

IN THE MATTER of the Resource Management Act 1991
("RMA" or "the Act")

AND

IN THE MATTER of an application to AUCKLAND
COUNCIL for private plan change 51 to
the partly operative Auckland Unitary
Plan by KARAKA AND DRURY
LIMITED

JOINT WITNESS STATEMENT OF EXPERTS IN RELATION TO STORMWATER
MANAGEMENT

16 AUGUST 2021

1. CAUCUSING

- 1.1 Ms Paula Vincent (for Auckland Council as submitter) and Mr Mark Tollemache (for the applicant Karaka and Drury Ltd) have caucused on the provisions for PC51 associated with stormwater management and the proposed PC51 Stormwater Management Plan.
- 1.2 Appendix 1 (blue track change text) outlines the stormwater provisions agreed as an alternative to the notified provisions of PC51 which utilised the SMAF1 controls of the Auckland Unitary Plan (operative in part).
- 1.3 Appendix 2 contains the updated Stormwater Management Plan ("SMP") prepared by Mr James Kitchen of McKenzie & Co.
- 1.4 Healthy Waters have indicated that they will approve the Stormwater Management Plan under the region wide Network Discharge Consent ("NDC") and this informs the precinct provisions in Appendix 1.
- 1.5 Mr Danny Curtis (for Auckland Council as submitter) and Mr James Kitchen (for the applicant Karaka and Drury Ltd) have caucused on the content of the Stormwater Management Plan to support this plan change and agree on the content of Revision I dated 13 August 2021. Both parties note that once adopted into the region wide Network Discharge Consent the SMP may be amended to reflect changes to stormwater management in response to changed development parameters. This would be done in accordance with and following the process set out in the region wide NDC.
- 1.6 The amended provisions:
 - 1) Delete the proposed SMAF1 overlay. This is replaced with bespoke provisions for hydrology mitigation.
 - 2) Insert indicative sub-catchments for Stream A and the Ngakoroa on Precinct Plan 1, and provide an explanation of these sub-catchments in the description of the Precinct, including that the Ngakoroa sub-catchment is tidally influenced where the sub-catchment drains to.

- 3) Amend objective IX.2(5) and Policy IX.3(6) to ensure consistency with the network discharge consent, stormwater management plan and the requirement to treat stormwater runoff from all impervious surfaces.
- 4) Insert a restricted discretionary activity rule status in Table IX.4.1 relating to the new standards in Rule IX.6.5.
- 5) Insert bespoke standards for stormwater management in Rule IX.6.5 that address hydrological mitigation and water quality consistent with the proposed Stormwater Management Plan. The hydrological mitigation standards are consistent with similar approaches in the Drury 1 Precinct to the north and the water quality is more rigorous than the default standards in Chapter E9 of the AUP.
- 6) Insert matters of discretion and assessment criteria in IX.8. for all activities addressing the efficient design and location of stormwater devices.
- 7) Insert matters of discretion and assessment criteria in IX.8 for infringements to the standards in Rule IX.6.5 that cross-reference the relevant discretions and assessment criteria in Chapters E9 and E10, along with the network discharge consent and the Stormwater Management Plan.
- 8) Insert matters of discretion and assessment criteria in IX.8 for the integration of stormwater devices with the design of the town centre and its amenity features.

1.7 The signatories to this Joint Witness Statement confirm that:

- 1) They agree with the outcome of the expert caucusing as recorded in this statement;
- 2) They have read Appendix 3 of the Environment Court's Practice Note 2014 and agree to comply with it; and
- 3) The matters addressed in this statement are within their area of expertise.



Ms Paula Vincent (for Auckland Council as submitter)



Mr Danny Curtis (for Auckland Council as submitter)



Mr Mark Tollemache (for the applicant Karaka and Drury Ltd)



Mr James Kitchen (for the applicant Karaka and Drury Ltd)

Appendix 1 – Relevant Stormwater Management Provisions of Plan Change 51

[Stormwater amendments blue track changes](#)

IX.1. Precinct description

...

[The main stormwater catchments are identified on Precinct Plan 1, and include:](#)

- [Stream A catchment – which includes land that drains to the north and will drain into land falling in the Drury 1 Precinct.](#)
- [Ngakoroa Stream catchment - which includes land that drains either directly or indirectly to the tidally influenced Ngakoroa Stream.](#)

IX.2. Objectives

(5) Include [appropriate](#) stormwater management and ecological enhancement measures when developing within the Precinct, to [avoid or](#) mitigate adverse effects of development on the receiving environments, and enhance the existing stream network [including](#) and [water lake](#) feature.

IX.3 Policies

Stormwater Management

(6) Require subdivision and development to:

- (a) Be consistent with any approved network discharge consent and supporting stormwater management plan [adopted by council under that discharge consent](#) including:
 - [a.](#) the application of water sensitive design to achieve water quality and hydrology mitigation, ~~and~~
 - [b.](#) [ensuring that all impervious services are treated through a treatment train approach to enhance water quality and protect the health of freshwater and marine environments.](#)

IX.4. Precinct rules

Table IX.4.1 Land use and subdivision activities in Drury 2 Precinct

Activity	Activity status
----------	-----------------

Subdivision		
(A3)	Subdivision that does not comply with standard IX.6.5	RD
Use and development		
(A7)	Any activity that does not comply with standard IX.6.5	RD

IX.6. Standards

[IX.6.5 Stormwater Management](#)

[IX.6.5.1 Hydrological Mitigation](#)

[\(1\) All new or redeveloped impervious surfaces \(including roads\) which discharge to the "Stream A" Sub-catchment as shown on Precinct Plan 1 must provide:](#)

- [\(a\) Retention \(volume reduction\) of at least 5mm runoff depth for the impervious area for which hydrology mitigation is required; and](#)
- [\(b\) Detention \(temporary storage\) and a drain down period of 24 hours for the difference between the predevelopment and post-development runoff volumes from the 95th percentile, 24 hour rainfall event minus the 5 mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required](#)

[\(2\) Clause \(1\) does not apply where:](#)

- [\(a\) A suitably qualified person has confirmed that soil infiltration rates are less than 2mm/hr or there is no area on the site of sufficient size to accommodate all required infiltration that is free of geotechnical limitations \(including slope, setback from infrastructure, building structures or boundaries and water table depth\); and](#)
- [\(b\) Rainwater reuse is not available because:](#)
 - [\(i\) The quality of the stormwater runoff is not suitable for on-site reuse \(i.e. for non-potable water supply, garden/crop irrigation or toilet flushing\); or](#)
 - [\(ii\) There are no activities occurring on the site that can re-use the full 5mm retention volume of water.](#)

[The retention volume can be taken up by providing detention \(temporary storage\) and a drain down period of 24 hours for the difference between the pre-development and post development runoff volumes from the 95th percentile, 24 hour rainfall event minus any retention volume that is achieved, over the impervious area for which hydrology mitigation is required.](#)

[For clauses \(a\) and \(b\) of this sub-clause to apply, the information must have been submitted with a subdivision application preceding the development or a land use application.](#)

[\(3\) If at the time of subdivision a communal device has been constructed to provide for the above requirements for multiple allotments, a consent notice shall be registered on such titles identifying that compliance with this provision has been met.](#)

[IX.6.5.2 Water Quality](#)

- (1) The activity rules and standards in Chapter E9 apply to development in the precinct with the following amendments:
- (a) Reference to high use roads is replaced with reference to all existing, new and upgraded or redeveloped roads.
 - (b) Development of surface car parking areas and vehicle access that are not defined as high contaminant generating car parking areas is a permitted activity provided water quality treatment of run off from impervious surfaces is installed in accordance with Rule IX.6.5.2(2).
 - (c) Buildings cannot have exterior materials with exposed surfaces made from zinc, copper and lead.
- (2) Runoff from all impervious parking areas, vehicle access and any roads identified in Rule IX.6.5.2(1)(a) and (b) must provide for quality treatment:
- (a) The device or system must be sized and designed in accordance with 'Guidance Document 2017/001 Stormwater Management Devices in the Auckland Region (GD01)'; or
 - (b) Where alternative devices are proposed, the device must demonstrate it is designed to achieve an equivalent level of contaminant or sediment removal performance to that of 'Guidance Document 2017/001 Stormwater Management Devices in the Auckland Region (GD01)';
 - (c) And in either case the device or system must be in accordance with an approved Stormwater Management Plan.
- (3) If at the time of subdivision a communal device has been constructed to provide for the above requirements for multiple allotments, a consent notice shall be registered on such titles identifying that compliance with this provision has been met.

IX.6.5.3 Operation and Maintenance of devices

- (1) Stormwater device/s on private land must be maintained and operated by the site owner in perpetuity.
- (2) For any communal device and any device required by IX.6.5.2 (2), the stormwater management device must be certified by a chartered professional engineer as meeting the required Standard above, and an operations and maintenance plan must be established and followed to ensure compliance with all permitted activity standards. The operations and maintenance plan must be provided to the Council within three months of practical completion of works.

IX.8. Assessment – restricted discretionary activities

IX.8.1 Matters of discretion

The council will restrict its discretion to all the following matters when assessing a restricted discretionary activity resource consent application, in addition to the matters specified for the relevant restricted discretionary activities in the overlay, Auckland-wide and zone provisions.

- (1) All activities:
- (a) Consistency with the objectives and policies of the Drury 2 Precinct

- (b) [Design of roads](#)
- (c) [Stormwater management devices](#)
- (2) [Non-compliance with Standard IX.6.5.1](#)
 - (a) [The matters of discretion listed in E10.8.1\(1\).](#)
 - (b) [Network Discharge Consent and adopted Stormwater Management Plan.](#)
- (3) [Non-compliance with Standards IX.6.5.2-3](#)
 - (a) [The matters of discretion listed in E9.8.1\(1\).](#)
 - (b) [Network Discharge Consent and adopted Stormwater Management Plan.](#)
- (5) [New buildings and alterations and additions to buildings not otherwise provided for in the Business – Town Centre Zone \(in addition to Rule H10.8.1\(2\)\):](#)
 - (d) [Integration of stormwater management devices.](#)

IX.8.2 Assessment Criteria

The council will consider the relevant assessment criteria below for restricted discretionary activities, in addition to the assessment criteria specified for the relevant restricted discretionary activities in the overlay, Auckland-wide and zone provisions.

- (1) All activities:
 - (a) The extent to which the proposal is consistent with the objectives and policies of the Drury 2 Precinct or achieves the equivalent or better outcome.
 - (b) [Whether the design of roads is in accordance with the minimum road widths and key design elements provided in Drury 2 Precinct's Appendix 1.](#)
 - (c) [Whether stormwater management devices are appropriately located and designed for the efficient removal of contaminants, and are designed to be efficient to address operating costs.](#)
- (2) [Non-compliance with Standard IX.6.5.1](#)
 - (a) [The assessment criteria listed in E10.8.2\(1\).](#)
 - (b) [Consistency of proposed stormwater management devices with the Network Discharge Consent and adopted Stormwater Management Plan.](#)
- (3) [Non-compliance with Standards IX.6.5.2-3](#)
 - (a) [The assessment criteria listed in E9.8.2\(1\).](#)
 - (b) [Consistency of proposed stormwater management devices with the Network Discharge Consent and adopted Stormwater Management Plan.](#)
- (5) [New buildings and alterations and additions to buildings not otherwise provided for in the Business – Town Centre Zone \(in addition to Rule H10.8.2\(2\)\):](#)

- (c) The design of stormwater management devices and their integration with the town centre and its amenity features.

Appendix 2 – Updated Stormwater Management Plan, August 2021



Auranga B2

STORMWATER MANAGEMENT PLAN

DATE: August 2021

JOB No.: 1823

PREPARED FOR:

Karaka and Drury Limited

DOCUMENT CONTROL RECORD

PROJECT: Auranga B2 – Stormwater Management Plan

CLIENT: Karaka and Drury Limited

PROJECT LOCATION: Auranga, Drury

FILE PATH:

Revision	Date	Author	Reviewed	Approved	Description
A	24/4/2020	JK	BJR	JK	First issue
	02/07/2020	JK	BJR	JK	Second Issue
C	29/07/2020	JK	BJR	JK	Third Issue
D	15/03/2020	JK	JK	JK	Fourth Issue
E	18/06/2021	JK	JK	JK	Fifth Issue
F	1/07/2021	JK	JK	JK	Sixth Issue
G	8/07/2021	JK	JK	JK	Seventh Issue
H	11/08/2021	JK	JK	JK	Eighth Issue
I	13/08/2021	JK	JK	JK	Ninth Issue

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1.0 INTRODUCTION

1.1 Background

The Auranga B2 development is located just to the west of Drury and is in addition to the existing Drury 1 Precinct (Auranga A and Auranga B1). The B2 area is approximately 38 km south of Auckland's central business district, 13 km south of the Manukau Centre, and 4 km southeast of the Papakura Centre. The Auranga B2 Private Plan Change (PPC) area is identified in Figure 1.

The Auranga B2 area is approximately 33.65 ha. The development will include both commercial and residential development. These are connected by a road network integrated with the adjoining Drury 1 Precinct. Access to the site is from Burberry Road and Karaka Road (SH22) from the south, and consented roading development to the north from Bremner Road, through land within Drury Precinct 1.

The PPC applicant, Karaka and Drury Ltd, plans to rezone the land to allow commercial and housing development to continue from the existing (and extended by PC6) Drury 1 Precinct. The PPC provides additional critical mass to support infrastructure development and to provide a sustained supply of housing and local amenities to serve Auckland's growth. The development of the Auranga B2 area is in line with the Auckland Unitary Plan (AUP) which has zoned the area as 'Future Urban' (FUZ). The Auranga B2 area is also identified in the Auckland Council (Council) Future Urban Land Supply Strategy (FULSS). According to the Auckland Council Future Urban Land Supply Strategy, Auranga B2 is covered within the wider Drury West area that is nominated to be 'development ready' by 2022.

The PPC area is proposed as a new Precinct. A toolbox of device options is proposed to suitably manage ongoing stormwater mitigation and water sensitive design requirements. The Precinct provisions will support the implementations of this tool box of options.

The Auranga B2 area is characterised by flat to gently rolling pastoral landform dropping off to the estuarine riparian edge of Drury Creek to the east and an unnamed tributary of Ngākōroa Stream, immediately adjacent to SH22, to the south east. A large constructed pond is the main freshwater feature within the area. There are several permanent, intermittent and ephemeral streams located within the PPC area.

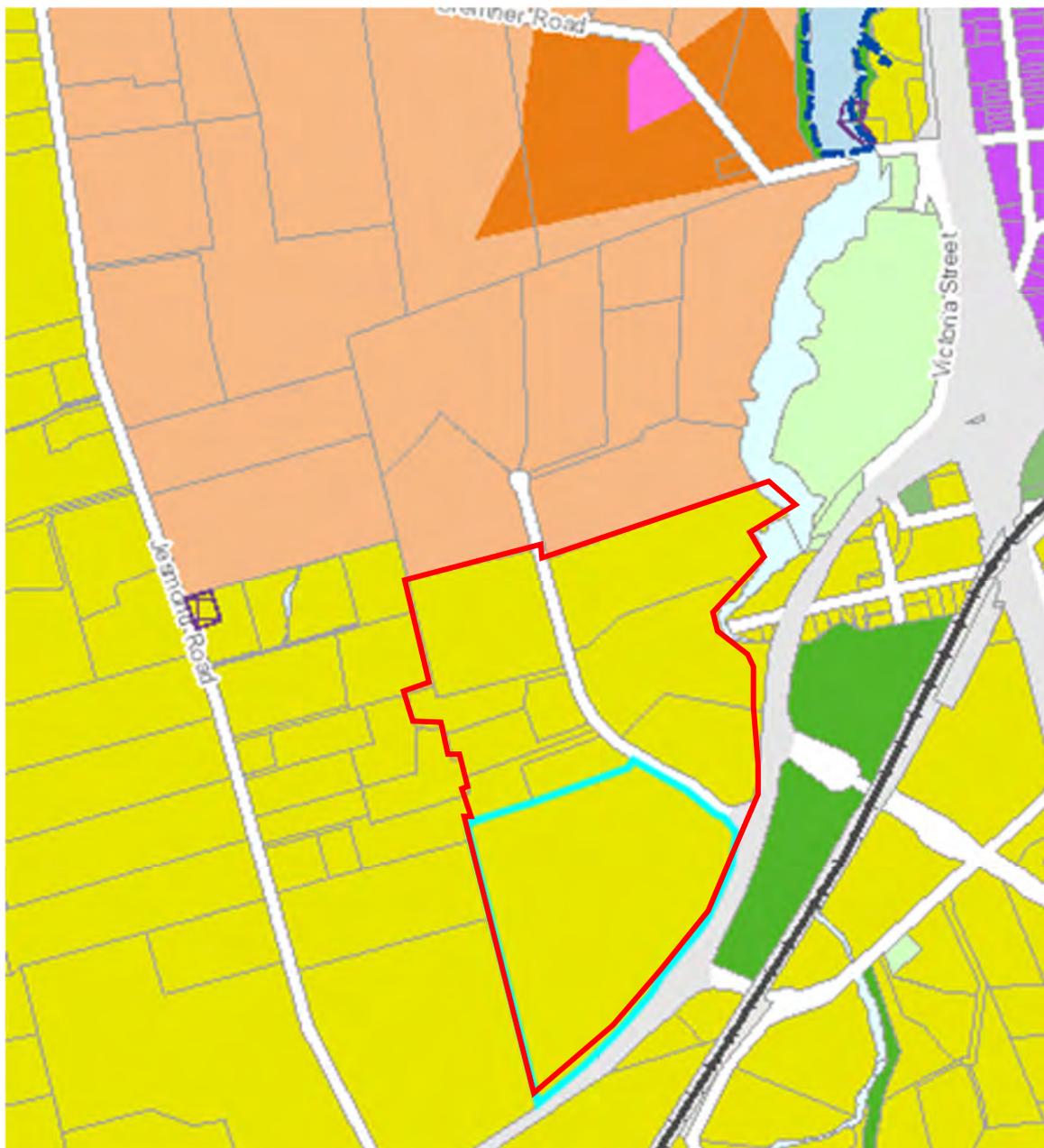


Figure 1: Auranga B2 Private Plan Change Area

1.2 Purpose

This SMP has been prepared to support an application for a Private Plan Change (“PPC”) by Karaka and Drury Ltd.

The overall purpose of the SMP is to provide guidance to the applicant and Auckland Council on how stormwater will be managed based on a developed future land use scenario, and to support the PPC application.

The SMP is consistent with Councils policies and plans. Non-statutory policy and planning documents are also considered.

1.3 Scope of the SMP

The scope of the SMP is to:

- Detail proposed stormwater management for development of the PPC area;
- Demonstrate how stormwater management related expectations under the AUP and Auckland Council's Stormwater Network Discharge Consent have been met; and
- Demonstrate design principles and consistency with the Stormwater Code of Practice (SWCOP) for initial approval of concept for stormwater assets to be vested to Council.

1.4 Outcomes of the SMP

The outcomes sought by the SMP are:

- An integrated stormwater management approach;
- A water sensitive treatment framework that manages and mitigates the impact of land use change from agricultural use to urban;
- Provide for retention of stream habitat, and protection and enhancement of riparian and estuary margins;
- Identify flood risk areas and ensure any development is located outside the floodplain;
- A set of Best Practicable Options (BPO) for stormwater that can be applied to the development, for water quality, retention, detention and flood management;
- Promote water conservation where possible and practicable; and
- Recognise opportunities to manage stormwater areas for multiple values and functions.

1.5 Infrastructure planning and funding

The costs of implementing the stormwater management devices, including private infrastructure, will be the responsibility of each landowner or developer, as part of each subdivision stage.

Maintenance for devices on private lots will be the sole responsibility of the future lot owners. Devices in public areas (roads and reserves) will be vested in Council, who will assume the ongoing maintenance costs (devices in roads expected to become the responsibility of Auckland Transport after vesting). Land to be vested with stormwater management devices, or which contain the stream network (up to the 100-year flow) will be vested at no cost.

Private on lot devices such as onsite tanks will be the sole responsibility of future purchasers. Communal devices (if located on private land such as rear lanes) will require ongoing maintenance by the future purchasers through a resident's society or body corporate (or similar). Details of how these will be managed and maintained in perpetuity can form part of the resource consent approval process (and is governed by the Council's recent stormwater bylaw).

No infrastructure funding agreement is considered necessary as there is no expectation that Council will be developing or funding stormwater infrastructure within the Auranga B2 at its cost. All infrastructure will be the responsibility of the developers/landowners to fund.

SH22 is proposed to be upgraded by Waka Kotahi (NZTA), downstream of the development, and as such the stormwater network will need to be considered in conjunction with this. This would be through potential pipe connections, and consideration of over land flow paths from the Auranga B2 area into the SH22 road reserve.

1.6 Network Discharge Consent (NDC)

Auckland Council obtained a Region-wide Network Discharge Consent to authorise the diversion and discharge of stormwater. The area covered by the NDC includes all future urban zoned land.

The preparation of a SMP is a direct requirement of the NDC for any activity seeking to utilise or fall with in parameters of the NDC by having the SMP “adopted” into the NDC framework.

In relation to a notified Plan Change, the NDC requires that a SMP can only be adopted if a SMP has been prepared to support the notified Plan Change, and the Plan Change must be consistent with that SMP (condition 13b).

As identified above, this SMP has been prepared to support the PPC for the rezoning of land known as Auranga B2. It is expected that the recommendations of this SMP are implemented via the PPC and that the documents will be “consistent”.

2.0 SITE DESCRIPTION

2.1 Summary of data sources and dates

Existing site appraisal item	Source and date of data used
Topography	<ul style="list-style-type: none"> • Auckland Council GIS records, April 2020
Geotechnical / soil conditions	<ul style="list-style-type: none"> • Preliminary Geotechnical Appraisal Report for Auranga B2 Re-zoning Concept, Drury, dated March 2019, Lander Geotechnical • Landcare S-Maps, April 2020
Existing stormwater network	<ul style="list-style-type: none"> • Watercourse Assessment Report (“WAR”), Morphum Environmental Consultants • Auckland Council GIS records, April 2020
Existing hydrological features	<ul style="list-style-type: none"> • Watercourse Assessment Report (“WAR”), Morphum Environmental Consultants
Stream, river, coastal erosion	<ul style="list-style-type: none"> • Preliminary Geotechnical Appraisal Report for Auranga B2 Re-zoning Concept, Drury, dated March 2019, Lander Geotechnical
Flooding and flowpaths	<ul style="list-style-type: none"> • Auckland Council GIS Rapid Flood Hazard Mapping • Auranga B SMP – T&T, May 2017
Coastal Inundation	<ul style="list-style-type: none"> • Auranga B SMP – T&T, May 2017

Existing site appraisal item	Source and date of data used
Ecological / environmental areas	<ul style="list-style-type: none"> Ecology Report, Dr Graham Ussher of RMA Ecology Ltd
Cultural and heritage sites	<ul style="list-style-type: none">
Contaminated land	<ul style="list-style-type: none">

2.2 Heritage

Archaeological sites, built heritage, history and cultural values are identified by Auckland Council's Heritage Report for the Drury Ophake Structure Plan (DOSP) area.

There is no evidence of pre-1900 archaeology or heritage, or significant 20th century heritage found within the PPC area.

2.3 Natural and physical characteristics

2.3.1 Catchment and Topography

The land is characterised by, and split into two distinct catchments. The central and north western portion of the PPC area is predominantly flat, at approximately RL 15m. This portion of the Catchment grades to the north, and eventually discharges into Stream A. This is noted as the "Stream A Catchment".

The remainder of the catchment is gently rolling pastoral landform, dropping off to the estuarine riparian edge of Drury Creek to the South and East and an unnamed tributary stream of Ngākōroa Stream, immediately adjacent to SH22, to the south and east. The topography rises from, approximately, RL 5m, on the eastern boundary, to, approximately, RL 22m, along the western boundary. The area slopes up-wards, generally, in a north-westerly direction. The land then falls in a southerly direction towards SH22 at approximately RL 10m. There is a more significant rise adjacent to SH22 where the gradient is, generally, 5% with some steeper gradients, of 10%. The Land Parcels consist of lifestyle-blocks and pastoral activities. A 1.3ha (approx.) ornamental pond (noted as Pond H further in the SMP) is the main freshwater feature within the area. In low flow events, this pond discharges into a Culvert under SH22, and then under the Rail line, and discharges into the Ngākōroa Stream. The stream in-turn then subsequently runs back under the Rail way & SH22 before become coastal headwaters. In high flow events when the Culverts are assumed to be blocked, the overland flowpath runs along the northern embankment of SH22, and discharges into the Ngākōroa Stream. At the intersection of Burberry Rd/SH22, the overland flowpath backs up and tops over Burberry Road.

The pond also has several permanent, intermittent and ephemeral streams which enter it.

The two catchments are shown in Figure 2 – PPC area catchments, below.



Figure 2 – PPC area catchments

2.3.2 Floodplains and overland flow paths

The overland flowpaths from the Stream A catchment is contained with two channels flowing north to Stream A. The eastern flow path, originates and remains within the existing Burberry Road reserve, and eventually extends north through private land. It is fully contained within road reserve in the PPC area. The western flow path, is contained within a defined channel, and is subject to some minor ponding areas. It is anticipated these ponds would be removed through the development process.

The PPC Ngākōroa Stream Catchment in Figure 2, partially discharges into the Pond, which in a 1% AEP event, would turn discharges into an overland flowpath which runs north and drains into the lower reaches of the Ngākōroa Stream on the north side of SH22. This overland flow path may over top SH22 in significant rainfall events, if the Culverts are blocked. This overland flowpath is to be maintained. No downstream upgrades are proposed as a result of this SMP.

The Council GIS website shows the floodplain and overland flow paths that comprise the north and south streams. The 1% AEP floodplain extent is derived from Rapid Flood Hazard Mapping of the Auckland Region undertaken in 2009. It simulates the 1% AEP rainfall event (without climate change) with 10 mm initial storage and 2.5 mm/h continuous rainfall loss with the terrain modelled with 10 m by 10 m grid. Refer Figure 3

An updated flood hazard assessment based on improved modelling has been undertaken specifically for the Auranga A & B catchment of which Stream H was part of the model. This is presented and discussed in Section 5.2 of this report. The finding of that updated flood hazard assessment is that there are no buildings/dwellings at risk from flooding

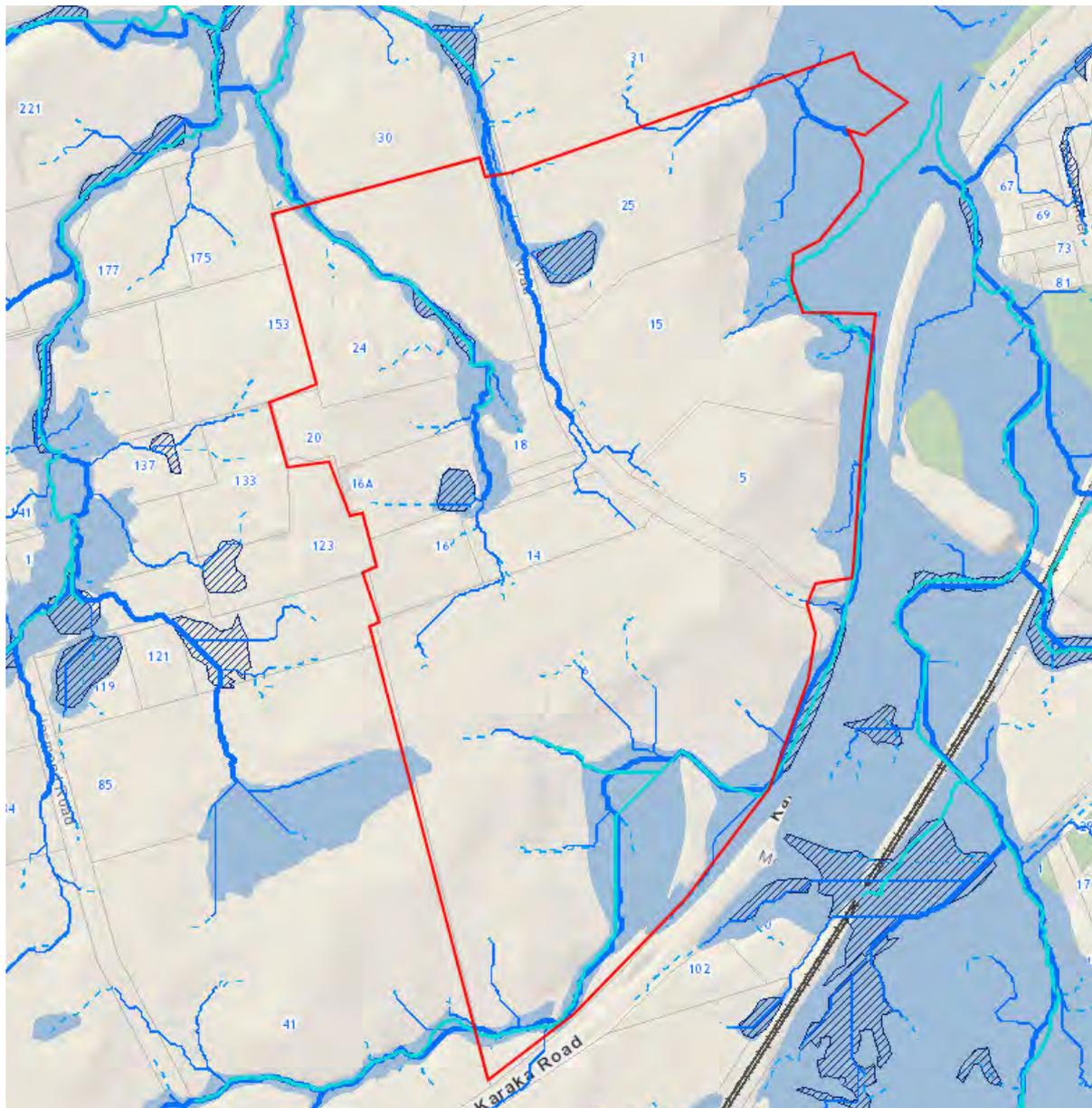


Figure 3: Auranga B2 Flood Plain and Overland Flow Paths (Source AC GeoMaps)

2.4 Current land use

The PPC area comprise a number of lifestyle landholdings with approximately ten dwellings with associated swimming pools, garages, barns, tennis courts and accessory sheds and buildings. The majority of the land is characterised by the lifestyle properties with small scale grazed pastoral land use, expansive mowed lawn areas and amenity plantings around the dwellings. Gravel and paved drives traverse the site providing vehicular access to the individual properties.

Burberry Road provides access to the site from SH22 and the Drury State Highway 1 (“SH1”) motorway intersection and the Ngākōroa Stream bridge (Jesmond Bridge). Burberry Road is currently rural in character being relatively narrow and devoid of kerb and channel, street lighting or footpaths.

2.5 Geotechnical

2.5.1 Soils

Landcare S-Map indicates that soil in the area is predominantly well drained, with the exception of the southern margin along SH 22 and the Ngākōroa Stream being poorly drained. Refer Figure 4.

A geotechnical assessment was completed by Lander Geotechnical, in a report titled “Preliminary Geotechnical Appraisal Report for Auranga B2 Re-zoning Concept, Drury”, dated March 2019. The geotechnical investigations from 26 boreholes around the site have indicated that the majority show the top 2 m consisting of either clayey silts, silty clays, silts and clays, with occasional sand and limonite inclusions. Typical topsoil depths ranged between 100mm and 400mm in thickness, averaging approximately 200mm.

Percolation rate tests have been undertaken across the wider Auranga area, by Lander Geotechnical in November 2015 for Auranga A, and in April 2017 for Auranga B. The data is summarised in Table 1 below. Both reports are included in the Appendices.

Percolation rate tests for adjacent land in Auranga A, and Auranga B (to the north of the Auranga B2) show a range of infiltration rates, well in excess of the minimum of 2mm/hr required for infiltration as per the infiltration criteria of Table 48 in GD01.

Infiltration for the purpose of hydrological mitigation is possible for these soils based on these rates. Site specific infiltration testing can be undertaken for devices that require infiltration at subdivision/land use stage.

Table 1 - Percolation Test results

Location	Test name	Percolation L/m ² /min	Gradient m/min	Gradient Mm/hr
Auranga A	P1	0.24	0.0028	168
	P2	0.05	0.0007	42
	P3	0.04	0.0007	42
Auranga B	HA2017-02	0.01	0.0007	42
	HA2017-05	0.02	0.0003	18
	HA2017-08	0.13	0.0033	198
	HA2017-11	0.09	0.0017	102

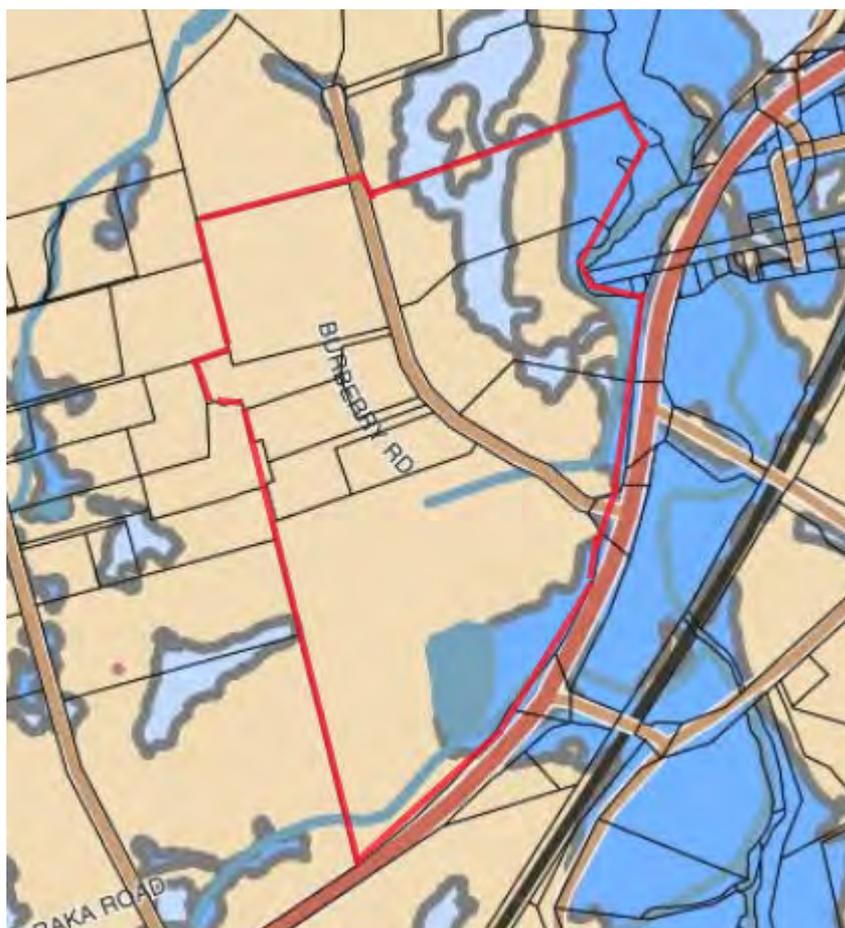


Figure 4 – Soil Drainage S-Map, from Landcare Research

2.5.2 Groundwater

A groundwater assessment was completed by Lander Geotechnical, in a report titled “Preliminary Geotechnical Appraisal Report for Auranga B2 Re-zoning Concept, Drury”, dated March 2019. Groundwater during site investigations was encountered within ten of the test locations between depths of 1.5m and 4.9m. Groundwater was not encountered in the other borehole locations and could be reasoned for by the dry summer period at the time of the investigations. A summary of the groundwater levels measured is also shown on Figure 5.

Site specific testing for groundwater levels including seasonal variation will be required for design of infrastructure, especially for stormwater devices that will rely on infiltration.

Borehole No.	Land Use Area**	Depth Encountered (m)	Standing GWL (m)
HA 2015 – 14	Outside B2 Area	2.0	1.2
HA2015 - 15	Outside B2 Area	1.5	1.0
HA2015 - 67	Outside B2 Area	4.0	4.2
HA2015 - 68	Outside B2 Area	2.7	2.7
HA2015 - 70	Outside B2 Area	3.0	3.0
HA2015 - 71	Outside B2 Area	4.9	4.9
HA2017 - 14	B2 Town Centre Zone	1.8	2.0
HA2017 - 15	B2 Town Centre Zone	2.2	2.2
HA2017- 18	Outside B2 Area	1.8	1.8
TP2017 - 03	Outside B2 Area	3.4	*NE

Note: groundwater levels have only been displayed for boreholes where groundwater was encountered. The remaining tests did not encounter groundwater over the depths drilled on the date of testing.

*NE = Groundwater not observed at the end of testing.

** Refer McKenzie and Co drawing 003, Rev A, Project No. 1823-PC2B for land use area references.

Figure 5: Auranga B2 - Groundwater depth relative to ground level. Note table is from the Preliminary Geotechnical Appraisal Report, Lander Geotechnical, March 2019

2.5.3 Contamination

The land within the PPC area, are largely used for agricultural and pastoral grazing purposes, in addition to lifestyle residential activities. No Preliminary Contamination Report has been undertaken upon the site, however, based on previous experience in Greenfields development and upon review of historic aerial imagery of the area which identified the sites historic use for pastoral farming purposes, it is considered highly likely that the site comprises some areas of potential contamination and HAIL activities. Specific assessment of these areas would be undertaken initially in the form of Preliminary Site Investigation (PSI) during the subdivision/land use stage and related consenting.

2.6 Ecology/Streams

An Ecology Report prepared by Dr Graham Ussher of RMA Ecology Ltd addresses the ecological values of the Auranga B2 site (Refer to AEE for details).

Figure 6 below illustrates and classifies the stream and pond features situated within the PPC area:

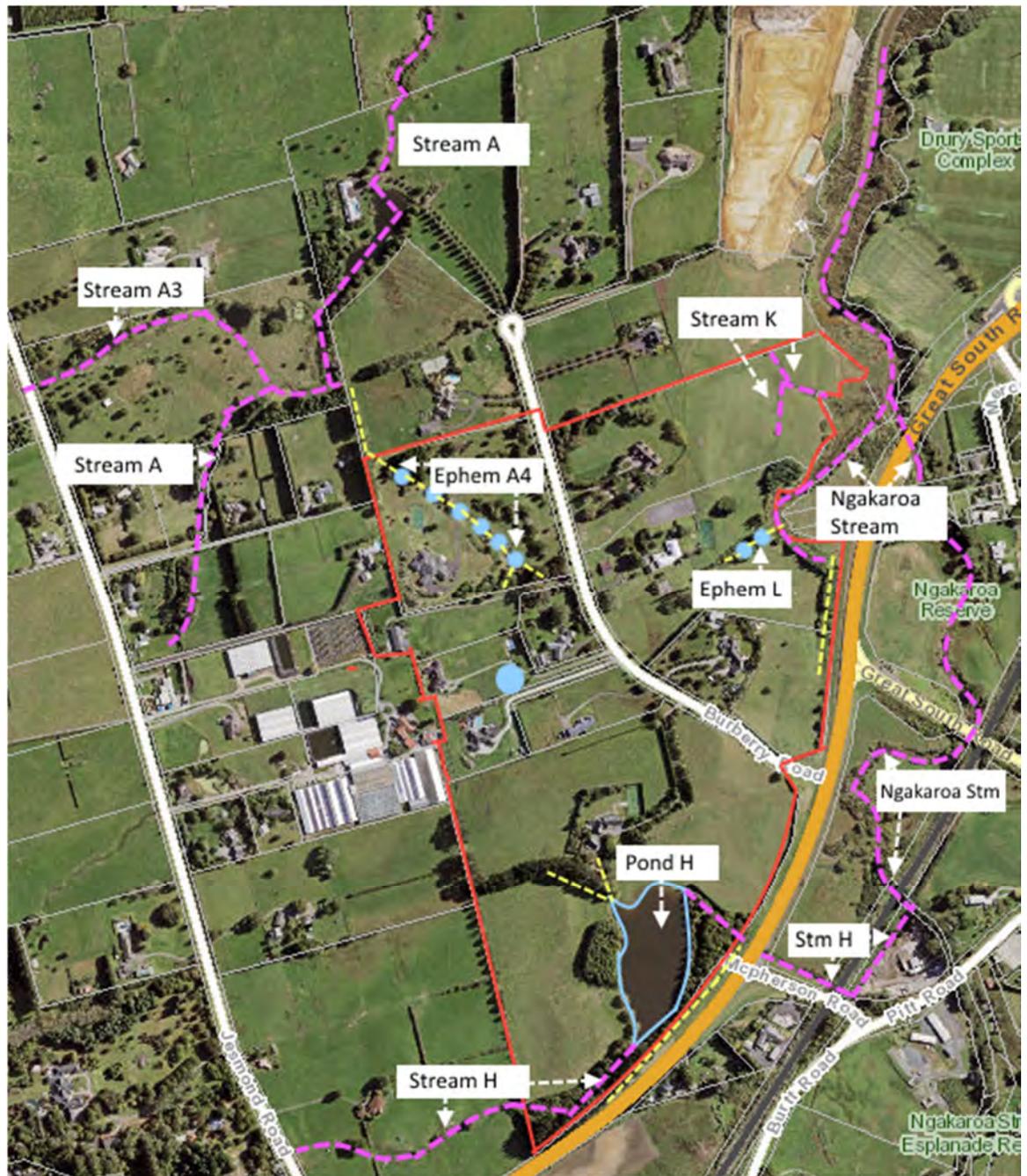


Figure 6: Stream types, and water features within the PPC area

The plan above demonstrates a combination of permanent, intermittent and ephemeral streams located in this portion of the PPC site.

Stream H

Stream H for the first part within the PPC area (before it enters the Pond H) deemed to follow the natural alignment. Thereafter, the flowpaths have been identified as significantly modified such that overflow from the pond via an intermittently flowing spillway channel, is fed into a culvert under SH22, under the adjacent rail line and through a constructed channel to the true right arm of Ngākōroa Creek.

The presumed natural flowpath of Stream H is along the true left of SH22 to join with the true left arm of Ngākōroa Creek. Instead, this portion of the natural stream has been infilled (around Burberry Road) and channelised to form a drain through which the remaining ephemeral flow is conveyed to the head of the true left arm of Ngākōroa Creek.

Stream H is identified as a permanent stream reach until it reaches the Stream H pond, after which it becomes an intermittent spillway (and thereafter exits the PPC area site).

Stream H is a permeant stream, which flows from the west to the east. This stream has a number of tributary inflows which either directly adjoin Stream H or flow through the adjacent pond and eventually join the stream. The stream has an average width of 0.92m and is shallow with an average depth of 6cm. The permanent section of the stream is soft bottomed and has a slow velocity. The stream is fenced from stock. A SEV was undertaken at this site which indicated moderate ecological value. This stream extends further to the east, then shown in the above plan, within land which is included in the Auranga B2 PPC site.

Pond H

The pond is fed by Stream H and a number of intermittent and ephemeral streams. Pond H is a recreational Pond only.

Ephemeral Streams L and A4

Ephemeral Stream L is located on the eastern side of PPC area and discharges to the true left arm of Ngākōroa Creek. The catchment size is small, and the watercourse is heavily modified.

Ephemeral watercourse A4 has been modified considerably, with a series of excavated ponds within 24 Burberry Road to capture water and excavated channels between ponds to enable overflow. The ponds flow into 30 Burberry Road (outside of the PPC boundary).

Ngākōroa Stream

The Ngākōroa Stream extends along the north-eastern corner of the site.

Auckland Council's Watercourse Assessment for the Ngākōroa Stream prepared for the DOSP area (by Morphum) describes the Ngākōroa Stream catchment as being 40.15km². The catchment is primarily drained by the Ngākōroa Stream, which discharges to Drury Creek and then to the Pahurehure Inlet of the Manukau Harbour.

The Ngākōroa Stream also includes a large tributary, designated as Ngākōroa West, which splits from the main branch in the Runciman area and extends south west. A small sub-catchment draining directly to the Pahurehure Inlet is also present to the west of Drury.

Due to the gentle topography of the area, Morphum have identified that freshwater systems tend to be low order, low energy watercourses connected to large wetland areas and that these waterways serve vital drainage and flood protection functions throughout this landscape.

The Watercourse Assessment identified that the catchment was highly modified, with historical vegetation clearance resulting in only small, fragmented pockets of native vegetation remaining. Modified stream channels were evident throughout the catchment, with the most common form of modification being straightening to increase conveyance.

RMA Ecology have identified the true left arm of Ngākōroa Stream forms part of the eastern boundary of PPC area with a broad floodplain and escarpment from SH22 north to the confluence with Stream K.

2.6.1 *Terrestrial and freshwater ecology values*

Riparian margins around the pond have been planted in predominantly exotic species including redwoods, alder and cypress, willow, pin and English oak and sweet gum. Exotic rushes were also noted along with indigenous flax. Over 50% of the buffer zone around the pond was wider than 10m.

Stream H was well shaded for most of its length by a mature stand of pine, macrocarpa and willow trees, which have been planted on both sides of the stream bank. Ferns were also present in places. A SEV was undertaken at this site which indicated moderate ecological value.

The RMA Ecology reporting identified that fish habitat was scarce within the PCP area, and that while the ponds are likely to support shortfin eel, the ephemeral watercourses and Stream K lack any habitat of note, and lack flow to support fish.

Stream H may support fish in the short section of plantation pine upstream of the Stream H pond, however the spillway to the pond was identified by RMA Ecology to likely present a barrier to fish as it was a wide, rock-lined channel that rarely supports flow.

Council's Ecology Reporting for the DOSP identifies that the area was likely to contain habitat for native skinks (mostly along margins of pasture and watercourses), however surveying was not considered necessary given the low likelihood of detection at present densities.

Stream H had a large amount of organic matter within the stream, which was likely to provide a food source and habitat for resident macroinvertebrates. Fish cover was present in the form of undercut banks and wood immediately upstream of the pond, and gambusia were noted in the stream.

The Council's Ecology Reporting for the DOSP identified that due to the degraded nature of the watercourses, species present were likely to consist predominantly of pollution tolerant and common (non-threatened) species such as shortfin eel, common smelt, common bully and Cran's bully. However, two threatened fish species (Inagna and Torrentfish) have been identified as being present with the DOSP area.

It is also acknowledged that the Ngākōroa stream is identified in the AUP as being a SEA Terrestrial (T_530b) and as meeting factor 2 (Threat Status and Rarity) of the Schedule 3 criteria.

The Council's Ecology Reporting for the DOSP identified that vegetation in the SEA included some nationally or regionally threatened plant species (Native oxtongue and Mingimingi), and that nationally or regionally threatened bird species have been recorded in the SEA (Caspian tern and South Island pied oystercatcher).

The Watercourse Assessment has identified that the Ngākōroa Stream mouth (adjacent to the PPC area) is an inanga spawning area and identified this area as a potential enhancement opportunity.

A three-stage treatment train approach, will ensure appropriate water quality prior to entering the SEA, to protect its values.

2.6.2 Water Course Assessment

A Watercourse Assessment Report (“WAR”) was undertaken by Morphum Environmental Consultants as part of the SMP for the DOSP area for the Ngākōroa Catchment. Map Series 1 (Refer Figure 7) identifies the following tributaries in the PPC area:

- Nga_Trib2_i
- Nga_Trib2_1,
- Nga_Trib2_3,
- Nga_Trib2_4
- Nga_Trib2_5
- Nga_Main_1

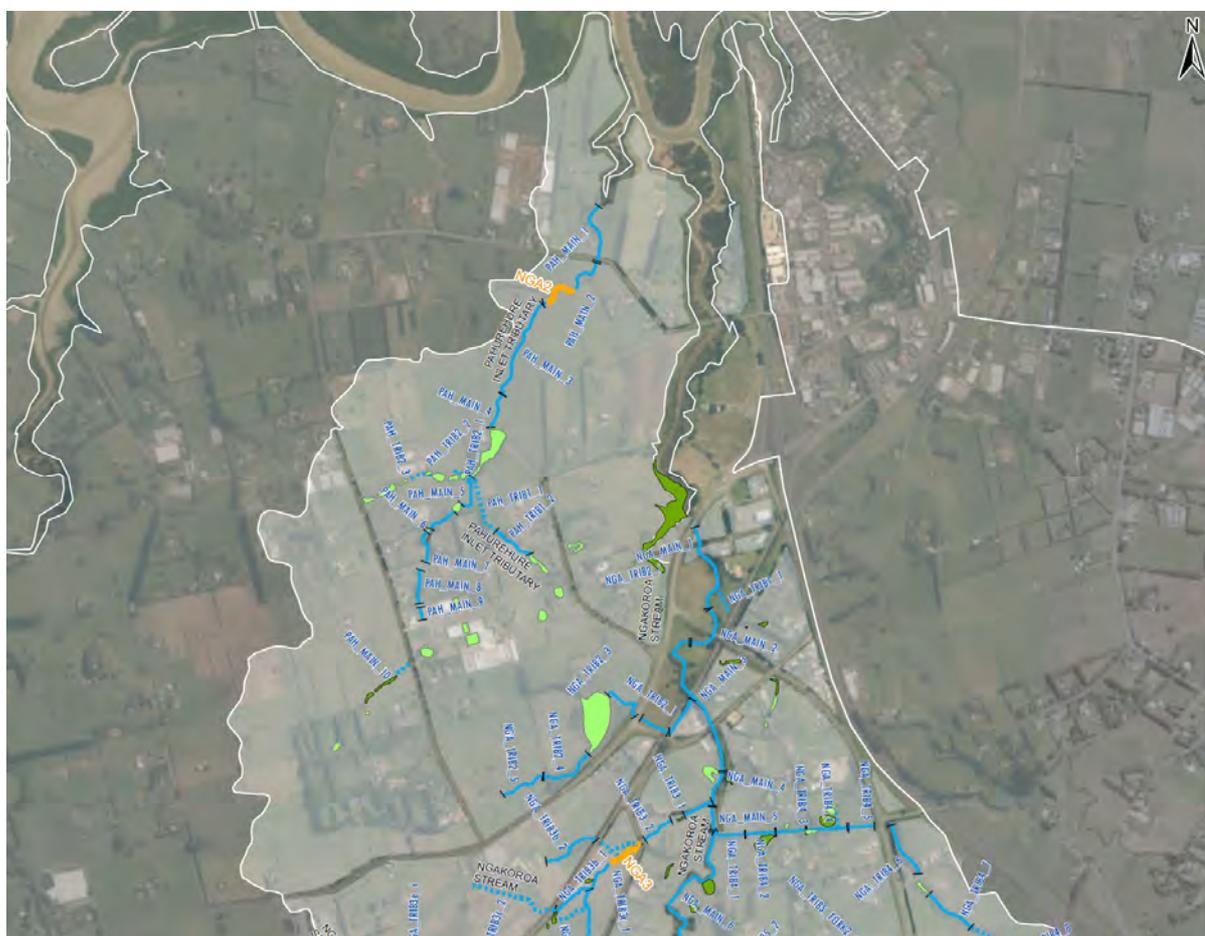


Figure 7: WAR Map 1A Overview Map (Source Morphum Environmental)

The WAR also identified the streams within the site as being in Management Zones. As per Figure 8 below.

Map7A - Management Zones and Enhancement Opportunities

MORPHUM
ENVIRONMENTAL

Figure 8: WAR Management Zones Map (Source Morphem Environmental)

2.7 Receiving environments

2.7.1 Streams, ponds and wetlands

The Auranga B2 discharges to Streams to the North and South. The receiving environments are summarised in Section 2.6.

2.7.2 Aquifers and soakage

The aquifers that are identified in the AUP are shown on Figure 1Figure 9 below.

The AUP overlays note the area as being within a High Use Stream Management Area. This is not addressed further as the development will not be taking water from the streams.

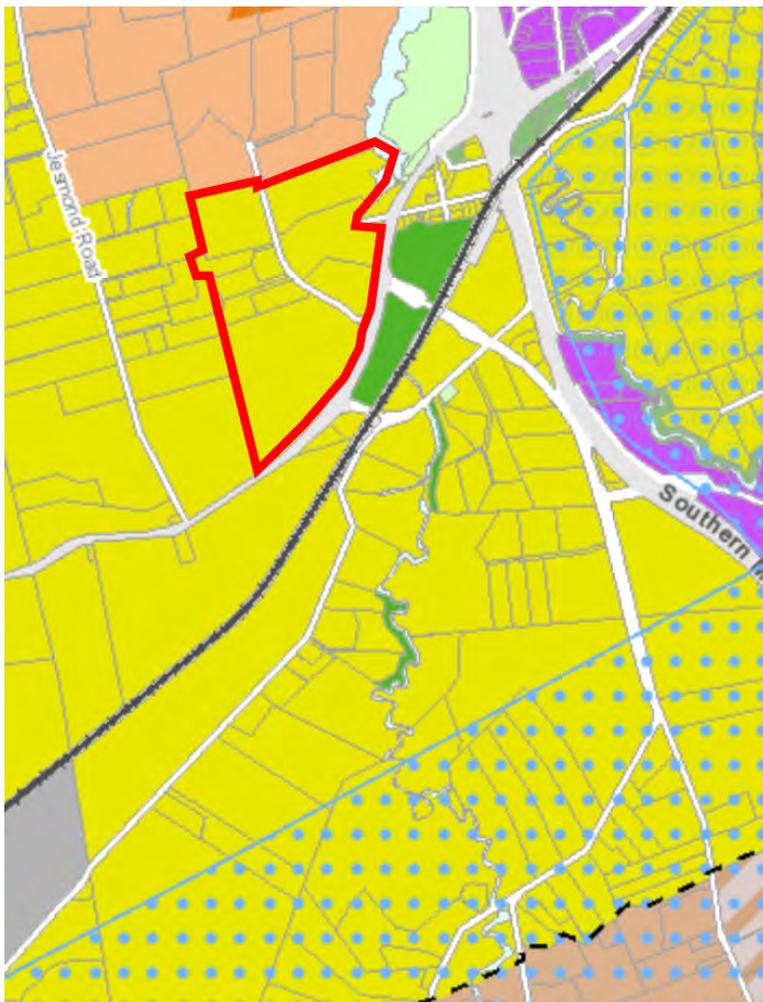


Figure 9 – Auranga B2 – Aquifers as per the AUP

2.7.1 Coastal Environment

The PPC does not directly adjoin the coastal environment, however the Ngākōroa Stream drains into the area known as the Drury Creek approximately 500m north of the PPC area.

The wider coastal environment of the Drury Creek (north of the PPC area) is also identified as SEA Marine 1 and 2 areas for intertidal habitat and wading bird areas, and saltmarsh areas.

The Council’s Ecology Reporting for the DOSP identifies while virtually all native vegetation has been removed from the terrestrial coastal edge, the coastal marine area itself remains largely intact and of good ecological health.

2.8 Existing stormwater network and other infrastructure

2.8.1 Existing stormwater network

Council GIS data does not show any existing stormwater culverts crossing Karaka Road at the southern boundary of the area. Most of this section of the network is in a traditional road embankment setup with cross fall (super-elevation) to side water channels within Agency designation. While not recorded on Council GIS, there are two culverts that pass under Karaka

Road (SH22) between Burberry and McPherson Roads, refer Figure 10 below. The culvert south of Burberry is a 375mm diameter RC pipe with 2.8-3.6m cover. This culvert is in average condition and is almost certainly not to current P46 specification standard for performance. The culvert north of McPherson is a 750mm diameter RC culvert with ~2.2-4.0m cover.

Drainage of this whole area is largely informal and follows natural flow paths.



Figure 10 Stormwater Infrastructure in SH22

2.8.2 Other infrastructure

Council GIS data does not show any existing wastewater or water infrastructure in the area.

The First Gas gas transmission line runs through 6,16,16A,20 and 24 Burberry Road, refer to Figure 11.

Transpower Transmission Lines are located outside of the site, approximately 700m to the east.

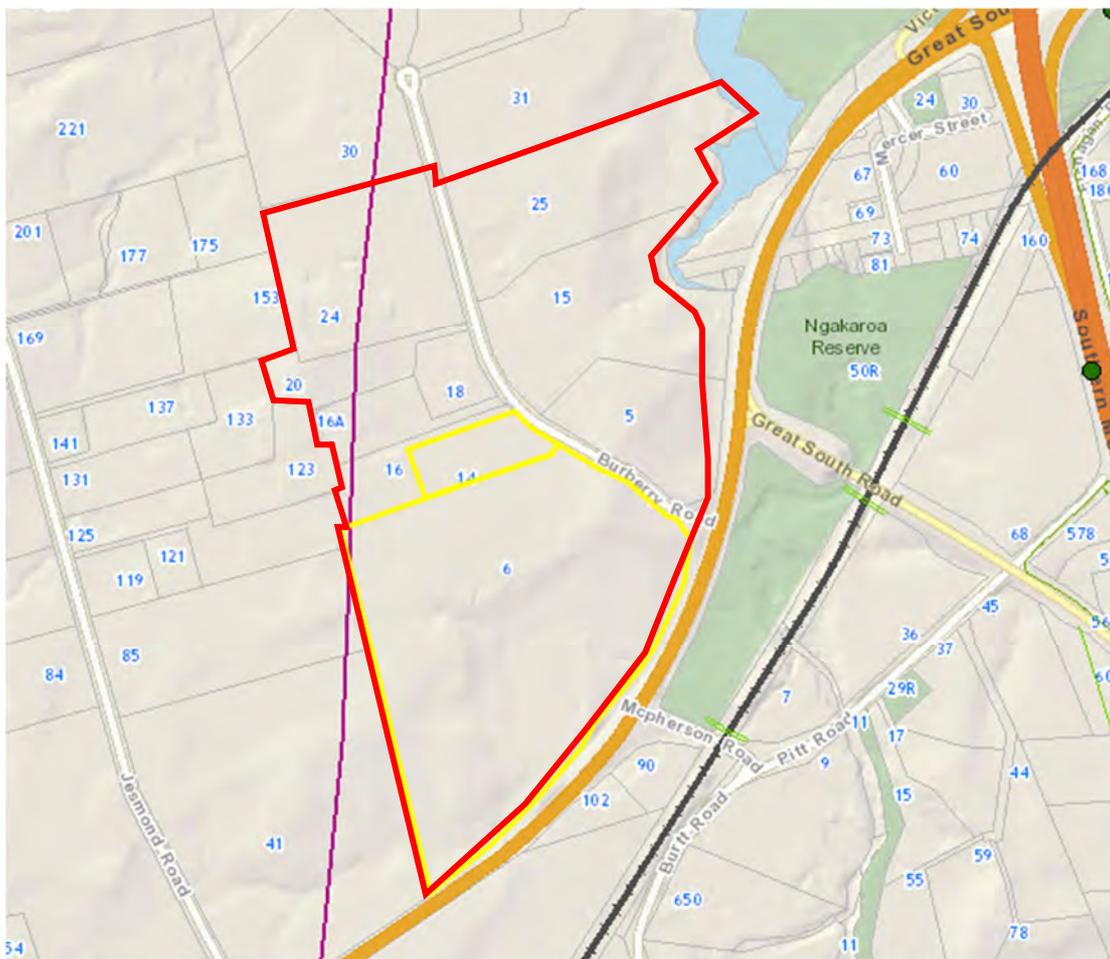


Figure 11: Gas Transmission line

3.0 Development Summary and Planning Context

3.1 Summary of Regulatory Requirements

A summary of the existing Regulatory Requirements is provided in the table below.

Table 2 – Regulatory Requirements

Requirement	Relevant regulatory / design to follow
Unitary Plan – SMAF hydrology mitigation	<ul style="list-style-type: none"> Chapter E10 of the AUP is not applicable without a PPC. However, hydrology mitigation is intertwined in AUP objectives.
High Contaminant Generating Areas	<ul style="list-style-type: none"> Chapter E9 of the AUP is not directly applicable at PPC stage (as no new uses are specifically proposed) but should be noted and utilised in BPO for stormwater management and identification of high use roads.
Natural Hazards	<ul style="list-style-type: none"> Chapter E36 of the AUP is not directly applicable at PPC stage (as no new uses are specifically proposed) but should

	be noted and utilised in BPO for stormwater management and identification of hazard areas. Those hazards applicable to the PPC area include flooding and coastal inundation.
Auckland Unitary Plan Precinct	<ul style="list-style-type: none"> There is no Precinct applicable to the land. However, the site adjoins the Drury 1 Precinct and therefore the provisions of that Precinct in respect to stormwater management should be taken into consideration in any BPO assessment.
Existing Catchment Management Plan	<ul style="list-style-type: none"> There is no existing Catchment Management Plan applicable. However, Auckland Council has prepared a Stormwater Management Plan for the entire Drury-Opaheke Structure Plan area.
Auckland Council Regionwide Network Discharge Consent	<ul style="list-style-type: none"> The Auckland Council Stormwater Network Diversion and Discharge Consent DIS60063613 is applicable, and the intention is to authorise stormwater discharges using this consent.

3.2 Regulatory Design Requirements:

The AUP is the planning document for Auckland that replace the former Regional Policy Statement and the 13 regional and district plans. The AUP became ‘operative in part’ on 15 November 2016. The AUP sets out objectives, policies and rules for development on both a city-wide scale and in some cases on a site-specific scale for areas that have been designated as ‘precincts’. The general AUP policies for management of stormwater and flooding are covered in Section E – Auckland Wide rules, namely:

- Section E1 – Water quality and integrated management
- Section E3 – Ponds, rivers, streams and wetlands
- 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 objectives are generally broad and the underlying policies that relate to stormwater management are considered to ensure correct interpretation of the objectives. The policies are wide ranging about what should be considered and do not specifically direct towards any water management solutions. The general outtakes from the assessment of these policies is that stormwater management for greenfield sites should avoid and/or minimise effects on the environment (especially for sensitive receiving environments) as far as is practicable and apply an integrated stormwater water management approach (AUP E.1.3(8)).

The following subsections summarise the most relevant policies in the AUP that development in Auranga B2 needs to give effect to. A more detailed review of all the relevant AUP objectives and policies has been undertaken in the Plan Change Assessment of Effects, prepared by Tollemache Consultants.

3.2.1 General

Policy 8 in Section E1 (Policy E1.3.8) sets out the following policies for management of stormwater runoff from greenfield development:

Avoid as far as practicable, or otherwise minimise or mitigate, adverse effects of stormwater runoff from greenfield development on freshwater systems, freshwater and coastal water by:

- *taking an integrated stormwater management approach (refer to Policy E1.3.10);*
- *minimising the generation and discharge of contaminants, particularly from high contaminant generating car parks and high use roads and into sensitive receiving environments;*
- *minimising or mitigating changes in hydrology, including loss of infiltration, to:*
 - i. *minimise erosion and associated effects on stream health and values;*
 - ii. *maintain stream baseflows; and*
 - iii. *support groundwater recharge;*
- *where practicable, minimising or mitigating the effects on freshwater systems arising from changes in water temperature caused by stormwater discharges; and*
- *providing for the management of gross stormwater pollutants, such as litter, in areas where the generation of these may be an issue.*

The other relevant policies from Section E1 are summarised briefly below:

- Maintain or enhance water quality, flows, stream channels and their margins where MCI scores for the existing streams are above the guidelines in Table E1.3.1 or Enhance water quality, flows, stream channels and their margins where MCI scores for the existing streams are below the guidelines in Table E1.3.1 (Policy E1.3.2a, Policy E1.3.2b and Policy E1.3.3).
- Discharges must avoid contamination that will have an adverse effect on the life supporting capacity of freshwater (Policy E1.3.4).
- Discharges must avoid contamination that will have an adverse effect on health of people and communities (Policy E1.3.5).
- An integrated stormwater management approach (Policy E1.3.10) must have regard to all of the following:
 - i. The nature and scale of the development and practical and cost considerations.
 - ii. The location and design of site and infrastructure to protect significant site features and minimise effects on receiving environments.
 - iii. The nature and sensitivity of receiving environments.
 - iv. Reducing stormwater flows and contaminants at source.
 - v. The use and enhancement of natural hydrological features and green infrastructure where practicable.

- Avoid, minimise or mitigate adverse effects of stormwater diversions and discharges (Policy E1.3.11).
- Manage contaminants in stormwater runoff from high contaminant generating carparks (> 30 cars) and high use roads (>5000 vehicles per day) to minimise adverse effects on water and sediment quality (Policy E1.3.12).
- Require Stormwater quality or flow management to be achieved on-site unless there is a downstream communal device (Policy E1.3.13).
- Adopt the best practicable option to minimise the adverse effects of stormwater discharges (Policy E1.3.14).
- Utilise stormwater discharge to ground soakage where it is possible to do so in a safe, and effective manner (Policy E1.3.15).

3.2.2 Hydrological Mitigation

a) Stream A Sub-Catchment

Bespoke precinct provisions are proposed to achieve hydrology mitigation which has been determined to be the BPO and is approximate to SMAF control.

Hydrological mitigation is aimed at protecting rivers and streams that are particularly susceptible to the effects of development or have relatively high values.

While the SMAF overlay is not directly applicable to the site in its current form, equivalent/similar provisions have been applied to the existing Drury 1 Precinct area which directly adjoins the PPC area, and which drains to the same coastal receiving environment. Therefore, equivalent outcomes to be achieved via similar principles have been taken into account.

The SMAF 1 hydrological mitigation requirements are outlined in Table E10.6.3.1.1 in the AUP and are as follows:

- Retention (volume reduction) of at least 5mm of runoff depth from impervious surfaces.
- Detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from impervious surfaces in the 95th percentile, 24-hour rainfall event minus the achieved retention volume.

It is proposed to adopt the same provisions for this plan change, from hereon will be referred to as **B2 Hydrological Mitigation**.

Exceptions for providing retention can be made in cases where soil infiltration rates preclude disposal to groundwater and rainwater reuse is not possible. Data provided for surrounding areas suggest that infiltration in B2 should readily be achieved, however site specific testing should be undertaken to confirm this.

b) Ngākōroa Stream Sub-Catchment

The Ngākōroa Sub-Catchment (refer Figure 2 – PPC area catchments) within the PPC area, discharges into an area prone to high levels of flooding, and potentially high groundwater tables. As such, there may be very little benefit to the receiving environment of implementing Hydrological Mitigation in the Ngākōroa Sub-catchment and its use may not justify the significant cost to construct and maintain in perpetuity, these devices.

As such, this SMP recommends that for the Ngākōroa catchment, no hydrological mitigation be required.

3.2.3 Natural hazards and flooding

Section E36 sets out the policies relating to management of natural hazards and flooding. The relevant policies are summarised briefly below:

- Identify land subject to natural hazards, taking into account the likely effects of climate change (Policy E36.3.1).
- Avoid development in greenfield areas which would result in an increased risk of adverse effects from coastal hazards, taking account of a longer-term rise in sea level in areas subject to coastal hazard (Policy E36.3.5).
- Avoid locating buildings in the 100-year ARI floodplain (Policy E36.3.17).
- Earthworks within the 100-year ARI floodplain should not permanently reduce floodplain conveyance or exacerbate flooding experienced by other sites upstream or downstream (Policy E36.3.20).
- Ensure all development in the 100-year floodplain does not increase adverse effects or increased flood depths or velocities to other properties upstream or downstream of the site (Policy E36.3.21).
- Maintain the function and capacity of overland flowpaths to convey stormwater runoff safely and without damage to the receiving environment (Policy E36.3.29) and Policy E36.3.30).

3.3 Drury-Opaheke Structure Plan

The Drury-Opaheke Structure Plan report identifies the following key outcomes regards to stormwater and flood management:

- The location and form of development avoids the impacts of natural hazards
- Management of the natural environment in a way that respects and is guided by Māori tikanga.
- Freshwater quality within the catchment is improved.
- The quality of the marine receiving environment is maintained or improved.
- The freshwater management functions of riparian margins are improved.
- Protect and improve biodiversity.

The guidance for stormwater and flood management is based on the Drury-Opaheke SMP which is outlined in further detail below.

3.4 Drury-Opaheke Draft Stormwater Management Plan

A draft Stormwater Management Plan was prepared by Mott McDonald to support the development of the Council's Drury Opaheke Structure Plan (DOSP).

The SMP recognises the key constraints and opportunities in the catchments and reflects the requirements of the Auckland Unitary Plan and region wide Network Discharge Consent. The SMP therefore seeks to achieve the following outcomes:

- Protecting and enhancing the environment and to connect communities to water.
- Ecological values are maintained or enhanced.
- Stream health is maintained or enhanced through improved baseflow.
- Urban development is facilitated, key infrastructure is protected, and people and the environment protected from significant flooding events.
- Stormwater is integrated with land uses and other values (e.g. landscape) so that the amount of land available for development is optimised.
- Sediment into sensitive receiving environments is minimised.
- Contaminants input into the sensitive receiving environments of the Drury Sands aquifer and Te Mānukanuka o Hoturoa / Manukau Harbour are minimised.

The recommended stormwater management approach takes into account the sensitivity of the receiving environments to further contaminants and makes use of water sensitive design as a tool to achieve integrated stormwater management as directed in policies E1.3(8) and (10) of the Auckland Unitary Plan.

To achieve these outcomes the SMP identifies a number of requirements for management of stormwater some of which are Structure Plan wide and others are specific to each catchment. For this PPC area the requirements for the Ngākōroa Stream catchment are relevant.

Key requirements are:

General:

- Development to be carried out using an integrated stormwater management (in accordance with E1.3.8 and E1.3.10 of the AUP) approach i.e. water sensitive design.

Water Quality:

- Freshwater and sediment quality are maintained where it is excellent or good and progressively improved over time in degraded areas in accordance with Section E1.2(1) of the AUP.
- Treatment of all impervious areas (excluding non-contaminant generating areas such as patios) to be provided at or near source using devices such as swales, rain gardens, tree pits. Runoff to be treated prior to discharge to the council system or directly to receiving environments (such as aquifers).

- Inert materials are preferred, or treatment is proposed from buildings to remove contaminants.
- Contaminant specific treatment devices are required for industrial or trade activities in accordance with E33 of the AUP.
- Sediment and erosion control measures, in accordance with GD05, are to be provided during earthworks and construction, including individual lot construction.
- Integrated naturalised (green) outfalls to be used when discharging to streams.

Minimising and mitigating hydrological change

- Changes in hydrology are avoided as far as practicable and any changes in hydrology are minimised or mitigated (in accordance with E1.3.8 of the AUP).
- The minimum requirement when hydrological mitigation is necessary is in accordance with Table E10.6.3.1.1 of the AUP.
- Stream erosion management may require staging of development so that the bottom of the catchment is developed first and stream bank strengthening is carried out in tandem. Council may consider collaborating or contributing to stream works in the event of multiple developers in the same sub-catchment.

Streams

- Protect and enhance all permanent and intermittent streams.
- A minimum 10m planted riparian margin shall be provided either side of intermittent streams and a minimum 20m riparian margin either side of permanent streams.
- Prepare natural stream channels for future storm flows through bioengineered erosion protection works.
- Watercourse margins should be sufficiently sized to allow space for gentle sloping embankments and revegetation of riparian margins.
- Outfalls should be pulled back from the streams where possible to allow for dispersal of flows and to disconnect impervious surfaces from the receiving environment to form part of a treatment train approach.
- Provide distributed stormwater outlets into watercourses rather than single discharge points.
- Barriers to fish passage occur at perched or steeply inclined culverts. Redevelopment presents an opportunity to remediate this issue through the removal and replacement of problem culverts.
- Integrate bioengineering to increase habitat values for fish.
- Improve inanga spawning habitat.
- Incorporate shared cycle/walkways along riparian corridors to improve connectivity to key recreational and transport infrastructure.
- Upgrade and install all required inlets and outlets to appropriate inlet outlet standards

- Retain existing stream meander patterns and reintroduce stream meanders and naturalisation where possible. Avoid any further channel straightening.
- Address erosion issues, both erosion hotspots and culvert erosion before and/or as urban development occurs.
- Carry out maintenance of existing culverts such as structural repairs, vegetation clearance and provision of erosion protection.
- For essential stream crossings, bank-to-bank bridges with minimal riparian and stream bed disturbance are preferred.
- Implement Enhancement Opportunities.
- Development of the FUZ should ensure that fish passage is maintained and where possible enhanced between the coastal marine area and natural stream management areas.

Ngākōroa Stream

- Remove redundant farm culverts during development.
- Investigate potential to implement esplanade reserves on Pahurehure Inlet tributary and Tributaries 3 and 8 as part of development.

Flood Management

- All buildings to be outside the 100-year ARI floodplain in accordance with E36.3.17.
- Avoid locating infrastructure in the 100-year ARI floodplain unless it can be designed to be resilient to flood damage.
- Ensure all development and changes within the 100-year floodplain do not increase adverse effects or increased flood depths or velocities to other properties upstream or downstream of the site.
- Avoid increasing flood risk and flood extent upstream and downstream for all flood events up to the 100-year ARI.
- Identify overland flowpaths and ensure that they remain unobstructed and able to safely convey runoff.
- Use capacity available in riparian margins as part of the water conveyance system and enhance intermittent streams to provide capacity and conveyance as a means to manage flood waters.

3.5 Watercourse Assessment

A Watercourse Assessment Report (“WAR”) was undertaken by Morphum Environmental Consultants as part of the SMP for the DOSP area for the Ngākōroa Catchment.

Streams within the PPC area are identified in the WAR as Management Zone 2, and key issues and objectives are listed for this Management Zone in Table 9, which is replicated below in Figure 12.

Table 9: MZ2 Issues and Objectives	
Specific Issues	Suggested Objectives and Actions
Watercourses and historic wetlands have been modified to become straight deep channels and extensively fragment the ecological landscape.	Re-meandering of modified watercourses, consider daylighting options, and formation of contiguous green corridors. See EO1, EO2, EO6, EO7, EO8, EO9 (Section 6.0)
High water table and flood prone areas	Expected limitations on development within floodplains provide opportunities for the creation of public open space for passive recreational use combined with stormwater management. This could include detention basins, integrated with naturalised stream corridors to increase sinuosity with consideration of conveyance capacity (see EO7; Section 6.0)
Four culverts under the rail corridor intersecting first order tributaries of NGA_TRIB3 were overgrown with blackberry and gorse and inaccessible to determine condition, particularly from the outlet (647 Burt Rd). Asset IDs: NGAPR_015, NGAPR_016, NGAPR_017	Refer maintenance recommendations to the appropriate authority (e.g. Kiwirail)
Poor condition of numerous private culverts on farm tracks	Advocate for the removal of redundant farm culverts through development
Stock damage to banks and watercourses	Advocate for the fencing and planting of riparian margins through the development process
Limited existing public open space or riparian reserves	Consider potential to implement esplanade reserves on Pahurehure Inlet tributary, and Tributaries 3 and 8 through future development.
Online ponds	Remove/remediate ponds to address associated impacts on water quality and freshwater ecology (see EO4, EO5; Section 6.0)
Barriers to fish migration within the Ngakoroa catchment	Remediate barriers to fish passage, namely: The perched culvert and its outlet structure (Asset IDs NGAPR_065 and NGA_139 respectively) which are located on NGA_TRIB3_4; A culvert located on PAH_MAIN_5 (Asset ID: NGAP_048), which is perched by 0.3 m; A perched PVC pipe (Asset ID: NGAP_050) located on PAH_TRIB2_2.
Culvert under shared driveway on NGA_TRIB8_6 presents a flood risk to non-habitable floors and access to properties (see Asset ID NGA_056)	Investigate remediation of undersized culvert to prevent flooding issues (see EO7; Section 6.0)

Figure 12: Management Zone Issues

Notably, none of the directly identified Tributaries or Assets fall within the PPC area.

3.6 Technical guidance

The following technical guidance is used to support the Stormwater Management Plan.

Table 3 – Stormwater Management Plan Guidance

Technical guidance	Application
Auckland Council, TR 2013/035, Auckland Unitary Plan stormwater management provisions: Technical basis of contaminant and volume management requirements (2013)	95 th percentile 24 hr rainfall depth for hydrological mitigation devices.
GD01: Stormwater management devices in the Auckland Region, December 2017. (Note this supersedes TP10).	Design of approved stormwater quality devices.
Auckland Council, GD 2015/04, Water Sensitive Design for Stormwater.	Consideration of Water Sensitive Design approaches.
Auckland Council, TP 124, Low Impact Design Manual for the Auckland Region.	Design of low impact stormwater treatment devices.
Auckland Council, TP108, Guidelines for stormwater runoff modelling in the Auckland Region (1999)	Hydrological method for flood modelling.
SW CoP: Code of Practice for Land Development and Subdivision, Chapter 4 – Stormwater, November 2015	Design of stormwater assets.
Auckland Transport, Transport Design Manual (TDM) – Road Drainage	Design of drainage in the road reserve.
Auckland Transport Code of Practice – Road Drainage	Design of drainage in the road reserve.

4.0 MANA WHENUA MATTERS

4.1 Identification and incorporation of mana whenua values

Stormwater management for previous stages of Auranga was subject to iwi feedback – this is outlined below:

- Treatment of contaminants this includes stormwater discharge treatment solutions with a treatment train approach to provide retention and detention;
- Managing effects (avoid, remedy, minimize, mitigate, balance); and
- Groundwater recharge.

More detailed iwi requirements are listed below:

- Streams and esplanades preserved in their natural state;
- Esplanade reserves should be 20 m in width and riparian margins 10 m;
- All riparian plantings to be eco-sourced natives;
- Sustainable development in all areas;
- Stormwater devices outside of the 100-year flood plain;
- Drains, waterways, wet areas and overland flow paths preserved and enhanced;
- A minimum of a three train, bio/low impact design treatment for all stormwater runoff;

- Reuse of roof water to lessen effects of water take from public supply;
- Groundwater recharge implemented;
- Narrower roads = less impervious=less flow=smaller devices;
- Use of pervious paving for footpaths [increases groundwater recharge ability];
- Pervious paving;
- Roading [where possible] to be around esplanade to allow for visual amenity;
- Removal of culverts and replacement with bridges [unless for pedestrian access only];
- Retention of view shafts for visual amenity;
- Use of “non-chemical” methods for weed removal, as far as possible;
- Cultural monitoring, especially around stream and coastal margins; and
- Naming opportunities.
- Naturalised (green) outfalls.

The DOSP also sought feedback from local iwi. Recommendations from that feedback was summarised in the DOSP SMP as:

- limiting development around awa to maintain access, preserve amenity, retain views and protect water quality;
- promoting resilient and water sensitive communities through water sensitive design that encourages water conservation;
- ensuring activity allows for the recharge of aquifers with uncontaminated water (such as the use of pervious paving);
- preserving sensitive and high value areas (such as floodplains, areas of indigenous vegetation and wetlands); and
- ensuring cumulative impacts and effects have been considered and measured at all steps.

5.0 STAKEHOLDER ENGAGEMENT AND CONSULTATION

As this PPC essentially drains to the same receiving environment as the Drury 1 Precinct, and this PPC is a progression of the existing Auranga development, no other engagement and consultation has been undertaken (other than iwi).

Due to the network discharging across or along SH22, further consultation will be required with NZTA, Kiwirail, and Auckland Transport on network coordination, during the Design and implementation process.

6.0 PROPOSED DEVELOPMENT

6.1 Proposed land use changes

The PPC is based on the Precinct Plan shown in Figure 13 below includes the following:

- Rezoning approximately 33.65 ha of land as Town Centre (TC), Terrace Housing and Apartment Building (THAB) and Mixed Housing Urban (MHU);
- A precinct plan illustrating:
 - the distribution of zones and higher order road networks;
 - the pond feature for protection

- o future esplanade reserve (however, this is subject to council accepting vesting etc at subdivision stage)
- o key retail and general retail frontages along key town centre roads
- o Utilising the ATCOP hierarchy of road cross sections;
- o Utilising the AUP underlying subdivision rules providing for vacant fee simple lots;
- o Utilising the AUP underlying subdivision rules to provide a subdivision pattern; and
- o Utilising the AUP underlying TC, THAB, and MHU zone rules with regard to building coverage and impervious surfaces on residential sites.

The extent of any public open space will be determined through Council's preferences in respect to acquisition.

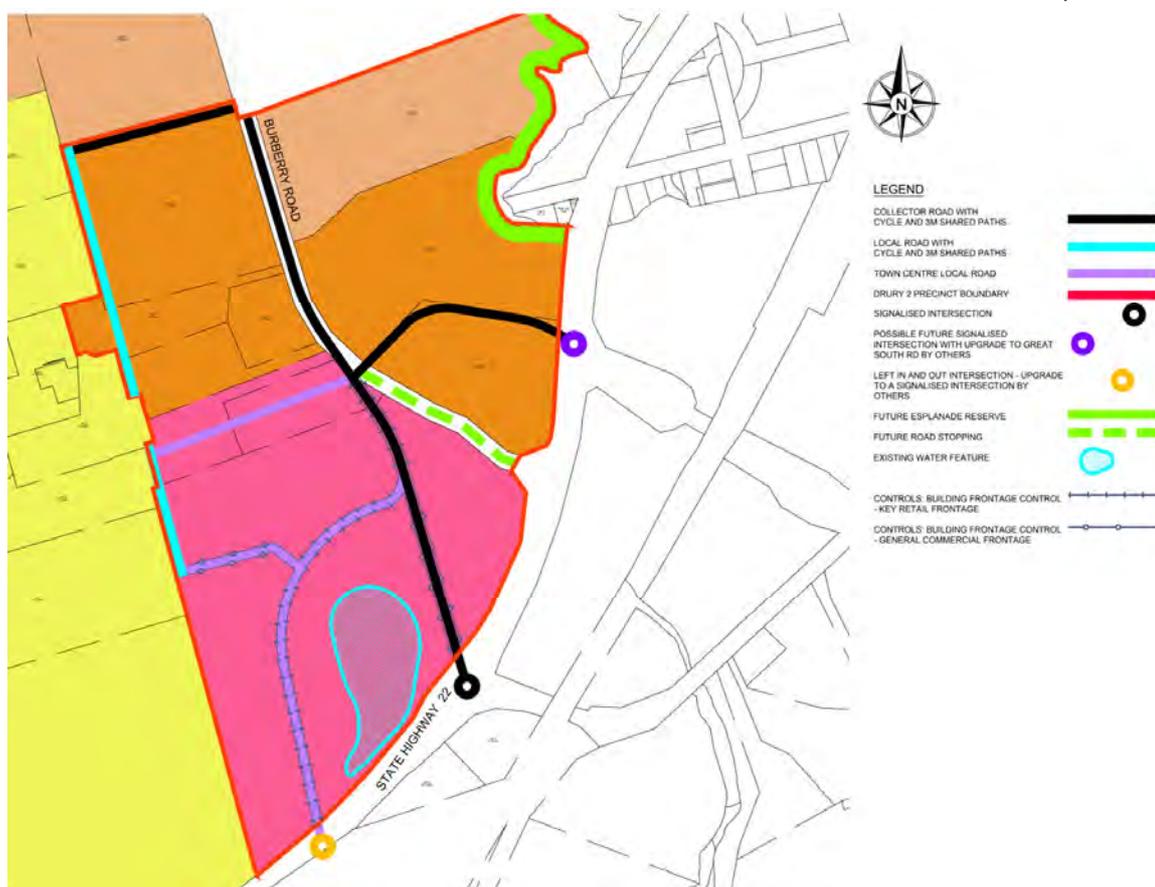


Figure 13 – Proposed Precinct Plan

6.2 Infrastructure upgrades

Specific transport improvements are required to support the Auranga B2 development. In summary, an upgrade of SH22 is required, to four lanes. It is also proposed to realign Burberry Road to exit to SH22, via a future signalised intersection, in the location opposite McPherson Road. All works within the PPC area, will require upgrade in accordance with ATCOP. These roading typologies provide an area within the road corridor, for stormwater devices and conveyance networks, and will also be subject to the E9 Stormwater Quality provisions, where identified as high use roads (and additional treatment to accord with GD01 for low use roads as required by this SMP).

As recommended by the ecology reporting the permanent and any intermittent streams margins will be enhanced with riparian planting (required by the proposed Precinct rules), undertaken progressively with each subdivision application.

6.2.1 Pond H

It is proposed to retain Pond H in Private Ownership. It is not proposed to vest this pond to Auckland Council. The pond is proposed to be used for recreational purposes, and as such the Pond is not proposed to be utilised for stormwater treatment purposes. All required treatment, will occur in either communal devices (preferred) or at-source devices, prior to being discharged into Pond H.

There are two options considered for the Pond H discharge, depending on the timing of development in the Pond H catchment, relative to other construction activities planned in the area.

- Option 1 – Discharge North along SH22 to the Ngākōroa Creek.
- Option 2 - Maintain Existing Discharge location, to pre-development Levels.

Both options are described in more detail below.

6.2.1.1 Option 1 - Discharge north along SH22, to Ngākōroa (Preferred option)

The preferred discharge option, is to capture the flows from Pond H, and then pipe this discharge to the north east along SH22, and discharge into the Ngākōroa Stream on the north side of SH22.

At Pond H outlet, a structure to capture up to the 10% event, and safely convey the 10% AEP flow through a new pipe network along SH22 to the North. The outlet will need to be maintained at a level that can ensure the outlet to the Ngākōroa Stream, is of sufficient level.

Some modifications to the outlet of the pond will be required, to ensure flows from the 1% AEP event can safely be managed through the Pond & conveyed to the floodplain adjacent to SH22

The discharge from Pond/Stream H currently discharges through existing culverts under SH22, and the Rail corridor, prior to discharging to the Ngākōroa stream. Due to the proposed

Due to the downstream flood plain



Figure 14 – Option 1 - Proposed Ngākōroa Catchment Outlet pipe

6.2.1.2 Option 2 – Maintain Existing Discharge location, to pre-development Levels

It is an option, if the preferred discharge route to the north, along SH22 is not possible (for example due to third party issues), to provide flow attenuation to maintain predevelopment flow levels, through a flow control structure at the pond H outlet.

This could also be a viable "temporary option" to allow development to progress while negotiations are underway to achieve the preferred option.

If Pond H is proposed to be used for flow attenuation, then the water level will raise by approximately 400mm for the 1% AEP event, to maintain flows to pre-development levels.

Figure 15 shows the existing catchment, and discharge location and route from the Pond, to the Ngākōroa Stream.

The required treatment of water from impervious surfaces, is proposed to be provided prior to discharge into Pond H.

No upgrades to the existing network downstream of the pond are proposed, as part of this option.

However, this options requires that at resource consent stage an erosion assessment be undertaken of the downstream discharge location, and further assessments of Pond H (including its dam structure) may be necessary.



Figure 15 – Option 2 - Pond H attenuated discharge route

7.0 FLOOD AND COASTAL RISK MANAGEMENT

7.1 Flood hazard assessment

Flood hazard assessment and modelling for the wider catchment was undertaken as part of the Auranga B1 PPC, by Tonkin + Taylor, and this study included land subject to this PPC and SMP. This report is included as Appendix D.

The assessment was carried out using a 2D model with 2013 LiDAR coupled with a 1D component to represent Hingaia Road Bridge. The flood modelling included major inflows from Slippery Creek, Hingaia Creek, and Ngākōroa Stream.

The method and assumptions used for the flood hazard assessment are detailed in the Tonkin + Taylor Auranga Flood Hazard Model Development memo May 2017, which was reviewed and considered acceptable by Council as part of the Auranga B1 PPC process. There is no need to update this further.

The flood hazard assessment was undertaken for the Scenario 5 that included MPD, climate change, 1% AEP rain event with mean high-water springs (MHWS) and 1 m sea level rise (3.1 mRL).

7.2 Modelled Flood risk

The flood hazard for the Auranga B2 was modelling by Tonkin + Taylor as part of the work for Auranga B1, and included the B2 area. These model results are shown in Figure 16 and Figure 17. The findings of the modelling show that the water level range for the 100-year ARI rainfall with

MHWS and climate change was 5.5mRL at the edge of the Ngākōroa stream/eastern edge of the PPC area, and between 10-20 mRL at some inland locations in the vicinity of streams and flowpaths. Water levels along the SH22 edge drainage system were in the vicinity of 7.5-8.0 mRL.

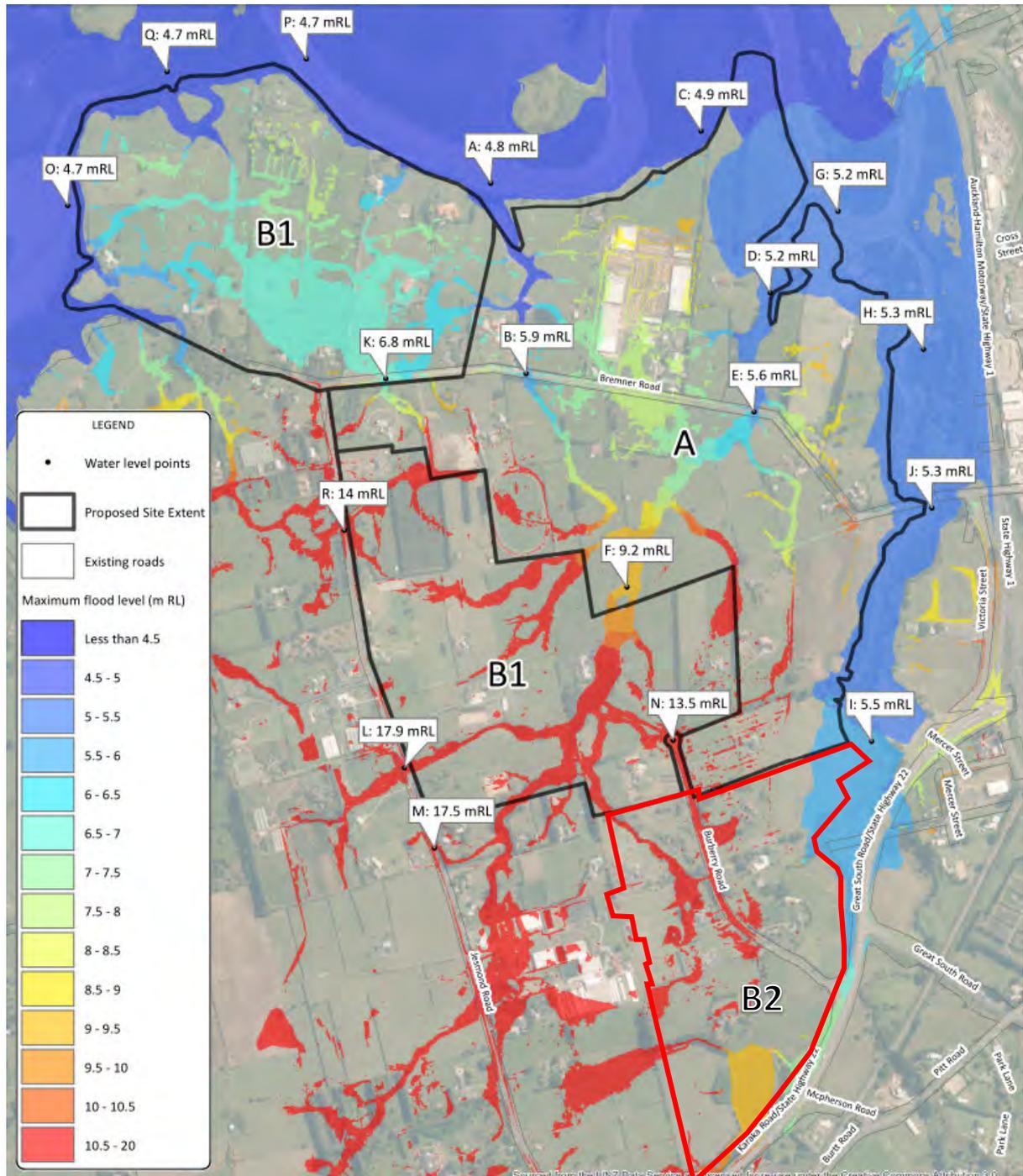


Figure 16: Auranga B2 – Flood hazard map - MPD, climate change, 1% AEP rain event with mean high-water springs (MHWS) and 1 m sea level rise (5.5 mRL)

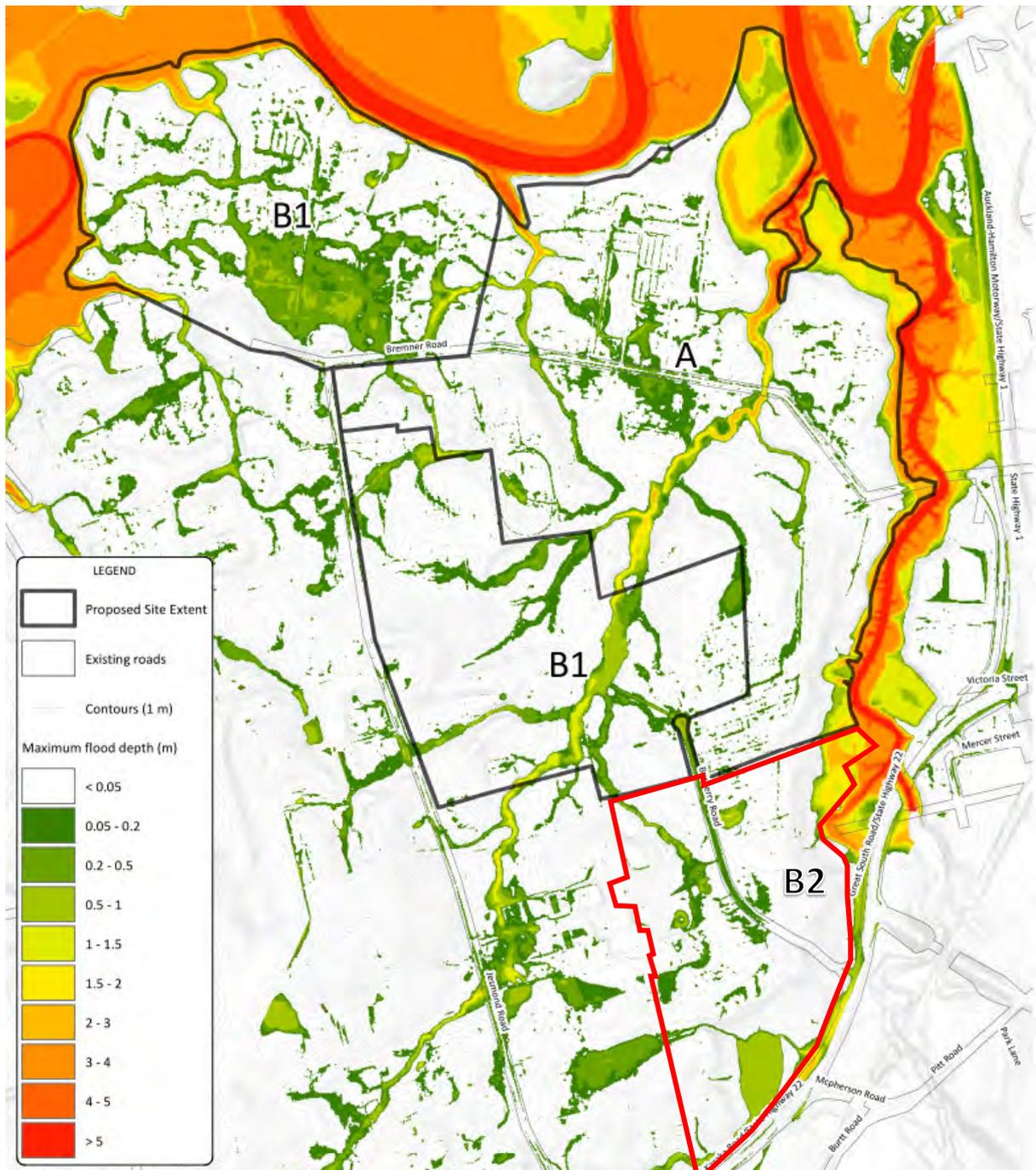


Figure 17 Auranga B2 – Flood hazard map for - MPD, climate change, 1% AEP rain event with 10% AEP extreme sea level and 1 m sea level rise

7.3 Coastal hazards

The coastal inundation hazards are based on the 100-year ARI extreme tide level and an appropriate allowance for sea level rise.

As part of the 2016 T&T work for Auranga B1 (but which also included the B2 site), extreme tide levels were obtained by T&T from NIWA (2013) where the closest modelled site (point 66) has a 100-year ARI tide of 3.5 m RL (AVD-46). Sea level rise was added to the extreme tide for the inundation level, this was taken as 1.0 m to 2115, giving a total inundation level of 4.5 mRL.

7.4 Flooding and coastal hazard management

The proposed development of the Auranga B2 PPC area does not change the flood hazard to buildings/dwellings in the area, or downstream of it. Therefore, the focus of flood management is to protect new development from the future flood hazard.

The flood and coastal hazard management proposed to protect new development from future flood and coastal hazards is as described in Table 4 and is the same strategy as approved for Auranga B1.

As the flood levels predicted by the flood assessment are higher than those for the coastal inundation hazard of 4.5 mRL, the higher flood level should be used in preference to the coastal inundation hazard level for coastal areas in avoiding hazards.

Table 4 - Flood and coastal management for Auranga B1

Proposed flood and coastal management		
Approach	Management	Existing AUP Provisions
Avoid the floodplain (including coastal inundation)	<ul style="list-style-type: none"> Define the floodplain as Scenario 5 for the MPD, climate change, 1% AEP rainfall event and MHWS with 1 m sea level rise. Exclude vulnerable development from the floodplain (car parking etc may be acceptable in the floodplain depends on depths and velocities etc – this can be managed at resource consent stage). The floodplains will be managed within the stream corridors and its associated riparian margins. While it may be necessary to shape the floodplain within the green corridors, but the main channel of the streams will not be modified. Apply freeboard of 500 mm to above the flood levels in Scenario 5 for building floor levels, which will accommodate hydrological and hydraulic uncertainties. 	Existing E36 and E38 Rules applicable
Flood resilience infrastructure	<ul style="list-style-type: none"> Design road crossings to be flood free for Scenario 5. Update the floodplain for any hydraulic changes resulting from infrastructure at the subdivision design stage. 	Existing E36 and E38 Rules applicable
Maintaining the proposed subcatchments as close as possible to the existing subcatchments	<ul style="list-style-type: none"> Maintain the catchment divides for Stream A and the Ngākōroa Stream and its tributaries, so that more flow does not enter these and increase the floodplains and flood hazard. 	
Maintain overland flow paths capacity	<ul style="list-style-type: none"> Maintain or redirect overland flow paths, but provide capacity in these for MPD, climate change, 1% AEP flows. 	Existing E12, E36 and E38 Rules applicable
Avoid the Coastal Erosion Hazard Zone (CEHZ)	<ul style="list-style-type: none"> Define the CEHZ. Exclude development from the CEHZ. 	Existing E36 and E38 Rules applicable

8.0 STORMWATER MANAGEMENT APPROACH

8.1 Summary of stormwater management

The National Policy Statement for Freshwater Management, the New Zealand Coastal Policy Statement and the AUP seek to improve the integrated management of freshwater and the use and development of land. Policy E1.3.8(a) of the AUP requires that greenfield development be carried out using an integrated stormwater management approach. This can be achieved using Water Sensitive Design (WSD) which is defined in GD04 as:

“An approach to freshwater management, it is applied to land use planning and development at complementary scales including region, catchment, development and site. Water sensitive design seeks to protect and enhance natural freshwater systems, sustainably manage water resources, and mimic natural processes to achieve enhanced outcomes for ecosystems and our communities.”

Integrated approaches such as WSD are important to minimise the adverse effects of growth and development on freshwater systems and coastal waters. In addition, WSD provides more resilience (to flooding, for example) than traditional approaches. It is also Auckland Council’s preferred stormwater management approach.

It is important to recognise that this SMP is the third SMP prepared for the Auranga development area and as such incorporating WSD at all levels of planning and development is well known to the team and is in keeping with principles set for previous stages. This includes:

- Interdisciplinary planning and design during all stages of progression of development plans and PPC documentation;
- Identification of natural ecosystems for protection and enhancement;
- Appropriate stormwater management to be applied to the site including a combination of communal and at – source / close to source options, and;
- Stormwater systems mimicking natural systems and processes.

The detailed design of stormwater management should be based on the proposed stormwater management set out in Table 7. Unlike previous stages of Auranga this PPC area does not drain directly to the Coastal environment, and instead drains to either Stream A, or the Ngākōroa Stream.

As such the stormwater management approaches apply across the PPC area for the receiving environments, and are intended to meet the hydrological mitigation requirements set by the direction of E1 of the AUP for greenfield development. This SMP also recognises that there may be options which vary from the standard E10 SMAF provisions and identifies that these may be explored for future development at resource consent stage.

Table 7 below outlines the proposed approach for stormwater management.

The stormwater network design (at resource consent stage) will also need to consider site specific conditions including physical constraints, ground conditions, infiltration rates together with the operation principles set out in this SMP.

It is expected that integrated management continue through the resource consent stages where the subdivision and development layouts integrate the stormwater devices/features into the overall design and where possible are utilised to enhance development.

8.2 Integrated stormwater management

The AUP establishes some overarching policies, including the requirement for an integrated stormwater management approach. The PPC and SMP incorporates aspects that provide an integrated stormwater management approach, which includes:

- Corridors along streams that provide a buffer to the streams to protect and retain stream habitats, manage stormwater (naturalised/green outfalls) and flooding;
- Enhance the stream habitats (including Terrestrial SEA) with riparian planting;
- Setback from streams to provide flood and erosion protection;
- Stormwater management to mitigate the effects of stormwater on the environment, in particular the treatment roads and carparks and the hydrological mitigation for impervious areas;
- It is expected that integrated management continue through the resource consent stages where the subdivision and development layouts integrate the stormwater devices/features into the overall design and where possible are utilised to enhance development.

8.3 Water Quality & Quantity

8.3.1 Quality

Under the NDC, Stormwater **quality** treatment is required for all new impervious surfaces.

The general approach for water quality is to manage the effects (avoid, remedy, mitigate), by providing mitigation as close to the source as possible and providing a treatment train approach. This is consistent with Mana Whenua preferences. Fewer, larger communal devices are preferred (where possible) over more frequently occurring and smaller devices, to provide a better whole-of-life cost for the assets.

This requires that all high use roads and high use car parking areas (both as defined in the AUP) and all other roads, car parking areas and common accessways, which occur in the PPC area will be appropriately treated using a range of bio-retention device options. A minimum of 3 stage treatment train is required (as identified by the Mana Whenua consultation).

Given recent experiences with Auckland Council on other projects, it is not considered necessary to determine which devices will be used for the roads and car parks separately (as these are subject to change dependent on AT/Healthy Waters requirements for each stage), and it is more appropriate to enable flexibility of choice to suit circumstances and specific design at development stages.

There is a preference for fewer, larger communal devices, over more frequently occurring and smaller devices. This preference will require that development considers options that address more than one property or stage at a time, to assess the feasibility of a combined device in the first instance. Only if a combined device is demonstrated as not feasible, then smaller at-source devices can be considered.

A toolbox range of options is proposed by this SMP in Table 5 (which is based on the DOSP SMP toolbox, replicated in Appendix B). The specific use of each device and its appropriateness for the development can be managed at individual land use and/or subdivision application stages as solutions are more appropriately tailor made for each development.

Treatment devices should be designed to accord with GD01.

It is acknowledged that previous stages of Auranga also had a requirement for a low level of treatment for local roads and low use car parks in coastal catchments. This was delivered through a tool box of options, including treatment only raingardens, sized at 2% of the impervious surfaces and permeable pavers. However, as this stage of development occurs under the newer NDC, full quality treatment is required..

8.3.2 Quantity - Stream A catchment

To meet the recommendation of this SMP, the PPC seeks to have a SMAF 1 equivalent mitigation (**B2 hydrological mitigation**) applied to the Stream A Catchment. This sets up as a starting point the 'base requirement' for hydrology mitigation of stormwater management. .

A toolbox range of options is proposed by this SMP in Table 5 (which is based on the DOSP SMP toolbox, replicated in Appendix B). The specific use of each device and its appropriateness for the development can be managed at individual land use and/or subdivision application stages as solutions are more appropriately tailor made for each development.

There is a preference for fewer, larger communal devices, over more frequently occurring and smaller devices. This preference will require that development considers options that address more than one property or stage at a time, to assess the feasibility of a combined device in the first instance. Only if a combined device is demonstrated as not feasible, then smaller at-source devices can be considered.

8.3.3 Quantity – Ngakoroa catchment

As the Ngakoroa catchment is intended to be a coastal catchment (through the preferred option) hydrological mitigation including detention is not required.

However, in the interim solution, quantity control is required in Pond H to manage downstream capacity and flooding.

8.4 Specific detail for each land use type

Roads

For all roads hydrological mitigation (as applicable in the Stream A catchment only) and water quality treatment of runoff will be achieved through a combination of features to form a 3-stage treatment train. These features could include a combination of oversized sumps, secondary communal devices, filter trenches/trench drains, swales, raingardens and tree pits, and green outlets.

Vegetated swales and rain gardens provide not only provide for retention/detention (if required) and they can also provide for water quality treatment close to the source.

Future development should consider options to reduce the total number of devices within the road network and seek to combine devices.

Residential Allotments – THAB zone/MHU zone

For all residential lots (and including for any shared access to service lots), hydrological mitigation of runoff (as applicable in the Stream A catchment only) and water quality treatment will be

achieved through a combination of features. While individual lot rainwater storage tanks are preferred (as they can promote the recycling and re-use of rainwater and can be above ground, or below ground), there are space constraints associated with these features and they may not always be able to provide for the types of dwellings/residential allotments anticipated in a Terraced Housing and Apartment Zone. For this reason, communal devices (underground tanks) and raingardens/planter boxes may be appropriate. Other features such as permeable paving also form part of the options available to achieve hydrological mitigation. Inert materials should be used for roofing materials, where possible, or treatment is proposed from buildings to remove contaminants.

Town Centre Zone (including car parking areas)

In the Town Centre zone, a range of options is proposed to achieve hydrological mitigation (as applicable in the Stream A catchment only) and water quality treatment. These include, rainwater tanks, and/or communal detention devices (e.g. raingardens/planter boxes). Permeable pavements may be used to for individual house/lot car parking areas.

Rainwater tanks will only be utilised where there is sufficient demand for water reuse and where they can be accommodated onsite (due to space constraints).

Green outfalls/outlets

Naturalised outfalls (or green outlets) into streams are preferred over harder traditional structures, to provide erosion protection at the discharge location and opportunity for treatment through vegetation (including temperature control).

The Town Centre Pond (Pond H) is earmarked for recreational and/or amenity use as part of the town centre activities, and as such has not been identified as being relied on for stormwater treatment function. However, has been identified as being able to provide for onsite detention as needed.

8.5 Subcatchments

Sub catchments will be maintained as close to the existing sub-catchments as possible, refer Table 6. A subcatchment plan is shown below in Figure 18.

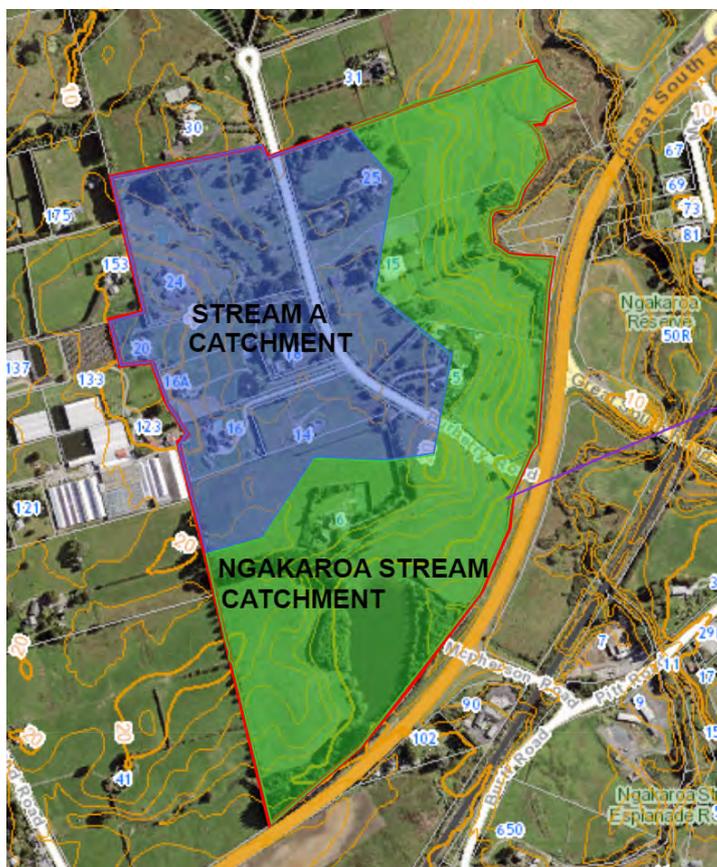


Figure 18 – Indicative Auranga B2 Subcatchments

8.6 Stormwater management requirements by sub-catchments

Table 5 – Options analysis and proposed stormwater management



Suggested table of performance criteria Stormwater Management				
Land use	Requirements	Stream A sub-catchment (north) - Options	Ngākōroa Stream sub-catchment (south) - Options	Auckland Council Guidance Documents
Mixed Housing Urban/Terrace Housing Apartment Buildings	Hydrological Mitigation - Retention and Detention	<ul style="list-style-type: none"> • Above ground rainwater storage/re-use tanks • Rain gardens/planter boxes • Underground storage tanks, structural cells • Permeable pavement and porous concrete • Filter trenches/trench drains • Note: Infiltration for retention is preferred. 	No hydrology mitigation proposed.	TR035 GD04 GD01
	Treatment	<ul style="list-style-type: none"> • Inert materials are preferred, or treatment is proposed from buildings to remove contaminants. 		
	Primary Stormwater Conveyance	<ul style="list-style-type: none"> • Retain and enhance permanent and intermittent streams. • Swales • Pipe network 		GD04 SWCOP GD01
	Secondary Stormwater Conveyance	<ul style="list-style-type: none"> • Retain and enhance permanent and intermittent streams • Swales and open channels • Road corridors 		GD04 SWCOP
Town Centre (Buildings and public space)	Hydrological Mitigation - Retention and Detention	<ul style="list-style-type: none"> • Above ground rainwater storage/re-use tanks • Rain gardens/planter boxes • Underground storage tanks, structural cells • Permeable pavement and porous concrete • Filter trenches/trench drains • Note: Infiltration for retention is preferred. 	<ul style="list-style-type: none"> • No Hydrological mitigation proposed. 	TR035 GD04 GD01
	Treatment	<p>3 train treatment approach</p> <ul style="list-style-type: none"> • Inert materials are preferred, or treatment is proposed from buildings to remove contaminants. • Raingardens • Tree pits • Filter strips/swales • Proprietary treatment devices • Wetlands 		GD01

	Primary Stormwater Conveyance	<ul style="list-style-type: none"> Retain and enhance permanent and intermittent streams. Swales Pipe network 		GD04 SWCOP GD01
	Secondary Stormwater Conveyance	<ul style="list-style-type: none"> Retain and enhance permanent and intermittent streams Swales and open channels Road corridors 		GD04 SWCOP
All roads/car parking / common accessways	Hydrological Mitigation - Retention and Detention	<ul style="list-style-type: none"> Rain gardens Tree pits Filter trenches/trench drains Permeable pavement and porous concrete 	No hydrology mitigation proposed.	TR035 GD04 GD01
	Treatment	<ul style="list-style-type: none"> Raingardens Tree pits Filter strips/swales Proprietary treatment devices Wetlands 		GD01
	Primary Stormwater Conveyance	<ul style="list-style-type: none"> Retain and enhance permanent and intermittent streams. Swales Pipe network 		GD04 SWCOP GD01
	Secondary Stormwater Conveyance	<ul style="list-style-type: none"> Retain and enhance permanent and intermittent streams Swales and open channels Road corridors 		GD04 SWCOP

Key Principals –

1. Working with the existing landform – minimizing and filling that effects infiltration and changes the natural flow paths, as far as practicable.
2. Minimize impervious surfaces and land disturbance thereby retaining the natural infiltration capacity of the soil.
3. Apply exemplar erosion and sediment control measures, (including small site development) to minimis the impact on the downstream receiving environment.
4. Disconnection of impervious surfaces from the receiving environment to encourage infiltration and attenuation prior to discharge to the stormwater system.
5. Avoid Soil compaction or undertake cultivation to include organics and restore damage to maximise permeability
6. Re-vegetation/planting to reduce runoff and erosion and maximise biodiversity
7. Inert materials are preferred, or treatment is proposed from buildings to remove contaminants.
8. Capture and reuse of rainwater for buildings and landscapes – the reuse component diverts stormwater first flush to wastewater (toilet flushing) or to ground for infiltration.
9. Devices to be chosen on a hierarchy of preferences from:
 1. Communal devices
 2. Close to source management
 3. At source management

8.7 Flooding and coastal hazard management

The flood and coastal hazard management proposed to protect new development from future flood and coastal hazards is as described in Table 6.

Table 6 - Flood and coastal management for Auranga B2

Proposed flood and coastal management	
Approach	Management
Avoid the floodplain (including coastal inundation)	<ul style="list-style-type: none"> Define the floodplain as Scenario 5 for the MPD, climate change, 1% AEP rainfall event and MHWS with 1 m sea level rise. Exclude development (housing, some exceptions necessary for infrastructure) from the floodplain. The floodplains will be managed within the stream corridors, with the residential areas outside of the floodplains. It may be necessary to shape the floodplain within the corridors, but the main channel of the streams will not be modified. Apply freeboard of 500 mm to above the flood levels in Scenario 5 for building floor levels, which will accommodate hydrological and hydraulic uncertainties. This will also account for the more extreme event represent by Scenario 6 for the MPD, climate change, 1% AEP flood and the 10% AEP extreme sea level with 1 m sea level rise.
Flood resilience infrastructure	<ul style="list-style-type: none"> Design road crossings to be flood free for Scenario 5. Update the floodplain for any hydraulic changes resulting from infrastructure at the subdivision design stage.
Maintaining the proposed subcatchments as close as possible to the existing subcatchments	<ul style="list-style-type: none"> Maintain the catchment divides for Stream A, and Ngākōroa Stream tributaries, so that more flow does not enter these and increase the floodplains and flood hazard. However, the option to modify the direction of flows discharging from the site with the Ngākōroa catchment should be considered and/or downstream infrastructure may require upgrading
Maintain overland flow paths capacity	<ul style="list-style-type: none"> Maintain or redirect overland flow paths, but provide capacity in these for MPD, climate change, 1% AEP flows. Attenuation required if overland flows maintained to the south, to maintain pre-development flows, through culverts under SH22 and the Railway.
Avoid the Coastal Erosion Hazard Zone (CEHZ)	<ul style="list-style-type: none"> Define the CEHZ Exclude development from the CEHZ.

8.8 Stormwater Conveyance

Primary flows generated by a 10-year ARI storm event will be likely be conveyed by a piped stormwater network to the downstream receiving environment, however the option of alternative conveyance methods should be explored first, such as–

- Soak holes (where practicable, and subject to testing)
- Retain and enhance permanent and intermittent streams
- swales

For events greater than a 10-year ARI rainfall event, the excess flow or secondary flows will be likely primarily conveyed by using road corridors, however alternative methods should be explored first, such as–

retain and enhance permanent and intermittent streams

swales and open channels

overland flow routes.

The downstream receiving environment will also be protected from erosion through the use of naturalised outfalls and vegetated channels to dissipate energy prior to discharge to the receiving environment.

8.9 Stormwater infrastructure

Stormwater infrastructure is proposed to be located in the road corridor to provide easy access for maintenance. Outfall pipes are generally proposed to be 600mm or less in diameter where practical. Naturalised (green) outfalls are to be implemented on a site by site basis as it may not be appropriate for all sites (due to site topography and erosion potential). The subdivision applications will demonstrate the details of the approach to stormwater infrastructure that will subsequently be applied across the PPC area.

8.10 Overland flowpaths

All roads are recommended to be a minimum of 200mm lower than all lot Finished Ground Level. Based on assumed 300mm thick floor slab for buildings, this will meet 500mm freeboard requirement. Therefore, overland flowpaths are proposed to follow the roads. All flow paths are proposed to be located within public areas (roads/parks) and not private properties or where occurring in private properties secured in perpetuity via consent notices at subdivision stage.

8.11 Asset ownership and maintenance requirements

Given our recent experiences with Auckland Council on other projects, it is not considered necessary to determine which devices will be used for the roads and car parks separately (as these are subject to change dependent on AT/Healthy Waters requirements for each stage), and it is more appropriate to enable flexibility of choice to suit circumstances and specific design at development stages.

A toolbox range of options for stormwater management devices is proposed only by this SMP. The specific use of each device and its appropriateness for the development can be managed at individual land use and/or subdivision application stages as solutions are more appropriately tailor made for each development.

Council will have ample opportunity to assess the appropriateness of the toolbox options utilised for each development as well as its design, and any proposals for assets (devices, riparian margins/streams, combined or at source devices etc) to be vested or private and the associated ongoing maintenance obligations.

8.12 Stormwater requirements summary

The requirements for stormwater management that will be adopted for the PPC and subsequent development are equivalent or similar to the AUP SMAF 1 stormwater and the operative flooding provisions. These are summarised below.

Details of the following aspects of the stormwater system will be addressed as part of subdivision design and land use consenting:

- Location of communal devices, or justification of other smaller devices;
- Specific design of proposed stormwater management device(s), including outfall locations and;
- Primary stormwater conveyance network for 10% AEP flows; and
- Overland flowpath layout for 1% AEP flows.

8.13 SMP Implementation

The PPC seeks to apply equivalent or similar rules to the SMAF 1 rules, and treatment of all impervious surfaces. This is considered the most efficient way to manage ongoing stormwater mitigation and water sensitive design requirements, whilst ensuring that there is opportunity to allow for review of device options during implementation.

In the case of the Ngākōroa stream catchment, the necessity for hydrological mitigation is not proposed, due to the proximity to tidal affected areas, water table levels, and discharge to flood prone tidal areas.

Although previous stage of Auranga including specific provisions for stormwater, this was in part due to the ongoing nature of the AUP decision making process. As the AUP is operative in part, its objectives and methods have been tested via planning section 32 assessments and determined to be appropriate outcomes.

Therefore, it is considered reasonable to utilise where possible existing methods to achieve similar outcomes.

The AUP and proposed precinct plan rule framework is set out in Table 7 - Implementation of stormwater management approach Table 7 below.

Table 7 - Implementation of stormwater management approach

Activity	Proposed Management	Design Requirements/ Standards	Reference	Justification
New residential buildings or habitable areas	Avoid new residential buildings or habitable areas in the floodplain	New residential buildings are required to be outside the 1% AEP floodplain (including the effects of climate change over a 100-year timeframe and a 1 m sea level rise).	AUP Chapter E36.4 Activity Table E36.4.1 Activities in the 1% annual exceedance probability (AEP) floodplain and overland flow paths, permitted activity A24 surface parking areas to comply with E36.6.1.7. Activities A34 to A38 relate to new structures or buildings in the floodplain and A42 to new structures or building in an overland flow path. The 'requirements' are recommended to avoid restricted discretionary (RD) status and associated requirements.	As the AUP is operative in part (and the E36 provisions are not subject to any further appeals), its objectives and methods have been tested via planning section 32 assessments and determined to be appropriate outcomes. Therefore, it is considered reasonable to utilise where possible existing methods to achieve outcomes.
New residential buildings or habitable areas	Avoid new residential buildings or habitable areas in the identified coastal inundation area	Habitable areas of buildings must be above the coastal storm inundation levels from the 1% AEP extreme sea level plus 1 m sea level rise.	AUP Chapter E36.4 Activity Table E36.4.1 permitted activities A12, A13, habitable areas to comply with E36.6.1.1.	As the AUP is operative in part (and the E36 provisions are not subject to any further appeals), its objectives and methods have been tested via planning section 32 assessments and determined to be appropriate outcomes. Therefore, it is considered reasonable to utilise where possible existing methods to achieve outcomes.
High use roads (>5,000 vehicles per day (vpd))	Treatment train – 3 minimum combination of: <ul style="list-style-type: none"> • Filter Strips • Vegetated swales; • Raingardens. 	Stormwater runoff to be treated by an approved stormwater quality device sized and	AUP Chapter E9 – Stormwater quality – High contaminant generating car parks and high use roads. Standards E9.6.1.4 (permitted activities) and E9.6.2.2. (controlled activities). New provisions inserted by B2 PPC.	As the AUP is operative in part (and the E9 provisions are not subject to any further appeals), its objectives and methods have been tested via planning section 32 assessments and determined to be appropriate outcomes. Therefore, it is considered reasonable to utilise where possible existing methods to achieve outcomes.

	<ul style="list-style-type: none"> • Tree pits; • Wetlands • Preference for larger centralised devices where possible, instead of many smaller devices. • Green outlets 	<p>designed in accordance with GD01.</p> <p>Hydrological Mitigation for areas discharging to Stream A</p>	<p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p> <p>Development in the Stream A catchment to provide Retention and Detention to B2 Hydrological Mitigation requirements as outlined in 3.2.2.</p>	<p>Where necessary to give effect to this SMP, new provisions are proposed in the B2 PPC.</p> <p>Vegetated swales provide conveyance, natural aesthetics and provide treatment close to the source.</p> <p>Raingardens and tree pits provide at source treatment and/or hydrological mitigation.</p>
<p>High contaminant car park such as for shopping areas (>30 vehicles, refer to full definition in reference material)</p>	<p>Combination of:</p> <ul style="list-style-type: none"> • Vegetated swales; • Tree pits; • Raingardens • Wetlands • Detention tanks (underground) • Dry Basins • Preference for larger centralised devices where possible, instead of many smaller devices. • Green outlets 	<p>Stormwater runoff to be treated by an approved stormwater quality device sized and designed in accordance with GD01.</p> <p>Hydrological Mitigation for areas discharging to Stream A</p>	<p>AUP Chapter E.9 – Stormwater quality – High contaminant generating car parks and high use roads. Standards E9.6.1.3 (permitted activities) and E9.6.2.1 (controlled activities).</p> <p>New provisions inserted by B2 PPC.</p> <p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p> <p>Development in the Stream A catchment to provide Retention and Detention to B2 Hydrological Mitigation requirements as outlined in 3.2.2.</p>	<p>As the AUP is operative in part (and the E9 provisions are not subject to any further appeals), its objectives and methods have been tested via planning section 32 assessments and determined to be appropriate outcomes. Therefore, it is considered reasonable to utilise where possible existing methods to achieve outcomes.</p> <p>Where necessary to give effect to this SMP, new provisions are proposed in the B2 PPC.</p> <p>Vegetated swales provide conveyance, natural aesthetics and provide treatment close to the source.</p> <p>Raingardens and tree pits provide at source treatment and hydrological mitigation - retention.</p> <p>Detention tanks will not provide for full hydrological mitigation requirements – detention only</p>
<p>Other roads and carparks areas that are not high contaminant</p>	<p>Combination of:</p> <ul style="list-style-type: none"> • Vegetated swales; • Tree pits; • Raingardens • Wetlands 	<p>Stormwater runoff to be treated by an approved stormwater quality device</p>	<p>Network discharge consent / New provisions inserted by B2 PPC.</p> <p>Development in the Stream A catchment to provide Retention and Detention to B2</p>	<p>Network discharge consent requires all impervious surfaces to be treated..</p> <p>As the AUP is operative in part (and the E9 provisions are not subject to any further appeals), its objectives and methods have been tested</p>

<p>generating activities e.g. Minor roads Residential, commercial</p>	<ul style="list-style-type: none"> • Pervious pavements (car parks only) • Dry Basins • Swales • Green outlets <p>Combination of quantity mechanism will inherently provide some level of treatment.</p>	<p>sized and designed in accordance with GD01 for impervious surfaces.</p> <p>Hydrological Mitigation for areas discharging to Stream A, however all areas should consider a Water sensitive design approach.</p>	<p>Hydrological Mitigation requirements as outlined in 3.2.2.</p> <p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p>	<p>via planning section 32 assessments and determined to be appropriate outcomes. Therefore, it is considered reasonable to utilise where possible existing methods to achieve outcomes.</p> <p>Where necessary to give effect to this SMP, new provisions are proposed in the B2 PPC</p> <p>The combination of quantity mechanisms will inherently provide some level of treatment.</p>
<p>Residential Lots /THAB Zone</p>	<p>Combination of:</p> <ul style="list-style-type: none"> • Rainwater tanks for roof runoff; • Permeable pavements for accessways and driveways; and/or • Communal devices (rain gardens, detention tanks etc) • Planter Boxes • Inert materials are preferred, or treatment is proposed from 	<p>Hydrological Mitigation for areas discharging to stream A.</p>	<p>Development in the Stream A catchment to provide Retention and Detention to B2 Hydrological Mitigation requirements as outlined in 3.2.2.</p> <p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p>	<p>Where necessary to give effect to this SMP, new provisions are proposed in the B2 PPC</p> <p>Rain tanks for roof can also provide for re-use for potable water, however are subject to space restrictions and may not be feasible for apartment style buildings.,</p> <p>Permeable paving for driveways and accessways.</p> <p>Raingardens, applicable but subject to space/geotechnical constraints within the lots (site specific consideration).</p> <p>Proprietary Stormwater treatment devices</p> <p>Swales</p>

	<p>buildings to remove contaminants.</p> <ul style="list-style-type: none"> • Green outlets 			<p>Communal retention/ detention device located in rear service lanes (in applicable lots) due to space constrains within lots where hydrological mitigation not achieved by other devices.</p> <p>Inert materials are preferred, or treatment is proposed from buildings to remove contaminants.</p>
Town Centre Zone activities	<p>Combination of:</p> <ul style="list-style-type: none"> • Rainwater tanks for roof runoff (subject to demand/space); • Permeable pavements • Planter Boxes • Tree pits • Raingardens • Communal devices located within common land (rain gardens, detention tanks etc • Inert materials are preferred, or treatment is proposed from buildings to remove contaminants. • Green outlets 	<p>Stormwater runoff to be treated by an approved stormwater quality device sized and designed in accordance with GD01.</p> <p>Hydrological Mitigation for areas within Steam A.</p>	<p>Treatment to accord with GD01</p> <p>Development in the Stream A catchment to provide Retention and Detention to B2 Hydrological Mitigation requirements as outlined in 3.2.2.</p> <p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p>	<p>Where necessary to give effect to this SMP, new provisions are proposed in the B2 PPC</p> <p>Rain tanks for roof can also provide for re-use for potable water, however are subject to space restrictions and may not be feasible for town centre activities.</p> <p>Permeable paving for public areas (footpaths/plazas etc).</p> <p>Communal retention/ detention devices more likely (raingardens, swales, tree pits etc).</p> <p>Inert materials are preferred, or treatment is proposed from buildings to remove contaminants.</p>
Open spaces and riparian margins	<ul style="list-style-type: none"> • Naturalised outfalls to stream • 10m Riparian buffer planting 	<p>Hydrological Mitigation (for impervious surfaces) for areas</p>	<p>Development in the Stream A catchment to provide Retention and Detention to B2 Hydrological Mitigation requirements as outlined in 3.2.2.</p>	<p>Naturalised outfalls provide erosion protection at the discharge location, and provide ecological value through vegetation.</p> <p>Where impermeable surfaces occur for public use tracks, playgrounds, open space activities etc the hydrological mitigation requirements will</p>

	<ul style="list-style-type: none"> • Communal devices • Permeable paving for tracks; • Swales, • filter strips • Gross Pollutant Traps • Green outlets 	<p>discharging to Stream A. Protect streams and ecological functions/values</p> <p>Protect Terrestrial SEA</p>	<p>Development in the Ngākōroa Stream Catchment does not need to provide for hydrological mitigation.</p>	<p>apply. This recognises that not all activities will be able to utilise permeable pavements.</p>
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8.14 Consenting Detail Requirements/Implementation

To accord with the E10 provisions each development stage will be required to identify the device choice, location and sizing. It is expected that each development will include specific comment on how it implements this SMP and has taken into account the requirements above (as this is required for consents to prove that they meet the requirements of the Region-Wide Stormwater NDC).

Furthermore, any development in the Precinct triggering a restricted discretionary activity, discretionary activity, or non-complying activity resource consent is required to provide an assessment against the Precinct objectives and policies which include specific objectives and policies relating to stormwater management .

It is recognised that there are specific opportunities and or site constraints which may require departures or additional information to be provided. These include:

- For development in the Stream A catchment, site specific infiltration testing may accompany resource consent applications and exceptions to the E10 provisions in relation to retention may be granted where soil infiltration rates preclude disposal to groundwater and rainwater reuse is not possible.
- Development in the Ngākōroa Stream Catchment may also benefit from seeking specific approval (which may be dependent on the final solution for direction of flows) to have the catchment treated in a similar method to a “coastal catchment” where no hydrological mitigation is required.

9.0 DEPARTURES FROM REGULATORY OR DESIGN CODES

There are no departures proposed as part of this SMP.

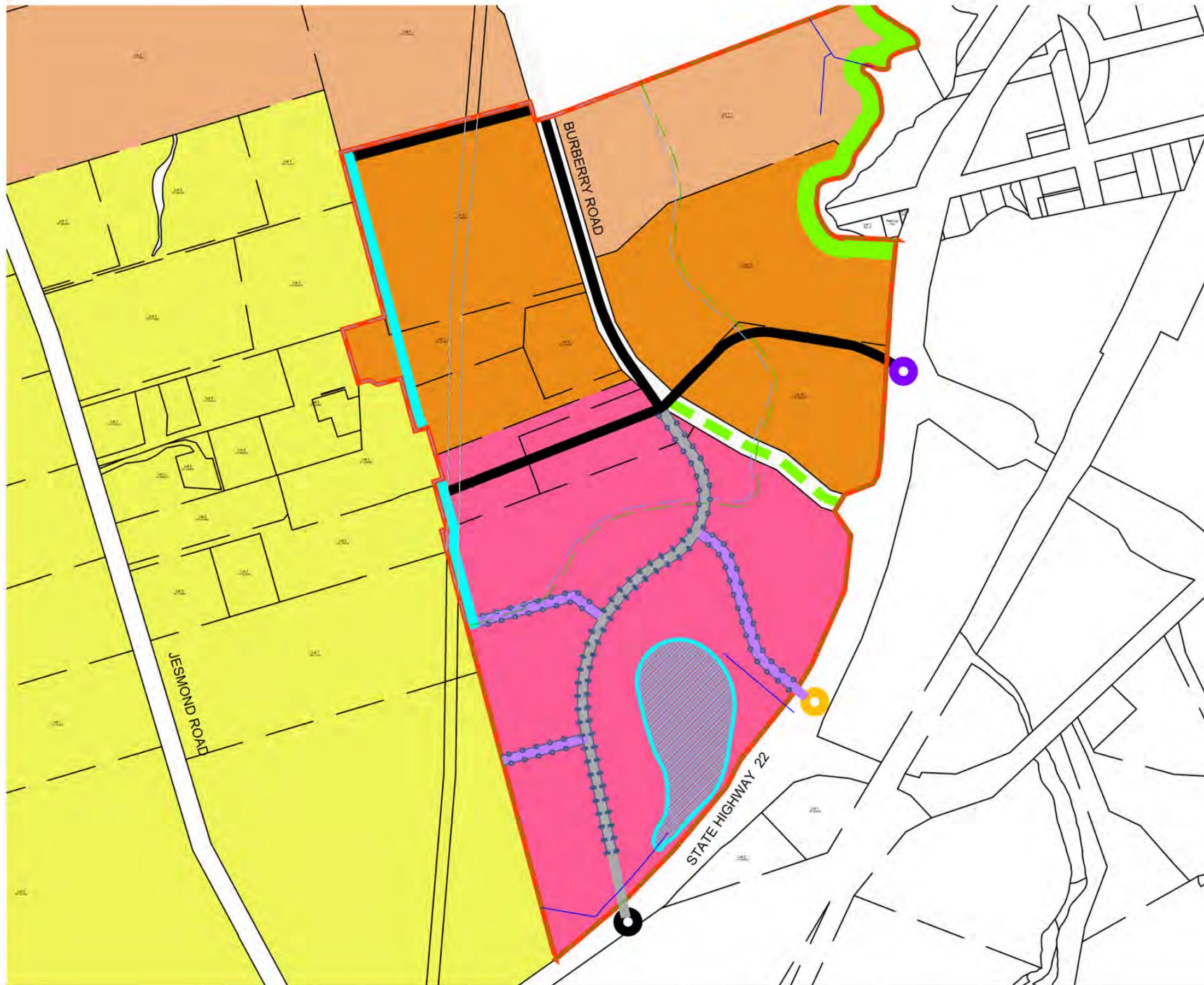
10.0 CONCLUSION & RECOMMENDATIONS

This Stormwater Management Plan (SMP) has been prepared to support an application for the Private Plan Change (PPC) made by Karaka and Drury Ltd. The SMP will support the PPC and future discharge and network discharge consents (NDC), through demonstrating the proposed stormwater management is the best practicable option, taking into consideration the existing site features the stormwater management meets the requirements, objectives and outcomes of the NDC, together with the Code of Practice, GD01 and GD04.

The SMP is supported by a flood hazard assessment, which was carried out using a 2D model with 2013 LiDAR coupled with a 1D component to represent Hingaia Road Bridge. The outcomes are flood hazard maps and proposed approaches for flood and coastal management for Auranga B2 (which align with previous approaches utilised for Auranga A and B1).

The development follows a water sensitive design approach (as required in the AUP), with a toolbox of options to provide the necessary treatment, hydrological mitigation and conveyance requirements. The proposed stormwater management plan is summarised in Section 8.0.

APPENDIX A – REPORT FIGURES



LEGEND

- COLLECTOR ROAD WITH SEPARATED ACTIVE TRANSPORT PROVISION
- LOCAL ROAD WITH SEPARATED ACTIVE TRANSPORT PROVISION
- TOWN CENTRE LOCAL ROAD
- MAINSTREET COLLECTOR ROAD WITH SEPARATED ACTIVE TRANSPORT PROVISION
- DRURY 2 PRECINCT BOUNDARY
- SIGNALISED INTERSECTION
- POSSIBLE FUTURE SIGNALISED INTERSECTION
- LEFT IN AND OUT INTERSECTION
- INDICATIVE OPEN SPACE / ESPLANADE RESERVE AND ACTIVE TRANSPORT NETWORK
- FUTURE ROAD STOPPING
- EXISTING WATER FEATURE
- INDICATIVE SUB-CATCHMENTS
- STREAM A
- NGAKOROA
- CONTROLS: BUILDING FRONTAGE CONTROL - KEY RETAIL FRONTAGE
- CONTROLS: BUILDING FRONTAGE CONTROL - GENERAL COMMERCIAL FRONTAGE
- FIRST GAS EASEMENT
- INDICATIVE INTERMITTENT OR PERMANENT STREAM

M	UPDATED GCF	JDK	12/08/21	ORIGINATOR:	DATE:	SIGNED:	PLOT BY:
L	UPDATE RD ALIGNMENTS	JDK	11/08/21	JDK	28/02/19		
K	UPDATE GCF	JDK	11/08/21	DRAWN:	DATE:	SIGNED:	PLOT DATE:
J	TEXT UPDATES	JDK	09/08/21	JDK	28/02/19		
I	STREAMS ADDED	JDK	05/08/21	CHECKED:	DATE:	SIGNED:	SURVEY BY:
H	UPDATED ROADS	JDK	04/08/21				
G	GIS CONTOURS ADDED	NC	23/06/20	APPROVED:	DATE:	SIGNED:	SURVEY DATE:
REV	DESCRIPTION	BY	DATE				

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PROJECT:
**PLAN CHANGE B2
BREMNER ROAD
DRURY**

TITLE:
PRECINCT PLAN



ISSUE STATUS: FOR INFORMATION ONLY		
PROJECT NO: 1823-PC2B	SCALES: 1:2,000 @ A1 1:4,000 @ A3	A1
DRAWING NO: 003		REV: M

APPENDIX B – TOOLBOX FOR WSD

Replicated from Table 13 of the P:

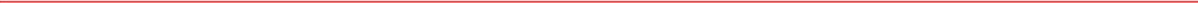


Table 13: Water Sensitive Design Toolbox

Key Principles

- Working with the existing landform - minimising cutting and filling that effects infiltration and changes the natural flowpaths, as far as practicable.
- Minimise impervious surfaces and land disturbance thereby retaining the natural infiltration capacity of the soil
- Apply exemplar erosion and sediment control measures (including small site development) to minimise the impact on the downstream receiving environment
- Disconnection of impervious surfaces from the receiving environment to encourage infiltration and attenuation prior to discharge to the stormwater system
- Utilise soakage into basaltic soils – directly via pervious surfaces or using soakage devices coupled with stormwater treatment.
- Utilise soakage into peat soils
- Utilise soakage in high use aquifer managements areas and high use stream management areas.
- Avoid soil compaction or undertake cultivation to include organics and restore damage to maximise permeability
- Re-vegetation/planting to reduce runoff and erosion and maximise biodiversity
- Use inert building materials
- Capture and reuse of rainwater for buildings and landscapes – the reuse component diverts stormwater first flush to wastewater (toilet flushing) or to ground for infiltration.

Land Use	Requirements	Options	Auckland Council Guidance Documents (refer Section 4.6 above)
Residential	Hydrological Mitigation – Retention and Detention	Above ground rainwater storage/re-use tanks	TR035 GD04
		Rain gardens/planter boxes	GD01
		Underground storage tanks, structural cells Permeable pavement and porous concrete Filter trenches/trench drains Note: Infiltration for retention is preferred.	
	Primary Stormwater Conveyance	In order of preference: Soakholes (where practicable, and subject to testing) Retain and enhance permanent and intermittent streams Swales Pipe network	GD04 SW CoP GD01
	Secondary Stormwater Conveyance	In order of preference: Retain and enhance permanent and intermittent streams Swales and open channels Road corridors	GD04 SW CoP

Key Principles

	Flood Risk Attenuation (where required)	'At source' storage, e.g. underground storage Wetlands. 'Dry' basins with multi-purpose functionality	GD04 SW CoP GD01
All roads/ carparking	Hydrological Mitigation - Retention and Detention	Rain gardens	TR035
		Tree pits	GD04
	Stormwater Treatment	Filter trenches/trench drains	GD01
		Permeable pavement and porous concrete	
		Note: Infiltration for retention is preferred.	
		Rain gardens	GD01
Primary Stormwater Conveyance	Tree pits		
	Filter strips/swales		
	Wetlands		
Secondary Stormwater Conveyance	In order of preference:	GD04	
	Soakholes (where practicable, and subject to testing)	SW CoP	
	Retain and enhance permanent and intermittent streams	GD01	
	Swales		
Flood Risk Attenuation (where required)	Pipe network		
	In order of preference:	GD04	
	Retain and enhance permanent and intermittent streams	SW CoP	
Business	Hydrological Mitigation - Retention and Detention	Swales and open channels	
		Road corridors	
		'At source' storage, e.g. underground storage	GD04 SW CoP GD01
Business	Hydrological Mitigation - Retention and Detention	Wetlands	
		'Dry' basins with multi-purpose functionality	
		Above ground rainwater storage tanks	TR035
		Rain gardens/planter boxes	GD04
		Underground storage tanks, structural	GD01

Key Principles

		<p>cells</p> <p>Permeable pavement and porous concrete</p> <p>Filter trenches/trench drains</p> <p>Detention basins</p> <p>Note:</p> <p>Infiltration for retention is preferred. Where retention is not achieved then treatment of impervious surfaces is required prior to discharge</p>	
Stormwater Treatment		<p>Rain gardens</p> <p>Tree pits</p> <p>Filter strips/swales</p> <p>Proprietary treatment devices</p> <p>Wetlands</p> <p>Contaminant specific treatment devices are required for industrial or trade activities</p>	GD01
Primary Stormwater Conveyance		<p>In order of preference:</p> <p>Soakholes (where practicable, and subject to testing)</p> <p>Retain and enhance permanent and intermittent streams</p> <p>Swales</p> <p>Pipe network</p>	<p>GD04</p> <p>SW CoP</p> <p>GD01</p>
Secondary Stormwater Conveyance		<p>In order of preference:</p> <p>Retain and enhance permanent and intermittent streams</p> <p>Swales and open channels</p> <p>Road corridors</p>	<p>GD04</p> <p>SW CoP</p>
Flood Risk Attenuation (where required)		<p>'At source' storage, e.g. underground storage</p> <p>Wetlands</p> <p>'Dry' basins with multi-purpose functionality</p>	<p>GD04</p> <p>SW CoP</p> <p>GD01</p>
Special Purpose	Hydrological Mitigation - Retention and Detention	To be confirmed	

APPENDIX C – LANDER PERCOLOATION TEST



Lander Geotechnical Consultants Limited
Level 3, 3 Osterley Way, P O Box 97 385,
Manukau, Auckland 2241
Phone: (09) 262 1528
www.landergeotechnical.co.nz

Memorandum

To	Mark Tollemache	From	Shane Lander
Email	marktollemache@ihug.co.nz	Date	20 April 2017
Company	Karaka & Drury Limited	Reference	J00557
cc		Pages	1 of 1, plus attachments
Subject	Auranga B1 – Percolation Test Results		

Lander Geotechnical have been engaged to undertake 4 percolation boreholes and conduct falling head percolation tests, in accordance with Auckland Council's guidelines. The tests were undertaken within 100mm diameter boreholes drilled in positions indicated on the attached site plan. They were positioned near existing site investigation boreholes from the Auranga B1 Preliminary Geotechnical Appraisal Report (Ref J00557 dated 17 February 2017), and accordingly for ease of reference are numbered the same as those adjacent boreholes.

Pre-soaking was undertaken the day prior to testing. The depth of each borehole drilled was a function of the position of the standing groundwater table at the time of pre-drilling.

Full results and associated plots are appended for your interpretation, use and distribution.

For and on behalf of Lander Geotechnical Consultants Limited

S G Lander

Principal Geotechnical Engineer

Encl.

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page:	1 of 2

Hole No: HA2017-02	Diamete	0.1	(m)
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Location: BREMNER ROAD	Depth:	1.96	(m)
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Weather conditions preceding test:	Dry
------------------------------------	-----

Details of presoaking:	17 Hrs
------------------------	--------

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
8:25	-	0.25	1.71	0
8:30	5	0.30	1.66	5
8:35	5	0.35	1.61	10
8:40	5	0.39	1.57	15
8:45	5	0.41	1.55	20
8:50	5	0.42	1.54	25
8:55	5	0.44	1.52	30
9:00	5	0.46	1.50	35
9:15	15	0.49	1.47	50
9:30	15	0.51	1.45	65
9:45	15	0.53	1.43	80
10:00	15	0.54	1.42	95
10:15	15	0.55	1.41	110
10:30	15	0.55	1.41	125
10:45	15	0.55	1.41	140
10:45	0	0.25	1.71	140
11:03	18	0.40	1.56	158
11:15	12	0.45	1.51	170
11:30	15	0.48	1.48	185
11:45	15	0.50	1.46	200
12:00	15	0.52	1.44	215
12:15	15	0.53	1.43	230
12:25	10	0.54	1.42	240

Test	HA2017-02
Gradient	0.0007 m/min
Percolation	0.01 L/m ² /min



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 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

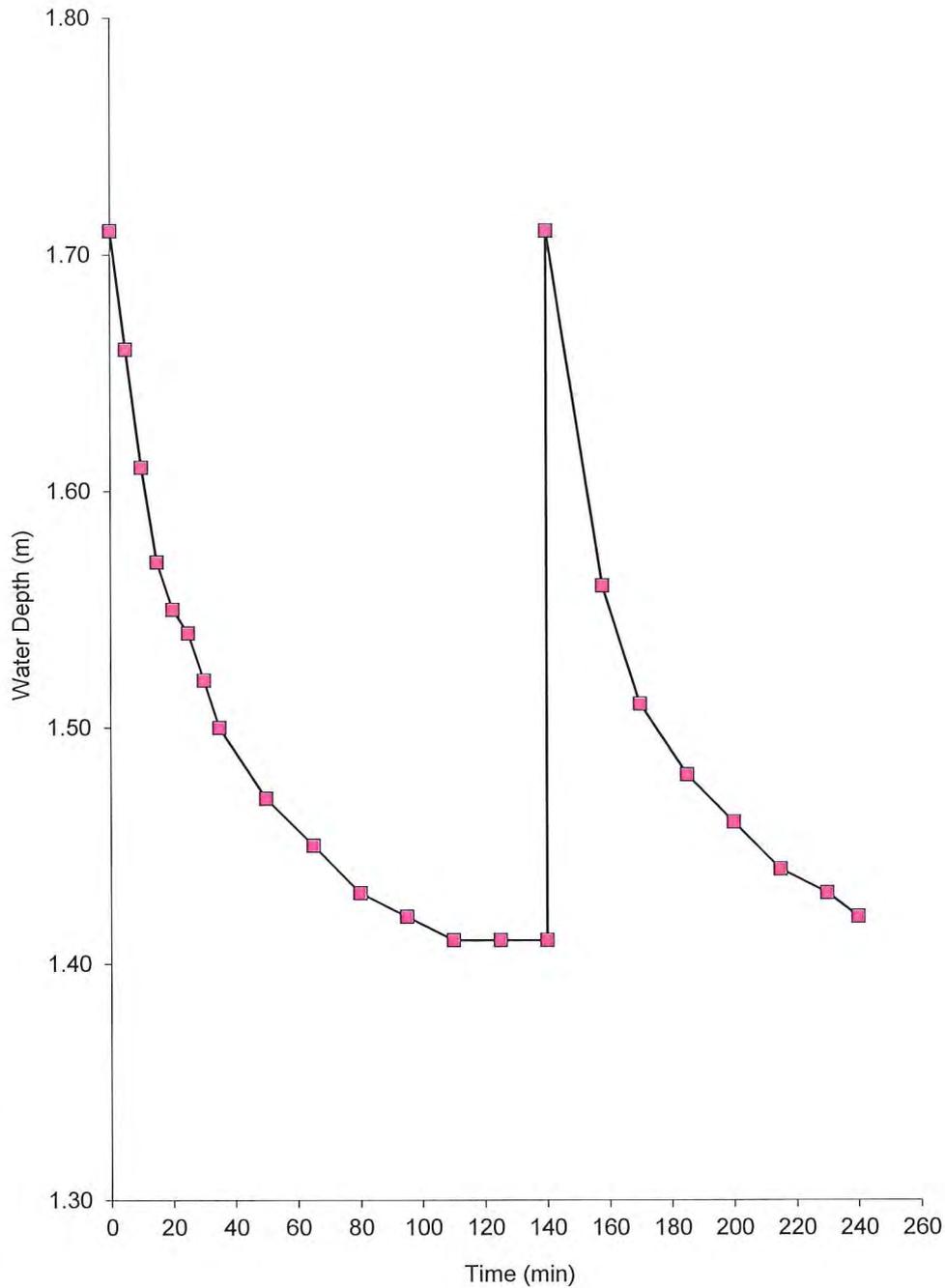
Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client: KARAKA & DRURY LIMITED	Job No: J00557
Location: AURANGA B1, DRURY	Date: 11.04.17
0	Page: 2 of 2
Hole No: HA2017-02	Diameter: 0.1 (m)
Location: BREMNER ROAD	Depth: 2.0 (m)

Water Depth vs Time



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 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page	1 of 2

Hole No:	HA2017-05	Diamete	0.1 (m)
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Location:	BREMNER ROAD	Depth:	0.97 (m)
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Weather conditions preceding test:	Dry
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Details of presoaking:	17 Hrs
------------------------	--------

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
13:00	-	0.250	0.72	0
13:05	5	0.260	0.71	5
13:10	5	0.270	0.70	10
13:15	5	0.280	0.69	15
13:20	5	0.290	0.68	20
13:25	5	0.295	0.68	25
13:30	5	0.300	0.67	30
13:45	15	0.320	0.65	45
14:00	15	0.335	0.64	60
14:15	15	0.355	0.62	75
14:30	15	0.375	0.60	90
14:45	15	0.395	0.58	105
15:00	15	0.400	0.57	120
15:17	17	0.410	0.56	137
15:30	13	0.420	0.55	150
15:47	17	0.430	0.54	167
16:00	13	0.435	0.54	180
16:15	15	0.445	0.53	195
16:30	15	0.450	0.52	210
16:45	15	0.455	0.52	225
17:00	15	0.460	0.51	240

Test	HA2017-05
Gradient	0.0003 m/min
Percolation	0.02 L/m ² /min



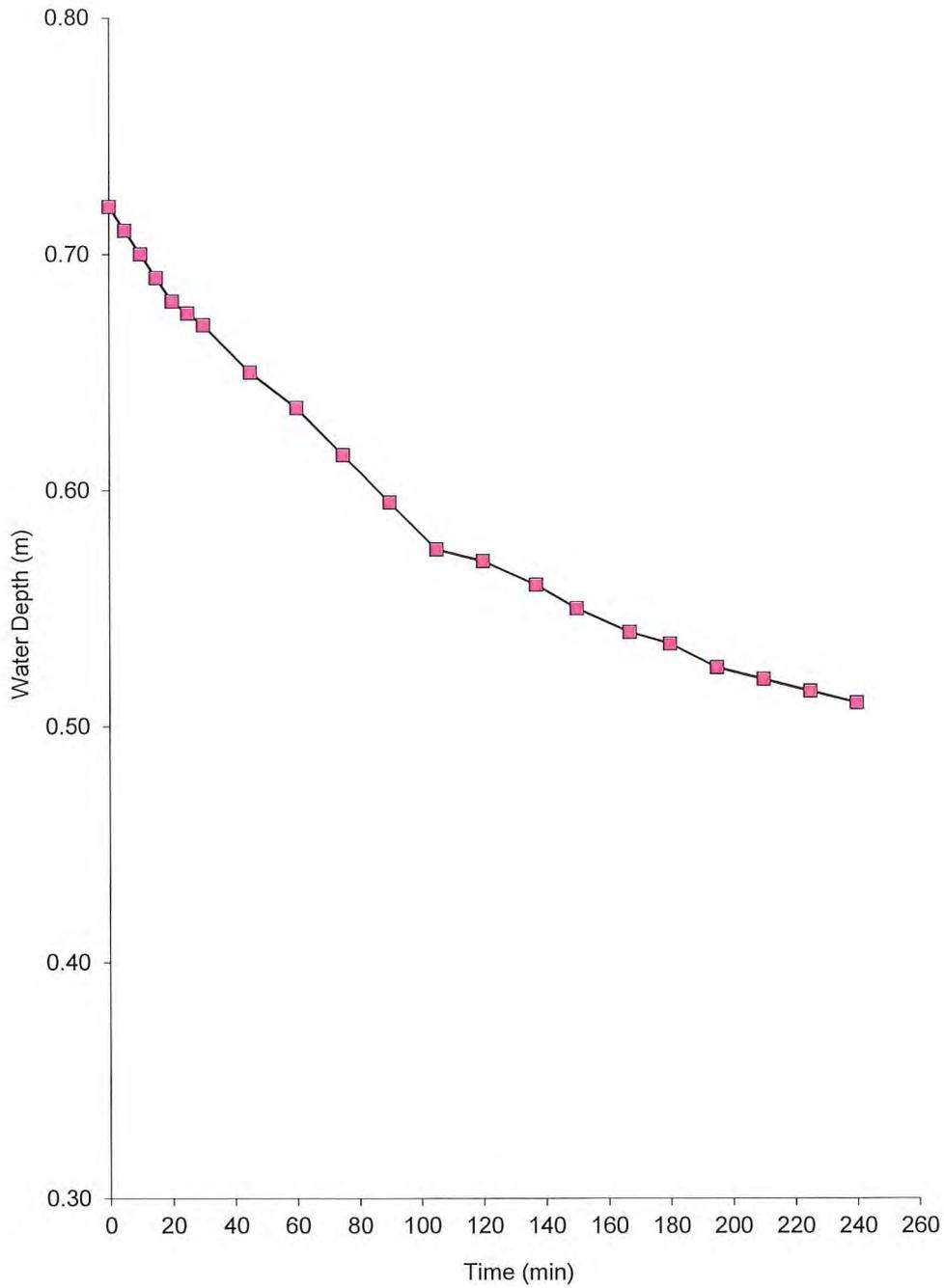
Lander Geotechnical Consultants Limited
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Phone: 027 488 6882
Email: shane@landergeotechnical.co.nz

Operator: JL
Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
	0	Page:	2 of 2
Hole No:	HA2017-05	Diameter:	0.1 (m)
Location:	BREMNER ROAD	Depth:	1.0 (m)

Water Depth vs Time



Lander Geotechnical Consultants Limited
P O Box 97 385, Manukau, Auckland 2241
Phone: 027 488 6882
Email: shane@landergeotechnical.co.nz

Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client: KARAKA & DRURY LIMITED	Job No: J00557
Location: AURANGA B1, DRURY	Date: 11.04.17
	Page: 1 of 2

Hole No: HA2017-08	Diamete: 0.1 (m)
Location: JESMOND ROAD	Depth: 2.3 (m)

Weather conditions preceding test: Dry

Details of presoaking: 17 Hrs

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
8:45	-	0.10	2.20	0
8:46	1	0.15	2.15	1
8:48	2	0.20	2.10	3
8:53	5	0.30	2.00	8
9:00	7	0.40	1.90	15
9:15	15	0.57	1.73	30
9:45	30	0.79	1.51	60
10:15	30	1.00	1.30	90
10:45	30	1.20	1.10	120
11:15	30	1.40	0.90	150
11:45	30	1.50	0.80	180
12:15	30	1.60	0.70	210
12:45	30	1.70	0.60	240

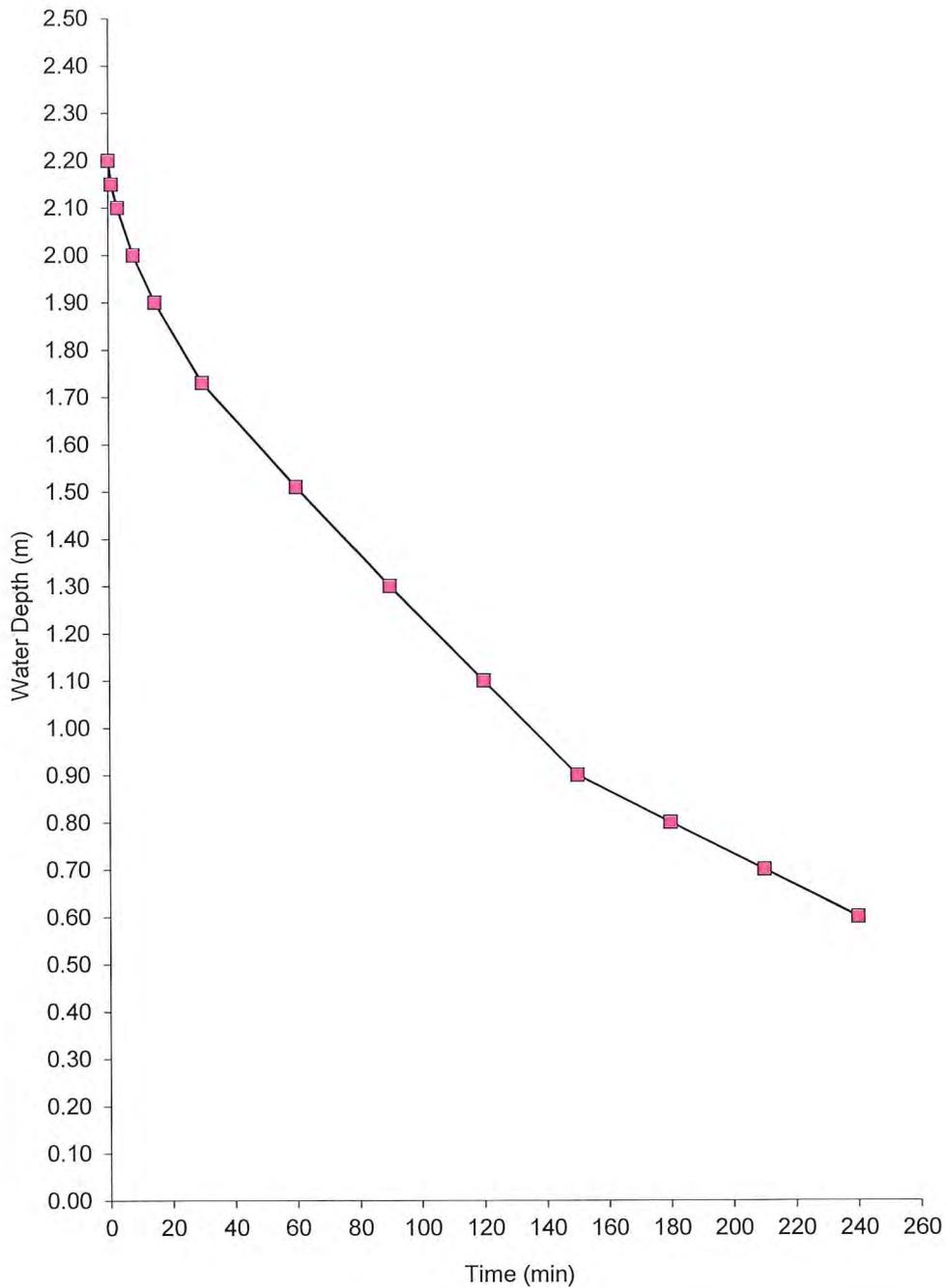
Test	HA2017-08
Gradient	0.0033 m/min
Percolation	0.13 L/m ² /min

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STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY 0	Date:	11.04.17
Hole No:	HA2017-08	Diameter:	0.1 (m)
Location:	JESMOND ROAD	Depth:	2.3 (m)

Water Depth vs Time



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Phone: 027 488 6882
Email: shane@landergeotechnical.co.nz

Operator: AB

Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page:	1 of 2
Hole No:	HA2017-11	Diamete	0.1 (m)
Location:	BURBERRY ROAD	Depth:	2.1 (m)
Weather conditions preceding test:		Dry	
Details of presoaking:		17 Hrs	

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
12:58	-	0.10	2.00	0
12:59	1	0.27	1.83	1
13:01	2	0.44	1.66	3
13:06	5	0.70	1.40	8
13:13	7	0.95	1.15	15
13:28	15	1.22	0.88	30
13:58	30	1.50	0.60	60
14:28	30	1.60	0.50	90
14:58	30	1.65	0.45	120
15:28	30	1.70	0.40	150
15:58	30	1.76	0.34	180
15:58	0	0.10	2.00	180
15:59	1	0.27	1.83	181
16:01	2	0.42	1.68	183
16:06	5	0.69	1.41	188
16:13	7	0.95	1.15	195
16:28	15	1.20	0.90	210
16:56	28	1.49	0.61	238

Test HA2017-11

Gradient 0.0017 m/min

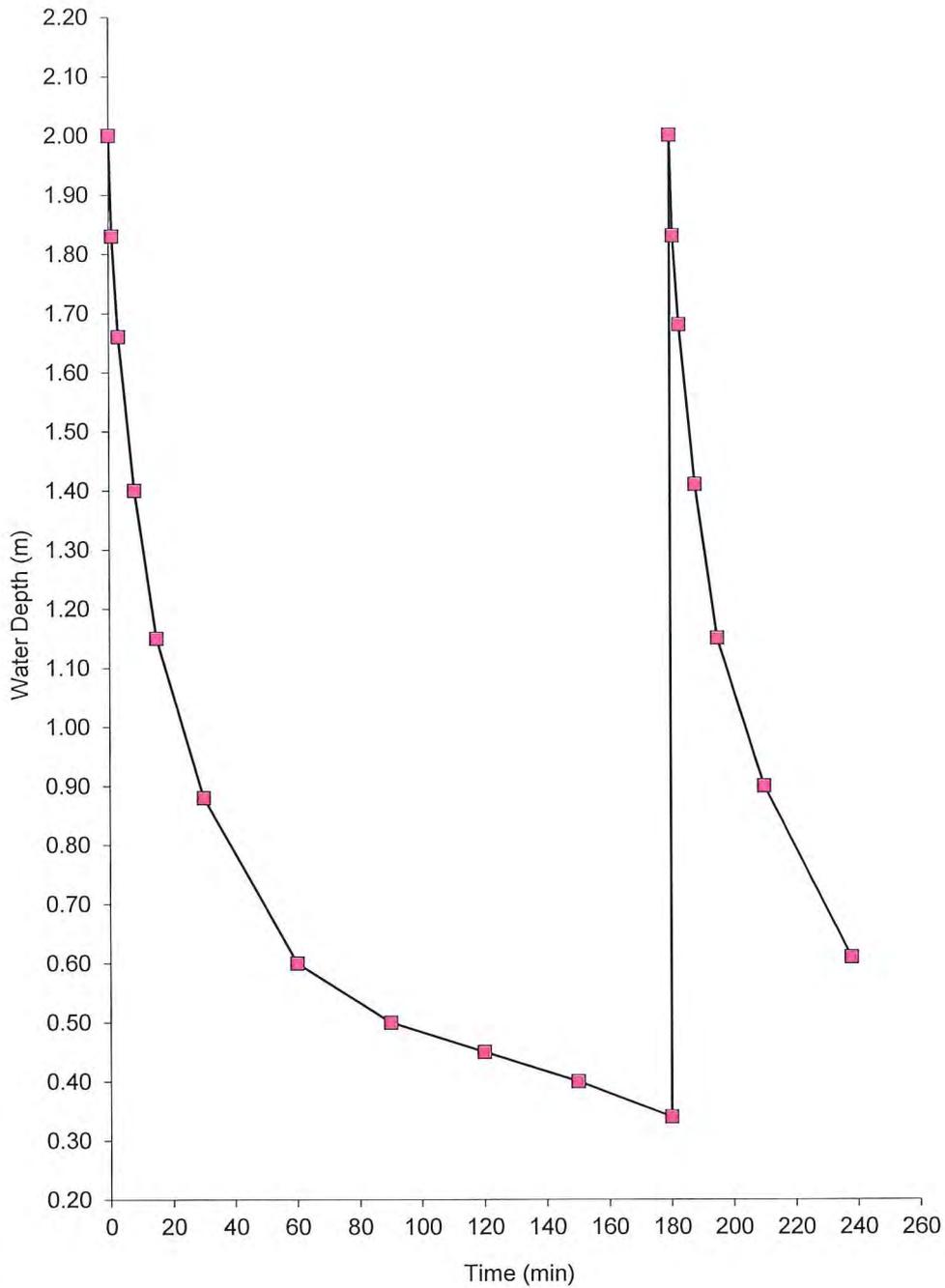
Percolation 0.09 L/m²/min

 <p>LANDER geotechnical</p>	<p>Lander Geotechnical Consultants Limited P O Box 97 385, Manukau, Auckland 2241 Phone: 027 488 6882 Email: shane@landergeotechnical.co.nz</p>	<p>Operator: AB</p> <p>Checked: JL</p>
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STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
	0	Page:	2 of 2
Hole No:	HA2017-11	Diameter:	0.1 (m)
Location:	BURBERRY ROAD	Depth:	2.1 (m)

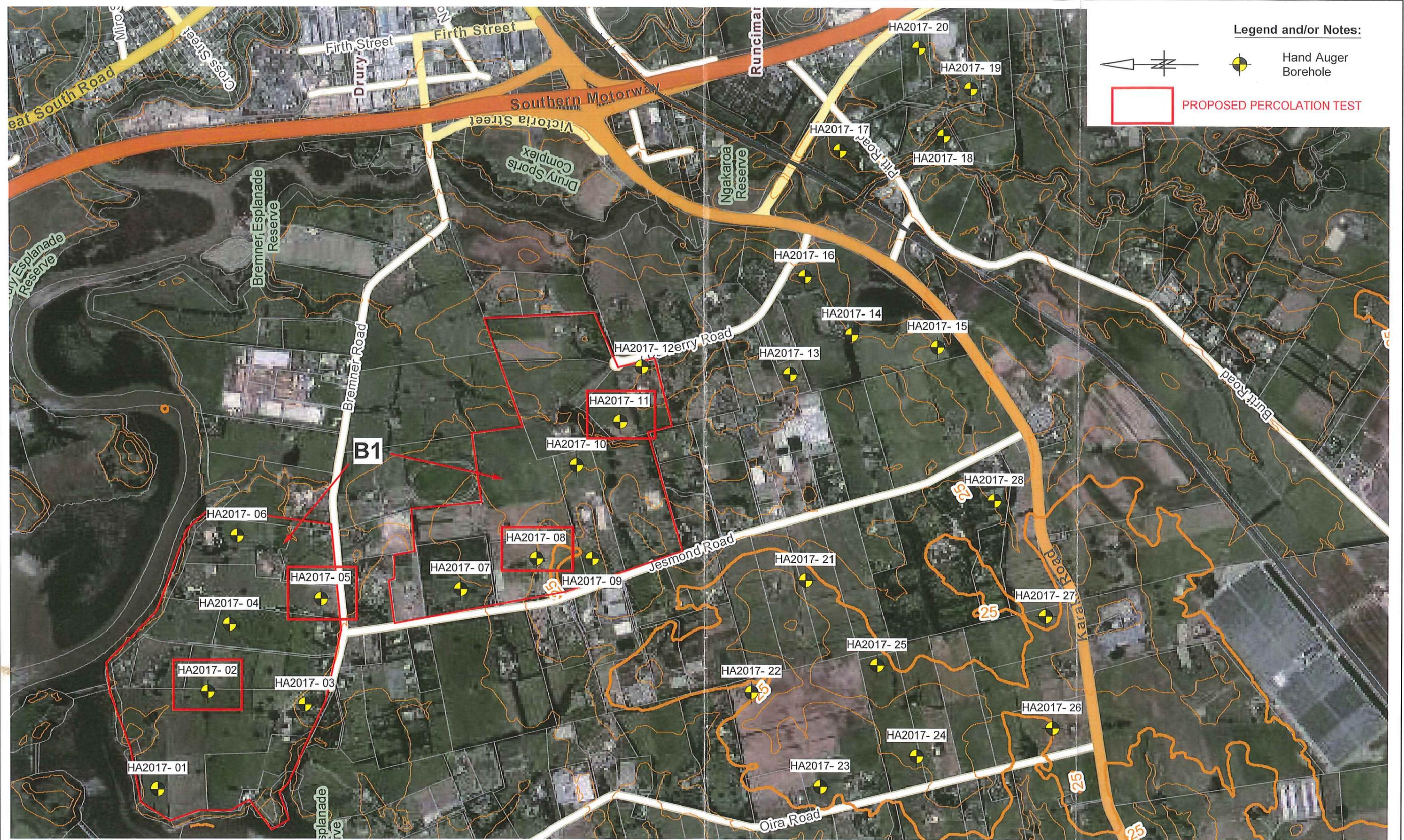
Water Depth vs Time



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Operator: AB

Checked: JL



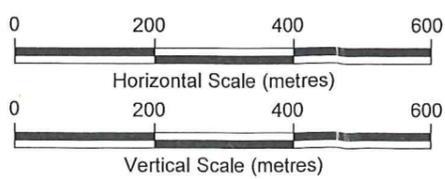
Legend and/or Notes:

- North
- Hand Auger Borehole
- PROPOSED PERCOLATION TEST

BASE PLAN SOURCE: AUCKLAND COUNCIL GIS DATABASE, DATED:16/02/17

revision	description	drawn	approved	date

drawn	TT		client:	KARAKA AND DRURY LIMITED
approved	SL		project:	AURANGA B1, DRURY
date	16/02/17		title:	SITE PLAN
scale	1:10000		project no:	J 00557
original size	A3		figure no:	01



Template revision: 1:1000 (10/12/14)

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY CONSULTANT LTD	Job No:	J00137
Location:	BREMNER ROAD FIRST STAGE QD	Date:	20.11.15
		Page	1 of 2

Hole No:	P1	Diamete	0.1 (m)
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Location:	Refer to Site Plan	Depth:	1.19 (m)
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Weather conditions preceding test:	Dry
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Details of presoaking:	Presoaked on 18.11.15
------------------------	-----------------------

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
09:29	-	0.065	1.125	0
09:30	1	0.165	1.025	1
09:32	2	0.210	0.980	3
09:35	3	0.285	0.905	6
09:39	4	0.350	0.840	10
09:45	6	0.416	0.774	16
10:22	37	0.711	0.479	53
10:52	30	0.855	0.335	83
11:22	30	0.939	0.251	113
11:25	3	0.212	0.978	116
11:55	30	0.535	0.655	146
12:25	30	0.725	0.465	176
12:55	30	0.831	0.359	206
13:25	30	0.923	0.267	236
13:32	7	0.160	1.030	243
13:33	1	0.183	1.007	244
13:34	1	0.201	0.989	245
13:37	3	0.242	0.948	248
13:41	4	0.290	0.900	252
13:47	6	0.354	0.836	258
14:29	42	0.645	0.545	300
14:36	7	0.125	1.065	307
14:37	1	0.145	1.045	308
14:38	1	0.161	1.029	309
14:41	3	0.195	0.995	312
14:45	4	0.232	0.958	316
14:51	6	0.301	0.889	322

Test P1
 Gradient 0.0028 m/min
 Percolation 0.24 L/m²/min



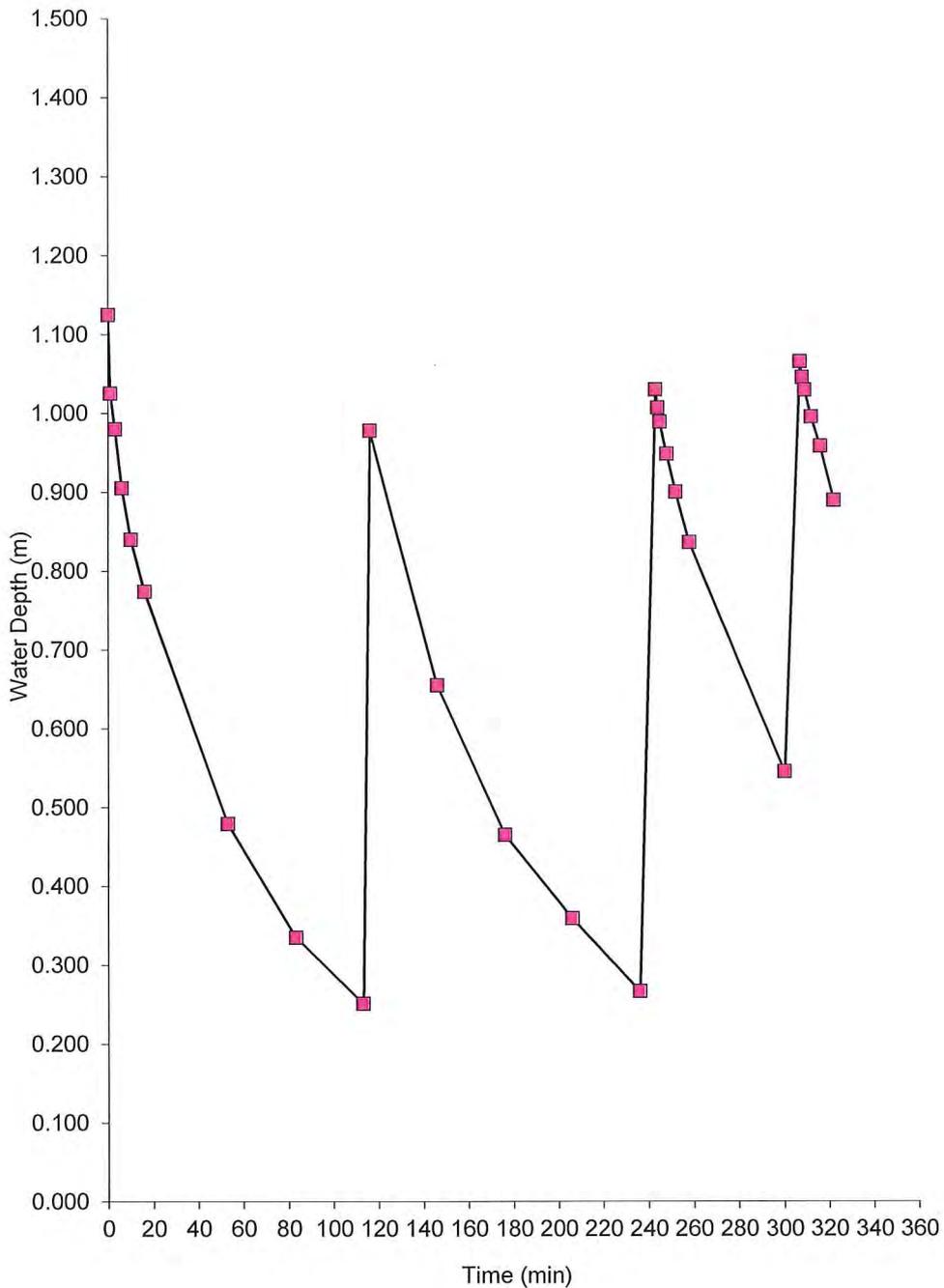
Lander Geotechnical Consultants Limited
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 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

Operator: AB/MVC
 Checked: *AB*

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY CONSULTANT LTD	Job No:	J00137
Location:	BREMNER ROAD FIRST STAGE QD	Date:	20.11.15
	0	Page	2 of 2
Hole No:	P1	Diameter:	0.1 (m)
Location:	Refer to Site Plan	Depth:	1.19 (m)

Water Depth vs Time



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 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

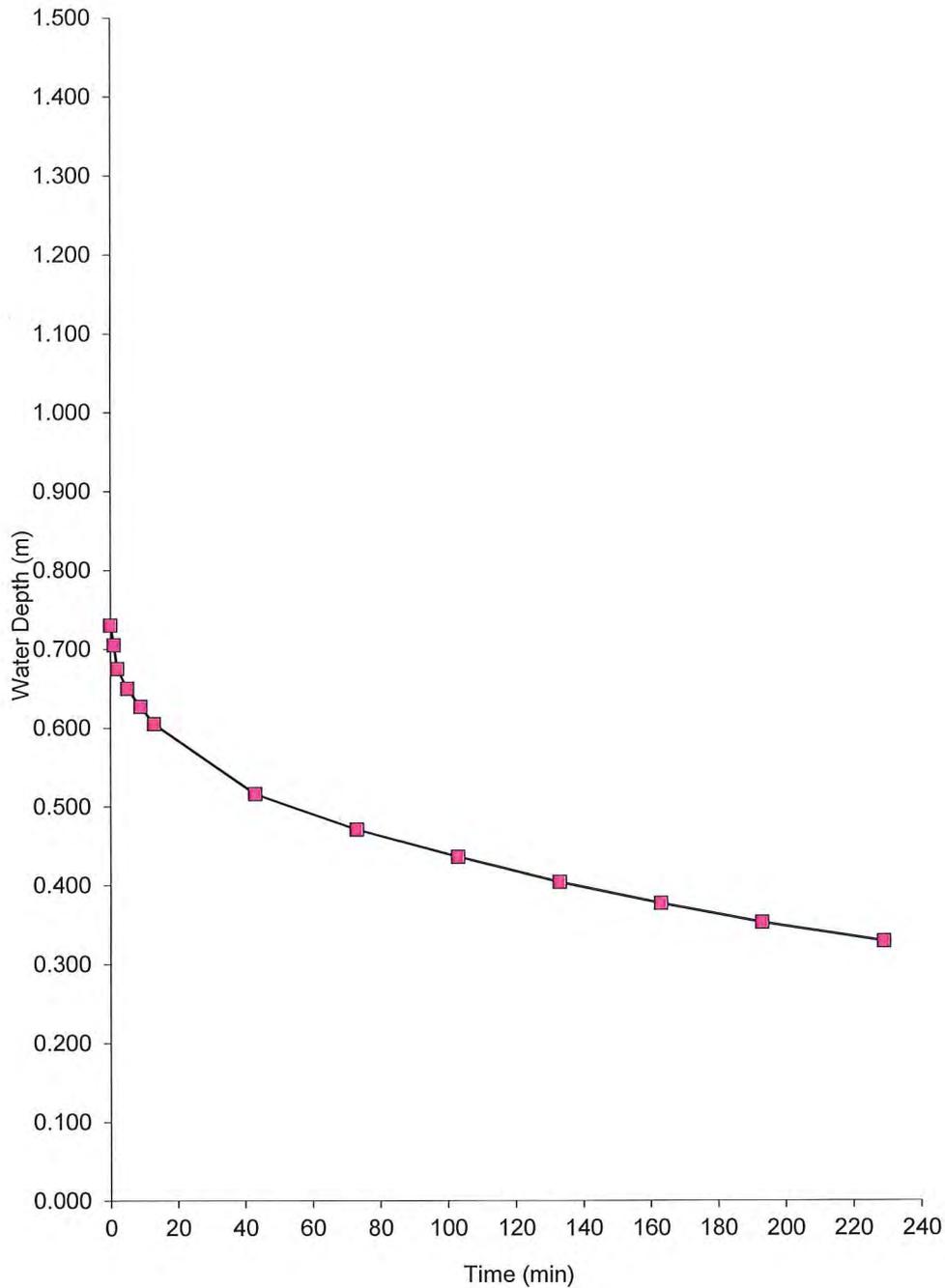
Operator: AB/MVC

Checked: AB

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY CONSULTANT LTD	Job No:	J00137
Location:	BREMNER ROAD FIRST STAGE QD	Date:	20.11.15
	0	Page:	2 of 2
Hole No:	P2	Diameter:	0.1 (m)
Location:	Refer to Site Plan	Depth:	0.75 (m)

Water Depth vs Time



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Operator: AB/MVC

Checked: AB

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY CONSULTANT LTD	Job No:	J00137
Location:	BREMNER ROAD FIRST STAGE QD	Date:	20.11.15
		Page:	1 of 2

Hole No:	P3	Diameter:	0.1 (m)
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Location:	Refer to Site Plan	Depth:	1.05 (m)
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Weather conditions preceding test: Dry

Details of presoaking: Presoaked on 18.11.15

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
10:24	-	0.025	1.025	0
10:25	1	0.050	1.000	1
10:26	1	0.085	0.965	2
10:29	3	0.120	0.930	5
10:32	3	0.160	0.890	8
10:36	4	0.195	0.855	12
10:39	3	0.225	0.825	15
11:02	23	0.345	0.705	38
11:08	6	0.360	0.690	44
11:54	46	0.475	0.575	90
12:24	30	0.525	0.525	120
12:54	30	0.575	0.475	150
13:24	30	0.600	0.450	180
13:54	30	0.630	0.420	210
14:23	29	0.650	0.400	239

Test P3
 Gradient 0.0007 m/min
 Percolation 0.04 L/m²/min



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 Email: shane@landergeotechnical.co.nz

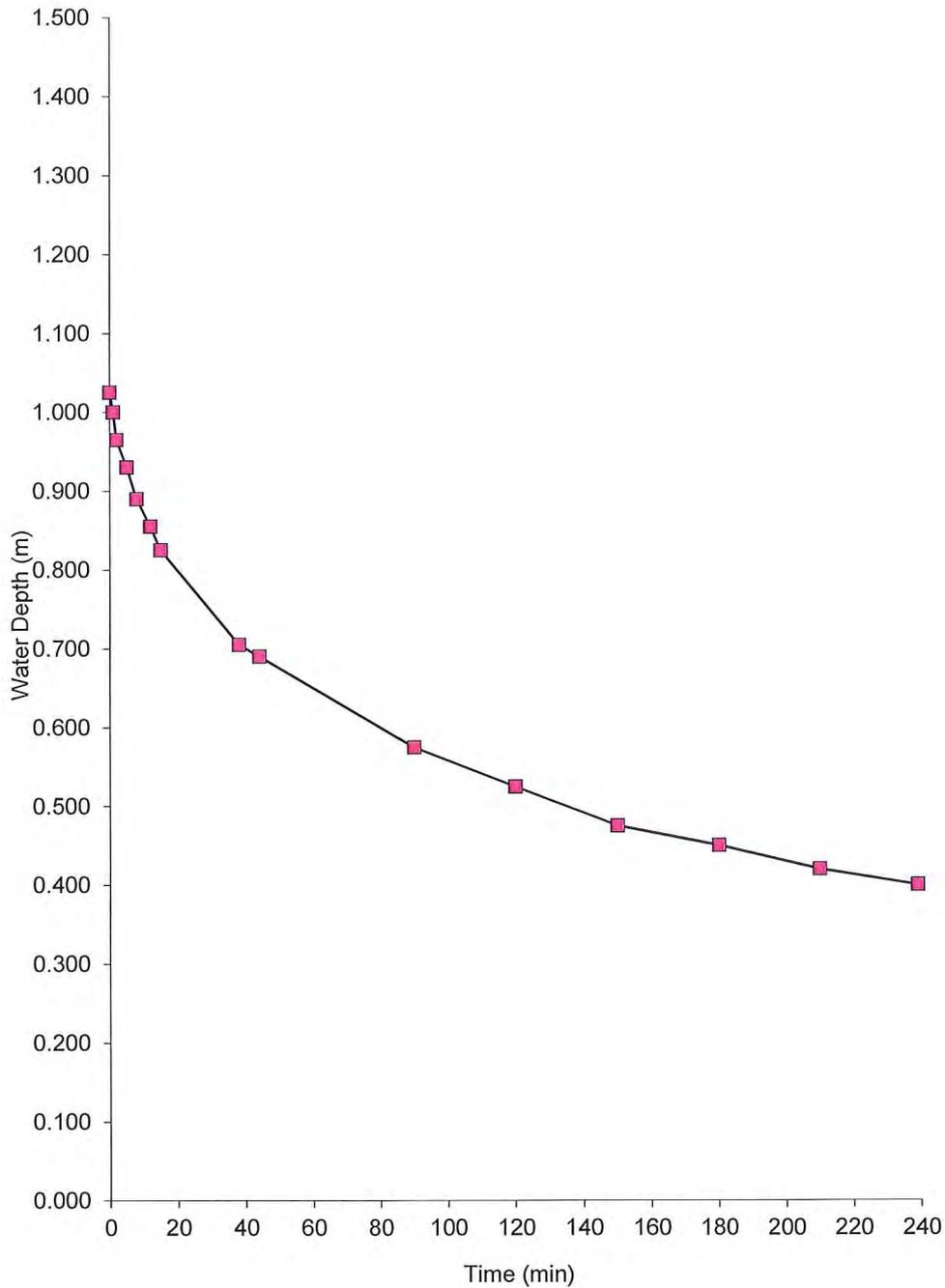
Operator: **AB/MVC**

Checked: **AB**

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY CONSULTANT LTD	Job No:	J00137
Location:	BREMNER ROAD FIRST STAGE QD	Date:	20.11.15
	0	Page	2 of 2
Hole No:	P3	Diameter:	0.1 (m)
Location:	Refer to Site Plan	Depth:	1.05 (m)

Water Depth vs Time



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 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

Operator: AB/MVC

Checked: AB



Legend and/or Notes:

- 5M HAND AUGER
- ⊕ HA 2015 - xx PROPOSED HAND AUGER
- ⊕ EXISTING BH (DO NOT DRILL)
- SAMPLES 0.5 TO 1.0M, 1.5 - 2.0M AND 2.5 TO 3.0M
- ⊕ PERCOLATION TEST 2M DEPTH
- ⊕ PERCOLATION TEST 1M DEPTH

263 bremner rd (water supply)
Rob is the owner
Tap to left as you entre the gate.

PRELIMINARY

revision		description	drawn	approved	date		drawn	XXX		client:	XXXXXXXXXX			
								approved		XXX	project:	TASK V/O#04 (QD1) proposed fieldwork plan		
								date		nov 2015	title:	XXXXXXXXXX		
								scale		1:5000	project no:	J 00137	figure no:	XX
								original size		A3				

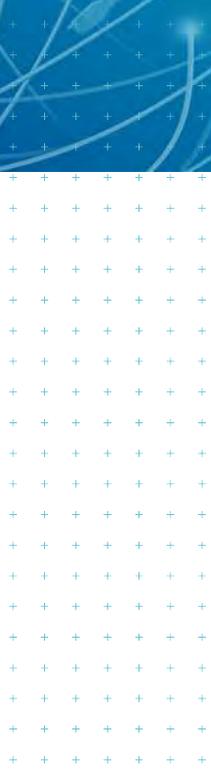
Template revision: 1:1000 (10/12/14)

APPENDIX D – TONKIN & TAYLOR AURANGA B1 SMP



Auranga B1- Stormwater Management Plan

Prepared for
Karaka and Drury Limited
Prepared by
Tonkin & Taylor Ltd
Date
May 2017
Job Number
1001534.v1



Distribution:

Karaka and Drury Limited

1 copy

Tonkin & Taylor Ltd (FILE)

1 copy

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Executive summary

This Stormwater Management Plan (SMP) has been prepared to support an application for the Private Plan Change (PPC) made by Karaka and Drury Ltd. The SMP will support the PPC and future discharge and network discharge consents (NDC).

The Auranga B1 PPC area adjoins the Drury 1 Precinct and is intended to yield approximately 1300 homes in addition to the approximately 1350 new homes already planned in the Drury 1 Precinct.

The requirements for stormwater management are based primarily on the Drury 1 Precinct stormwater rules¹ and the Auckland Unitary Plan (AUP).

The SMP is supported by a flood hazard assessment, which was carried out using a 2D model with 2013 LiDAR coupled with a 1D component to represent Hingaia Road Bridge. The outcomes are flood hazard maps and proposed approaches for flood and coastal management for Auranga B1.

Options for stormwater management approaches are discussed in Appendix F of the document. The development follows a water sensitive design approach (as required in the AUP). The proposed stormwater management plan is summarised in Section 6. However, the preferred approaches match those of the Drury 1 Precinct (Appendix B) which were as recently as August 2016 determined to be appropriate for the adjoining 84.5 ha Precinct and were confirmed through Auckland Council's (Council) decision for the Bremner Road Special Housing Area NDC.

¹ Rule 3.1 and 6.7 of the operative Drury 1 Precinct (PV15 decision)

1 Introduction

1.1 Background

The Auranga B1 development is located just to the west of Drury and is supplementary to the existing Drury 1 Precinct. The Precinct is approximately 38 km south of Auckland's central business district, 13 km south of the Manukau Centre, and 4 km southeast of the Papakura Centre. The Auranga B1 Private Plan Change (PPC) area is identified in Figure 1-1.

The Auranga B1 area is approximately 83 ha. The development will include residential development that will yield approximately 1300 new homes over five years. These are connected by a road network forming a basic grid and integrated with the adjoining Drury 1 Precinct. Access to the site is from Bremner Road from the south, and Jesmond Road from the West.

The PPC applicant, Karaka and Drury Ltd, plans to rezone the land to allow housing development to continue from the existing Drury 1 Precinct. The PPC provides additional critical mass to support infrastructure development and to provide a sustained supply of housing to serve Auckland's growth. The development of the Auranga B1 area is in line with the Auckland Unitary Plan (AUP) which has zones the area as 'Future Urban' (FUZ). The Auranga B1 area is also identified in the Auckland Council (Council) Future Urban Land Supply Strategy (FULSS). According to the *Infrastructure Provision Study for Future Urban Areas 2017-2027 1.0 Draft for discussion*, Auranga B1 is covered within the wider Drury West area that is nominated to be 'development ready' by 2022.

The PPC is proposed as an extension to the existing Drury 1 Precinct and as such this SMP aligns with the applicable rules under that existing Precinct that were demonstrated as being appropriate by the Plan Variation 15 (PV15) and SMP (T&T, 2016). A NDC will be sought in partnership with Council (as the applicant) for the Auranga B1 area after the completion of the plan change process.

The Auranga B1 area is characterised by two areas, the first being an irregular area bounded by coastline and existing rural areas. It is bounded on two sides by the Manukau Harbour (Drury Creek and Oira Creek) and to the south by Bremner Road. The second area rezones the land between the Drury 1 Precinct south of Bremner Road and east of Jesmond Road.

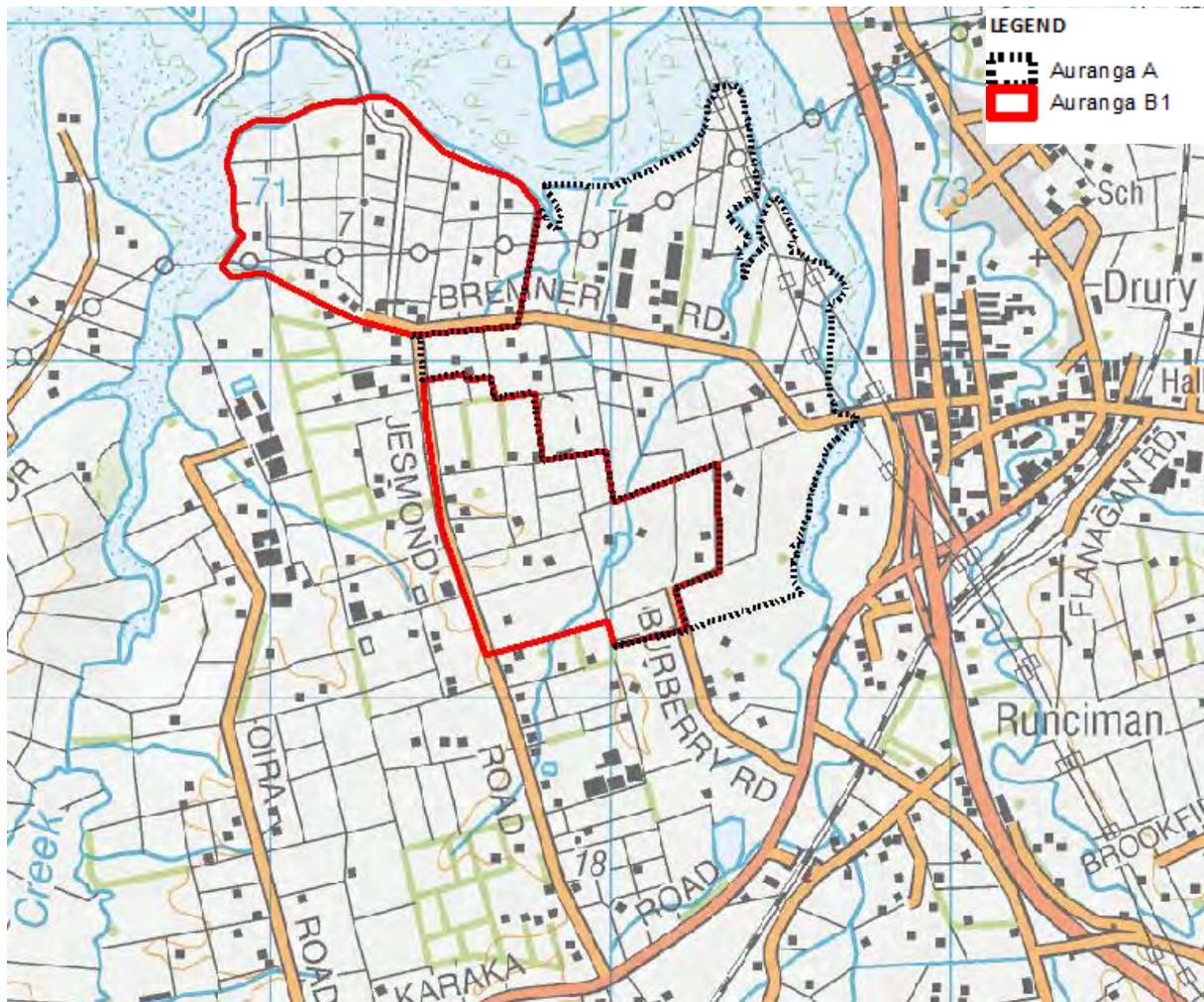


Figure 1-1: Auranga B1 development

1.2 Purpose

The overall purpose of the SMP is to provide guidance to the applicant and Council on how stormwater will be managed based on a developed future land use scenario, and to support the PPC.

The SMP is consistent with Councils policies and plans. Non-statutory policy and planning documents are also considered.

1.3 Zoning

The Auranga B1 area is currently zoned FUZ under the AUP. The immediately adjoining Auranga B1 in the Drury 1 Precinct is zoned Mixed Housing Suburban, Mixed Housing Urban, Terrace Housing and Apartment Building and Local Centre.

Under the AUP, Council has applied the FUZ to suitable land that is located on the periphery of existing urban development still within the Rural Urban Boundary (RUB). The intent is to negate the need for urban development outside of the RUB.

The FUZ provides for rural activities to continue to be undertaken until such time that a structure plan and plan change process is undertaken to enable urban development of the land. Subdivision and the construction of additional dwellings are to be avoided until such time that the land is rezoned for urban activities.

The PPC request for Auranga B1 (an extension to the Drury 1 Precinct) introduces the Mixed Housing Suburban and Mixed Housing Urban zones.

1.4 Scope of the SMP

The scope of the SMP is to:

- Detail proposed stormwater management for the development;
- Demonstrate compliance with the stormwater management expectations, rules and objectives under the Drury 1 Precinct (the Drury Precinct Rules are provided in Appendix B for reference);
- Demonstrate alignment with the AUP objectives and policies;
- Demonstrate how stormwater management related expectations under AUP Appendix 1 Structure Planning 1.4.7(3) have been met;
- Inform the PPC, future NDC/Discharge Consent applications including consideration of possible options and selection of the preferred option as the Best Practicable Option (BPO);
- Inform Infrastructure Funding Agreements with the Healthy Waters Department (HWD) and determination of targeted development contributions (in this case to be funded by the landowners/developers); and
- Demonstrate design principles and consistency with the Stormwater Code of Practice (SWCOP) for initial approval of concept for stormwater assets to be vested to Council.

1.5 Outcomes of the SMP

The outcomes sought by the SMP are:

- An integrated stormwater management approach;
- A water sensitive treatment framework that manages and mitigates the impact of land use change from agricultural use to urban;
- Provide for retention of stream habitat, and protection and enhancement of riparian and estuary margins;
- Identify flood risk areas and ensure any development is located outside the floodplain;
- A set of BPO for stormwater that can be applied to the development;
- Utilisation of the Drury 1 Precinct stormwater requirements as a template for the hydrological mitigation aspects of stormwater management;
- Provide indicative locations of stormwater attenuation management devices;
- Promote water conservation; and
- Recognise opportunities to manage stormwater areas for multiple values and functions.

1.6 Infrastructure planning and funding

Stormwater infrastructure will comprise a combination of measures within the public and private realms to accord with the SMP and include the following public devices along with the public reticulated network:

- Raingardens/swales;
- Dry detention basins; and
- Green infrastructure corridor.

The costs of implementing the stormwater management devices, including private infrastructure, will be the responsibility of each landowner or developer, as part of each subdivision stage.

All of the assets (apart from infrastructure within the lots and private rear lanes) will be vested in Council and will require ongoing maintenance. According to the Auckland Council stormwater management provisions cost and benefit assessment (TR2013/43) the average cost of raingarden maintenance is \$500 to \$800 annually.

Onsite tanks will be the sole responsibility of future purchasers. Communal devices (if located on private land such as rear lanes) will require ongoing maintenance by the future purchasers through a resident's society or body corporate (or similar). Details of how these will be managed and maintained in perpetuity can form part of the resource consent approval process (and is governed by the Council's recent stormwater bylaw).

No infrastructure funding agreement is considered necessary as there is no expectation that Council will be developing or funding stormwater infrastructure within the Auranga B1 at its cost. All infrastructure will be the responsibility of the developers/landowners to fund.

1.7 Network Discharge Consent (NDC)

No NDC covers this greenfield location. The existing NDC for the Drury 1 Precinct covers the PV15 area which was previously identified as the Bremner Road SHA.

This is effectively due to the land only being identified for urbanisation through the FUZ of the AUP, and therefore it does not feature for stormwater management any legacy document associated with

the Operative Regional Policy Statement, Operative Regional Plan: Air Land Water or Operative Auckland Council District Plan (Papakura Section).

The AUP establishes that NDCs are to be prepared by Council as the operator of the stormwater network utility. It would be a non-complying activity for a party other than Council to apply for a NDC as NDCs are only applicable to the operator of the utility.

Where there is no NDC, then discharge consents are required to establish roads and other impervious surfaces. These can be applied for on a comprehensive basis, with ultimately the discharge consent being transferred to Council as utility operator with the vesting of any stormwater reticulated networks and infrastructure. Where no network is vested to Council then the discharge consent can remain in private ownership.

1.8 Report layout

The report has the following layout:

- The stormwater requirements are established based on the AUP, iwi advice and other technical guidance, this is provided in Section 2 of the report;
- A site description is provided in Section 3 and includes heritage features, natural physical characteristics, current land use, ecological survey, receiving environments, existing infrastructure;
- Proposed changes including land use changes and infrastructure upgrades, are described in Section 4 of the report;
- Flood and coastal risks and management is described in Section 5 of the report; and
- The proposed stormwater management solutions are summarised in Section 6.

The appendices contain supporting information, namely:

- Appendix A contain key figures in A3 Format;
- Appendix B Drury 1 Precinct rules;
- Appendix C contains an analysis of AUP objectives and policies;
- Appendix D contains historical aerial photographs;
- Appendix E has a drawing with stormwater sub-catchments;
- Appendix F contains consideration of treatment for low use road;
- Appendix G Stormwater management options;
- Appendix H Lander Geotech (20 April 2017) – Percolation Test Results; and
- Appendix I Drury 1 Precinct typical details for roads and stormwater details.

2 Stormwater requirements

2.1 Approach

The approach is to extend the stormwater requirements applied to the existing Drury 1 Precinct into the Auranga B1 PPC. Generally, the stormwater provisions for a Precinct is unique to that area, taking into account the recommendations of any NDC, discharge consent or SMP. Generally the approach to stormwater in the Precincts applies the most up to date stormwater positions in respect to best practice, and are informed from the specific assessments relevant to the local context. In the case of Auranga B1, the stormwater management rules of the existing Drury 1 Precinct meet all of these objectives.

Compliance with the AUP has been demonstrated through the PV15 process and the resulting Drury 1 Precinct Rules. Bespoke and specific stormwater management approaches have been adopted in the adjoining Drury 1 Precinct. These are proposed to be utilised in the extended Precinct area as proposed through the PPC.

2.1.1 Drury 1 Precinct objectives and policies

The policies and objectives applicable to this SMP are broad and the compliance with these will be ensured through adoption of the Drury 1 Precinct Rules, described in Section 2.4 and included in Appendix B.

Objective 5 – Stormwater runoff is managed to enable the maintenance and enhancement of natural waterways and water quantity.

Policy 8 – Require on-site management, or for higher density development private communal management of stormwater runoff from impervious surface. Stormwater from roads should generally be management in road corridors.

Policy 9 – Require native riparian planting along waterways.

2.1.2 Consideration of AUP objectives and policies

A review of the AUP objectives and policies has been undertaken and is summarised in Table C1 and C2 in Appendix C respectively. The objectives are generally broad and the underlying policies that relate to stormwater management have considered to ensure correct interpretation of the objectives. The policies are wide ranging about what should be considered and do not specifically direct towards any water management solutions. The general outtakes from the assessment of these policies is that stormwater management for greenfield sites should avoid and/or minimise effects on the environment (especially for sensitive receiving environments) as far as is practicable and apply an integrated stormwater water management approach (AUP E.1.3(8)). This approach is consistent with the Drury 1 Precinct objectives, policies and rules adopted for this PPC. The applicable chapters of the AUP are listed below, refer to Appendix C for further details:

- E.1 – Water quality and integrated management
- E.8 – Stormwater – Discharge and diversion
- E.9 – Stormwater quality – High Contaminant generating car parks and high use roads
- E.3 – Lakes, rivers, streams and wetlands
- E.36 – Natural hazards and flooding.

2.2 Iwi advice

Stormwater management for Auranga B1 was discussed with iwi on 10 April 2017 during a site visit and subsequent meeting.

Previously, three cultural impact assessments (CIAs) were received from the following iwi as part of PV15. Supplementary reports were also prepared by the same iwi:

- Ngati Tamaoho;
- Ngati Te Ata; and
- Te Akitai Waioha.

The main iwi requirements are summarised below. The CIAs and supplementary reports should be read in their entirety.

- Treatment of contaminants this includes stormwater discharge treatment solutions with a treatment train approach to provide retention and detention;
- Managing effects (avoid, remedy, minimize, mitigate, balance); and
- Groundwater recharge.

More detailed iwi requirements are listed below:

- Streams and esplanades preserved in their natural state;
- Esplanade reserves should be 20 m in width and riparian margins 10 m;
- All riparian plantings to be eco-sourced natives;
- Sustainable development in all areas;
- Stormwater devices outside of the 100 year flood plain;
- Drains, waterways, wet areas and overland flow paths preserved and enhanced;
- A minimum of a three train, bio/low impact design treatment for all stormwater runoff;
- Reuse of roof water to lessen effects of water take from public supply;
- Groundwater recharge implemented;
- Narrower roads = less impervious=less flow=smaller raingardens;
- Use of pervious paving for footpaths [increases groundwater recharge ability];
- Pervious paving;
- Roading [where possible] to be around esplanade to allow for visual amenity;
- Removal of culverts and replacement with bridges [unless for pedestrian access only];
- Retention of view shafts for visual amenity;
- Use of “non-chemical” methods for weed removal, as far as possible;
- Cultural monitoring, especially around stream and coastal margins; and
- Naming opportunities.

The iwi groups were briefed on the draft PV15 SMP in December 2015 and provided feedback at meetings in February and March 2016. As a result of this feedback, green outfalls was added as the preferred discharge method to that SMP.

Iwi feedback in February 2016 included:

- Request for more treatment and more elements to treatment trains for catchments discharging to the coast;
- Infiltration basins would provide an additional element to the treatment trains;

- Concern about the long term degradation of the Manukau Harbour as indicated by Council monitoring data with two red triggers levels, six orange trigger levels and none green;
- Iwi queried whether smaller catchment could be combined; and
- Requested that plants be chosen that didn't lose their leaves in autumn as this would cause blockage and extra loads on GPTs.

Iwi feedback in March 2016 for PV15 was that they were generally satisfied due to the inclusion of raingardens for the treatment of roads discharging to the coast and the application of impermeable paving for driveways/accessways for areas discharging to the coast. This feedback remain relevant as the same stormwater management approaches are proposed for Auranga B1.

2.3 Technical guidance

The following technical guidance is used to support the Stormwater Management Plan.

Technical guidance	Application
Drury 1 Precinct Rules	Precinct rules for stormwater management – quality and quantity requirements.
Bremner SHA NDC	NDC rules for stormwater management – quality and quantity requirements.
Bremner SHA SMP (dated May 2016)	Basis for precinct rules.
Auckland Council, TR 2013/035, Auckland Unitary Plan stormwater management provisions: Technical basis of contaminant and volume management requirements (2013)	95 th percentile 24 hr rainfall depth for hydrological mitigation devices.
Auckland Council, TP10, Stormwater management devices: Design guidelines manual (2003)	Design of approved stormwater quality devices.
Auckland Council, GD 2015/04, Water Sensitive Design for Stormwater.	Consideration of Water Sensitive Design approaches.
Auckland Council, TP 124, Low Impact Design Manual for the Auckland Region.	Design of low impact stormwater treatment devices.
Auckland Council, TP108, Guidelines for stormwater runoff modelling in the Auckland Region (1999)	Hydrological method for flood modelling.
Auckland Council, Rapid Flood Assessment, 2012	2D flood hazard model specification.
Auckland Council, Code of Practice	Design of stormwater assets.

2.4 Stormwater requirements

There is no existing catchment management plan for the catchment. The requirements for stormwater management that will be adopted for the PPC and subsequent development are based primarily on the existing Drury 1 Precinct rules for land use and subdivision development and AUP stormwater and flooding provisions. Rules 3 and 6.7 which establish the stormwater requirements for the Drury 1 Precinct, summarised below. This SMP is consistent with the approved SMP associated with PV15 and the NDC, and therefore we consider it appropriate for the Auranga B1 area to be subject to Rules 3 and 6.7 (Appendix B).

Table 2.1: Auranga B1 – Recommended requirements for stormwater management

Aspect	Applicability	Requirements	Reference
Flooding	All areas	New residential buildings are required to be outside the 1% AEP floodplain (including the effects of climate change over a 100 year timeframe and a 1 m sea level rise).	AUP Chapter E36.4 Activity Table E36.4.1 Activities in the 1% annual exceedance probability (AEP) floodplain and overland flow paths, permitted activity A24 surface parking areas to comply with E36.6.1.7. Activities A34 to A38 relate to new structures or buildings in the floodplain and A42 to new structures or building in an overland flow path. The 'requirements' are recommended to avoid restricted discretionary (RD) status and associated requirements.
Coastal inundation	All areas	Habitable areas of buildings must be above the coastal storm inundation levels from the 1% AEP extreme sea level plus 1 m sea level rise.	AUP Chapter E36.4 Activity Table E36.4.1 permitted activities A12, A13, habitable areas to comply with E36.6.1.1.
Stormwater quality	Roads discharging to estuary	Treatment of runoff from all impervious surfaces through the implementation of rain gardens (or equivalent) with surface area sized to 2% of the contributing catchment.	Drury 1 Precinct Rule 6.7.2.
	High use roads (>5,000 vehicles per day (vpd))	Stormwater runoff from high use road are to be treated by an approved stormwater quality device. Approved stormwater quality devices ... is sized and designed in accordance with TP10 or achieves ... for high use roads and carparks, stormwater quality devices that are more effective at removal of sediment and metals should be used (refer to full definition in the AUP).	AUP Chapter E.9 – Stormwater quality – High contaminant generating car parks and high use roads. Standards E9.6.1.4 (permitted activities) and E9.6.2.2. (controlled activities).
	High contaminant car park such as for shopping areas (>30 vehicles, refer to full definition in reference material)	Stormwater runoff from high contaminant car parks are to be treated by an approved stormwater quality device. Approved stormwater quality devices ... is sized and designed in accordance with TP10 or achieves ... for high use roads and carparks, stormwater quality devices that are more effective at removal of sediment and metals should be used (refer to full definition in reference material).	AUP Chapter E.9 – Stormwater quality – High contaminant generating car parks and high use roads. Standards E9.6.1.3 (permitted activities) and E9.6.2.1 (controlled activities).

Aspect	Applicability	Requirements	Reference
	Other areas that are not high contaminant generating activities e.g. Minor roads Residential, commercial	Water sensitive design approach subject to practicality and BPO. These AUP policies collectively say that stormwater management for greenfield sites should avoid to minimise effects on the environment (especially for sensitive receiving environments) and use green infrastructure for stormwater management where practicable.	AUP E.1.3.8 and E.1.3.10.
Stormwater quantity	Impervious surfaces discharging to streams	Provide hydrology mitigation measures for any impervious surface greater than 50 m ² as follows: <ul style="list-style-type: none"> • retention (volume reduction) of at least 5 mm runoff depth • detention (temporary storage) to match pre-development runoff volumes. 	Drury 1 Precinct Rule 3.1 (dwellings and onsite impervious areas) and 6.7.1 (Roads).
	Impervious surfaces discharged to estuary	No requirements.	

3 Site description

3.1 Heritage features

The CFG Heritage report (March 2017) identified a noticeable lack of archaeological sites within the lowland areas of the Manukau Harbour. The farming activity for the past 150 years and landscape erosion would have modified the landscape and obscured any surface evidence of archaeological sites.

Previous archaeological research in the area has been limited and large scale archaeological survey in the Manukau Lowlands has never been carried out. It is a result of gradual increase in residential developments in the area that led to a number of archaeological surveys (Clough 2000; Foster 2007; Foster 2014; Foster 2015). It is known that there are 30 recorded archaeological sites within 2 km of the SHA area, twenty-one of which are pre-European sites, dominated by shell middens within the intertidal areas of the Pahurehure inlet. The historic period sites trace back to the early use of Drury as a military outpost during the New Zealand wars and the subsequent settlement of the township.

Site R12/1064 has been previously identified within the Esplanade Reserve adjoining the PPC area. CFG Heritage Report has undertaken a site survey and was not able to relocate the archaeological site. No other heritage features were identified in the PPC area.

3.2 Natural and physical characteristics

3.2.1 Catchment and topography

The site is at the downstream end of the Ngakoroa Stream and Oira Creek catchments and covers two areas, one to the east of Jesmond Road and one to the north of Bremner Road.

The area located to the east of Jesmond Road has a land form dominated by rolling country and generally drains to the north or east. Within the site two streams Stream B (west stream) and Stream A (east stream) convey stormwater in a general south to north direction are located within the site refer to Figure 3-1. The west and east streams have catchment areas of 65 ha and 160 ha, respectively.

North of Bremner Road the land is bound by the estuarine waters of Drury Creek on the north and Oira Creek to the west. The land form is flat to gently rolling and the majority of the land is low intensity farming and lifestyle block. There are several intermittent streams, with small catchments that flow directly into the estuary, apart from tributary B1 which joins to Stream B within the Auranga A development area.

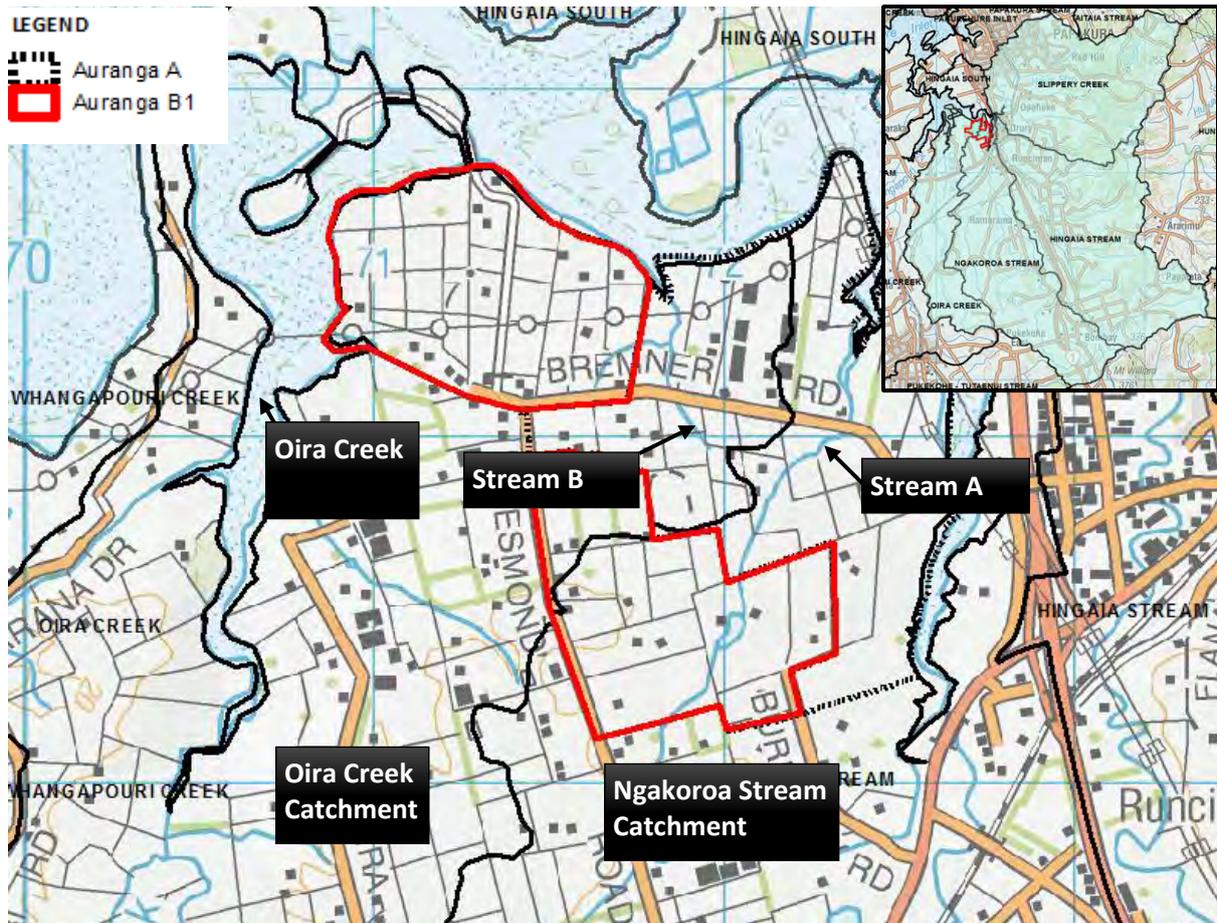


Figure 3-1: Site location map showing catchment boundaries applicable to Auranga B1

The site is dominated by gently rolling terrain, with coastal frontage to the upper estuary reach of Drury Creek. The ground elevations across the majority of the site are between 7 mRL and 10 mRL, the highest elevation is at 25 mRL at the south western corner while the lowest elevation is at 1.5 mRL at Drury Creek on the northern side, refer to Figure 3-2 below for site topography.

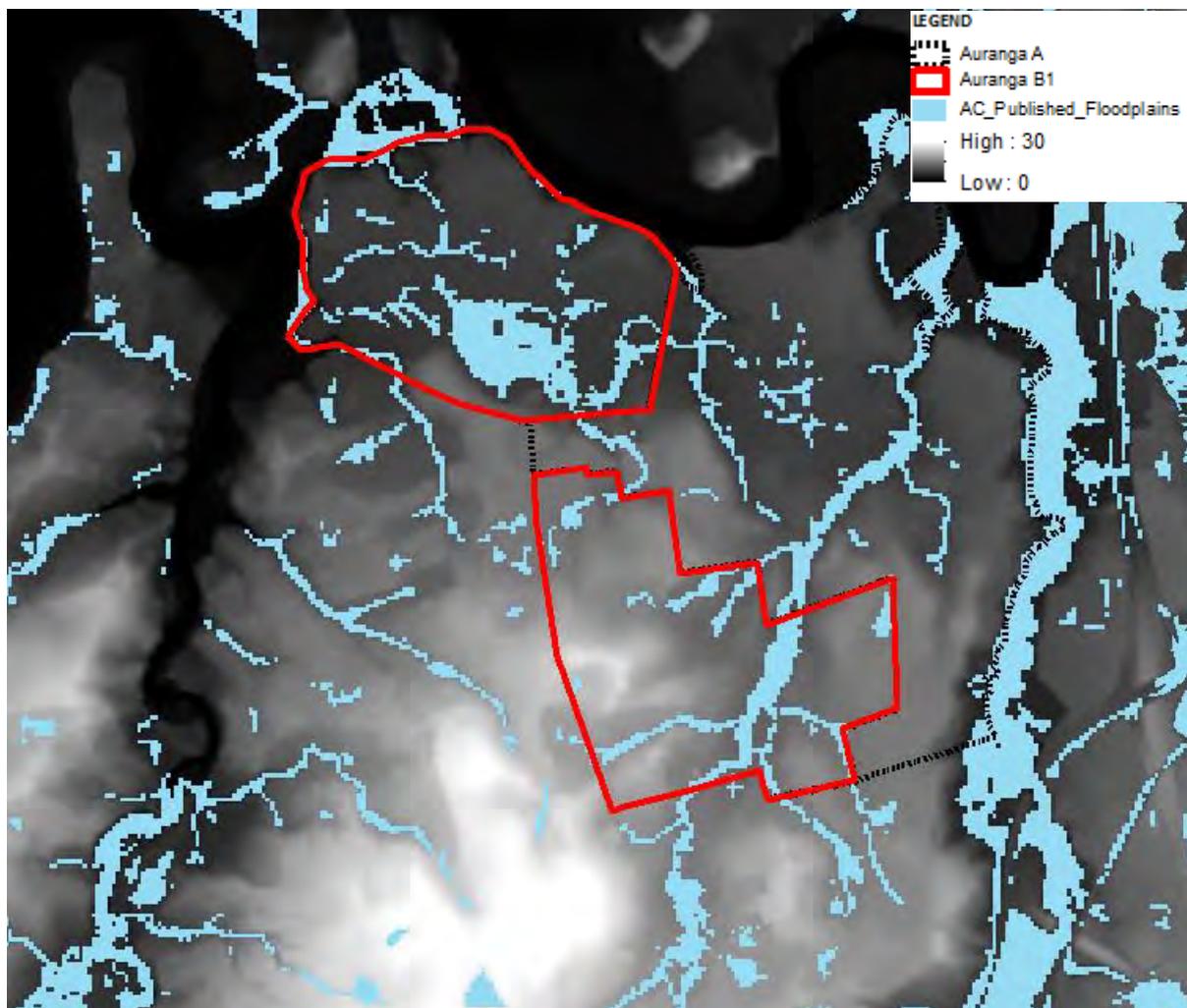


Figure 3-2: Site topography for Auranga B1 area

3.2.2 Floodplains and overland flow paths

The Council GIS website shows the floodplain and overland flow paths that comprise the west and east streams, refer to Figure 3-3.

The 1% AEP floodplain extent is derived from Rapid Flood Hazard Mapping of the Auckland Region undertaken in 2009. It simulates the 1% AEP rainfall event (without climate change) with 10 mm initial storage and 2.5 mm/h continuous rainfall loss with the terrain modelled with 10 m by 10 m grid.

An updated flood hazard assessment based on improved modelling has been undertaken specifically for this project. This is presented and discussed in Section 5.2 of this report. The finding of that updated flood hazard assessment is that there are no buildings/dwellings at risk from flooding.

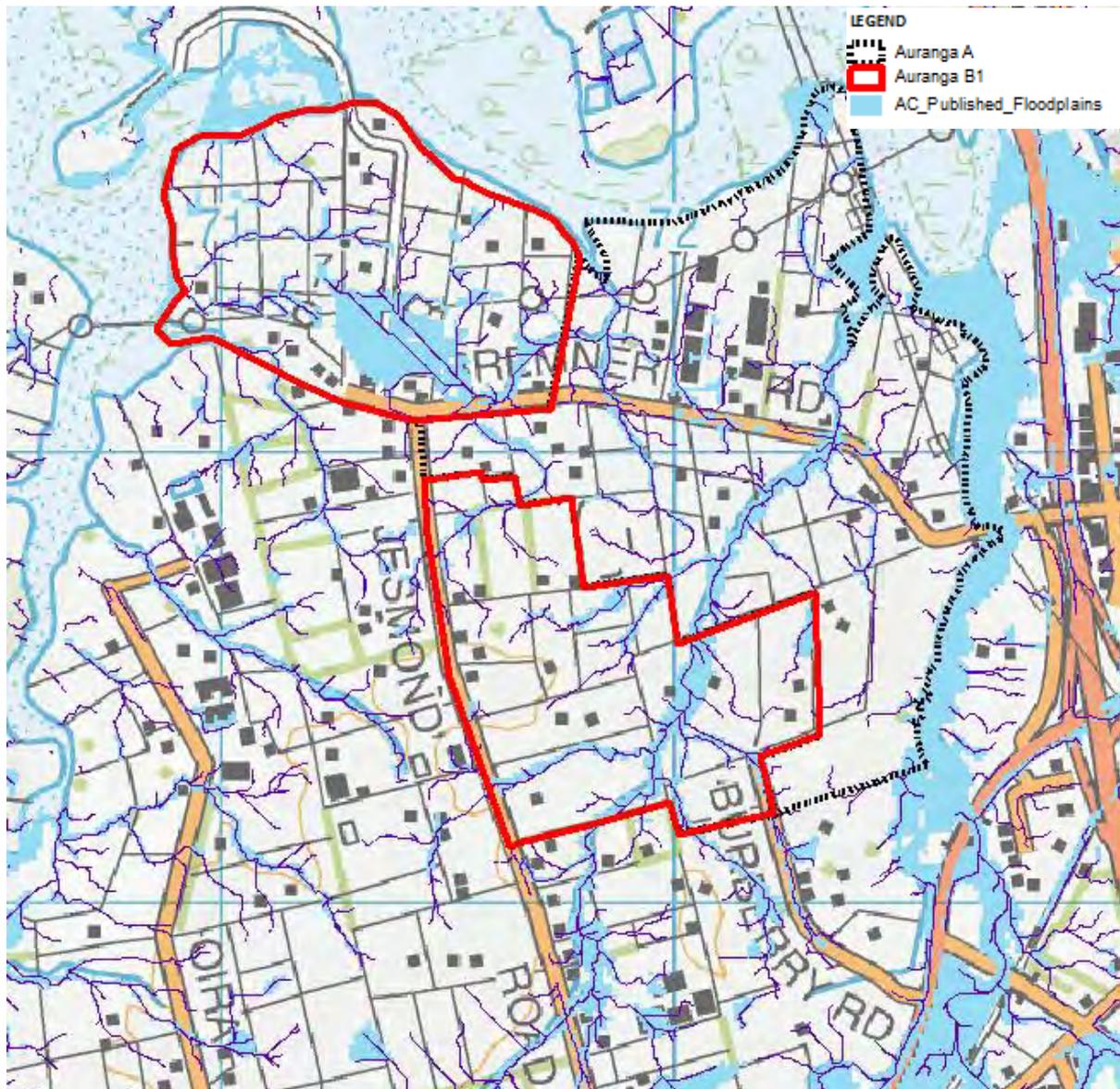


Figure 3-3: Existing 1% AEP floodplain (light blue) and overland flow paths (dark blue lines) for Auranga B1 (from Auckland Council Geomaps)

3.3 Current land use

The current land use is for farming and horticulture purposes, with some life style dwellings, refer Figure 3-4. Vegetation on the site is mainly grazed rank pasture grasses and exotic tree species used for hedging and shelter belts. Some native trees are present on the site but are generally located in amenity gardens surrounding dwellings.

The site has historically been farmed for livestock, with parts in more recent years being used for horticulture and rural lifestyle living, refer Figure 3-5. Historic aerial photographs are available on the Council GIS website and from LINZ, the earliest dates to 1960 refer to Appendix D for historic aerial photos.



Figure 3-4: Auranga B1 - most recent (2010) aerial photo (source Auckland Council GIS website)

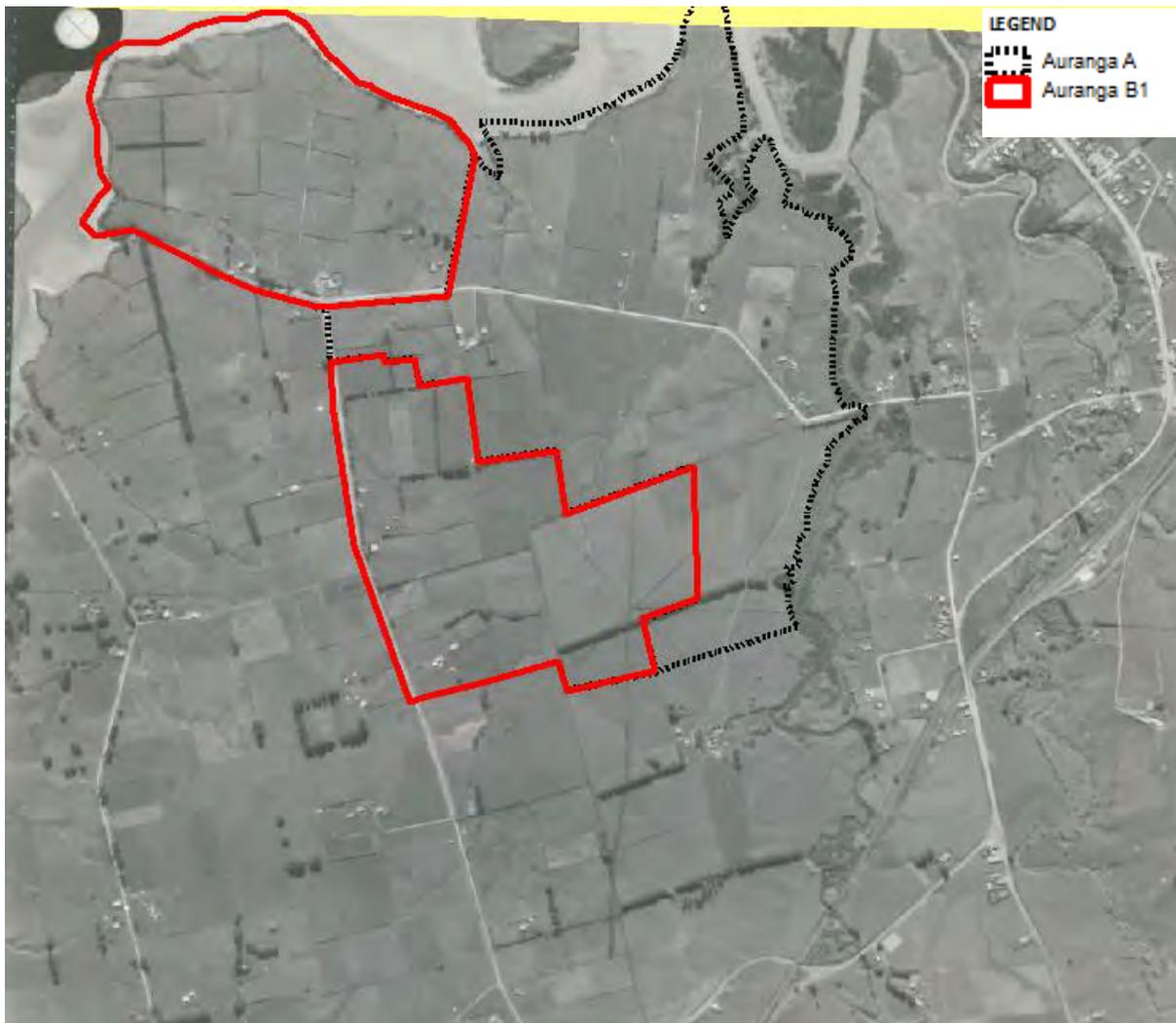


Figure 3-5: Auranga B1 - 1960 aerial photo (source LINZ historic aerial photographs)

3.4 Geotechnical, soils, groundwater and contaminated land

3.4.1 Geotechnical

Geotechnical constraints have been identified as a part of the Lander Geotechnical Preliminary Geotechnical Appraisal Report February 2017 for the PPC area. The main findings are summarised below:

- **Ground stability:** Most of the site is observed to have gentle to rolling land with no obvious signs of ground instability. However, “the northern boundary of the site is characterised by relatively short, but sub-vertical to steep foreshores to tidal river that display signs of active erosion and regression in localised areas”. Residential setbacks are recommended as an initial solution, further investigation will be undertaken during the detailed geotechnical site investigations.
- **Earthworks and infrastructure:** Although not identified to be specific issue in the boreholes undertaken in the February 2017 is noted that natural soils, particularly those with high pumice content will be prone to piping and further investigation at time of subdivision will be required to assess risk if on-site stormwater management systems are proposed.

3.4.2 Soils

Landcare S-Map indicates that soil in the area is predominantly poorly drained in the north and predominantly moderately well drained in the south, refer to Figure 3-6.

The geotechnical investigations from 12 boreholes around the site have indicated that the majority show the top 2 m consisting of either silty clay or clayey silt 100 to 500 mm of topsoil, refer to Lander Geotechnical Preliminary Geotechnical Appraisal Report February 2017 for the site.

Percolation rate tests have been undertaken for Auranga B1 areas and are summarised in Table 3.1 and with the test results included in Appendix H. The results show poorer infiltration for the area north of Bremner Road and better infiltration for the area east of Jesmond Road, which is consistent with the infiltrations patterns identified by S-Map. Infiltration for the purpose of hydrological mitigation is possible for these soils based on these rates.

Table 3.1: Percolation test results (from Lander Geotech, 20 April 2017)

Area	Test location	Percolation (L/m ² /min)	Gradient (m/min)	Gradient (mm/hr)
North of Bremner Road	HA2017-02	0.01	0.0007	42
	HA2017-05	0.02	0.0003	18
East of Jesmond Road	HA2017-08	0.13	0.0033	198
	HA2017-11	0.09	0.0017	102

Percolation rate tests for adjacent land in Auranga A show a similar range of infiltration rates with 0.0028 m/min to 0.0007 m/min and percolation rate of 0.24 L/m²/min to 0.05 L/m²/min, refer to Lander Geotechnical percolation tests November 2015 (submitted with PV15).

Site specific infiltration testing will be require for devices that require infiltration.

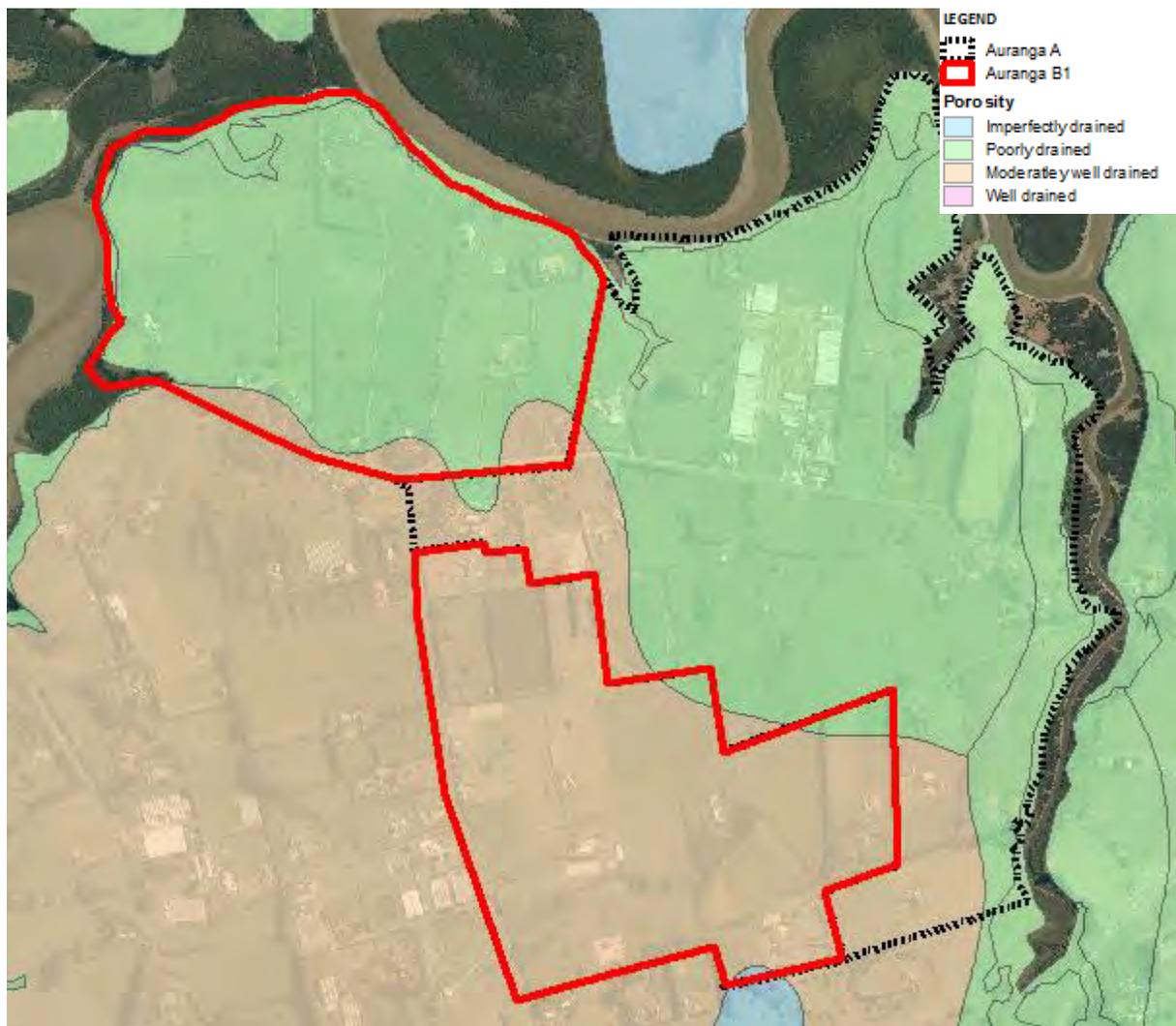


Figure 3-6: Auranga B1 - Soil map from S-Map (Landcare)

3.4.3 Groundwater

Groundwater during site investigations was found in boreholes 2017-05 and 2017-07 at 2.8 m and 2.7 m from ground level respectively. Standing levels were recorded at 3.0 m and 2.8 m respectively upon completion of the investigation. Ground water was not encountered in any of the other boreholes. The ground water readings are shown against each of the test locations in Figure 3-7 below. Refer to the Lander Geotechnical Preliminary Geotechnical Appraisal Report February 2017 for more details.

Site specific testing for groundwater levels including seasonal variation will be required for design of infrastructure, especially for stormwater devices that will rely on infiltration.

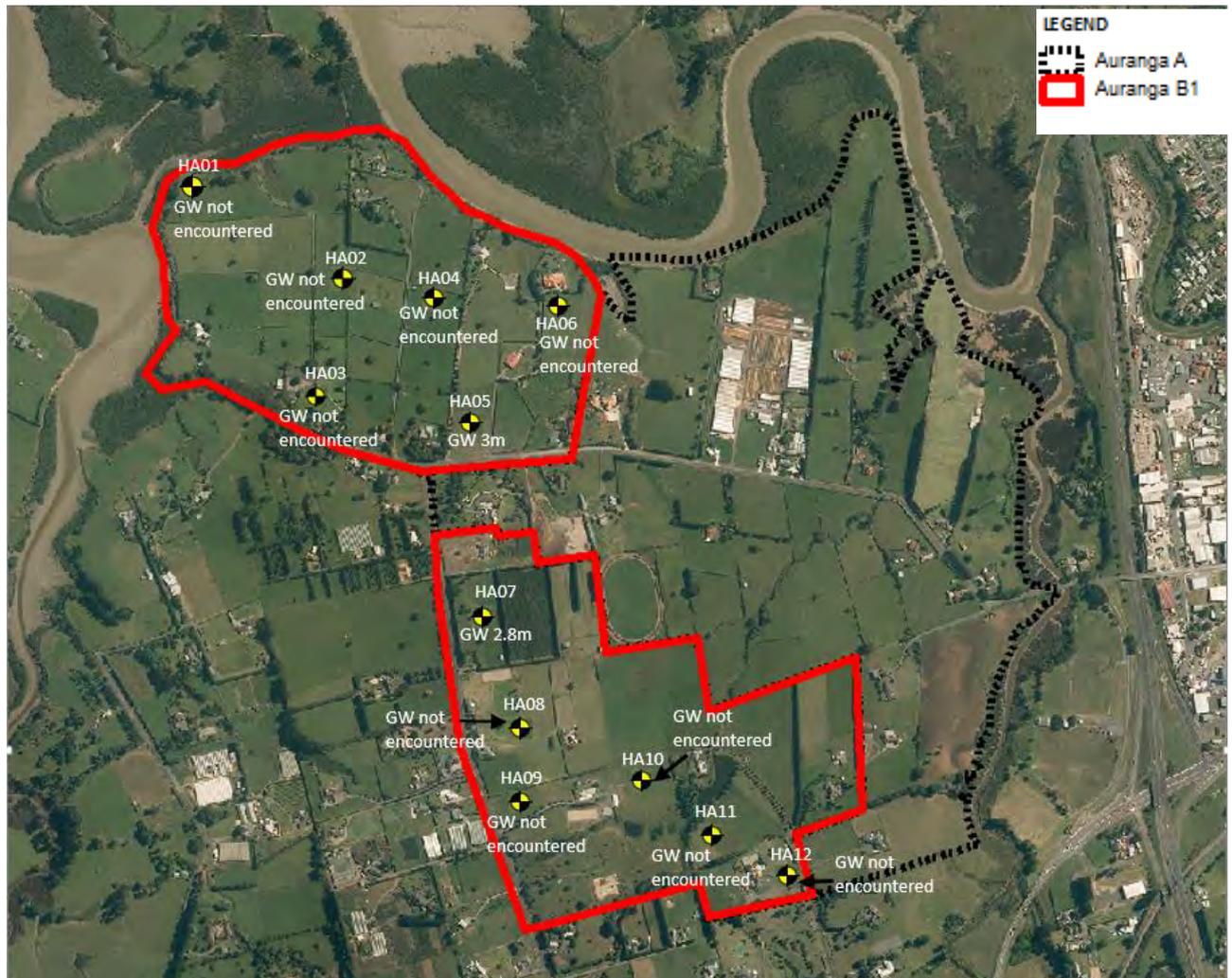


Figure 3-7: Auranga B1 - Groundwater depth relative to ground level. Note figure is from the Preliminary Geotechnical Appraisal Report, Lander Geotechnical, February 2017

3.4.4 Contaminated sites

A desktop assessment and site inspection was undertaken to identify potential contaminated sites, refer to Focus Environmental Services Ltd, Preliminary Site Investigation March 2017. The findings are summarised in the PSI included in the PPC supporting documentation (Attachment 9).

HAIL sites are identified as sites where any potential hazardous activities listed on the Hazardous Activities and Industries List (HAIL) had occurred (or is currently occurring) on site as a result of past or current land use. The proposed sites are considered a HAIL site due to the potential sources of contaminations identified in the PSI.

The contaminated land report Focus Environmental Services Ltd, Preliminary site investigation March 2017 recommends that prior to the development of the areas of the site where potentially contaminating land uses and/or activities have taken place, a detailed site investigation (DSI) is recommended. The DSI would confirm if the identified land uses and/or activities have affected the site soils and will confirm the consenting requirements for these areas of the site.

This is consistent with the approach of the AUP which requires a DSI where necessary triggers are met.

3.5 Ecological survey

Ecological values of terrestrial, freshwater and coastal marine areas within the site were determined through desktop analysis and site visit, refer to RMA Ecology Ltd Auranga B1 Ecological Assessment: Preliminary Values report March 2017. The main ecological findings are described in the sub sections following.

3.5.1 Terrestrial and freshwater ecology values

- The site supports approximately 935 m of permanent stream, 1,775 m of intermittent stream, and 1,580 m of ephemeral stream (refer to Figure 3-8). The headwaters of Stream A contain several on-line ponds totalling nearly 0.65 ha.
- A single, small (520 m²) freshwater wetland is present in the upper headwaters of Stream A. Access to complete a field assessment was not possible, however remote assessment and aerial photography suggests that it is likely to be a degraded artificial pond rather than a natural wetland. There is at least one saline wetland (closest to the Drury Creek Islands Recreation Reserve) which extends into 415 Bremner Road by approximately 40 m.
- Overall aquatic ecology values range from low to moderate within PPC area. All streams have been heavily modified by past farming activities and some continue to be degraded by lack of riparian cover and stock access. No rare or threatened aquatic species were recorded.
- Overall biological and water quality information reinforces subjective assessments that the streams at the site are heavily degraded.
- There is no remnant or secondary regenerating native forest on this site and no listed Significant Ecological Areas (SEA), nor does any of the vegetation present meet any of the qualifying criteria for ecological significance.
- Indigenous vegetation is very scarce and what is present is largely garden amenity plantings. Where naturally occurring, indigenous vegetation is present, it is only self-seeded saplings of common native shrubs amongst weed-dominated vegetation. There is no old growth or naturally regenerating forest.
- The existing Esplanade Reserve around the coastal edge supports mostly weeds on the eastern part (impenetrable thickets of privet, gorse, woolly nightshade, barberry, Japanese honeysuckle) while the western part is mown or rank grass with a weedy strip adjacent to the water's edge is largely degraded with extensive infestations of invasive weeds.
- Mature exotic trees and exotic scrub provides limited and low quality nesting and food resources for birds although no bird species observed onsite are classified as threatened.
- Birds within the PPC area include common cosmopolitan native and exotic species – no rare or threatened species.
- The coastal margins of the PPC area are part of an extensive SEA-Marine within Drury Creek and are likely to support rare banded rail and crake (as has been recorded from the Ngakaroa stream margins to the west that are contiguous with Drury Creek surrounding the PPC area).
- Suitable lizard habitat is present on the site. Exotic, invasive rainbow skinks are present throughout the PPC area. No native lizards were recorded, however it is expected that the native copper skink is present in some of the small discrete areas of suitable habitat. The likelihood of the PPC area supporting native geckos or other skinks is considered to be very low owing to the past history of habitat clearance and lack of nearby source lizard populations to support re-colonisation.

Due to the low diversity of native birds and native vegetation, and likely lack of any habitat for all native lizards except one, the overall indigenous ecological value of the site is considered to be low.

3.5.2 Saline and marine ecology values

Drury Creek forms the northern boundary of the PPC area and it is listed as an SEA in its entirety (Marine SEA (SEA_M_1_29b and SEA_M2_29a). This section of Drury Creek is recognised because of its sandy-mud intertidal areas and variety of marshes, grading from mangroves through to extensive areas of jointed rush-dominated saltmarsh, to freshwater vegetation in response to salinity changes.

The site is also noted by Council for its values for wading bird roosting, including being an important area for rare pied stilt, banded rail and crake. Intertidal invertebrates were not sampled, however a recent report for Drury South development (Golder 2009) found invertebrate species typical for mangrove habitats in the Auckland region, with low species richness across sites sampled. That survey found no rare or special organisms were detected at any of the intertidal sampling locations.

Drury Creek forms the northern boundary of the PPC area and it is listed as a significant ecological area in its entirety (Marine SEA (SEA_M_1_29b and SEA_M2_29a). This section of Drury Creek is recognised because of its sandy-mud intertidal areas and variety of marshes, grading from mangroves through to extensive areas of jointed rush-dominated saltmarsh, to freshwater vegetation in response to salinity changes.

The site is also noted by Council for its values for wading bird roosting, including being an important area for rare pied stilt, banded rail and crake. Intertidal invertebrates were not sampled, however a recent report for Drury South development (Golder 2009) found invertebrate species typical for mangrove habitats in the Auckland region, with low species richness across sites sampled. That survey found no rare or special organisms were detected at any of the intertidal sampling locations.

Figures Figure 3-8 and Figure 3-9 show the permanent and intermittent streams for B1 north and south, note that these will be updated once ground truthing takes place on site in the winter months.

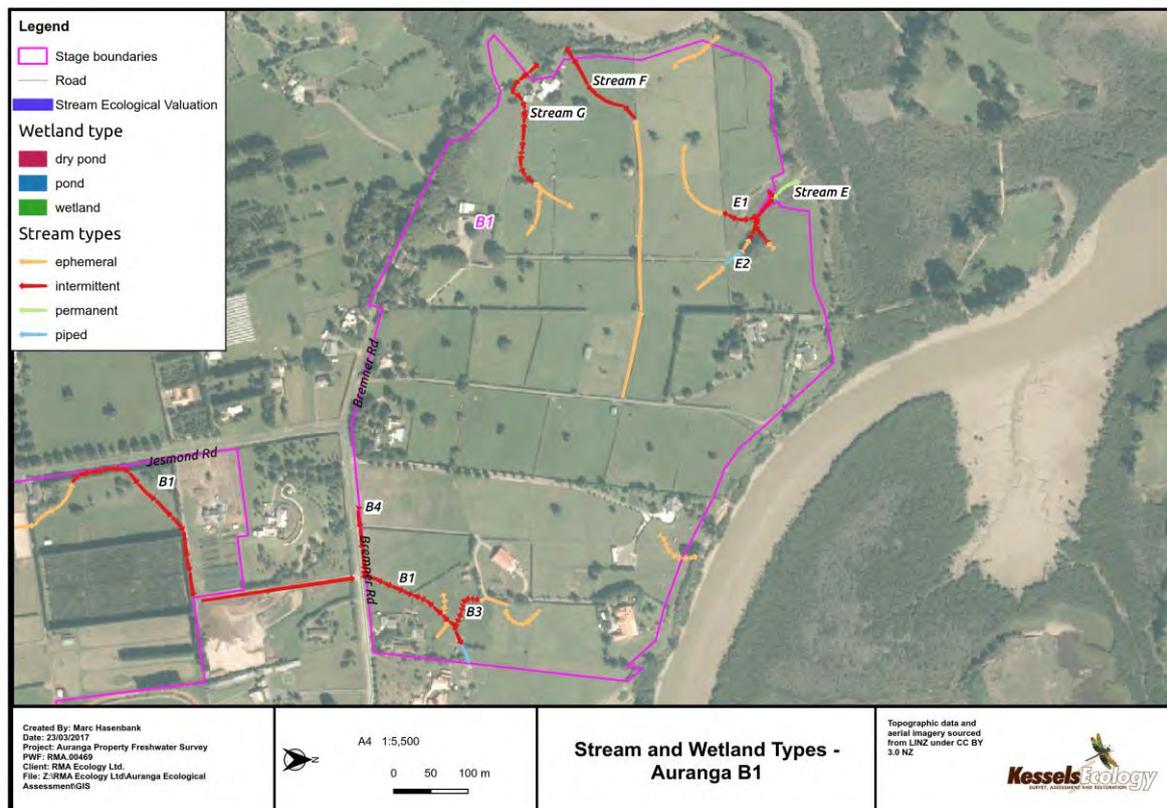


Figure 3-8: Auranga B1 - permanent and intermittent streams B1 north

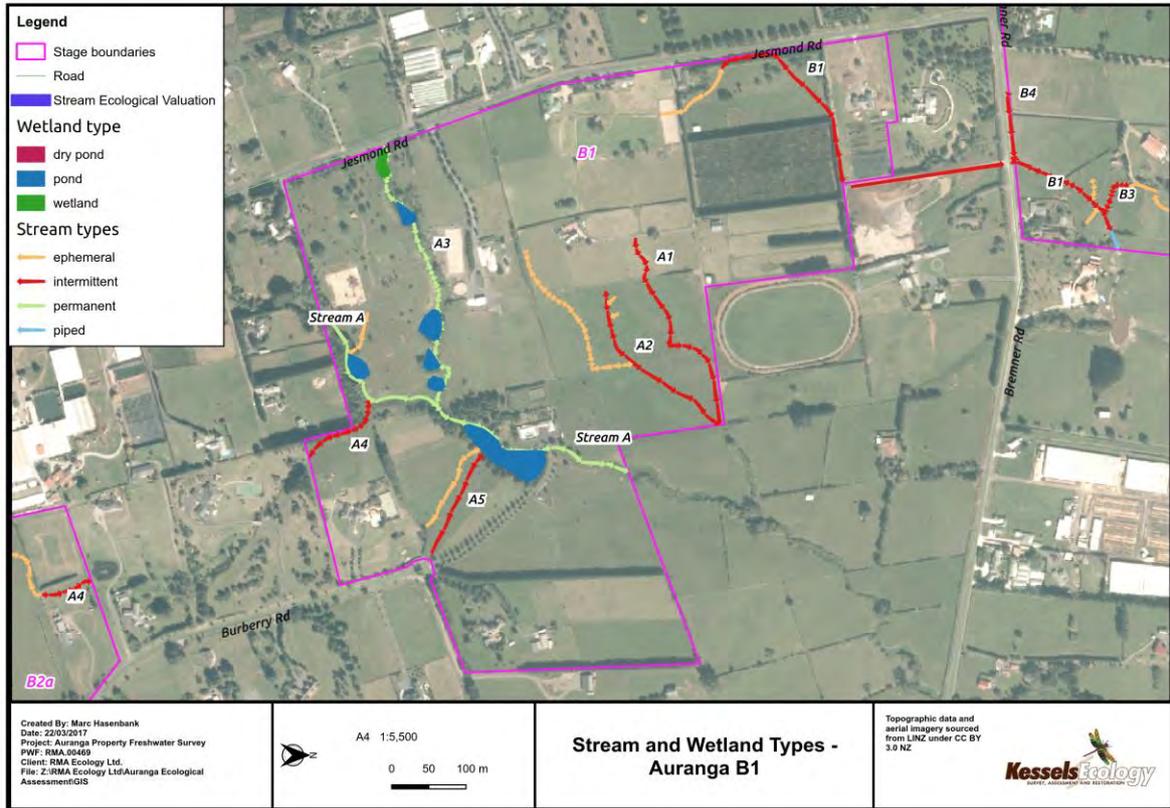


Figure 3-9: Auranga B1 - permanent and intermittent streams B1 north



Figure 3-10 Significant Ecological Areas for terrestrial and marine environments

3.6 Receiving environments

3.6.1 Streams, lakes and wetlands

The Auranga B1 areas discharge to west and east streams associated with the existing Drury 1 Precinct, and to the estuarine Drury Creek and Oira Creek. The receiving environments are summarised in Section 3.4.

3.6.2 Aquifers and soakage

The aquifers that are identified in the AUP are shown on Figure 3-11 below.

The AUP overlays note the area as being within a High Use Stream Management Area. This is not addressed further as the development will not be taking water from the streams.

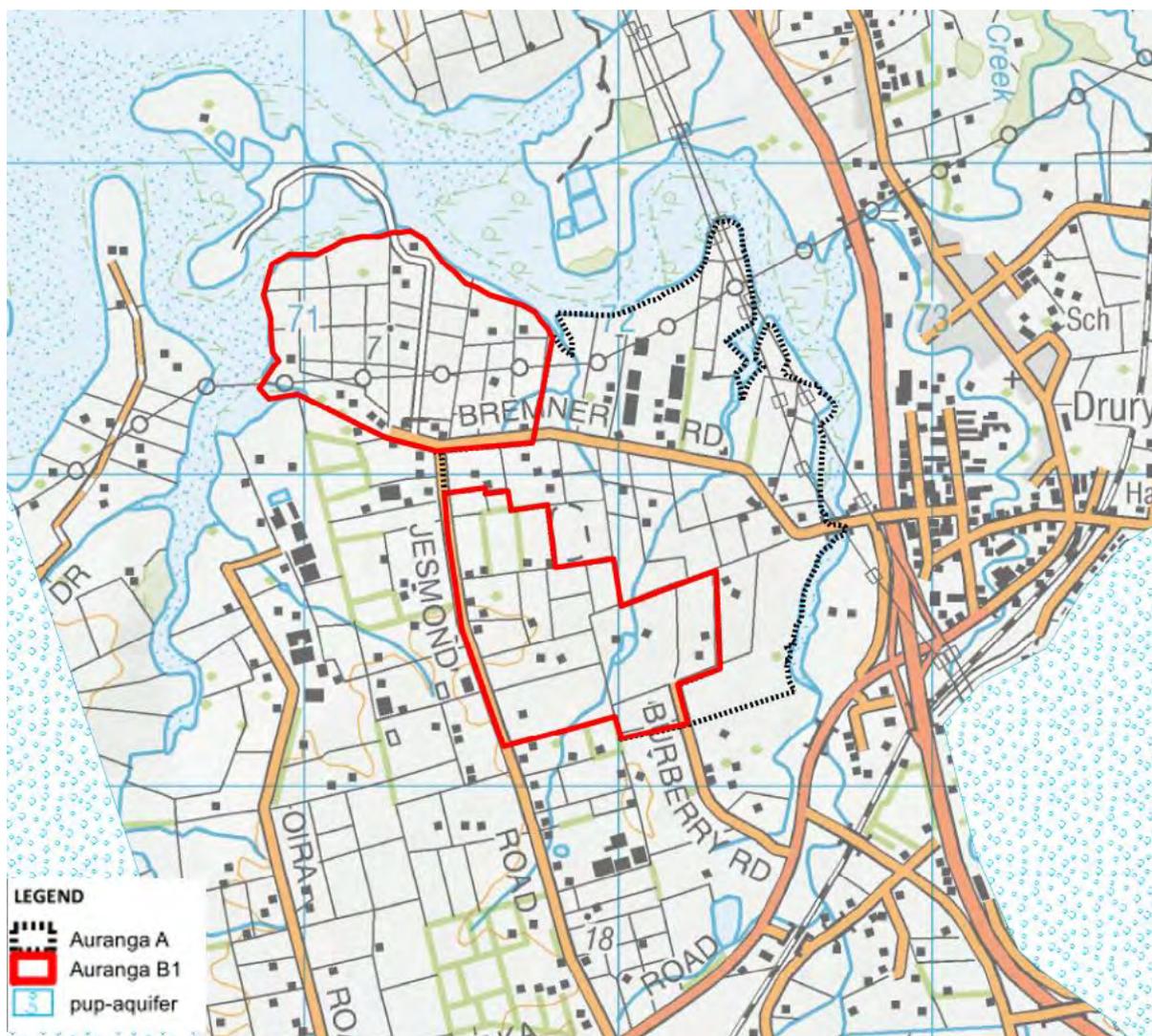


Figure 3-11: Auranga B1 - Aquifers as per the Auckland Unitary Plan

3.6.3 Coastal environment

The coastal environments especially the SEAs are summarised in Section 3.5.2.

3.7 Existing stormwater network and other infrastructure

3.7.1 Stormwater, water and wastewater networks

Council GIS data does not show any existing stormwater culverts crossing Bremner Road at the southern boundary of the northern area. It does not show any existing wastewater or water infrastructure in the area.

3.7.2 Other infrastructure

The Counties Power 33kva lines run east to west through the northern PPC area refer to Figure 3-12.

The First Gas gas transmission line runs through 30 and 38 Burberry Road.

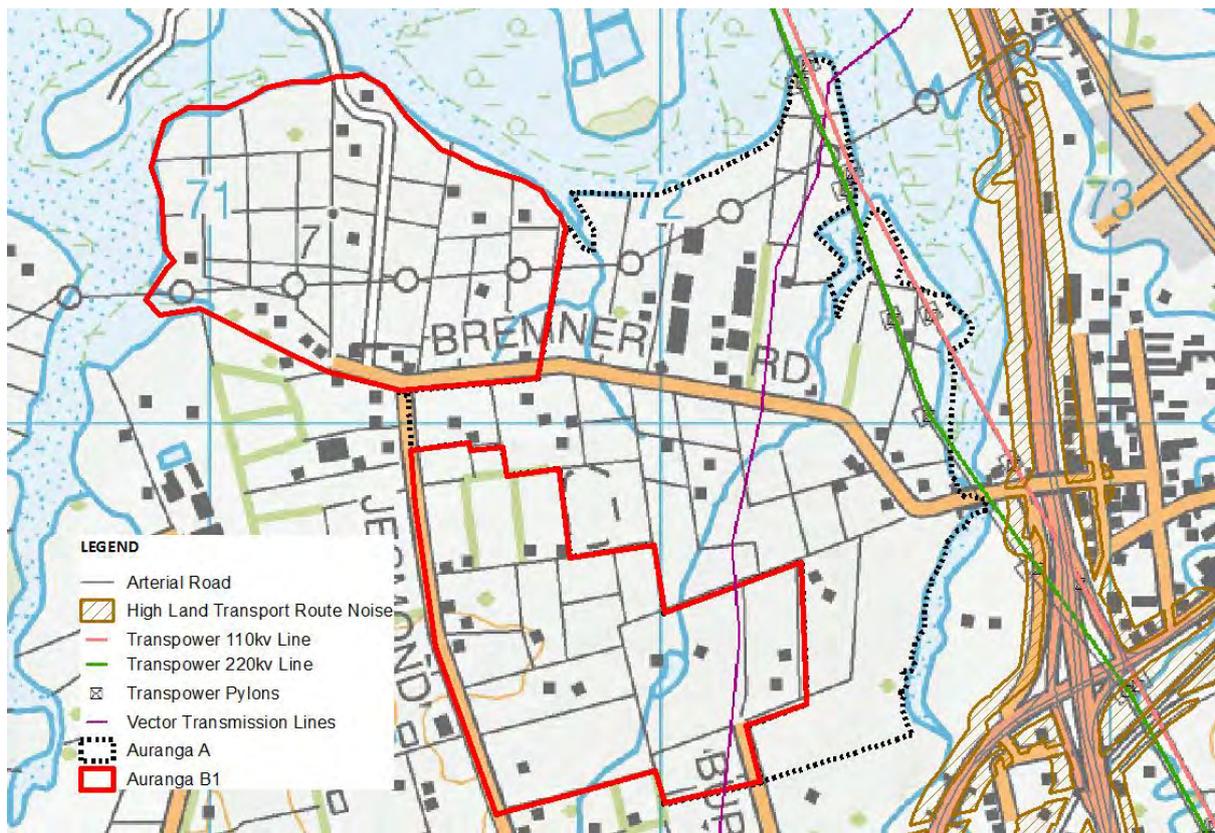


Figure 3-12: Power lines in the vicinity of Auranga B

4 Proposed changes

4.1 Proposed land use changes

The PPC is based on the precinct plan shown in Figure 4-1 includes the following:

- i Rezoning approximately 83 ha of land as Mixed Housing Suburban and Mixed Housing Urban;
- ii A precinct plan illustrating the distribution of zones and higher order road networks;
- iii Utilising the Drury 1 Precinct's hierarchy of road cross sections;
- iv Utilising the Drury 1 Precinct's subdivision rules providing for vacant fee simple lots;
- v Utilising the Drury 1 Precinct's rules to provide a subdivision pattern based on a grid based network of roads; and
- vi Utilising the Drury 1 Precinct's rules, building coverage on residential sites of up to 50% and impervious surfaces up to 70%.

The extent of public open space will be determined through Council's preferences in respect to acquisition.

4.2 Infrastructure upgrades

The existing Bremner Road and Jesmond Road will require upgrades as outlined on the cross-sections identified in the Drury 1 Precinct. The roading typologies for the Drury 1 Precinct provide for stormwater devices such as raingardens, refer to Appendix I. The details for the Drury 1 Precinct rain gardens that will provide water quality and hydrological mitigation for roads are also included in Appendix I. The same approaches will be applied for Auranga B1. The floodplains will be managed in accordance with the AUP, with the residential dwellings outside of the floodplains. It may be necessary to shape the floodplain within the green corridors. The main channels of the streams will be enhanced with riparian planting (required by the Drury 1 Precinct rules proposed to be utilised in Auranga B1), undertaken progressively with each subdivision application.

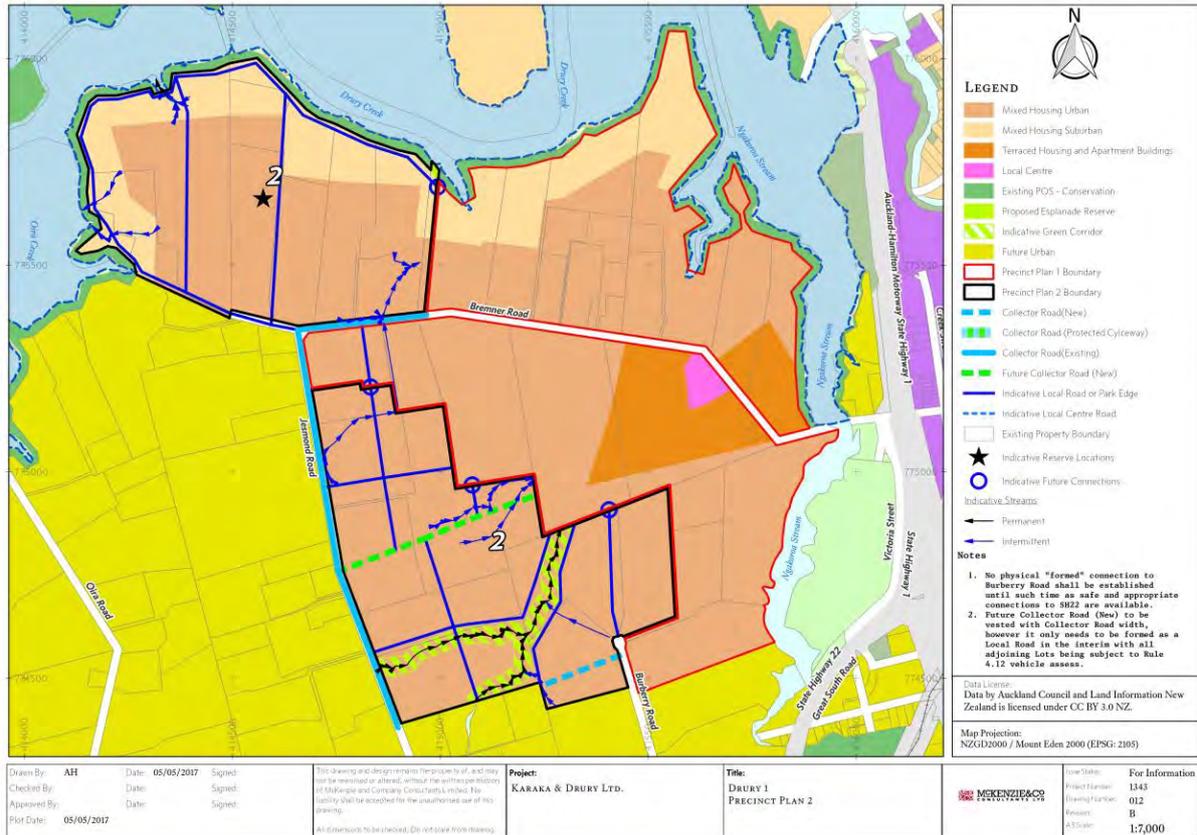


Figure 4-1 Precinct Plan for Auranga B1

5 Flood and coastal risk management

5.1 Flood hazard assessment

A flood hazard assessment has been undertaken to confirm flood levels for the PPC area. The assessment was carried out using a 2D model with 2013 LiDAR coupled with a 1D component to represent Hingaia Road Bridge. The flood modelling includes major inflows from Slippery Creek, Hingaia Creek, Ngakaroa (eastern boundary of the Drury 1 Precinct), Oira and Whangaouri Creek.

The method and assumptions used for the flood hazard assessment are detailed in the Tonkin + Taylor Auranga Flood Hazard Model Development memo, December 2015. This memo has been updated and re-issued as version 2 (memo date 05 May 2017) to show a larger extent of land that includes Auranga B1 (Appendix J).

Review comments regarding the original model were received from Council, *MODEL QA/QC-Stormwater Catchment: Auranga* (10 December 2015). These comments were addressed and no significant changes were made as a result.

The flood hazard assessment was undertaken for the Scenario 5 that included MPD, climate change, 1% AEP rain event with mean high water springs (MHWS) and 1 m sea level rise (3.1 mRL).

5.2 Existing flood risk

Information regarding the existing flood hazard is available from the Council GIS website and is discussed in section 3.2.2. The existing flood hazard has not been re-assessed as a part of this preliminary assessment. There are no buildings/dwellings at risk from flooding in the PPC area.

5.3 Flooding and coastal hazard management

The proposed development of the Auranga B1 PPC area does not change the flood hazard to buildings/dwellings in the area or downstream of it. Therefore, the focus of flood management is to protect new development from the future flood hazard.

The flood and coastal hazard management proposed to protect new development from future flood and coastal hazards is as described in Table 5-1.

Table 5-1: Flood and coastal management for Auranga B1

Proposed flood and coastal management	
Approach	Management
Avoid the floodplain (including coastal inundation)	<ul style="list-style-type: none"> Define the floodplain as Scenario 5 for the MPD, climate change, 1% AEP rainfall event and MHWS with 1 m sea level rise. Exclude development (housing, some exceptions necessary for infrastructure) from the floodplain. The floodplains will be managed within the stream green corridors, with the residential areas outside of the floodplains. It may be necessary to shape the floodplain within the green corridors, but the main channel of the streams will not be modified. Apply freeboard of 500 mm to above the flood levels in Scenario 5 for building floor levels, which will accommodate hydrological and hydraulic uncertainties.

Proposed flood and coastal management	
Approach	Management
Flood resilience infrastructure	<ul style="list-style-type: none"> Design road crossings to be flood free for Scenario 5. Update the floodplain for any hydraulic changes resulting from infrastructure at the subdivision design stage.
Maintaining the proposed subcatchments as close as possible to the existing subcatchments	<ul style="list-style-type: none"> Maintain the catchment divides for Stream A and Stream B so that more flow does not enter these and increase the floodplains and flood hazard.
Maintain overland flow paths capacity	<ul style="list-style-type: none"> Maintain or redirect overland flow paths, but provide capacity in these for MPD, climate change, 1% AEP flows.
Avoid the Coastal Erosion Hazard Zone (CEHZ)	<ul style="list-style-type: none"> Define the CEHZ. Exclude development from the CEHZ.

5.4 Proposed flood risk

The flood hazard for the Auranga B1 area is shown in Figure 5-1 and Figure 5-2. The findings of the modelling are:

- The water level range at the site for the 100 year ARI rainfall with MHWS and climate change (Scenario 5) is 4.7 – 17.5 mRL;
- Flood depths outside the Stream A (east stream) are relatively shallow;
- The flood levels predicted by the flood assessment are higher than those for the coastal inundation hazard of 4.5 mRL. The basis for the CIH coastal inundation hazard level is described further in Section 5.5. The higher flood level should be used in preference are to the coastal inundation hazard level for coastal areas.
- No buildings/dwellings are at risk of flooding.

The results show that the water levels at the site are influenced by the tide level at the Manukau Harbour and the Hingaia Road Bridge, as well as the 1% AEP floods from the contributing catchments.

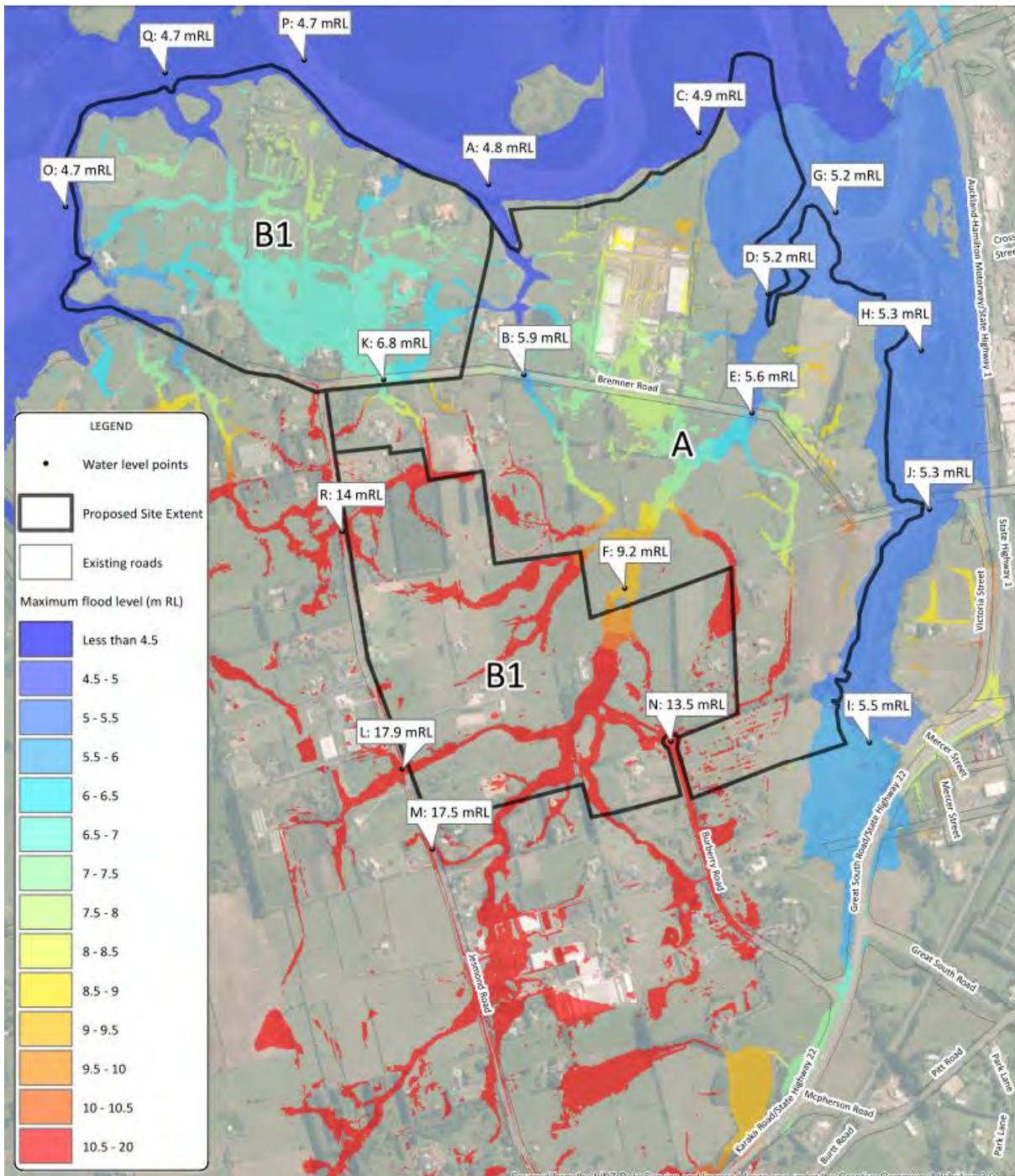


Figure 5-1: Auranga B1 – Flood hazard map - MPD, climate change, 1% AEP rain event with mean high water springs (MHWS) and 1 m sea level rise (3.1 mRL)

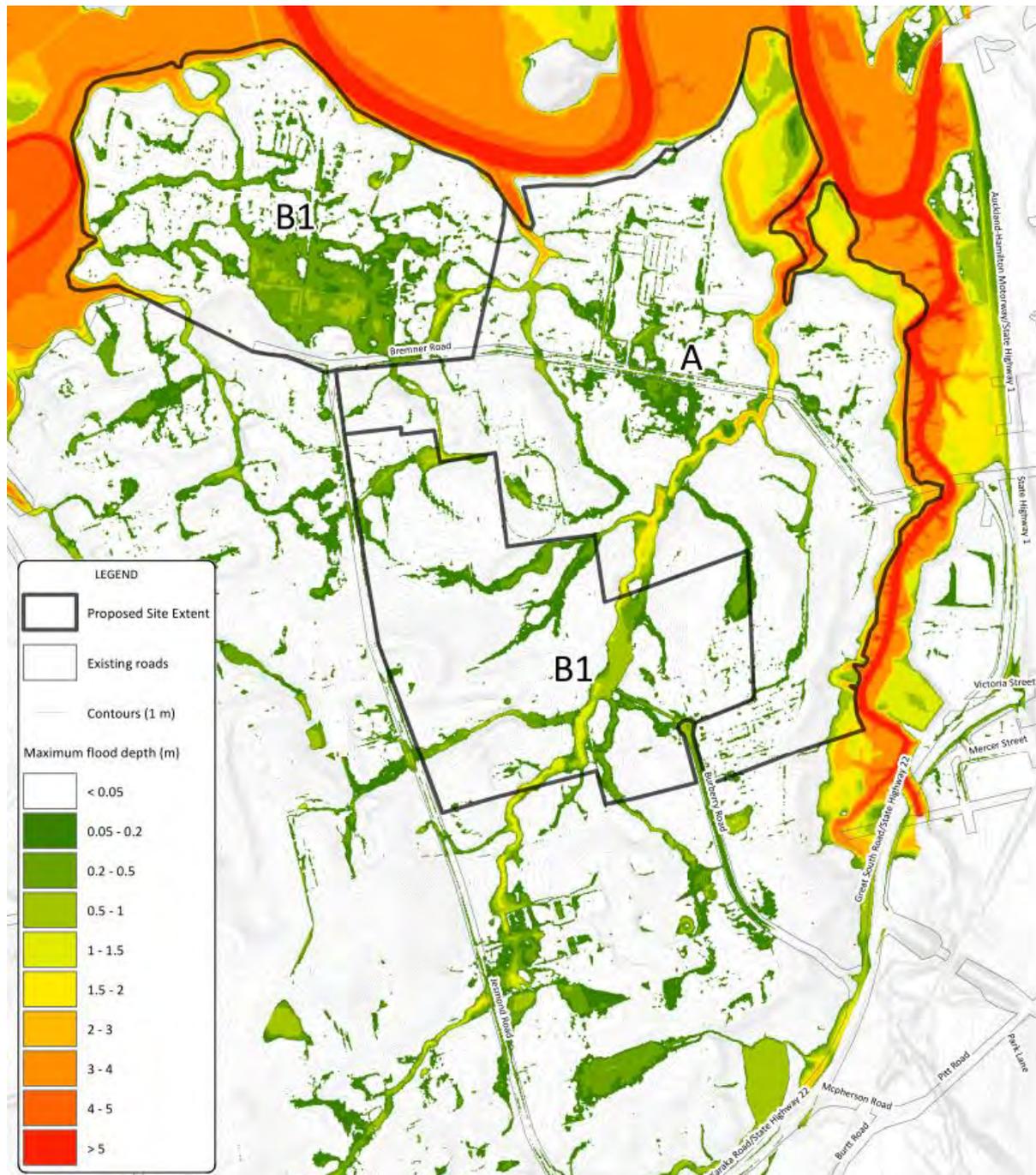


Figure 5-2 Auranga B1 – Flood hazard map for - MPD, climate change, 1% AEP rain event with 10% AEP extreme sea level and 1 m sea level rise (3.1 mRL)

5.5 Coastal hazards

The coastal inundation hazards are based on the 100 year ARI extreme tide level and an appropriate allowance for sea level rise.

Extreme tide levels were obtained from NIWA (2013) where the closest modelled site (point 66) has a 100 year ARI tide of 3.5 m RL (AVD-46). Sea level rise is added to the extreme tide for the inundation level, this was taken as 1.0 m to 2115, giving a total inundation level of 4.5 mRL.

As described in Section 5.3 the flood hazard assessment predicts higher water levels in the coastal areas due to the combination of rainfall and high sea levels than the levels predicted for the CIHZ.

Therefore the water levels for the flood hazard assessment (Scenario 5) will be taken in preference to the CIHZ.

6 Stormwater management plan

6.1 Summary of stormwater management

The detailed design of stormwater management should be based on the proposed stormwater management set out in Table 6-1. These stormwater management approaches apply to the stream and estuary receiving environments as shown in Figure 6-1.

The approach is based on Drury 1 Precinct and is supported by the assessment of stormwater management options in Appendix G.

The detailed design will also need to consider local issues and constraints such as physical constraints, ground conditions and receiving environments.

Precinct rules for stormwater management are proposed that capture the key requirements for stormwater management from this SMP and can be based on the Drury 1 Precinct rules. The Drury 1 Precinct rules related to stormwater are included in Appendix B.

Table 6-1 Auranga B1 - Summary of proposed stormwater management with requirements and BPO for stream and estuary receiving environments

		Land use		
		Roads/car parks	Other impervious, public e.g. low use roads	Other impervious, private e.g. lots
Receiving Environment Type	Stream	Water quality treatment Water quantity management (hydrological mitigation)	Water quantity management (hydrological mitigation)	Water quantity management (hydrological mitigation)
		Raingardens (roads/car parks) Stormwater network OLFP in roads Green outfalls		Rain tanks Permeable paving and communal devices (lots) Stormwater network OLFP in roads Green outfalls
	Estuary	Water quality treatment		Follow best practice based on AUP policies
		Raingardens (or equivalent) Stormwater network OLFP in roads Green outfalls		Pervious pavements for driveways/laneways Stormwater network OLFP in roads Green outfalls

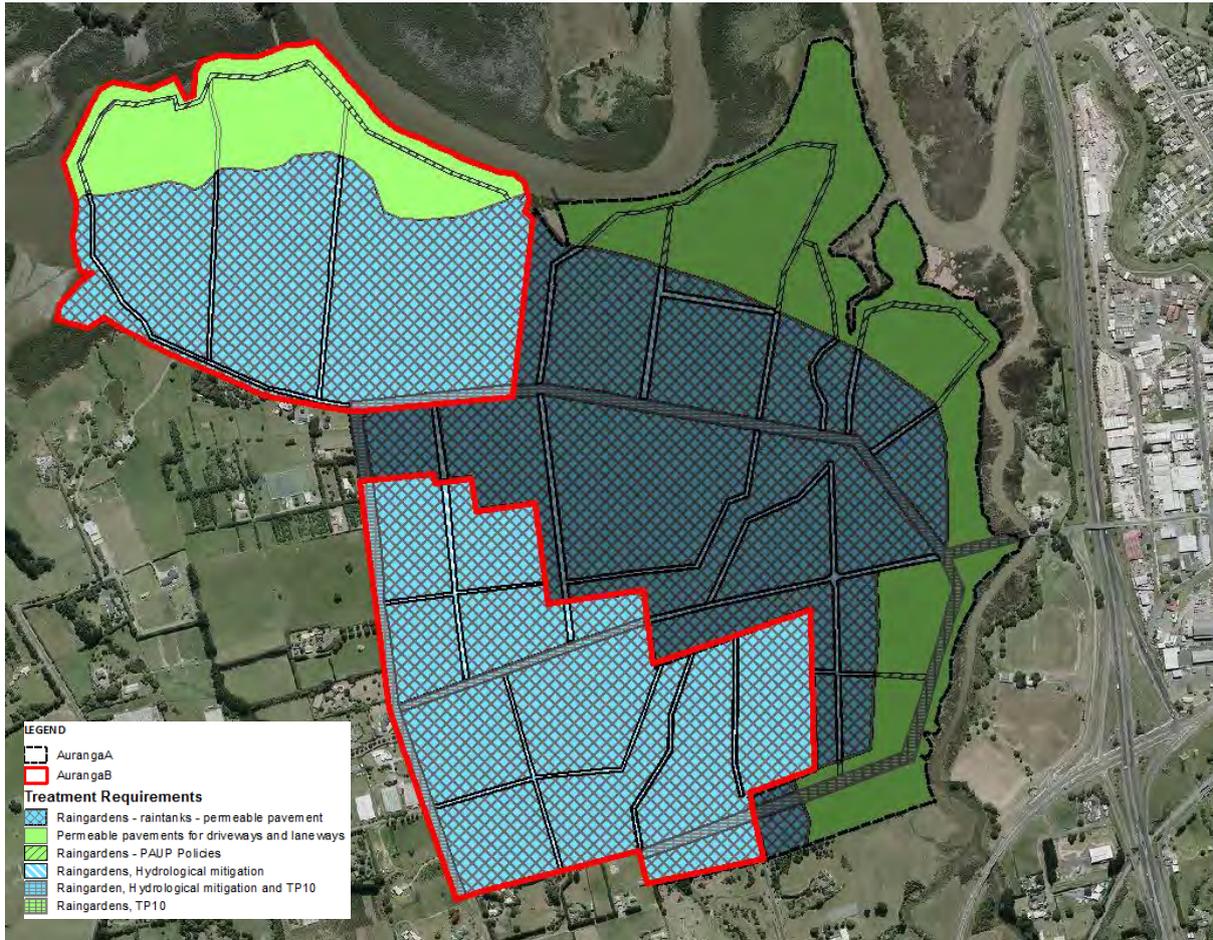


Figure 6-1: Auranga B1 - Plan of proposed stormwater management areas to be used with Table 6.1

6.2 Development areas with stormwater discharges to streams

Development areas with stormwater discharges to streams (from the runoff from impervious areas) requires water quantity (hydrological mitigation). In addition, some areas such as high use roads also require water quality treatment. It is recognised that the provision of raingardens for hydrological mitigation in low use roads will provide water quality improvement. Table 6-2 provides more details and reasons for the proposed stormwater management for these areas.

Table 6-2 Areas with stormwater discharges to streams – Options analysis and proposed stormwater management

Activity	Proposed stormwater management	Design requirements	Reason, treatment, maintenance, costs, aesthetics
High use roads and high contaminant car park	Raingardens	Quality treatment and hydrological mitigation - sized for TP10.	Raingardens addresses both stormwater quality and hydrological mitigation. They add aesthetic value to the environment and provide treatment close to source.
Other roads	Raingardens	Hydrological mitigation	Raingardens address hydrological issues and dual purpose of water quality treatment where required. They add aesthetic value to the environment and provide treatment close to source.
Residential lots <350 m ²	Combination of: Rain tanks for roof water Permeable paving for driveways and laneways Communal retention/ detention device located in rear service lanes (in applicable lots)	Hydrological mitigations	BPO based on site specific constraints, especially space constraints Rain tanks for roof water due to possible re-use for potable water Permeable paving for driveways and laneways. Communal retention/ detention device located in rear service lanes (in applicable lots) due to space constrains within lots where hydrological mitigation not achieved by other devices.
Residential lots >350 m ²	Combination of: Rain tanks for roof water Permeable paving for driveways and laneways Communal retention/ detention device located in rear service lanes (in applicable lots) Raingardens if practicable	Hydrological mitigations	BPO based on site specific constraints. Rain tanks for roof water due to possible re-use for potable water Permeable paving for driveways. Raingardens, applicable but subject to space/geotech constraints within the lots (site specific consideration). Communal retention/ detention device located in rear service lanes (in applicable lots) due to space constrains within lots where hydrological mitigation not achieved by other devices.
Stormwater outfalls to streams	Green outfalls preferred, with harder, traditional structures where there is	Minimise stream erosion	Green outfalls provide erosion protection at the discharge location and opportunity for treatment through vegetation (including temperature control).

Activity	Proposed stormwater management	Design requirements	Reason, treatment, maintenance, costs, aesthetics
	high ground levels relative to the discharge invert level.		

6.3 Development areas with stormwater discharges into the estuary

Development areas with stormwater discharges into the estuary (from the runoff from impervious areas) that are high contaminant generating, such as roads, require stormwater quality treatment. For these areas stormwater quantity management is not required. Table 6-3 provides more details and reasons for the proposed stormwater management for these areas.

Quality and quantity treatment is not required under the AUP region wide rules for low contaminant generating areas discharging to coast. The AUP objectives and policies say that greenfield sites should avoid and/or minimise effects on the environment (especially for sensitive receiving environments) as far as is practicable and apply an integrate land development and water management water sensitive design approach.

Our technical analysis (refer Appendix F) of very low use roads (<1000 vpd) found there to be relatively low level of contaminant generation, consequently a low treatment effectiveness and therefore only minor benefit from treatment of these areas. However in the development of the Drury 1 Precinct rules, Council Healthy Water and iwi requested some level of treatment to be provided to reflect the AUP policies. Karaka and Drury Limited included in the Drury 1 Precinct rules to provide stormwater treatment for low use roads (<5,000 vpd) by raingardens sized based on 2% of the contributing catchments and by permeable paving for driveways/accessways. The approach from the Drury 1 Precinct is proposed to be utilised as the stormwater management rules for the extended area into Auranga B1.

Table 6-3 Areas with stormwater discharges into the estuary – Options analysis and proposed stormwater management

Activity	Proposed stormwater management	Design requirements	Reason, treatment, maintenance, costs, aesthetics
Roads including car parking	Raingardens	Quality treatment - sized for 2% of contributing catchment	Raingardens addresses quantity issues. They add aesthetic value to the environment and provide treatment close to source.
Private driveways/laneways	Permeable pavements	Quality treatment - sized to TP10	Best practise to manage pollutants from vehicles.
Stormwater outfalls will discharge to the estuary	Green outfalls preferred, with harder, traditional structures where there is high ground levels relative to the discharge invert level.	Minimise stream erosion	Green outfalls provide erosion protection at the discharge location and opportunity for treatment through vegetation (including temperature control).

6.4 Flooding and coastal hazard management

The flood and coastal hazard management proposed to protect new development from future flood and coastal hazards is as described in Table 6-4.

Table 6-4: Flood and coastal management for Auranga B1

Proposed flood and coastal management	
Approach	Management
Avoid the floodplain (including coastal inundation)	<ul style="list-style-type: none"> Define the floodplain as Scenario 5 for the MPD, climate change, 1% AEP rainfall event and MHWS with 1 m sea level rise. Exclude development (housing, some exceptions necessary for infrastructure) from the floodplain. The floodplains will be managed within the stream corridors, with the residential areas outside of the floodplains. It may be necessary to shape the floodplain within the corridors, but the main channel of the streams will not be modified. Apply freeboard of 500 mm to above the flood levels in Scenario 5 for building floor levels, which will accommodate hydrological and hydraulic uncertainties. This will also account for the more extreme event represented by Scenario 6 for the MPD, climate change, 1% AEP flood and the 10% AEP extreme sea level with 1 m sea level rise.
Flood resilience infrastructure	<ul style="list-style-type: none"> Design road crossings to be flood free for Scenario 5. Update the floodplain for any hydraulic changes resulting from infrastructure at the subdivision design stage.
Maintaining the proposed subcatchments as close as possible to the existing subcatchments	<ul style="list-style-type: none"> Maintain the catchment divides for west and east streams so that more flow does not enter these and increase the floodplains and flood hazard.
Maintain overland flow paths capacity	<ul style="list-style-type: none"> Maintain or redirect overland flow paths, but provide capacity in these for MPD, climate change, 1% AEP flows.
Avoid the Coastal Erosion Hazard Zone (CEHZ)	<ul style="list-style-type: none"> Define the CEHZ Exclude development from the CEHZ.

6.5 Other stormwater matters

In this section the approaches to other stormwater matters are summarised.

6.5.1 Contaminated land

All contaminated sites will address the requirements the AUP and NES.

6.5.2 Subcatchments

Sub catchments will be maintained as close to the existing sub-catchments as possible, refer Table 6-4. An indicative subcatchment map is shown in Appendix E. As discussed in Section 6 the subcatchment are discharging to either the streams or estuary.

6.5.3 Stormwater infrastructure

Stormwater infrastructure is proposed to be located in the road corridor to provide easy access for maintenance. Outfall pipes are proposed to be 300 to 600 m diameter. Green outfalls are to be implemented on a site by site basis as it may not be appropriate for all sites (due to site topography and erosion potential). The subdivision applications will demonstrate the details of the approach to stormwater infrastructure that will subsequently applied across the PPC area.

6.5.4 Overland flowpaths

All roads are proposed to be a minimum of lower than all lots. Therefore, overland flowpaths are proposed to follow the roads. All flow paths are proposed to be located within public areas (roads/parks) and not private properties. Requirements for overland flow paths are included in Table 6-4.

6.5.5 Integrated stormwater management

The AUP establishes some overarching policies, including the requirement for an integrated stormwater management approach. The PPC and SMP incorporates aspects that provide an integrated stormwater management approach, which includes:

- Corridors along streams that provide a buffer to the streams to protect and retain stream habitats, manage stormwater (green outfalls) and flooding;
- Enhance the stream habitats with riparian planting;
- Protection of estuary margins;
- Setback from streams to provide flood and erosion protection;
- Setbacks from the coast to provide a buffer to the coast and for protection from erosion and coastal inundation; and
- Stormwater management as detailed above to mitigate the effects of stormwater on the environment, in particular the treatment roads and carparks and the hydrological mitigation for impervious areas discharging to streams (refer Table 6-1).

7 Applicability

This report has been prepared for the benefit of Karaka and Drury Limited with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Report prepared by:



Sarah Basheer

Water Resources Engineer

Sarah Karlsen

Water Resources Engineer

Authorised for Tonkin & Taylor Ltd by:



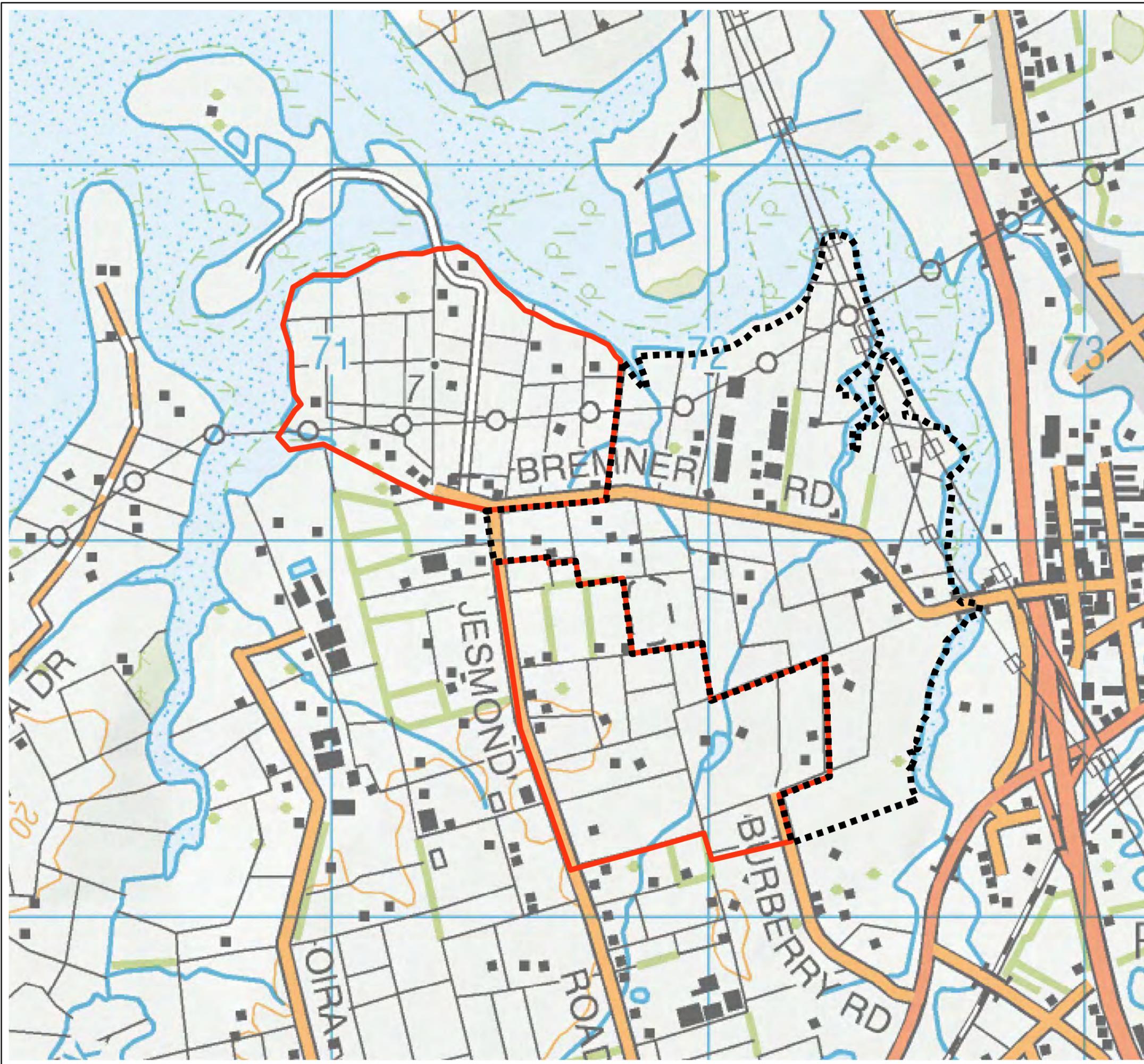
Tim Fisher

Project Director

sjk

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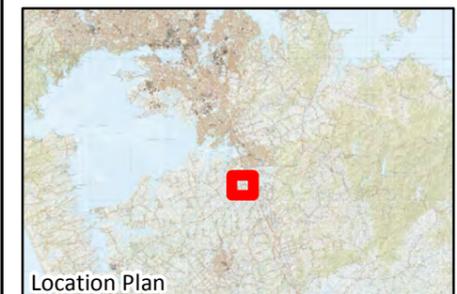
Appendix A: Report Figures in A3



LEGEND

-  AurangaA
-  AurangaB

A3 SCALE: 1:10,000



Notes:

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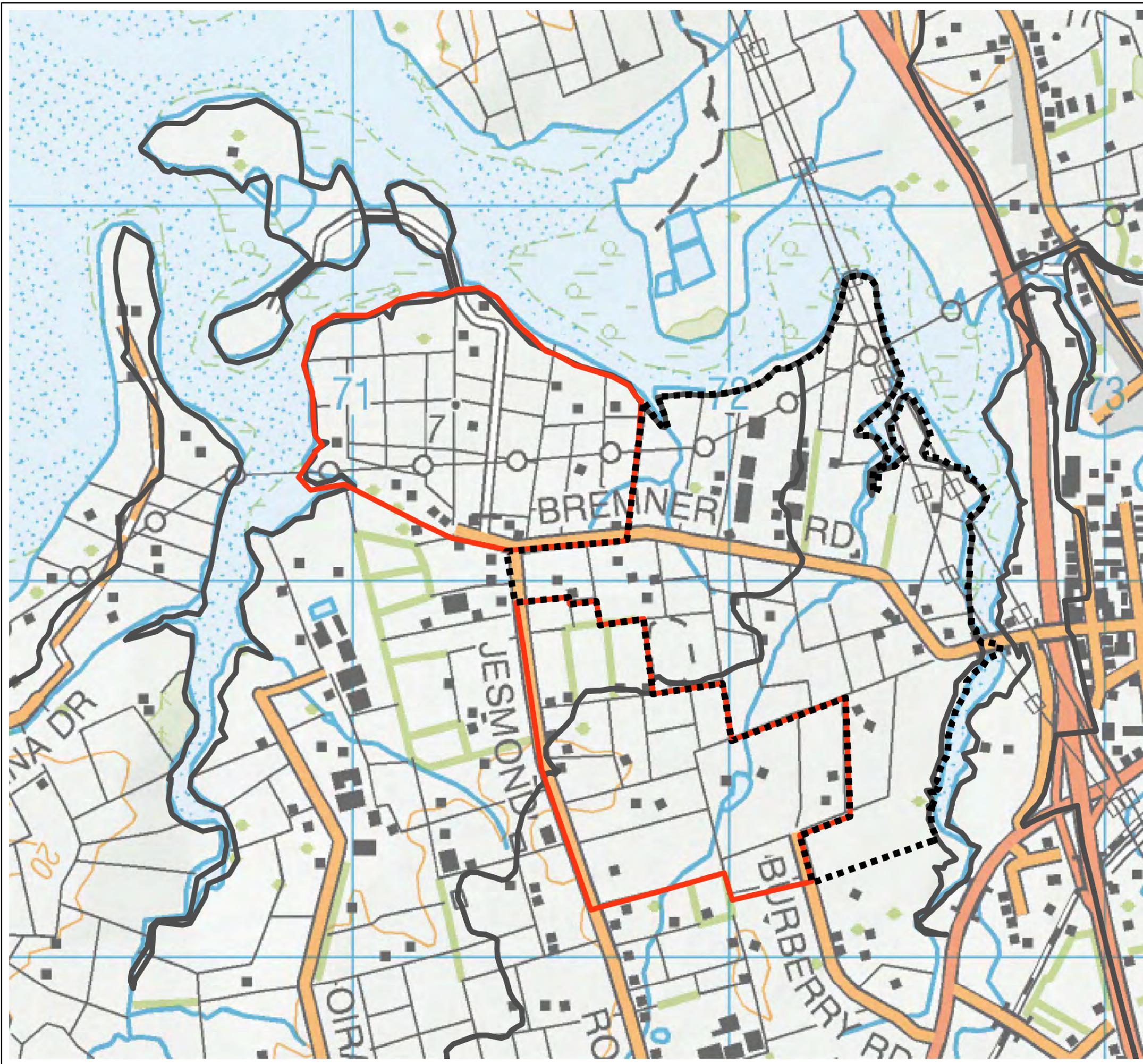


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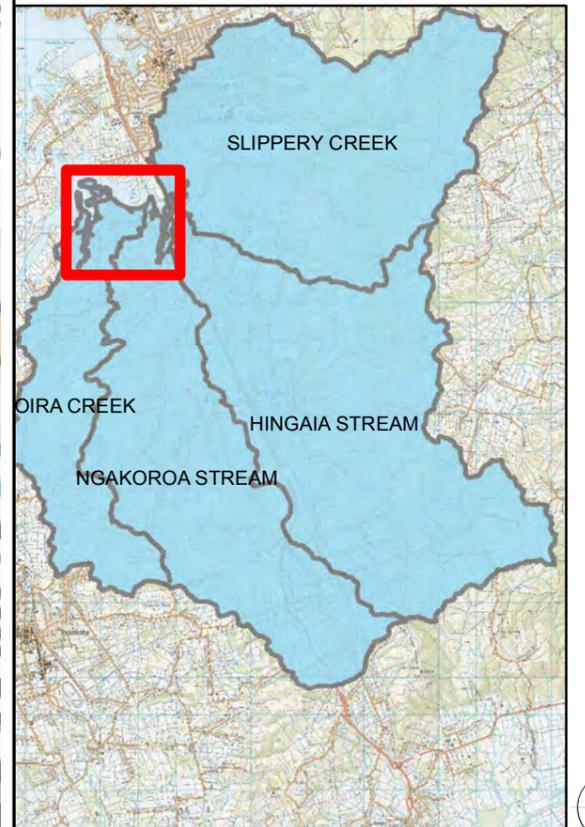
AURANGA B1
STORMWATER MANAGEMENT PLAN
Site Layout Plan

Figure 1-1



- LEGEND**
-  AurangaA
 -  AurangaB
 -  Catchments

A3 SCALE: 1:10,000



Location Plan

Notes:

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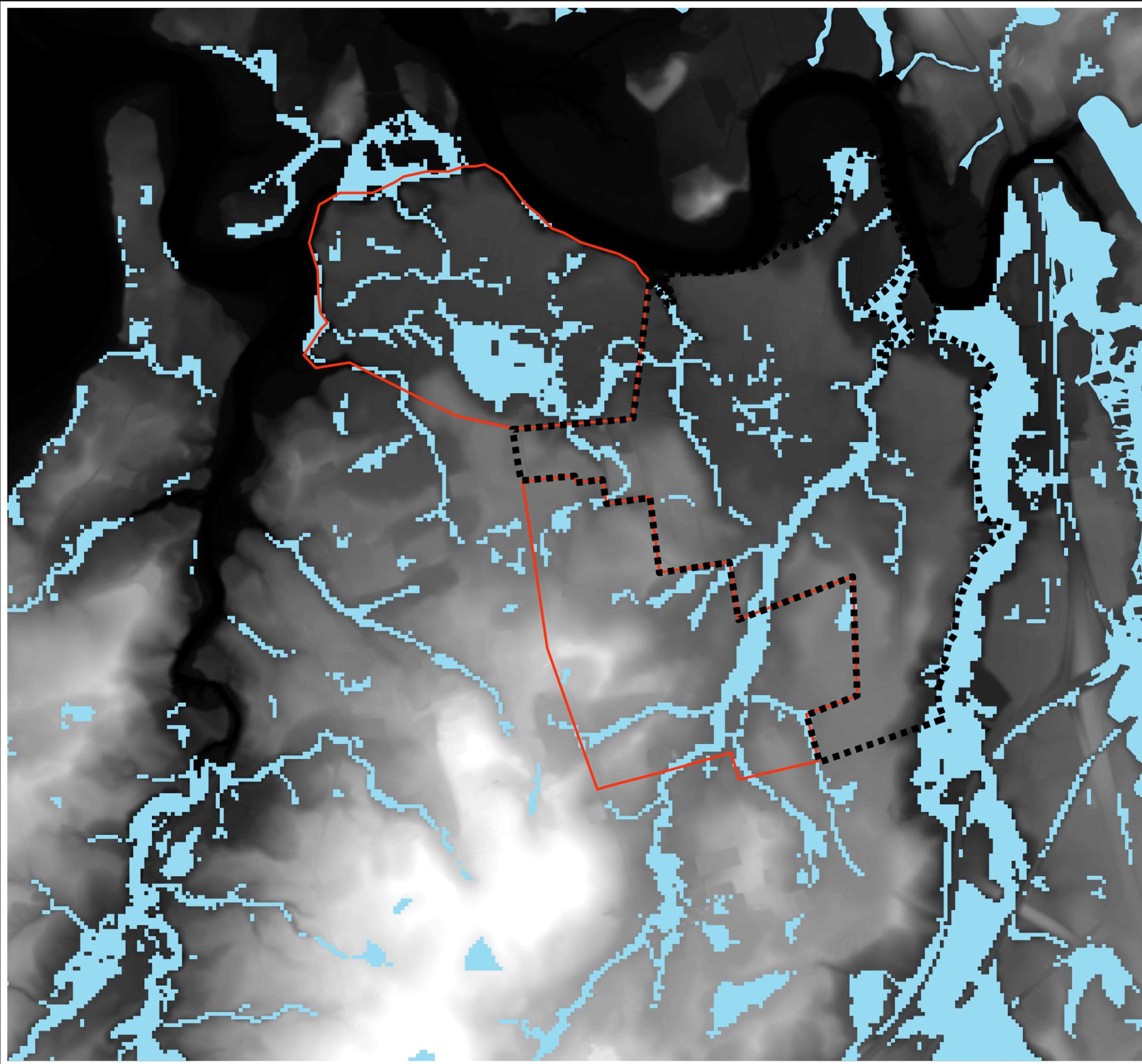
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AURANGA B1
STORMWATER MANAGEMENT PLAN
Catchments

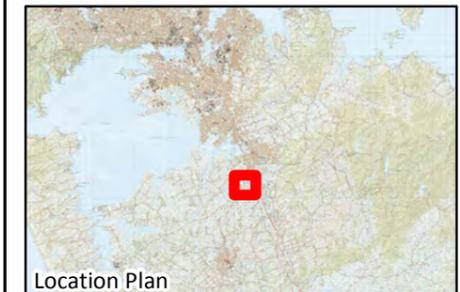
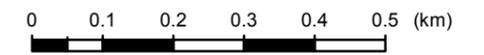
Figure 3-1



LEGEND

- AC_Published_Floodplains
- High : 30
- Low : 0
- AurangaA
- AurangaB

A3 SCALE: 1:10,000



Location Plan



Notes:

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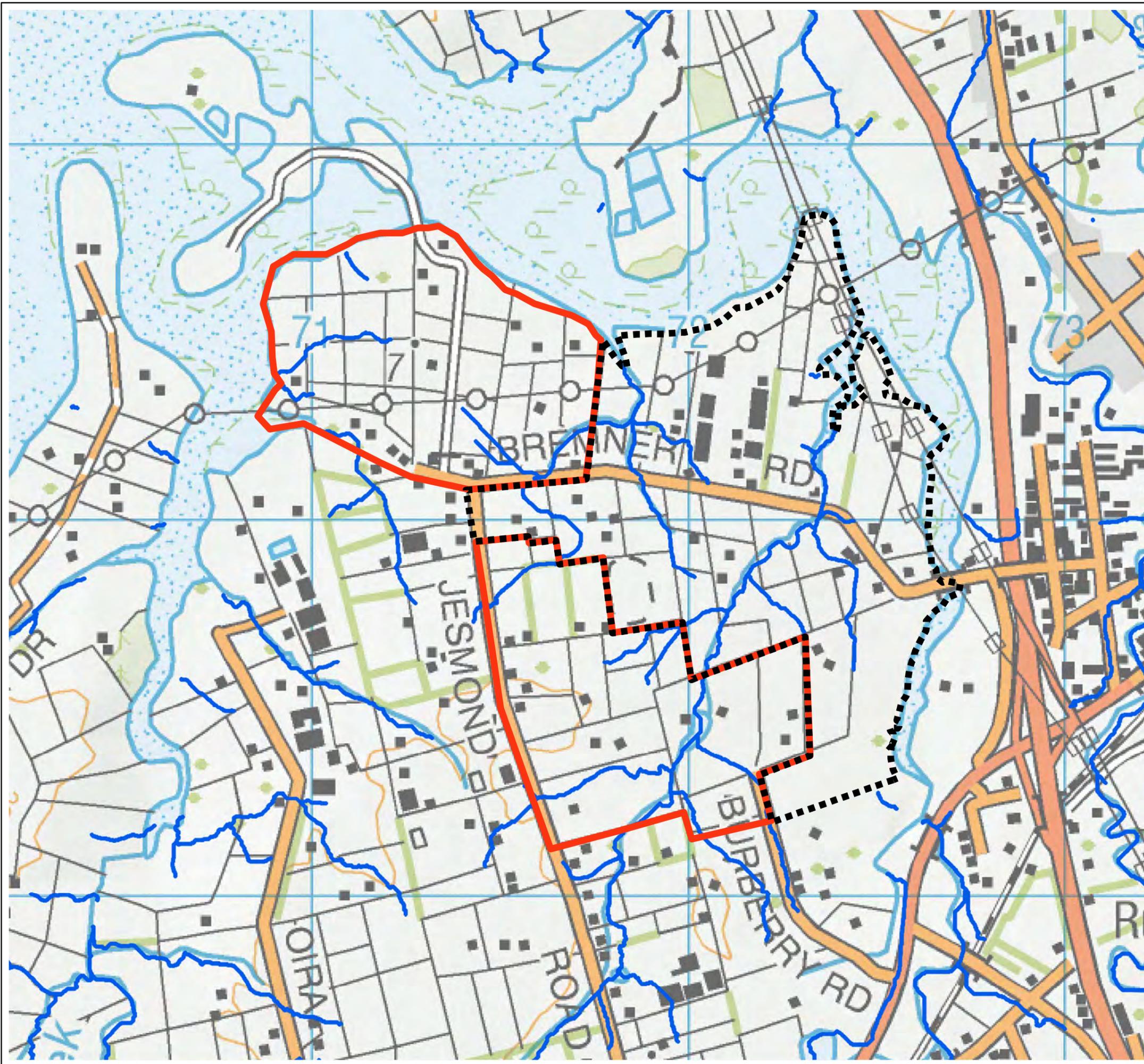
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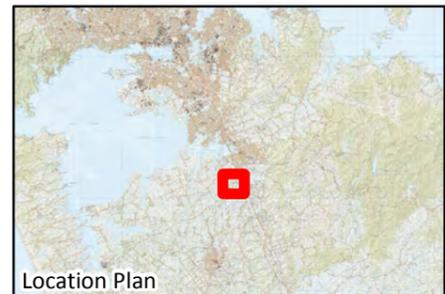
AURANGA B1
STORMWATER MANAGEMENT PLAN
Auckland Council floodplain and
Topography (LiDAR 2013)

Figure 3-2



- LEGEND**
-  AurangaA
 -  AurangaB
 -  Overland Flow Path

A3 SCALE: 1:10,000



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AURANGA B1
STORMWATER MANAGEMENT PLAN
Overland Flow Paths

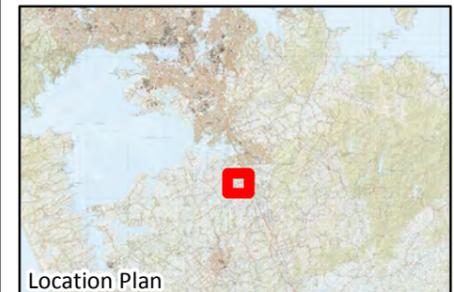
Figure 3-3



LEGEND

-  AurangaA
-  AurangaB

A3 SCALE: 1:10,000



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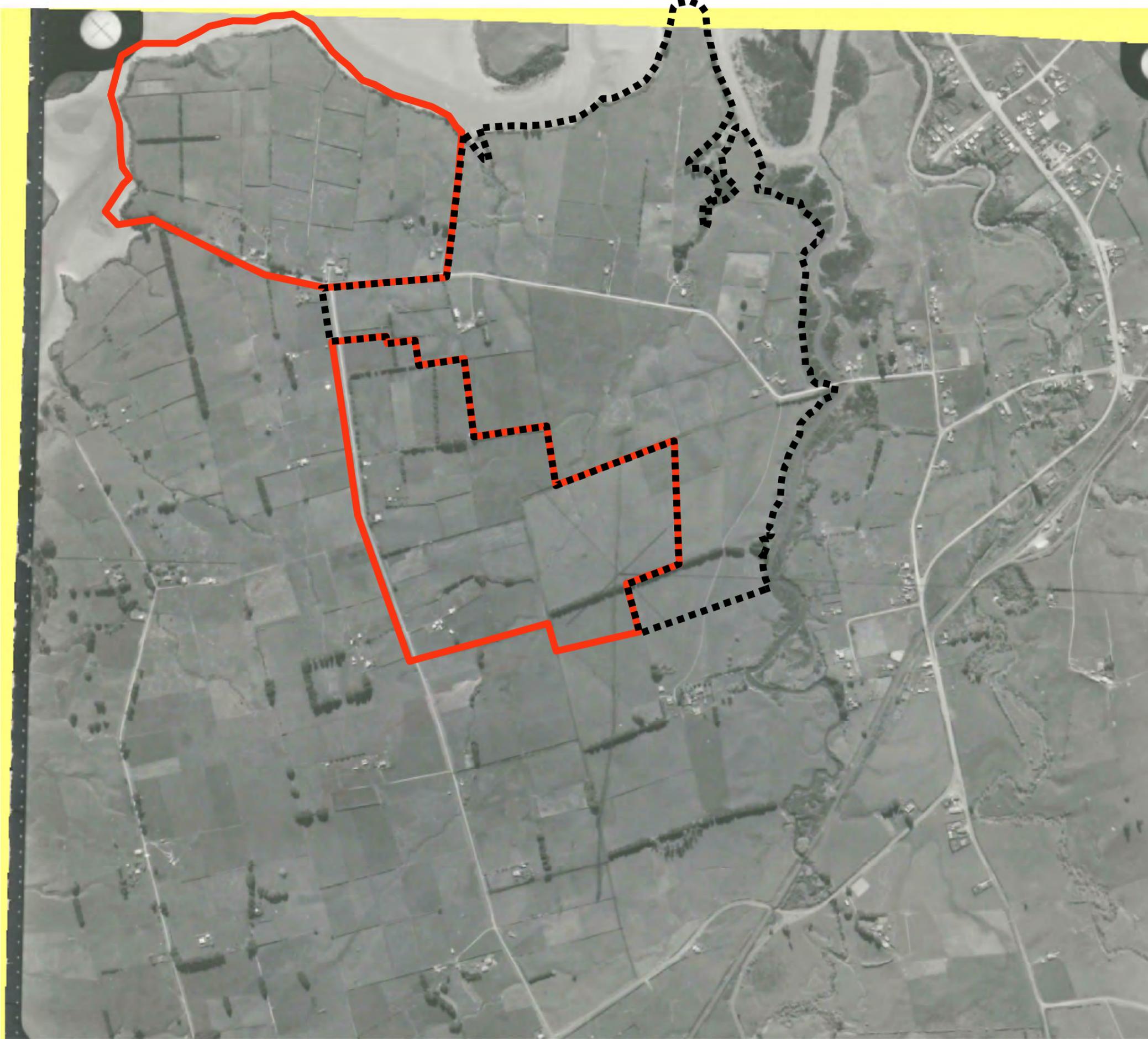


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AURANGA B1
STORMWATER MANAGEMENT PLAN
 2010 Aerial Photograph

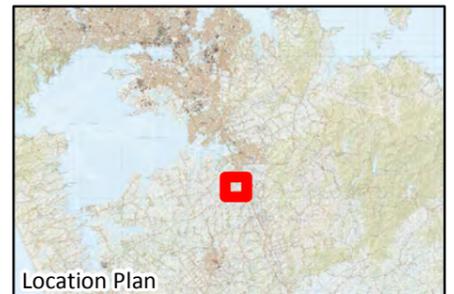
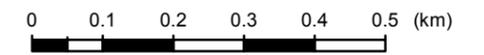
Figure 3-4



LEGEND

-  AurangaA
-  AurangaB

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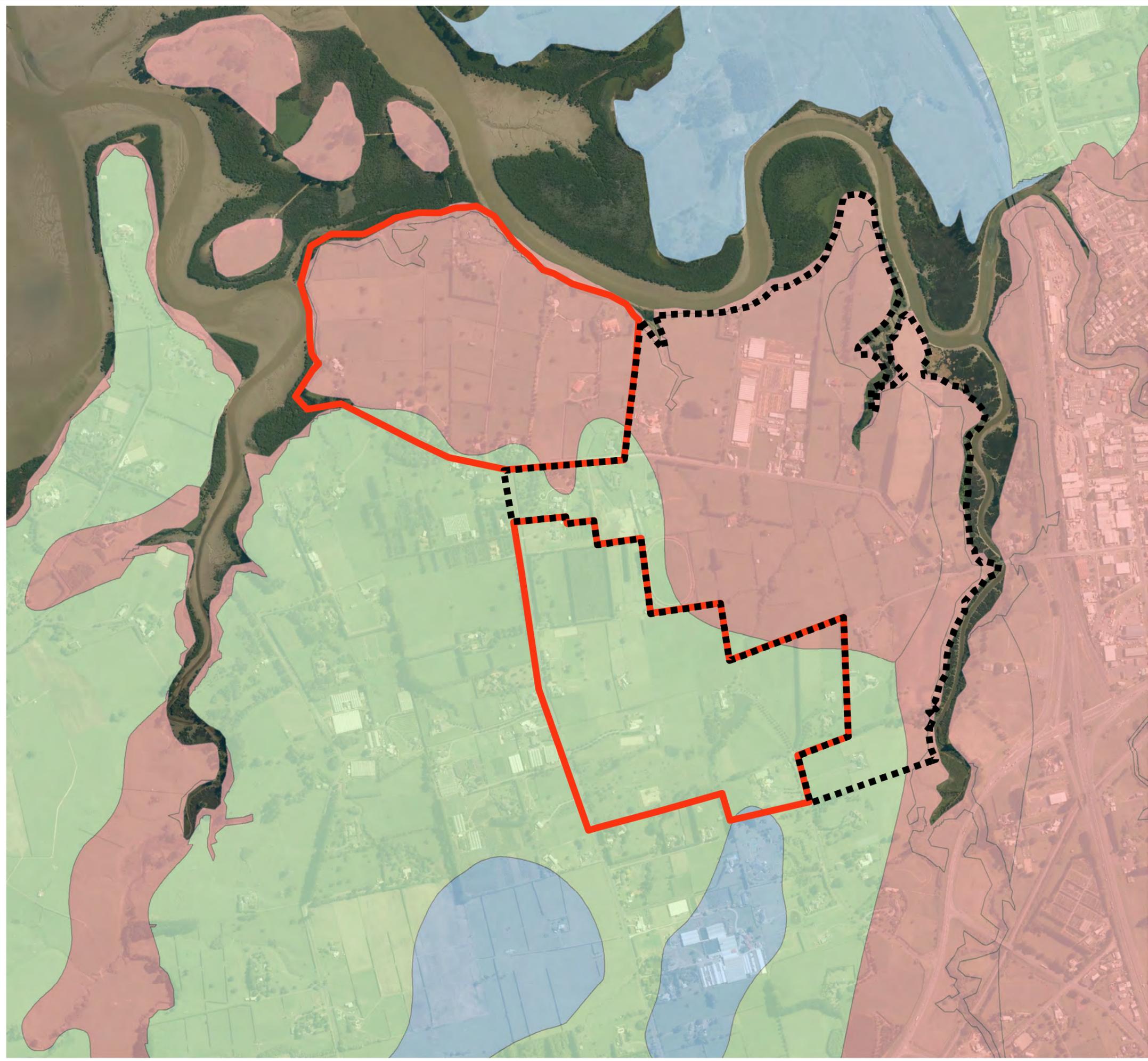
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AURANGA B1
STORMWATER MANAGEMENT PLAN
 1960 Aerial Photograph

Figure 3-5



LEGEND

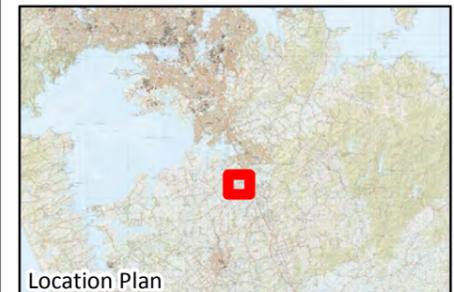
-  Auranga A
-  Auranga B1

Porosity

Porosity1

-  Imperfectly drained
-  Moderately well drained
-  Poorly drained
-  Well Drained

A3 SCALE: 1:10,000



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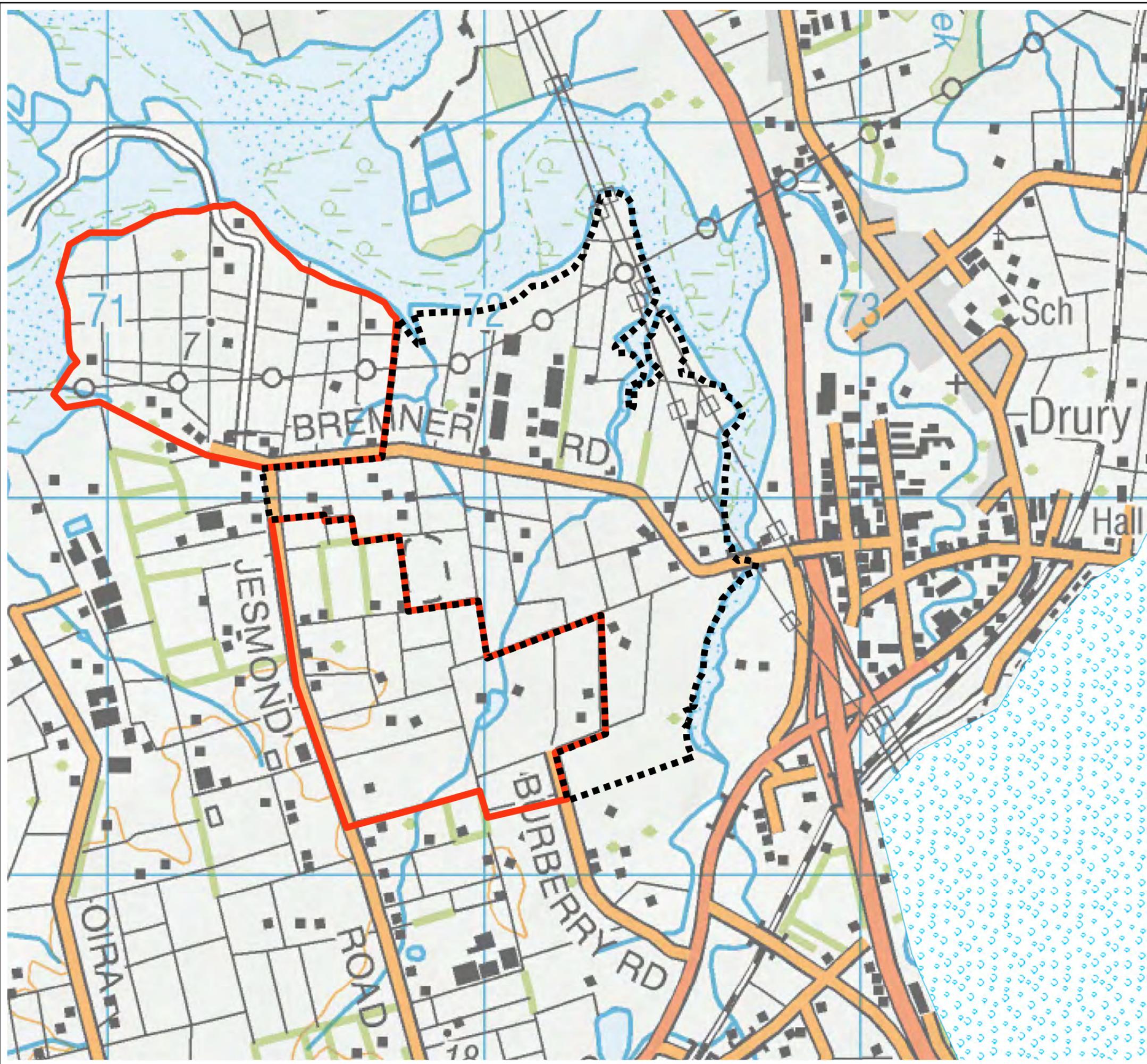
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AURANGA B1
STORMWATER MANAGEMENT PLAN
 Soil Map - (Source S-Map)

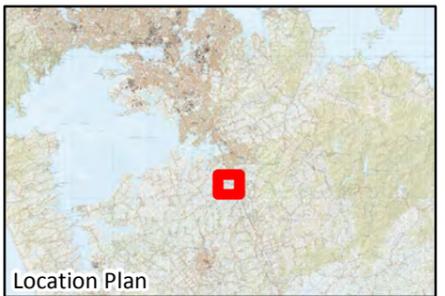
Figure 3-6



LEGEND

-  Auranga A
-  Auranga B1
-  Auckland Unitary Plan Aquifer

A3 SCALE: 1:10,000



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**AURANGA B1
STORMWATER MANAGEMENT PLAN
Aquifer**

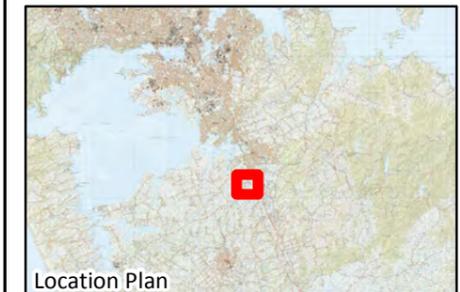
Figure 3-11



LEGEND

- Transpower Line 220 kV
- Transpower Line 110 kV
- Vector Transmission Line
- Arterial Road
- High Land Transport Route Noise
- Auranga A
- Auranga B1

A3 SCALE: 1:10,000



Notes:

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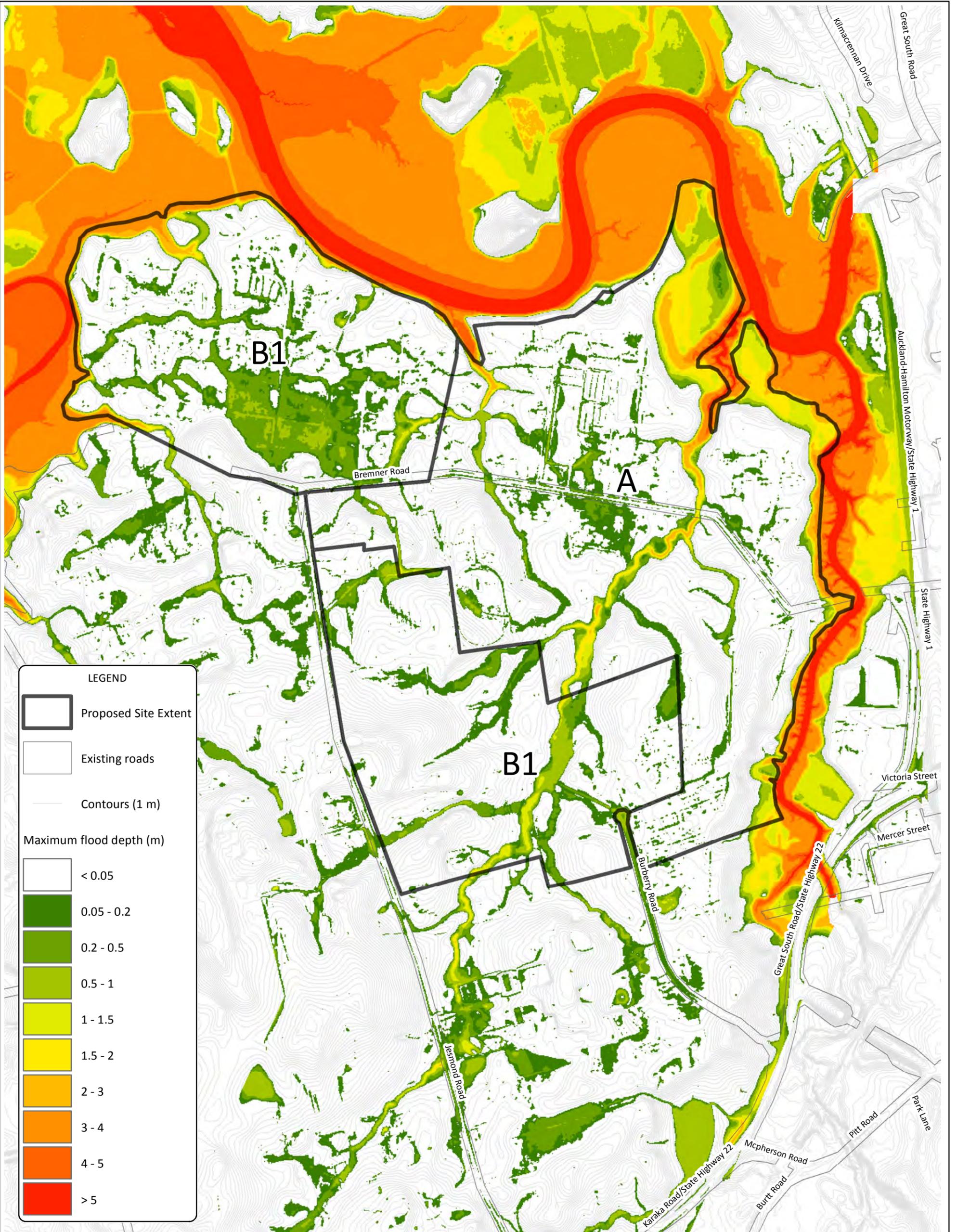


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AURANGA B1
STORMWATER MANAGEMENT PLAN
Power lines

Figure 3-12



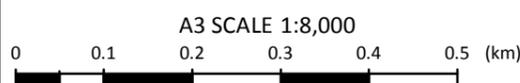
LEGEND

- Proposed Site Extent
- Existing roads
- Contours (1 m)

Maximum flood depth (m)

- < 0.05
- 0.05 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- > 5

Notes: Road alignments sourced from Land Information New Zealand data as at 21/03/2017 (Crown Copyright Reserved).



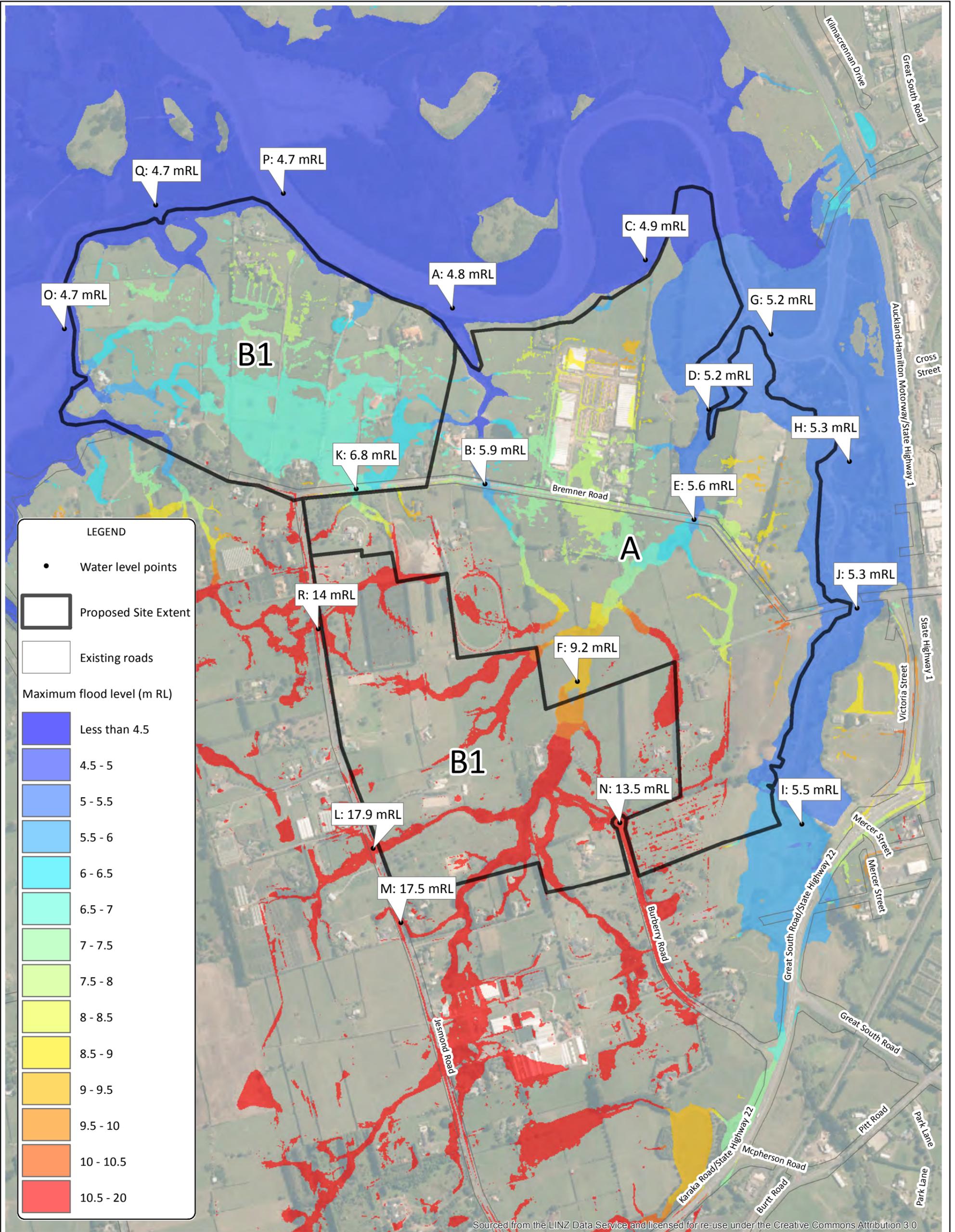
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AURANGA B1
FLOOD DEPTH MAP
 Model results - MPD 1% AEP with climate change and 3.1 mRL tailwater

FIGURE No. **Figure B1**

Rev. **0**



LEGEND

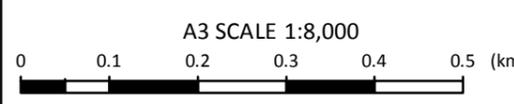
- Water level points
- ▭ Proposed Site Extent
- ▭ Existing roads

Maximum flood level (m RL)

Less than 4.5
4.5 - 5
5 - 5.5
5.5 - 6
6 - 6.5
6.5 - 7
7 - 7.5
7.5 - 8
8 - 8.5
8.5 - 9
9 - 9.5
9.5 - 10
10 - 10.5
10.5 - 20

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Notes: Road alignments sourced from Land Information New Zealand data as at 21/03/2017 (Crown Copyright Reserved).



Tonkin+Taylor
105 Carlton Gore Rd, Newmarket, Auckland
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DRAWN	SJN	Mar.17
CHECKED	SGB	May.17
APPROVED	TSRF	May.17
ARCFILE	1001534_B02.mxd	
SCALE (AT A3 SIZE)	1:8,000	
PROJECT No.	1001534	

**AURANGA B1
FLOOD DEPTH MAP**
Model results - MPD 1% AEP with climate change and 3.1 mRL tailwater

FIGURE No. **Figure B2**

Rev. **0**

Appendix B: Drury 1 Precinct Rules

Decisions following the hearing of concurrent applications for a variation to the Proposed Auckland Unitary Plan and a qualifying development under the Housing Accords and Special Housing Areas Act 2013

Subject

Application for a variation (Plan Variation 15) to the Proposed Auckland Unitary Plan under section 61, and an application for a qualifying development resource consent under section 25, of the Housing Accords and Special Housing Areas Act 2013 by Karaka and Drury Consultant Ltd for the approved Bremner Road Special Housing Area at 121 Bremner Road, 132 Bremner Road, 138 Bremner Road, 144 Bremner Road, 160 Bremner Road, 207 Bremner Road, 213 Bremner Road, 229 Bremner Road, 235 Bremner Road, 241 Bremner Road, 245 Bremner Road, 249 Bremner Road, 251 Bremner Road, 253 Bremner Road, 259 Bremner Road, 260 Bremner Road, 263 Bremner Road, 269 Bremner Road, 312 Bremner Road, 322 Bremner Road, 330 Bremner Road, 31 Burberry Road, and 37 Burberry Road.

The Qualifying Development by Karaka and Drury Consultant Ltd for vacant lot subdivision of 51 residential lots, including the provision of an esplanade reserve, drainage reserve, with associated roads, infrastructure, landscaping and earthworks at 109R, 121, 132 & 160 Bremner Road and 31 Burberry Road.

The hearing was held 27 July 2016 at Manukau.

Pursuant to Section 61 of the Housing Accords and Special Housing Areas Act 2013, Proposed Plan Variation 15 to the Proposed Auckland Unitary Plan is APPROVED SUBJECT TO MODIFICATIONS.

Pursuant to Section 25 of the Housing Accords and Special Housing Areas Act 2013, resource consent for the qualifying development application (Council references JSL/2016/1855 and REG/2016/1856) is GRANTED.

The full decisions are set out below.

Accord Territorial Authority Hearings Panel of Independent Commissioners:

Barry Kaye (Chair)

Kitt Littlejohn

Murray Kay

Council Officers and Technical Advisers

Alina Wimmer – Lead Project Planner, Masterplanning

Ila Daniels – Lead Project Planner

Chris Butler – Principal Urban Design

For the Applicants

Simon Berry and Helen Andrews – Counsel

Charles Ma - Applicant

Ian Munro – Urban design

Mark Tollemache - Planning

For Submitters

None present.

Decisions of the Commissioners

Introduction

These decisions follow a public hearing of concurrent applications made on behalf of Karaka and Drury Consultant Ltd under the Housing Accords and Special Housing Areas Act 2013 (HASHAA) for a variation to the Proposed Auckland Unitary Plan (PAUP) and a qualifying development (QD) resource consents to facilitate the Bremner Road Special Housing Area (SHA) at Drury. Ultimately this development will provide for approximately 1,350 dwellings with 51 proposed for the first qualifying development.

The Bremner Road SHA was approved as part of the Auckland Council's tranche 6 and 9 special housing areas and formally established by an Order in Council in August 2015 and February 2016 respectively. The applications under consideration in these decisions are confined to the approved SHA site.

The proposed Plan Variation (PV) seeks to re-zone 84.62ha of land from Future Urban Zone to a combination of Terrace Housing and Apartment Building, Mixed Housing Urban, Mixed Housing Suburban, and Local Centre zones and establishing the Drury 1 Precinct.

The associated QD application is made under section 25 of the HASHAA and relies on the PV being approved. Both applications satisfy the Schedule 4A Part 2 criteria for "qualifying developments" for the purposes of the HASHAA – which states as follows:

Maximum number of storeys that buildings may have:	6
Maximum calculated height that buildings must not exceed:	27 metres
Minimum number of dwellings to be built:	50, for developments on land zoned Future Urban in the proposed Auckland combined plan; or
Percentage of dwellings that must be affordable dwellings:	For developments relating to 15 or

more dwellings only —

(a) 10%, according to criteria A; or

(b) 5%, according to criteria B.

The application is made under Criteria A for the QD. There is no dispute that the QD satisfies the application criterion.

Section 71 of the HASHAA requires that when concurrent PV and resource consent applications are heard together, a decision on the variation must be made before any decision on the resource consent can be made (mainly because the zoning of the land and/or classification of some of the proposed activities could change if the variation is approved). We confirm that is the process we have followed both in making our decision and in the recording of it.

After the introductory and descriptive sections which are common to both applications, this decision document is then generally divided into two parts: first the discussion and decision relating to the plan variation followed by consideration of and a decision on the QD consent applications. As the applications are interconnected, with the QD consent aspects being wholly reliant on the variation being approved, it is appropriate to issue one comprehensive decision covering both. This format will also avoid duplication.

In the same manner the Council planners' report prepared by Ms Wimmer and Ms Daniels of the Development Project Office (DPO) addressed the applications with, where appropriate, a combined commentary and assessment of certain issues. For convenience we refer to their combined document as "the Council's report".

The applications along with the reasons for them were described in considerable detail in the application materials and again in some depth in the Council's report. As a result it is not necessary for much of that detail to be repeated except to the extent that it relates directly to the issues under discussion. Avoiding duplication has also aided us in releasing the decisions in accordance with the relatively short timetables imposed by the HASHAA.

The site and surrounding area

Chapter 2.2 of the combined report helpfully describes the general locality and area of the site as follows:

The Bremner Road SHA area is bordered by Drury Creek in the north, southern motorway to the east SH22 (Karaka Road) to the south and Jesmond Road to the west. The site is largely gently rolling terrain, with coastal frontage to the upper estuary reach of Drury Creek. The current land use is rural, lifestyle blocks and horticulture.

The land is characterised by flat to gently rolling pastoral landform, extending down towards the coastal and estuarine edge. To the north of Bremner Road the land is predominantly flat and elevated approximately 5m above sea level. Land on the southern side of Bremner Road is typically more undulating and more elevated to a height of approximately 10-15m. Two permanent watercourses dissect the pastoral land, both originating within the site and flowing north towards the coastal edge.

To the east of the SHA, on the eastern side of the Ngakoroa Stream, is the elevated corridor of the Southern Motorway (SH1), comprising a strong linear feature with its associated near continuous movement of vehicles. The linear corridor of the motorway is also reinforced by the double alignment of the high voltage transmission line corridor, which runs almost in parallel with the motorway before traversing the Ngakoroa Stream, the eastern part of the site before crossing the Drury Creek north towards the Otahuhu substation.

Bremner Road provides the main direct east-west access through the site from Drury and the Drury industrial area via the motorway overbridge and the Ngakoroa Stream bridge to the area of rural residential development to the south of Drury Creek.

The proposals

PV15

The proposed PV seeks to re-zone 84.62ha of land from Future Urban Zone to a combination of Terrace Housing and Apartment Building, Mixed Housing Urban, Mixed Housing Suburban, and Local Centre zones and establishing the Drury 1 Precinct.

It is proposed to vary the underlying PAUP zones to:

- Retail including dairies in the Terrace Housing and Apartment Buildings zone would change from a restricted discretionary activity in PAUP to become a non-complying activity in the precinct
- The activity table provides for a single circuit electricity overhead line up to and including 110kV within roads and unformed roads
- The precinct introduces a new rule related to a performance standard for treatment of stormwater from impervious areas excluding roads.
- Activities that are unable to comply with the stormwater performance standard are a restricted discretionary activity.
- The density provisions of the underlying Mixed Housing Suburban zone are altered to allow for an average density of 200m² per dwelling where a parent site has a minimum net site area of 1000m² and a 20m wide frontage
- No density limits apply for four or more dwellings in the Mixed Housing Urban zone where a parent site has a minimum net site area of 1000m² and the site has a 20m wide frontage
- Affordable housing provisions are introduced that “carry across” the HASHAA provisions and are intended to apply to qualifying developments made after HASHAA expires

PV15 also introduces specific development controls that apply to the precinct only:

- Introduces a new rule on building height that provides for a maximum building height of 8m with the ability for 50% of a building's roof elevation (pitched roof) to reach a height of 9m
- Varies the height in relation to boundary control from the underlying zone to allow for zero lot boundaries
- Varies the minimum yards by providing for 8m rear yards, or part of a building up to 5m in height within the rear yard provided that it is no closer than 3m from the rear boundary. The rear yard does not apply to a building up to a height of 7m where the site adjoins a rear lane (access lot).
- Maintains the riparian and coastal protection yards at 10m
- Provides for 40 percent building coverage for sites over 400m² net site area and 50 per cent building coverage for sites 400m² or less
- Introduces a new rule that creates a maximum impervious site area of 70%
- Reduces the dwellings fronting the road control to reduce front façade glazing from 30% to 20%
- Alters the garages rule to allow for 50% of the width of the front façade of a dwelling to be taken up by the garage and no garage on the road frontage for rear lane development
- Introduces a vehicle access rule that requires rear lane development for sites fronting a road with a 3m shared footpath or infringements are a non-complying activity
- Introduces a development control for stormwater management with a related performance standard i.e. provide for retention (volume reduction) and detention (temporary storage) of stormwater from impervious surfaces
- Introduces a new maximum building height of 11.5m for the Mixed Housing Urban zone
- Introduces a new height in relation to boundary controls that creates zero lot lines except for those parts of the building that are within the 8m rear yard, 55 degrees for north boundaries, 45 degrees for east or west boundaries and 35 degrees for southern boundaries
- No more than two gable end/dormer roof projects are allowed for every 6m length of the site boundary
- The front, side yard, riparian and coastal protection yards are the same as in the underlying Mixed Housing Urban zone except that there is an 8m rear yard. The new rear yard rule allows a single storey building (or part of the

building) up to 5m in height within the rear boundary so long as it is no closer than 3m from the rear boundary.

- Introduces a new maximum impervious area control of 70 per cent
- Provides for 40 percent building coverage for sites over 400m² net site area and 50 per cent building coverage for sites 400m² or less
- There is a new minimum landscaped area rule that provides for landscaping for a minimum of 30% of the net site area, with at least 50% of the front yard comprised of landscaped area
- Alters the garages rule in the Mixed Housing Urban zone to allow for 50% of the width of the front façade of a dwelling to be taken up by the garage and no garage on the road frontage for rear lane development
- Introduces a vehicle access rule that requires rear lane development for sites fronting a road with a 3m shared footpath and makes infringements a non-complying activity
- The subdivision rules provide for development in accordance with the precinct plan or in accordance with an approved or concurrent subdivision and land use consent as a restricted discretionary activity
- Vacant lot subdivision in all residential zones requires a minimum site size of 325m² where there is a minimum front site width of 12.5m or more
- Vacant lot subdivision with a minimum site size of 260m² where the site has a minimum front width of 10-12.49m, and the alternative front site is complied with, and the site's frontage is not to a road on the north-west to north-east boundary
- There are no minimum site sizes where subdivision is proposed as part of an integrated land use consent or to subdivide an approved land use consent for a residential development
- Introduces a lot/site size dimension table
- There is a new rule on "movement network" that specifies a maximum block length and perimeter, establishes road cross-sections
- Duplicates site access and stormwater management rules from the land use control section into the subdivision section
- Provides for 10m riparian margin planting of 10,000 plants per ha
- Cross-references to the Order in Council affordable housing provisions applying to applications containing 15 or more vacant sites or dwellings.

- The precinct also includes specific controls, an activity table, notification and subdivision controls related to the electricity transmission corridor

Further details of what is sought are contained in the PV15 application.

QD

A description of the proposed works is set out in full in Section 1.0 of the *Qualifying Development (QD) subdivision and associated works* (hereafter referred to as the AEE) prepared by Mr Mark Tollemache and Ms Fion Tang, with the Subdivision and Engineering Plans and Design Statement contained in Appendices 1 of the QD.

The proposed QD application for land use, subdivision and a discharge consent at 109R, 121, 132 & 160 Bremner Road and 31 Burberry Road, Drury. Consent is sought for the following:

At 31 Burberry Road, 132 and 160 Bremner Road, the principal site for the QD, the following works are sought:

- The scheme includes 51 vacant residential lots ranging in size from 260m² to 2,133m² with a balance lot of 1.16ha. The total lots being “affordable dwellings” are five which equates to 10% with rounding. The proposal seeks consent for two access lots as well, being Lots 301 and Lots 302.
- A 1.03ha esplanade reserve (Lot 100) and a local purpose recreation reserve (Lot 101) are provided along the coastal edge. This esplanade has a minimum width of 20m and is topped up to slightly more in width by the local purpose recreation reserve lot. The esplanade will be planted out in accordance with the landscape concept to be agreed by Council Parks and Ecologist. All these works will be completed by the applicant at no cost to Council.
- Five internal roads will be vested within Council, being Road 22, 23, 26, 27 and 28 (Lot 300). Road 22 is the principal access road in the development with Roads 23, 26 and 27 providing future access points to the western parts of the plan variation area.
- The new internal roading network has been designed in accordance with the PV cross sections with footpaths, on-street parking bays, rain gardens, vehicle crossings, street trees and street lighting on both sides.
- Bulk earthworks across the site provide for a cut to fill volume of 38,000m³ over an area of 6.9ha. This quantum includes the minor earthworks at 31 Burberry Road, 121 and 160 Bremner Road. The earthworks sought do not take into account or rely on the works under the bulk earthworks consent being given effect to, but each are instead standalone consents. The agent Mr Mark Tollemache has advised that they would not be giving effect to both and that the bulk earthworks consent is largely required for tendering reasons.
- The provision of internal pipe network for the site for both storm water, water and waste water. This network would connect into the bulk supply points for waste and water being delivered by the other consents identified in section 1.4 of the report.

- It is noted that the AEE identifies that a temporary three day water supply storage was sought at 31 Burberry Road on the scenario that the network to Hingaia had not yet been completed. This storage would have required the installation of four tanks (11m dia x 6m high) on a concrete platform with a small pump station. However, Mr Mark Tollemache has since confirmed that this is now not required nor sought as part of the application.
- Given no Network Discharge Consent (NDC) currently exists for the catchment a private stormwater discharge consent is sought for the storm water flows from the new network including the provision of two new outlets within the esplanade reserve discharging to Ngakaroa Stream. The proposal also includes the creation of a new drainage lot (Lot 102).

It is also intended to undertake works at 121 Bremner Road, being:

- Undertake upgrading and widening works within Bremner Road which will include the vesting of additional land (Lot 100) for road reserve and a balance lot for 121 Bremner Road. There is a separate Scheme Plan for this subdivision.
- The earthworks required for the works within the existing road reserve of Bremner Road and within 121 Bremner Road for the widening works are 5,923m², with a cut of 2,513m³ and fill of 1,550m³.

It is also intended to undertake works at 109R Bremner Road (existing esplanade reserve), being:

Earthworks over 365m² and 700m³ fill to create a gradual batter from Bremner Road into the esplanade reserve. Please note that the AEE has included a right of entry approval from the Franklin Local Board.

Notification and Submissions

Limited notification of proposals under the HASHAA is required by each of sections 67 and 29. The proposal (both PV and QD) was limited notified on the 16 May 2016 and submissions closed on 16 June 2016.

At the close of the initial submission period, a total of 21 submissions were received. There were no late submissions.

No submissions opposed the application, twenty submissions were in support and one submission was neutral. These are summarised in the combined report.

Counties Power gave notice on 21/7/2016 that it was withdrawing its submission.

Hong Yue (235 Bremner Road) gave notice on 18/7/2016 that it was withdrawing the amendments sought to the PV, and was now in support of the application.

Transpower New Zealand indicated it would not attend the hearing and tabled a written statement seeking that their suggested Condition (a) be included in the QD conditions and advising that the applicant did not oppose that relief. This matter was confirmed at the hearing by the applicant and the documentation updated accordingly.

Council Report Issues Identified

Ms Wimmer identified in the Combined Report a number of amendments to the PV. It was put to us that the amendments identified in that report, subject to the agreement reached between Ms Wimmer and Mr Tollemache for the applicant, were accepted by the applicant and recommended by Ms Wimmer. The upshot of that is there were no issues between the parties in respect of the Plan Variation provisions in the final version as recommended by Ms Wimmer and agreed to by the applicant.

The proposed variation to the PAUP

Section 61 provides a framework for consideration of a plan variation in the context of the HASHAA. Under sub-section (4) these considerations, in order of priority, are:

- (a) the purpose of the Housing Accords and Special Housing Areas Act 2013
- (b) Part 2 of the Resource Management Act;
- (c) the matters in section 74 (2)(a) of the RMA (namely: any proposed regional policy statement (“RPS”), any proposed regional plan with respect to any matter of national significance, any management plans and strategies prepared under other statutes, any relevant entry in the Historic Places register, and the extent to which the district plan needs to be consistent with plans or proposed plans of adjacent territorial authorities);
- (d) other matters set out in sections 74 to 77D of the RMA (with some exceptions);
- (e) any other relevant provision or relevant statute.

The purpose of the HAASHA is stated in section 4 to be to enhance housing affordability by facilitating an increase in land and housing supply in certain regions or districts, listed in Schedule 1 to that Act, identified as having housing supply and affordability issues. That provision can be taken to have been satisfied by the fact that this SHA has been approved and the application for the variation has been made. The evidence satisfied us that the proposed Mixed Housing Urban, Mixed Housing Suburban, Terrace Housing and Apartment Building and Local Centre zoning is appropriate for the location and will provide for a variety of housing forms, including higher density development around the local centre, which will increase the potential yield of this land. Consequently it is not necessary for us to discuss section 4 further.

Part 2 of the RMA encompasses the purpose and principles of that statute in sections 5 to 8. Section 5 sets out the Act’s purpose, namely the promotion of sustainable management as that expression is defined in section 5(2). Section 6 requires that all persons exercising functions and powers under the RMA in relation to managing the use, development and protection of natural and physical resources are to recognise and provide for seven matters of national importance, which are listed.

We have found that requirement satisfied by the proposed variation (and the related QD application) making express provision for riparian management and avoiding development that would serve to detract from their importance. Furthermore, provision is made for both enhancement of the streams and their margins and for pedestrian and cycle access alongside them.

In section 7 other matters are to be paid 'particular regard' and these include: the efficient use and development of natural and physical resources; maintenance and enhancement of amenity values; any finite characteristics of natural and physical resources; and the intrinsic values of ecosystems. We confirm that we have paid particular regard to those matters in reaching our decision.

Section 8 requires that the principles of the Treaty of Waitangi are to be taken into account. Cultural Impact Assessments were provided with the applications. No issues were raised in the CIA that would preclude consideration of the applications or result in a finding that they should be declined.

Principal issues in contention

As reported to us by legal counsel for the applicant, no issues in contention remain between Mr Tollemache and Ms Wimmer. The amendments agreed between the planners were included in Attachment 1 to Mr Tollemache's evidence. After having heard from both the applicant and the Council's officers at the hearing we did not identify any other matters that were an issue or a matter that needed further discussion therefore we concluded that the joint position of the parties was an appropriate basis upon which we could make our decision.

Purpose of the HASHAA and Part 2 of the Resource Management Act

We have concluded that the purpose of the HASHAA is satisfied by the variation provisions as modified by Ms Wimmer and Mr Tollemache.

We have taken account of Part 2 in the course of reaching our decision. Overall we have found that the variation, as modified, meets the purpose of the RMA in section 5 as well as the matters to which regard must be paid, or may be paid, in sections 6 to 8 of the Act. The proposed Precinct development provides for the sustainable use of the land and enables a net environmental benefit in terms of riparian and stream protection and enhancement. Open space areas have been planned as an integral part of the development and will benefit the health and wellbeing of the new community. Use of transport modes is actively encouraged by the proposal, and walking and cycling are promoted by the provisions. The views of tangata whenua have been incorporated, particularly in the stormwater management and water design provisions (but not limited to those).

Decision on the plan variation application

Application for Variation 15 to the Proposed Auckland Unitary Plan

At the conclusion of hearing the evidence in relation to PV15 the Commissioners adjourned and deliberated. On reconvening the Chair delivered an oral decision approving PV15 and the reasons for that decision noting that the full decision would be provided in writing as soon as possible.

The application to vary the Proposed Auckland Unitary Plan by Karaka and Drury Consultant Ltd within the Bremner Road SHA made under section 61 of the Housing Accords and Special Housing Areas Act 2013 is **ACCEPTED WITH MODIFICATIONS**

pursuant to section 71. The Plan provisions shall be deemed operative on the date of public notice of this decision (section 73 HASHAA) for the land identified in Appendix 2 of the Plan Variation application as follows:

Property Address		Legal Description			
121	Bremner Rd	Lot	2	DP	119463
132	Bremner Rd	Lot	9	DP	166291
138	Bremner Rd	Lot	1	DP	376355
144	Bremner Rd	Lot	1	DP	37093
160	Bremner Rd	Lot	Pt 9	DP	12364
169	Bremner Rd	Lot	1	DP	119463
207	Bremner Rd	Lot	2	DP	113113
207	Bremner Rd	Lot	3	DP	113113
213	Bremner Rd	Lot	1	DP	113113
229	Bremner Rd	Lot	1	DP	168112
235	Bremner Rd	Lot	2	DP	168112
241	Bremner Rd	Lot	1	DP	188360
245	Bremner Rd	Lot	1	DP	198792
249	Bremner Rd	Lot	4	DP	102261
251	Bremner Rd	Lot	5	DP	102261
253	Bremner Rd	Lot	1	DP	102261
259	Bremner Rd	Lot	2	DP	99330
260	Bremner Rd	Lot	8	DP	12364
263	Bremner Rd	Lot	1	DP	132199
269	Bremner Rd	Lot	2	DP	132199
312	Bremner Rd	Lot	1	DP	94117
322	Bremner Rd	Lot	1	DP	164625
330	Bremner Rd	Lot	1	DP	371107
31	Burberry Rd	Lot	10	DP	166291
37	Burberry Rd	Lot	2	DP	376355

The modified variation text is attached to this decision (clean version) as Attachment 1.

The submissions lodged on the variation are accepted.

The reasons for this decision are:

- (a) Overall the proposed plan variation supports an efficient use of land within the RUB, and the structure planning that has occurred for this Special Housing Area indicates that if the site is re-zoned it will enable a mix of housing, including affordable housing, to be developed. The re-zoning fulfils the purpose of HASHAA to enhance housing affordability by facilitating an increase in land and housing supply.
- (b) The plan variation provides for net benefits in the context of Part 2 of the RMA in terms of creating parks, some employment in the local centre, additional residential land, and restoring and enhancing stream margins and habitat. The cultural impact assessments did not raise any significant issues in relation to the

proposed provisions, and no items of historic heritage have been identified for protection. The changes made to the Precinct and zoning diagrams will provide for better land use and transport integration.

- (c) Relevant section 74 - 77D RMA matters have been taken into account in reaching this decision.
- (d) Other matters raised by submitters and specialists are addressed in other parts of the Proposed Auckland Unitary Plan, and the variation incorporates only those matters considered necessary or appropriate to tailor solutions for this site - such as additional access and transport provisions, provisions governing overhead transmission lines, and changes to aid interpretation.
- (e) For the avoidance of doubt, we have found that the modified provisions will give effect to the National Policy Statement on Electricity Transmission 2008 and the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009.

The Qualifying Development Application

An Assessment of Environmental Effects (AEE) was prepared pursuant to section 27 of the HASHAA and submitted with the QD application. Variation 15 was required in order to rezone the land to enable development of the sort sought to occur. As we have approved the variation with modifications (as reflected in that decision and the attached PAUP variation text) we have jurisdiction to consider the QD applications in terms of the new zonings it applies.

The QD has been described above.

Notification and submissions on the QD application

As noted earlier, this application was limited notified to the same parties as the variation application.

The principal issues in contention for the QD applications

Section 6.0 of the Council report reviews matters relating to the QD. In summary the Council report finds no significant issues that cannot be managed through appropriate conditions - either as proposed by the applicants or as amended by Council.

On the first day of the hearing it was clear that the applicant disagreed with Condition 24 re rear lanes and a requirement to provide certain details via the subsequent EPA process. Mr C Butler for the Council had prepared supplementary evidence about that matter in particular. Mr Butler set out in some detail the reasons why he considered Condition 24 should remain. Those reasons included a concern that not having a condition such as was proposed by the Council would set an undesirable precedent given the number of potential future rear lanes that may emerge within the PV area. On that point Mr Munro and Mr Tollemache opined the opposite in that having the condition set an undesirable precedent.

Mr Butler gave us a number of example where he considers good urban design had led to landscaping and lighting being incorporated in rear lanes. He also referred us to the assessment criteria in the subdivision provision of the PAUP which addressed primarily vehicle and pedestrian safety matters. He reiterated that the proposed condition was both appropriate and necessary.

Mr Munro advised us he took issue with the late presentation of that supplementary evidence as he and Mr Tollemache had not seen it and had no time to respond properly. We agreed with that position in principle and advised that Messrs Munro and Tollemache could provide a response to Mr Butler on Day 2 (when Mr Munro was not able to attend).

At the adjourning of Day 1 and following discussions between the parties and Panel the Council and the applicant agreed that they would further discuss before re-convening that suggested condition 24 to see whether or not any resolution was possible.

On reconvening on Day 2 (29th July) we were advised by Mr Berry that a collective position on proposed Condition 24 had not been reached and that Mr Munro and Mr Tollemache had prepared a joint statement of supplementary evidence which was supported by supplementary evidence from Mr Leo Hill about the nature of rear lanes in respect of the Council's proposed Condition 24 and from Mr Maday, an engineer with McKenzie and Co in regards to the potential cost of providing lighting in the rear lane.

Mr Berry took us through his supplementary submissions addressing a number of matters that had been raised on Day 1 by the Panel. He advised us as to how the variation 'sat' with the proposed Unitary Plan having regard to the point in process that Plan was at. He confirmed our jurisdiction to approve the Plan Variation in accordance with the agreed (between Council and the applicant) provisions set out in Mr Tollemache's evidence in chief.

He then turned to the proposed Condition 24 which was the only remaining matter where there were still differences between the Council and the applicant's expert planner and urban designer. He advised us that the proposed Condition 24 set out in Mr Tollemache's supplementary evidence should be preferred to that proposed by the Council. In support of that position he noted that the purpose of rear lanes is for vehicle access and not as a public space whether people will gather and spend time. He also advised us that the proposed condition negates the ability to achieve fee-simple vacant sites.

Additionally, the proposed Condition sought to achieve outcomes associated with a public road rather than a private access lane. There was in his view no supporting provisions in the PAUP that justified a condition of the type sought by the Council and referred to Part 3, Chapter H5.4.2 in that respect (subdivision assessment criteria). Those criteria relate to traffic safety matters and not the landscape and lighting matters that the Council sought to include via proposed Condition 24.

In concluding he noted that *"if the matter of landscaping of the rear lane was so important, then it is submitted that specific guidance would have been contained in other PV's recently approved under HASHAA. That is not the case."*

In the joint statement Mr Tollemache and Mr Munro had prepared they addressed the issues relating to the merits or otherwise of proposed Condition 24. He reiterated that the criteria in part 3, Chapter H5.4.2 do not address lighting or landscaping and that Mr Butlers reliance on those was erroneous as they addressed safety matters.

He re-emphasised (as his evidence in chief addressed the same matters) that the rear lane was just that - access for vehicles to garages located in rear yards-and that by taking that design approach it reinforced the achieved of high quality front yards and frontages. There was no justification in his opinion to attempt to turn a rear lane for access into a street frontage effectively. He said that: *“if pedestrians linger in the rear lanes instead of at the street, then the design will have failed badly”*.

He noted that noted of the four traffic engineers involved in the proposal had raised concerns over either lighting or landscaping in relation to achieving adequate vehicle and pedestrian safety. He advised us that the lane as designed will provide a substantially more traffic clamed environment than a typical straight road given the narrow 7m width of the proposed lane, the tight corners at either end, the proposed landscaping and threshold hold treatments at either end of the lane and the proposed permeable surface already offered and built into the design.

Mr Tollemache also noted that the analysis by Mr Butler failed to reflect the ultimate double loaded garage context that the lane supports (garages on either side). He then went on to talk about how rear lanes in fact were not cost effective for a developer given loss of residential land and costs of building. He noted that in this case the developer had deliberately chosen to accept those facts on the basis of the overall positive urban design benefits accruing from the rear lane context in relation to the overall consequential enhancement of street frontages. He also rebutted the notion of use of varying types of pavers and colours/textures which the Council considered added amenity value as being simply a personal values based aesthetic judgement. He also noted in response to Mr Butler’s views on lighting options and costs that Mr Maday’s cost estimates showed that the provision of lighting as sought by the Council may be as high as \$500,000 throughout the PV15 area, and thus was simply not a realistic option.

Mr Tollemache then took us through his suggested revised Condition 24 acknowledging that sub clause (i) could remain as is and that sub clause (v) was appropriate to remain where modified as he proposed. The other clauses had no basis and should be deleted.

In conclusion, Mr Tollemache noted the applicant’s urban designer would be in agreement with the Council if the rear lane were frontage lanes - but they were not.

Following this there was some dialogue between the Panel and the parties as to whether it was appropriate for the Council to then effectively have another right of reply to the applicant’s evidence – which Mr Berry noted was not reasonable. The Panel adjourned to consider this and other matters. After the adjournment the Panel advised that Ms Daniels and Mr Butler could make brief comments only in order to clarify the Councils final position.

Mr Berry was then asked to conclude his case for the applicant and advise in his reply the final position of the applicant.

The Panel then adjourned to deliberate having earlier in the proceedings advised that it was likely that an oral decision would be delivered.

After deliberating the hearing was re-convened and the Chair advised that the Panel's decision was to approve the QD but with a modified Condition 24 which followed Mr Tollemache's suggested wording but with slight variations in proposed sub clause (ii). Reasons for the decision were given. It was noted that the Panel on balance preferred the evidence of Mr Munro and Mr Tollemache and agreed with the submissions of Mr Berry in regards to proposed Condition 24.

In reaching our decision we note the following matters.

The Plan Variation was approved with the agreement of the applicant and the Council on the content of the proposed provisions. Those provisions do not contain any rules or standards that relate to rear lanes. No cross section of the proposed rear lane was included to guide the nature of its formation.

The proposal was a non-complying activity overall. That enabled any matters to be considered where relevant beyond the guidelines that the identified assessment criteria as set out. We were not advised as to any adverse effects that related to the rear lane and needed to be mitigated by conditions and/or design and thus required the use of a condition such as the Council's proposed Condition 24.

The rear lane is just that, and not a road. Given the future double garaging associated with it the functional aspect of it prevails notwithstanding that establishing a slow speed environment within the lane is appropriate (and is to be achieved by way of an amended Condition 24).

We agree with the applicant's experts that there is no clear direction in the PAUP that identifies support for the level of detail that the Council sought in its version of Condition 24. Overall, given the vision that Mr Ma set out for the Plan Variation area overall and also noting that it is likely that the development of dwellings on the sites abutting the rear lane is likely to include various forms of lighting and security we do not consider Condition 24 as proposed by the Council is justified or necessary. We are satisfied that a level of pedestrian and traffic safety and a quality of design commensurate with the purposes of the rear lane will eventuate.

We also note that Transpower an opposing submitter did not attend the hearing but tabled a written statement from Louise Miles of their Environmental Policy and Planning and Customer Solutions Group. That statement addressed two conditions that Transpower saw as being necessary for the QD. Their condition (a) referred to NZECP34: 2001 (the safe distance code) and their condition (b) sought to restrict landscaping within the transmission corridor and to achieve compliance with the hazards from trees regulations.

They advised that the Council did not support either condition but that the applicant had no issues with condition (a). They then went on to discuss their reasons for seeking the conditions. They noted that Auckland Council had imposed the sought after conditions on other occasions. They then noted that following a review of the proposed landscaping plan for the QD they were now satisfied and withdrew seeking condition (b). They still sought imposition of their condition (a). Mr Berry advised in his

submissions that the applicant was prepared to accept that condition. The Council's position was that it is not considered reasonable to include a condition that relates to another regulation and that condition (a) was a matter that could adequately be addressed through an advice note. We agree with that approach.

Following our delivery of the oral decision the hearing was then adjourned so that the Council and the applicant's planners could liaise over producing a final accurate set of conditions to be provided to the Panel before the hearing closed. Five working days were allowed for that having noted that receipt of the conditions earlier would assist in closing the hearing earlier and making a decision as soon as possible thereafter.

S34 HASHAA

Section 34 of the HASHAA states the following matters:

34. Consideration of applications

- (1) An authorised agency, when considering an application for a resource consent under this Act and any submissions received on that application, must have regard to the following matters, giving weight to them (greater to lesser) in the order listed:
 - (a) the purpose of this Act:
 - (b) the matters in Part 2 of the Resource Management Act 1991:
 - (c) any relevant proposed plan:
 - (d) the other matters that would arise for consideration under—
 - (i) sections 104 to 104F of the Resource Management Act 1991, were the application being assessed under that Act:
 - (ii) any other relevant enactment (such as the Waitakere Ranges Heritage Area Act 2008):
 - (e) the key urban design qualities expressed in the Ministry for the Environment's New Zealand Urban Design Protocol (2005) and any subsequent editions of that document.
- (2) An authorised agency must not grant a resource consent that relates to a qualifying development unless it is satisfied that sufficient and appropriate infrastructure will be provided to support the qualifying development.
- (3) For the purposes of subsection (2), in order to be satisfied that sufficient and appropriate infrastructure will be provided to support the qualifying development, the matters that the authorized agency must take into account, without limitation, are —
 - (a) compatibility of infrastructure proposed as part of the qualifying development with existing infrastructure; and
 - (b) compliance of the proposed infrastructure with relevant standards for infrastructure published by relevant local authorities and infrastructure companies; and
 - (c) the capacity for the infrastructure proposed as part of the qualifying development and any existing infrastructure to support that development.

We confirm that we have given due consideration to the matters required of us by section 34 of HASHAA, and the explicit priority hierarchy therein. In particular we note

that no infrastructural issues of significance were raised for our consideration and we are satisfied that sufficient and appropriate infrastructure will be provided to support the qualifying development (and conditions are imposed to that effect)

RELEVANT PLANNING INSTRUMENTS

The most relevant planning instrument for present purposes is the PAUP as amended by the Commissioners' decision on Variation 15 because that contains the most recent provisions for this land. We are satisfied that those provisions are met and present no obstacle to consents being granted.

The Auckland Housing Accord, which is a relevant matter for the purposes of section 104(1)(c) of the RMA, directs that SHAs are not subject to the operative Regional Policy Statement or any other operative district plan. While the provisions of a district plan are technically a matter to which regard must be had under section 34(1)(d) of the HASHAA, the status of development activities in this area have been changed substantially by the approved Variation 15 to the PAUP and the district plan provisions now have little to no weight as a result as they have been superseded.

The National Policy Statement for Freshwater Management 2011 ("NPSFM") is also relevant to this proposal. The PAUP provides for adoption of the directions of the NPSFM in the Water section of that plan. Appropriate riparian mitigation planting is required as part of the consent conditions proposed and imposed.

We also note that the on-going involvement of iwi in the development process should ensure that appropriate consideration is had and provision made for tangata whenua roles and interests.

Furthermore, any future land use, development or subdivision will need to comply with the overlay rules contained in the PAUP, which includes the Electricity Transmission Corridor overlay that traverses the wider site.

RESOURCE CONSENT REQUIREMENTS

The QDs require resource consent as follows.

Resource Consents for the Qualifying Development

Based on the provisions of the applicant's PV request, consent is required for the QD for the following reasons:

- Subdivision in accordance with the Drury 1 Precinct requires consent as **restricted discretionary** activity pursuant to rule F6.X Drury 1.3.
- The following lots do not comply with the minimum 26m depth requirement Lots 4 (roadside boundary), 24, 25, 39, 40 and 51. This requires consent as **discretionary** activity pursuant to rule F6.X Drury 5.3.2 (Table 7).
- The subdivision establishes part of three future blocks, and therefore the full perimeter of the block cannot be measured as that requires future QD applications for subsequent development stages to be prepared. For the avoidance of doubt, resource consent is sought for the partial provision of blocks. This requires consent as **discretionary** activity pursuant to rule F6.X Drury 5.3.1(a).

- The subdivision includes the establishment of a park edge road to Lots 100 and 101. However, Lot 1 is located between the road network and the proposed reserves to vest. This requires consent as **discretionary** activity pursuant to rule F6.X Drury 5.4.
- The proposed subdivision proposes site access for Lot 1 over a 3m shared path to the proposed new Collector Road (Road 22). This requires consent as **non-complying** activity pursuant to rule F6.X Drury 5.5.
- The proposed subdivision does not propose any riparian margin planting at this stage to the intermittent stream corridor within proposed balance lot 52. For completeness this requires consent as **discretionary** activity pursuant to rule F6.X Drury 5.6.1.

Proposed Auckland Unitary Plan 2013

Chapter H - Transport

- The proposed subdivision involves land which has capacity to accommodate more than 30 additional dwellings with 51 residential lots proposed. This requires consent as **restricted discretionary activity** pursuant to H.1.2.3.1.

Chapter H – Subdivision

- The proposed subdivision will establish an esplanade reserve. This requires consent as a **restricted discretionary activity** pursuant to Part 3, Chapter H, Section H.5.1.1 (Table 1).
- The proposed subdivision will require works within the 1 percent AEP floodplain. This requires consent as a **restricted discretionary activity** pursuant to Part 3, Chapter H, Section H.5.1.1 (Table 1).
- The proposed subdivision requires the vesting of 1,118m² of land from 121 Bremner Road for the road widening works. This is a subdivision that is not listed with tables 1-5 of the subdivision section. This requires consent as a **discretionary activity** pursuant to Part 3, Chapter H, Section H.5.1.1 (Table 6).
- The subdivision activity does not comply with the general subdivision control provided by Rule H5.2.1.3(a) which requires that lots be provided with both legal and physical access. The proposal is for vacant lots which all have legal access/frontage to a road to be vested, however the proposal does not seek to construct individual driveways. This requires consent as a **discretionary activity** pursuant to Part 3, Chapter H, Section H.5.1.1

Chapter H Natural Resources – Earthworks

- The proposal involves 38,000m³ of earthworks over the entire site area of 6.9 ha for roads, servicing infrastructure and the future building platforms. General earthworks greater than 2,500m² or 2,500m³ within a residential zone requires consent as **restricted discretionary activity** pursuant to Rule H.4.2.1.1.

- The proposal involves earthworks within the 50m Coastal Protection Yard from MHS of 2.34ha and 16,040m³. Any earthworks greater than 1,000m² and 1000m³ within the within the Coastal Protection Yard requires consent as a **non-complying activity** pursuant to Rule H.4.2.1.1.
- The proposal involves 365m² and 700m³ (fill) of earthworks to create a gradual buffer within the existing esplanade within the Public Open Space Conservation Zone. Any earthworks from 501m² up to 1000m² and up to 1,000m³ within this zone require consent as a **restricted discretionary activity** pursuant to Rule H.4.2.1.2.
- The proposal involves earthworks within a 1 percent AEP floodplain. Any earthworks within a **100-year ARI flood plain** requires consent as **restricted discretionary activity** pursuant to Rule H.4.2.1.2.

Chapter H – Stormwater Management

Stormwater Discharges

- Stormwater discharge from impervious areas not otherwise authorised by stormwater discharge and diversion rules requires consent as a **discretionary activity** pursuant to Part 3, Chapter H, Section 4.14.1

Stormwater Management Flow

- The proposal involves stormwater discharges from the impervious areas being within a stormwater Management Area Flow (SMAF) 1 area that are unable to comply with the permitted and controlled activity controls. This requires consent as a **restricted discretionary activity** pursuant to Part 3, Chapter H, Section 4.1.14.2.1.
- The proposal involves the provision and vesting of 1.53ha of new roads that do not meet the hydrology mitigation requirements. This requires consent as a **restricted discretionary activity** pursuant to Part 3, Chapter H, Section 4.1.14.2.1.

Stormwater Management Quality

- The proposal involves upgrade works to existing Bremner Road and the provision of a new collector road (Road 22), both of these roads would trigger the high use public roads treatment provisions. The proposed roads would not meet the stormwater quality management provisions therefore this requires consent as a restricted discretionary activity pursuant to Part 3, Chapter H, Section 4.1.14.3.1.

Overall the QD is a non-complying activity under the relevant plan, being the PAUP as modified by PV15.

PART 2 OF THE RMA

The future provision of affordable housing and comprehensive development of a residential community will contribute to and enable the social, economic, and cultural wellbeing of people and communities. We have found that any adverse effects of the developments will be adequately avoided, remedied, or mitigated. Overall the proposals are consistent with the purpose of the RMA.

The relevant matters of national importance provided in section 6 of the RMA as they relate to this application are appropriately provided for, particularly the protection of riparian stream margins including the avoidance of any inappropriate development.

The relevant 'other matters' set out in section 7 of the RMA have been paid regard and in particular the amenity values of this area will be maintained, the proposal is consistent with the efficient use and development of the site, and no ecosystems will be adversely affected by the proposed subdivision.

The proposal is consistent with the principles of the Treaty of Waitangi because it has taken account of iwi values and there are no waahi tapu that will be affected as a result of the subdivision. Consultation with iwi has been undertaken and the applicable iwi management plan has been taken into account when reaching the decision on the application.

Accordingly, the QD can be granted consent.

DECISIONS ON THE QD APPLICATION

The Panel delivered an oral decision approving the Plan Variation and the reasons for that decision- noting that the full decision would be provided in writing as required.

That then enabled the QD to be considered and an oral decision was delivered approving the QD with the full decision set out below.

Pursuant to sections 34 to 38 HASHAA and also, as referred to in those sections, sections 104, 104B, 105, 106, 107, 108 and 220 of the RMA, consent is **granted** to the non-complying activity application by Karaka Drury Consultant Limited to authorise resource consent for the comprehensive vacant lot subdivision of 51 residential lots, including the provision of an esplanade reserve, drainage reserve, with associated roads, infrastructure, landscaping and earthworks at 109R, 121, 132 & 160 Bremner Road and 31 Burberry Road, Drury, Auckland, legally described as esplanade reserve, Lot 9 DP 166291, Lot 2 DP 119463, Pt Lot 9 DP 12364, Lot 10 DP 166291 and Bremner Road (Road Reserve)..

The reasons for these decisions are:

The proposals are consistent with the purpose of HASHAA and also with the intent of Part 2 of the RMA;

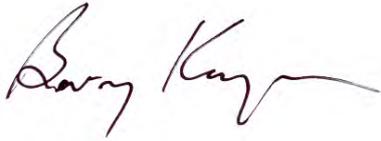
- the proposals are consistent with the objectives and policies of the Drury 1 Precinct variation 15 to the Proposed Auckland Unitary Plan and, further, that these particular applications will cause no adverse effects on the environment;
- the proposals are generally consistent with the outcomes sought by the Proposed Auckland Unitary Plan and the approved Precinct Provisions;
- the infrastructure required for these developments is feasible and can be serviced adequately to meet the requirement for qualifying development application;
- the proposal demonstrates that the matters identified in the Urban Design Protocol are met;

- No issues arise for the purpose of sections 105, 106 and/or 107 of the Resource Management Act 1991;
- Granting consent to the QD will promote the sustainable management of the resources in terms of the enhanced affordable housing purpose of the HASHAA.

CONDITIONS OF CONSENT

Under sections 37 and 38 of the Housing Accords and Special Housing Areas Act 2013 and sections 108 and 220 of the Resource Management Act 1991, consents are granted for the application, subject to the conditions included as Attachment 2.

Barry Kaye

A handwritten signature in black ink that reads "Barry Kaye". The signature is written in a cursive, flowing style with a long horizontal stroke at the end.

Chairperson

Sitting with Commissioners Littlejohn and Kay

August 2016

Attachment 1

PROPOSED AUCKLAND UNITARY PLAN, PART 2 - REGIONAL AND DISTRICT OBJECTIVES AND POLICIES, CHAPTER F: PRECINCT OBJECTIVES AND POLICIES

Drury 1 Precinct

Precinct Objectives and Policies

F6.X Drury 1

Precinct description

The Precinct has an area of 84.62 ha and is bordered by Drury Creek in the north, southern motorway to the east SH22(Karaka Road) to the south and Jesmond Road to the west. The site is gently rolling terrain, with coastal frontage to the upper estuary reach of Drury Creek. Two permanent watercourses run through the land, both originating within the site and flowing north towards the coastal edge.

It incorporates the provisions of the Precinct Plan and includes the development of a local centre with opportunities for intensive residential development.

Refer to planning maps for the location and extent of the precinct.

The following underlying zones apply to the Precinct:

- Mixed Housing Suburban
- Mixed Housing Urban
- Terrace Housing and Apartment Building
- Local Centre

Objectives

The objectives are as listed in the relevant underlying zones and Auckland wide provisions, except as specified below:

1. An integrated, more intensive residential environment which has high levels of amenity, allows for a range of housing densities and typologies and incorporates opportunities for a local centre.
2. A well connected roading layout that supports a range of travel modes, provides a strong definition of public spaces, legible and safe urban road pattern and clear differentiation between the private and public realm.

3. Ecology is maintained and enhanced through riparian margin re-planting at the time of development, building set-backs and landscaping.
4. Buildings are developed in an intensive manner, reflecting an urban character and amenity with clear definition of public fronts where buildings are massed, and private back yards that are predominantly open (excluding rear lane accessed garaging).
5. Stormwater runoff is managed to enable the maintenance and enhancement of natural waterways and water quality.
6. Subdivision, land use and development in the Precinct will not adversely impact on the safe and efficient operation of the National Grid.
7. To promote availability of affordable housing to first home buyers and/or Community Housing Providers.

Policies

The policies are as listed in the relevant underlying zones and Auckland wide provisions except as specified below:

1. Enable and support an intensive urban form and character defined by:
 - i. Establishing a local centre within a walkable pedestrian focused environment and focus retail and commercial development in this centre
 - ii. Providing a clear definition between public and private spaces, including roads and public open space.
 - iii. Opportunities for convenient, comfortable and safe interaction at the public / private road boundary interface through the enablement of low-height, visually open porch structures extending into the front yard setback.
 - iv. An urban built form that encourages higher density, intensive and massing towards the road frontage and side boundaries of sites, with less development within the rear yards.
 - v. Provision of a medium density built form along the northern coastal edge of the Precinct.
 - vi. A reliance on high quality and safe interconnected roads and public open spaces in preference to larger private outdoor spaces
2. Enable high density residential development (including smaller vacant sites and integrated residential developments), particularly in close proximity to the local centre, collector roads and public open spaces.
3. Maximise vehicular, cycling and pedestrian connectivity and permeability of the road network wherever possible.
4. Encourage roads to form urban blocks and to front public open spaces.
5. Require residential development within urban blocks to:
 - i. conform to a perimeter block pattern of development where buildings are massed towards the road and provide front building façades to the road

- ii. generally provide vacant site that have narrower frontages than their depth
 - iii. ensure there is sufficient space between the rear of opposing dwellings to provide privacy and back yards for outdoor living
 - iv. maintain reasonable solar access to rear yards
 - v. avoid driveway crossings to shared paths and dedicated cycle lanes, utilising access from side roads, access lots or rear lanes
 - vi. generally avoid rear lots
6. Control road façade elements to ensure dwellings relate to the road, including presence of a front door, sufficient glazing, ability to establish verandas / porches, landscaping provision, fencing heights and the control of garage in proportion to the façade.
 7. Enable the development of rear lanes, including opportunities for rear garaging and habitable areas above the garage, especially where lot or dwelling frontage widths are narrow.
 8. Require on-site management, or for higher density development private communal management of stormwater runoff from impervious areas. Stormwater from roads should generally be managed within the road corridors.
 9. Require native riparian planting along waterways.
 10. Avoid adverse effects of subdivision, land use and development on the National Grid line by ensuring that:
 - i. Appropriate buffer distances for managing subdivision, land use and development are provided
 - ii. Sensitive activities, buildings and most structures are excluded from establishing within 12m of the centreline of a National Grid transmission line and within 12m of a National Grid support structure; and
 - iii. Subdivision, landuse and development is managed around the National Grid line to ensure that future activities, buildings and development do not restrict the operation, maintenance, upgrading and development of the National Grid line.
 11. Utilise the National Grid corridor for road or open space networks where practicable, provided that they are designed and located to avoid adverse effects on the operation, maintenance, upgrading and development of the National Grid lines.
 12. For new residential developments containing 15 or more dwellings, or involving the creation of 15 or more vacant sites, require either:
 - i. 10 per cent of new dwellings to be relative affordable, with the purchase price to be set relative to the median house price in the Auckland region and sold to first home buyers and owned for at least three years; or
 - ii. 5 per cent to be retained affordable, with the purchase price to be set relative to the median household income in Auckland region and sold to Community Housing providers or Housing New Zealand and owned for long term retention.
 13. New residential developments containing 15 or more dwellings/sites provide for affordable housing that is distributed throughout the development.

Precinct Rules

K6.X Drury 1

The activities, controls and assessment criteria in the underlying Mixed Housing Suburban zone, Mixed Housing Urban zone, Terrace Housing and Apartment Buildings zone, Local Centre zone and Auckland-wide rules apply in the Precinct unless otherwise specified below. Refer to the Precinct Planning Map for the location and extent of the underlying zones.

The provisions of Appendix 6.X.1 apply in relation to the National Grid until the Unitary Plan becomes operative, at which time the operative provisions of the Electricity Transmission (National Grid) Corridor overlay in Chapter J will apply (and Appendix 6.X.1 will cease to have effect).

1 ACTIVITY TABLE

The activities in the relevant underlying zones apply in the Precinct except as specified in the activity tables below and that in Appendix 6.X.1.

1.1 Residential Zones

ACTIVITY TABLE: RESIDENTIAL ZONES	
ACTIVITY	ACTIVITY STATUS
Residential	
Integrated Residential Developments	RD
Commerce	
Show home	P
Retail in the Terrace Housing and Apartment Buildings Zone	NC
Infrastructure	
Overhead electricity lines (a single circuit) up to and including 110kV. Within areas of the Road and Unformed Road this activity shall have the same status as the adjacent Residential zone	P
On-site stormwater management (dwellings and impervious areas excluding roads)	
Impervious areas (excluding roads) of less than or equal to 50m ² within a site	P
Impervious areas (excluding roads) greater than 50m ² within a site that meet hydrology mitigation requirements in the relevant Precinct Rules below	P
Communal stormwater device(s) located within common land serving two or more dwellings that meet hydrology mitigation requirements in the relevant Precinct Rules below	C
Impervious areas unable to comply with the activity controls	RD

1.2. Local Centre Zone

ACTIVITY TABLE: LOCAL CENTRE ZONE	
ACTIVITY	ACTIVITY STATUS
On-site stormwater management (dwellings and impervious areas excluding roads)	

Impervious areas (excluding roads) of less than or equal to 50m ² within a site	P
Impervious areas (excluding roads) greater than 50m ² within a site that meet hydrology mitigation requirements in the relevant Precinct Rules below	P
Impervious areas unable to comply with the activity controls	RD
Communal stormwater device(s) located within common land serving two or more buildings that meet hydrology mitigation requirements in the relevant Precinct Rules below	C

1.3 Subdivision

The Activity Table 1 – General, and Activity Table 2 – Residential zones, and Table 4 – Standards for vacant site subdivision in the City Centre and Business zones in H5 Subdivision, and related controls, apply within the Precinct, except as specified in Activity Table below.

Activity Table	
Subdivision Activity	Activity Status
Subdivision in accordance with the Precinct Plan	RD
Subdivision not in accordance with the Precinct Plan	D
Subdivision of sites in accordance with an approved land use consent or a concurrent subdivision and land-use consent	RD

2 LAND USE CONTROLS – RESIDENTIAL ZONES

The land use controls in the relevant underlying zones apply in the Precinct, except as specified below.

2.1 Density

- The number of dwellings on a site must not exceed the limits specified below in Table 1:

TABLE 1: DENSITY	
ZONE	DENSITY
Mixed Housing Suburban	Maximum allowable average density of 200m ² per dwelling where the requirements of rule 2.1.2 below are met
Mixed Housing Urban	No density limits apply where four or more dwellings are proposed and

	the requirements of rule 2.1.3 below are met
Terrace Housing and Apartment Buildings	No density limits apply

2. Within the Mixed Housing Suburban zone the site:
 - a) has a minimum net parent site area of 1000m²
 - b) is at least 20m wide at the frontage of the site.
3. Within the Mixed Housing Urban zone the site:
 - a) has a minimum net parent site area of 1000m²
 - b) is at least 20m wide at the frontage of the site.
4. Development that does not comply with clauses 1-3 above is a discretionary activity.

2.2 Affordable Housing

Purpose: To ensure that the precinct contains affordable housing to help address Auckland's housing affordability needs.

A. General Controls

1. New residential developments containing 15 or more dwellings/vacant sites must provide for affordable dwellings/ vacant sites that are either (B) relative affordable or (C) retained affordable that will meet the requirements of clauses 2-9 below.
2. All resource consent applications requiring the provision of affordable dwellings/vacant sites must be accompanied by details of the location, number and percentage of relative and/or retained affordable dwellings/vacant sites.
3. Affordable dwellings/vacant sites must be spread throughout the development, with no more than six in any one cluster.
4. For staged developments, a proportionate number of affordable dwellings and/or vacant sites must be provided at each respective stage on a pro rata basis and spread throughout the development in accordance with clause 3 above.
5. For apartments, no more than one-third of the total number of identified affordable dwellings shall be located on a single building level/storey, unless the development is two levels, in which case no more than half of the identified affordable dwellings shall be located on a single building level.
6. If the calculation of the percentage of dwellings (and/or vacant sites) that must be affordable dwellings (and/or vacant sites) results in a fractional dwelling (or vacant site) of one-half or more, that fraction is counted as 1 dwelling (or vacant site), and any lesser fraction may be disregarded.
7. For avoidance of doubt, the land use rules do not apply to resource consent applications processed under the Housing Accords and Special Housing Areas Act 2013 (HASHAA) as the provisions specified within the relevant Order in Council amendment to that Act apply. The above provisions apply to consents that are not processed under HASHAA.
8. Provision of relative and retained affordable dwellings not in accordance with the Land Use Controls below is a Discretionary Activity.

B. Relative Affordable

Number of Relative Affordable Dwellings or Sites

Purpose: To ensure that the precinct contains price relative affordable housing available to first home buyers to help address Auckland's housing affordability needs.

1. For new residential developments containing 15 or more dwellings or involving the creation of 15 or more vacant sites, (or a mixture of both with the total cumulative number of dwellings and/or vacant sites being 15 or more), at least 10 per cent of the total number of dwellings/vacant sites must be relative affordable and meet the following criteria:
 - a. The price at which a dwelling may be sold does not exceed 75 per cent of the Auckland region median house price (calculated as an average of three calendar months previous to the date the application for resource consent is approved or the date on which all appeals on the resource consent application are finally resolved, whichever is the later) that is published by the Real Estate Institute of New Zealand.
 - b. If the application is for a subdivision consent, the applicant must identify the sites of the subdivision allocated for the building of relative affordable dwellings and must specify the mechanism (consent notice for example) for ensuring that the combined value of the building and the land upon completion will meet that criterion or is a building associated with such a dwelling.
 - c. Dwellings must be sold to first home buyers who must reside in the dwelling and retain ownership for three years from the date of first transfer. Any dwellings built on vacant sites identified for affordable housing must be sold to first home buyers who must reside in the dwelling and retain ownership for three years from the date of transfer.

Eligibility for Relative Affordable Housing

Purpose: To ensure relative affordable housing is purchased by appropriate persons

2. Prior to the first transfer of affordable dwellings (including new dwellings that have never been occupied and are built on vacant sites that are identified for affordable dwellings), the consent holder must provide to Council a statutory declaration that confirms the sale complies with the following eligibility requirements:
 - a. the purchaser has a gross household income, as at the date of the statutory declaration, that does not exceed 120 per cent of the Auckland median household income as set at the date of signing the unconditional sale and purchase agreement.
 - b. the consent holder has sold the dwelling (and any associated parking that is required by resource consent and storage) at a price which is not more than that defined by the 75 per cent median price in accordance with clause 8.1(a) above.
 - c. the purchaser is a first home buyer and has never owned any other real property.
 - d. the purchaser is a natural person purchasing the affordable dwelling in their own name and not in the name of any other person or entity.
3. Prior to the transfer of a vacant site identified for affordable dwellings, the purchaser must be made aware of the consent notice mechanism required to ensure any building built on the site is a dwelling that will meet the relative affordable criteria in 8.1 above or is a building associated with such a dwelling.
4. Prior to the transfer of a vacant site identified for an affordable dwelling to a purchaser that intends to develop, own and occupy the affordable dwelling themselves, the consent

holder must provide to Council a statutory declaration executed by the intended purchaser that confirms the sale complies with the following eligibility requirements:

- a. the purchaser has a gross household income, as at the date of the statutory declaration, that does not exceed 120 per cent of the Auckland median household income as set at the date of signing the unconditional sale and purchase agreement.
 - b. Any development of the site must be such that the combined value of the dwelling and the land upon completion, as confirmed by a valuation carried out by a registered valuer, must be no more than that defined by the 75 per cent median price in accordance with clause 8.1(a) above.
 - c. the purchaser intends to own and occupy the affordable dwelling exclusively as their residence for no less than three years from the date of purchase.
 - d. the purchaser is a first home buyer and has never owned any other real property.
 - e. the purchaser is a natural person purchasing the affordable dwelling in their own name and not in the name of any other person or entity.
5. A consent notice must be placed on the computer freehold register for the respective affordable dwellings/vacant sites requiring the above eligibility criteria be met for three years from the date of the transfer to the eligible purchaser.
 6. Relative affordable housing that does not comply with clauses 1-5 above is a discretionary activity.

C. Retained Affordable

Eligibility for Retained Affordable Housing

Purpose: To ensure that the precinct contains income related retained affordable housing to help address Auckland's housing affordability needs and to ensure retained housing is appropriately managed by Community Housing Providers to achieve ongoing provision and availability where required.

1. Purchasers in respect of retained affordable housing must be a registered community housing provider or Housing New Zealand Corporation.
2. Retained affordable housing that does not comply with clause 1 above is a discretionary activity.

Number of Retained Affordable Dwellings or Sites

1. For new residential developments containing 15 or more dwellings or involving the creation of 15 or more vacant sites, (or a mixture of both with the total cumulative number of dwellings and/or vacant sites being 15 or more), at least 5 per cent of the total number of dwellings, or vacant sites, in any development must be retained affordable and meet the following criteria.
 - a. The price at which a dwelling may be sold would mean that the monthly mortgage payments for a household receiving the Auckland median household income (as published by Statistics New Zealand for the most recent June quarter before the date the application for resource consent is approved or the date on which all appeals on the resource consent application are finally resolved, whichever is the later) would not exceed 30 per cent of the household's gross monthly income, based on the assumptions that:
 - i. the dwelling is purchased with a 10 per cent deposit; and

- ii. the balance of the purchase price is financed by a 30-year reducing loan, secured by a single mortgage over the property, at a mortgage interest rate equal to the most recent average two-year fixed rate. This interest rate used is that published most recently by the Reserve Bank of New Zealand, in relation to the date application for resource consent is made.
2. As part of the resource consent application evidence must be provided to demonstrate a community housing provider will purchase the dwellings/sites. Prior to the transfer of the retained affordable dwellings/sites a Council approved statutory declaration must be returned by the consent holder to demonstrate the dwellings/sites are sold at the price point outlined in clause 1 above.
3. Retained affordable housing that does not comply with clauses 1-2 above is a discretionary activity.

Where the following definitions apply:

Retained affordable

Housing that is:

- a. built by a registered community housing provider or Housing New Zealand Corporation;
or
- b. sold to a registered community housing provider or Housing New Zealand Corporation;
and
- c. sold at a price defined by the Auckland median household income as published by Statistics New Zealand for the most recent June quarter before the date the application for resource consent is approved or the date on which all appeals on the resource consent application are finally resolved, whichever is the later.

Relative Affordable

Housing that is:

- a. bought by first home buyers and remains in the same ownership for three years from the date of first transfer, where the purchaser has a gross household income that does not exceed 120 per cent of the Auckland median household income as set at the date of signing the unconditional sale and purchase agreement.
- b. sold at a price that does not exceed 75 per cent of the Auckland region median house price published by the Real Estate Institute of New Zealand and calculated as an average of three calendar months previous to the date the application for resource consent is approved or the date on which all appeals on the resource consent application are finally resolved, whichever is the later

Community Housing Provider

means a housing provider (other than Housing New Zealand Corporation) that has, as one of its objectives, the provision of one or both of the following types of housing:

- a. social rental housing;
- b. affordable rental housing
- c. Rent to own (ie. as provided by New Zealand Housing Foundation)

Household Income

Household income shall include all taxable income as defined by the New Zealand Inland Revenue Department.

Show home

A house on a newly built subdivision which is furnished and decorated to be shown to prospective buyers

3 DEVELOPMENT CONTROLS – ALL ZONES

On-site stormwater management (dwellings and onsite impervious areas, excludes roads)

Purpose: ensure appropriate stormwater retention and detention associated with site development.

1. Within catchments draining to streams all new impervious surfaces of 50m² and over must be designed to achieve the following:

Except as provided by c. the following (a. and b.) applies.

- a. Provide retention (volume reduction) of at least 5mm of runoff depth for the impervious area for which hydrology mitigation is required; and
- b. Provide detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24 hour rainfall event minus the 5mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required.
- c. Where:
 - i. A suitably qualified person has confirmed that soil infiltration rates are less than 2mm/hr or there are no areas on the site of sufficient size to accommodate all required infiltration that is free of geotechnical limitations (including slope, setback from infrastructure, building structures or boundaries and water table depth); and
 - ii. Rainfall reuse is not available because:
 - a) The quality of the stormwater runoff is not suitable for on-site reuse (i.e. for non-potable water supply, garden irrigation or toilet (flushing)); or
 - b) There are no activities occurring on the site that can re-use the full 5mm retention volume of water;

the retention volume can be taken up by providing detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24 hour rainfall event over the impervious area for which hydrological mitigation is required (minus any designed retention volume that is achieved).

2. The stormwater device/s:
 - a. Must be maintained by the site owner(s) in perpetuity. A consent notice will be registered on the certificate of title to that effect at time of subdivision.
 - b. If rainwater tanks are proposed to achieve the retention requirements above, the rainwater tank must be dual plumbed to non-potable uses such as toilet and washing machine in the dwelling.

3. Compliance shall be demonstrated to the Council in conjunction with any application for building consent, or by way of certificate of compliance or at the time of subdivision.
4. Stormwater devices within the National Grid Yard must comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances NZECP34:2001, including their ongoing operation and maintenance.
5. Compliance with the above land use controls will be deemed to satisfy the permitted and controlled activity controls in H4.14. Stormwater Management and the overlay rules for Stormwater Management Area Flow.

4. DEVELOPMENT CONTROLS - MIXED HOUSING SUBURBAN ZONE

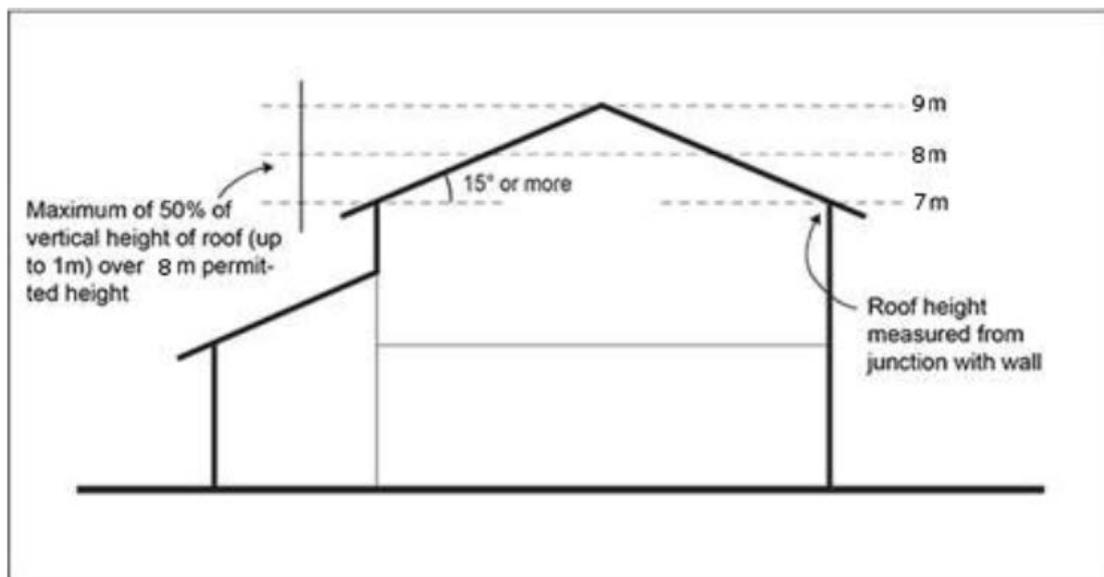
The following development controls apply in the Precinct instead of all the development controls identified in the underlying Mixed Housing Suburban zone (Rule I1.7).

4.1 Building Height

Purpose: manage the height of buildings to:

- Achieved the planned built character of predominantly one and two storeys
 - Provide some flexibility to enable variety in roof forms.
1. Buildings must not exceed 8m in height except that 50% of a building's roof elevation, measure vertically from the junction between wall and roof, may exceed this height by 1m, where the entire roof slopes 15 degrees or more (as shown on figure 1 below).

Figure 1: Building height



4.2 Height in relation to boundary

Purpose: manage the bulk and scale of buildings and maintain a reasonable level of sunlight access and minimise adverse visual dominance effects to immediate neighbours.

1. The following height in relation to boundary controls apply:
 - a. For all lots, the height in relation to boundary control does not apply to the street boundary.

In the case of front lots (not being a corner lot or adjacent to a corner lot) a building height in relation to boundary of 5m and 45° must apply on side boundaries adjoining other front lots, up to a maximum distance of 8m from the rear boundary.

A height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) must apply to the remaining part of any side boundary that is within 8m from the rear boundary and to all rear boundaries.

In the case of front lots which adjoin a corner lot the following apply:

On side boundaries that adjoin the shortest side boundary of the corner lot, a height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) must apply to the whole length of the boundary including where that side boundary extends beyond the corner lot.

On side boundaries that adjoin the longest side boundary of the corner lot, a building height in relation to boundary of 5m and 45° must apply up to a maximum distance of 8m from the rear boundary. Rule 1c above must apply to the remaining part of the side boundary that is within 8m from the rear boundary.

In relation to the shortest side boundary of a corner lot (including where that side boundary extends beyond the corner lot) all windows above the ground floor level facing the corner lot (or facing a lot adjoining the corner lot) must have a window sill level at least 1.6m above the floor level or be fitted with opaque glass

A height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) must apply to any rear boundary.

In the case of corner lots the following apply:

- On the shortest side boundary of the corner lot, a height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) must apply
- On the longest side boundary of the corner lot, a building height in relation to boundary of 5m and 45° must apply up to a maximum distance of 8m from the rear boundary. A height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) must apply to the remaining part of the side boundary that is beyond 8 m from the rear boundary.
- All buildings within 6m of the shortest side boundary must be limited to a single storey and a 5m maximum height.

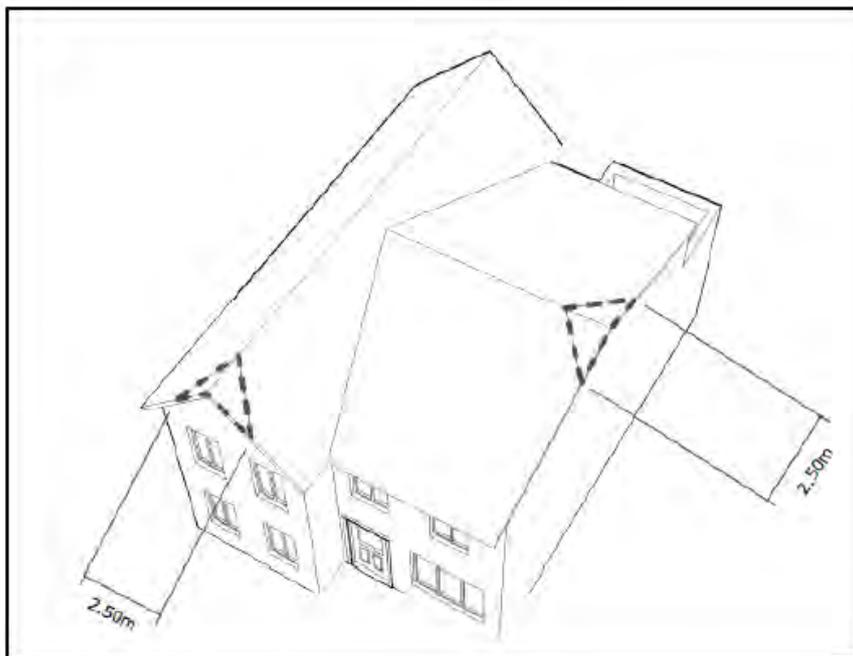
For all rear boundaries a height in relation to boundary of 2.5m and either 45°(for east or west boundaries), 55°(for north boundaries), 35°(for southern boundaries) apply.

2. This control does not apply to a boundary adjoining sites within the public open space zones or vested reserves exceeding 2000m².
3. Where the boundary adjoins a rear lane (access lot) the control applies from the farthest boundary of the rear lane (access lot).

4. A gable end, dormer or roof may project beyond the recession plane where that portion beyond the recession plane is:
 - a. no greater than 1.5m² in area and no greater than 1m in height
 - b. no greater than 2.5m cumulatively in length measured along the edge of the roof.

No more than two gable end, dormer or roof projections are allowed for every 6m length of site boundary.
5. The height in relation to boundary rule does not apply to existing or proposed internal site boundaries within an application area.
6. The height in relation to boundary control does not apply to site boundaries where there is an existing common wall between two buildings on adjacent sites or where a common wall is proposed.

Figure 2: exceptions for gable ends and dormers



4.3 Yards

Purpose:

- maintain the built character of the streetscape and provide sufficient space for landscaping in the front yard
- maintain a reasonable standard of residential amenity
- ensure dwellings are adequately set back from streams and the coast
- Provide a reasonable standard of visual and acoustic privacy between different dwellings, including their outdoor living space, on the same or adjacent sites

1. The minimum yards must be those in Table 2.

Table 2

Yard	Minimum depth
Front	4m
Side	1m
Rear	8m, except that a single storey building (or part of a building) up to a maximum height of 5m, is permitted within the rear yard provided that it is no closer than 3m from the rear boundary.
Riparian	10m from the edge of all permanent and intermittent streams
Coastal protection yard	10m

2. The rear yard in Table 2 does not apply to a building up to a height of 7m where the site adjoins a rear lane (access lot).
3. The side yard control does not apply to site boundaries where there is an existing common wall between two buildings on adjacent sites or where a common wall is proposed.
4. A single storey unenclosed verandah / porch space attached to the building is exempt from the front yard setback provided it must not be located within 2m of the front boundary.
5. Rule H1.2.3.3.e.(i) does not apply.

4.4 Outlook

Purpose: ensure a reasonable standard of amenity for dwellings and encourage building windows to face the road, rear yard and/or rear lane

1. Where the principal glazing from the principal living room or dining room of a dwelling does not face a road or a rear lane (access lot), an outlook space must be provided as follows:
 - a. A depth of 4m within the site measured at right angles to and horizontal from the window to which it applies
 - b. A width of 4m measured within the site from the centre point of the largest window on the building face to which it applies
 - c. The height of the outlook space is the same as the floor height, measures from floor to ceiling, of the building face to which the control applies.
 - d. Be clear and unobstructed by buildings.

4.5 Impervious Area

Purpose: manage the amount of stormwater runoff generated by a development.

1. The maximum impervious area of the site area must be 70 per cent.

4.6 Building Coverage

Purpose: manage the extent of buildings on the site to achieve the planned built character.

1. Maximum building coverage shall comply with Table 3 below:

TABLE 3: Maximum Building Coverage	
Sites over 400 net site area	40 per cent
Sites under 400 net site area	50 per cent
Integrated Residential Developments	50 per cent

4.7 Landscaping

Purpose:

- provide for on-site amenity and an attractive streetscape character
- improve stormwater absorption on-site.

1. The minimum landscaped area shall be 30 per cent of the net site area.
2. At least 50% of the front yard must comprise landscaped area.

4.8 Outdoor Living

Purpose: provide dwellings with outdoor living space that is of a functional size and dimension and is accessible from the principal living room, dining room, kitchen and is separated from vehicle access and maneuvering areas.

1. A dwelling at ground floor level must have an outdoor living space that is at least 20m² that comprises ground floor space that:
 - a. has no dimension less than 4m and has a gradient not exceeding 1 in 20;
 - b. is directly accessible from the principal living room, kitchen or dining room;
 - c. is free of buildings, parking spaces, servicing and maneuvering areas;
2. Where an entire dwelling is located above ground level, it must have an outdoor living space in the form of a balcony or roof terrace that is at least 5m² for studio and one bedroom dwellings and 8m² for two or more bedroom dwellings and has a minimum dimension of 1.8m.

4.9 Dwellings Fronting the Road

Purpose: ensure dwellings are orientated to provide for passive surveillance of the road and contribute to streetscape amenity.

1. The front façade of a dwelling on a site must contain:
 - a. glazing that is cumulatively at least 20 per cent of the area of the front façade measured on the basis of a storey height of 2.4m per storey (excluding garage door).

- b. a main entrance door that is visible from the road.

4.10 Fences

Purpose: enhance passive surveillance over the road and maintain the open character of front yards.

1. Fences in a front yard must not exceed 1.2m in height.

4.11 Garages

Purpose:

- minimise the dominance of garages as viewed from the road
- avoid parked cars over-hanging the footpath.

1. A garage door facing a road:
 - a. must be no greater than 50 per cent of the width of the front façade of the dwelling to which the garage relates.
 - b. must not project forward of the front façade of a dwelling.
 - c. must be set back at least 5m from the site's frontage.
2. If the site is served by a rear lane (access lot) there must not be a garage on the site's road frontage.

4.12 Vehicle Access

Purpose:

- maintain a safe road frontage and shared space footpath uninterrupted by vehicle crossings
1. Sites fronting a road with a 3m shared footpath on the site's frontage must not have direct vehicle access to that road frontages.
 2. Where the site is served by a rear lane (access lot) there must not be direct vehicle access from the road.
 3. Development that does not comply with clause 1 or 2 above is a ~~non-complying~~ discretionary activity.

4.13 Minimum dwelling size

Purpose:

- Dwellings are functional and of a sufficient size to provide for the day-to-day needs of residents, based on the number of occupants the dwelling is designed to accommodate.
1. Dwellings must have a minimum net internal floor area as follows:
 - a. 30 m² for studio dwellings
 - b. 45 m² for one bedroom dwellings

5. DEVELOPMENT CONTROLS – MIXED HOUSING URBAN ZONE

The following development controls apply in the Precinct instead of all the development controls identified in the underlying Mixed Housing Urban zone (Rule I1.8).

5.1 Building Height

Purpose: manage the height of buildings to:

- be consistent with an urban residential character
- maintain a reasonable standard of amenity for adjacent sites
- support intensification of residential density and intensity
- provide some flexibility to enable variety in roof forms

1. Buildings must not exceed 11.5m in height.

5.2 Height in relation to boundary

Purpose:

- enable building height and intensity to be located in the front of the site to provide a built character and streetscape consistent with the planned urban environment and its density
- manage height in the rear yard of the site to minimise adverse visual dominance, allow the establishment of spacious rear yards, solar access to rear yards, and reasonable outlook and privacy (subject to rear lane-accessed housing)
- enable the passive surveillance of the rear lanes by providing for minor dwelling or habitable space above the garage

1. The following height in relation to boundary controls shall apply.
 - a. No height in relation to boundary control shall apply to the road boundary or a boundary with a rear lane (access lot).
 - b. No height in relation to boundary control shall apply to the side boundaries located outside the 8m rear yard.
 - c. A height in relation to boundary of 2.5m and either 45° (for east or west boundaries), 55° (for north boundaries), 35° (for southern boundaries) shall apply to the side boundaries located within the 8m rear yard.
2. A gable end, dormer or roof may project beyond the recession plane where that portion beyond the recession plane is:
 - a. no greater than 1.5m² in area and no greater than 1m in height
 - b. no greater than 2.5m cumulatively in length measured along the edge of the roof.
3. No more than two gable end, dormer or roof projections are allowed for every 6m length of site boundary.

4. The height in relation to boundary rule does not apply to existing or proposed internal site boundaries within an application area.
5. The height in relation to boundary control does not apply to site boundaries where there is an existing common wall between two buildings on adjacent sites or where a common wall is proposed.

5.3 Yards

Purpose:

- maintain the built character of the streetscape, enable more intensive development adjoining the road and interaction with the road, and provide reasonable transitional space for landscaping in the front yard
- maintain a reasonable standard of residential amenity
- ensure buildings are adequately set back from streams and the coastal edge to maintain water quality and provide protection from natural hazards
- Provide a reasonable standard of visual and acoustic privacy between different buildings, including their outdoor living space, on the same or adjacent sites

1. The minimum yards must be those in Table 4.

Table 4

Yard	Minimum depth
Front	2.5m
Side	1m. One side yard can be reduced to 0m provided that legal provision is made for access for maintenance of the structure or it is a common / party wall.
Rear	8m, except that a single storey building (or part of a building) up to a maximum height of 5m, is permitted within the rear yard provided that it is no closer than 3m from the rear boundary.
Riparian	10m from the edge of all other permanent and intermittent streams
Coastal protection yard	10m

2. The rear yard in Table 4 does not apply to a building up to a height of 7m where the site adjoins a rear lane (access lot).
3. The side yard control does not apply to site boundaries where there is an existing common wall between two buildings on adjacent sites or where a common wall is proposed.
4. A single storey unenclosed verandah / porch space attached to the building is exempt from the front yard setback provided it must not be located within 1m of the front boundary.
5. Rule H1.2.3.3.e.(i) does not apply.

Note: Additional yard setbacks may be required to meet compliance with Appendix 6.X.1 and/or the requirements of the National Grid Electricity Transmission Corridor Overlay.

5.4 Outlook

Purpose: ensure a reasonable standard of amenity for dwellings and encourage building windows to face the road, rear yard and/or rear lane

1. Where the principal glazing from the principal living room or dining room of a dwelling does not face a road or a rear lane (access lot), an outlook space must be provided as follows:
 - a. A depth of 4m within the site measured at right angles to and horizontal from the window to which it applies
 - b. A width of 4m measured within the site from the centre point of the largest window on the building face to which it applies
 - c. The height of the outlook space is the same as the floor height, measures from floor to ceiling, of the building face to which the control applies.
 - d. Be clear and unobstructed by buildings.

5.5 Impervious Area

Purpose: manage the amount of stormwater runoff generated by a development.

1. The maximum impervious area of the site area must be 70 per cent.

5.6 Building Coverage

Purpose: manage the density of buildings on the site consistent with the urban residential character.

1. Maximum building coverage shall comply with Table 5 below:

TABLE 5: Maximum Building Coverage	
Sites over 400 net site area	40 per cent
Sites under 400 net site area	50 per cent
Integrated Residential Developments	50 per cent

5.7 Landscaping

Purpose:

- provide for on-site amenity and an attractive streetscape character
- improve stormwater absorption on-site.

1. The minimum landscaped area shall be 30 per cent of the net site area.
2. At least 50% of the front yard must comprise landscaped area (excluding the area of an unenclosed verandah space from rule 4.3.4 above).

5.8 Outdoor Living

Purpose: provide dwellings with outdoor living space that is of a functional size and dimension and is accessible from the principal living room, dining room, kitchen and is separated from vehicle access and maneuvering areas.

1. A dwelling at ground floor level must have an outdoor living space that is at least 20m² that comprises ground floor space that:
 - a. has no dimension less than 4m and has a finished gradient not exceeding 1 in 20;
 - b. is directly accessible from the principal living room, kitchen or dining room;
 - c. is free of buildings, parking spaces, servicing and maneuvering areas;
2. Where an entire dwelling is located above ground level, it must have an outdoor living space in the form of a balcony or roof terrace that is at least 5m² for studio and one bedroom dwelling and 8m² for two or more bedroom dwelling and has a minimum dimension of 1.8m.

5.9 Dwellings Fronting the Road

Purpose: ensure dwellings are orientated to provide for passive surveillance of the road and contribute to streetscape amenity.

1. The front façade of a dwelling on a site must contain:
 - a. glazing that is cumulatively at least 20 per cent of the area of the front façade measured on the basis of a storey height of 2.4m per storey (excluding garage door).
 - b. a main entrance door that is visible from the road.
2. A habitable room fronting a rear lane (access lot) must have a façade that contains glazing that is cumulatively at least 20 per cent of that storey's façade to the rear lane.

5.10 Fences

Purpose: enhance passive surveillance over the road and maintain the open character of front yards.

1. Fences in a front yard must not exceed 1.2m in height.

5.11 Garage

Purpose:

- minimise the dominance of garages as viewed from the road
- avoid parked cars over-hanging the footpath.

1. A garage door facing a road:
 - a. must be no greater than 50 per cent of the width of the front façade of the dwelling to which the garage relates.

- b. must not project forward of the front façade of a dwelling.
 - c. must be set back at least 5m from the site's frontage.
2. If the site is served by a rear lane (access lot) there must not be a garage on the site's road frontage.

5.12 Vehicle Access

Purpose:

- maintain a safe road frontage and shared space footpath uninterrupted by vehicle crossings
1. Sites fronting a Future Collector Road (New), Collector Road (Existing) and a Collector Road – Protected Cycleway identified on the Precinct Plan 1 or a road with a 3m shared footpath on the site's frontage (which includes the Collector Road (New)) must not have direct vehicle access to that road frontages.
 2. Where the site is served by a rear lane (access lot) there must not be direct vehicle access from the road.
 3. Development that does not comply with clause 1 or 2 above is a ~~non-complying~~ discretionary activity.

5.13 Minimum dwelling size

Purpose:

- Dwellings are functional and of a sufficient size to provide for the day-to-day needs of residents, based on the number of occupants the dwelling is designed to accommodate.
2. Dwellings must have a minimum net internal floor area as follows:
 - a. 30 m² for studio dwellings
 - b. 45 m² for one bedroom dwellings

6 SUBDIVISION CONTROLS

The subdivision controls in the Precinct are those listed in the Auckland-wide rules – subdivision except as specified below and in Appendix 6.X.1

6.1 Minimum Site Sizes for Vacant Sites – Residential Zones

1. Minimum vacant site sizes shall comply with Table 6 below:

TABLE 6: Minimum Site sizes for proposed vacant sites– Residential Zones	
Minimum site size where the minimum front site width is 12.5m or greater	325m ²
Minimum site size where the minimum front site width is between 10m and 12.49m and Table 7 (Alternative Front Site) is complied with and the site's frontage is not to a road on the north-west to north-east boundary	260m ²

2. Rule 2.3.1.1(b) Part 3, Chapter G, Section 5 does not apply.
3. There are no minimum site sizes where subdivision is proposed as part of an integrated land use consent or to subdivide around an approved land use consent for a residential development.
4. Subdivision that does not comply with clause 1 above is a discretionary activity.

6.2 Minimum Site Dimensions for Vacant Sites

1. Minimum site dimensions for vacant sites shall comply with Table 7 below:

TABLE 7: Minimum site dimensions for proposed vacant sites – Residential zones	
Front site: Minimum Width in metres	12.5m
Alternative Front Site: Width in metres where a legal mechanism restricts the width of a garage and vehicle crossing for any subsequent building development to a single car width or where a rear lane provides legal access	10m to 12.49m
Front Site: Minimum Depth in meters	26m
Minimum Legal Width of Rear Lanes in meters	7m

2. There are no minimum site dimensions where subdivision is proposed as part of an integrated land use and subdivision consent or to subdivide an approved land use consent for a residential development.
3. Subdivision that does not comply with clause 1 above is a discretionary activity.
4. Rear sites are a non-complying activity.

6.3 Movement Network

1. All subdivision must comply with the following controls:
 - a. All new subdivisions, roads and lots shall comply with the following:

- (i) Maximum Block Length: 250m

- (ii) Maximum Block Perimeter: 750m

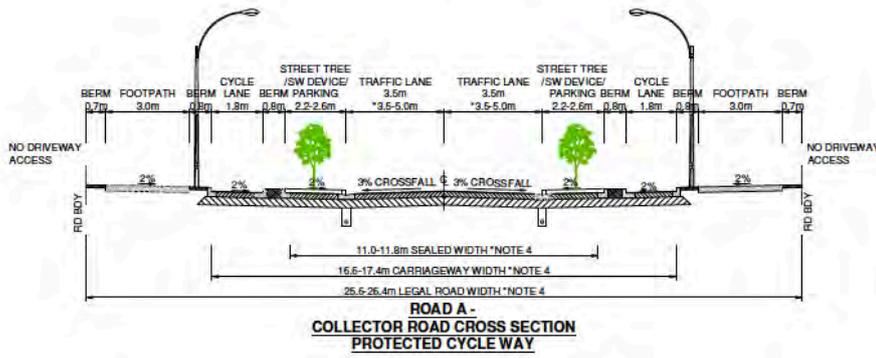
For clarity the measurements above may be curvilinear.

- b. Cul de sac roads are a non-complying activity. This rule does not apply to staged road construction as part of a staged subdivision or balance site.

 - c. Collector Roads must be provided in accordance with the alignments in Precinct Plan 1.

 - d. Roads must be constructed to the standards illustrated in Figures 3 to 9 below (with reference to Precinct Plan 1) or where not contained in the figures below, the relevant Auckland Wide rules shall apply. Except that where a road is located beneath the National Grid Subdivision Corridor, the road will be constructed with a design specific to the accommodation of the Corridor. The design will be determined as part of the resource consent required within the National Grid Subdivision Corridor.
2. Subdivision that does not comply with clause 1(a), (c) and (d) above is a discretionary activity.

Figures 3 to 9 Road Cross Sections



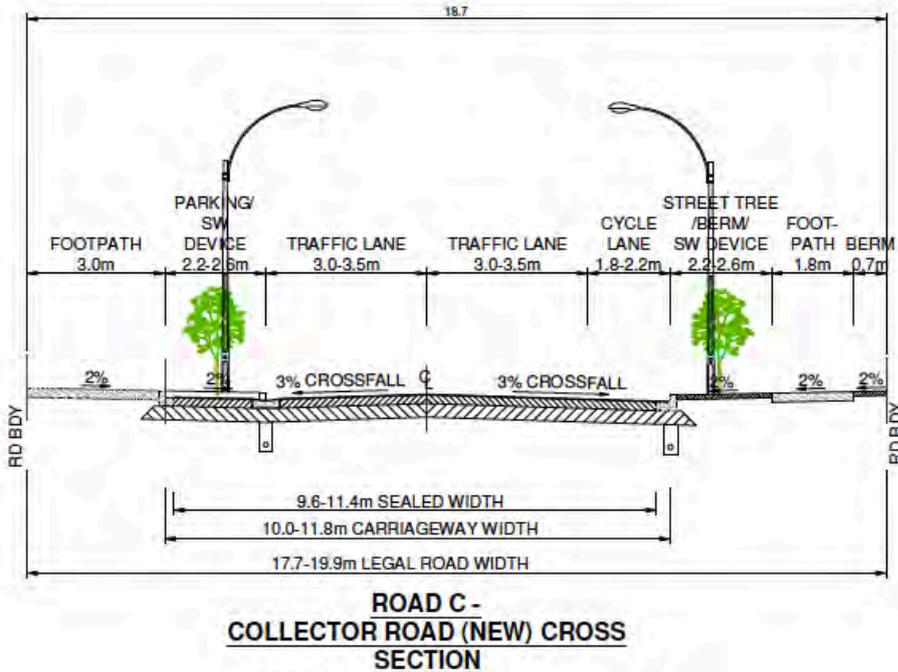
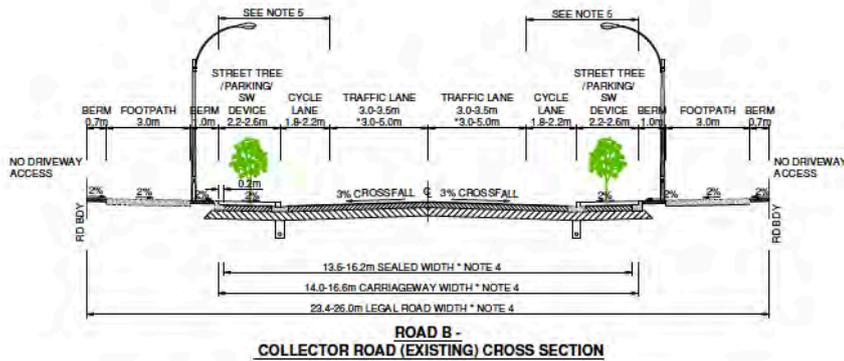
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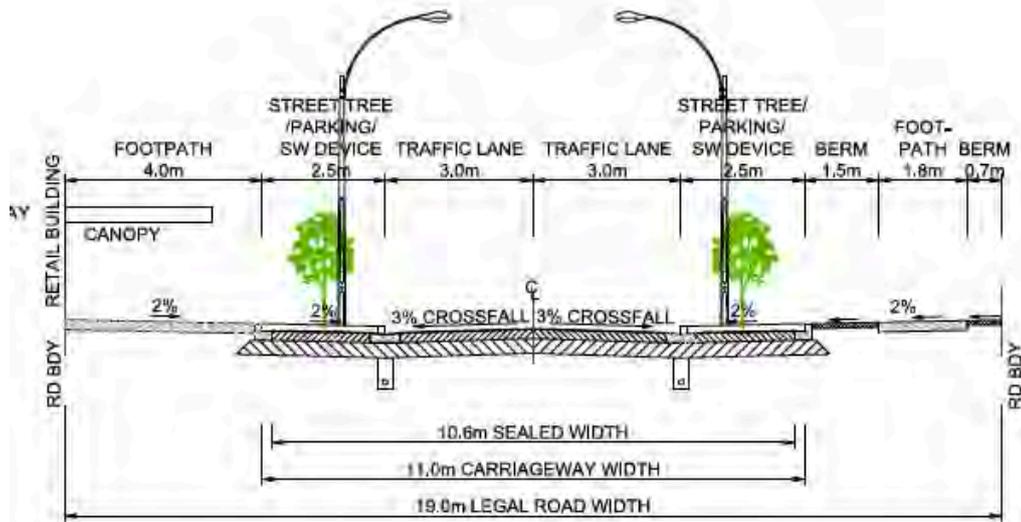
STORMWATER NOTE:

1. STORMWATER DEVICE WIDTH TO BE CONFIRMED SUBJECT TO WIDTH OF DEVICE USED.

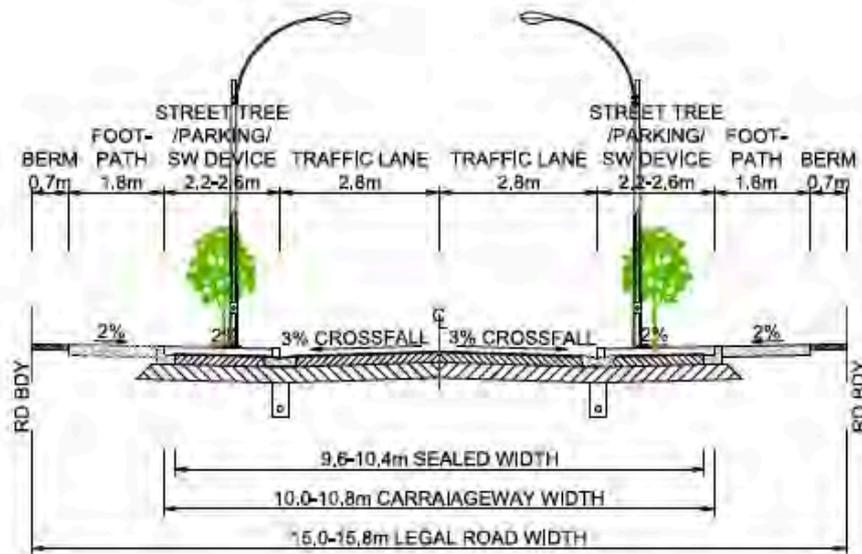
COLLECTOR ROAD:

1. TRAFFIC LANE WIDTH 3.0m UNLESS PUBLIC TRANSPORT ROUTE.
2. CYCLE LANE WIDTH VARIES IN TREATMENT I.E. SEPARATED/ BUFFER DEPENDING ON TRAFFIC VOLUMES ON COLLECTOR ROAD.
3. TRAFFIC LANES TO INCREASE 3.0m FOR TRAFFIC RIGHT TURNING BAYS ON ROAD A AND B
4. ALL CARRIAGEWAY/LEGAL ROAD WIDTH TO INCREASE FOR TURNING BAYS TO MAINTAIN STANDARD PARKING/ SW DEVICE/ CYCLE LANES AND BERMS WIDTHS AS SHOWN
5. CYCLELANE AND PARKING BAYS CAN BE INTERCHANGEABLE





**ROAD E -
LOCAL CENTRE ROAD
CROSS SECTION**



**ROAD F -
LOCAL ROAD (PARKING BOTH SIDES)
CROSS SECTION**



Notes:

1. stormwater device width to be confirmed subject to width of device used.

6.4 Park Edge Roads

1. Where subdivision adjoins a Public Open Space Zone or Future Esplanade Reserve on Precinct Plan 1, or a recreation reserve to vest then park edge roads must be provided.
3. Subdivision that does not comply with clause 1 above is a discretionary activity.

6.5 Site Access

1. Where subdivision adjoins a Future Collector Road (New), Collector Road (Existing) or a Collector Road – Protected Cycleway identified on the Precinct Plan 1 or a road with a 3m shared footpath on the site's frontage (which includes the Collector Road (New)), rear lanes (access lot) or access from side roads must be provided so that no vehicle access occurs directly from the sites frontage to the 3m shared footpath.
2. Subdivision that does not comply with clause 1 above is a discretionary activity.

6.6 Riparian Margin

1. Riparian margins must be planted either side to a minimum width of 10m measured from the bank of the stream. This rule shall not apply to road crossings over streams.
2. Any planting required, will be implemented in accordance with a council approved landscape plan and must be use eco-sourced native vegetation, be consistent with local biodiversity and planted at a density of 10,000 plants per hectare.
3. Subdivision that does not comply with clauses 1 or 2 above is a discretionary activity.

6.7 Stormwater Management

1. Within catchments draining to streams, stormwater runoff from impervious surfaces within roads (and future roads) of 50 m² and over must be directed to a stormwater device(s) designed and sized to achieve the following stormwater hydrology mitigation requirements:

Except as provided by c. the following (a. and b.) applies.

- a. Provide retention (volume reduction) of at least 5mm of runoff depth for the impervious area for which hydrology mitigation is required; and
- b. Provide detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24 hour rainfall event minus the 5mm retention volume or any greater retention volume that is achieved, over the impervious area for which hydrology mitigation is required.
- c. Where:
 - i. A suitably qualified person has confirmed that soil infiltration rates are less than 2mm/hr or there are no areas on the site of sufficient size to accommodate all required infiltration that is free of geotechnical limitations (including slope, setback from infrastructure, building structures or boundaries and water table depth); and

- ii. Rainfall reuse is not available because:
 - c) The quality of the stormwater runoff is not suitable for on-site reuse (i.e. for non-potable water supply, garden irrigation or toilet (flushing)); or
 - d) There are no activities occurring on the site that can re-use the full 5mm retention volume of water;

the retention volume can be taken up by providing detention (temporary storage) and a drain down period of 24 hours for the difference between the pre-development and post-development runoff volumes from the 95th percentile, 24 hour rainfall event over the impervious area for which hydrological mitigation is required (minus any designed retention volume that is achieved).

- 2. Within catchments draining to the coast, stormwater runoff from impervious surfaces within roads (and future roads) must achieve water quality treatment to all impervious surfaces based on rain gardens (or the equivalent) with a surface area sized to 2% of the contributing catchment.
- 3. Stormwater devices within the National Grid Yard must be designed to comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances NZECP34:2001, including their ongoing operation and maintenance.
- 4. Compliance with the above land use controls will be deemed to satisfy the permitted and controlled activity controls in H4.14. Stormwater Management and the overlay rules for Stormwater Management Area Flow.

6.8 Affordable Housing

- 1. Rule 2.2 shall apply to subdivision applications containing 15 or more vacant sites.

7. ASSESSMENT - LAND USE CONTROL INFRINGEMENTS

7.1 Matters of Discretion

In addition to the general matters set out in clause G2.3 of the General Provisions and the specific matters set out for infringements in the relevant underlying zones and Auckland-wide rules, the council will restrict its discretion to the matters below for the relevant land use control infringement.

- 1. Stormwater Management
 - a. The council will restrict its discretion to

- i. items (a) - (d) listed under Stormwater Management – Flow in the Auckland-wide rules and
 - ii. whether the non-compliance occurs on sites/lots intended for affordable housing or higher density development.
2. Development Control Infringements
 - a. The council will restrict its discretion to those matters listed in Part 3 I 1.11, and Part 3, G2; and
 - b. urban design outcomes and density enabled by infringements to building coverage
 3. Integrated Residential Development
 - a. The Council will restrict its discretion to those matters listed under “four or more dwellings” in the Residential Zones.

7.2 Assessment Criteria

In addition to the general assessment criteria in clause G2.3 of the General Provisions and the specific assessment criteria for the infringement in the relevant underlying zones and Auckland-wide rules, the council will consider the relevant assessment criteria below for the development control infringement.

1. On-site stormwater management
 - a. The council will consider assessment criteria (a) - (d) listed under Stormwater Management – Flow in the Auckland-wide rules.
 - b. Where the non-compliance occurs on sites/lots intended for affordable housing or higher density development applicants may demonstrate that runoff from the impervious surfaces can be accommodated within the public stormwater system/network.
2. Development control Infringements

- a. The council will consider assessment criteria listed in Part 3 I 1.11, and Part 3 G 2.3.
- b. The extent that any infringement of building coverage enables quality urban design outcomes and higher density development.

3. Integrated Residential Development

- a. The Council will consider the assessment criteria applying to “four or more dwellings” in the Residential Zones.

8. ASSESSMENT - SUBDIVISION

8.1 Matters of Discretion

1. Subdivision

- a. The council will restrict its discretion to those matters listed for subdivision under the Auckland wide rules, and the following matters:
 - i. Consistency with Precinct Plan 1
 - ii. Stormwater management
 - iii. The matters for discretion outlined in Part 3 H5.4, Table 13
 - iv. The discretions for subdivision within the National Grid Subdivision Corridor in Appendix 6.X.1, and the design and layout of subdivision within the National Grid Subdivision Corridor.
 - v. Transportation Management

8.2 Assessment Criteria

1. For development that is a restricted discretionary activity, the following assessment criteria apply in addition to the criteria specified for the relevant restricted discretionary activities in the Zone and Auckland Wide Rules:
 - a. The structural elements of Precinct Plan 1 are incorporated into the subdivision design.
 - b. The approach to stormwater management for roads, lanes (access lots) and sites addresses the recommendations of the Stormwater Management Plan (May 2016) (including those relating to the catchments discharging to both the streams and estuary), and that the hydrology mitigation requirements outlined in the relevant rules can be met. Consent Notices may be required on the titles of all new sites to ensure compliance with the onsite stormwater management requirements contained in the rules of this Precinct and where recommended with the subdivision application to implement the Stormwater Management Plan (May 2016).
 - c. The design of low impact outfalls as lengths of manmade channels with a natural form (materials and planting) to dissipate energy and minimise erosion for outfalls to streams and the coast.
 - d. The assessment criteria outlined in Part 3, ~~Chapter H, Section 5.4.~~
 - e. The assessment criteria for subdivision within the National Grid Subdivision Corridor in Appendix 6.X.1, and the design and layout of subdivision within the National Grid Subdivision Corridor.
- a. The implementation of relevant upgrades to the roading network

Development of up to 50 households should occur when the following transport requirements are met:

- Bremner Road approach to the Ngakoroa Stream Bridge to a two lane urban road (as required by the consented development) including separated cycle lanes (including a shared path on one side of the Ngakoroa Stream Bridge)
- Footpaths to link the Drury 1 Precinct to Drury Township, as per Drawing Reference A1,1013-Qd1EX022 by McKenzie and Co Consulting
- SH22/Victoria Street intersection – changes to the intersection refer diagram below

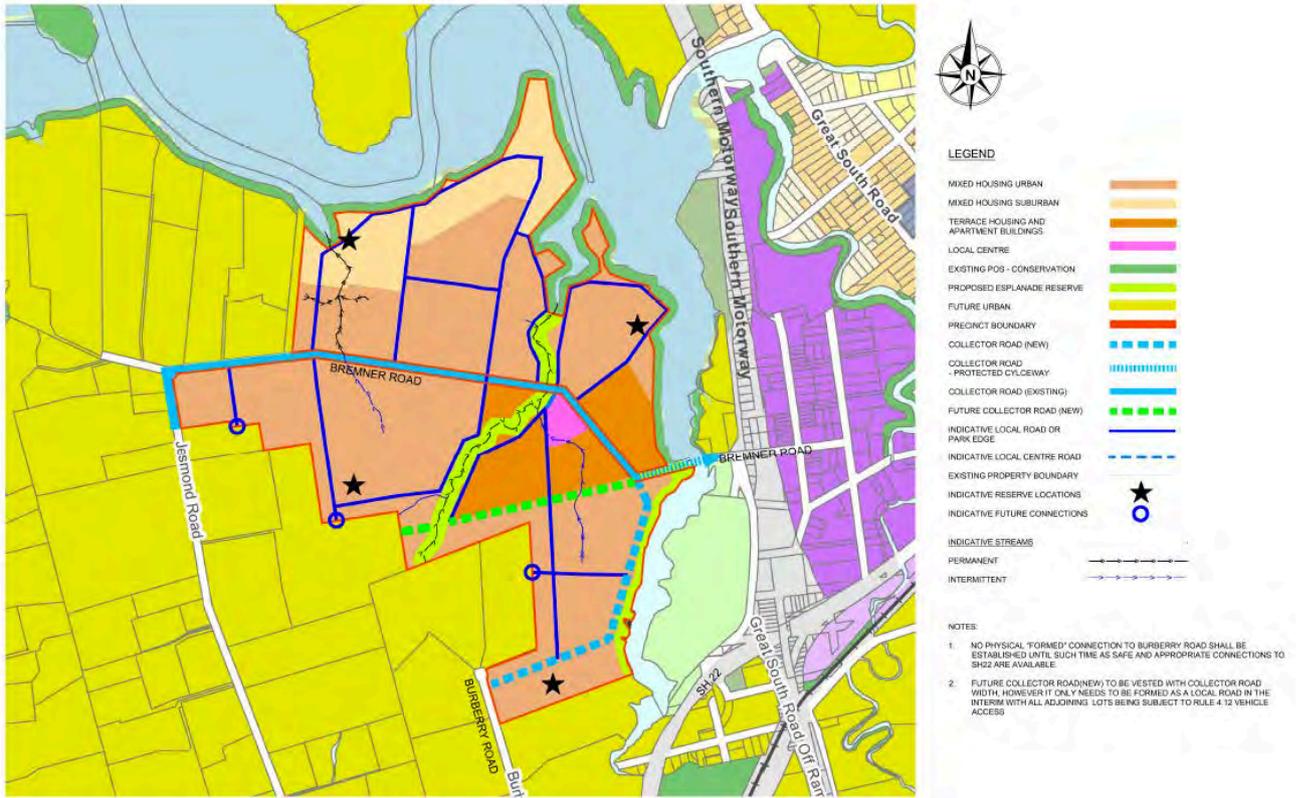


- Pedestrian Improvements at Norrie Road/Great South Road Intersection, as illustrated at Figure 5-4 of the ITA
- Pedestrian upgrade (one side only) of Bremner Road motorway overbridge, including safety improvements to the footpath and handrail structures.
- Great South Road/Firth Street intersection priority changes to the intersection
 - a) Prior to the development of 100 cumulative dwellings being constructed across the Drury 1 Precinct, the Firth Street/Great South Road intersection improvements, including markings and curve realignment as per Drawing 1, Revision A, dated 20 June should be implemented
 - b) Prior to the development of 400 cumulative dwellings being constructed across the Drury 1 Precinct, a dedicated cycle facility should to be constructed across State Highway 1, alongside Bremner Road.

Special Information requirement:

1. For Integrated Residential Development, the Special Information Requirements applying to “four or more dwellings” in the underlying residential zones apply

9 PRECINCT PLAN 1



1. National Grid Definitions

The following definitions are applicable:

Activities sensitive to National Grid lines

Any dwellings, papakāinga, visitor accommodation, boarding houses, retirement villages, supported residential care, education facilities, hospitals and healthcare facilities and care centres.

National Grid lines

Parts of the National Grid of transmission lines and cables (aerial, underground and undersea), stations and substations and other works used to connect grid injection points and grid exit points to convey electricity within and beyond the district and region.

National Grid subdivision corridor

Means the area measured either side of the centreline of an above ground National Grid line as follows:

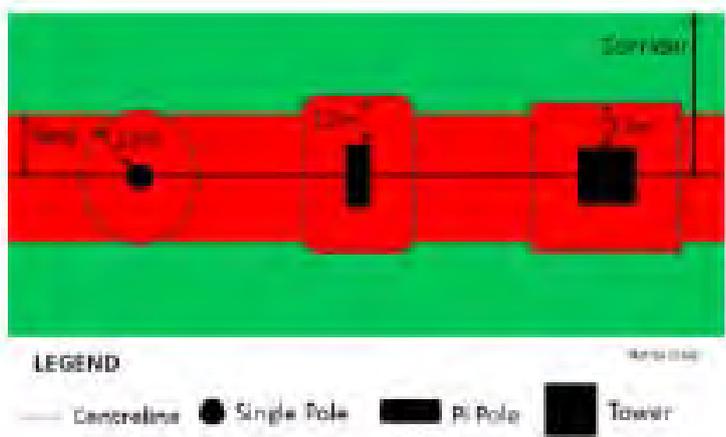
- 32m for the 110kV National Grid lines.
- 37m for the 220kV National Grid lines.

National Grid support structure

A tower or pole comprising part of the National Grid that supports conductors as part of a transmission line. For the purpose of defining the National Grid Yard and the rules in this Appendix, measurements are taken horizontally from the outer visible edge of the base of the support structure at existing ground level.

National Grid Yard (shown in red in diagram below) means: -

- the area located 12 metres in any direction from the outer edge of a National Grid support structure; and
- the area located 12 metres either side of the centreline of any overhead National Grid line.



2. National Grid Rules

1. The location of the electricity transmission corridor must be updated if any National Grid support structure or line is relocated, replaced or removed.
2. Compliance with the NZECP34:2001 is mandatory under the Electricity Act 1992. All activities regulated by NZECP34:2001, including any activities that are otherwise permitted by the Unitary Plan, must comply with this regulation. Compliance with the permitted activity status in this plan does not ensure compliance with NZECP34:2001.

The following table specifies the development activities within the *National Grid Subdivision Corridor* and *National Grid Yard*.

Activities	Activity Status
Within the <i>National Grid Subdivision Corridor</i>	
Subdivision for a network utility or electricity transmission	P
Creation of lots involving the location of a building platform within the <i>National Grid Yard</i>	NC
All other subdivision	RD
Within the <i>National Grid Yard</i>	
Any building or structure unless it is otherwise provided for below.	NC
Network utilities and transmission lines between electricity generation facilities and the National Grid	P
Fences less than 2.5m high and no closer than 5m from a <i>National Grid support structure</i>	P
Alterations to existing buildings that do not increase the building envelope or footprint	P
Establishing <i>activities sensitive to National Grid lines</i> in an existing building	NC
Increasing* the intensity or scale of existing <i>activities sensitive to National Grid lines</i> in an existing building	NC
Earthworks that comply with Development Control 3.1.1	P
Earthworks that do not comply with Development Control 3.1.1.1	RD
Earthworks that do not comply with Development Control 3.1.1.2. or Development Control 3.1.1.3.	NC

- * For the purposes of this Rule, “Increasing the intensity or scale of existing activities sensitive to transmission lines” means any increase in the actual or potential capacity for people to be accommodated.

3 Development Controls

3.1 Permitted Activities

3.1.1 Earthworks within the *National Grid Yard*

All Earthworks with the *National Grid Yard* must comply with the following controls:

1. Be no deeper than 300mm within 12m of any *National Grid support structure*
Except that:
Vertical holes not exceeding 500mm in diameter beyond 1.5 from the outer edge of pole support structure or stay wire are exempt.
2. Not create an unstable batter that will affect a *National Grid support structure*; and
3. Not result in a reduction in the ground to conductor clearance distances below what is required by Table 4 of NZECP34:2001

Provided that the following are exempt from points (1) above:

- Earthworks for Network Utilities; or
- Earthworks undertaken as part of domestic or other cultivation, or repair, sealing or resealing of a road, footpath or driveway.

4. Notification

1. The council will consider the restricted discretionary activities listed in the activity table without the need for public or limited notification. However, limited notification will be given to Transpower New Zealand Ltd unless written approval from Transpower is provided at the time the application is lodged.

5. Assessment - Restricted discretionary activities – subdivision

5.1 Matters of discretion

The council will restrict its discretion to the matters below for the activities listed as restricted discretionary in the activity table:

1. Subdivision within the *National Grid Subdivision Corridor*
 - a. Impacts on the operation, maintenance, upgrade and development of the National Grid, including reverse sensitivity effects.
 - b. Compliance with NZECP34:2001.

- c. The ability of the applicant to provide a complying building platform.
- d. Location, design and use of the proposed building platform or structure as it relates to the *National Grid line*.
- e. The risk of electrical hazards affecting public or individual safety, and the risk of property damage.
- f. The nature and location of any vegetation to be planted within the vicinity of the *National Grid Yard*.
- g. the design and layout of roads.

2. Earthworks within the *National Grid Yard*

- a. Impacts on the operation, maintenance, upgrade and development of the National Grid.
- b. Compliance with NZECP34:2001.
- c. The risk to the structural integrity of the National Grid.
- d. Any impact on the ability of the National Grid owner (Transpower) to access the transmission lines.
- e. The risk of electrical hazards affecting public or individual safety, and the risk of property damage.

6. **Assessment Criteria**

The council will consider the relevant assessment criteria below for the restricted discretionary activities listed above.

1. Subdivision

- a. The effects on the ability of the National Grid owner (Transpower) to operate, maintain, upgrade and develop the National Grid, including access to the line.
- b. The extent to which the design and construction of the subdivision allows for earthworks, building and structures to comply with NZECP34:2001.
- c. The ability to provide a complying building platform.
- d. Location, height, scale, orientation and use of the proposed building platform or structure, or vegetation, as it relates to the National Grid line.
- e. The extent to which the subdivision design and consequential development will
 - (i) minimise potential reverse sensitivity and nuisance effects of the National Grid.

2. Earthworks

- a. The effects on the ability of the National Grid owner (Transpower) to operate, maintain, upgrade and develop the transmission network, including access to the line.
- b. Compliance with NZECP34:2001.
- c. The risk to the structural integrity of the National Grid.
- d. The risk of electrical hazards affecting public or individual safety, and the risk of property damage.

7. Special information requirements

In addition to the general information requirements for a resource consent application an electrical engineering assessment prepared by a suitably qualified person may also be required to demonstrate compliance with NZECP34:2001.

Attachment 2:

Under sections 37 and 38 HASHAA and sections 108 and 220 of the RMA, this consent is subject to the following conditions:

General Conditions

1. The comprehensive vacant lot subdivision to create 51 vacant residential lots from an existing title (132 Bremner Road), creation of 5 lots identified for future affordable housing (Lots 5, 24, 41,42 and 43), roads, esplanade reserve, recreation reserve, drainage reserve and infrastructure to vest at 132 Bremner Road, Bremner Road upgrades including vesting of Lot 100 from 121 Bremner Road for road widening purposes and a balance lot 52, associated earthworks, roads, landscaping and infrastructure, shall be carried out in accordance with the plans and all information submitted with the application, detailed below and all referenced by the Council as consent number JSL/2016/1855 and REG/2016/1856
 - Application Form, and Assessment of Effects titled ‘Resource Consents for a Qualifying Development (QD) Subdivision and Associated works - 109R, 121, 132 & 160 Bremner Rod and 31 Burberry Road, Drury’ prepared by Mark Tollemache and Fion Tang and dated May 2016; Drawings, specialist reports and additional information as detailed below.

In the event of any inconsistency between the approved drawings and supplementary documentation, the approved drawings will prevail.

Drawing Number	Title	Author	Revision Number	
TP001	EXISTING TOPOGRAPHICAL PLAN	McKenzie & Co	C	
SP001	PROPOSED SUBDIVISION OF LOT 9 DP166291 - SHEET 1 OF 3	McKenzie & Co	G	
SP002	PROPOSED SUBDIVISION OF LOT 9 DP166291 - SHEET 2 OF 3	McKenzie & Co	H	
SP003	PROPOSED SUBDIVISION OF LOT 9 DP166291 - SHEET 3 OF 3	McKenzie & Co	G	
SP004	PROPOSED EASEMENT OVER LOT 10 DP166291	McKenzie & Co	A	
SP005	PROPOSED SUBDIVISION OF LOT 2 DP119463	McKenzie & Co	B	
EW001	EARTHWORKS FINAL CONTOUR PLAN	McKenzie & Co	C	
EW002	EARTHWORKS CUT/ FILL PLAN	McKenzie & Co	D	
EW003	EROSION AND SEDIMENT CONTROL - OVERALL	McKenzie & Co	E	
EW004	EROSION AND SEDIMENT CONTROL - SHEET 1 OF 3	McKenzie & Co	C	
EW005	EROSION AND SEDIMENT CONTROL - SHEET 2 OF 3	McKenzie & Co	C	
EW006	EROSION AND SEDIMENT CONTROL - SHEET 3 OF 3	McKenzie & Co	C	
EW010	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1 OF 3	McKenzie & Co	A	
EW011	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2 OF 3	McKenzie & Co	A	
EW012	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 3 OF 3	McKenzie & Co	A	

RD001	ROADING LAYOUT - OVERALL PLAN	McKenzie & Co	E	
RD010	ROADING LAYOUT - PROPOSED INTERSECTION LAYOUT - BREMNER ROAD, ROAD 20/22	McKenzie & Co	D	
RD011	ROADING LAYOUT - FUTURE INTERSECTION LAYOUT - BREMNER ROAD, ROAD 20/22	McKenzie & Co	B	
RD020	LONGSECTION - ROAD 20 LONGSECTIONS	McKenzie & Co	B	
RD021	LONGSECTION - ROAD 22 LONGSECTIONS - SHEET 1 OF 2	McKenzie & Co	B	
RD022	LONGSECTION - ROAD 22 LONGSECTIONS - SHEET 2 OF 2	McKenzie & Co	B	
RD023	LONGSECTION - ROAD 23 LONGSECTIONS	McKenzie & Co	A	
RD024	LONGSECTION - ROAD 26 LONGSECTIONS	McKenzie & Co	B	
RD025	LONGSECTION - ROAD 27 LONGSECTIONS	McKenzie & Co	B	
RD026	LONGSECTION - ROAD 28 LONGSECTIONS	McKenzie & Co	A	
RD031	TYPICAL CROSS SECTIONS - SHEET 1 OF 2	McKenzie & Co	D	
RD032	TYPICAL CROSS SECTIONS - SHEET 2 OF 2	McKenzie & Co	D	
RD033	TYPICAL CROSS SECTIONS - UTILITY SERVICES LAYOUT	McKenzie & Co	A	
RD040	AUCKLAND TRANSPORT STANDARD DETAILS - SHEET 1 OF 5	McKenzie & Co	A	
RD041	AUCKLAND TRANSPORT STANDARD DETAILS - SHEET 2 OF 5	McKenzie & Co	A	
RD042	AUCKLAND TRANSPORT STANDARD DETAILS - SHEET 3 OF 5	McKenzie & Co	A	
RD043	AUCKLAND TRANSPORT STANDARD DETAILS - SHEET 4 OF 5	McKenzie & Co	A	
RD044	AUCKLAND TRANSPORT STANDARD DETAILS - SHEET 5 OF 5	McKenzie & Co	A	
SW001	OVERALL STORMWATER LAYOUT PLAN	McKenzie & Co	C	
SW002	PROPOSED STORMWATER LAYOUT PLAN - SHEET 1 OF 4	McKenzie & Co	B	
SW003	PROPOSED STORMWATER LAYOUT PLAN - SHEET 2 OF 4	McKenzie & Co	B	
SW004	PROPOSED STORMWATER LAYOUT PLAN - SHEET 3 OF 4	McKenzie & Co	C	
SW005	PROPOSED STORMWATER LAYOUT PLAN - SHEET 4 OF 4	McKenzie & Co	C	
SW010	STORMWATER LONGSECTIONS - SHEET 1 OF 7	McKenzie & Co	A	
SW011	STORMWATER LONGSECTIONS - SHEET 2 OF 7	McKenzie & Co	A	
SW012	STORMWATER LONGSECTIONS - SHEET 3 OF 7	McKenzie & Co	A	
SW013	STORMWATER LONGSECTIONS - SHEET 4 OF 7	McKenzie & Co	A	
SW014	STORMWATER LONGSECTIONS - SHEET 5 OF 7	McKenzie & Co	A	
SW015	STORMWATER LONGSECTIONS - SHEET 6 OF 7	McKenzie & Co	A	
SW016	STORMWATER LONGSECTIONS - SHEET 7 OF 7	McKenzie & Co	A	

SW050	BREMNER ROAD RAINGARDEN DETAILS - SHEET 1 OF 2	McKenzie & Co	B	
SW051	BREMNER ROAD RAINGARDEN DETAILS - SHEET 2 OF 2	McKenzie & Co	B	
SW052	BREMNER ROAD TREATMENT SWALE DETAILS - SHEET 1 OF 2	McKenzie & Co	B	
SW053	BREMNER ROAD TREATMENT SWALE DETAILS - SHEET 2 OF 2	McKenzie & Co	B	
SW054	ROAD 22 RAINGARDEN DETAILS - SHEET 1 OF 2	McKenzie & Co	B	
SW055	ROAD 22 RAINGARDEN DETAILS - SHEET 2 OF 2	McKenzie & Co	B	
SW056	LOCAL ROAD RAINGARDEN DETAILS - SHEET 1 OF 3	McKenzie & Co	B	
SW057	LOCAL ROAD RAINGARDEN DETAILS - SHEET 2 OF 3	McKenzie & Co	B	
SW058	LOCAL ROAD RAINGARDEN DETAILS - SHEET 3 OF 3	McKenzie & Co	B	
SW070	STORMWATER - CATCHMENT PLAN	McKenzie & Co	B	
SW075	100-YR STORMWATER OVERLAND FLOW PATH	McKenzie & Co	B	
SW080	STORMWATER STANDARD DETAILS - SHEET 1 OF 3	McKenzie & Co	B	
SW081	STORMWATER STANDARD DETAILS - SHEET 2 OF 3	McKenzie & Co	B	
SW082	STORMWATER STANDARD DETAILS - SHEET 3 OF 3	McKenzie & Co	B	
WW001	WASTEWATER PLAN - OVERALL	McKenzie & Co	C	
WW002	WASTEWATER PLAN - SHEET 1 OF 4	McKenzie & Co	B	
WW003	WASTEWATER PLAN - SHEET 2 OF 4	McKenzie & Co	B	
WW004	WASTEWATER PLAN - SHEET 3 OF 4	McKenzie & Co	B	
WW005	WASTEWATER PLAN - SHEET 4 OF 4	McKenzie & Co	C	
WW010	WASTEWATER LONG SECTIONS - SHEET 1 OF 6	McKenzie & Co	B	
WW011	WASTEWATER LONG SECTIONS - SHEET 2 OF 6	McKenzie & Co	B	
WW012	WASTEWATER LONG SECTIONS - SHEET 3 OF 6	McKenzie & Co	B	
WW013	WASTEWATER LONG SECTIONS - SHEET 4 OF 6	McKenzie & Co	B	
WW014	WASTEWATER LONG SECTIONS - SHEET 5 OF 6	McKenzie & Co	B	
WW015	WASTEWATER LONG SECTIONS - SHEET 6 OF 6	McKenzie & Co	B	
WW080	WATERCARE SERVICES LIMITED WASTEWATER STANDARD DETAILS - SHEET 1 OF 2	McKenzie & Co	B	
WW081	WATERCARE SERVICES LIMITED WASTEWATER STANDARD DETAILS - SHEET 2 OF 2	McKenzie & Co	B	
UT000	WATER SUPPLY PLAN - OVERALL	McKenzie & Co	E	
UT001	WATER SUPPLY PLAN - SHEET 1 OF 5	McKenzie & Co	D	
UT002	WATER SUPPLY PLAN - SHEET 2 OF 5	McKenzie & Co	C	
UT003	WATER SUPPLY PLAN - SHEET 3 OF 5	McKenzie & Co	D	

	5			
UT004	WATER SUPPLY PLAN - SHEET 4 OF 5	McKenzie & Co	D	
UT005	WATER SUPPLY PLAN - SHEET 5 OF 5	McKenzie & Co	B	
UT010	WATER STORAGE TANK & PUMP STATION DETAIL	McKenzie & Co	C	
UT080	WATERCARE SERVICES LIMITED WATER SUPPLY STANDARD DETAILS - SHEET 1 OF 3	McKenzie & Co	A	
UT081	WATERCARE SERVICES LIMITED WATER SUPPLY STANDARD DETAILS - SHEET 2 OF 3	McKenzie & Co	A	
UT082	WATERCARE SERVICES LIMITED WATER SUPPLY STANDARD DETAILS - SHEET 3 OF 3	McKenzie & Co	A	
PP01	Planting Plan 01	LA4 Landscape Architects	-	
PP02	Planting Plan 02	LA4 Landscape Architects	A	
PP03	Planting Schedules	LA4 Landscape Architects	-	
DP01	Construction & Planting Details 01	LA4 Landscape Architects	-	
DP02	Construction & Planting Details 02	LA4 Landscape Architects	-	
The following drawings are for information only to give context to the wider roading upgrades as per condition 34				
EX001	COASTAL MARINE AREA - RECLAMATION PLAN	McKenzie & Co	C	
EX002	COASTAL MARINE AREA - RECLAMATION CROSS SECTIONS	McKenzie & Co	A	
EX020	EXTERNAL WORKS - PEDESTRIAN UPGRADE - OVERVIEW PLAN	McKenzie & Co	E	
EX021	EXTERNAL WORKS - PEDESTRIAN UPGRADE - PLAN SHEET 1 OF 4	McKenzie & Co	F	
EX022	EXTERNAL WORKS - PEDESTRIAN UPGRADE - PLAN SHEET 2 OF 4	McKenzie & Co	E	
EX023	EXTERNAL WORKS - PEDESTRIAN UPGRADE - PLAN SHEET 3 OF 4	McKenzie & Co	E	
EX024	EXTERNAL WORKS - PEDESTRIAN UPGRADE - PLAN SHEET 4 OF 4	McKenzie & Co	E	
EX030	EXTERNAL WORKS - PEDESTRIAN UPGRADE - TYPICAL CROSS SECTIONS	McKenzie & Co	E	
EX031	EXTERNAL WORKS - PEDESTRIAN UPGRADE - NORRIE BRIDGE DETAILS	McKenzie & Co	C	
EX032	EXTERNAL WORKS - PARKS RIGHT OF ENTRY PLAN	McKenzie & Co	B	
EX033	EXTERNAL WORKS - PARKS RIGHT OF ENTRY PLAN - CUT AND FILL PLAN	McKenzie & Co	A	
EX040	EXTERNAL WORKS - PEDESTRIAN UPGRADE - ATCOP DETAILS SHEET 1 OF 2	McKenzie & Co	B	
EX041	EXTERNAL WORKS - PEDESTRIAN UPGRADE - ATCOP DETAILS SHEET 2 OF 2	McKenzie & Co	B	

EX150	EXTERNAL WORKS - JESMOND BRIDGE WIDENING	McKenzie & Co	E
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Specialist Report	Title	Author	Date
Infrastructure and Servicing Report	Auranga Bremner SHA, Karaka and Drury Consultant Ltd, 132 Bremner Road, Drury, Auckland – Qualifying Development and Enabling Works at 31 Burberry, 121 and 160 Bremner Rd	James McKenzie	2 May 2016
Traffic Report	Auranga SGA Qualifying Development 1 – Traffic Report	Ida Dowling and Leo Hills	7 May 2016
Geotechnical Investigation Report	Auranga Development, Stage 1 Qualifying Development, Bremner Road, Drury	S.G Lander	27 April 2016
Additional Traffic Assessment	Auranga s64 Response	Leo Hills	23 June 2016
Additional Information			
Additional Contamination Information	Email titled FW: 1013 – Bremner Road SHA with attached XRF Results	Mark Tollemache and Sam Woolley	24 May 2016
Additional Contamination Information	Email titled FW: 1013 – Bremner Road SHA with attached Extent of contamination plan	Mark Tollemache	30 May 2016
Additional Contamination Information Updated PSI	Preliminary Site Investigation Auranga Development Auckland	Sam Woolley of Focus Environmental Services Ltd	June 2016
Additional Earthworks Information	Email titled Re: 1013-132 Bremner Road, with attached Sediment pond sizing Calculations and drawings	Chris Maday of McKenzie & Co	30 June 2016
Additional Earthworks Information	Email titled: 138 Bremner Road Qualifying Development with attached updated ULSE calculations and Infrastructure Report	Mark Tollemache and Chris Maday of McKenzie & Co	10 June 2016
Additional Ecology Information	Letter titled 'Auranga SHA – Reply to Council Comments regarding QD 1'	Graham Ussher	6 July 2016
Additional Infrastructure Information	Email titled '347426: Bremner Road – HPO request for specialist input 16052016 – Bremner Road SHA'	Mark Tollemache and Robert White	22 June 2016

Monitoring Charges

2. The consent holder shall pay the Council an initial consent compliance monitoring charge of \$1500.00 (inclusive of GST), plus any further monitoring charge or charges to recover the actual and reasonable costs that have been incurred to ensure compliance with the conditions attached to this consent.

The \$1500.00 (inclusive of GST) charge shall be paid as part of the resource consent fee and the consent holder will be advised of the further monitoring charge or charges as they fall due. Such further charges are to be paid within one month of the date of invoice.

Advice Note:

Compliance with the consent conditions will be monitored by Council (in accordance with section 35(d) of the RMA). The initial monitoring charge is to cover the cost of inspecting the site, carrying out tests, reviewing conditions, updating files, etc, all being work to ensure compliance with the resource consent. In order to recover actual and reasonable costs, inspections, in excess of those covered by the base fee paid, shall be charged at the relevant hourly rate applicable at the time. Only after all conditions of the resource consent have been met, will Council issue a letter on request of the consent holder.

Lapse of Consent – JSL-2016-1855

3. Under section 51 of the Housing Accords and Special Housing Area Act (HASHAA) 2013 (s.125 of the RMA), this consent lapses three years after the date it is granted unless the consent is given effect to or the Council extends the period after which the consent lapses.

Advice Note:

This timeframe is deemed acceptable as the level of works proposed would be anticipated to take three years from the date of granting consent,

PRE-DEVELOPMENT CONDITIONS

Pre-construction Meeting

4. Prior to the commencement of the construction or earthworks activity, the consent holder shall hold a pre-construction meeting that:
 - (i) is located on the subject site
 - (ii) is scheduled not less than 5 working days before the anticipated commencement of earthworks
 - (iii) includes the Team Leader, Southern Monitoring, Resource Consenting and Compliance
 - (iv) includes the engineer/s to the contract
 - (v) includes representation from the contractors who will undertake the works
 - (vi) includes project and Council ecologist
 - (vii) includes project archaeologist

- (viii) includes Kaitiaki representatives from Te Akitai Waiohua, Ngati Te Ata and Ngati Tamaoho

The following information shall be made available for discussion at the pre-construction meeting:

- (a) Timeframes for key stages of the works authorised under this consent
- (b) Resource consent conditions
- (c) Finalised Site Specific Erosion and Sediment Control Plan
- (d) Final Chemical Treatment Management Plan
- (e) Traffic Management Plan
- (f) Landscaping and Weed Management Plans

A pre-construction meeting shall be held prior to the commencement of the earthworks activity in each period between October 1 and April 30 that this consent is exercised.

Advice Note:

To arrange the pre-construction meeting please contact the Senior Compliance Advisor, SHA Consenting, on specialhousingarea@aucklandcouncil.govt.nz or 09 373 6392.

Heritage Briefing

5. Prior to the commencing of the earthworks activity on site a contractors briefing shall be undertaken by the projects Archaeologist/ historic heritage expert. This briefing should provide information to contractors regarding what constitutes archaeological/ historic heritage materials; the legal requirements of unexpected archaeological discoveries; the appropriate procedures to follow if archaeological/ historic heritage materials are uncovered whilst the project archaeologist is not on site, to safeguard materials; and the contact information of the relevant agencies (including the project archaeologist/ historic heritage expert, the Auckland Council Senior Compliance Advisor (HPO), Auckland Council Heritage Unit and Heritage NZ Pouhere Taonga) and mana whenua. Documentation demonstrating that the contractor briefing has occurred shall be provided to the Team Leader, Southern Monitoring, Resource Consenting and Compliance at the pre-start meeting under condition (4).

Finalised Erosion and Sediment Control Plan

6. Prior to the commencement of the earthworks activity on the subject site, a finalised Site Specific Erosion and Sediment Control Plan, including an updated Universal Soil Loss Equation (USLE) shall be prepared and submitted to the Team Leader, Southern Monitoring, Resource Consenting and Compliance for approval in writing. No earthworks activity on the subject site shall commence

until confirmation from council is provided that the final management plan is satisfactory.

Advice Note:

The finalised ESCP contain sufficient detail to address the following matters:

- *Details of specific erosion and sediment controls to be utilised, (location, dimensions, capacity)*
- *supporting calculations including an updated USLE and design drawings*
- *catchment boundaries and contour information*
- *details of construction methods*
 - *timing and duration of construction and operation of control works (in relation to the staging and sequencing of earthworks)*
- *details relating to the management of exposed areas (e.g. grassing, mulching)*
- *monitoring and maintenance requirements*

In the event that minor amendments to the erosion and / or sediment controls are required, any such amendments should be limited to the scope of this consent. Any amendments which affect the performance of the controls may require an application to be made in accordance with section 127 of the RMA (or s52 of HASHAA). Any minor amendments should be provided to the Senior Compliance Advisor prior to implementation to confirm that they are within the scope of this consent.

Specifications for Decanting Earth Bunds

7. All Decanting Earth Bunds utilised during earthworks shall be designed to ensure that they:
 - a. have a three percent storage capacity, being at least three cubic metres of impoundment volume for every 100m² of contributing catchment;
 - b. be constructed to a 3:1 to 5:1 length-to-width ratio and have a rectangular shape;
 - c. have a T/bar floating decant which decants at a rate of 3 litres per second, per hectare.

Advice Note:

The Decanting Earth Bunds required by Condition (7) should be constructed in accordance with Best Practice and Auckland Regional Council, Technical Publication No. 90, Erosion & Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

Chemical Treatment Management Plan

8. Prior to the commencement of bulk earthworks at the site, a Final Chemical Treatment Management Plan (CTMP) shall be submitted for the written approval of the Team Leader, Southern Monitoring, Resource Consenting and Compliance. The plan shall include as a minimum:
- a) Specific design details of the chemical treatment system based on a rainfall activated methodology for the site's sediment retention pond and Decanting Earth Bunds;
 - b) Monitoring, maintenance (including post storm) and contingency programme (including a record sheet);
 - c) Details of optimum dosage (including assumptions);
 - d) Results of initial chemical treatment trial and bench testing;
 - e) A spill contingency plan; and
 - f) Details of the person or bodies that will hold responsibility for long term operation and maintenance of the chemical treatment system and the organisational structure which will support this system.

Advice Note:

In the event that minor amendments to the CTMP are required, any such amendments should be limited to the scope of this consent. Any amendments which affect the performance of the CTMP may require an application to be made in accordance with section 127 of the RMA (or s52 of HASHAA). Any minor amendments should be provided to the Senior Compliance Advisor (HPO) prior to implementation to confirm that they are within the scope of this consent.

Erosion and Sediment Control Certification

9. Prior to bulk earthworks commencing, a certificate signed by an appropriately qualified and experienced engineer shall be submitted to the Team Leader, Southern Monitoring, Resource Consenting and Compliance to certify that the erosion and sediment controls have been constructed in accordance with the erosion and sediment control plans as specified in condition 1, 6, 7 and 8 of this consent.

Certified controls shall include the, Sediment Retention Ponds, Decanting Earth Bunds, Cleanwater Diversions, Dirty Water Diversions, Contour Drains and Super Silt Fences. The certification for these subsequent measures shall be supplied immediately upon completion of construction of those measures. Information supplied if applicable, shall include:

- a) Contributing catchment area;
- b) Shape and volume of structure (dimensions of structure);
- c) Position of inlets/outlets; and
- d) Stabilisation of the structure.

Road and Traffic Management

10. Prior to the commencement of the earthworks or construction activity on the subject site, a Traffic Management Plan (TMP) shall be prepared by a qualified Site Traffic Management Supervisor and submitted for approval by the Team Leader, Southern Monitoring, Resource Consenting and Compliance. No earthworks or construction on the subject site shall commence until confirmation is provided from Council that the TMP is satisfactory and any required measures referred to in that plan have been put in place. The TMP shall ensure that the following matters are included at a minimum:
- (i) the control of the movement of earthmoving vehicles to and from the site
 - (iii) a designated haulage route on the public roading network for heavy vehicles accessing the site
 - (iv) signage proposed to warn road users of heavy vehicle movements
 - (v) measures to ensure that any mud, dirt or debris tracked on to the surrounding roads by heavy vehicles accessing the site is avoided and/or cleaned up if it occurs

Advice Note:

It is the responsibility of the applicant to seek approval for the Traffic Management Plan from Auckland Transport if it is required. Please contact Auckland Transport on (09) 355 3553 and review www.beforeudig.co.nz before you begin works.

Weed Management

11. Prior to any commencement of works within the proposed esplanade reserve (Lots 100 and 101) a weed management plan shall be submitted to the Team Leader, Southern Monitoring, Resource Consenting and Compliance for approval in writing. This plan clearly identify weeds within the reserve areas on a plan, the recommended control methods for the weeds identified and the time frames for implementing the weed plan and responsibilities. Any chemical control to be used must follow best practice methodology and be suitable for the purpose and the environment in which it is to be used.

Once the Weed Control Plan above has been approved by Team Leader, Southern Monitoring, Resource Consenting and Compliance the consent holder shall control all existing weed infestations in accordance with, but not limited to, the approved Weed Control Plan to the satisfaction of Council's Team Leader, Southern Monitoring, Resource Consenting and Compliance prior to the issue of s224(c) certificate.

Advice Note: Weed Control means, that there are no fruiting and / or flowering individuals of weed species present within the covenant area and any mature weed species present are dead. In addition there shall be no areas where weed

species are smothering and / or out competing native vegetation including suppressing the natural regeneration processes. Control shall be demonstrated to the satisfaction of council's Senior Compliance Advisor (DPO) or similar position.

DEVELOPMENT IN PROGRESS CONDITIONS

12. Archaeology/ Historic Heritage

If, at any time during site works, potential koiwi (human remains), archaeology or artefacts are discovered, then the following discovery protocol is to be followed:

- (a) All earthworks will cease in the immediate vicinity (at least 10m from the site of the discovery) while a suitably qualified archaeologist is consulted to establish the type of remains.
- (b) If the material is identified by the archaeologist as human, archaeology or artefact, earthworks must not be resumed in the affected area (as defined by the archaeologist). The consent holder must immediately advise the Team Leader, Southern Monitoring, Resource Consenting and Compliance, Heritage New Zealand Pouhere Taonga and Police (if human remains are found) and arrange a site inspection with these parties.
- (c) If the discovery contains koiwi, archaeology or artefacts of Maori origin, representatives from Te Akitai Waiohua, Ngati Te Ata and Ngati Tamaoho Trust are to be provided information on the nature and location of the discovery.
- (d) The Te Akitai Waiohua, Ngati Te Ata and Ngati Tamaoho are to be given the opportunity to monitor the earthworks and conduct karakia and other such religious or cultural ceremonies and activities as are appropriate.

Advice Note:

The Heritage New Zealand Pouhere Taonga Act 2014 provides for the identification, protection, preservation and conservation of the historic and cultural heritage of New Zealand. It is an offence under this Act to destroy, damage or modify any archaeological site without an authority from Heritage New Zealand Pouhere Taonga. An archaeological site is defined as a place associated with pre-1900 human activity where there may be evidence relation to history of New Zealand. Archaeological features' may include old whaling stations, ship wrecks, shell middens, hangi or ovens, pit depressions, defensive ditches, artefacts, or koiwi tangata (human skeletal remains), etc. For guidance and advice on managing the discovery of archaeological features, contact the Team Leader Cultural Heritage Implementation, Auckland Council on 09 301 0101.

13. If any unrecorded historic heritage site (Any site that meets the RMA definition of historic heritage) are exposed as a result of any activity associated with the consent proposals then these sites shall be recorded within the Auckland Council Cultural Heritage Inventory by the project archaeologist/ historic heritage expert.

Earthworks

14. There shall be no deposition of earth, mud, dirt or other debris on any road or footpath resulting from earthworks activity on the subject site. In the event that such deposition does occur, it shall immediately be removed. In no instance shall roads or footpaths be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses or receiving waters.

Advice Note:

In order to prevent sediment laden water entering waterways from the road, the following methods may be adopted to prevent or address discharges should they occur:

- *provision of a stabilised entry and exit(s) point for vehicles*
- *provision of wheel wash facilities*
- *ceasing of vehicle movement until materials are removed*
- *cleaning of road surfaces using street-sweepers*
- *silt and sediment traps*
- *catchpits or enviropods*

In no circumstances should the washing of deposited materials into drains be advised or otherwise condoned.

It is recommended that you discuss any potential measures with the Senior Compliance Advisor, SHA Consenting who may be able to provide further guidance on the most appropriate approach to take. For more details please contact specialhousingarea@aucklandcouncil.govt.nz or 09 373 6392. Alternatively, please refer to Auckland Regional Council, Technical Publication No. 90, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

15. The operational effectiveness and efficiency of all erosion and sediment control measures specifically required as a condition of resource consent, or by the approved Erosion and Sediment Control Plan under condition 6, 7 and 8, shall be maintained throughout the duration of earthworks activity, or until the site is permanently stabilised against erosion.
16. All excavation in the work areas shall be managed to minimise any discharge of debris, soil, silt, sediment or sediment-laden water from beyond subject site to either land, stormwater drainage systems, watercourses or receiving waters. All sediment and erosion controls shall be installed in accordance with the Auckland Regional Council Guidelines for Land Disturbing Activities in the Auckland Region, Technical Publication TP90.
17. The site shall be progressively stabilised against erosion at all stages of the earthwork activity, and shall be sequenced to minimise the discharge of contaminants to groundwater or surface water.

Advice Note:

Interim stabilisation measures may include:

- *the use of waterproof covers, geotextiles, or mulching*
- *top-soiling and grassing of otherwise bare areas of earth*
- *aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward*

It is recommended that you discuss any potential measures with the Council's monitoring officer who may be able to provide further guidance on the most appropriate approach to take. Please contact the Team Leader, Southern Monitoring, Resource Consenting and Compliance for more details. Alternatively, please refer to Auckland Regional Council, Technical Publication No. 90, Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region.

18. All perimeter controls shall be operational before earthworks commence. All 'cleanwater' runoff from stabilised surfaces including catchment areas above the site shall be diverted away from earthworks areas via a stabilised system, so as to prevent surface erosion.

Advice Note:

Perimeter controls include cleanwater diversions, silt fences and any other erosion control devices that are appropriate to divert stabilised upper catchment runoff from entering the site, and to prevent sediment-laden water from leaving the site.

19. No sediment laden runoff shall leave the site without prior treatment via an approved sediment control device.

Seasonal Restriction

20. No earthworks on the site shall be undertaken between 30 April and 1 October in any year, without the prior written approval of the Team Leader, Southern Monitoring, Resource Consenting and Compliance at least two weeks prior to 30 April of any year. Revegetation/stabilisation is to be completed by 30 April in accordance with measures detailed in Auckland Regional Council Guidelines for Land Disturbing Activities in the Auckland Region, Technical Publication TP90 and any amendments to this document.

Completion or Abandonment of Earthworks

21. Upon abandonment or completion of earthworks on the subject site all areas of bare earth shall be permanently stabilised against erosion to the satisfaction of the Team Leader, Southern Monitoring, Resource Consenting and Compliance.

Advice Note:

Should the earthworks be completed or abandoned, bare areas of earth shall be permanently stabilised against erosion. Measures may include:

- *The use of mulching.*
- *Top-soiling, grassing and mulching of otherwise bare areas of earth.*
- *Aggregate or vegetative cover that has obtained a density of more than 80% of a normal pasture sward.*

The on-going monitoring of these measures is the responsibility of the consent holder. It is recommended that you discuss any potential measures with the Council's monitoring officer who will guide you on the most appropriate approach to take. Please contact the Team Leader, Southern Monitoring, Resource Consenting and Compliance for more details. Alternatively, please refer to Auckland Regional Council, Technical Publication No. 90, Erosion & Sediment Control: Guidelines for Land Disturbing Activities in the Auckland Region.

Dust Management

22. There shall be no airborne or deposited dust beyond the subject site as a result of the earthworks or construction activity that, in the opinion of the Team Leader, Southern Monitoring, Resource Consenting and Compliance, is noxious, offensive or objectionable.

Advice Note:

In assessing whether the effects are noxious, offensive or objectionable, the following factors will form important considerations:

- *The frequency of dust nuisance events*
- *The intensity of events, as indicated by dust quantity and the degree of nuisance*
- *The duration of each dust nuisance event*
- *The offensiveness of the discharge, having regard to the nature of the dust*
- *The location of the dust nuisance, having regard to the sensitivity of the receiving environment.*

Noise

23. All construction and earthworks activities on the subject site shall comply with the New Zealand Standard 6803:1999 for Acoustics - Construction Noise, at all times. The use of noise generating tools, motorised equipment, and vehicles that are associated with construction and/or earthworks activity on the subject site shall be restricted to between the following hours to comply with this standard:

- Monday to Saturday: 7:30am to 6.00pm
- Sundays or Public Holidays: No works

Rear Lane Design (Lot 301)

24. Prior to the lodgment of Engineering Plan Approval, the consent holder shall provide full design details of the rear lane design (Lot 301) for approval in writing to the Manager, Resource Consenting and Compliance, in consultation with the Principal Urban Designer, Auckland Design Office. The design should clearly illustrate the following;
- i. Landscaping shall be provided at the entry and exist points of the laneway visible from Road 26 to add to the visual amenity and interest of the public streetscape and to contribute to the achievement of slow vehicle speeds into and out of the rear lane, and clear delineation that the rear lane is a private carriageway (such as by varying surface materials at the entry / exit).
 - ii. Verification from a traffic engineer that the rear lane is designed to achieve low vehicle speeds (10km/hr).

The laneway shall then be implemented in accordance with the details approved above to the satisfaction of Manager, Resource Consenting and Compliance and maintained thereafter.

Engineering Plan Requirements and Approvals

25. Prior to the commencement of any earthworks/construction or prior to the lodgement of the survey plan pursuant to s.45 of the HASHAA (s.223 of the RMA), whichever is the earlier, the consent holder shall submit 2 hard copies and one PDF/CD version of complete engineering plans (including engineering calculations and specifications) to the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance for approval. Details of the registered engineer who shall act as the developer's representative for the duration of the development shall also be provided with the application for Engineering Plan Approval.

The engineering plans shall include but not be limited to the information regarding the following engineering works:

- Design and location of any counterfort and/or subsoil land drainage required and the proposed ownership and maintenance of the counterfort and/or subsoil land drainage.
- Detailed design of all roads to be vested in Council including intersections, parking, indicative vehicle crossings, pedestrian crossings, footpaths, street lighting, street furniture and other structures/facilities on the roads (including street furniture, traffic calm devices and safety measurements i.e. marking and street sign etc.). In particular, the necessary works to the adjacent road reserve in terms of upgrade works to the road carriageway and the provision of additional footpaths. All roads shall be designed in accordance with Auckland Transport's Code of Practice (ATCOP). In particular:

- Right turn bays and flush median shall be provided along Road 22 at all local road intersections as part of this development. The design may require amendments to landscaping, rain gardens and other features to accommodate the right turn bays/flush median;
- Clear inter-visibility sight lines shall be demonstrated by a visibility assessment at all intersections and driveways for motorists. That clear inter-visibility sight lines shall be provided at all pedestrian crossing points between motorists and pedestrians. No planting or street furniture shall compromise sight distance requirements;
- A 30kph speed environment calming devices on local residential streets shall be provided. This shall be achieved via a Local Area Traffic Management (LATM);
- Vehicle tracking requirements at all intersections shall be met including for service and rubbish trucks. It is understood from Auckland Council Waste Management that 8m and 10.3m trucks will be servicing the waste and recycling collections. No crossing of the centerline shall be permitted on Collector Roads. Vehicle tracking plans (10.3m truck) shall be provided for review with the EPA drawings. If turning is unable to occur within the proposed road reserve for Road 27 then a temporary turning head may be required;
- All proposed batter slopes within the road reserve shall be no greater than 1:5 for safety and mowing requirements. Otherwise they will need to be planted. That planting shall be approved by AC Parks;
- The raingardens shall be designed in accordance with Auckland Council SW/Parks and Auckland Transport requirements. Auckland Council Parks to approve appropriate planting taking into account maintenance, sight lines, encroachment onto carriageway and footpath;
- All proposed trees within the road are appropriate species to ensure that sight lines are not compromised;
- A plan showing the indicative vehicle crossings for the lots. Indicative vehicle crossing locations shall be shown and overlaid with landscaping plans, street lightings, services and indented parking bays to ensure space for these are planned;
- Pedestrian crossing facilities shall be provided for good connectivity for pedestrians and cyclists as required throughout the development;
- Pram crossings shall be provided at all crossing points and designed in accordance with ATCOP requirements including the use of AT approved tactile pavers;

- Road 20 (Bremner Road) Crossing – That the design details of a pedestrian/cyclist refuge island shall be provided on Road 20 at the intersection of Road 22;
 - That cycle ramps on and off ramps shall be provided for cyclists wanting to exit from on road to off road facilities or vice versa. The design of the cycle ramps shall be in accordance with ATCOP requirements;
 - A sign and road marking plan(s) shall be submitted;
 - The Stormwater and Wastewater reticulation and manholes shall be clear of the carriageway and shall be outside the carriageway within the berm or within private property
 - The Utilities reticulations shall demonstrate sufficient cover will be achieved under parking bays, footpaths, and grass berm; and
- Detailed Landscape Planting Plan and maintenance programmes for all street planting and landscaping on the proposed roads and esplanade and drainage reserves. The Landscaping Planting Plan shall be prepared in accordance with the following requirements:
 - Be prepared by a suitably qualified landscape architect;
 - Be in general accordance with the application drawings by LA4 Landscape Architects dated 13/07/16 and titled *Planting Plan 01-05 – Auranga Development 132 Bremner Road project* No: 16445 drawing No PP01 –PP05 Rev A.
 - Ensure that species are able to maintain appropriate separation distances from paths, roads, street lights and vehicle crossings in accordance with the Auckland Transport Code of Practice;
 - Identify all new planting to be undertaken on the site;
 - Street trees shall be size Pb95 or larger at the time of planting,
 - Include specifications for plant condition and planting methodology;
 - Include details of the intended species, spacing, plant sizes at the time of planting, their likely heights on maturity and how planting will be staged, established and maintained;
 - Include a commitment to replacing planting if the initial work fails; and
 - Include provisions and methods to ensure landscaping works do not unduly interfere with any overland flow path and swales.
 - Any planting adjacent Ngakoroa Stream shall incorporate Auckland Council Riparian Planting Guidelines TP148.

The Maintenance programme for for all planting to be established shall include:

- vegetation maintenance policies for the proposed planting, in particular details of maintenance methodology and dates / frequencies for the

first two years of the issue of the consent by an appointed contractor with arboriculture experience; and

- design strategy, specification and management plans for the treatment/maintenance issue relating to reserves.
- Detailed design of the Stormwater system and devices for the management of the quality of the stormwater runoff from the contributing development upstream catchment (including treatment devices and all ancillary equipment/structure etc.). The stormwater system and devices shall be designed in accordance with the Auckland Council Code of Practice for Land Development and Subdivision: Chapter 4 - Stormwater; in particular:
 - The proposed stormwater system shall be designed to identify health and safety risk during the life of the asset and shall ensure safety to the public, property and to operating personnel, contractor and Council employee.
 - The proposed stormwater system shall have an asset life of a minimum of 100 years.
 - The proposed network layout shall be reviewed at EPA stage to ensure the design complies with the s4 of the Code of Practice. Where the design deviates from the CoP commentary shall be provided explaining the reason for deviation and any additional operational or maintenance implications.
 - All access ways and JOALs (Lots 301 and 301) must be shall be constructed using permeable pavements capable of detaining and managing the first 5mm of any rainfall runoff.
 - Stormwater from all road reserve impervious areas must be directed to at source bio-retention devices designed and sized to accommodate stormwater runoff from the impervious road reserve and achieve SW quality treatment requirements as set out below:

Bremner Rd (<5000 vpd)

Full quality treatment devices for all impervious areas designed in accordance with TP10.

Road 22 (<3000 vpd)

Quality treatment devices shall have surface area sized on 2% of the contributing catchment and 1.0m depth bio-retention media and otherwise in general accordance in accordance with TP10.

All other roads

Quality treatment devices shall have surface area sized on 2% of the contributing catchment and can have 1:1 internal side slopes and minimum 600mm media depth

Details of the stormwater discharge outlets including engineered erosion protection measures designed in accordance with Auckland Council Technical Publication Number 10 (TP10).

- Details of fire hydrants to be installed. Any fire hydrants shall be designed in accordance with the Water and Wastewater Code of Practice for Land Development and Subdivision.

- Information relating to gas, electrical or telecommunication reticulation including ancillary equipment.
- The design of the laneway (302).
- The design of the rear lane (Lot 301). The drawings submitted shall be in accordance with the details approved under condition 24

As part of the application for Engineering Plan Approval, a chartered professional engineer shall:

- Certify that all public roads and associated structures/facilities or access ways have been designed in accordance with the ATCOP.
- Certify that the proposed stormwater system or devices proposed have been designed in accordance with the Auckland Council's Code of Practice for Land Development and Subdivision: Chapter 4 - Stormwater.
- Provide a statement that the proposed infrastructure has been designed with the long term operation and maintenance of the asset.
- Confirm that all practical measures are included in the design to facilitate safe working conditions in and around the asset.

Advice Note:

1. *Within the former Papakura District water and wastewater services are provided by Veolia under a Franchise Agreement. The developer deals directly with Veolia in relation to all water and wastewater servicing matters throughout the subdivision process. Compliance with Veolia's water and wastewater requirements (as evidenced by the issuing by Veolia of a Compliance Certificate) is necessary prior to the issue by Auckland Council of a Completion Certificate s224(c).*
2. *It is noted that if the EPA drawings require any permanent traffic and parking restrictions e.g. broken yellow lines, then the development will require Traffic Control Committee (TCC) resolutions from Auckland Transport. The consent holder would be expected to prepare and submit a resolution report to TCC.*
3. *It is recommended that the consent holder contact the Arboricultural Advisor (South) prior to submitting the planting plan in order to obtain advice on the most appropriate species to use.*
4. *All activities associated with the subdivision (lot 100 and Bremner Road upgrades), including the earthworks, structures, any operation of mobile plant, and persons working near exposed line parts, shall comply with the New Zealand Electrical Code of Practice for Electrical Safe Distances (NZECP34:2001), or any subsequent revision of the code.*

AFFORDABILITY

26. Lots 5, 24, 41, 42 and 43 are allocated for the building of affordable dwellings that meet the required percentage of affordable dwellings set out in the affordability criteria in the Housing Accords and Special Housing Areas (Auckland) Amendment Order 2013 Bremner Road SHA dated 17 August 2015.
27. The price at which a dwelling on these lots may be sold shall not exceed 75% of the Auckland Region Median House Price published by Real Estate Institution New Zealand for the most recent full month of September 2015 being \$578,250.00.

GENERAL SUBDIVISION CONDITIONS

Section 223 Condition Requirements (s.45 of HASHAA) for Subdivision of Lot 9 DP 166291

Street Naming

28. The consent holder shall submit a road naming application for proposed new roads for approval by the Franklin Local Board prior to the lodgement of the survey plan for the subdivision.

Advice Note:

In accordance with Council policy the road naming application shall provide suggested street names (one preferred plus two alternative names) and includes evidence of meaningful consultation with local Iwi groups. The street naming approval for the proposed roads shall be obtained from Local Board prior to the approval of the survey plan pursuant to Section 45 of HASHAA. The consent holder is advised that the process of naming roads currently takes approximately two or three months. The applicant is therefore advised to submit the road naming application for approval by the Council as soon as practicable after the approval of this subdivision consent.

29. Within three years of the decision of the subdivision consent, the Consent holder shall submit a survey plan of the subdivision to Auckland Council for approval pursuant to s.45 of HASHAA (s.223 of the RMA). The survey plan shall be general in accordance with the approved subdivision plans in Condition 1 of the consent and the following requirements:
 - a. The Memorandum of Easements in accordance with the approved subdivision plans shall be duly granted or reserved Lots 100 and 101 shall be vested in Auckland Council as one a Local Purpose Reserve (Esplanade) at no cost.
 - b. Lot 300 shall be vested in Auckland Council as a public road.
 - c. Lot 102 shall be vested in Auckland Council as a drainage reserve.
 - d. That Lot 301 hereon be held in undivided one twenty sixth shares by the owners of Lots 2-14 and fourteen one, twenty sixth shares by the owner of Lot

52 and individual certificates be issued in accordance herewith.

- e. That Lot 302 hereon be held as two undivided one half shares by the owners of Lots 39 and 40 hereon as tenants in common in the said shares and that individual certificates be issued in accordance herewith
- f. An easement in gross in favour of Auckland Council for public access shall be duly created and reserve if the temporary turning head for the road to service Lots 41-46 and 51 is located outside the road boundary.

The existing easements for the purpose as outlined below shall be cancelled under section 243(e) of the RMA. The consent holder shall prepare the section 243(e) resolution within the Land Information NZ Land online Territorial Authority Certifications portal as part of the survey plan application for this subdivision.

- Right of way, right to convey electricity and telecommunications created by easement instrument C878364.6 over Lot 9 DP16629
- Right to convey water created by easement instrument C878364.7 over Lot 9 DP16629; and
- Right to store water created by easement instrument C878364.7 over Lot 9 DP16629.

Section 223 Condition Requirements (s.45 of HASHAA) for Subdivision of Lot 2 DP 119 463

30. Within three years of the decision of the subdivision consent, the Consent holder shall submit a survey plan of the subdivision to Auckland Council for approval pursuant to s.45 of HASHAA (s.223 of the RMA). The survey plan shall be general in accordance with the approved subdivision plans in Condition 1 of the consent and the following requirements:

- Lot 100 shall be vested in Auckland Council as a public road.

The existing easements for the purpose as outlined below shall be cancelled under section 243(e) of the RMA. The consent holder shall prepare the section 243(e) resolution within the Land Information NZ Land online Territorial Authority Certifications portal as part of the survey plan application for this subdivision.

- Right to convey water created by easement instrument C878364.7 over Lot 1 DP119463.

SECTION 224 CONDITION REQUIREMENTS (S.46 OF HASHAA) for Subdivision of Lot 2 DP 119 463

Infrastructure

Subdivision of Lot 2 DP 119 463

31. All proposed roads (including the Bremner Road and pedestrian upgrades) and ancillary facilities such as street lighting, and traffic calm devices if any, marking, street sign, and street furniture to be vested in Council shall be constructed in accordance with the approved Engineering Plans to the satisfaction of the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance.

An Engineering Completion Certificate certifying that all proposed roads and the ancillary structures on the roads to be vested in Auckland Council have been constructed in accordance with the approved Engineering Plans shall be provided in support of the s.224 application (s.46 of the HASHAA).

All RAMM as-built plans and data for the new roads shall also be provided with the s.224(c) application (s.46 of the HASHAA). This shall be inclusive of kerb lines, cesspits, footpath, intersection control devices, pavement marking, street lighting, street furniture, street name, directional signs and landscaping etc.

A report from a suitably qualified and registered electrician shall be supplied with the 224(c) application (s.46 of the HASHAA). The report shall certify that all street lightings have complied with the relevant safety standards and that they are connected to the network and are operational.

SECTION 224 CONDITION REQUIREMENTS (S.46 OF HASHAA) for Subdivision of Lot 9 DP 166291

32. All proposed roads (including the Bremner Road and pedestrian upgrades) and ancillary facilities such as street lighting, and traffic calm devices if any, marking, street sign, and street furniture to be vested in Council shall be constructed in accordance with the approved Engineering Plans to the satisfaction of the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance.

An Engineering Completion Certificate certifying that all proposed roads and the ancillary structures on the roads to be vested in Auckland Council have been constructed in accordance with the approved Engineering Plans shall be provided in support of the s.224 application (s.46 of the HASHAA).

All RAMM as-built plans and data for the new roads shall also be provided with the s.224(c) application (s.46 of the HASHAA). This shall be inclusive of kerb lines, cesspits, footpath, intersection control devices, pavement marking, street lighting, street furniture, street name, directional signs and landscaping etc.

A report from a suitably qualified and registered electrician shall be supplied with the 224(c) application (s.46 of the HASHAA). The report shall certify that all street lightings have complied with the relevant safety standards and that they are connected to the network and are operational.

33. Prior to the submission of s.224(c) application the consent holder shall prepare and submit a Traffic Resolution report to AT Traffic Control Committee (TCC) for approval.

Roads Upgrades

34. The Bremner Road carriageway and pedestrian/ cycle upgrades identified below shall be completed in full in accordance with the approved engineering prior to the issue of the 224(c) certificate pursuant to Section 46 of the HASHAA for the 51 lots. Alternatively, the consent holder shall submit a copy of an agreed Infrastructure Funding Agreement or alternative arrangements agreed with Auckland Transport which deals with these upgrades to the satisfaction of Council.

Table: Schedule of Road Upgrades

- i. Bremner Road approach to the Ngakoroa Stream Bridge to a two lane urban road including separated cycle lanes (including a shared path on one side of the Ngakoroa Stream Bridge)
- ii. Footpaths to link the Drury 1 Precinct to Drury Township, as per Drawing Reference A1,1013-Qd1EX022 by McKenzie and Co Consulting
- iii. SH22/Victoria Street intersection – changes to the intersection as illustrated in figure 1, Revision A, dated 9 June 2016 in the sec 64 response from commute dated 23 June 2016
- iv. Pedestrian Improvements at Norrie Road/Great South Road Intersection, as illustrated at illustrated in revision A of the McKenzie and Co Consultants Ltd Drawing number RD100, dated 30 November 2015 and revision E of the McKenzie and Co consultants Ltd drawing number RD1013-QD1-EX022, dated 20 June 2016.
- v. Pedestrian upgrade (one side only) of Bremner Road motorway overbridge, including safety improvements to the footpath and handrail structures.
- vi. Great South Road/Firth Street intersection priority changes to the intersection as illustrated in revision E of the McKenzie and Co consultants Ltd drawing number RD1013-QD1-EX022, dated 20 June 2016

Infrastructure Connections

35. Prior to the issue of the 224c Certificate pursuant to s46 of the HSAHAA, the consent holder shall provide evidence to confirm that the wastewater pump station and trunk line, the bulk supply to the Waikato Trunk water main have been constructed and vested in Auckland Council or as otherwise agreed with Veolia and Watercare.

Wastewater Connections

36. The sewer system, as required by this consent, shall be designed and adequately sized to service future development of upstream lots and lots within that area as defined within the Catchment Management Plan.
37. The consent holder shall provide and install a complete public wastewater system to serve all lots in accordance with the Water and Wastewater Code of Practice for Land Development and Subdivision to the satisfaction of Auckland Council. This includes the establishment of the wastewater trunk from the Hingaia pump station to the consented Bremner Road pump station and the development of the reticulated network from 132 Bremner Road to this pump station.
38. A certificate from Veolia Water confirming that separate wastewater connections have been provided for all lots shall be provided in support of the 224(c) application pursuant to Section 46 of the HASHAA.

Advice Note:

In respect to conditions relating to waste and water connections within the former Papakura District water and wastewater services are provided by Veolia under a Franchise Agreement. The developer deals directly with Veolia in relation to all water and wastewater servicing matters throughout the subdivision process. Compliance with Veolia's water and wastewater requirements (as evidenced by the issuing by Veolia of a Compliance Certificate) is necessary prior to the issue by Auckland Council of a Completion Certificate s224(c).

Water Supply

39. The consent holder shall provide and install a complete water supply reticulation system to serve all lots in accordance with the Water and Wastewater Code of Practice for Land Development and Subdivision to the satisfaction of Auckland Council. This includes the establishment of the water supply trunk from 103 Flanagan Road to 132 Bremner Road.
40. A certificate from Veolia Water confirming that separate water supply connections for all residential lots have been provided for all lots shall be

provided in support of the 224(c) application for each stage pursuant to Section 46 of the HASHAA.

Fire Hydrants

41. Fire hydrants shall be designed, provided and installed within 135m of the furthest point on any property and within 65m of the end of a cul-de-sac in accordance with Water and Wastewater Code of Practice to the satisfaction of Auckland Council.

A certificate from Veolia Water confirming that evidence of undertaking the hydrant flow test and compliance with the standards has been undertaken shall be provided in support of the s.224 application, pursuant to s46 of the HASHAA.

Network Utility Services

42. Individual private connection to the underground reticulation of electricity, gas and telecommunication services to the boundary of each lot shall be provided and installed to the satisfaction of the appropriate network utility providers.

Certificates from the network utility providers and certified 'as-built' given locations of all plinths, cables and ducts shall be supplied to the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance as part of the s224 application, pursuant to s46 of the HASHAA.

121 Bremner Road

43. Prior to the issue of the 224c Certificate pursuant to s46 of the HSAHAA, a statement from a licensed cadastral surveyor shall be provided to the satisfaction of the Team Manager, Resource Consent Project Management. The statement shall confirm that all existing services to the buildings at 121 Bremner Road will not be affected by the subdivision.

Geotechnical Completion Report

44. A Geotechnical Completion Report by a suitably qualified and Registered Engineer shall be provided to Council with the 224 application in accordance with the "Auckland Council Code of Practice for Land Development and Subdivision Section 2.6". The report shall confirm the stability of the land for residential development including any special conditions/requirements to be met for any future development on the site. The Geotechnical Completion Report shall also include all associated as-built plans for earthworks and subsoil drains and a Statement of Professional Opinion on Suitability of Land for building construction.

Advice Note:

The findings of this completion Report may necessitate the requirement for a consent notice on the residential lots in respect to future development of a dwelling. This is dealt with by condition 58 below.

Stormwater

Operation and Maintenance Manual for the Stormwater Management Devices for the Private Access Lots

45. The consent holder shall prepare an Operation and Maintenance Manual for the permeable pavers on Lots 301 and 302 setting out the principles for the general maintenance for stormwater flow and treatment purposes. The Operation and Maintenance Manual shall be submitted to the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance for approval. The Operation and Maintenance plan shall include, but not be limited to:
- details of who will hold responsibility for short-term and long-term maintenance of the access surface
 - a programme for regular maintenance and inspection of the pavers
 - a programme for the collection and disposal of debris and sediment collected by the pavers

Operation and Maintenance Manual for the drainage reserve

46. The consent holder shall prepare an Operation and Maintenance Manual for all stormwater devices on Lot 102, setting out the principles for the general operation and maintenance for the stormwater system, outlet channel and the associated management devices. The Operation and Maintenance Manual shall submit to the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance for approval. The Operation and Maintenance plan is to include, but not be limited to:
- a detailed technical data sheet;
 - all the requirements as defined within the Stormwater Management Device Design Guidelines Manual (TP 10);
 - details of who will hold responsibility for short-term and long-term maintenance of the stormwater devices;
 - a programme for regular maintenance and inspection of the stormwater system;
 - a programme for the collection and disposal of debris and sediment collected by the stormwater management device or practices;
 - a programme for post storm maintenance;
 - a programme for inspection and maintenance of outfall erosion;
 - general inspection checklists for all aspects of the stormwater system, including visual check of roadside catchpits, wetlands and outfalls;

- a programme for inspection and maintenance of vegetation associated with the stormwater devices; and
- recommended on-going control methodology to eradicate invasive weeds from terrestrial areas.

Stormwater Completion Certifications

47. The consent holder shall provide and install a complete public stormwater system to serve all lots and the drainage lot (Lot 102) in accordance with the approved Engineering Plans to the satisfaction of the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance.

Individual private stormwater connections to *proposed public stormwater systems* for each lot at the lowest point within the boundary shall be provided and installed in accordance with the approved Engineering Plans to the satisfaction of the Principal Development Engineer, SHA Consenting, Natural Resources and Specialist Input, Resource Consenting and Compliance.

An Engineering Completion Certificate certifying that all public stormwater pipes and individual stormwater connections have been constructed in accordance with the approved Engineering Plan and the Auckland Council Code of Practice for Land Development and Subdivision – Chapter 4: Stormwater shall be provided in support of the s.224(c) application pursuant to s.46 of HASHAA.

Video inspections of all public stormwater pipes and as-built plans for all public and individual private stormwater lines shall be supplied with the s.224(c) application pursuant to s.46 of the HASHAA. The video inspections shall be carried out within one month of the lodgement of the application for the s.224(c) certificate.

Advice Note:

As-built documentation for all assets to be vested in Council required by the conditions above shall be in accordance with the current version of the Development Engineering As-built Requirement' (currently Version 1.2). A valuation schedule for all asset to be vested in Council shall be included as part of the as-built documentation.

Parks

Establishment of Esplanade and Drainage Reserve Lot Planting

48. Prior to lodgment of section 224(c) certification, planting shall be implemented in accordance with the approved landscape plans under condition 25 to the satisfaction of the Team Leader, Southern Monitoring, Resource Consenting and Compliance and the Parks Consent Planner (South). In particular;
- a. all works shall be undertaken in accordance with the relevant Auckland Council Code of Practice or Specification;

- b. Planting shall occur within the recognised planting season May to September. All trees shall be good quality specimens and planted and staked to the satisfaction of the Arboricultural Advisor.
- c. All planting and establishment maintenance shall be carried out in accordance with the specifications provided within the approved plans.
- b. any defects identified at the practical completion audit are to be remedied by the applicant. The practical completion of the works will be determined by Auckland Council Parks – Arboricultural Advisor (South) to their satisfaction.

The consent holder will request a meeting on site with the Parks Specialist South to review the work. A Practical Completion Certificate will be issued by the Manager, Park Sport and Recreation (South) on completion of the works to the standards required in conditions and the two year maintenance programme will commence from this time.

Advice Note:

The consent holder shall apply for a practical completion certificate from the Arboricultural Advisor to demonstrate streetscape planting/road reserve landscaping has been satisfactorily implemented and to formalise the commencement of the two year maintenance period.

If there are any uncompleted works the Parks Specialist may agree these can be completed following s.224(c) and will be noted on the Practical Completion. A bond (including the option of bank guaranteed bond) will be required by the council for any uncompleted works.

Maintenance of Landscaping within the Esplanade and Drainage Reserve

- 49. All soft landscape works (including planting and soft landscape work within esplanade and drainage reserves proposed) will be maintained by the consent holder for two years in accordance with the Auckland Council Planting and Lawn Specifications from the issue of Practical Completion Certificate by the Team Leader, Parks Consents. The Practical Completion must be provided as part of the s.224(c) application (s.46 of the HASHAA). If the consent holder seeks to obtain s224c (s46 of HASHAA) within the two year maintenance period then a maintenance bond (*including the option of bank guaranteed bond*) shall be payable to Council.

Advice Note

The multiplication factor for the street tree bond varies according to the whether the locations of vehicle crossings yet to be constructed are known and the level of construction activity required to develop individual lots, and hence the likelihood of subsequent damage to the trees.

- 50. The amount of the bond for all other plantings including rain gardens and esplanade planting will be 1.5 times the contracted rate for maintenance and shall be agreed in consultation with the Parks Consent Planner (South) (at practical completion audit) prior to the signing of the bond.

51. The consent holder will be responsible for any defects relating to any hard landscape features within the esplanade reserve for a period of 12 months following the issue of Practical Completion of landscape works by the Manager, Park Sport and Recreation (South). A provisional defects meeting is to be held between the Parks Department and consent holder prior to the end of the 12 month period to confirm defects, if any. The Practical Completion Certificate for all hard landscape features must be provided as part of the s.224(c) application (s.46 of the HASHAA).
52. In accordance with section 108(2)(b) RMA, the consent holder will pay to the Council a refundable maintenance bond in respect of any weed removal and weed management, planting, landscape works or rubbish removal required under the conditions of this consent prior to the issue of a certificate under section 224(c) RMA. The maintenance bond will be held for a period of two years from practical completion of the works. The amount of the bond will be 1.5 times the contracted rate for maintenance.

Establishment and Maintenance of Street Planting

53. Prior to lodgement of section 224(c) certification, the consent holder shall either:
 - a. Establish street trees in general accordance with the approved planting plan and maintained by the consent holder for a period of two years from the date of the Section 224 certificate for the subdivision. The consent holder shall enter into a bond (*including the option of bank guaranteed bond*) with the Council on its usual terms and conditions to secure compliance with this condition. The bond shall remain in place until such time as the street trees have been certified by a suitably qualified arborist as being “fully established and sustainable” to the satisfaction of the Auckland Council Parks Arborist or the 2 year maintenance period has been completed satisfactorily according to the approved specifications, whichever is sooner. If 224c certificate is issued within the 2 year maintenance period then a bond will be payable of 2.5 times the contracted rate for maintenance and shall be agreed in consultation with the Parks Consent Planner (South) (at practical completion audit) prior to the signing of the bond.

OR:

- b. A payment per tree shall be paid to Council for the planting and maintenance of street trees. The payment shall be calculated based on the cost for the planting and maintenance of each street tree at the time the 224c application is lodged to Council.

Advice Note

The multiplication factor for the street tree bond varies according to the whether the locations of vehicle crossings yet to be constructed are known and the level of construction activity required to develop individual lots, and hence the likelihood of subsequent damage to the trees.

Parks As-Built Information

54. Prior to the issue of the 224(c) certificate under this consent the consent holder will provide to the Parks Consent Planner (South) as built plans for landscape works (hard and soft) within reserves and streets in CAD and pdf form including the following details;
- a. asset description, make and/or serial number;
 - b. all finished hard and soft landscape asset locations and type, and any planted areas must be shown to scale with the square metres of planting, species and number of plants;
 - c. all underground services and drainage; and
 - d. all paint colours, graffiti coatings, pavers and concrete types with names of products to be included on the assets approved as part of the engineering plan approval.

Consent Notice - Fencing adjacent to public and private reserves

55. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lot 1 to ensure that the following conditions are to be complied with on a continuing basis:

Any fencing along the boundary or boundaries of this lot that adjoins the Local Purpose (Drainage) Reserve (Lot 102) or the local Purpose (Esplanade and Recreation) Reserve (Lots 100 & 101), shall be no more than 1.2m high and 75% transparent in nature.

The maximum height of any fencing, retaining wall, or combination of fencing and retaining wall on the boundary of the reserve shall have a combined height of no greater than 1.2m when measured from the boundary.

The owner(s) of this lot shall thereafter maintain the fencing in perpetuity.

Consent Notice – Stormwater Devices

56. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered into against the Certificates of Title of lots 301 and 302 access lots to ensure that the following conditions are to be complied with on a continuing basis:

The on-site stormwater treatment shall be operated and maintained to meet the following requirements:

Stormwater device/s on private land including the permeable paving must be operated and maintained by the site owner(s) in perpetuity in accordance with the approved Operation and Maintenance Manual under condition 47.

57. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered into against the Certificates of Title of all residential lots to ensure that the following conditions are to be complied with on a continuing basis:

The on-site stormwater treatment shall be operated and maintained to meet the following requirements:

Stormwater runoff from all impervious roof areas must be directed to a first flush type device(s) capable of diverting the first 2mm of runoff from any rain event to ground or proposed alternative quality treatment device sized to meet the above requirement.

Consent Notice – Geotechnical

58. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered into against the Certificates of Title of any residential Lots which are recommended specific engineering investigation or design as outlined in the Foundation Completion Report required by Condition (55) to ensure that the conditions stated in said report shall be complied on a continuing basis. The consent notices required by Condition (55) shall be prepared by the Council's solicitor, executed and registered on the Computer Freehold Register (Certificate of Title) of the land at the consent holder's expense, requiring the owner of the land to comply with this condition on a continuing basis.

Consent Notice – Affordability

59. Before titles to lots 5, 24, 41, 42 and 43 that are deemed to be for affordable dwellings under Criteria A of the affordability criteria set out in the Housing Accords and Special Housing Areas (Auckland) Amendment Order 2015 Bremner Road SHA dated 17 August 2015 are transferred, the consent holder shall provide to the Council's Team Manager, Resource Consents Project Management a statutory declaration from the purchaser of the lot that the purchaser meets all the following criteria:
- i. The purchaser's gross household income, as at the date of the declaration, does not exceed 120% of the Auckland median household income;
 - ii. The value of the finished dwelling and land shall not be more than that defined under Criteria A of the affordability criteria set out in the Housing Accords and Special Housing Areas (Auckland) Amendment Order 2013 Bremner Road SHA dated 17 August 2015.
 - iii. The purchaser has the legal right to and intends to own and occupy the affordable dwelling exclusively as their residence for not less than 3 years after gaining title to the dwelling;
 - iv. The purchaser is a first home buyer and has never owned any other real property;
 - v. The purchaser is a natural person and is purchasing the lot in their own name and not in the name of any other person.

The obligations above shall be the subject of a consent notice under section 221 of the Resource Management Act 1991 and recorded against the computer freehold registers for lots 5, 24, 41, 42 and 43 are provided to meet the relevant Special Housing Area's affordability criteria. The consent notice shall specify that it ceases to have effect 3 years after the date of transfer of title to the first purchaser.

Consent Notice – Laneway fencing

60. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lots 2 to 13 to ensure that the following conditions are to be complied with on a continuing basis:
Any fencing along the boundary or boundaries of this lot that adjoins Lot 301 (JOAL) shall be no more than 1.8 m high provided that the top 300mm of the fence is 50% transparent.

Consent Notice – Garage and Vehicle Crossing Width

61. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lots 15 – 22, 26 to 32, 34, 37, 41 to 45 and 47 to 49 to ensure that the following conditions are to be complied with on a continuing basis:

The development of the lot is restricted to a single car width garage and vehicle crossing.

Consent Notice – No Direct Vehicle Access to Road from Lot

62. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lots 2 – 13 and 39 to 40 to ensure that the following conditions are to be complied with on a continuing basis:
Vehicle crossings directly to the road frontage are prohibited. Vehicle access shall be restricted to the JOAL.

Consent Notice – Vehicle Crossing Location

63. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lot 1 to ensure that the following conditions are to be complied with on a continuing basis:
Lot 1 must only have a single vehicle crossing accessed from Road 22 (Lot 300 road to vest). Vehicle access directly to Bremner Road is prohibited.

Consent Notice – Vehicle Crossing Location

64. A Consent Notice pursuant to s.221 of the RMA (s.44 of HASHAA) shall be registered against the Certificates of Title of lots 14, 15, 17, 18, 20, 21, 23, 25, 30, 33, 35, 36, 38, 43, 46, 50 and 51 to ensure that the following conditions are to be complied with on a continuing basis:
Vehicle crossings are prohibited to be located over raingardens or formed car parking bays within the road reserve (Lot 300).

Solicitor Undertaking

65. A solicitor undertaking from the solicitor acting for the consent holder shall be provided as part of the application for the s.224c certificate, pursuant to s.46 of the HASHAA. The undertaking shall confirm that the solicitor acting for the consent holder will undertake the following actions at the consent holder's expense:

- (i) Register all legal documents (including consent notices and/or easement instrument, etc).
- (ii) Complete the legal process to vest the proposed roads, and esplanade reserve to Council.
- (iii) Provide a post registration copy of relevant certificates of title to Auckland Council within one month of the Certificates of Title being issued.

Private Discharge Consent Conditions for REG/2016/1856 Only

General Conditions

- 66. Discharge permit REG/2016/1856 shall expire on 27th July 2051 unless it has lapsed, been surrendered or been cancelled at an earlier date pursuant to the RMA.
- 67. The following stormwater management works are constructed for the following catchment areas and design standards and they are completed prior to construction of further impervious surfaces.

Works to be undertaken	Catchment area	Design guideline(s)
HW 1/1	Infrastructure and Servicing Report (see condition 1)	Infrastructure and Servicing Plan (see condition 1)
HW 9/1 with rain garden	Infrastructure and Servicing Plan (see condition 1)	Infrastructure and Servicing Plan (see condition 1)
HW 10/1	Infrastructure and Servicing Plan (see condition 1)	Infrastructure and Servicing Plan (see condition 1)

- 68. In the event that any modifications to the stormwater management system are required, the following information shall be provided:
 - Plans and drawings outlining the details of the modifications; and
 - Supporting information that details how the proposal does not affect the capacity or performance of stormwater management system.

All information shall be submitted to, and verified by the Team Leader – Central Monitoring and Incidents, prior to implementation.

Advice Note:

All proposed changes must be discussed with the Team Leader Central Monitoring and Incidents, prior to implementation. Any changes to the proposal which will affect the capacity or performance of the stormwater management system will require an application to Council pursuant to Section s52 of

HASHAA. An example of a minor modification can be a change to the location of a pipe or slight changes to the site layout. If there is a change of device type (even proprietary), the consent will have to be varied (s52 of HASHAA).

Construction meetings

69. Five working days prior to initiation of any construction of stormwater devices on the site, a pre-construction site meeting between Team Leader – Central Monitoring and Incidents and all relevant parties, including the site stormwater engineer, shall be arranged.
70. The following information shall be provided at the pre-construction meeting:
 - i) Timeframes for key stages of the works authorised under this consent;
 - ii) Contact details of the site contractor and site stormwater engineer; and
 - iii) Approved (signed/stamped) construction plans.

Any resulting modifications to the stormwater management system may be reviewed by Auckland Council at this time and shall be verified in accordance with Condition 69 above.

71. Within 30 days of Practical Completion and prior to operation of the stormwater management works, a post construction site meeting shall be arranged and conducted between Team Leader – Central Monitoring and Incidents and all relevant parties, including the site stormwater engineer. As-Built certification and plans shall be available for this meeting, as specified in Condition 74.

Certification of construction works

72. Within 30 days of practical completion, As-Built certification and plans of the stormwater management works, which are certified (signed) by a suitably qualified registered surveyor or engineer as a true record of the stormwater management system, shall be provided to the Team Leader – Central Monitoring and Incidents.
73. The As-Built plans shall include, but not be limited to:
 - i) The surveyed location (to the nearest 0.1m) and level (to the nearest 0.01m) of the discharge structure, with co-ordinates expressed in terms of NZTM and LINZ datum;
 - ii) Plans and cross sections of all stormwater management devices, including confirmation of the storage volumes and levels of any outflow control structure
 - iii) Documentation of any discrepancies between the design plans and the As-Built plans.

Operation and maintenance

74. An Operation and Maintenance Plan for the stormwater management and treatment system shall be submitted to the Team Leader – Central Monitoring and Incidents within 30 days of completion of the installation of the stormwater works set out in Condition 67 of this consent.
75. The Operation and Maintenance Plan shall set out how the stormwater management and treatment system is to be operated and maintained to ensure adverse environmental effects are minimised. The plan shall include, but not be limited to:
 - i) A programme for regular maintenance and inspection of the stormwater management system;
 - ii) A programme for the collection and disposal of debris and sediment collected by the stormwater management devices or practices;
 - iii) A programme for post storm maintenance;
 - iv) General inspection checklists for all aspects of the stormwater management system, including visual checks
 - v) A written maintenance contract with an appropriate stormwater management system operator, shall be entered into, and maintained, for the on-going maintenance of the Stormfilters.
76. The stormwater management and treatment system shall be managed in accordance with the approved Operation and Maintenance Plan.
77. Any amendments to the Operation and Maintenance Plan shall be submitted to and approved by the Team Leader – Central Monitoring and Incidents, in writing prior to implementation.
78. Notwithstanding Conditions 69 and 76, the stormwater management system shall be maintained to minimise erosion and hazards to safety.

Advice Notes

1. *The consent holder shall obtain all other necessary consents and permits, including those under the Building Act 2004, and the Historic Places Act 1993. This consent does not remove the need to comply with all other applicable Acts (including the Property Law Act 2007), regulations, relevant Bylaws, and rules of law. This consent does not constitute building consent approval. Please check whether a building consent is required under the Building Act 2004. Please note that the approval of this resource consent, including consent conditions specified above, may affect a previously issued building consent for the same project, in which case a new building consent may be required.*
2. *A copy of this consent should be held on site at all times during the establishment and construction phase of the activity. The consent holder is requested to notify Council, in writing, of their intention to begin works, a minimum of seven days prior*

to commencement. Such notification should be sent to the specialhousing area @aucklandcouncil.govt.nz and include the following details:

- name and telephone number of the project manager and the site owner;
 - site address to which the consent relates;
 - activity to which the consent relates; and
 - expected duration of works.
3. *The granting of this resource consent does not in any way allow the applicant to enter and construct drainage within neighbouring properties, without first obtaining the agreement of all owners and occupiers of said land to undertake the proposed works. Any negotiation or agreement is the full responsibility of the applicant, and is a private agreement that does not involve Council. Should any disputes arise between the private parties, these are civil matters which can be taken to independent mediation or disputes tribunal for resolution. It is recommended that the private agreement be legally documented to avoid disputes arising. To obtain sign-off for the resource consent, the services described by the conditions above are required to be in place to the satisfaction of Council.*

Appendix C: Analysis of AUP Objectives and Policies

Table A1: Assessment of AUP Objectives related to Stormwater

AUP Operative in Part version (updated 24 March 2017)		SMP consideration
Chapter reference	Relevant sub-sections	
E.1.2 – Water quality and integrated management	1,2,3	The Objectives are broad, which is expected given this is their role in the plan. Therefore, we rely on the underlying Policies that relate to stormwater management to correctly interpret these objectives. E2 Objectives are not applicable to the SMP.
E.8.2 – Stormwater – Discharge and diversion	Refers to E1 and E2 objectives	
E.9.2 – Stormwater quality – High Contaminant generating car parks and high use roads	Refers to E1 objectives	
E.3.2 – Lakes, rivers, streams and wetlands	4,5	Applies to structures associated with streams within the catchment, i.e. culverts and bridges.
E.36.2 – Natural hazards and flooding	1,4,5,6	The applicable Objectives of E.36 have been applies at a plan change level. The Objectives will also apply at sub-division stage and will need to be considered at this time. As with E1 the objectives are broad and the applicable Policies have been used to interpret these.

Table A2: Assessment of AUP Policy related to Stormwater

AUP Operative in Part version (updated 24 March 2017)		SMP consideration
E.1.3 – Water quality and integrated management	8, 10-16	The SMP should demonstrate an integrated approach to manage the adverse effects of stormwater discharge. This should include the implementation of an integrated stormwater management approach, minimise the generation and discharge of contaminants, and minimise or mitigate effects on hydrology and fresh water systems. SMP and Precinct Rules are the tools to implement integrated land development and water management, so this policy will be met. The SMP should align with the requirements of the Drury 1 Precinct and apply measures that are in accordance with these rules. SMP should pay attention of high contaminant generating activities and sensitive receiving environments and hydrological mitigation to streams.
E.8.3 – Stormwater – Discharge and diversion	Refers to E1 and E2 policies	
E.9.3 – Stormwater quality – High Contaminant generating car parks and high use roads	Refers to E1 policies	

		The SMP should adopt a BPO approach.
E.3.3 – Lakes, rivers, streams and wetlands	7, 8	The SMP should consider the applicable Policies with regards to structures in, on, under or over the streams that dissect the Auranga B1 area. This should include consideration of alternatives, minimising the extent of modification, safety, flood hazards, public access and maintenance.
E.36.3 – Natural hazards and flooding	1, 3	<p>The SMP should consider the identify land that maybe subject to flood hazards and the consequence of the hazard. It should be considered in relation to the proposed activity, public safety and other property. It should also consider exacerbation of any existing hazards.</p> <p>The SMP should consider the Policies at a Plan Change level. Some Policies within E.36.3.1 are only applicable at a subdivision level and have not been considered here.</p>

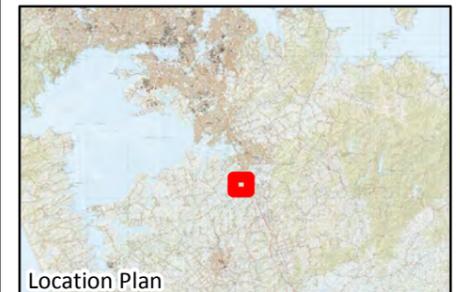
Appendix D: Historical Aerial Photographs



LEGEND

-  Auranga A
-  Auranga B1

A3 SCALE: 1:7,500



Notes:

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CHECKED	SGB	May.17
APPROVED	TSRF	May.17
ARCFILE 1001534_SMP_C1.mxd		
SCALE (AT A3 SIZE) 1:7,500		
PROJECT No. 1001534		



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AURANGA B1
 STORMWATER MANAGEMENT PLAN
 1960 Aerial Photograph

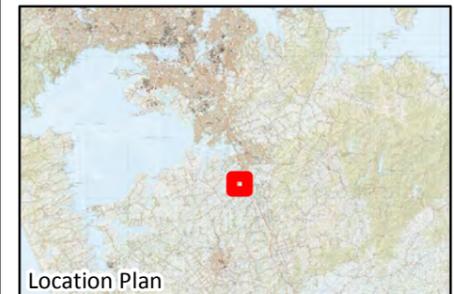
Figure D1



LEGEND

- AurangaA
- Auranga B1

A3 SCALE: 1:7,500



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PROJECT No. 1001534		

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AURANGA B1
STORMWATER MANAGEMENT PLAN
 1982 Aerial Photograph

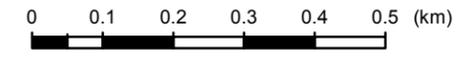
Figure D2



LEGEND

-  Auranga B1
-  AurangaA

A3 SCALE: 1:10,000



Notes:

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APPROVED	TSRF	May.17

ARCFILE
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SCALE (AT A3 SIZE)
1:10,000

PROJECT No.
1001534



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AURANGA B1
STORMWATER MANAGEMENT PLAN
 1988 Aerial Photograph

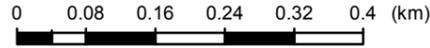
Figure D3



LEGEND

- Auranga B1
- Auranga A

A3 SCALE: 1:8,166



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SCALE (AT A3 SIZE) 1:8,166		
PROJECT No. 1001534		



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AURANGA SHA
STORMWATER MANAGEMENT PLAN
 Site Layout

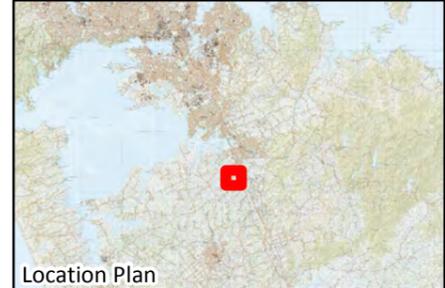
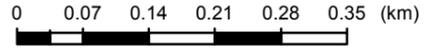
Figure D4



LEGEND

-  AurangaA
-  Auranga B1

A3 SCALE: 1:7,500



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PROJECT No. 1001534		



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AURANGA B1
STORMWATER MANAGEMENT PLAN
 2001 Aerial Photograph

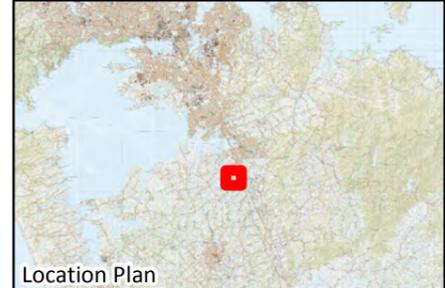
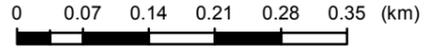
Figure D5



LEGEND

-  AurangaA
-  Auranga B1

A3 SCALE: 1:7,500



Notes:

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SCALE (AT A3 SIZE)		
1:7,500		
PROJECT No.		
1001534		



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AURANGA B1
 STORMWATER MANAGEMENT PLAN
 2006 Aerial Photograph

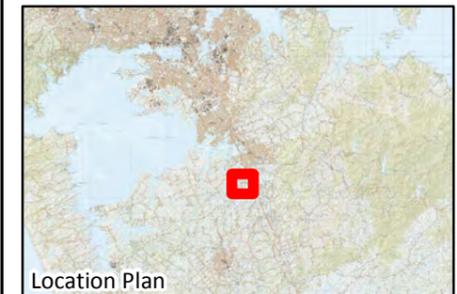
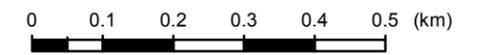
Figure D6



LEGEND

-  AurangaA
-  Auranga B1

A3 SCALE: 1:10,000



Notes:

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ARCFILE 1001534_SMP_C7.mxd		
SCALE (AT A3 SIZE) 1:10,000		
PROJECT No. 1001534		



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AURANGA B1
 STORMWATER MANAGEMENT PLAN
 2008 Aerial photograph

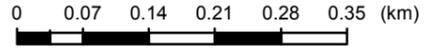
Figure D7



LEGEND

- AurangaA
- Auranga B1

A3 SCALE: 1:7,500



Notes:

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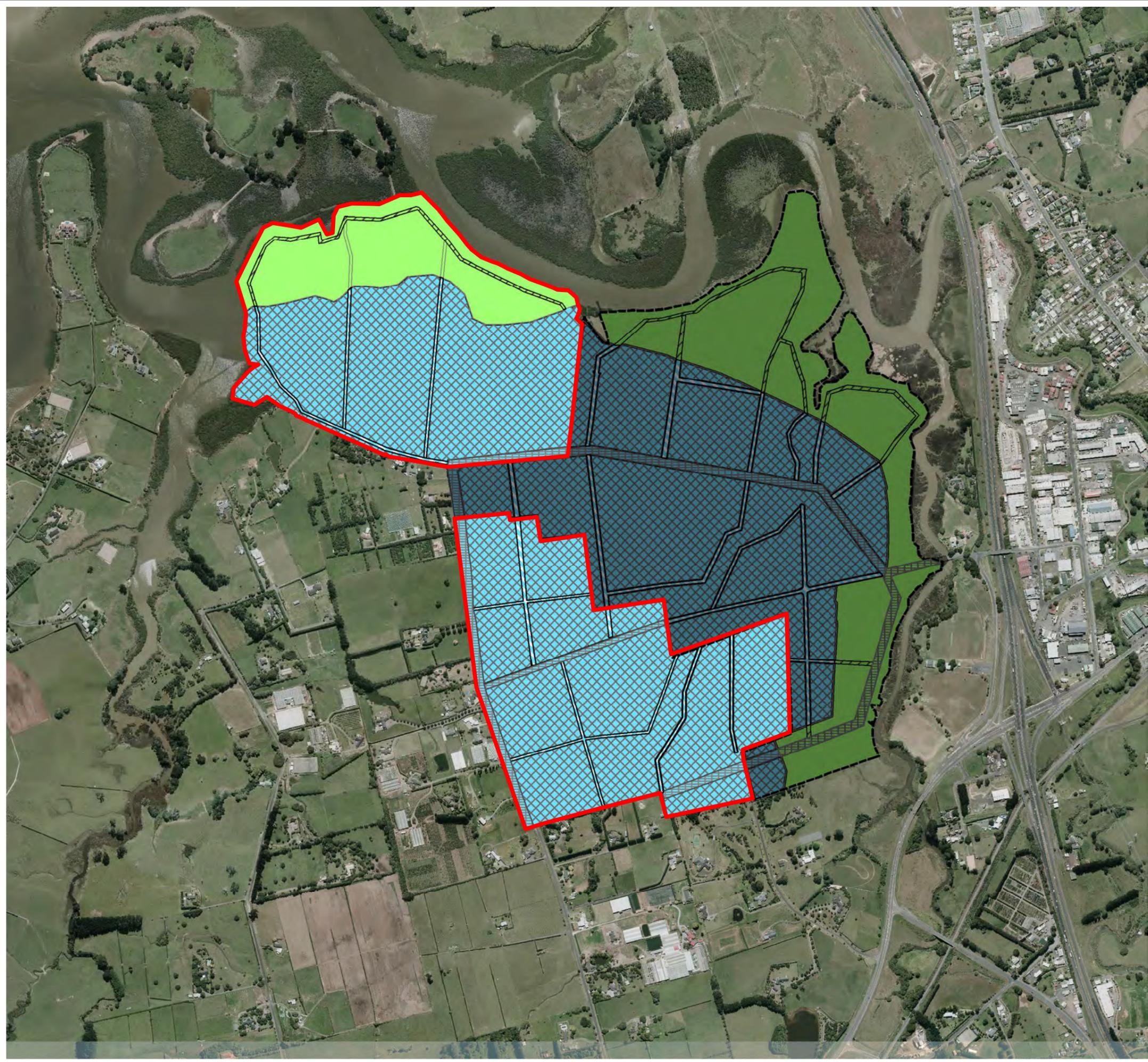
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SCALE (AT A3 SIZE) 1:7,500		
PROJECT No. 1001534		

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AURANGA B1
 STORMWATER MANAGEMENT PLAN
 2010/2011 Aerial Photograph

Figure D8

Appendix E: Stormwater Subcatchment Plan



LEGEND

AurangaA

AurangaB

Treatment Requirements

Raingardens - raintanks - permeable pavement

Permeable pavements for driveways and laneways

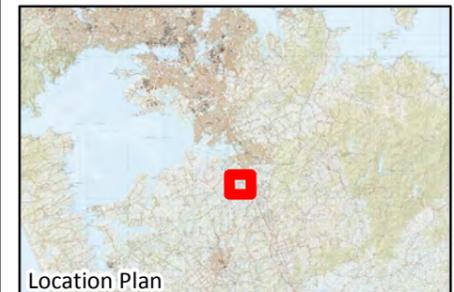
Raingardens - PAUP Policies

Raingardens, Hydrological mitigation

Raingarden, Hydrological mitigation and TP10

Raingardens, TP10

A3 SCALE: 1:10,000



Notes:

Topomap sourced from the LINZ Data Service
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ARCFILE 1001534_SMP_6-1.mxd		
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**AURANGA B1
 STORMWATER MANAGEMENT PLAN**

Figure 6-1

Appendix F: Consideration of treatment for low use roads

This appendix contains supplementary technical analysis as requested by Auckland Council (Council) for PC15 on the approach to treatment in catchments that are discharging to streams and whether water quality treatment is appropriate/practical. This section was written based on the PAUP to support the Auranga A SMP. It was to respond to Council's requirement for great consideration of the PAUP objectives and policies, in particular for a water sensitive design approach.

The PAUP objectives and policies say for greenfield sites the development should avoid to minimise effects on the environment (especially for sensitive receiving environments) as far as is practicable and apply an integrate land development and water management water sensitive design approach.

Specifically Policy 9a requires *Applying a water sensitive design approach....to the extent appropriate to the development and receiving environment whether low use roads should get water quality treatment* (refer Appendix B). The discussion with Council has focused on what is the appropriate level of treatment for low use roads, so this is the focus of this technical analysis.

F1 Basis for water quality treatment of high contaminant generating activities

The PAUP proposes a targeted, risk based approach to water quality treatment as activities change or there is redevelopment. The technical basis of this approach was developed in Council Technical Report 2013/035 (TR035). This is a different approach to the Air, Land and Water Plan that required all new impervious areas.

TR035 identifies high contaminant generating activities (HCGAs) that are to be targeted for water quality treatment. It identifies HCGAs as those activities with contaminant loads greater than design effluent quality requirements (DEQRs). The DEQRs were based on the observed performance of stormwater BMPs from international literature (compiled in the International BMP database) and represent a reasonable expectation of the effluent water quality from most of the stormwater treatment practices currently regarded as 'best practice'.² The contaminant loads of different activities were assessed based on the Council's Contaminant Load Model (CLM).

The approach of targeting HCGAs was to get the most benefit from water quality treatment. TR035 says that the approach also recognised that where water quality of runoff is not substantially worse than the DEQRs there is minimal gain to be had from undertaking treatment.³

The outcome of the TR035 analysis is the PAUP water quality rules (H.4.14.3) that require treatment only from HCGAs. An example of a HCGA is a high use road, which is based on a technical assessment in TR035 that roads of with more than approximately 5000 vpd exceed the DEQR.

F2 Consideration of treatment for roads in the Auranga development

The Auranga SHA will include a number of high use roads and these will have water quality treatment in accordance the PAUP H.4.14.3, as these rules provide a strong lead as to the expectations set by the PAUP objectives and policies.

In this section we consider the technical merits of providing treatment for roads with less than 5,000 vpd. We assess the likely contaminant yields from low use roads and the effectiveness of bioretention devices to treat these loads.

Low use roads

Lower use roads are those with less than 5,000 vpd. A large proportion of roads service less than 50 lots. Conservatively, assuming 10 trips per day per lot, that equates to 500 vpd for these roads.

² Auckland Council Technical Report 2013/035 Executive Summary (Page 1, Paragraph 6)

³ Auckland Council Technical Report 2013/035 Section 4.3.1 (Page 43, Paragraph 5)

So the contaminant loads from these roads should be represented by the category of roads with <1000 vpd.

Total Suspended Solids

In terms of the change in total suspended solids (TSS) load caused by the development, the replacement of pastoral land with a sealed road will likely result in a lower sediment load. According to the CLM, roads with <1000 vpd will have a TSS specific yield of 21 g/m²/year⁴. By comparison the from the existing farmed pasture the TSS specific yield is predicted to be 152 g/m²/year for slopes less than 10%. Therefore, the TSS yield is already being reduced by 86% due to the change in activity from pastoral to residential (once the construction activities cease).

In terms of the effectiveness of treatment, TR035 derived a DEQR for TSS of 20 mg/L⁵ based on the median effluent concentration of a range of treatment devices. Based on the CLM, roads with traffic volumes less than 1000 vpd per day will yield a runoff TSS concentration of 18 mg/L, while roads with daily volumes between 1000 and 5000 vpd will yield 23 mg/L⁶. These vehicle counts and concentrations, relative to the DEQR, informed the threshold for high use roads of 5000 vpd.

Figure F1 below shows influent and effluent concentrations of TSS for a number of studied bioretention devices that have been compiled in the International BMP database. Although the influent and effluent concentrations in the probability plot are not paired values, the relative position and slope of the two populations are a good indication of the effectiveness of the BMP⁷.

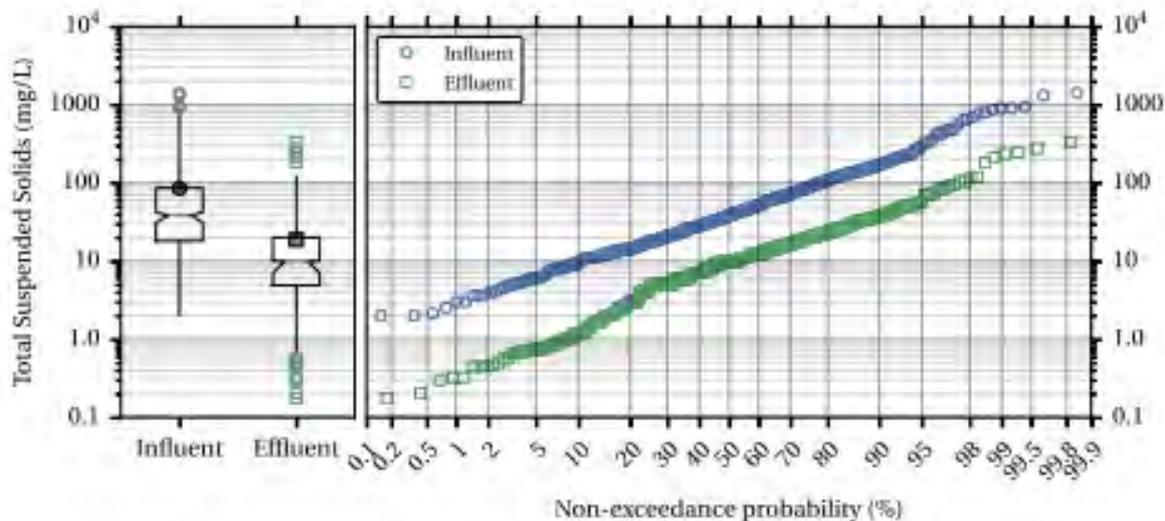


Figure F1: Box and probability plots of total suspended solids at bioretention BMPs (Water Wright Engineers and Geosyntec Consultants 2012)

The graph is plotted with a logarithmic scale for x and y axes, but a linear scale would reveal that the gap between effluent and influent quality increases at higher concentrations. High amounts of sediment are removed at higher influent concentrations, conversely for low influent concentrations a lower amount of sediment can be removed by treatment.

For a high use road with 5,000 to 20,000 vpd the CLM predicts 44 mg/L TSS. Figure F1 suggests after treatment 10 mg/L TSS could be typically expected, a reduction of 34 mg/L. However, for an influent concentration of 18 mg/L (the CLM prediction for vpd <1000), with treatment the effluent

⁴ Auckland Council Technical Report 2010/004 Table 10

⁵ Auckland Council Technical Report 2013/035 Table 1

⁶ Auckland Council Technical Report 2013/035 Table 4

⁷ International BMP Database Statistical Addendum 2012

concentration will reduce to typically 6 mg/L, a reduction of 12 mg/L. This demonstrates the reduction in effectiveness of the bioretention device for influent with low TSS.

Zinc

In terms of the change in Zinc (Zn) load caused by the development, the replacement of pastoral land with a sealed road with <1000 vpd will have no effect on Zn loads. According to the CLM, roads with < 1000 will have a Zn yield of 4.4 µg/m²/year⁸. By comparison the Zn yield from the existing farmed pasture (with slopes less than 10%) is predicted by the CLM to be 5.3 µg/m²/year.

TR035, based on data in the International BMP Database, sets the DEQR for zinc at 30 µg/L⁹. Based on the CLM, roads with traffic volumes less than 1000 vpd per day will yield a runoff zinc concentration of 4.4 µg/L while roads with daily volumes between 1000 and 5000 vpd will yield 27 µg/L¹⁰. Figure F2 below shows a similar pattern of diminishing returns in terms of treatment at higher concentrations. Assuming an influent concentration of 4 µg/L from roads with <1000 vpd one could expect an effluent concentration in the order of 1 µg/L, which is reduction of 3 µg/L. This is less effective than the treatment of a high use road with 5,000 – 20,000 vpd where the CLM predicts 111 µg/L Zn and Figure F2 predicts after treatment to 45 µg/L, which is a reduction of 66 µg/L. This demonstrates the reduction in effectiveness of the bioretention device for influent with low Zn.

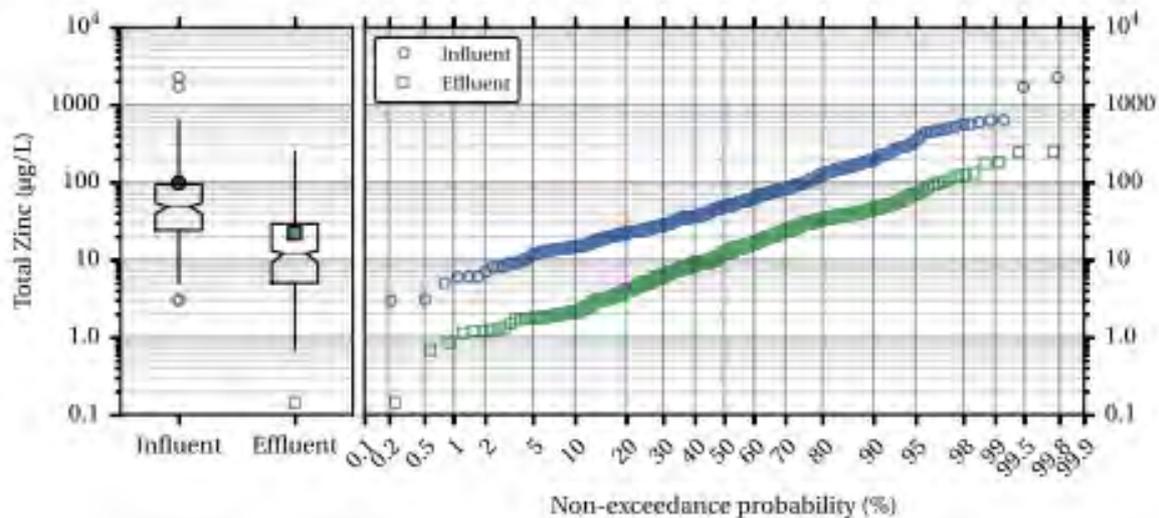


Figure F2: Box and probability plots of total zinc at Bioretention BMPs (Water Wright Engineers and Geosyntec Consultants 2012)

⁸ Auckland Council Technical Report 2010/004 Table 10

⁹ Auckland Council Technical Report 2013/035 Table 1

¹⁰ Auckland Council Technical Report 2013/035 Table 6

Copper

In terms of the change in Zinc (Zn) load caused by the development, the replacement of pastoral land with a sealed road with <1000 vpd will have a minimal effect on Cu loads. According to the CLM, roads with <1000 vpd will have a Cu yield of 1.5 $\mu\text{g}/\text{m}^2/\text{year}$ ¹¹. By comparison the Cu yield from the existing farmed pasture is predicted by the CLM to be 1.1 $\mu\text{g}/\text{m}^2/\text{year}$, so the Cu load is essentially unchanged with development.

From the results of the International BMP Database, the DEQR for copper has been set at 10 $\mu\text{g}/\text{L}$.¹² Based on the CLM, roads with traffic volumes less than 1000 vpd per day will yield a runoff copper concentration of 0.7 $\mu\text{g}/\text{L}$ while roads with daily volumes between 1000 and 5000 vpd will yield 4.2 $\mu\text{g}/\text{L}$ ¹³. Figure F3 below shows an even more pronounced pattern of diminishing returns. At influent concentrations <5 $\mu\text{g}/\text{L}$ there is no difference as a result of treatment, and very little benefit from 5-10 $\mu\text{g}/\text{L}$. Assuming an influent concentration of 0.7 $\mu\text{g}/\text{L}$ one could expect the effluent concentration to be unchanged.

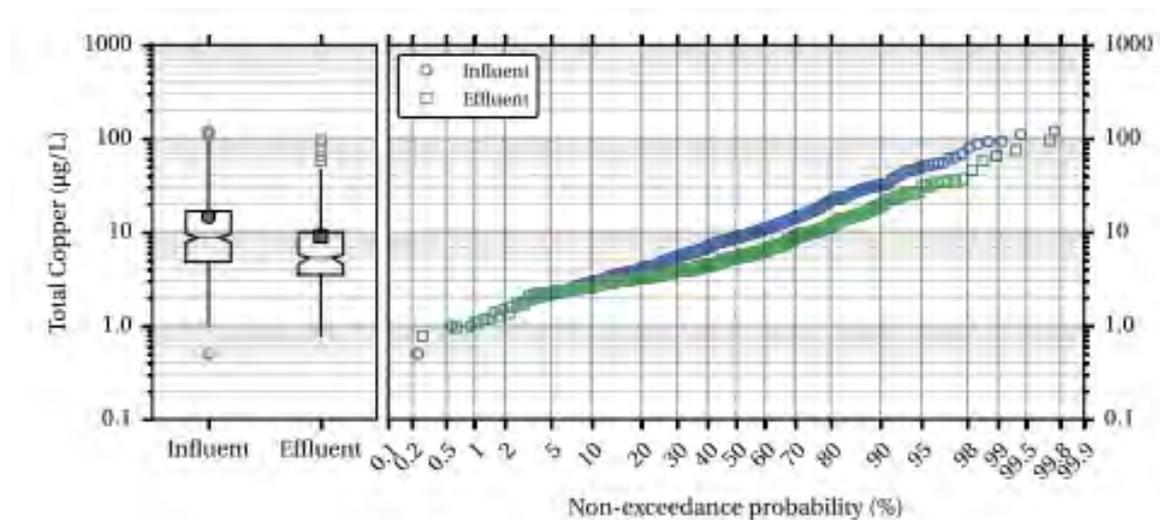


Figure F3: Box and probability plots of total copper at Bioretention BMPs (Water Wright Engineers and Geosyntec Consultants 2012)

Summary

Overall, our assessment has found that the low use roads (<1000 vpd) will have a relatively low level of contaminant generation and there is only a minor benefit from treatment. In particular:

- TSS yields are actually reduced by the change from pasture to roads with <1000 vpd, so there is not an effect to mitigate. Bioretention devices are demonstrated to have a reduced effectiveness at concentration below the DEQR as are expected for the low use roads.
- Zn yields are essentially unchanged by the change from pasture to roads with <1000 vpd, so there is not an effect to mitigate. At the predicted Zn concentration the bioretention devices will have a reduced level of effectiveness.
- Cu yields increase by a minimal amount for the change from pasture to roads with <1000 vpd, so there is a negligible effect to mitigate. The BMP Database suggests that for the Cu concentrations expected from roads <1000 vpd that bioretention types of treatment will not have any effectiveness.

¹¹ Auckland Council Technical Report 2010/004 Table 10

¹² Auckland Council Technical Report 2013/035 Table 1

¹³ Auckland Council Technical Report 2013/035 Table 5

In summary, for the Auranga development, our assessment has found that the very low use roads (<1000 vpd) will have a relatively low level of contaminant generation and there is a low treatment effectiveness and therefore only minor benefit from treatment of these areas

Appendix G: Stormwater Management Options

This section of the SMP assesses options and determines best practicable options (BPO) to achieve the stormwater requirements established in Section 2. The constraints and features of the site (Section 3) and the applicability of different management options are considered for the BPO. This section is based on the BPO assessment for the PV15 SMP which was accepted associated with the Drury 1 Precinct and the approved NDC.

G1 Stormwater management options

G1.1 Stormwater management tailored to the receiving environments

Stormwater management is considered according to the receiving environment, namely:

- Areas with stormwater runoff discharging to streams; and
- Areas with stormwater runoff discharging into the estuarine environment.

Figure G1 below shows the catchments discharging into stream and estuarine environments. These areas have different stormwater management approaches because stormwater discharges to stream require stormwater quantity management (hydrological mitigation) to mitigate for stream erosion and base flow effects. Whereas, areas with stormwater discharges to the estuarine environment do not require stormwater quantity management as these effects are not present.

This approach of targeting the stormwater management based on the requirements of the AUP is considered to mitigate the effects of the development from stormwater to the level expected by the AUP. The requirements for stormwater management that need be met by the BPO are described in Section 2.

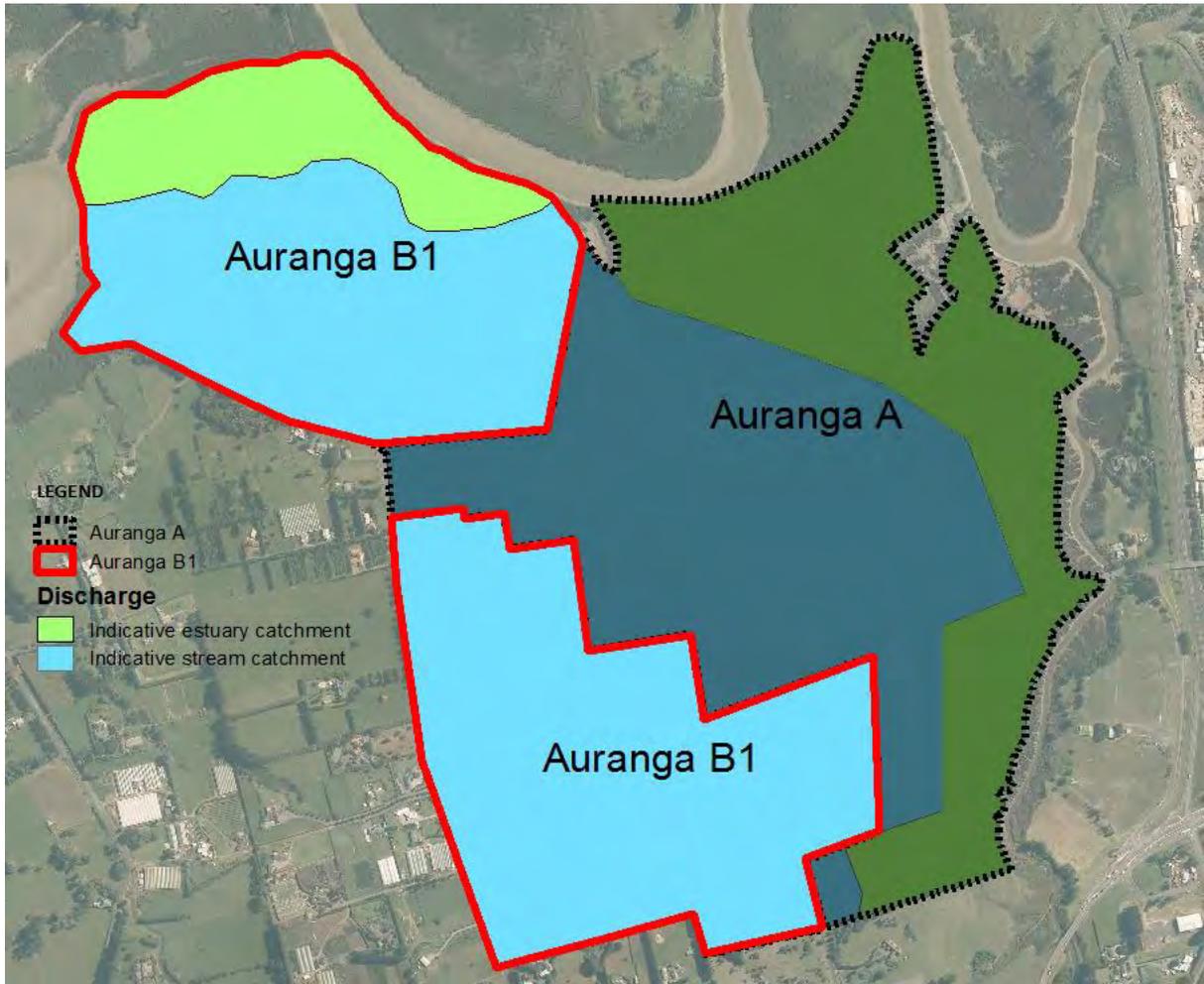


Figure G1: Auranga B1 - Stormwater areas discharging to stream and estuarine environments

G1.2 Stormwater quality and quantity toolbox

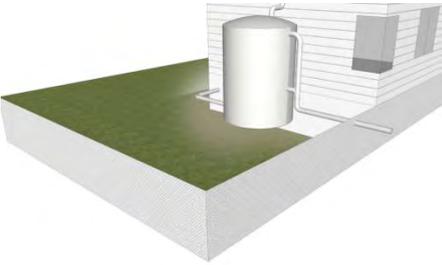
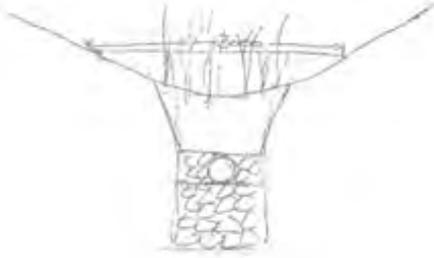
Stormwater quality treatment is required under the stormwater provisions of the AUP (including the Drury 1 Precinct) by an approved stormwater quality device, which are to be designed in accordance with TP10.

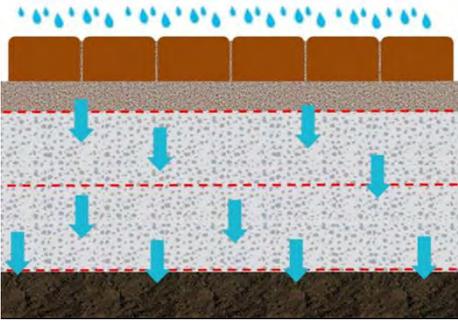
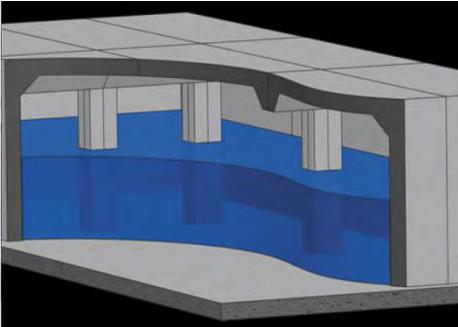
Stormwater quantity management is proposed to meet the requirements of the stormwater provisions of the AUP (including the Drury 1 Precinct) for hydrological mitigation for areas discharging to streams. It is proposed to undertake hydrological mitigation to the level of that required for the adjoining Drury 1 Precinct.

G1.3 Stormwater management options

The available options for stormwater management to meet the stormwater quality and quantity requirements are summarised in Table G-1.

Table G-1 Toolbox for stormwater management devices

Type	Application	Strength/ advantage	Weakness/ limitations	Illustrations*
Rainwater tanks	Residential buildings (as applicable to roofs and requires water reuse opportunities)	Water re-use (retention). On-site.	No infiltration, but detention can be included. Only applicable to run-off from roofs.	
Rain gardens	Roads/lots	Treatment and retention (infiltration). Detention can be included. On-site.	Space constraints within roads or lots.	
Swales	Roads	Treatment. On-site.	More width than raingarden. No detention or retention.	
Infiltration Swale	Roads	Treatment and retention (infiltration). Detention can be included.	More width than raingarden.	
Infiltration basin	Roads	Treatment and retention. Detention (can be included).	Typically communal detention device.	

Type	Application	Strength/advantage	Weakness/limitations	Illustrations*
Permeable paving	Pavements	Detention. No additional space. At source.	Maintenance requirements and long term effectiveness.	 <p>14</p>
Green outfalls	All	Polishing treatment. Improved aesthetic. Erosion protection.	Limitation of application if land adjacent to discharge is too high.	Naturalised channels with rock and planting.
Communal retention/detention devices	Multiple high intensity lots	Potential solution hydrological mitigation requirement for intensively developed sites where there is insufficient room for on-site hydrological mitigation.	Potential limitations are the infiltration capacity and interactions with groundwater, which should be investigated by site specific assessment.	 <p>15</p>

*Illustrations from Nicholas Vigar, Auckland Council

G2.1 Stormwater management for small lots

For PC15 we analysed the space that is available within small lots to establish what stormwater management options can fit within the constraints of these sites.

The constraints for stormwater management were described in the PAUP evidence of Aidan Nelson who advised on the following offsets to mitigate for potential geotechnical effects:

- 3 m offset from building foundations
- 1 m offset from property boundaries.

¹⁴ Image from Cleanwaterways.org.nz

¹⁵ Modular precast example from HUMES

These were mapped for some preliminary building plans on small lots, refer Figure F-2. The analysis established that for small lots **less than 350 m²** there is insufficient space for stormwater solutions such as raingardens or similar that rely on infiltration.

For small lots, where treatment is required beyond raintanks and permeable pavers it will be necessary to provide communal devices.

G2.1 Consideration of treatment for low use roads

In this section consideration is given to the Council request for a water sensitive design approach. In particular, whether very low use roads (e.g. residential roads) need water quality treatment.

Our assessment has found that the very low use roads (<1000 vpd) will have a relatively low level of contaminant generation and there is a low treatment effectiveness and therefore only minor benefit from treatment of these areas. In particular:

- TSS yields are actually reduced by the change from pasture to very low use roads, so there is not an effect to mitigate as the roads are less polluting than the previous landuse. Bioretention devices are demonstrated to have a reduced effectiveness for TSS concentrations below the DEQR as are expected for the very low use roads.
- Zn yields are essentially unchanged by the change from pasture to very low use roads, so there is not an effect to mitigate. At the predicted Zn concentration the bioretention devices will have a reduced level of effectiveness.
- Cu yields increase by a minimal amount for the change from pasture to very low use roads, so there is a negligible effect to mitigate. The BMP Database suggests that at for the Cu concentrations expected from very low use roads that bioretention types of treatment will not have any effect.

Appendix F contains the technical analysis that supports this assessment.

In response to Council SWU and iwi requests for a water sensitive design approach (especially due to the sensitive receiving environments), Karaka and Drury Consultants Limited proposed for the Drury 1 Precinct to provide stormwater treatment for all low use roads (<5,000 vpd) by installing raingardens with sizes based on 2% of the contributing catchments as well as permeable paving for driveways/accessways. This approach will be continued for Auranga B1.



Figure G-7-4 Assessment of space constraints (for rain gardens) within small lots

G2.3 Development areas with stormwater discharges to streams

Development areas with stormwater discharges to streams (from the runoff from impervious areas) requires water quantity (hydrological mitigation). In addition, some areas such as high use roads also require water quality treatment. Table G-2 below describes the different activities and the associated issues, options and proposed stormwater management for areas with stormwater discharges to streams.

Table G-2 Development areas with stormwater discharges to streams – Options analysis and proposed stormwater management

Activity	Proposed development	Requirement (refer Section 2)	Issue	Options	Proposed stormwater management
High use roads	The PPCSHA will include a number of high use roads. The roads are not proposed to have driveway entrances (as properties are to be accessed through rear lane access ways or side roads).	Treatment and hydrological mitigation.	Need quality treatment close to source. Space constraints due to access ways and services (but reduced where rear lanes access ways are used). Risk to road pavement due to stormwater device.	Rain tanks – not applicable as no potable water reuse opportunity. Raingardens – applicable as provides water quality and quantity management. Swales – not applicable as does not provide quantity management. Infiltration basins – not applicable as does not provide water quality management. Permeable paving – not applicable due to high traffic loads.	Raingardens – as this addresses both stormwater quality and quantity issues
High contaminant car park	Car parks providing for 30 cars (likely to be the local centre’s car parking areas).	Treatment and hydrological mitigation.	Need treatment close to source. Space constraints due to access ways and services. Risk to road pavement due to stormwater device.	Rain tanks – not applicable as no potable water reuse opportunity. Raingardens – applicable as provides water quality and quantity management. Swales – not applicable as does not provide quantity management. Infiltration basins – not applicable as does not provide water quality management. Permeable paving – not applicable due to vehicle movements and turning pressures from vehicle wheels.	Raingardens – as this addresses both stormwater quality and quantity issues
Other areas not high	Residential lots <350 m ² .	Hydrological mitigation only, but	Prefer hydrological mitigation close to source.	Rain tanks –applicable potable water reuse opportunity.	Combination of: Rain tanks due to possible re-use for potable water

Activity	Proposed development	Requirement (refer Section 2)	Issue	Options	Proposed stormwater management
contaminant generating (no treatment required) e.g lots, low use roads		consider WSD and devices that will provide water quality improvements as well.	Space constraints most acute for Residential lots <350 m ² therefore greater reliance on communal devices.	Communal retention/ detention device – applicable due to space limitations within lots. Permeable paving – applicable for driveways Raingardens, but will be subject to space constraints within the lots.	Permeable paving for driveways Communal retention/ detention device located in rear service lanes (in applicable lots) due to space constrains within lots.
	Residential lots >350 m ²		Prefer hydrological mitigation close to source Space constraints less acute for Residential lots <350 m ² therefore greater reliance on communal devices.	Rain tanks –applicable potable water reuse opportunity. Raingardens, applicable but subject to space/geotech constraints within the lots (site specific consideration). Communal retention/ detention device – applicable due to space limitations within lots. Permeable paving – applicable for driveways.	Combination of: Rain tanks due to possible re-use for potable water Permeable paving for driveways Raingardens, applicable but subject to space/geotech constraints within the lots (site specific consideration) Where above is insufficient use communal retention/ detention device.
	Low use roads		Prefer hydrological mitigation close to source. Space constraints due to access ways and services. Risk to road pavement due to stormwater device.	Raingardens – most applicable as also provides quantity management. Rain tanks – not applicable as no potable water reuse opportunity. Swales – not applicable as does not have quantity management. Infiltration basins – applicable as it addresses water quantity management. Permeable paving – not applicable due to high traffic loads.	Raingardens – as this addresses both stormwater quality Infiltration basins as a second choice where rain gardens not suitable.
Discharges to streams	Stormwater outfalls will discharge to streams	WSD approach, iwi requests for	Erosion at the discharge location and opportunity for vegetation for	Concrete outfall to stream – not preferred due to erosion in stream.	Green outfalls preferred, with harder, traditional structures where there is

Activity	Proposed development	Requirement (refer Section 2)	Issue	Options	Proposed stormwater management
		treatment train.	treatment (including temperature control).	Green outfall, which is a length of manmade naturalised stream between the outfall and the stream that is able to dissipate energy. Green outfalls with planting will provide polishing treatment and temperature control. The length to be maximised in the future esplanade reserves. The application of green outfalls may be limited in some instances by high ground levels relative to the discharge invert level.	high ground levels relative to the discharge invert level.

G3 Development areas with stormwater discharges into the estuary

Development areas with stormwater discharges into the estuary (from the runoff from impervious areas) that are high contaminant generating, such as high use roads, require stormwater quality treatment. However, for discharges into the estuary stormwater quantity management is not required.

Table G-3 includes special consideration of treatment of areas that are not high contaminant generating activities, in particular the application of a water sensitive design approach and whether low use roads should have water quality treatment. As with the Drury 1 Precinct, to meet Council SWU Healthy Water and iwi requirements treatment for these areas has been proposed.

Table G-3 Development areas with stormwater discharges into the estuary – Options analysis and proposed stormwater management

Activity	Proposed development	Requirement (refer Section 2)	Issue	Options	Proposed stormwater management
High contaminant car park	No high contaminant car park areas are proposed in areas where stormwater discharge is to the estuary, however if this changes then the following will be applied.	Water quality treatment.	Need treatment close to source. Space constraints due to access ways and services. Risk to road pavement due to stormwater device.	Rain tanks – not applicable as no potable water reuse opportunity Raingardens – applicable as has water quality treatment Swales – applicable as does have quality treatment Infiltration basins – not applicable as does not have water quality treatment Permeable paving – not applicable due to vehicle movements and turning pressures from vehicle wheels	Raingardens– as this addresses stormwater quality close to source.
Other areas not high contaminant	This is applicable to all low use roads and impervious areas in lots (including roofs)	Water sensitive design approach subject	Refer to Section F1.5	Raingardens for low use roads. Refer to Section F1.5. Permeable paving for driveways and accessways.	Raingardens for low use roads. Permeable paving for driveways and accessways.
Discharges to estuaries	Stormwater outfalls will discharge to the estuary	Water sensitive design approach, iwi	Erosion at the discharge location and opportunity for	Concrete outfall to estuary – not preferred due to erosion in estuary and undermining of outfall is a common problem.	Green outfalls preferred, with harder, traditional structures where there is

Activity	Proposed development	Requirement (refer Section 2)	Issue	Options	Proposed stormwater management
		requests for treatment train.	vegetation for treatment (including temperature control).	Green outfall, which is a length of manmade naturalised stream between the outfall and the stream that is able to dissipate energy. Green outfalls with planting will provide polishing treatment and temperature control. The application of green outfalls may be limited in some instances by high ground levels relative to the discharge invert level.	high ground levels relative to the discharge invert level.

**Appendix H: Lander Geotech (20 April 2017) –
Percolation Test Results**



Lander Geotechnical Consultants Limited
Level 3, 3 Osterley Way, P O Box 97 385,
Manukau, Auckland 2241
Phone: (09) 262 1528
www.landergeotechnical.co.nz

Memorandum

To	Mark Tollemache	From	Shane Lander
Email	marktollemache@ihug.co.nz	Date	20 April 2017
Company	Karaka & Drury Limited	Reference	J00557
cc		Pages	1 of 1, plus attachments
Subject	Auranga B1 – Percolation Test Results		

Lander Geotechnical have been engaged to undertake 4 percolation boreholes and conduct falling head percolation tests, in accordance with Auckland Council's guidelines. The tests were undertaken within 100mm diameter boreholes drilled in positions indicated on the attached site plan. They were positioned near existing site investigation boreholes from the Auranga B1 Preliminary Geotechnical Appraisal Report (Ref J00557 dated 17 February 2017), and accordingly for ease of reference are numbered the same as those adjacent boreholes.

Pre-soaking was undertaken the day prior to testing. The depth of each borehole drilled was a function of the position of the standing groundwater table at the time of pre-drilling.

Full results and associated plots are appended for your interpretation, use and distribution.

For and on behalf of Lander Geotechnical Consultants Limited

S G Lander

Principal Geotechnical Engineer

Encl.

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page	1 of 2
Hole No:	HA2017-02	Diamete	0.1 (m)
Location:	BREMNER ROAD	Depth:	1.96 (m)
Weather conditions preceding test:		Dry	
Details of presoaking:		17 Hrs	

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
8:25	-	0.25	1.71	0
8:30	5	0.30	1.66	5
8:35	5	0.35	1.61	10
8:40	5	0.39	1.57	15
8:45	5	0.41	1.55	20
8:50	5	0.42	1.54	25
8:55	5	0.44	1.52	30
9:00	5	0.46	1.50	35
9:15	15	0.49	1.47	50
9:30	15	0.51	1.45	65
9:45	15	0.53	1.43	80
10:00	15	0.54	1.42	95
10:15	15	0.55	1.41	110
10:30	15	0.55	1.41	125
10:45	15	0.55	1.41	140
10:45	0	0.25	1.71	140
11:03	18	0.40	1.56	158
11:15	12	0.45	1.51	170
11:30	15	0.48	1.48	185
11:45	15	0.50	1.46	200
12:00	15	0.52	1.44	215
12:15	15	0.53	1.43	230
12:25	10	0.54	1.42	240

Test HA2017-02
 Gradient 0.0007 m/min
 Percolation 0.01 L/m²/min



Lander Geotechnical Consultants Limited
 P O Box 97 385, Manukau, Auckland 2241
 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

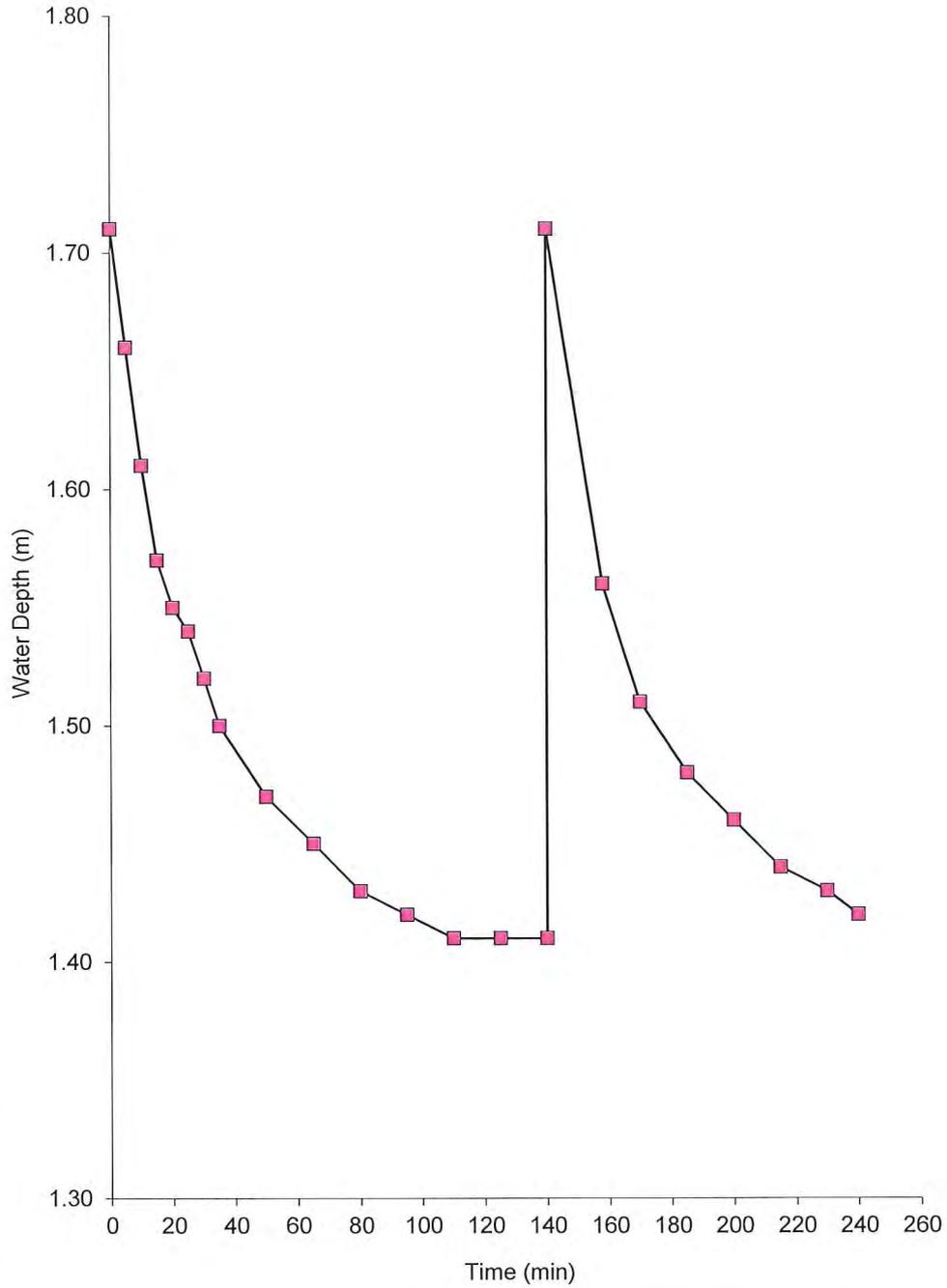
Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client: KARAKA & DRURY LIMITED	Job No: J00557
Location: AURANGA B1, DRURY	Date: 11.04.17
0	Page: 2 of 2
Hole No: HA2017-02	Diameter: 0.1 (m)
Location: BREMNER ROAD	Depth: 2.0 (m)

Water Depth vs Time



Lander Geotechnical Consultants Limited
 P O Box 97 385, Manukau, Auckland 2241
 Phone: 027 488 6882
 Email: shane@landergeotechnical.co.nz

Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page	1 of 2

Hole No: HA2017-05	Diamete	0.1	(m)
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Location: BREMNER ROAD	Depth:	0.97	(m)
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Weather conditions preceding test:	Dry
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Details of presoaking:	17 Hrs
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Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
13:00	-	0.250	0.72	0
13:05	5	0.260	0.71	5
13:10	5	0.270	0.70	10
13:15	5	0.280	0.69	15
13:20	5	0.290	0.68	20
13:25	5	0.295	0.68	25
13:30	5	0.300	0.67	30
13:45	15	0.320	0.65	45
14:00	15	0.335	0.64	60
14:15	15	0.355	0.62	75
14:30	15	0.375	0.60	90
14:45	15	0.395	0.58	105
15:00	15	0.400	0.57	120
15:17	17	0.410	0.56	137
15:30	13	0.420	0.55	150
15:47	17	0.430	0.54	167
16:00	13	0.435	0.54	180
16:15	15	0.445	0.53	195
16:30	15	0.450	0.52	210
16:45	15	0.455	0.52	225
17:00	15	0.460	0.51	240

Test	HA2017-05
Gradient	0.0003 m/min
Percolation	0.02 L/m ² /min



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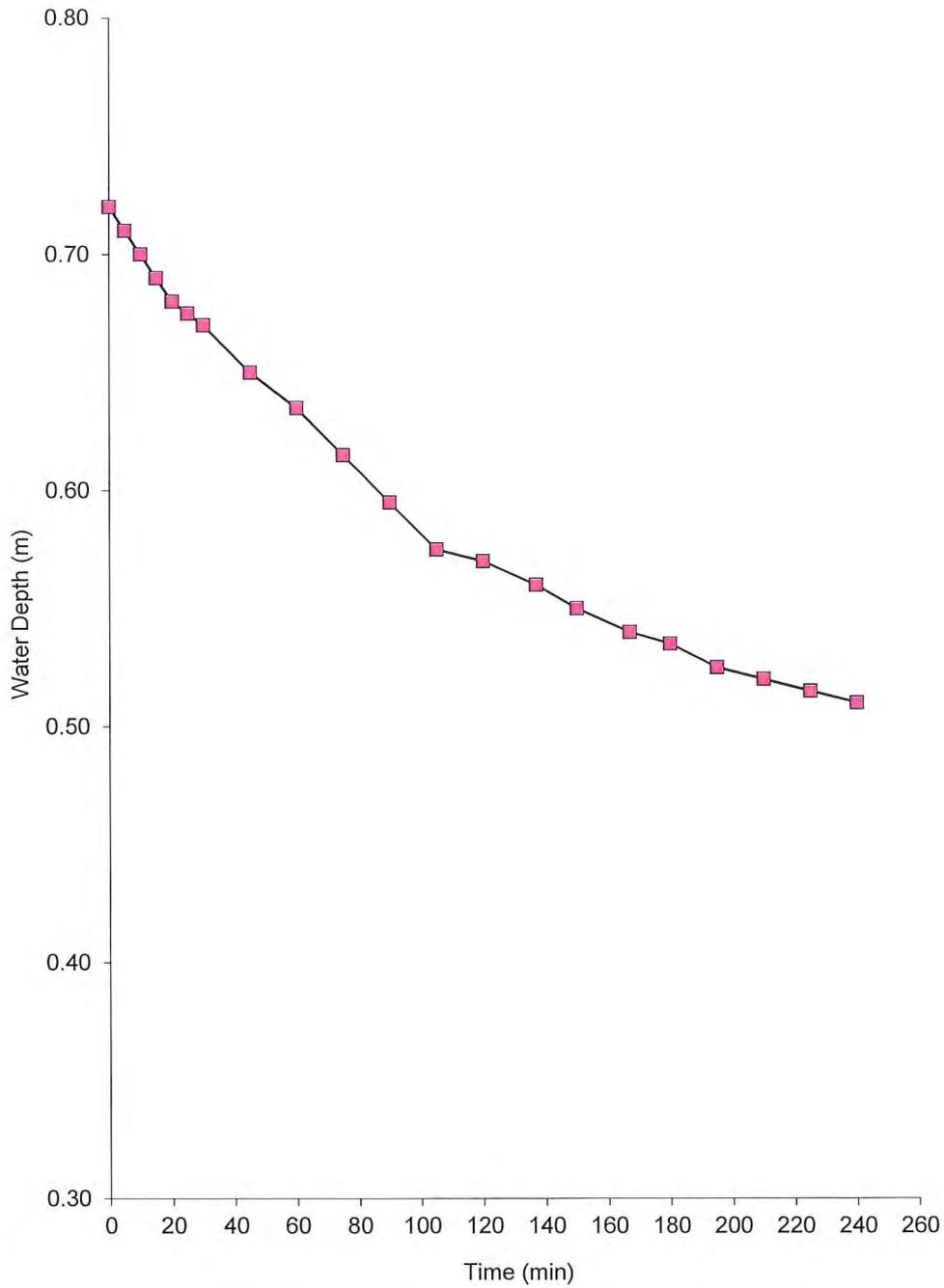
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Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
	0	Page:	2 of 2
Hole No:	HA2017-05	Diameter:	0.1 (m)
Location:	BREMNER ROAD	Depth:	1.0 (m)

Water Depth vs Time



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Phone: 027 488 6882
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Operator: JL

Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page	1 of 2
Hole No:	HA2017-08	Diamete	0.1 (m)
Location:	JESMOND ROAD	Depth:	2.3 (m)
Weather conditions preceding test:		Dry	
Details of presoaking:		17 Hrs	

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
8:45	-	0.10	2.20	0
8:46	1	0.15	2.15	1
8:48	2	0.20	2.10	3
8:53	5	0.30	2.00	8
9:00	7	0.40	1.90	15
9:15	15	0.57	1.73	30
9:45	30	0.79	1.51	60
10:15	30	1.00	1.30	90
10:45	30	1.20	1.10	120
11:15	30	1.40	0.90	150
11:45	30	1.50	0.80	180
12:15	30	1.60	0.70	210
12:45	30	1.70	0.60	240

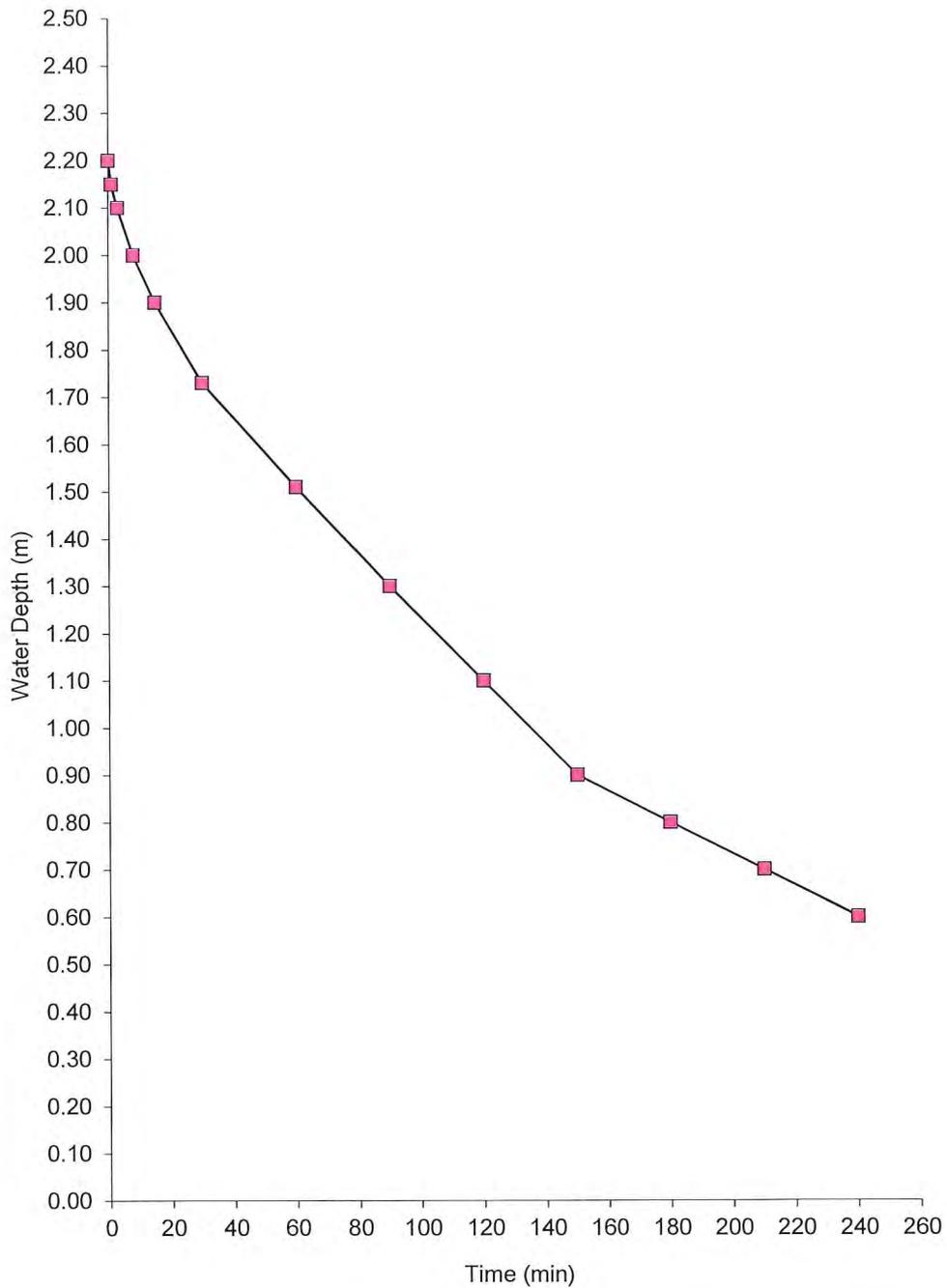
Test	HA2017-08
Gradient	0.0033 m/min
Percolation	0.13 L/m ² /min

	<p>Lander Geotechnical Consultants Limited P O Box 97 385, Manukau, Auckland 2241 Phone: 027 488 6882 Email: shane@landergeotechnical.co.nz</p>	<p>Operator: AB Checked: JL</p>
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STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY 0	Date:	11.04.17
		Page	2 of 2
Hole No:	HA2017-08	Diameter:	0.1 (m)
Location:	JESMOND ROAD	Depth:	2.3 (m)

Water Depth vs Time



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P O Box 97 385, Manukau, Auckland 2241
Phone: 027 488 6882
Email: shane@landergeotechnical.co.nz

Operator: AB

Checked: JL

STORMWATER PERCOLATION TEST

Client:	KARAKA & DRURY LIMITED	Job No:	J00557
Location:	AURANGA B1, DRURY	Date:	11.04.17
		Page:	1 of 2
Hole No:	HA2017-11	Diamete	0.1 (m)
Location:	BURBERRY ROAD	Depth:	2.1 (m)
Weather conditions preceding test:		Dry	
Details of presoaking:		17 Hrs	

Time of Test (hr.min)	Time Interval (min)	Depth Reading (m)	Water Depth (m)	Cum Time (min)
12:58	-	0.10	2.00	0
12:59	1	0.27	1.83	1
13:01	2	0.44	1.66	3
13:06	5	0.70	1.40	8
13:13	7	0.95	1.15	15
13:28	15	1.22	0.88	30
13:58	30	1.50	0.60	60
14:28	30	1.60	0.50	90
14:58	30	1.65	0.45	120
15:28	30	1.70	0.40	150
15:58	30	1.76	0.34	180
15:58	0	0.10	2.00	180
15:59	1	0.27	1.83	181
16:01	2	0.42	1.68	183
16:06	5	0.69	1.41	188
16:13	7	0.95	1.15	195
16:28	15	1.20	0.90	210
16:56	28	1.49	0.61	238

Test HA2017-11

Gradient 0.0017 m/min

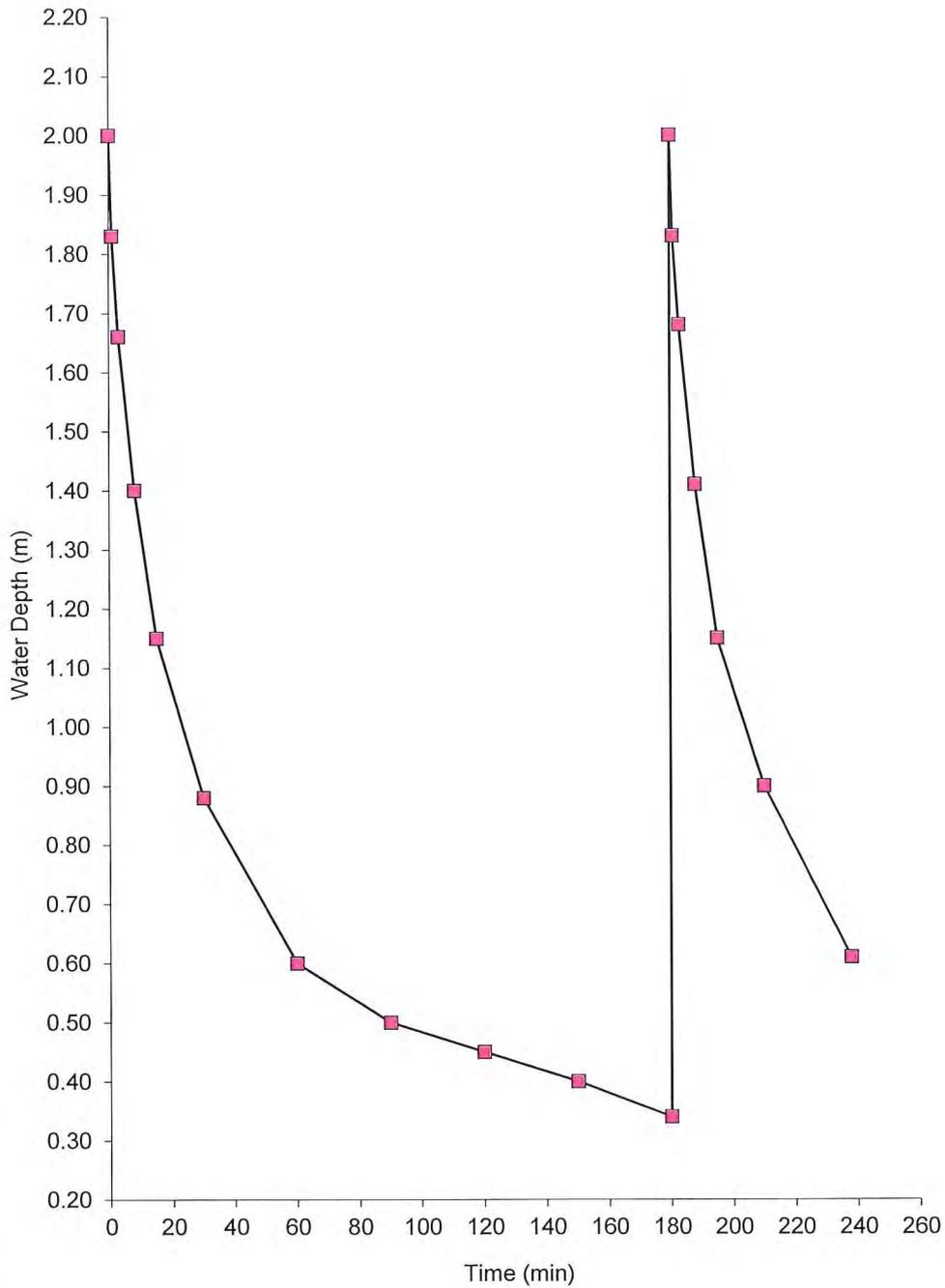
Percolation 0.09 L/m²/min

 <p>LANDER geotechnical</p>	<p>Lander Geotechnical Consultants Limited P O Box 97 385, Manukau, Auckland 2241 Phone: 027 488 6882 Email: shane@landergeotechnical.co.nz</p>	<p>Operator: AB</p> <p>Checked: JL</p>
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STORMWATER PERCOLATION TEST

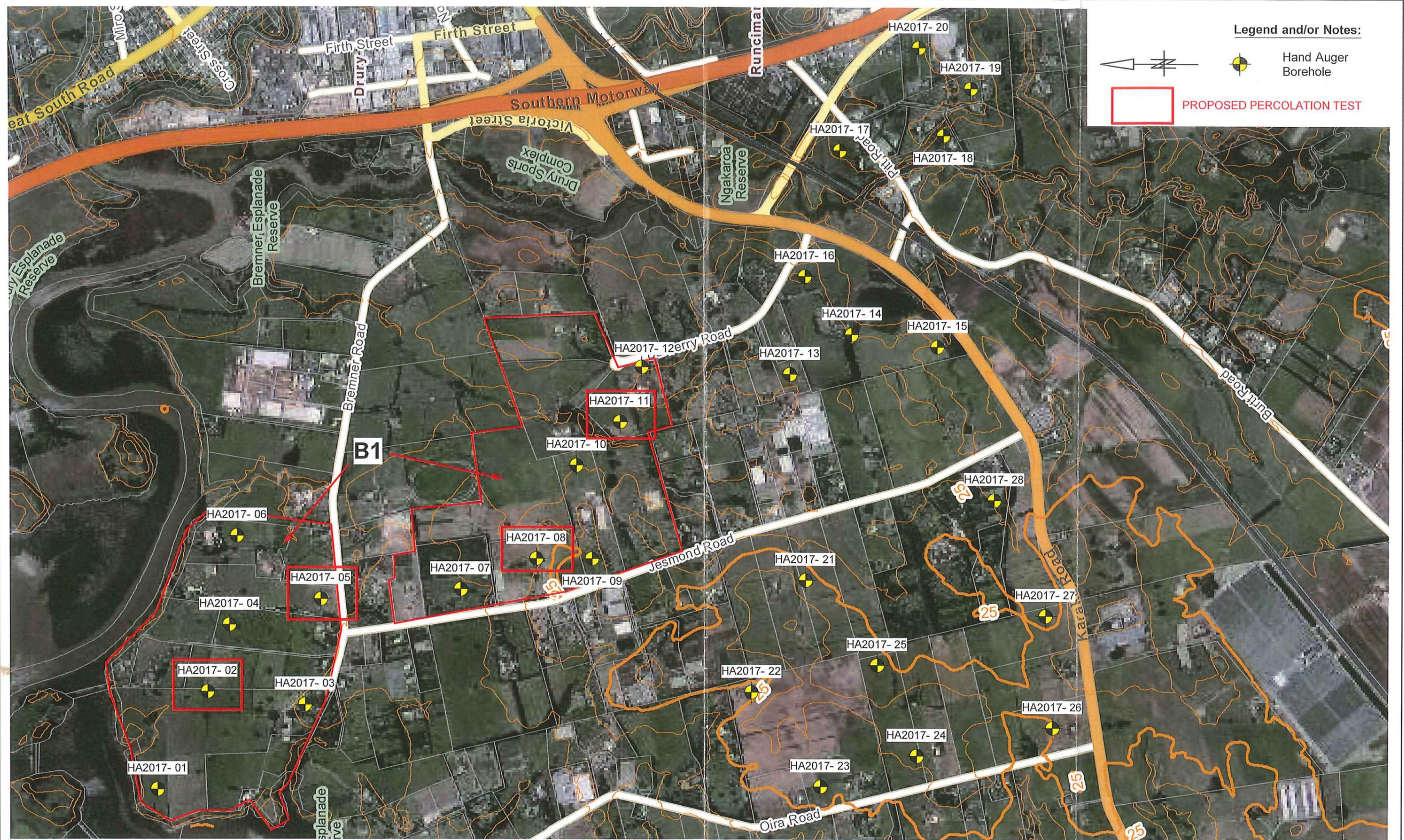
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Location: AURANGA B1, DRURY	Date: 11.04.17
0	Page: 2 of 2
Hole No: HA2017-11	Diameter: 0.1 (m)
Location: BURBERRY ROAD	Depth: 2.1 (m)

Water Depth vs Time



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Operator: AB
 Checked: JL

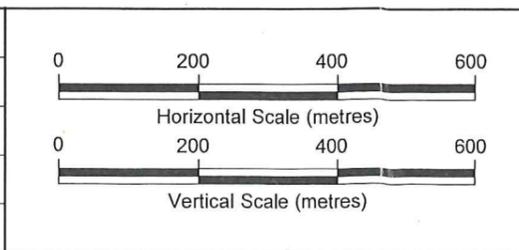


Legend and/or Notes:

- North
- Hand Auger Borehole
- PROPOSED PERCOLATION TEST

BASE PLAN SOURCE: AUCKLAND COUNCIL GIS DATABASE, DATED:16/02/17

revision	description	drawn	approved	date



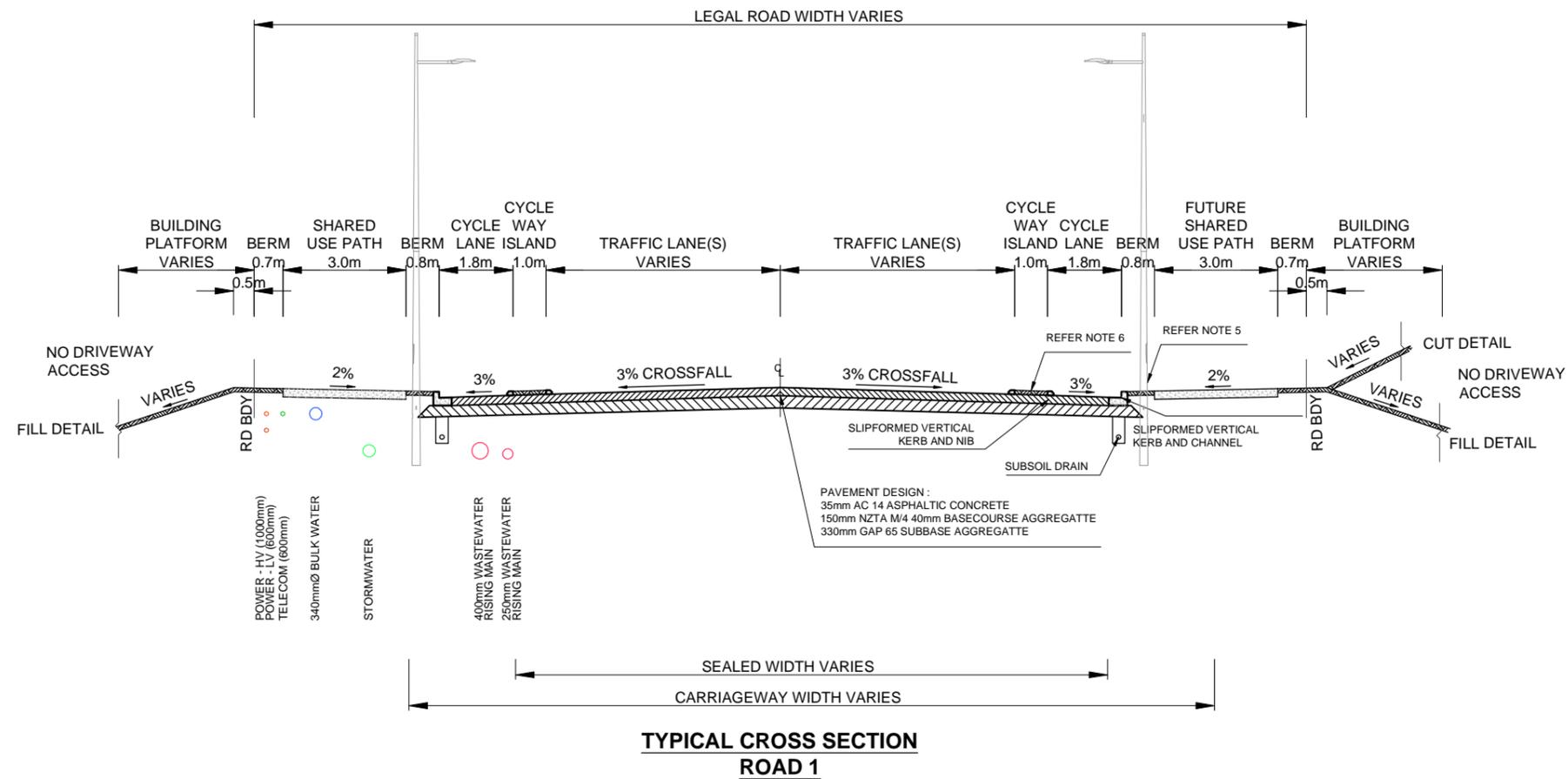
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approved	SL
date	16/02/17
scale	1:10000
original size	A3



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project:	AURANGA B1, DRURY	
title:	SITE PLAN	
project no:	J 00557	figure no: 01

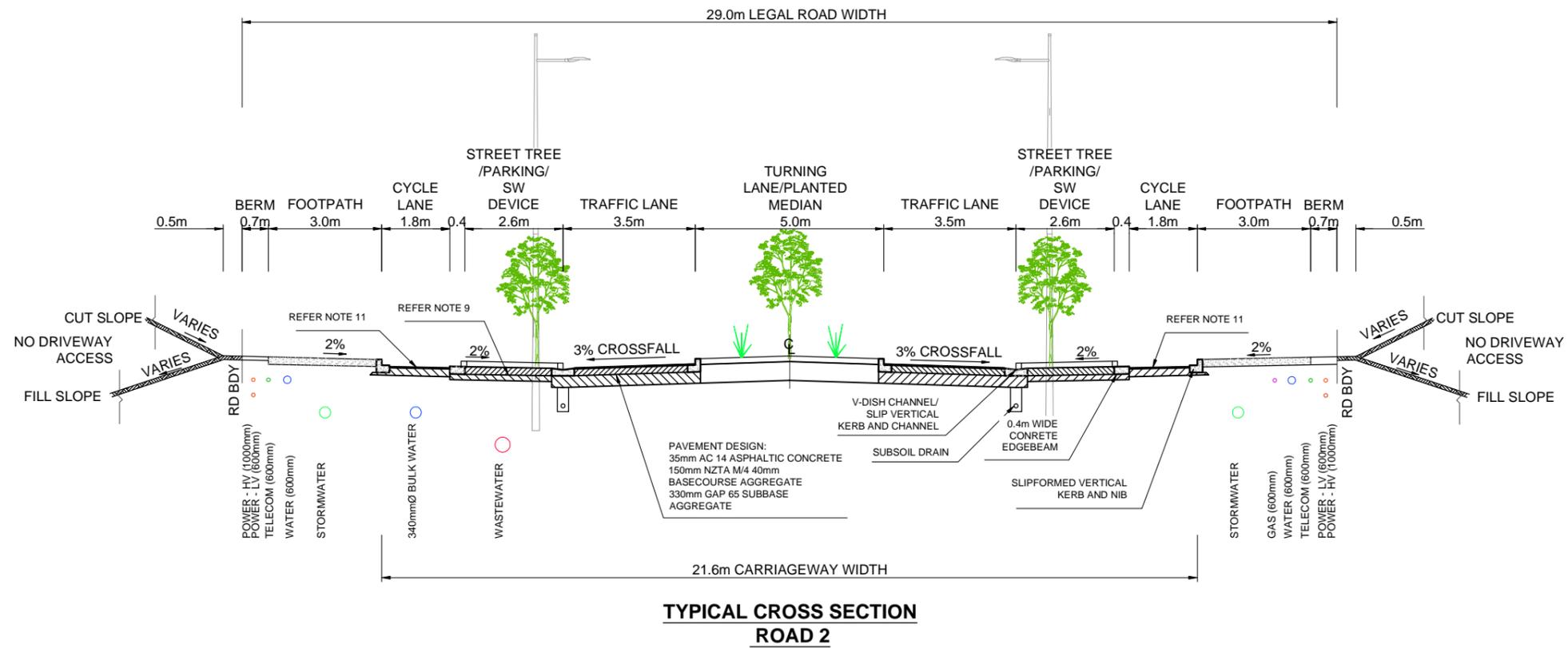
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Appendix I: Drury 1 Precinct typical details for roads and stormwater details



NOTES

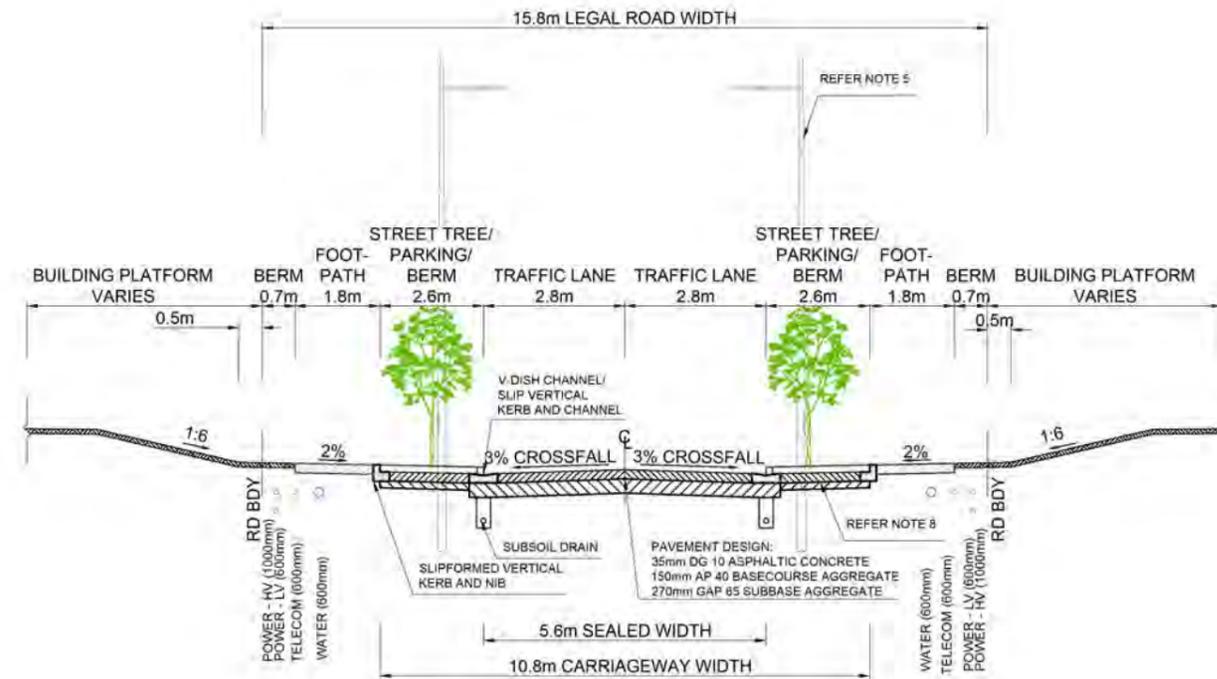
- SUBGRADE CBR ASSUMED AS CBR OF 4. SUBGRADE TO BE TESTED BY SCALA PENOTROMETER BY CONTRACTOR FOLLOWING BULK EARTHWORKS PRIOR TO FINAL ROAD TRIMMING. RESULTS TO BE PROVIDED TO THE ENGINEER TO CONFIRM PAVEMENT DEPTH.
- GRADE 4 MEMBRANE CHIPSEAL TO BE PLACED (AT 1L/m² OF RESIDUE BITUMEN) ON BASECOURSE PRIOR TO ASPHALT SURFACING.
- SUBSOIL DRAINAGE TO BE IN ACCORDANCE WITH ATCOP DRAWING RD025.
- REFER TO LANDSCAPING PLANS FOR TREE PIT AND PLANTING DETAILS.
- REFER TO STREETLIGHTING PLANS FOR LIGHTING DETAILS. COLUMNS TO BE MINIMUM 0.8m OFFSET FROM FACE OF KERB UNLESS SPECIFIED.
- CYCLEWAY PROTECTION ISLAND TO BE CONCRETE INFILL WITH 0.5m GAPS FOR DRAINAGE AT 3m CENTRES UNLESS SHOWN OTHERWISE. REFER TO ATCOP DRAWING FP013 ON SHEET 1013-1-395 FOR TYPICAL DETAILS.
- CUT BATTERS VARY UP TO MAXIMUM SLOPE OF 1:3. FILL BATTERS VARY FROM MINIMUM SLOPE OF 1:3.
- CENTRAL MEDIAN PLANTER WILL VARY IN WIDTH FROM 2.0m TO 5.0m DEPENDING ON RIGHT TURNING BAYS.
- REFER TO DRAWING 1013-1-365 FOR DETAIL ON THE CYCLE LANE/PARKING/RAINGARDEN CONNECTION AND PAVEMENT DETAIL.
- REFER TO TYPICAL CROSS SECTION ON SHEET 1013-1-363 FOR DETAILS OF UTILITIES SERVICES SETOUT.
- REFER TO SHEET 1013-1-395 FOR HEAVY DUTY CYCLE PAVEMENT DETAILS.



		ORIGINATOR: CJM	DATE: 27/06/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA	TITLE: TYPICAL CROSS SECTIONS SHEET 1 OF 3	ISSUE STATUS: ENGINEERING APPROVAL		
		DRAWN: HM	DATE: 31/03/17	SIGNED:	PLOT DATE: 03/04/17				PROJECT NO: 1013	SCALES: 1:75 @ A1 1:150 @ A3	A1
D FOR EPA APPROVAL		MWM	24/03/17	CHECKED:	SURVEY BY:				DRAWING NO: 1013-1-360	REV: D	
C S92 RESPONSE		MWM	10/03/17	DATE:	SIGNED:						
B ROAD 2 CENTRAL MEDIAN WIDENED		CJM	4/08/16	DATE:	SIGNED:						
A FIRST ISSUE		CJM	27/06/16	APPROVED:	DATE:	SIGNED:					
REV DESCRIPTION		BY	DATE								



**TYPICAL CROSS SECTION
ROADS 5 CH 280-402**

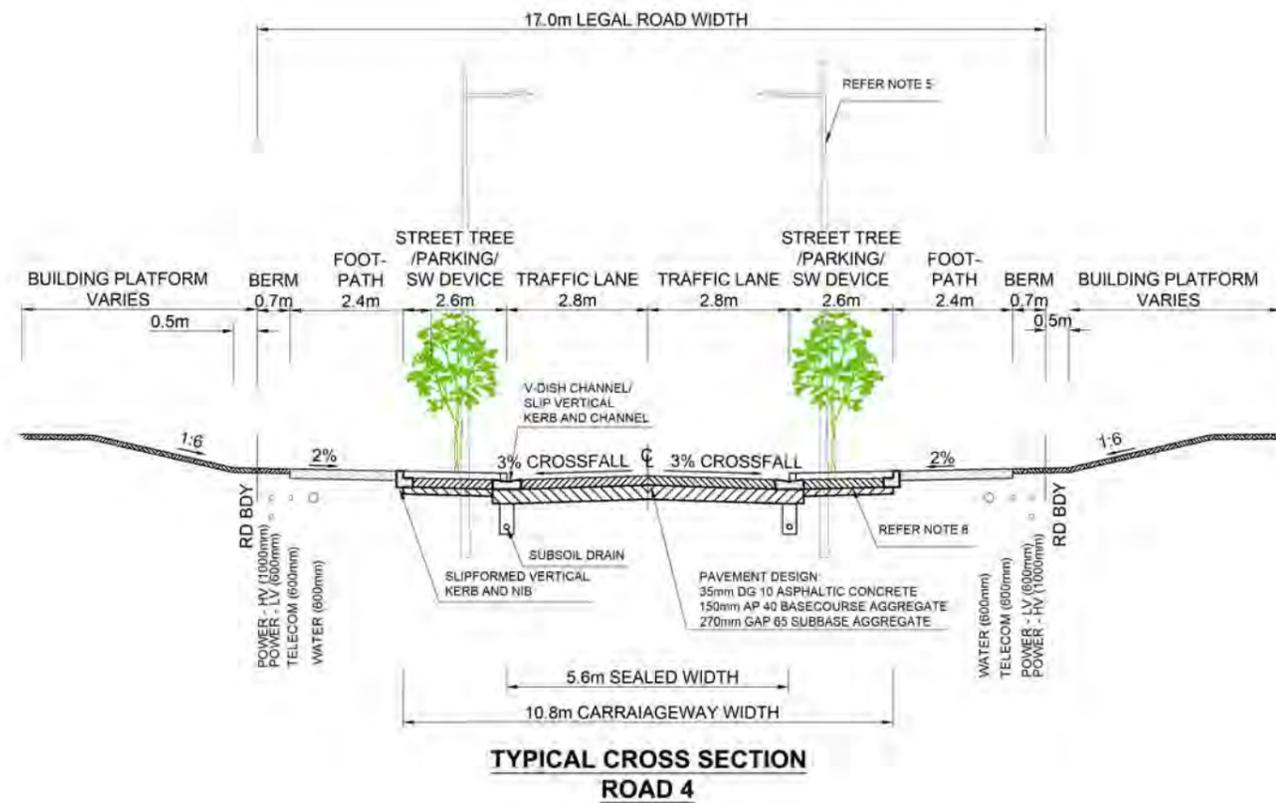


**TYPICAL CROSS SECTION
ROADS 11, 16, 19 & ROAD 5 CH 0-280**

NOTES

1. SUBGRADE CBR ASSUMED AS CBR OF 4. SUBGRADE TO BE TESTED BY SCALA PENETROMETER BY CONTRACTOR FOLLOWING BULK EARTHWORKS PRIOR TO FINAL ROAD TRIMMING. RESULTS TO BE PROVIDED TO THE ENGINEER TO CONFIRM PAVEMENT DEPTH.
2. GRADE 4 MEMBRANE CHIPSEAL TO BE PLACED (AT 1L/m² OF RESIDUE BITUMEN) ON BASECOURSE PRIOR TO ASPHALT SURFACING.
3. SUBSOIL DRAINAGE TO BE IN ACCORDANCE WITH ATCOP DRAWING RD025.
4. REFER TO LANDSCAPING PLANS FOR TREEPIT AND PLANTING DETAILS.
5. REFER TO STREETLIGHTING PLANS FOR LIGHTING DETAILS. COLUMNS TO BE MINIMUM 0.8m OFFSET FROM FACE OF KERB UNLESS SPECIFIED.
6. CUT BATTERS VARY UP TO MAXIMUM SLOPE OF 1:3. FILL BATTERS VARY FROM MINIMUM SLOPE OF 1:3.
7. REFER TO TYPICAL CROSS SECTION ON SHEET 1013-1-363 FOR DETAILS OF UTILITY SERVICES SETOUT
8. CARPARK PAVEMENT IN ACCORDANCE WITH 1013-1-365

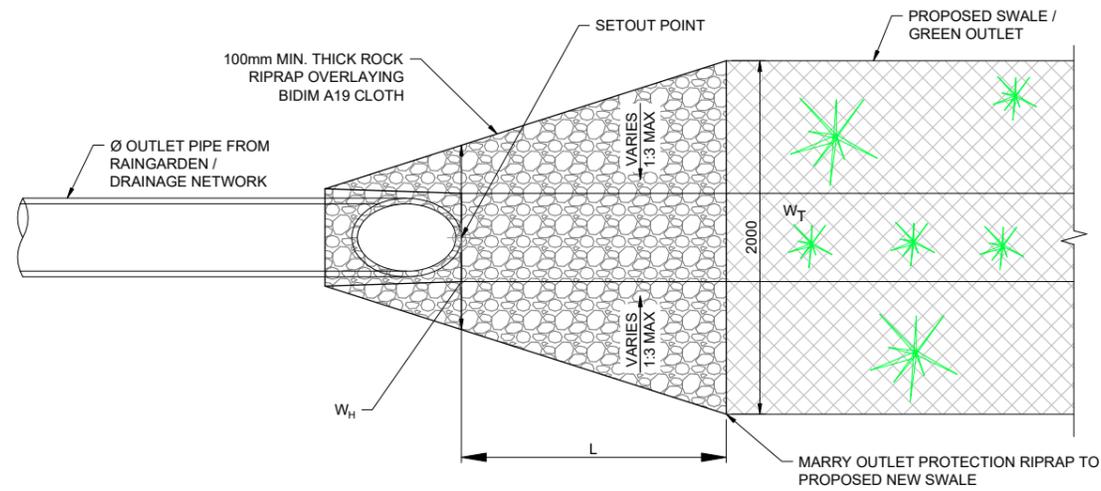
		ORIGINATOR: CJM	DATE: 27/06/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA	TITLE: TYPICAL CROSS SECTIONS SHEET 2 OF 3	ISSUE STATUS: ENGINEERING APPROVAL	
		DRAWN: HM	DATE: 31/03/17	SIGNED:	PLOT DATE: 03/04/17			SCALES: 1:75 @ A1 1:150 @ A3	A1	
		CHECKED:	DATE:	SIGNED:	SURVEY BY:					
B	FOR EPA APPROVAL	MWM	24/03/17							
A	FIRST ISSUE	CJM	27/06/16							
REV	DESCRIPTION	BY	DATE	APPROVED:	DATE:	SIGNED:	SURVEY DATE	DRAWING NO: 1013-1-361	REV: B	



NOTES

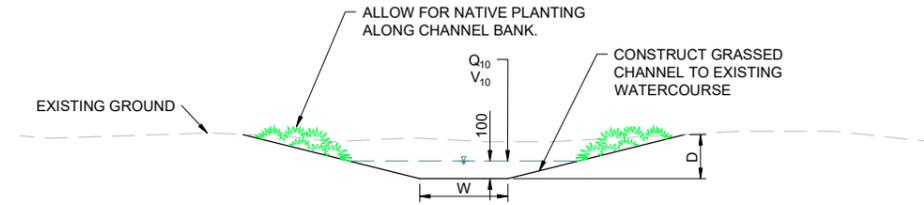
1. SUBGRADE CBR ASSUMED AS CBR OF 4. SUBGRADE TO BE TESTED BY SCALA PENOTROMETER BY CONTRACTOR FOLLOWING BULK EARTHWORKS PRIOR TO FINAL ROAD TRIMMING. RESULTS TO BE PROVIDED TO THE ENGINEER TO CONFIRM PAVEMENT DEPTH.
2. GRADE 4 MEMBRANE CHIPSEAL TO BE PLACED (AT 1L/m² OF RESIDUE BITUMEN) ON BASECOURSE PRIOR TO ASPHALT SURFACING.
3. SUBSOIL DRAINAGE TO BE IN ACCORDANCE WITH ATCOP DRAWING RD025.
4. REFER TO LANDSCAPING PLANS FOR TREETIP AND PLANTING DETAILS.
5. REFER TO STREETLIGHTING PLANS FOR LIGHTING DETAILS. COLUMNS TO BE MINIMUM 0.8m OFFSET FROM FACE OF KERB UNLESS SPECIFIED.
6. CUT BATTERS VARY UP TO MAXIMUM SLOPE OF 1:3. FILL BATTERS VARY FROM MINIMUM SLOPE OF 1:3.
7. REFER TO TYPICAL CROSS SECTION ON SHEET 1013-1-363 FOR DETAILS OF UTILITY SERVICES SETOUT.
8. CARPARK PAVEMENT IN ACCORDANCE WITH 1013-1-365.

		ORIGINATOR: CJM	DATE: 27/06/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA STAGE 1	TITLE: TYPICAL CROSS SECTIONS SHEET 3 OF 3		ISSUE STATUS: ENGINEERING APPROVAL				
		DRAWN: HM	DATE: 31/03/17	SIGNED:	PLOT DATE: 03/04/17		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">PROJECT NO: 1013</td> <td style="width: 50%;">SCALES: 1:75 @ A1 1:150 @ A3</td> <td rowspan="2" style="width: 10%; text-align: center; vertical-align: middle;">A1</td> </tr> <tr> <td colspan="2">DRAWING NO: 1013-1-362</td> <td style="text-align: center; vertical-align: middle;">REV: B</td> </tr> </table>	PROJECT NO: 1013		SCALES: 1:75 @ A1 1:150 @ A3	A1	DRAWING NO: 1013-1-362		REV: B
PROJECT NO: 1013	SCALES: 1:75 @ A1 1:150 @ A3	A1												
DRAWING NO: 1013-1-362			REV: B											
		CHECKED:	DATE:	SIGNED:	SURVEY BY:									
REV	DESCRIPTION	BY	DATE	APPROVED:	DATE	SIGNED:	SURVEY DATE							



TYPICAL OUTLET DETAIL - PLAN

SCALE: 1:20 @ A1
1:40 @ A3

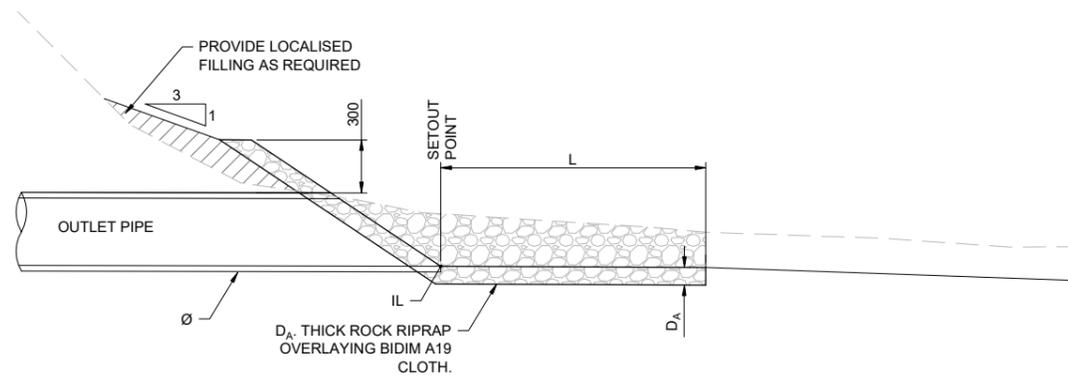


TYPICAL SECTION - GREEN OUTLET

SCALE: 1:20 @ A1
1:40 @ A3

SWALE DIMENSIONS

OUTLET	BASE WIDTH 'W'	SWALE SLOPE '%'	SWALE DEPTH 'D'	10% AEP FLOW -l/s 'Q ₁₀ '	10% AEP VELOCITY -m/s 'V ₁₀ '
1/0	0.5	20	VARIES	194	2.53
2/0	0.40	33.3	VARIES	59.4	2.19
4/0	0.73	60	VARIES	473.5	4.61
16/0	0.3	20	VARIES	134.9	2.36
19/0	1.0	33.3	VARIES	430	3.53
26/0	0.15	33.3	VARIES	128.5	2.86
27/0	0.1	33.3	VARIES	104	2.73
33/0	0.7	2.0	VARIES	85.4	0.84



TYPICAL ELEVATION

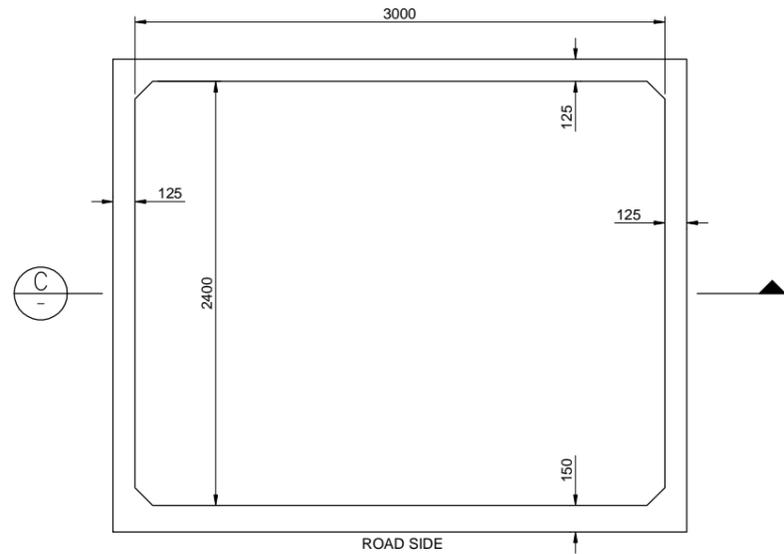
SCALE: 1:20 @ A1
1:40 @ A3

OUTLET DIMENSIONS

OUTLET	PIPE DIAMETER 'Ø'	INCOMING GRADE '%'	INVERT LEVEL 'IL'	LENGTH 'L'	WIDTH 'W _H '	WIDTH 'W _T '	THICKNESS 'D _A '	RIP RAP DIAMETER 'd _s '
1/0	450	0.6	5.10	1.80	2.15	2.55	0.28	0.08
2/0	300	0.6	5.59	1.20	1.00	1.70	0.15	0.04
4/0	750	0.6	4.43	6.48	2.15	2.25	0.41	0.20
16/0	375	0.6	4.50	1.50	2.15	2.13	0.26	0.07
19/0	600	0.6	3.13	2.40	2.15	3.40	0.41	0.12
26/0	375	0.6	5.61	1.50	2.15	2.13	0.24	0.07
27/0	375	0.6	5.73	0.90	1.50	2.13	0.18	0.05
33/0	375	0.6	6.24	1.50	2.15	2.13	0.14	0.04

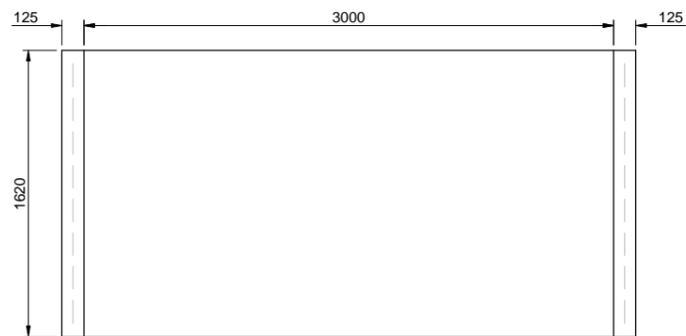
Refer to Engineering Calculations (TP10/HEC14)

		ORIGINATOR: MWM		DATE: 10/02/17	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT:	TITLE:	ISSUE STATUS:			
		DRAWN: MWM		DATE: 10/02/17	SIGNED:	PLOT DATE: 31/03/17		AURANGA STAGE 1	INSITU OUTLET STRUCTURES TO STREAMS / COASTAL AREAS		ENGINEERING APPROVAL		
		CHECKED:		DATE:	SIGNED:	SURVEY BY:					PROJECT NO:	SCALES:	A1
B	FOR EPA APPROVAL	HS	31/03/17	APPROVED:	DATE:	SIGNED:		SURVEY DATE:	1013	AS SHOWN	REV:		
A	FIRST ISSUE	MWM	10/02/17							B			
REV	DESCRIPTION	BY	DATE										



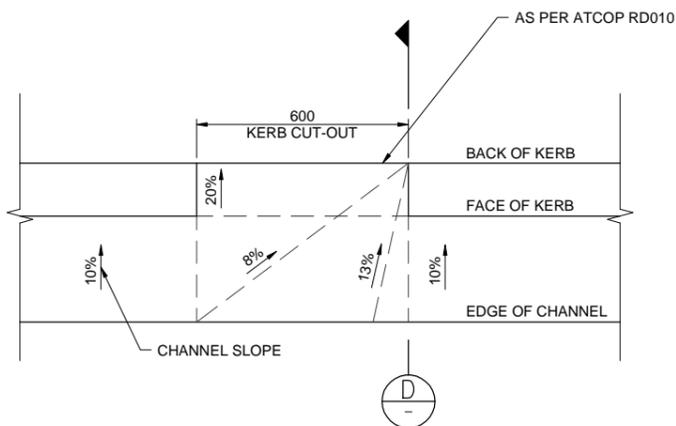
HYNDS PRE-CAST RAINGARDEN SURROUND

SCALE: 1:20 @ A1
1:40 @ A3



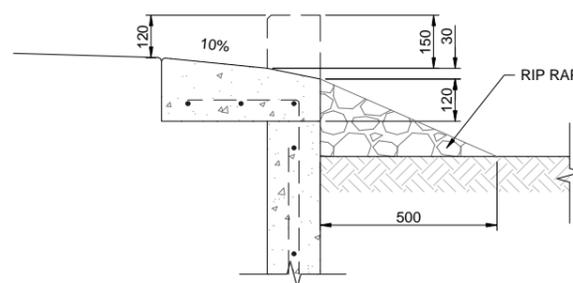
HYNDS PRE-CAST RAINGARDEN SURROUND - SECTION C-C

SCALE: 1:20 @ A1
1:40 @ A3



KERB CUT-OUT DETAIL A

SCALE: 1:10 @ A1
1:20 @ A3



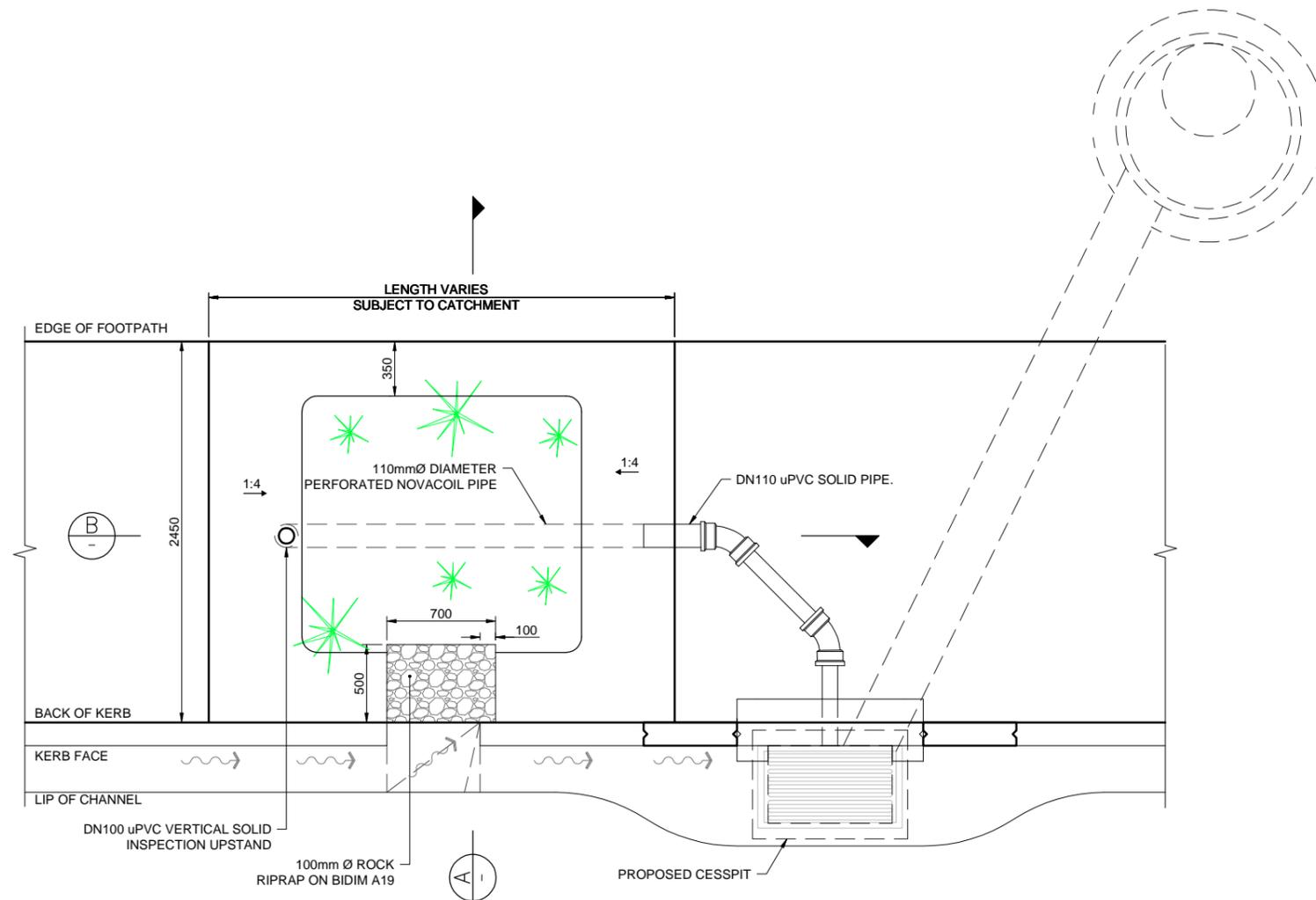
KERB CUT-OUT - SECTION D-D

SCALE: 1:10 @ A1
1:20 @ A3

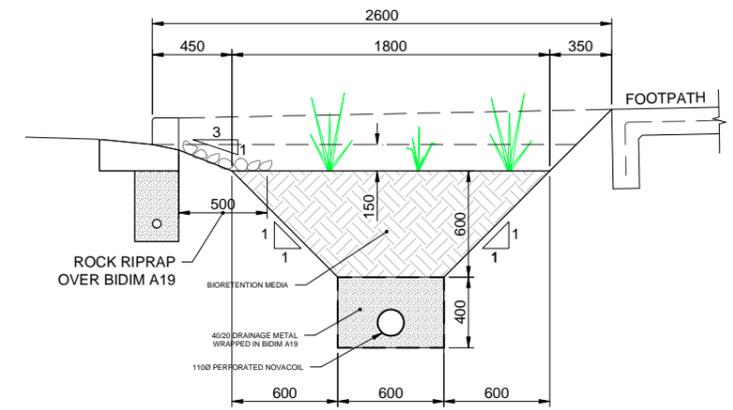
RAINGARDEN CATCHMENT INFORMATION

DEVICE NAME	CATCHMENT (CA) m2	Raingarden size (2% CA) m ²	Retention Volume 5mm	Detention Volume 16.3mm	Modules	Area
DCP 1/1	1363	27.26	6.82	22.17	4	28.8
DCP 2/1	1298	25.96	6.49	21.12	4	28.8
CP 3/1	922	18.44	4.61	15.00	3	21.6
CP 4/1	656	13.12	3.28	10.67	2	14.4
CP 5/1	671	13.42	3.36	10.92	2	14.4
CP 6/1	703	14.06	3.52	11.44	2	14.4
CP7/1	376	7.52	1.88	6.12	2	14.4
CP 8/1	634	12.68	3.17	10.31	2	14.4
DCP 9/1	708	14.16	3.54	11.52	2	14.4
DCP 10/1	587	11.74	2.94	9.55	2	14.4
CP 12/1	320	6.40	1.60	5.21	1	7.2
CP 13/1	294	5.88	1.47	4.78	1	7.2
CP14/1	219	4.38	1.10	3.56	1	7.2
DCP15/1	586	11.72	2.93	9.53	2	14.4
CP 16/1	322	6.44	1.61	5.24	1	7.2
DCP 17/1	496	9.92	2.48	8.07	2	14.4
DCP 18/1	439	8.78	2.20	7.14	2	14.4
CP 19/1	457	9.14	2.29	7.43	2	14.4
CP 20/1	344	6.88	1.72	5.60	1	7.2
CP 26/1	272	5.44	1.36	4.42	1	7.2
DCP 27/1	308	6.16	1.54	5.01	1	7.2
DCP 28/1	351	7.02	1.76	5.71	1	7.2
CP 35/1	332	6.64	1.66	5.40	1	7.2
CP 41/1	382	7.64	1.91	6.21	2	14.4
CP 42/1	218	4.36	1.09	3.55	1	7.2
CP 43/1	476	9.52	2.38	7.74	2	14.4
CP 44/1	997	19.94	4.99	16.22	3	21.6
CP 45/1	1012	20.24	5.06	16.46	3	21.6
CP 46/1	1121	22.42	5.61	18.24	4	28.8
CP 47/1	252	5.04	1.26	4.10	1	7.2
CP 48/1	268	5.36	1.34	4.36	1	7.2
CP 49/1	977	19.54	4.89	15.89	3	21.6
CP 56/1	792	15.84	3.96	12.88	3	21.6
CP 57/1	956	19.12	4.78	15.55	3	21.6
CP 58/1	376	7.52	1.88	6.12	2	14.4
CP 65/1	238	4.76	1.19	3.87	1	7.2
CP 66/1	509	10.18	2.55	8.28	2	14.4
CP 67/1	613	12.26	3.07	9.97	2	14.4
CP 68/1	893	17.86	4.47	14.53	3	21.6

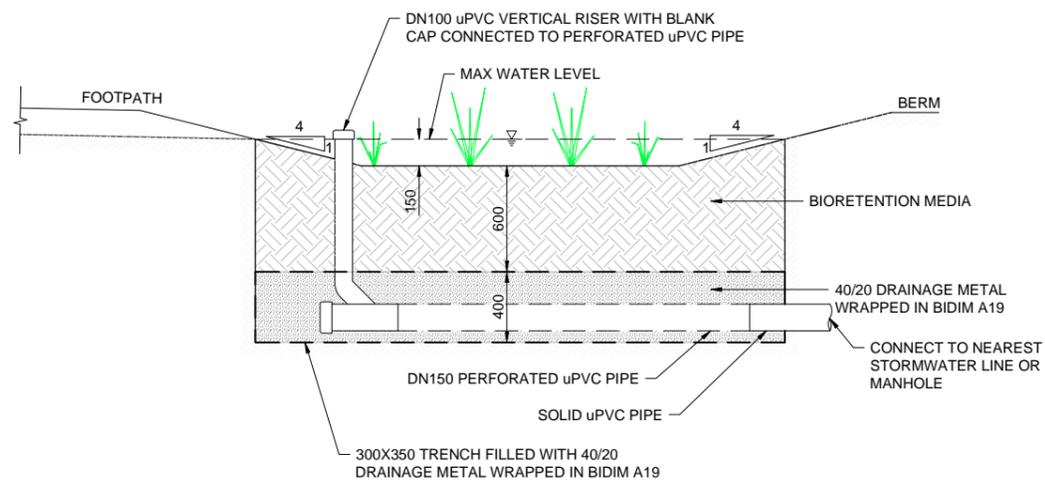
ORIGINATOR: CM		DATE: 11/03/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA	TITLE: RAINGARDEN TYPE 1 SHEET 2 OF 2	ISSUE STATUS: ENGINEERING APPROVAL		
DRAWN: DNV		DATE: 11/03/16	SIGNED:	PLOT DATE: 03/04/17		PROJECT NO: 1013	SCALES: AS SHOWN	A1		
CHECKED:		DATE:	SIGNED:	SURVEY BY:		DRAWING NO: 1013-1-436		REV: B		
APPROVED:		DATE:	SIGNED:	SURVEY DATE:						
REV	DESCRIPTION	BY	DATE							
B FOR EPA APPROVAL		MWM	31/03/17							
A FIRST ISSUE		MWM	29/07/16							



LOCAL ROAD RAINGARDEN - PLAN
 SCALE: 1:20 @ A1
 1:40 @ A3

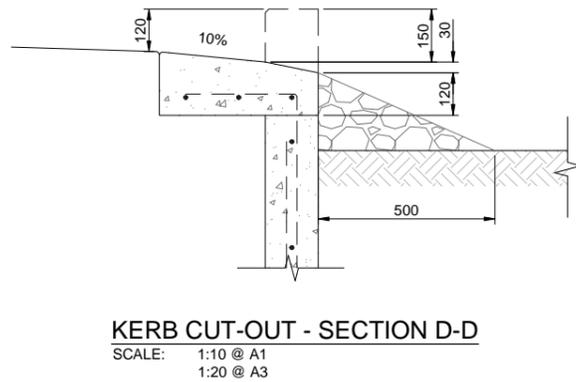
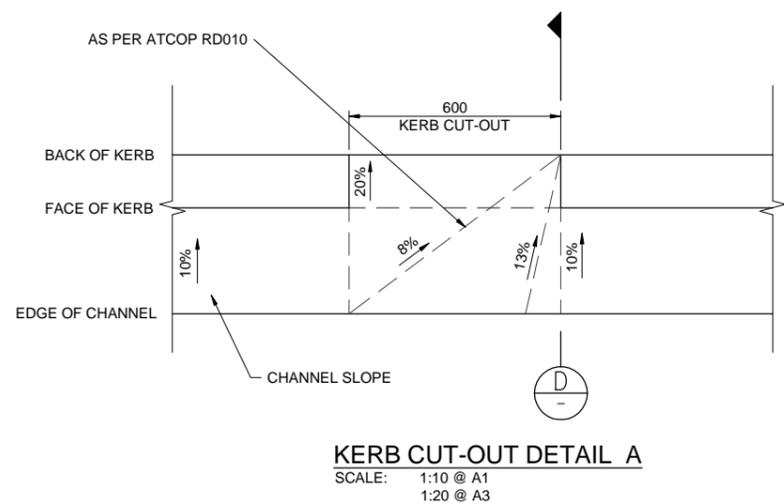


**TYPE A - DISCHARGE TO STREAM
 LOCAL ROAD RAINGARDEN - SECTION A-A**
 SCALE: 1:20 @ A1
 1:40 @ A3



RAINGARDEN - SECTION B-B
 SCALE: 1:20 @ A1
 1:40 @ A3

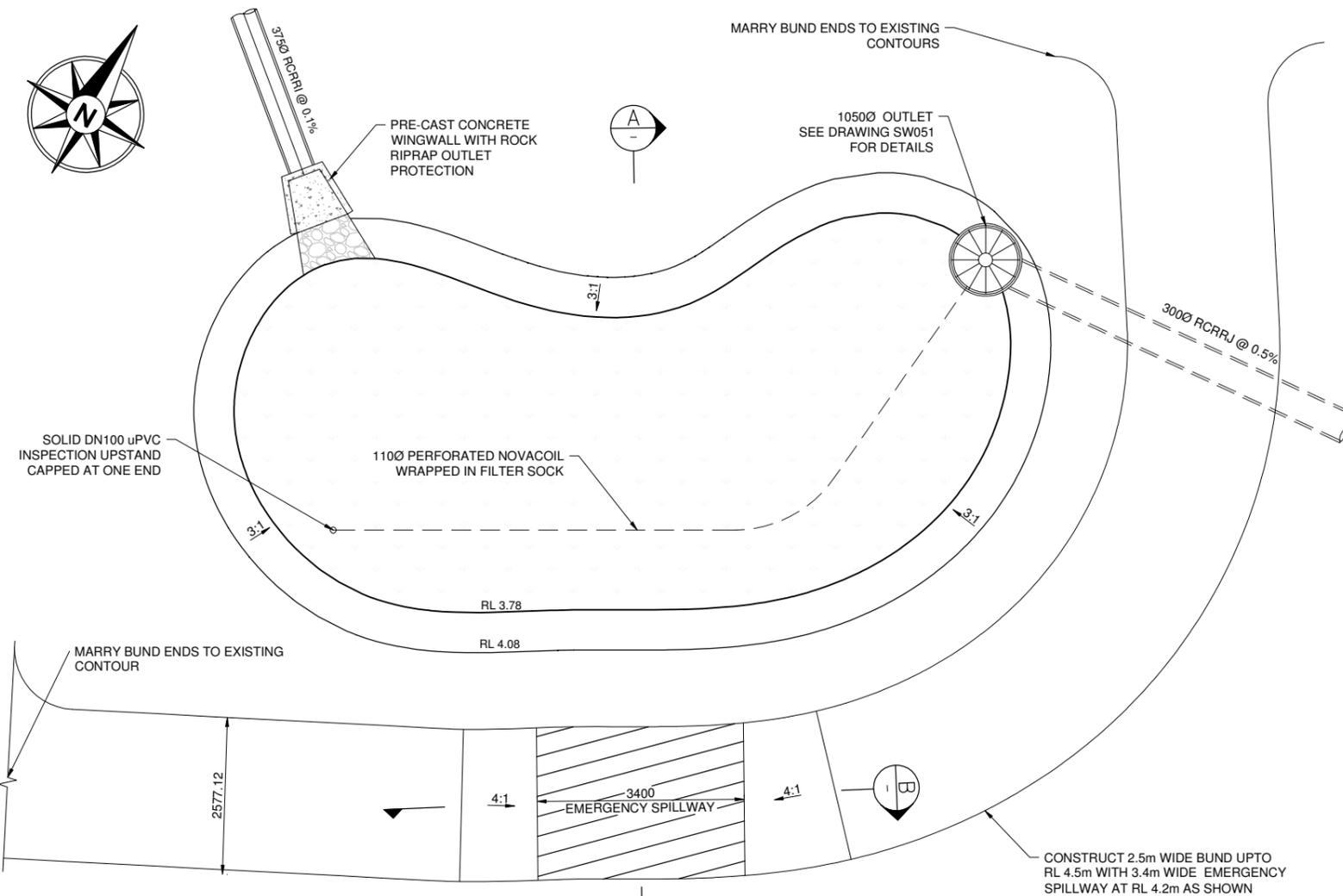
		ORIGINATOR: CM	DATE: 11/03/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT:	TITLE:	ISSUE STATUS: ENGINEERING APPROVAL			
		DRAWN: DNV	DATE: 11/03/16	SIGNED:	PLOT DATE: 03/04/17		AURANGA STAGE 1 BREMNER ROAD, DRURY	RAINGARDEN TYPE 2 SHEET 1 OF 2	PROJECT NO: 1013		SCALES: AS SHOWN	A1
C	FOR EPA APPROVAL	ML	31/03/17	CHECKED:	SURVEY BY:				DRAWING NO: 1013-1-437		REV: C	
B	S92 RESPONSE	ML	08/02/17	APPROVED:	SURVEY DATE:							
A	FIRST ISSUE	CJM	29/07/16									
REV	DESCRIPTION	BY	DATE									



RAINGARDEN CATCHMENT INFORMATION

DEVICE NAME	CATCHMENT INFORMATION		RAINGARDEN SIZING		
	CATCHMENT (CA) m2	Raingarden size (2% CA) m ²	Width	Length	Area
DCP 11/1	567	11.34	2.2	5.2	11.4
DCP 17/1	496	9.92	2.2	4.6	10.1
DCP 18/1	439	8.78	2.2	4	8.8
DCP 21/1	859	17.18	2.2	7.9	17.4
DCP 22/1	618	12.36	2.2	5.7	12.5
DCP 23/1	575	11.50	2.2	5.3	11.7
CP 24/1	256	5.12	2.2	2.4	5.3
CP 25/1	207	4.14	2.2	2	4.4
CP 29/1	398	7.96	2.2	3.7	8.1
CP 30/1	322	6.44	2.2	3	6.6
DCP 33/1	378	7.56	2.2	3.5	7.7
DCP 34/1	302	6.04	2.2	2.8	6.2
CP 36/1	255	5.10	2.2	2.4	5.3
CP 37/1	196	3.92	2.2	1.8	4.0
CP 38/1	197	3.94	2.2	1.8	4.0
DCP 39/1	443	8.86	2.2	4.1	9.0
DCP 40/1	782	15.64	2.2	7.2	15.8
CP 69/1	374	7.48	2.2	3.5	7.7

		ORIGINATOR: CM	DATE: 11/03/16	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT:	TITLE:	ISSUE STATUS: ENGINEERING APPROVAL			
		DRAWN: DNV	DATE: 11/03/16	SIGNED:	PLOT DATE: 03/04/17			RAINGARDEN TYPE 2 SHEET 2 OF 2	PROJECT NO: 1013		SCALES: AS SHOWN	A1
C	FOR EPA APPROVAL	ML	31/03/17	CHECKED:	SURVEY BY:				DRAWING NO: 1013-1-438		REV: C	
B	S92 RESPONSE	ML	08/02/17	APPROVED:	SURVEY DATE:							
A	FIRST ISSUE	CJM	29/07/16									
REV	DESCRIPTION	BY	DATE									



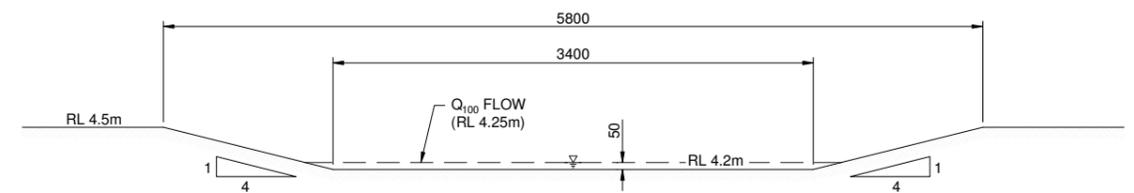
BREMNER ROAD RAINGARDEN - PLAN

SCALE: 1:50 @ A1
1:100 @ A3

CATCHMENT SUMMARY	
TOTAL CATCHMENT	0.2354ha
WQV	46.46m ³
Q _{wc}	8.62 l/s
EDV	0.05m ³
PEAK FLOW	0.0457m ³ /s

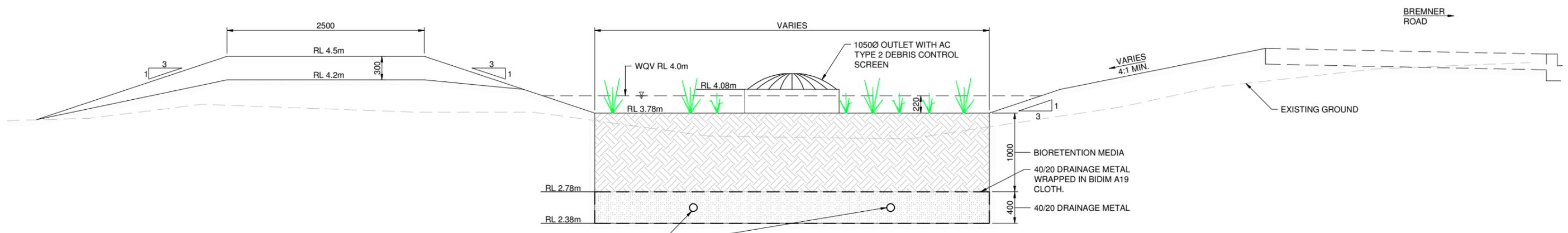
RAINGARDEN SIZE:

DESIGN AREA	62m ²
REQUIRED	47m ²



RAINGARDEN SPILLWAY SECTION B-B

SCALE: 1:25 @ A1
1:50 @ A3



RAINGARDEN SECTION A-A

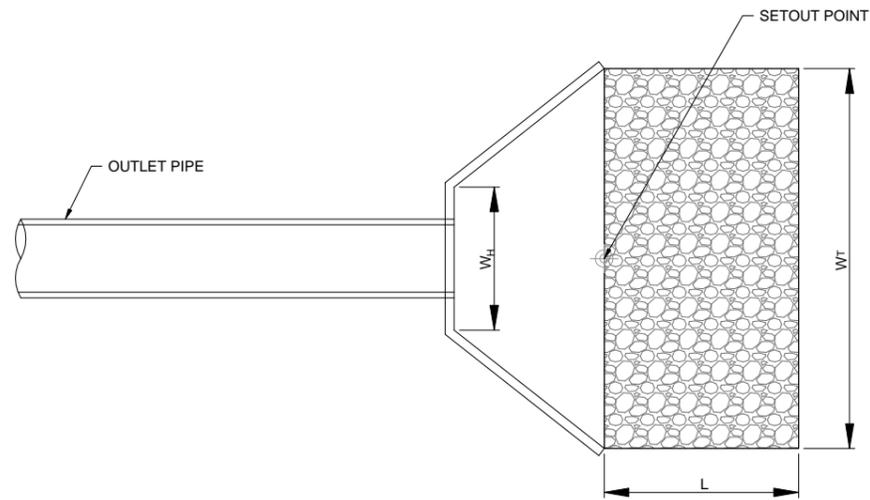
SCALE: 1:25 @ A1
1:50 @ A3

REV	DESCRIPTION	BY	DATE	APPROVED:	DATE:	SIGNED:	SURVEY DATE:
A	FIRST ISSUE	MWM	10/02/17				

ORIGINATOR:	MWM	DATE:	10/02/17	SIGNED:		PLOT BY:	
DRAWN:	MWM	DATE:	10/02/17	SIGNED:		PLOT DATE:	17/03/17
CHECKED:		DATE:		SIGNED:		SURVEY BY:	
APPROVED:		DATE:		SIGNED:		SURVEY DATE:	

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ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING		RECLAMATION AREA		

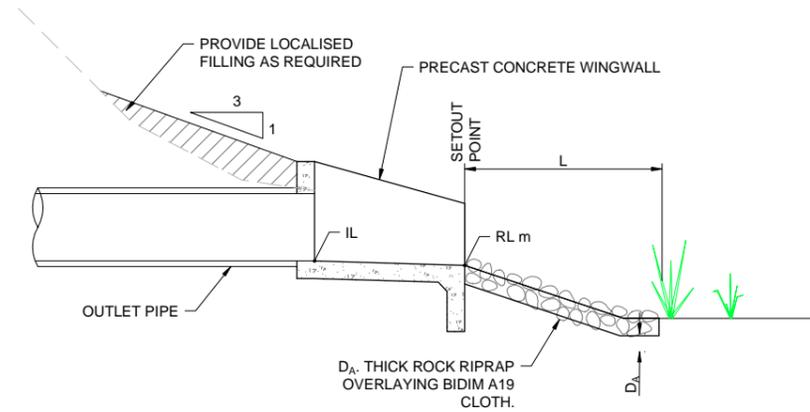
ISSUE STATUS:	FOR CONSENT		
PROJECT NO:	1013	SCALES:	AS SHOWN
DRAWING NO:	1013-RD1-430	REV:	A



NOTE:
CONTRACTOR TO REFER TO SUPPLIER TO OBTAIN THE CORRECT SIZE PRECAST WINGWALL TO SUIT THE PIPE DIAMETER

TYPICAL OUTLET DETAIL - PLAN

SCALE: 1:20 @ A1
1:40 @ A3



TYPICAL ELEVATION

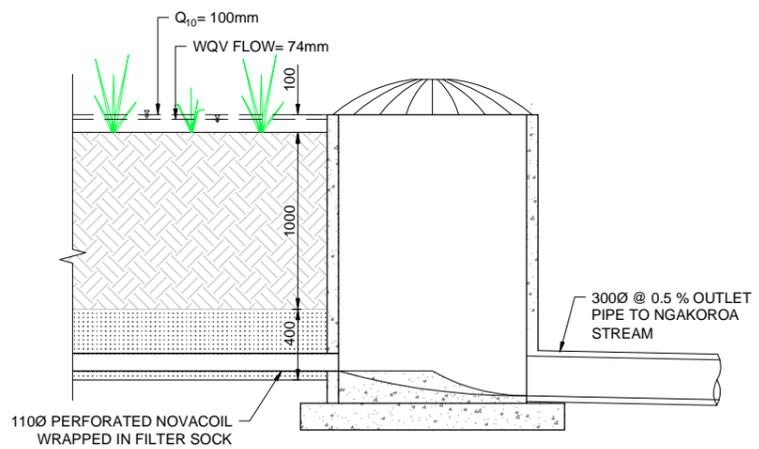
SCALE: 1:20 @ A1
1:40 @ A3

OUTLET DIMENSIONS

OUTLET	PIPE DIAMETER 'Ø'	INCOMING GRADE '%'	INVERT LEVEL 'IL'	LENGTH 'L'	WIDTH 'Wh'	WIDTH 'Wt'	THICKNESS 'DA'	RIP RAP DIAMETER 'ds'
28/1	375	0.1	4.03	1.50	2.15	2.13	0.07	0.02

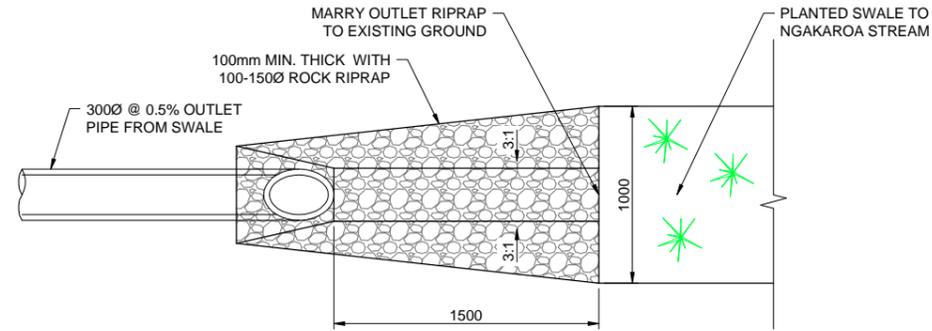
Refer to Engineering Calculations (TP10/HEC14)

		ORIGINATOR: MWM	DATE: 10/02/17	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA RECLAMATION AREA	TITLE: BREMNER ROAD PRECAST OUTLET STRUCTURES	ISSUE STATUS: FOR CONSENT		
		DRAWN: MWM	DATE: 10/02/17	SIGNED:	PLOT DATE: 17/03/17			PROJECT NO: 1013		SCALES: AS SHOWN	A1
		CHECKED:	DATE:	SIGNED:	SURVEY BY:			DRAWING NO: 1013-RD1-432		REV: A	
REV	DESCRIPTION	BY	DATE	APPROVED:	DATE:		SIGNED:	SURVEY DATE:			



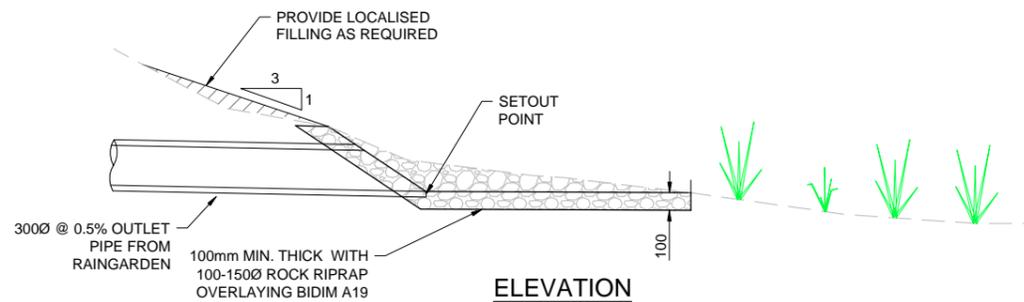
SWALE OUTLET DETAIL

SCALE: 1:20 @ A1
1:40 @ A3

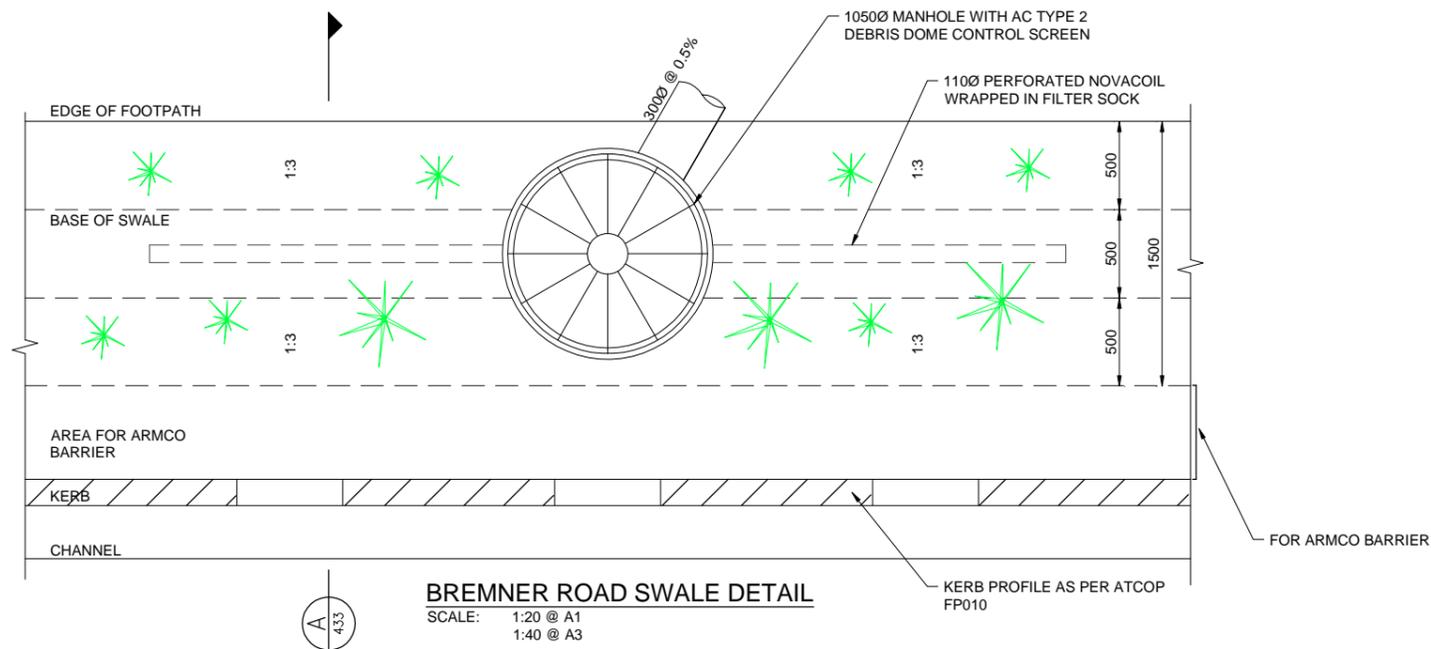


SWALE OUTLET TO NGAKOROA STREAM DETAIL - PLAN

SCALE: 1:20 @ A1
1:40 @ A3



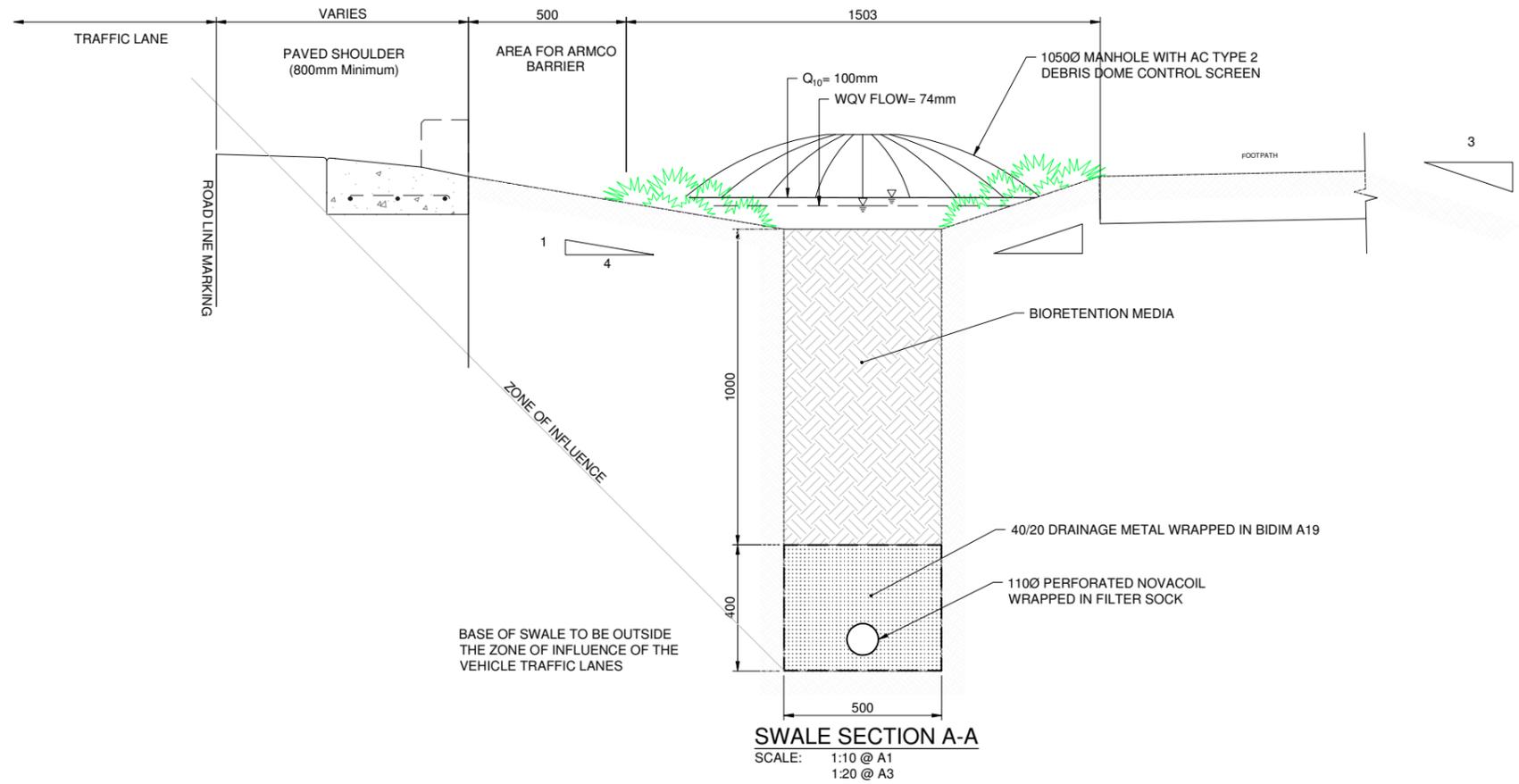
ELEVATION



BREMNER ROAD SWALE DETAIL

SCALE: 1:20 @ A1
1:40 @ A3

ORIGINATOR: MWM		DATE: 10/02/17	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT:	TITLE:	ISSUE STATUS: FOR CONSENT			
DRAWN: MWM		DATE: 10/02/17	SIGNED:	PLOT DATE: 17/03/17		AURANGA	BREMNER ROAD SWALES SHEET 1 OF 2	PROJECT NO: 1013		SCALES: AS SHOWN	A1
CHECKED:		DATE:	SIGNED:	SURVEY BY:		RECLAMATION AREA		DRAWING NO: 1013-RD1-433		REV: A	
REV	DESCRIPTION	BY	DATE	APPROVED:				DATE:	SIGNED:	SURVEY DATE:	



BOTANICAL NAME	COMMON NAME
<i>Apodasmia Smilis</i>	O'I'OI
<i>Carex Secta</i>	PUREI
<i>Carex Pumila</i>	BLUE DUNE SEDGE

NOTE:

1. PLANT SPECIES TO BE CONFIRMED ON DETAILED ENGINEERING APPROVAL
2. DEPTH SHOWN IS FOR BREMNER SOUTH SWALE.

SWALE DETAILS

	BREMNER NORTH	BREMNER SOUTH
BASE WIDTH (m)	0.5	0.5
TOP WIDTH (m)	1.50	1.50
WQV FLOW DEPTH (mm)	72.9	84.4
Q10 FLOW DEPTH (mm)	100	100
Q10 FLOW (m ³)	0.0155	0.0258

		ORIGINATOR: MWM	DATE: 10/02/17	SIGNED:	PLOT BY:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REWORKED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF MCKENZIE AND COMPANY CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR THE UNAUTHORISED USE OF THIS DRAWING. ALL DIMENSIONS TO BE CHECKED; DO NOT SCALE FROM DRAWING	PROJECT: AURANGA RECLAMATION AREA	TITLE: BREMNER ROAD SWALES SHEET 2 OF 2		ISSUE STATUS: FOR CONSENT	
		DRAWN: MWM	DATE: 10/02/17	SIGNED:	PLOT DATE: 17/03/17		PROJECT NO: 1013	SCALES: AS SHOWN		A1	
		CHECKED:	DATE:	SIGNED:	SURVEY BY:		DRAWING NO: 1013-RD1-434	REV: A			
REV	DESCRIPTION	BY	DATE	APPROVED:	DATE:		SIGNED:	SURVEY DATE:			

**Appendix J: Auranga Flood Hazard Model
Development (05 May 2017)**

Memo

To:	Mark Tollemache	Job No:	1001534
From:	Sarah Basheer/ Tim Fisher	Date:	5 May 2017
Subject:	Auranga - Flood Hazard Model Development		

1 Introduction

Karaka & Drury Ltd are proposing Auranga B1, which is a rezoning of approximately 83 ha at a site located west of State Highway One (SH1) at Drury. The site is adjacent to the Auranga A site, refer to Figure 1-1.

The site is at the downstream end of the Oira Creek and Ngakaroa Stream catchments and adjacent to the estuarine section of Drury (Hingaia) Creek, which drains to the Manukau Harbour. Drury Creek also receives water from Hingaia Stream and Slippery Creek catchments. Two streams (A and B stream) convey stormwater in a general south to north direction are located within the area, refer to Figure 1-1.

The purpose of the flood hazard assessment is to confirm the 1% Annual Exceedance Probability (AEP) flood levels in the vicinity of the site as a result of flooding from the surrounding streams, overland flooding and tidal conditions in the area.

This memo describes the modelling methodology, assumptions and the flooding predicted for the Auranga area. This Version 2 of the memo is an update to include Auranga B1. The previous version of memo issued on 9 May 2016 was for Auranga A. The same model results are used for both and have been approved by Auckland Council for Auranga A



Figure 1-1 Overview of site location with catchment boundaries applicable to Auranga B1 (red) and Auranga A (black dashed)

2 Modelling Methodology and Assumptions

The Auranga model is a coupled One Dimensional (1D)/Two Dimensional (2D) hydraulic model built using MIKE 11 and MIKE 21 software by DHI. The majority of the model is represented in 2D with a small 1D component added to represent the Hingaia Road Bridge (refer to Figure 2-1 for model extent).

A predominantly 2D model was considered suitable for this area as there is no piped stormwater systems and few hydraulic structures. Furthermore the flood extents are generally much wider than the main stream channels. Representation of storage (that is best done in 2D) is also important because of the large volume in the estuary.

Several sensitivity runs were carried out to assess the impacts of the following:

- 1 Adjacent catchment inflows (Hingaia Stream also including Slippery Creek, Ngakoroa Stream, Oira Creek and Whangapouri Creek),
- 2 Downstream tailwater level at Manukau Harbour, and
- 3 Hingaia Road Bridge.

2.1 Hydrology and tidal boundary conditions

All the scenarios were carried out for the Maximum Probable Development (MPD), 1% AEP rainfall event with climate change. Climate change was allowed for by a 16.8% increase in rainfall depth. Scenario 5 and Scenario 6 also had hydrological losses taken into account, by using weighted curve numbers and assuming 70% overall imperviousness within the catchment. This is explained further in the Table 2-1.

More frequent events (50% AEP, 10% AEP) were not assessed as a part of this project as the purpose of the model is to determine the 1% AEP flood levels for Auranga to ensure the proposed works avoid this flood hazard.

The model scenario reported in this memo is Scenario 5. This tailwater scenario is based on Mean High Water Spring (MHWS) with 1 m sea level rise, and was modelled to establish a flood extent range for the Auranga B1 site

Table 2-1 details the methodology and assumptions that were applied for this model scenario. A selection of scenarios that were modelled prior to Scenario 5 have been listed in the table in Appendix A.

2.2 Model bathymetry

The 2D model bathymetry was generated from the 2013 LiDAR data provided by Auckland Council (AC). The 1D model cross-sections have been sourced from the 2013 LiDAR except for the bridge, where a topographical survey was carried out. Changes to the 2D terrain at depressions / culvert crossings / ponds are noted in Table 2-1. In addition, the 2D terrain bed level in the stream section (from approximately 200 m upstream of the Hingaia Road Bridge to end of the 2D model extent) has been set to the surveyed bed level at the bridge, as no other information was available.

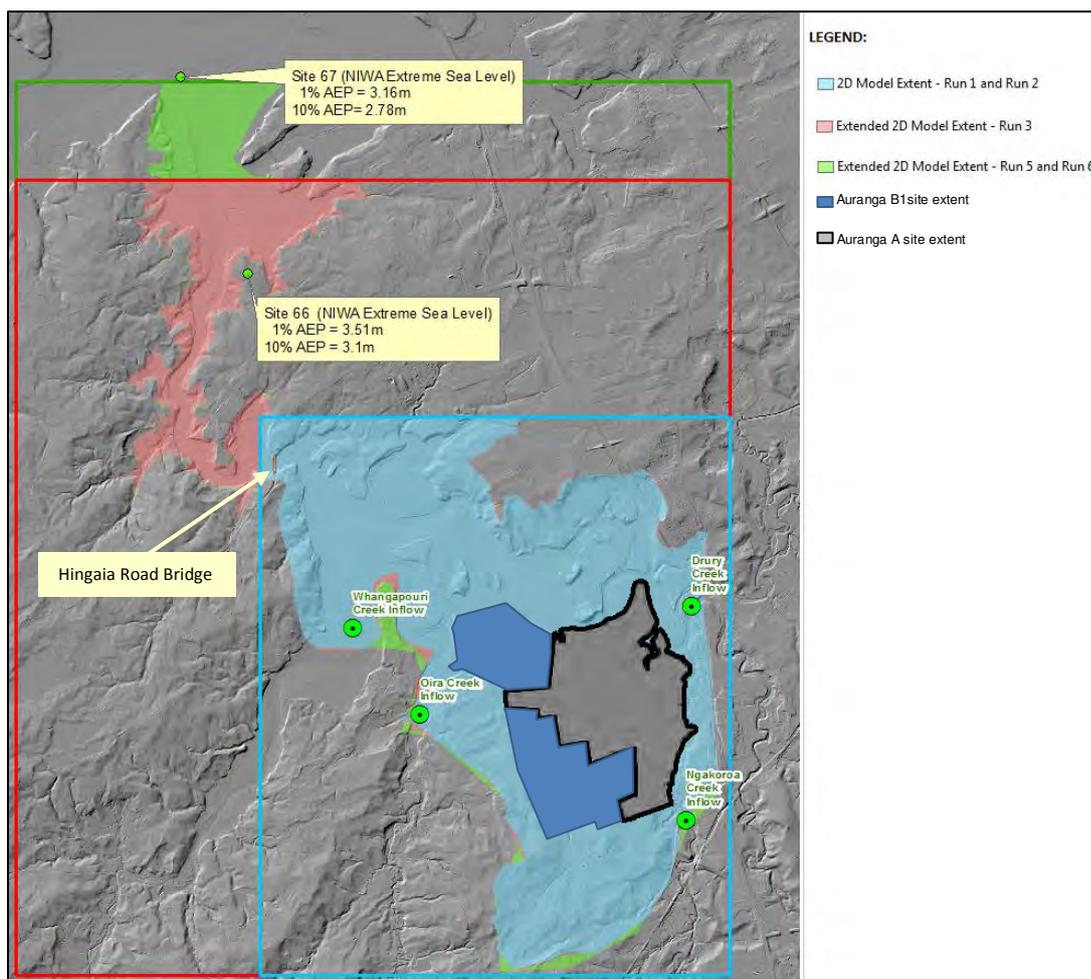


Figure 2-1 Model Extent

Table 2-1 - Final model run scenarios

Scenario 5 Refined model for MHWS plus CC	
Tailwater Condition	Constant level of 3.1 m <i>Approach:</i> Tailwater level = Manukau MHWS + tidal amplification incl. storm surge component + 1 m SLR = 1.94 + 0.16 + 1 = 3.1 m <i>Applied at:</i> Near Manukau Harbour (NIWA site 67)
Model Extent	Refer to Figure 2-1
Mike 21 Model Type	Classic grid – 2 m
Model Roughness	Manning's M – 20 (for both Mike 11 and Mike 21)

Scenario 5 Refined model for MHWS plus CC	
Catchment Inflows - Hingaia / Slippery Creek	Sourced from Hingaia July 2015 model Peak flow rate of 600 m ³ /s
Catchment Inflows - Ngakaroa Stream	Sourced from TP108 calculations in HEC-HMS with a single weighted CN (Derived using approach specified in Auckland Council 2012 RFA specs, pg. 4-5). Refer to Table 2-2 for catchment parameters. Peak flow rate of 307 m ³ /s
Catchment Inflows - Oira Creek	Same method as above. Refer to Table 2-2 for catchment parameters. Peak flow rate of 144 m ³ /s
Catchment Inflows - Whangap-ouri Creek	Same method as above. Refer to Table 2-2 for catchment parameters. Peak flow rate of 447 m ³ /s
Rainfall	<i>Model Approach:</i> 1% AEP CC rain-on-grid with effective rainfall, derived from a constant average 24 hr rainfall depth.
	<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 234 mm for 1% AEP CC (from HIRDS, as per T+T email dated 18-Sep-2015).
	<i>Losses:</i> Calculated using TP108 approach (Eqn. 3.1 in TP108) and approach specified in Auckland Council 2012 RFA specs (pg. 4-5).
Hingaia Road Bridge	Surveyed bridge represented in Mike 11. Refer to Section 2.3 for details.
Other bridge / culvert crossings	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.
Ponds / Dams / Depress-ions	<i>Terrain:</i> Ponds / Dams marked for decommissioning taken out of the terrain. Refer to Figure 2-2.
	<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.

Table 2-2 Catchment Parameters

	Area	Pervious CN	Weighted Curve Number (Assume 70% imp.)	Initial Abstraction	24hr Rainfall depth	Chanelisation factor	Catchment Length	Catchment Slope	Time of concentration
TP108 notation	A		CN	IA	P24	C	L	Sc	Tc
Units	ha			mm	mm		km	m/m	Hrs
NGAKAROA STREAM	3,766.62	39 ¹	80.3	0	234	0.8	16.07	0.01	3.39
OIRA CREEK	1,885.39	50.9 ²	83.9	0	234	0.8	16.08	0.01	4.09
WHANGAPOURI CREEK	5,269.90	51.1 ²	83.9	0	234	0.8	11.53	0.00	3.43
RFH EXTENT – AURANGA	981.43	61 ¹	86.9	0	234	N/A	N/A	N/A	N/A

¹Dominant

²Weighted average between the two most dominant

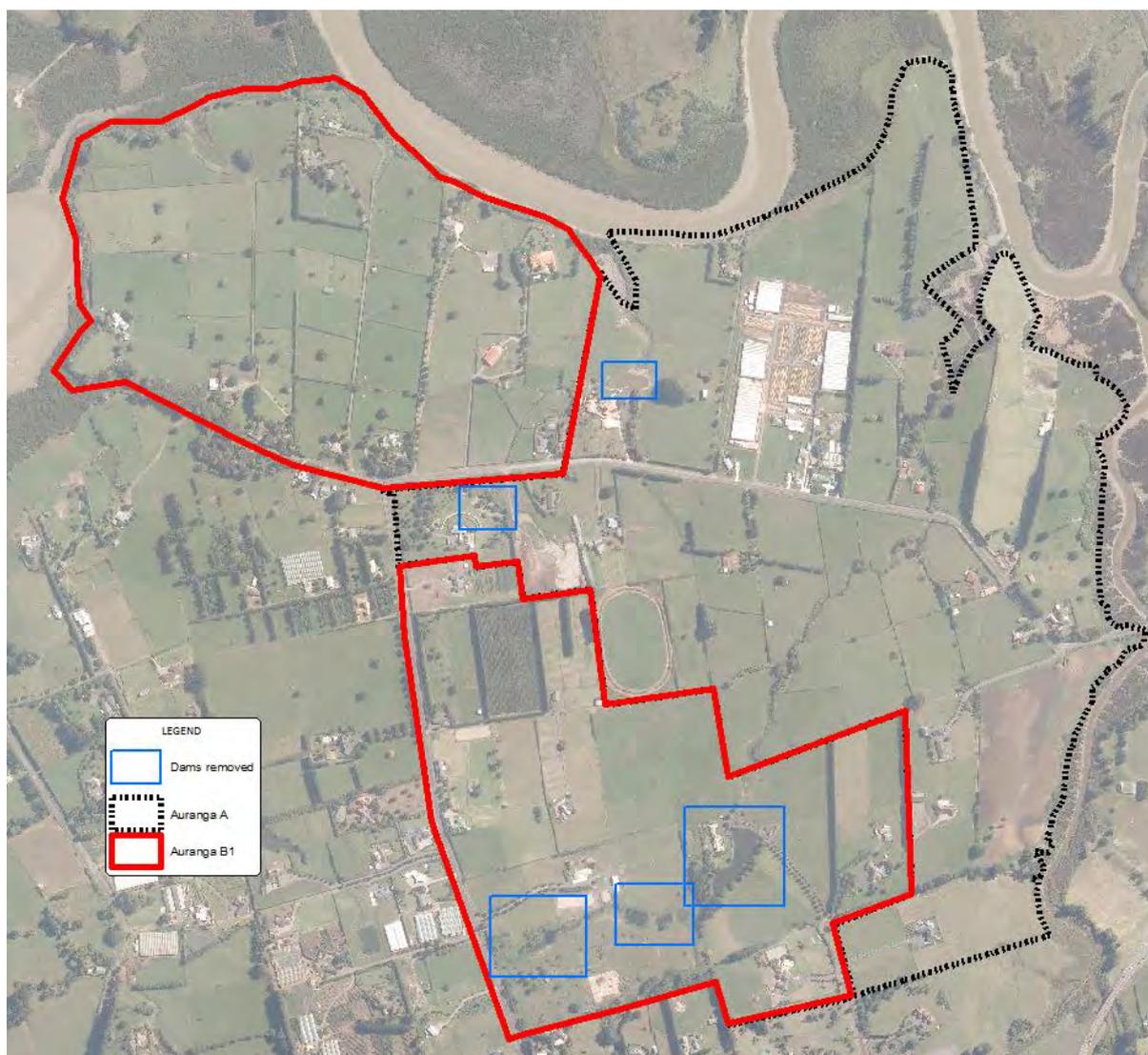


Figure 2-2 Location of dams marked for decommissioning

2.3 Hingaia Road Bridge

The Hingaia Road Bridge was surveyed and included in the model as a 1D structure as the hydraulic losses were considered to be sufficiently important to the flood levels at Auranga. The bridge railings are approximately 1.2 m high and are thought to have a high chance of blockage during large storm events refer to Figure 2-3. Therefore, the overtopping level at the bridge is assumed to be at the top of the bridge railing for Scenarios 5 and 6. Figure 2-4 illustrates the Hingaia Road Bridge levels as represented in the model.



Figure 2-3 Hingaia Road Bridge

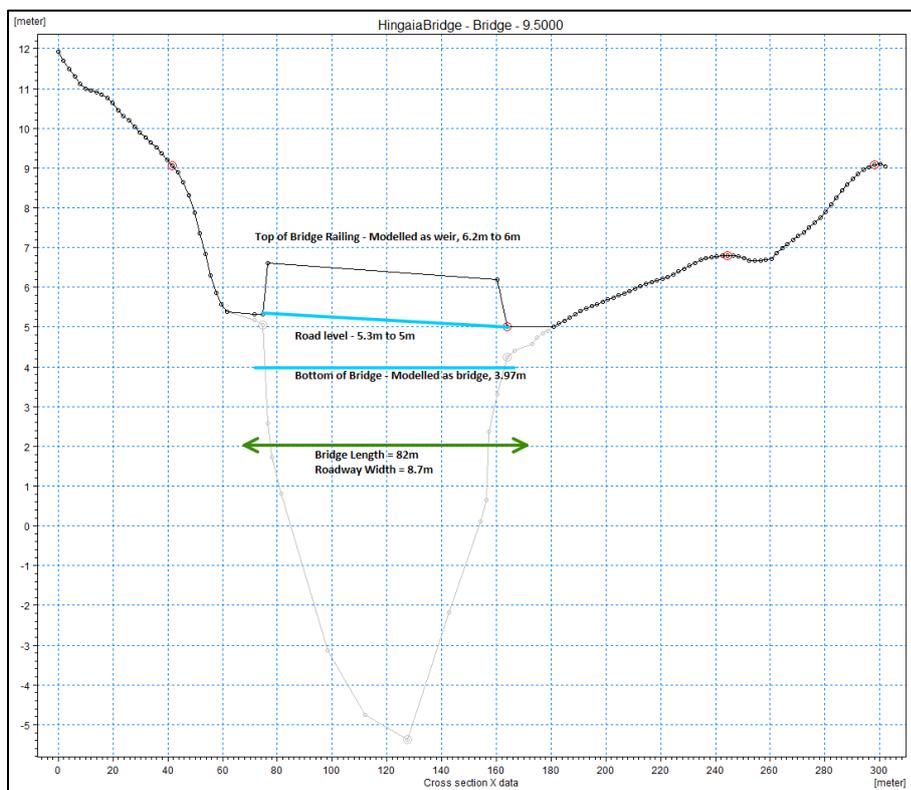


Figure 2-4 Hingaia Road Bridge Setup

3 Results

The figures and long-sections in Appendices B – C illustrate the flood depth levels and extent around Auranga for various scenarios and maximum flood levels. The results are summarised in Table 3-1 below.

Table 3-1: Water Level results for Scenario 5

Location ¹	Water levels
	Scenario 5 (mRL)
A	4.8
B	5.9
C	5.2
D	5.2
E	5.6
F	9.2
G	5.2
H	5.3
I	5.5
J	5.3
L	17.9
M	17.5
N	13.5
O	4.7
P	4.7
Q	4.7
R	14

¹Refer to Appendix C for location map

The figure in Appendix C shows a long section taken through Ngakaroa Stream. The long section plot confirms the major factors governing water level at the site are the tide levels, the Hingaia Road Bridge and the 1% AEP rainfall runoff from the contributing catchments. For the bridge, this is demonstrated through the water level difference upstream and downstream sides of the bridge.

4 Conclusions and recommendations

A flood hazard assessment has been undertaken to confirm flood levels at the proposed site. The assessment was carried out using a 2D model based on 2013 LiDAR with a 1D component to represent Hingaia Road Bridge. The following summarises the results of the hydraulic modelling undertaken:

- The water level range at the site for the 100 year ARI rainfall with MHWS and climate change (Scenario 5) is 4.7 – 17.5 mRL;
- Flood depths outside the Stream A (east stream) are relatively shallow;

- The results show that the water levels at the site are influenced by the tide level at the Manukau Harbour and Hingaia Road Bridge, as well as the 1% AEP floods from the contributing catchments.

We recommend that proposed floor levels at the site are raised above flood levels for Scenario 5 for the 1% AEP flood and MHWS with 1 m sea level rise.

We recommend a freeboard of 500 mm to be applied above the flood levels in Scenario 5 for building floor levels, which will accommodate hydrological and hydraulic uncertainties. This will also account for the more extreme event represented by Scenario 6 for the 1% AEP flood in conjunction with the 10% AEP extreme sea level with 1 m sea level rise.

5 Applicability

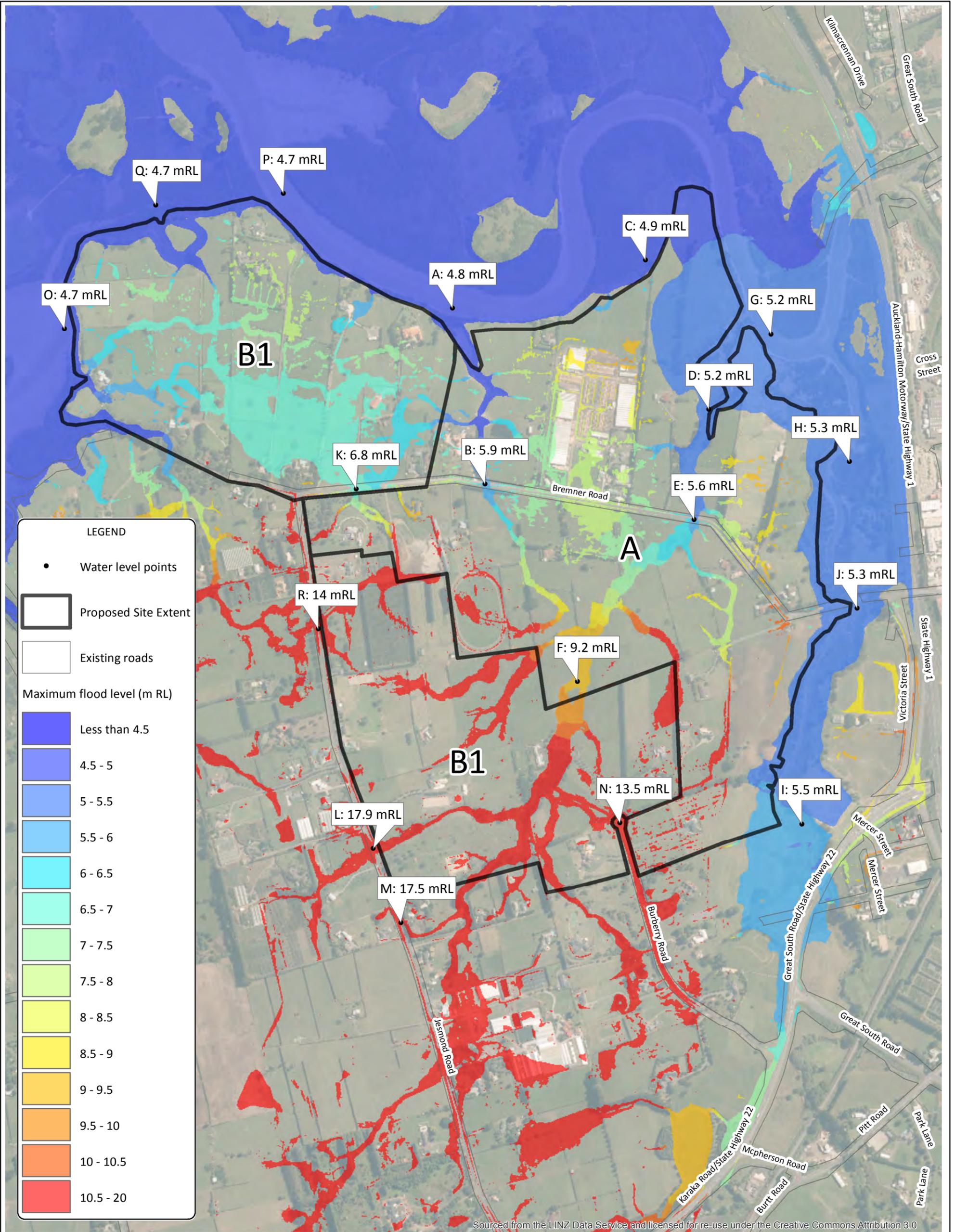
This memo has been prepared for the benefit of Karaka and Drury Limited with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Appendix A: Model Scenarios

	Scenario 1 20Aug – 2.4 m Tailwater	Scenario 2 17Aug – 6 m Tailwater (superseded by Scen 3)	Scenario 3 25Aug – 4.5 m Tailwater (conservative flood extent)	Scenario 4 Coastal inundation (Note: this was done as part of coastal assessment)	Scenario 5 Refined model for MHWs plus CC	Scenario 6 Refined model for 10% AEP extreme sea level plus CC
Tailwater Condition	<i>Level:</i> Constant level of 2.44 m	Constant level of 6 m	Constant level of 4.51 m	Constant level of 4.5 m	Constant level of 3.1 m	Constant level of 3.8 m
	<i>Approach:</i> Manukau MHWs + 0.5 m SLR	<i>Approach:</i> Sourced from Hingaia July 2015 model	<i>Approach:</i> 1% AEP coastal inundation + 1 m SLR	<i>Approach:</i> 1% AEP extreme sea level inundation of 3.5 m + 1 m SLR.	<i>Approach:</i> Tailwater level = Manukau MHWs + tidal amplification incl. storm surge component + 1 m SLR = 1.94 + 0.16 + 1 = 3.1 m	<i>Approach:</i> 10% AEP extreme sea level inundation of 2.8 m + 1 m SLR.
	<i>Applied at:</i> Just downstream of the Hingaia Road Bridge (NIWA site 66)	<i>Applied at:</i> Just downstream of the Hingaia Road Bridge (NIWA site 66)	<i>Applied at:</i> Near Manukau Harbour (NIWA site 67)	(NIWA site 67)	<i>Applied at:</i> Near Manukau Harbour (NIWA site 67)	<i>Applied at:</i> Near Manukau Harbour (NIWA site 67)
Model Extent	Refer to Figure 2-1	Refer to Figure 2-1	Refer to Figure 2-1	Bathtub model	Refer to Figure 2-1	Refer to Figure 2-1
Mike 21 Model Type	Classic grid – 2 m	Classic grid – 2 m	Classic grid – 1 m	NA	Classic grid – 2 m	Classic grid – 2 m
Catchment Inflows - Hingaia / Slippery Creek	Sourced from Hingaia July 2015 model	Sourced from Hingaia July 2015 model	Sourced from Hingaia July 2015 model	NA	Sourced from Hingaia July 2015 model	Sourced from Hingaia July 2015 model
	Peak flow rate of 600 m ³ /s	Peak flow rate of 600 m ³ /s	Peak flow rate of 600 m ³ /s		Peak flow rate of 600 m ³ /s	Peak flow rate of 600 m ³ /s
Catchment Inflows - Ngakaroa Creek	Sourced from Hingaia July 2015 model	Sourced from Hingaia July 2015 model	Sourced from TP108 calcs in HEC-HMS with a Curve Number of 90	NA	Sourced from TP108 calcs in HEC-HMS with a single weighted CN (Derived using approach specified in Auckland Council 2012 RFA specs, pg. 4-5). Refer to Table 2-2 for catchment parameters.	Sourced from TP108 calcs in HEC-HMS with a single weighted CN (Derived using approach specified in Auckland Council 2012 RFA specs, pg. 4-5). Refer to Table 2-2 for catchment parameters.
	Peak flow rate of 305 m ³ /s	Peak flow rate of 305 m ³ /s	Peak flow rate of 342 m ³ /s		Peak flow rate of 307 m ³ /s	Peak flow rate of 307 m ³ /s
Catchment Inflows - Oira Creek	Not represented	Not represented	Sourced from TP108 calcs in HEC-HMS with a Curve Number of 90	NA	Same method as above. Refer to Table 2-2 for catchment parameters.	Same method as above. Refer to Table 2-2 for catchment parameters.
			Peak flow rate of 150 m ³ /s		Peak flow rate of 144 m ³ /s	Peak flow rate of 144 m ³ /s
Catchment Inflows - Whangapouri Creek	Not represented	Not represented	Sourced from TP108 calcs in HEC-HMS with a Curve Number of 90	NA	Same method as above. Refer to Table 2-2 for catchment parameters.	Same method as above. Refer to Table 2-2 for catchment parameters.
			Peak flow rate of 465 m ³ /s		Peak flow rate of 447 m ³ /s	Peak flow rate of 447 m ³ /s

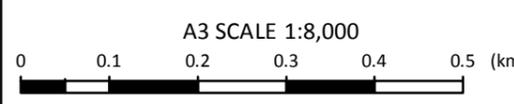
	Scenario 1 20Aug – 2.4 m Tailwater	Scenario 2 17Aug – 6 m Tailwater (superseded by Scen 3)	Scenario 3 25Aug – 4.5 m Tailwater (conservative flood extent)	Scenario 4 Coastal inundation (Note: this was done as part of coastal assessment)	Scenario 5 Refined model for MHWS plus CC	Scenario 6 Refined model for 10% AEP extreme sea level plus CC
Rainfall	<i>Model Approach:</i> TP108 – 1% AEP CC rain-on-grid approach, assuming 100% runoff.	<i>Model Approach:</i> TP108 – 1% AEP CC rain-on-grid approach, assuming 100% runoff.	<i>Model Approach:</i> TP108 – 1% AEP CC rain-on-grid approach, assuming 100% runoff.	NA	<i>Model Approach:</i> 1% AEP CC rain-on-grid with effective rainfall, derived from a constant average 24 hr rainfall depth.	<i>Model Approach:</i> 1% AEP CC rain-on-grid with effective rainfall, derived from a constant average 24 hr rainfall depth.
	<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 218 mm for 1% AEP CC.	<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 218 mm for 1% AEP CC.	<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 218 mm for 1% AEP CC.		<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 234 mm for 1% AEP CC (from HIRDS, as per T+T email dated 18-Sep-2015).	<i>Rainfall Depth:</i> Using a 24 hr runoff depth of 234 mm for 1% AEP CC (from HIRDS, as per T+T email dated 18-Sep-2015).
	<i>Losses:</i> Not represented	<i>Losses:</i> Not represented	<i>Losses:</i> Not represented		<i>Losses:</i> Calculated using TP108 approach (Eqn. 3.1 in TP108) and approach specified in Auckland Council 2012 RFA specs (pg. 4-5).	<i>Losses:</i> Calculated using TP108 approach (Eqn. 3.1 in TP108) and approach specified in Auckland Council 2012 RFA specs (pg. 4-5).
Hingaia Road Bridge	Terrain left as is. This model is assuming no flow restriction by the Hingaia Road Bridge.	Terrain left as is. This model is assuming no flow restriction by the Hingaia Road Bridge.	Terrain left as is. This model is assuming no flow restriction by the Hingaia Road Bridge.	NA	Surveyed bridge represented in Mike 11. Refer to Section 2.3 for details.	Surveyed bridge represented in Mike 11. Refer to Section 2.3 for details.
Other bridge / culvert crossings	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.	NA	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.	Bremner Road and Great South Road crossings burnt into the terrain to allow unrestricted flow.
Ponds / Dams / Depressions	<i>Terrain:</i> Terrain left as is.	<i>Terrain:</i> Terrain left as is.	<i>Terrain:</i> Terrain left as is.	<i>Terrain:</i> Terrain left as is.	<i>Terrain:</i> Ponds / Dams marked for decommissioning taken out of the terrain. Refer to Figure 2-2.	<i>Terrain:</i> Ponds / Dams marked for decommissioning taken out of the terrain. Refer to Figure 2-2.
	<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.	<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.	<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.		<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.	<i>Initial Water Level:</i> Initial water level in the model set to "filled" for all depressions.

Appendix B: Flood depth and flood level maps



Sourced from the LINZ Data Service and licensed for re-use under the Creative Commons Attribution 3.0

Notes: Road alignments sourced from Land Information New Zealand data as at 21/03/2017 (Crown Copyright Reserved).

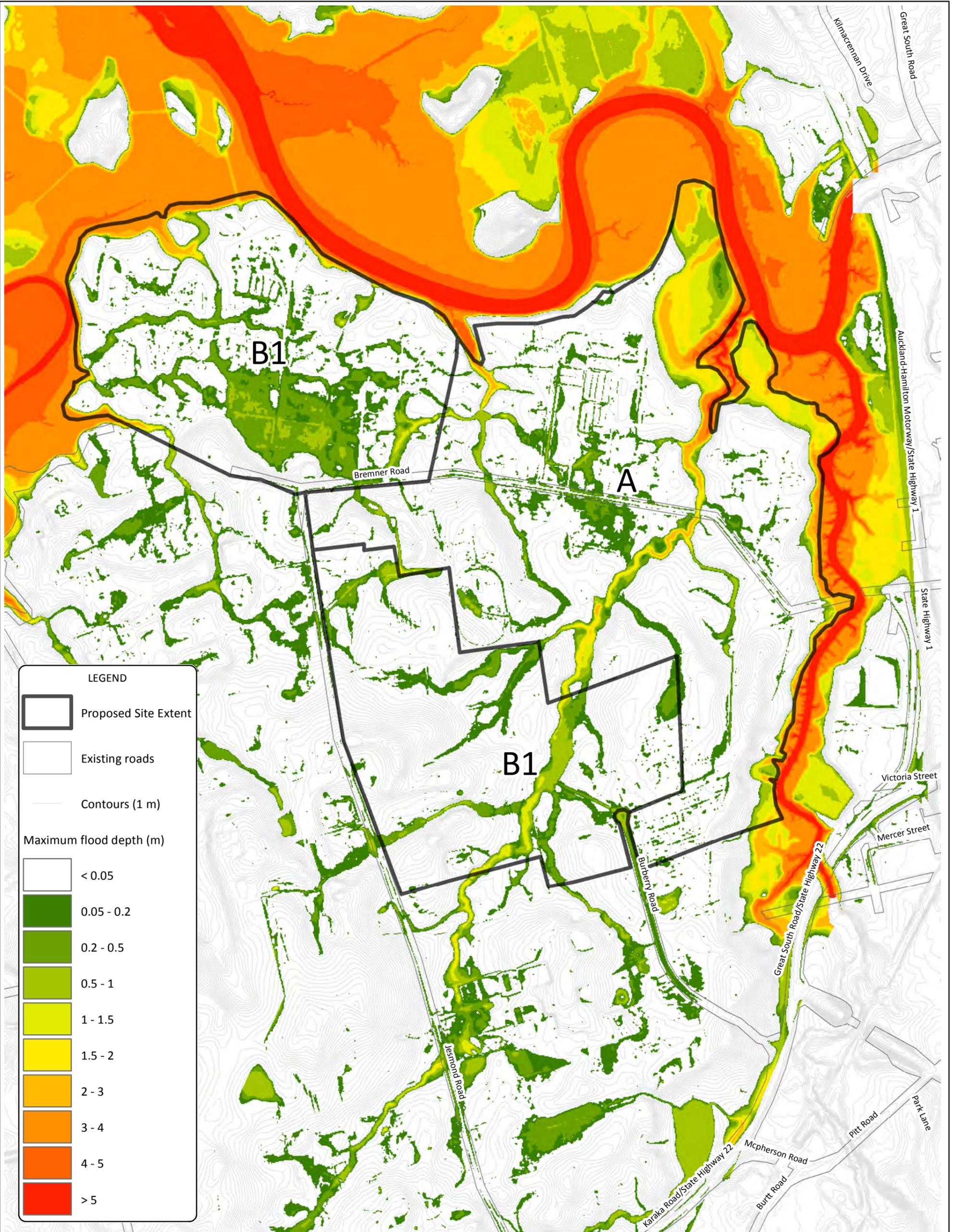


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DRAWN	SJN	Mar.17
CHECKED	SGB	May.17
APPROVED	TSRF	May.17
ARCFILE 1001534_B02.mxd		
SCALE (AT A3 SIZE) 1:8,000		
PROJECT No. 1001534		

**AURANGA B1
 FLOOD DEPTH MAP**
 Model results - MPD 1% AEP with climate change and 3.1 mRL tailwater

FIGURE No. **Figure B2** Rev. **0**



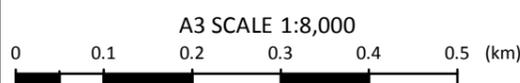
LEGEND

- Proposed Site Extent
- Existing roads
- Contours (1 m)

Maximum flood depth (m)

- < 0.05
- 0.05 - 0.2
- 0.2 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- > 5

Notes: Road alignments sourced from Land Information New Zealand data as at 21/03/2017 (Crown Copyright Reserved).



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1001534_B01.mxd		
SCALE (AT A3 SIZE)		
1:8,000		
PROJECT No.		
1001534		

AURANGA B1
FLOOD DEPTH MAP
 Model results - MPD 1% AEP with climate change and 3.1 mRL tailwater

FIGURE No. **Figure B1** Rev. 0

Appendix C: Flood Results Long-section

Drury and Ngakaroa Creek Longsection

