Auckland Region

6.1.2 UPDATED PRINCIPLES

The only changes to the above are the integration of the stakeholder feedback outline in Section 4 above, in particular mana whenua input.

6.2 PROPOSED STORMWATER MANAGEMENT

6.2.1 GENERAL

The proposed development will result in a net increase to the impervious coverage on the site from its current circa 4500m^2 to possibly up to nearly 39000m^2) and will generate increased stormwater runoff that will need to be managed. A stormwater management network of proprietary treatment devices or swales, raingardens and pipes will be utilised to treat and convey flows from future impervious areas and roading infrastructure in a treatment train approach. The existing pipe, outlet, and open channel does not have capacity and will need to be upgraded to service the redeveloped site.

The site has an overall slope to the south and east, this is away from the existing piped stormwater network in Westney Road. A small part of the site (near the road frontage) may be able to connect to the existing public network, although this is limited due to capacity constraints. We have considered upgrading this piped network but there are further downstream constraints and, even if the pipe size constraints did not exist, only about a third of the site could achieve a gravity connection to the existing network. So, the proposal is that the majority of the site will utilise the dominant existing overland flowpath to the south and east. This will need to be upgraded to accommodate the increased flowrates. As noted in Appendix B a small part of the site (Catchment A) currently has an overland flowpath through the neighbouring school property. We have visited the site and there is no defined flowpath across the school, water simply ponds near the boundary before overtopping as sheet flow, see Figure 9 below. For this reason, retaining or upgrading this OLFP is not practicable. Installing a new piped network across the school property (to connect to the public network) may be possible. But this would only be able to accept a small proportion of the site due to downstream pipe capacity constraints (of existing 450mm pipe). For these reasons it is proposed that this small part of the site be recontoured so that overland flow is towards the south and east (along with the rest of the site). This change will result in reduction of uncontrolled nuisance stormwater flows from the site towards the school and will reduce the flood risk at the school during larger rain events.

Existing and proposed catchment sizes and flows are shown on plans 470 and 472 appended to this report

FIGURE 9: Existing OLFP, looking from northern boundary.

6.2.2 WATER QUALITY

The stormwater management provision requirements are as follows:

- Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from the development on freshwater systems by minimising or mitigating changes in hydrology. This is achieved by minimising erosion and related effects on stream health, maintaining stream base flows and supporting groundwater recharge.
- Minimise or mitigate adverse effects of stormwater runoff by reducing the discharge of gross stormwater pollutants from high contaminant generating activities and encouraging the restoration of freshwater systems.

To protect water quality, treatment will be provided for the Water Quality Flow of 10mm/hr. This will predominately be provided by proprietary devices. The use of bio-retention based treatment devices (such as raingardens) was also considered. It is likely that these would be capable of providing acceptable levels of treatment but would require a much larger footprint to achieve this. Additionally due to the flat nature of the site and high-water table it would not be possible to construct one or two larger rain gardens to provide treatment. A large number of rain gardens would need to be constructed with direct inflows from the carpark, this has drawbacks from a maintenance perspective and accordingly proprietary devices are preferred for this site. Rain gardens may be integrated where there is space and fall available to a piped network, but proprietary devices are likely to predominate.

While we are proposing a change to the catchment C OLFP we do not believe there are negative effects associated with this. Other than flowing across the school property in an uncontrolled way this OLFP is piped to the same coastal environment as the proposed open channel to the southeast of the site.

It is anticipated that the carparking or accessway will be deemed to be a High Use Road with more than 5000 vehicular movements per day. Accordingly, it is proposed to provide treatment of all vehicular accessways and carparks as per the Network Discharge Consent (NDC). If left untreated, the receiving environment will be susceptible to high levels of sediments and contaminants, ultimately leading to a damaged ecosystem, loss in biodiversity and eutrophication.

The options to treat runoff from the future accessways and carparks (detail design of this will be done at later stage) are as follows:

Atlan Filter Treatment Devices (or similar)

Preliminary sizing of the Atlan treatment device has been carried and is indicatively detail is included in the drawings. At this stage we have assumed 50% of site, approx. 20000m2 will be used for trafficable/ parking, which will require 18 Atlan filters. These devices:

- Improve the quality of stormwater runoff before it enters receiving waterways using its inorganic filter media, which removes non-point source pollutants.
- Are capable of absorbing and retaining the most challenging pollutants from stormwater runoff including total suspended solids, total phosphorous and Total nitrogen
- Include a passive self-cleaning function is activated when the siphon is broken at the end of the storm event.
- Provide 85% TSS removal

It is noted that full depth filters will be necessary to achieve the required level of treatment, and this has been allowed for within the concept design.

Catchpit Inserts – Enviropod® Filter

- Captures sediment, litter, debris and other pollutants before they enter the drainage system.
- The 200-micron standard fitout allows for a 95% removal up to 20 L/s.

It is proposed to use inert building materials (ie no lead or bare zinc) to prevent the generation of contaminant-laden runoff from the proposed buildings.

Our understanding is that development of the site is not likely to include hazardous goods or high-risk activities requiring additional treatment or control of chemical liquid waste and this SMP does not make provision for these activities. If these activities are proposed, then a revision of this SMP will be required.

6.2.3 WATER QUANTITY

The change in zoning and associated development of the site will increase the impervious area, which will result in an increase in stormwater runoff. We have considered different options to manage this.

Option 1

Treat all contaminant laden stormwater on the site, upgrade downstream pipework to the south and east of the site beyond the existing downstream treatment pond to allow direct discharge to the coastal environment. Provide hydrology mitigation in the form of SMAF-1 retention and detention.

Option 2

Upgrade the existing pond system to be able to provide treatment and attenuation for the proposed development. This would involve removal of existing vegetation within the conservation zone as well as extensive earthworks in and round the existing pond and outlet.

Option 3

Provide flow attenuation for all events by utilising an on-site underground tank system with discharge via the existing outlets and open channel to the southeast. We have calculated the tank size required, and it is possible to fit this within the development. Refer to plan 400, option 3 in Appendix 1.

Following consideration of the above we considered that providing attenuation for the larger storm events (10/100-year ARI) would not be the best overall solution considering the site lies in the lower portion of the catchment and any effects of increased stormwater runoff can be effectively managed due to the proximity to the coastal environment. In regard to the stream erosion, we have carried out a preliminary design for the open channel conservatively assuming maximum impervious site coverage with no flow attenuation. The modelled flow velocity is low (approx. 1m/s) and therefore only standard erosion protection measures, such as vegetated rip rap or rock rip rap, is required for erosion protection measures.

Based on the above we believe it is appropriate to adopt the option 1 approach which achieves treatment of stormwater at source and mitigation of any effects associated with the increase in stormwater runoff due to increased impervious area. Option 2 would not provide treatment at source and would involve significant disruption to well established landscaping within a conservation zone.

Option 3 is possible, but there is significant additional capital cost associated with the larger on-site tanks for minimal benefits. The only benefit of option 3 is the removal of the need to upgrade the existing outlet and open channel, but as these upgrades are seen as readily achieved this benefit is small. The proposed approach achieves:

1. **Water Quality** – All impervious area within the development to be treated to GD01 standards as we are discharging to a coastal receiving environment.

2. **Hydrology Mitigation** – SMAF 1 requirements to be met for new developments within the site. The assessment of retention demand should be part of the detailed design process and will be dependent on water re-use possibilities (which are specific to the land use) as well as development layout and soakage available in areas that are clear of buildings.

3. **Stormwater Conveyance** – Downstream infrastructure has been assessed to ensure it is able to cater for all expected rain events up to the 1% AEP event. A new piped system and minor upgrades to the downstream OLFP are required. Based on topographic survey there is sufficient freeboard to neighbouring properties to allow the stormwater to be safely conveyed while maintaining an appropriate freeboard. Cross sections have been generated at several points along the OLFP showing the water level during the 1% AEP event, these are appended to this report. The Marsden Point Fuel Transmission Line is underneath the OLFP alignment and is therefore a consideration when planning any earthworks in this vicinity. However, we have discussed the proposed plans with the asset owners who have advised the pipes are approximately 2.5m deep, allowing the proposed drainage and OLFP works to be safely carried out without comprising the fuel pipe. Clearance to the pipes should be confirmed (by survey) at the detailed design stage.

6.2.4 EXISTING PONDS

There is an existing constructed marsh pond system (forebay and main pond) downstream of the site. A topographical survey has been undertaken to study the existing OLFP and determine whether this discharges directly into the ponds or passes alongside them. Based on the survey the existing OLFP is not designed to discharge directly into the ponds (it is not aligned with the other inlets near the forebay) but the OLFP is at a similar elevation to the side of the main pond and therefore it is likely that the OLFP partially discharges into the main pond during large rain events. However, there is sufficient space to realign and deepen the OLFP so that can bypass the main pond and drain directly into the Pukaki Creek system.

We considered upgrading the existing pond to cater for the site, however, we do not believe that this is a preferred option for the following reasons:

- Enlarging the existing ponds and forebay would require the removal of most (if not all) of the well-established vegetation currently present. In time of course this could be re-planted, but it would be detrimental in the short term.
- We have a preference for managing stormwater quality as close to the source as possible. The general advantage of this is that it allows different levels of treatment to be provided in various locations. In particular, in this case it allows the treatment to be specific to the land use.
- There is limited land available around the existing pond, which would make enlargement more complex to design and construct.

6.2.5 CONSTRUCTION OF NEW PIPEWORK AND OLFP

To ensure that the upgrades associated with option 1 are practicable we have carried out a preliminary design and prepared a preliminary construction methodology for the construction and staging of the outlet and associated riprap apron. It is envisaged that a detailed methodology will be produced in conjunction with the contractor.

Establishment

Carry out a topographical survey of where the outfall structure and associated riprap apron will be located and set the alignment for the pipe. Positively identify the existing fuel pipes and verify depth of pipes along the alignment of proposed works.

Erosion and Sediment Control Devices Construction

Install a super silt fence on the downstream contours of the outlet structure, including up to the extents of the riprap. It is envisaged that this will occur concurrently with the other erosion and sediment control devices for the development although it is beyond the extent of the bulk earthworks. Since the stream is only fed by the stormwater from the pipe network, it is envisioned that the diversion of clean water can be achieved by flexible piping while works proceed.

Earthworks

Excavate the area where the outlet device and riprap are to be constructed. Based on the safety and practical requirements, the contractor will make an informed decision as to the size of equipment to use down the slope.

Pipe Laying (open trench)

Trenches will be excavated to the required levels to lay the pipes leading up to the outlet structure. It is expected that the contractor will take all the required safety precautions to reduce the risk of trench collapse.

Placement of Outlet structure and riprap

- The outlet structure will be positioned as per the detailed design and similar to current location so that any stream reclamation works (and consents) are not triggered, and secondly on a flatter part of ground where there is sufficient room for erosion protection measures to be constructed at the outlet.
- Place the filter fabric on the exposed ground and prepare the compacted hardfill for placement of the pre-cast outlet structure.
- Once the structure has been placed, the necessary pipe connection will be made and the area behind the structure is to be backfilled with drainage material (scoria).
- Place the angular rocks and secure them into position around the pre-excavated area. Larger rocks to be keyed into the slope and are to be used at the downstream end of the apron.
- Note that the upstream end of the pipe leading into the outlet should be kept closed (or diverted to the downstream end until works on site have been completed.

Channel Upgrade

- Progressively upgrade and stabilise the channel.

Post Construction

The super silt fences are to be kept in place for the duration of the works and removed at the commissioning of the network.

6.2.6 WORKS ON THIRD PARTY LAND

The works described in Section 6.2.5 above require works beyond the subject site. The extent of works required is subject to detailed design, the conceptual design appended is conservatively based on no hydraulic controls on the stormwater runoff from the developed site so it is anticipated that the extent of works required on third party land can be refined and reduced once specific design on the development site is completed.

Works are required on the neighbouring land at 1 Verissimo Drive, 3 Verissimo Drive, and 5 Verissimo Drive. These works are identified on the 400 series plans appended. Landowner approval will be required for the proposed works and obtaining this will be the responsibility of the site owner. However, it should be noted that within 5 Verissimo Dr there is an easement in gross for stormwater drainage and almost all of the work proposed is within the existing easement. A small area beyond the easement is proposed as this would provide a more natural appearance to the drain, however this could be modified if approval for this extension proved difficult to obtain. We understand that the current landowner has a good relationship with the owners of 1&3 Verissimo Dr and therefore it is anticipated that approval for all the proposed works can be obtained.

No works are proposed within Council owned land.

Approval is also needed from the fuel line owner. The proposed works will reduce the cover above the fuel line but preliminary discussions with the fuel line owner indicate that there is sufficient cover to allow for the proposed works without comprises the protective concrete slab above the fuel line.

6.2.7 DEVELOPMENT STAGING

It is anticipated that all stormwater infrastructure will be installed prior to the formation of future buildings and accessways.

6.3 ASSET OWNERSHIP

It is proposed that the stormwater pipes and outlet structure outwith the site will be vested as public stormwater assets with the proposed stormwater network and treatment device within the site boundary to be privately owned. Specifically, referring to plan 1636-02 402 RC2, the SWMH 7 and the pipework, manholes, and outlet structure downstream of this would be vested as public. The reasons for these assets being public is that they are located on third party land and the development site is likely to be subdivided.

The remainder of the stormwater infrastructure installed on-site will be privately owned by the landowners. This may change dependent on the extent of future subdivision within the site, this should be considered at subdivision stage. The owners of the respective devices will be responsible for the operation of their device and are required to abide by Auckland Council's Stormwater bylaw (2015). This bylaw states that the owner of a private stormwater management system must ensure it is maintained in good operating condition. They must also, when requested by council, provide information which demonstrates that the device is maintained in good operating conditions and will function to its original specifications during a stormwater event. They must also carry out any works required to keep the device in good working condition. The Council can enforce this bylaw under the following Acts, The Local Government Act 1974, the Land Drainage Act 1908, the Soil Conservation and Rivers Control Act 1941, and the Health Act 1956.

6.4 ONGOING MAINTENANCE REQUIREMENTS

As stated in Section 6.3 above, it is the responsibility of the landowners to maintain the private stormwater devices in accordance with Auckland Council's Stormwater Bylaw. Typical operation and maintenance details for the individual stormwater devices are as follows:

6.4.1 PROPRIETARY TREATMENT DEVICES I.E., ATLAN FILTER AND ENVIROPOD

All stormwater devices implemented on site will have an Operations and Maintenance Plan (O&M). The specific responsibilities for the O&M of each device will depend on the owner of the stormwater device. It is envisaged that the proposed stormwater management devices and the reticulation network (excluding the pipes that serve the neighbouring sites to the west) All devices require audits that should be conducted once a year. Owners of stormwater devices must keep a copy of the operations and maintenance manual for the device available and produce this copy on request of the council. The O&M manuals should contain logbooks for recording inspections and maintenance activities. It is expected that manufacturers will provide each private device's own operations and maintenance manual. Attached is a draft copy of the O&M for the proposed Atlan Filter.

6.4.2 RAIN TANKS (NON-POTABLE RE-USE)

Raintanks may be specified during the building design to reduce potable water use. Periodically the property's plumbing and drainage system should be checked for leaks and faults. Only fully certified practitioners should inspect the tanks for inspections and maintenance. These maintenance check requirements range from quarterly for the outlet pipe to every few years for pump inspections.

It is essential that appropriate access is provided to all components of the rainwater tank system to enable regular inspection and maintenance (at least annually) to be carried out with minimal effort and inconvenience. Roofs and collections areas must be kept free of overhanging tress to reduce organic

litter and prevent access by rodents, cats, possums, and other wildlife. Inlets and overflows should be screened, and access hatches kept closed.

6.5 IMPLEMENTATION OF STORMWATER NETWORK

The stormwater network has been conceptually designed to manage the stormwater run-off from the proposed development. All stormwater conveyance and treatment devices will be finalised as part of the Building Consent stage and Engineering Plan Approval. Once approved, the works will be installed and monitored in coordination with Auckland Council inspectors for signoff.

Operations, maintenance and monitoring of the proposed stormwater system will be critical in ensuring that the short and long-term performance of the system is maintained with the key focus being the prevention of sedimentation.

Monitoring will be carried out during the construction stages, on completion and will continue throughout the life cycle of the system.

6.6 POST-CONSTRUCTION FLOOD RISK ASSESSMENT

6.6.1 FLOODING 10 PERCENT AEP EVENT (NETWORK CAPACITY)

The option 1 approach described above includes designing an upgrade to the existing piped outlet. In accordance with Auckland Council's Stormwater Code of Practice and TP108, the stormwater system will be designed and sized to convey flows from the 10-year ARI rainfall event adjusted for a 13.2% increase due to climate change.

The proposed primary drainage network will consist of two main stormwater networks as described below:

1. A piped network with approximate pipe size of 825mm between the site and the current open channel.
2. One open channel along the current OLFP route from the new outlet to beyond the downstream pond system, this will also have capacity to convey the 100-year event storm. The surface levels across the site need to be designed to ensure rain events greater than the piped system capacity can be conveyed by overland flow towards the open channel.

Overall combined peak flow from developed site for 10-year ARI event for each catchment and capacities reviewed. It is proposed that the final pipe and outlet structure will be vested as public stormwater assets and existing public network diversion will be publicly owned.

6.6.2 FLOOD RISK WITHIN THE SITE

Stormwater conveyance within the site is subject to detailed design. However, it is likely that the design will include a system of pipework sized to convey stormwater flows up to the 10% AEP rain event with larger flows being conveyed by overland flow. As these overland flowpaths originate within the site it is appropriate to for the design of these to be carried out when carrying out design for the proposed development of the site. The overland flowpaths must be designed to convey stormwater from rain events up to 1% AEP. The design of these overland flowpaths should be used to inform the minimum floor level for any new buildings proposed within the site in accordance with the stormwater code of practice.

6.6.3 FLOOD RISK TO ADJACENT PROPERTIES

Development of the subject site will result in increased rates of stormwater runoff and therefore we have assessed whether this could cause any increase in flood risk to downstream properties. Specifically, we have considered the residential properties on Jaylo Place as they are the only residential properties downstream. We have prepared two cross-sections adjacent to no. 9 and no. 11 Jaylo Place (plan 462). These show that without modification to the ground level there would be a small increase in flow depth, but that this could be offset by minor recontouring of the ground so that the flood event flow depth is unchanged.

As there is more than 500mm between the flood flow surface and the house FFL there is no appreciable flood risk to these properties associated with development of the subject site. Based on this no stormwater attenuation is required for flood risk purposes.

However, once a detailed design of the subject site has been undertaken, we recommend that existing surface levels be re-shaped so that there is no increase in flood level depth.

6.7 DEPENDENCIES

Works external to the site boundary, including on neighbouring land, are required. Neighbours will be liaised with, and we understand that neighbour's approval can be obtained if required to enable the proposed works.

7.0 DEPARTURE FROM REGULATORY OR DESIGN CODES

The proposed stormwater management approach for the development meets the minimum regulatory or design codes and is considered the best practicable approach.

8.0 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

8.1 CONCLUSIONS

This SMP has been developed for the specific private plan change of the site. An integrated stormwater management approach will be adopted across the site and has been developed based on the policies set out in the Auckland Unitary Plan along with stormwater specific guidelines from Auckland Council's Code of Practice, GD01 and the New Zealand Building Code. The main outcomes of the SMP include:

- The provision of an integrated stormwater management approach.
- The assurance of no/minimal adverse changes to the downstream OLFP and flood risk.
- The mitigation of any adverse effects from stormwater runoff on surface water quality by providing a treatment train approach.

In order to achieve the desired outcomes, the following Water Sensitive Design principles will be adopted:

- Promoting inter-disciplinary planning and design
- Protecting and enhance the values and functions of the natural ecosystems
- Addressing stormwater effects as close to the source as possible through the provision of proprietary treatment devices or raingardens for all contaminant generating impervious surfaces.
- Mimicking natural systems and process for stormwater management
- Enhancing the receiving environment.

Detailed Design of the proposed stormwater management approach, including device selection, sizing and location will be addressed and finalised at Detailed Design stage of the development and approved through the Engineering Plan Approval and Building Consent processes.

8.2 FUTURE WORK

This SMP is a live document and should be updated in response to feedback from future technical investigation and reports, iwi consultation, and the consenting process.

9.0 LIMITATIONS

9.1 GENERAL

This report is for the use by Rotokohu Investments Ltd only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the particular project described to us and its extent is limited to the scope of work agreed between the client and Envelope Engineering Limited. No responsibility is accepted by Envelope Engineering Limited or its directors, servants, agents, staff or employees for the

accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.

APPENDICES

APPENDIX A
PLANS – TOPOGRAPHICAL, DRAINAGE, AND CATCHMENTS

APPENDIX B
STORMWATER DESIGN CALCULATIONS

APPENDIX C
OPERATION AND MAINTENANCE MANUAL

APPENDIX D
PROPERTY FILE RECORD

APPENDIX E
RELEVANT CORRESPONDENCE