STORMWATER MANAGEMENT PLAN FOR PPC REQUEST

Campana Road Plan Change, Papatoetoe Auckland

CIVIL ENGINEERING ▾ SURVEYING ▾ LAND DEVELOPMENT

PROJECT INFORMATION

CLIENT	Campana Landowners Consortium
PROJECT	285001

DOCUMENT CONTROL

DATE OF ISSUE	08/11/2024
REVISION	B
AUTHOR	Ken Ha Senior Engineer
REVIEWED BY	Ryan Wyllie Associate
APPROVED BY	Ryan Wyllie Associate

5 Owen Road, Epsom
PO Box 11605, Ellerslie, 1542.
New Zealand
Phone 09 571 0050
www.maven.co.nz

TABLE OF CONTENTS

1 INTRODUCTION

The purpose of this Stormwater Management Plan ('SMP') is to outline the proposed management of stormwater for the proposed Campana Road Plan Change Area ('PCA'), located west of Papatoetoe and north of Wiri. This SMP is prepared to support the Campana Road PCA application with Auckland Council to rezone from Future Urban to Light Industrial Zone. The proposed zoning for this PCA can be found in Figure 1 below.

Figure 1: Proposed Business – Light Industrial Zoning Plan for Campana Road Plan Change

This SMP prepared for Campana Road PCA has adopted the framework from the Auckland Council - Network Discharge Consent's Schedule 4 to ensure that the receiving environment is protected and enhanced as it undergoes change from the current rural environment to an urban form. The proposed stormwater management approach is considered to generally align with the outcomes of the Network Discharge Consent (NDC). Final stormwater management solutions will be worked through in detail as part of any future resource consent(s), based on details design layouts, and site-specific constraints. Future resource consent applications will, however, ensure compliance with the outcomes of this overarching SMP.

2 EXISTING SITE APPRAISAL

This section of the report summarises the existing site characteristics and conditions within the plan change area (PCA), as they relate to stormwater management.

2.1 SUMMARY OF DATA SOURCES AND DATES

This section provides a summary of key datasets used in the writing of this SMP, including those that have been used to generate supporting figures provided in Appendices.

Table 1: Regulatory and Design Requirements

PCA Characteristics	Source and date of data used
Topography	• Auckland Council GeoMaps Data, 2023
Geotechnical / soil conditions	• Geotechnical Appraisal Report - Campana Road, Wiri by Babbage Consultants Ltd • Auckland Council GeoMaps, Areas Susceptible to Coastal Instability and Erosion, 2023 • Predicting Auckland's Exposure to Coastal Instability and Erosion Technical Report TR2020/021
Existing stormwater network	• Auckland Council GeoMaps, Stormwater Assets, 2023
Existing hydrological features	• Auckland Council GeoMaps, Catchments and Hydrology Layer, 2023
Stream, river, coastal erosion	• Ecological Impact Assessment – Campana Road, Private Plan Change by Viridis Environmental Consultants • Auckland Council GeoMaps, Catchments and Hydrology Layer, 2023
Flooding and flowpaths	• Auckland Council GeoMaps, Overland Flow Paths Layer, 2023
Coastal Inundation	• Auckland Council GeoMaps, Coastal Inundation Layer, 2023 • Auckland's Exposure to Coastal Inundation by Storm-tides and Waves, Dec 2020, TR2020/024
Ecological / environmental areas	• Auckland Council Unitary Plan Viewer, Significant Vegetation Layer, 2023
Cultural and heritage sites	• TBC
Contaminated land	• Preliminary Site Investigation – Campana Road, Wiri by Babbage Consultants Ltds • Auckland Council GeoMaps, Contaminated Land Site, 2023

2.2 LOCATION AND GENERAL INFORMATION

The PCA is approximately 2km east (via State Highway 20B) of the Auckland Airport and about 5km from Manukau Centre. The development site is currently accessible directly off SH20B and will be accessible from a proposed road, referred to as the Campana Road that will be constructed as part of the development of the Plan Change area. The location in relation to the greater Auckland Region is illustrated in Figure 2, below.

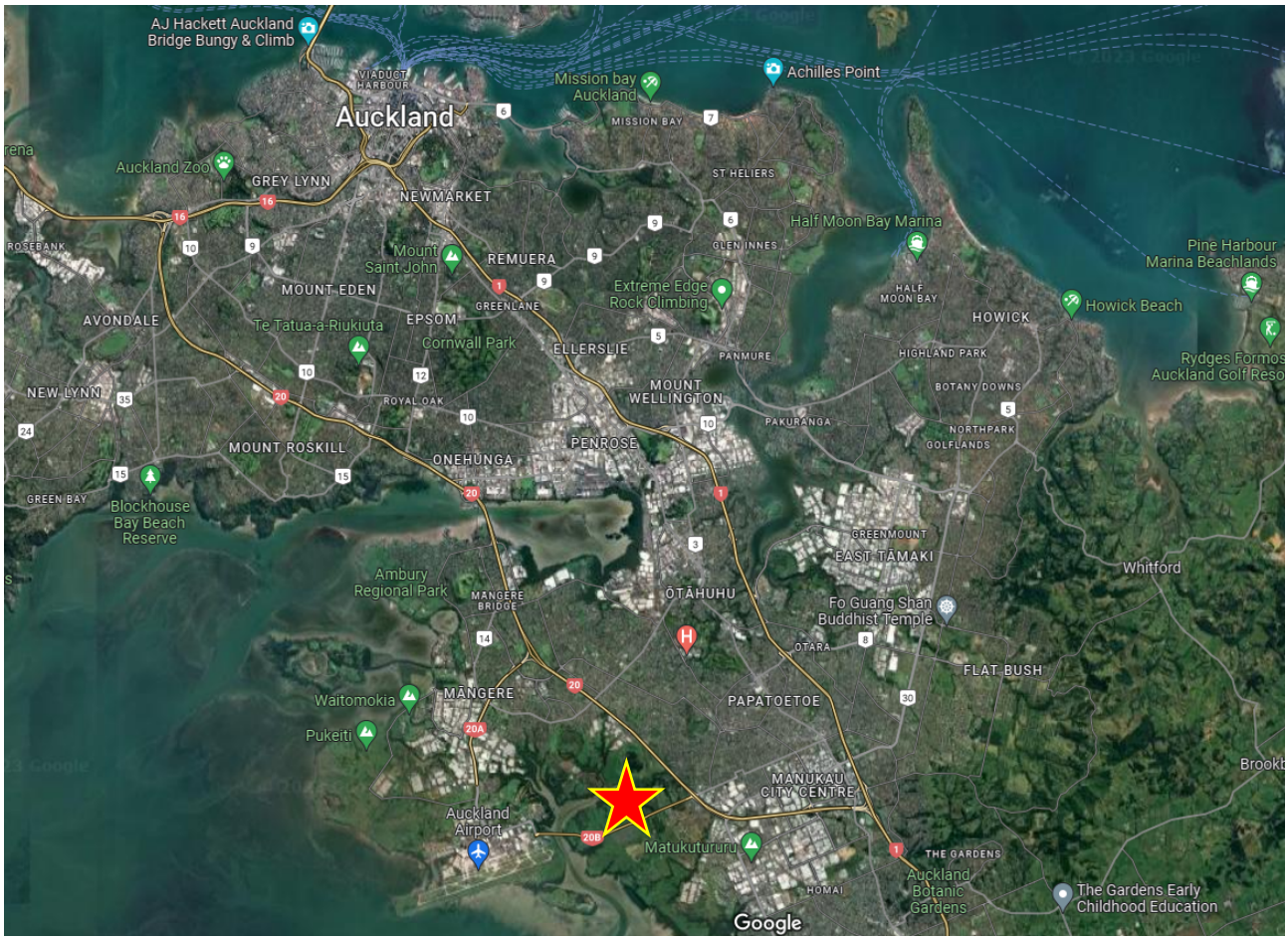


Figure 2: Campana Plan Change Location (Star)

The PCA is located within a predominantly light industrial zone area within the Puhinui Precinct in the Auckland Unitary Plan (AUP). The PCA is comprised of five Future Urban Zone (FUZ) properties. The PCA is approximately 30.89ha in total size and is greenfield in nature. The PCA is made up of two portions of land separated by the Manukau Harbour estuary. The southern extent of the PCA is bounded by SH20B and the remaining boundary is bounded by the Manukau Harbour estuary.

Table 2 provides key property details of the PCA and Figure 3 shows the location and extent of the PCA with addresses shown.

Figure 3: Map Showing Campana Road Plan Change Area Outlined in Green

Table 2: Property Information

Existing site element	Details
Site address	• 5,11 & 10 Campana Road • 485& 467 Puhinui Road
Legal description	• Allot 190 Parish of Manurewa • Lot 1-3 DP 402013 • Lot 2-3 DP 71211
Current Land Use	• The PCA comprises open greenspace for farming, horticulture, commercial and residential
Current building coverage	• Approximately 3.6Ha of the PCA comprise buildings or other impervious surfaces
Historical Land Use	• Rural - residential and farmland

2.3 TOPOGRAPHY AND CATCHMENTS

2.3.1 Topography

The PCA is moderately flat with a steep drop off near the existing estuary that runs in a north south direction. Most of the site is level and situated at RL 10 m . In close proximity to the estuary, the land steeply drops to RL 3 m. The existing topography of the site has been highly modified as part of the historical farming activity carried out on site.

2.3.2 Catchments

The stormwater catchments of the PCA are confined within the boundaries of the PCA area. SH20B acts as a dam that directs most of the stormwater runoff from the upstream catchment away from the PCA and discharges to the estuary adjacent to the PCA directly.

The whole PCA catchment is predominantly used for agricultural, rural industrial purposes, or undeveloped farmlands. The extent of the catchment is illustrated in Figure 4 below.

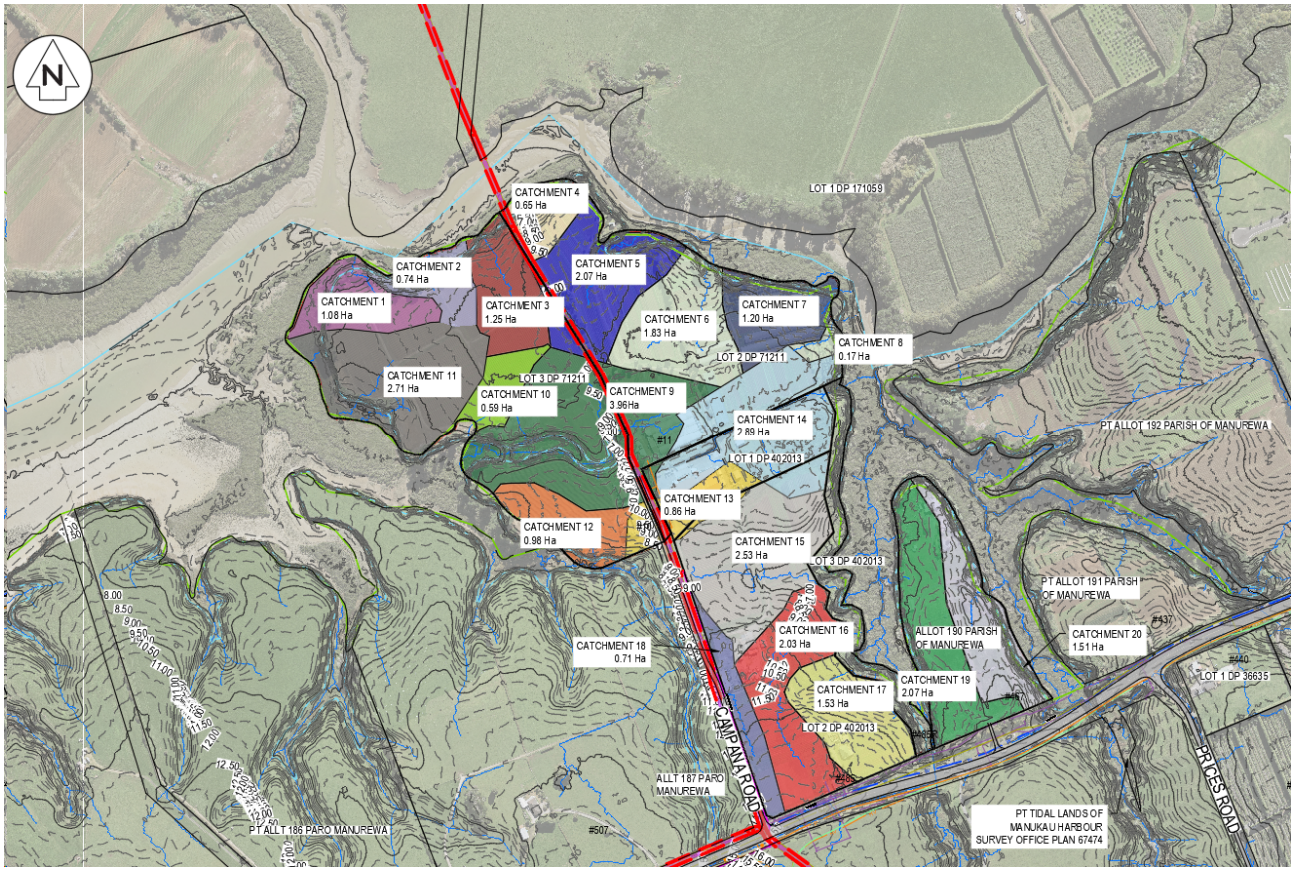


Figure 4: Existing Stormwater Catchment Plan

There are twenty sub-catchments in the PCA. A summary of these catchments can be found in Table 3 below and discussed further in Section 2.6 of this Report.

Table 3: Catchment Coverage Summary

Catchment	Pasture/crop area (m^2)	Residential, farm building and driveway (m^2)	Total area (m^2)
1	10829	0	10829
2	7367	0	7367
3	12491	0	12491
4	6515	0	6515
5	20652	0	20652
6	16699	1578	18277
7	9565.6	2445.4	12011
8	1674	0	1674
9	36498.8	3141.2	39640
10	5918	0	5918
11	27084	0	27084
12	9707.8	42.2	9750
13	3537	5081	8618
14	24926.9	3941.1	28868
15	24553.6	753.4	25307
16	18423.4	1874.6	20298
17	14485.1	802.9	15288
18	5550.9	1514.1	7065
19	10936.8	9749.2	20686
20	10043.7	5048.3	15092
	277458.6	35971.4	313430

Note: The impervious area is based on desktop study.

2.4 GEOTECHNICAL

A Geotechnical Appraisal Report (GAR) has been prepared for the PCA by Babbage Consultants and is included in the plan change application.

In accordance with the Geological Maps, most of the site is underlain by pumiceous deposits of the Puketoka Formation, with the main make up from pumiceous mud, sand and gravel with muddy peat and lignite, and with a small portion of the north-eastern section of the PCA underlain with the lithic tuff of the Auckland Volcanic Field.

The GAR has anticipated the ground conditions for this site to comprise of a surficial layer of Auckland Volcanic Field tuff deposits, typically consisting of 1-3 m of stiff to hard silt and clay mixtures and medium dense gravelly sand, underlaid by Pleistocene aged alluvial deposits of the Tauranga Group. The Alluvium is anticipated to consist of stiff to hard silt and clay mixtures, with interbedded layer of loose and medium dense sand and silty sand, and occasional thin peat bands within the upper 15-20 m. The Tauranga Group Alluvium is underlain by 40m+ Kaawa Formation sandstone, typically recovered as dense shelly sand within slight cementation. Localised deposits of fill material are also likely to present across the site.

The GAR concluded that the site is generally suitable for a light industrial development with a low geotechnical constraint potentially present on site. The main concern raised in the GAR relates to the existing steep embankment around the site which is subject to coastal erosion.

2.5 EXISTING DRAINAGE FEATURES AND STORMWATER INFRASTRUCTURE

2.5.1 PUBLIC STORMWATER INFRASTRUCTURE

Figure 5: Auckland Council GeoMaps Extract

Auckland Council's GeoMaps (Figure 5) identifies that there are no existing public stormwater networks present in the vicinity of the plan change area, other than the stormwater networks that currently service SH20B. All sites within the plan change area currently discharge stormwater run-off via various private on-site stormwater systems into the estuary directly. These private stormwater systems are expected to be removed and replaced once the site is redeveloped.

2.5.2 EXISTING DRAINAGE FEATURES

The site is a peninsula in layout with the runoff catchment contained within the PCA. There are only two permanent streams present within the PCA area with no intermediate streams. Also present in the site are poorly formed ephemeral/overland flow paths or farm drains. Many of the existing watercourses have been modified in the past through historical farming practices to manage stormwater runoff drainage within the sites.

Ultimately all sub-catchments within this SMP drain to the Pukaki creek of the Manukau Harbour. Refer to the existing runoff and features of the PCA in Figure 6, below:

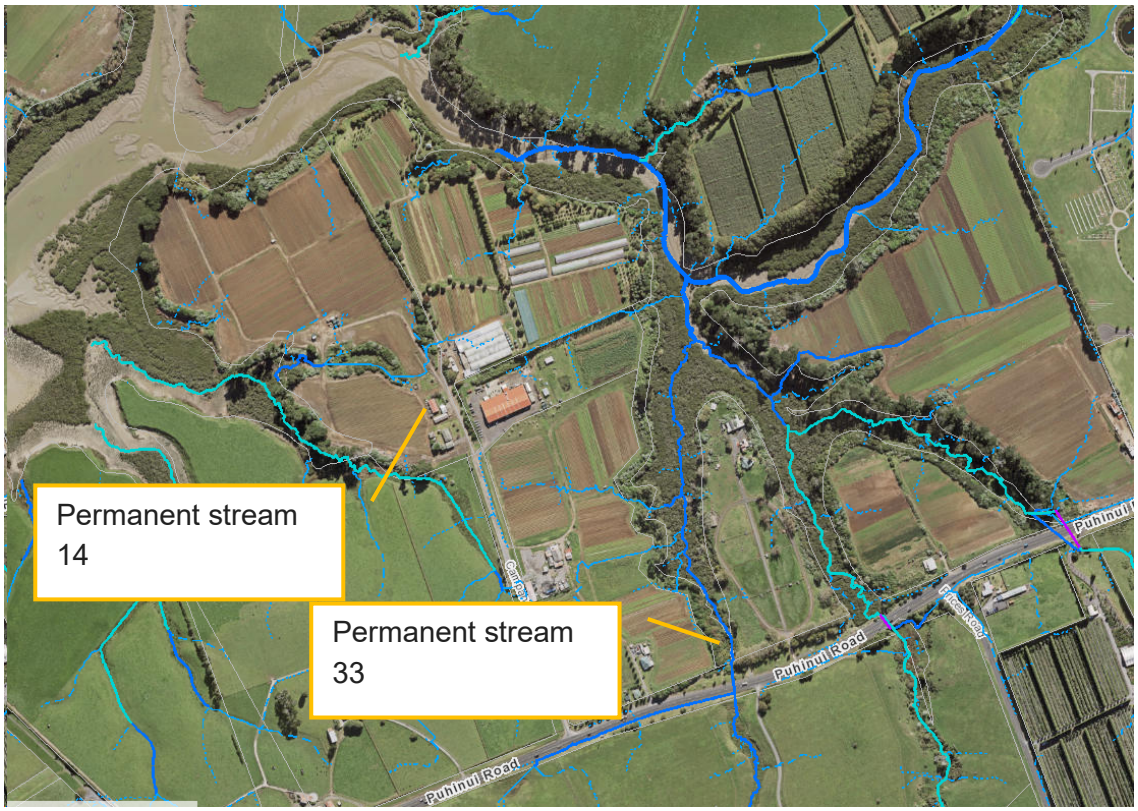


Figure 6: Existing Catchments and Hydrological Features

2.6 RECEIVING ENVIRONMENT

2.6.1 PUKAKI CREEK CATCHMENT

Most of the sub-catchments within the PCA discharge to the Pukaki Creek Catchment which is a tributary extending east from the main Manukau Harbour channel. This has been identified as a Significant Ecological Areas (Marine 2) overlay of the AUP. Refer to Figure 7, below for reference:

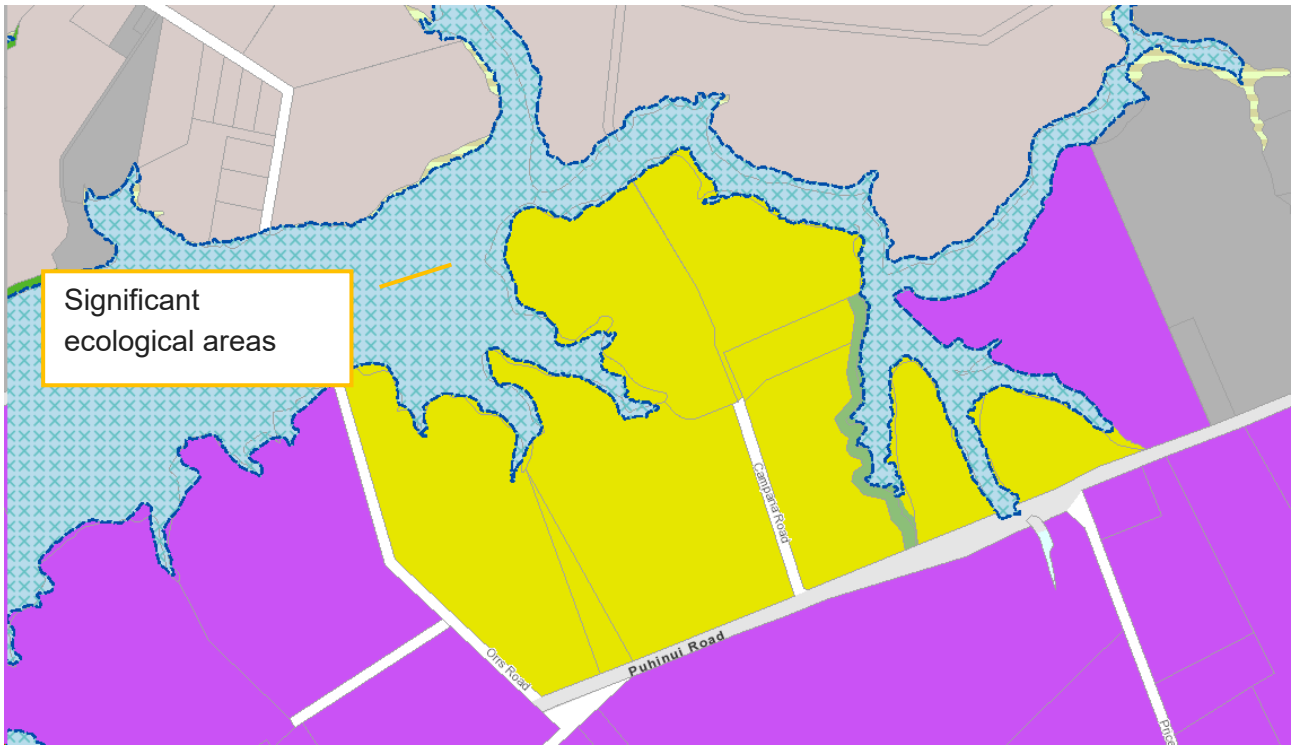


Figure 7: Significant Ecological Areas Overlay

The overall health of the Pukaki has been scored as moderate from the Auckland Council Manukau Harbour Intertidal Ecology Monitoring 1987 to February 2018 Technical Report 2019/025. The Pukaki Creek catchment comprised of a mixture of developed urban area, rural farmland, light industrial zone and future urban zone.

The urbanisation of the Pukaki Creek Catchment can potentially improve the overall ecological health, through careful planning and the use of stormwater management devices. There is potential to enhance the receiving environment with riparian planting, which will provide additional shading to reduce water temperatures in localising areas to aid in the growth of aquatic habitat for native flora and fauna. The implementation of water-sensitive design practices, such as stormwater runoff quality treatment and controlled runoff will also improve water quality within the catchment.. The PCA overall will benefit the Pukaki Creek Catchment with increased streamside habitat and improved water quality.

2.6.2 MANUKAU HARBOUR

The ultimate receiving environment is the Manukau Harbour. The overall health of the Manukau Harbour is poor overall although some minor improvements have been observed over the years (marine Report Card- Manukau Harbour 2018). The key objective of this SMP is to protect the downstream receiving environment by controlling at source contaminants, improving the stormwater run-off quality and enhancing the riparian areas of PCA.

2.7 FLOODING AND FLOW PATHS

Within the PCA area, there are numerous minor overland flow paths that convey stormwater run-off generated from the site into the Pukaki Creek estuary. A snapshot of these overland flow paths and 100-year flood plain can be found in Figure 8, below:

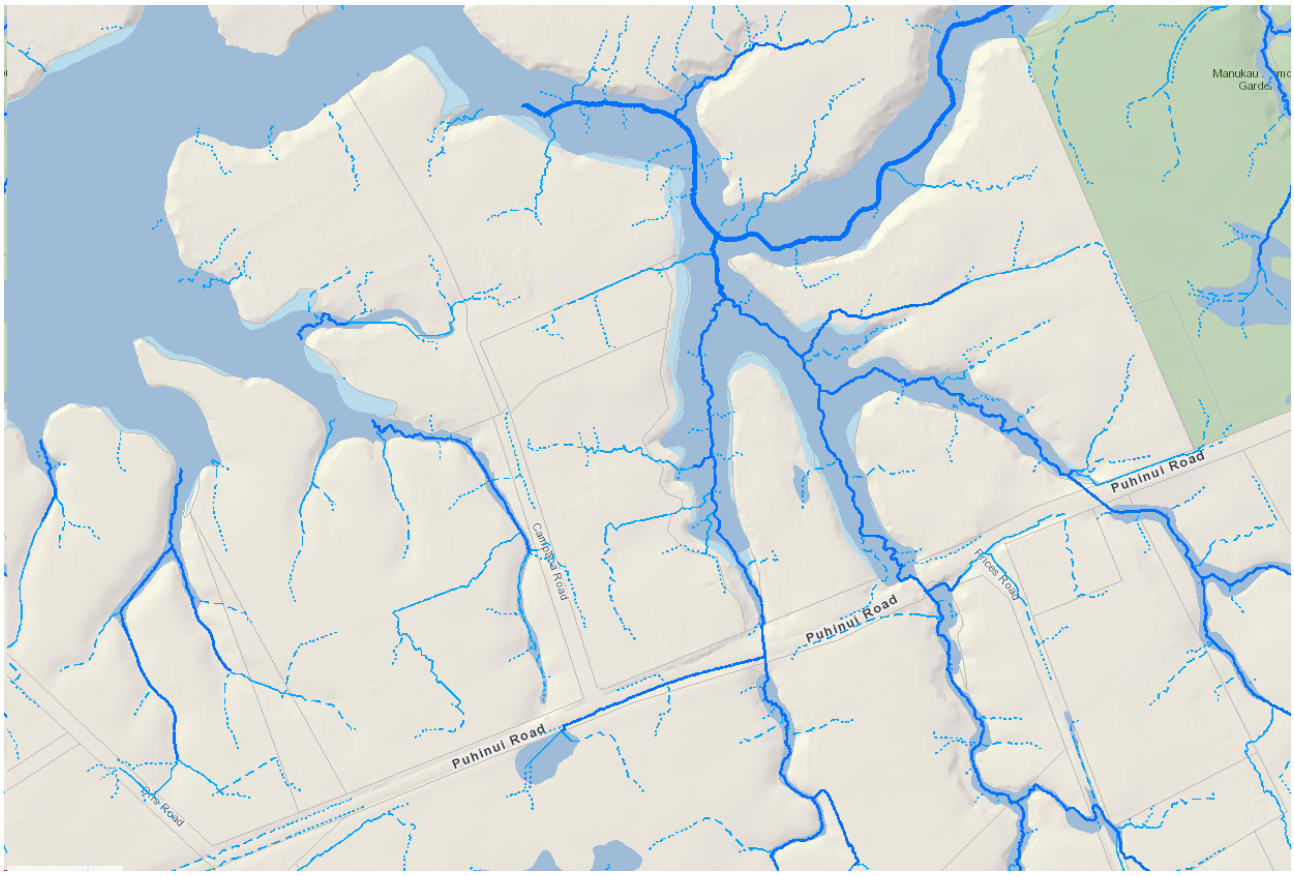


Figure 8: Existing Overland Flow Paths and Flood Plains

As shown in the figure above, the flooding risk within the PCA is low as the site is divided into multiple smaller sub-catchments that drain directly to the estuary with minimal localised ponding.

Flood hazard risk to the site from Coastal Inundation by storm-tides and waves, where the 1% Annual Exceedance Probability (AEP) storm event coincides with the high tide, is discussed below.

2.8 COASTAL INUNDATION

The PCA is subject to coastal inundation due to its proximity to the Manukau Harbour estuary. A high-level assessment of coastal inundation impact to the PCA has been carried out as per TR2020/024.

According to TR2020/024, the closest node to the site from the calculated extreme sea-level value is node 47, refer to Figure 9 below for more information.

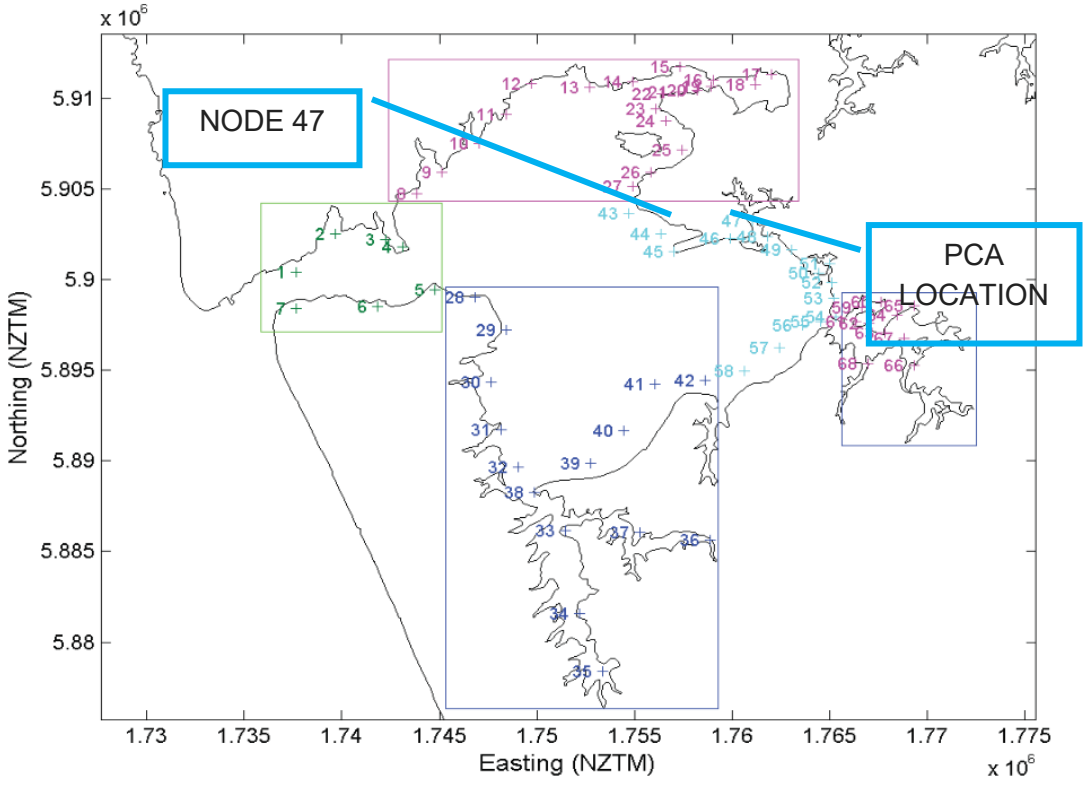


Figure 3-15: Locations of extreme sea-level calculations in the Manukau Harbour.

(Colour-coding corresponds to Table 3-6.)

Figure 9: Locations of Extreme Sea-level Calculations in Manukau Harbour (TR2020/024)

Site	Easting (NZTM)	Northing (NZTM)	AEP: 0.39 / ARI: 2 yr	0.18 / 5 yr	0.1 / 10 yr	0.05 / 20 yr	0.02 / 50 yr	0.01 / 100 yr	0.005 / 200 yr
27	1754934	5905159	2.42	2.48	2.53	2.61	2.75	2.86	2.97
28	1746847	5899044	2.32	2.36	2.39	2.43	2.51	2.61	2.71
29	1748450	5897247	2.37	2.41	2.45	2.49	2.58	2.68	2.78
30	1747655	5894346	2.38	2.42	2.46	2.50	2.60	2.71	2.82
31	1748160	5891747	2.44	2.48	2.53	2.58	2.71	2.83	2.95
32	1749064	5889649	2.49	2.55	2.61	2.68	2.83	2.95	3.08
33	1751470	5886154	2.53	2.58	2.63	2.72	2.89	3.03	3.17
34	1752179	5881555	2.63	2.70	2.77	2.86	3.04	3.18	3.32
35	1753385	5878358	2.67	2.74	2.82	2.93	3.12	3.26	3.42
36	1758871	5885667	2.68	2.75	2.82	2.93	3.12	3.26	3.41
37	1755270	5886061	2.67	2.72	2.78	2.88	3.05	3.20	3.34
38	1749867	5888251	2.49	2.54	2.59	2.67	2.84	2.97	3.11
39	1752763	5889856	2.44	2.49	2.55	2.64	2.81	2.95	3.08
40	1754460	5891659	2.45	2.50	2.56	2.65	2.82	2.95	3.09
41	1756055	5894262	2.43	2.48	2.54	2.62	2.79	2.93	3.06
42	1758654	5894467	2.43	2.49	2.55	2.64	2.82	2.95	3.09
43	1754737	5903659	2.41	2.46	2.51	2.56	2.65	2.73	2.82
44	1756339	5902562	2.42	2.48	2.52	2.58	2.67	2.76	2.86
45	1757041	5901563	2.43	2.48	2.52	2.57	2.68	2.77	2.87
46	1759939	5902269	2.49	2.55	2.60	2.66	2.77	2.87	2.96
47	1761037	5903271	2.55	2.61	2.66	2.72	2.83	2.92	3.02
48	1761839	5902372	2.55	2.61	2.67	2.73	2.85	2.95	3.05

Figure 10: Water Levels in Various Storm Scenario (TR2020/024)

As shown in Figure 10 above, the 1% AEP flood level for node 47 is 2.92 m RL. This water level is in relation to the Auckland Vertical Datum 1946 plus 0.22 m offset for mean sea level rise. In accordance with Auckland Unitary Plan (AUP) chapter E36 Natural Hazards and Flooding, coastal hazards policies, all habitable areas that are subject to coastal storm inundation risk shall provide freeboard above the 1% AEP flood level including allowance for 1 m sea rise. This requirement has set the minimum floor level for any habitable floor area within the PCA to be no less than 4.45m RL.

Most of the plan change land mass is situated at 8-10m RL., which is over 3 m above the minimum finished floor level of 4.45 m. An additional 25m coastal protection yard setback will also be potentially imposed on the PCA following the light industrial zoning requirements. Given the above, there is minimal to no risk of coastal inundation to the PCA. A detailed assessment will be provided at the resource consent stage.

2.8.1 BIODIVERSITY

Viridis Environmental Consultants prepared an Ecological Impact Assessment in support of the Plan Change application. The Report identified that there are two permanent watercourses, no intermittent watercourses, and various natural wetlands found within the PCA. The biodiversity of the PCA can be broken down into two main areas, which are outlined below:

2.8.2 TERRESTRIAL VEGETATION

The vegetation of the site is grouped into three types. Type one is a mixture of native and exotic vegetation that are densely grown around the coastal edge of the site. This type has a moderated ecological value. Type two is the shelterbelt planting, which is low in ecological value as it mostly contains exotic vegetation. Type three is amenity and orchard trees which are minimal and scattered in nature. These are not considered to have much ecological value. The overall ecological value of the entire PCA terrestrial vegetation is currently rated low. There are potential opportunities to enhance the coastal edge planting to improve the ecological value of the overall site. This can be explored at the resource consent stage.

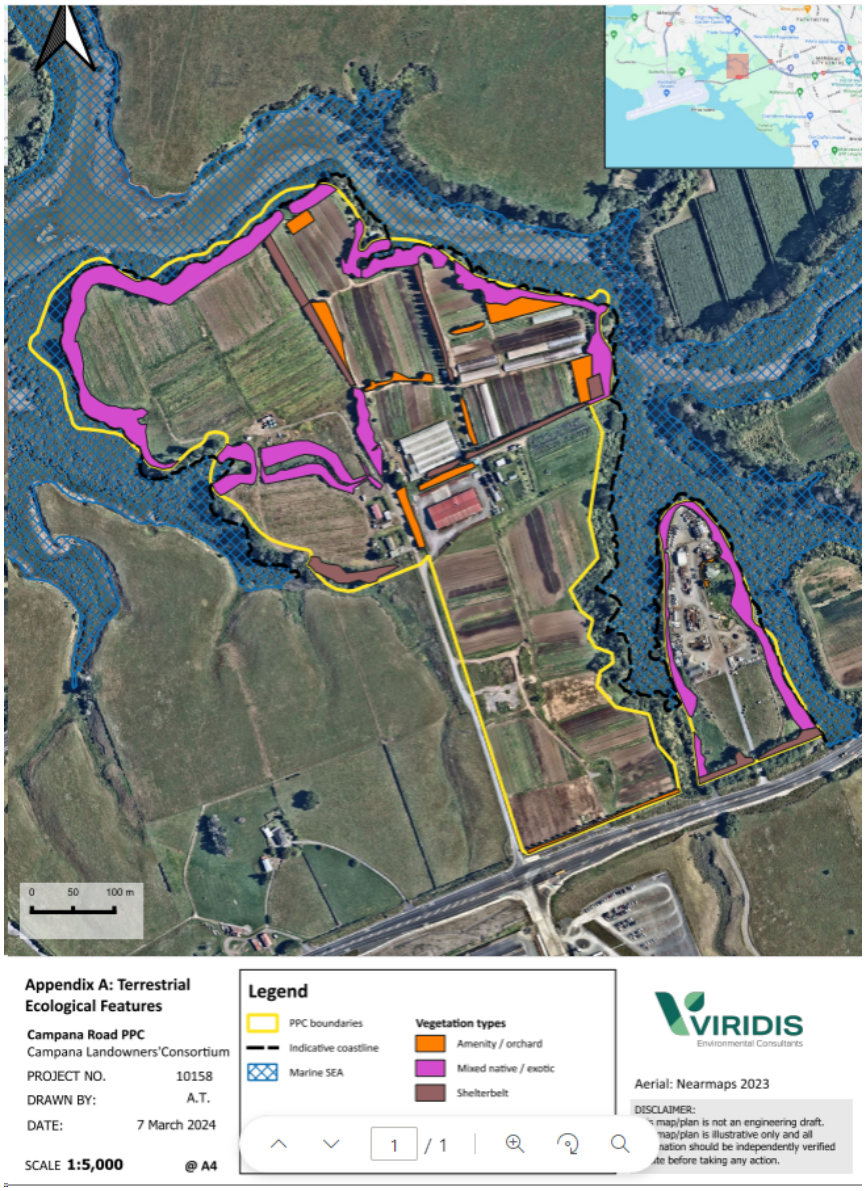


Figure 11: Existing Terrestrial Ecological Feature for the PCA.

2.8.3 STREAM AND WETLAND ECOLOGY VALUE

PCA contains the following stream and wetland features:

- Permanent Stream
  - Watercourse 14: This permanent stream originates within the PCA and is fed by two artificial drains (11&13). The upstream portion of this watercourse is fed by discharge from an underground drain as part of the transmission gas pipe that runs underneath Campana Road. The stream width ranges from 0.3 to 0.5m wide, with a depth of water at 0.03m, with a short span. The stream alignment has been modified in the past for culvert and driveway installation. This permanent stream feeds natural wetland D, and has a low ecological value rating given it only contains shallow water flow with no natural pools.
  - Watercourse 33: this stream is technically located outside of the PCA and dissects the PCA into two portions, the eastern portion and the western portion. The ecological value for this stream is moderate.
- Wetlands
  - Wetland A: this wetland is 170m^2 in size and is located at the confluence of two modelled Overland Flow Paths (OLFPs). This wetland is considered a natural inland wetland and has a low ecological value rating.
  - Wetland B: this is a small wetland of approximately 40m^2 in size located along the coastal edge at the base of a gentle slope, where it abuts the coastal wetland/salt marsh and mangrove habitat. This wetland is also rated as having low ecological value.
  - Wetland C: wetland C is moderate in size which contains mainly exotic species and lacks suitable habitat for indigenous aquatic fauna which gives it a low ecological value rating.
  - Wetland D: this is the largest wetland within the PCA. It is approximately 1,370m^2 in size and is divided into two parts by a private driveway with a culvert installed. The downstream of this wetland abuts the coastal mangrove habitat with the upper portion fed by permanent stream 14. The existing culvert is currently a barrier for fish passage. This wetland is rated as moderate in ecological value and there is an opportunity to enhance this wetland to provide a shelter/habitat for a select at-risk native birds in the region.
  - Wetland E: this wetland is mostly located within the neighbouring land with a small portion located within the PCA. The ecological value for this wetland is rated at moderate.
  - Wetland F: This is a putative wetland which does not classify as natural wetland as defined in the NPS-FM
  - Wetland G: this is a small wetland located outside of the PCA and has a low rating in terms of ecological value.

The watercourse maps for this area from Viridis Environmental Consultant can be found in Figure 12 below. Please refer to the Ecological impact assessment from Viridis for more information.

Figure 12: Existing Watercourse Classification and Location Map by Viridis within the PCA

2.9 CULTURAL AND HERITAGE SITES

TBC

2.10 CONTAMINATED LAND

Babbage Consultants Limited have completed a Preliminary Site Investigation (PSI) Report for the PCA area. The report concluded the following:

The site has been used for Horticultural purposes for over 51 years.

Based on the historical information, the site is subject to activities on the Hazardous Activities and Industry List (HAIL). The NESCS will apply to the site as the proposed development will not meet the NESCS permitted activities thresholds.

The site potentially has contaminants generated from horticulture activities, domestic on-site wastewater treatment and commercial activities.

Please refer to the PSI reports provided in support of the PPC application for more information.

3 DEVELOPMENT SUMMARY AND PLANNING CONTEXT

Following the initial site appraisal through section two of this report, the regulatory and planning requirement of the AUP will be discussed in detail below

3.1 REGULATORY AND DESIGN REQUIREMENTS

In accordance with the AUP, the Auckland Council's regulatory and design requirements are listed in Table 4, below:

Table 4: Relevant regulatory and design requirements

Requirement	Relevant regulatory / design to follow
National Policy Statement for Freshwater Management 2020	• Ministry for the Environment
New Zealand Coastal Policy Statement 2010	• Department of Conservation
Natural Resources of the Regional Policy Statement	• AUP Chapter B7
High-use Stream Management Areas	• AUP Chapter D3
Natural Stream Management Area	• AUP Chapter D4
Significant Ecological Area	• AUP Chapter D9
Water Quality and Integrated Management	• AUP Chapter E1
Discharge and Diversion	• AUP Chapter E8
High Contaminant Generating Areas	• AUP Chapter E9
Hydrological Mitigation	• AUP Chapter E10
Natural Hazards and Flooding	• AUP Chapter E36
Auckland Council Regionwide Network Discharge Consent	• NDC Schedule 4
Stormwater Management Devices in the Auckland Region	• GD01 (Auckland Council, 2017)
Application of Principals of Water Sensitive Design	• GD04 (Auckland Council, 2015)

3.1.2 NETWORK DISCHARGE CONSENT

The Auckland region-wide network discharge consent (NDC) came into effect in October 2019. The NDC allows for the stormwater diversion and discharge from developments to be incorporated under Auckland Council's consent, and for stormwater infrastructure assets to be vested to Auckland Council, provided they comply with the NDC conditions. The NDC requirements for greenfield developments, relevant to the PCA, and as stipulated in the NDC Schedule 4, are:

Receiving Environment:

- Minimise the stormwater related effects of the development.
- Retain/restore natural hydrology as far as practicable.
- Minimise the generation and discharge of contaminants (including gross stormwater pollutants and stormwater flows at source).
- Minimise temperature related effects.
- Enhance freshwater systems including streams and riparian margins.
- Minimise engineered structures in streams.
- Protect the values of Significant Ecological Areas as identified in the AUP.

Water Quality:

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

Stream Hydrology:

- Achieve equivalent hydrology (runoff volume, peak flow) to pre-development (grassed state) level via SMAF 1 stormwater controls.

Flooding:

- Ensure that there is sufficient capacity within the pipe networks downstream of the connection point to cater for the stormwater runoff associated with development in the 10% AEP event, including flows from contributing catchments for maximum probable development by:
  - Demonstrating sufficient capacity is available in the network including flows from the total catchment (maximum probable development) during the 10% AEP event.
  - Attenuating and reducing stormwater flows and volume on-site such that there is no increase in peak flow in a 10% AEP event compared to that pre-development. Note that any devices associated with this option will also require an operation and maintenance plan to ensure the long-term efficacy of such a system.
  - Upgrading the relevant pipe network to a size that can cater for the additional flows from the development in the 10% AEP event (taking into account existing flows from the contributing catchment); or
  - Upgrading the relevant pipe network to a size that is larger than would otherwise be required to cater for the 10% AEP event for the development, due to the need to cater for flows from the contributing catchment at maximum probable development, subject to a fair and proportionate funding agreement with Healthy Waters.
  - Building in 1% AEP event footprint shall be undertaken in accordance with the Stormwater Code of Practice.

Assets:

- All new assets that are intended to become part of the public stormwater network are to be designed and constructed to the required level of service, for the design life of the asset, subject to reasonable asset maintenance.

3.1.3 STORMWATER MANAGEMENT DEVICES IN AUCKLAND REGION

The stormwater management devices in the Auckland Region Guideline Document 001 (GD01) were developed in 2017 to replace Technical Publication 10 (TP10). GD01 provides a wide range of stormwater management devices to address the stormwater detention, retention, and water quality requirements for the whole Auckland region. Those devices listed in this document are considered a best practice option for mitigating the adverse effects of land-use and subdivision activities.

4 MANA WHENUA MATTERS

5 STAKEHOLDER ENGAGEMENT AND CONSULTATION

5.1 HEALTHY WATERS

5.1.1 INITIAL CONSULTATION INPUT FROM HEALTHY WATERS - FEBRUARY 2024

Healthy Waters has been actively engaged in providing feedback for this private plan change. Much of the feedback from Healthy Water has been incorporated and reflected within the updated Stormwater Management Plan (SMP). The changes made include, but are not limited to, the following items:

- Provision for protecting and enhancing the existing natural wetlands on site
- Discussion of the SMAF 1 requirement for Campana Road
- Providing solutions and mitigation measures for accident contaminant spill scenarios
- Addressing water temperature mitigation
- Making minor updates to wording and sections based on the feedback received

It is anticipated that further consultation with Healthy Water will be necessary during the submission of this plan change. A comprehensive table outlining all comments will be compiled and circulated to Healthy Water specialists as part of the ongoing consultation process to ensure that all raised concerns have been adequately addressed or resolved.

5.1.2 CLAUSE 23 INPUT FROM HEALTHY WATERS

At the Clause 23 stage, Healthy Waters raised several points regarding the proposed SMP. The key inputs are as follows:

On-Site Flooding and Freeboard

On-site flooding and freeboard are not major concerns, as any overland flow paths are expected to be minor and unlikely to trigger the 500mm freeboard requirement. The proposed land use/zoning does not involve vulnerable activities, allowing these matters to be addressed under the current AUP provisions at the resource consent stage.

Water Quality Treatment for Roof Areas

Healthy Waters agreed that water quality treatment for roofs is unnecessary if they are constructed with inert materials. Consequently, the SMP and associated toolbox options have been updated to reflect this.

Natural Wetland Protection

The SMP provides adequate protection for the identified natural wetland on-site through riparian yard offsets, as per the NPS-FM 2020. The post-development catchment area will be encouraged to be similar in size to the pre-development area to maintain base flow levels, with any high flows bypassing the wetland when feasible.

Multiple Private Outlets

The main stormwater strategy on-site involves maintaining existing stormwater catchments as much as possible to protect the receiving environment. There is potential to combine some minor outlets into a major outlet, though this would be a preference rather than focusing post-development flow through a few public outlet locations.

Stream erosion assessment

Only watercourse 14 will receive stormwater runoff from the development. According to an ecological assessment by Viridis Ltd, this low-value stream is primarily fed by a subsoil drain from the Wiri Oil main through the site. Similar to wetland protection, base flows will be engineered to remain consistent, with high flows designed to bypass the stream if possible. If bypassing isn't feasible, stream erosion will be managed through enhanced tree planting along the riparian yard. The actual catchment for this stream is relatively small, and the lower section is subject to coastal inundation, making the increase in flow through this stream bed insignificant.

5.2 IWI CONSULTATION

Te Akitai has been engaged to provide their feedback for this private plan change. The stormwater management for this catchment has been designed to adopt Te Akitai Waiohua principal and values for this stormwater management area.

The Te Akitai Waiohua has advocated for a water-sensitive design approach that emphasises managing contaminants at their source through the use of bio-retention stormwater treatment devices. The strategy encourages ground infiltration for stormwater runoff and emphasises the reduction of stormwater generation wherever feasible. Additionally, the approach suggests that earthworks should be minimised where feasible to avoid altering the natural infiltration capacity of the existing ground. This commitment reflects a focus on sustainable practices, promoting natural processes for water management, and minimizing the environmental impact of development. Please refer to the Te Akatia Waiohua principal in Appendix B for more information.

Adopting the feedback from Te Akitai iwi, the changes to the SMP are listed but not limited to the items shown below:

- Rainwater harvesting tank and grey water reused is recommended to reduce the run-off back to the received environment post-development scenario

- Ground soakage devices are recommended to be implemented on-site if ground infiltration is feasible
- At source stormwater treatment devices are recommended
- Enlargement of sediment retention pond is recommended to provide higher sediment-laden water treatment outcome during earthworks

6 PROPOSED DEVELOPMENT

Campana Landowners' Consortium is applying to rezone the proposed PCA from the current FUZ to light industrial zone.

The proposed plan change introduces zoning that generally corresponds with the broader zoning patterns observed in this region. This section of the report summarises the planned future development in the PCA, particularly as it relates to stormwater management.

6.1 PROPOSED REZONING INFORMATION

The proposed plan change is considered a greenfield development as the proposal entails changing the existing zoning from FUZ to light industrial zone. The existing Campana Road will be redeveloped and upgraded to the current Auckland Transport public road specification to provide legal access for future development in PCA.

6.2 EARTHWORKS

An Infrastructure Report has been prepared to support this plan change application. A preliminary earthworks model has been developed for the plan change area to indicate the volume of earthworks required to provide suitable building platforms and the roading networks servicing the plan change area.

See appended Earthworks Plans for further details. Proposed earthworks volumes are tabled below:

Table 5: Earthwork's Area and Volume

Site Area	30.89 Ha
Earthworks Area	24.2 Ha
Cut Volume	55400 m^3
Fill	52400 m^3

The existing overland flow path and watercourse will be utilised as a means of stormwater water discharge path. Several lesser overland flow paths and ephemeral watercourses/drains will be removed.

Future resource consent will require erosion and sediment control measures to be implemented and maintained per the approved Engineering Drawings.

The Te Akitai Principles required a higher standard of earthworks management to avoid sediment discharge into the receiving environment. A more conservative approach has been proposed initially and it has been scaled back to the best practice option as recommended in GD01 as per the input from Auckland Council. The following measurements are recommended to achieve this requirement:

- Erosion and sediment control measures will be designed and maintained in accordance with GD05.
- Adopting a minimum of 2% of the contributing catchment area to size for all sediment retention ponds (SRP) regardless of the site slope. Increasing the forebay volume to capture and store more sediment.
- Incorporated drop-out pit within the SRP catchment to reduce the sediment load on the SRP similar to the treatment train approach used in stormwater treatment.
- Silt control measures will need to be installed on-site before or during (as specified) earthworks commencement.
- All silt control measures will be checked and confirmed acceptable by the Engineer and relevant council compliance and monitoring specialists before relevant earthworks commence.

- A comprehensive sediment and erosion control maintenance and inspection plan shall be prepared for the earthworks to ensure all sediment and erosion control measures are effective.
- The site will be progressively stabilised as areas of earthworks are completed.

6.3 POST-DEVELOPMENT STORMWATER SCENARIO

Given the preliminary level of this plan change, a development concept is not being detailed at this stage. It is expected that the existing stormwater catchment will be retained as much as possible to minimise the earthworks on site.

The post-development catchment plan will be updated for this SMP at the resource consent stage once a layout has been agreed upon and developed.

6.4 PRINCIPLES OF STORMWATER MANAGEMENT

6.4.1 ORIGINAL PRINCIPLES

The stormwater management principles presented below are consistent with the site-specific constraints and opportunities, AUP policies and the network discharge consent.

The stormwater management framework for this plan change pursues:

Water Quality –

Treatment of all contaminants generating impervious areas by a water quality treatment device designed in accordance with GD01/TP10 for the relevant contaminants.

The roof run-off from the SMP area is to be excluded from the water quality requirement if it is to be constructed with inert material

Or,

- An alternative level of mitigation determined through a SMP that:
  - applies an Integrated Stormwater Management Approach (as per above);
  - meets the NDC Objectives and Outcomes in Schedule 2; and
  - is considered the BPO.

Frequent Rain Event Management:– Hydrology mitigation SMAF 1 is not required for most of the PCA area except Campana Road which discharges toward an existing stream. Stormwater reuse tanks are proposed for all roof areas which will provide a minimum of 5mm retention. For the hardstand/ driveway and other impervious areas, 5mm of retention is required where ground soakage is feasible. This approach is in line with Te Akitai Waiohua Principle.

Protection of existing natural wetlands and watercourse – the design shall consider the existing natural catchment of existing natural wetlands and watercourse located on site. The catchment area of these wetland post-development shall be kept to similar size if practicable to mimic the same base flow and pre-development environment. If this is not possible, engineering design intervention is required to mitigate the impact on these existing wetlands/ watercourse to ensure the design outcome will provide a similar base flow toward these wetlands/watercourse and the high flow will be diverted to prevent scouring. The 10m riparian yard setback and riparian yard planting are proposed around the existing natural wetland/ watercourse to provide a buffer zone to protect and enhance these natural wetlands/watercourse.

Conveyance – Provide a stormwater network to convey runoff generated from the 10% AEP event from the development and convey this to the receiving environment. Where this network is proposed to be vested with the Auckland Council, the network should be designed in accordance with the requirements set out in the SWCoP. It is a preference to maintain size of the post development stormwater catchment as close as possible to the pre-development. this also apply for the outfall structure to prevent down stream/ received environment from erosion

Overland Flow Management – Natural overland flow paths are to be retained and improved where practical in the developed scenario. Flow paths through development sites will be required to be incorporated into the final landform with the improvement of flood storage and conveyance. So that flooding does not pose a risk to property or people. The flow path will also be protected and kept free from obstruction. Where alterations are made to the overland flow path as a result of earthworks, it will be necessary for the developer to demonstrate no negative impacts are caused by the proposed changes.

Floodplain Management – The management of the floodplain will be provided through the provisions contained within the AUP(OP). No vulnerable activities will be allowed within the floodplain (unless suitably mitigated) and general levels of development will be kept to a minimum in such areas. It is noted that the existing landform may be subject to change, to suit the development layout. However, development must demonstrate that any change will not have any adverse effect.

Flood mitigation - adopting no mitigation for large storm events due to the site being located at the end of the stormwater catchment.

Receiving Environment – protect and enhance the receiving environment through the provision of water quality treatment, reduction of post-development run-off through the roof water tank, ground infiltration design if possible and riparian yard planting.

The SMP ensures compliance with the NDC Schedule 4 requirements for greenfield developments, these requirements are listed in Table 2 in Section 6.2.1, and form the outcomes sought by the stormwater management strategy. The stormwater strategy developed for the site demonstrates the overarching principles of how stormwater is to be managed within the development, as required by the regional NDC. The stormwater management proposed for the site generally aligns with the concept of Water Sensitive Design.

The strategy for stormwater management is outcome-focused. The stormwater management plan provides a solution-based approach for the receiving environment. The plan sets up a clear process to mitigate the effects on the receiving environment, which is the Pukaki Creek located immediately downstream of the development.

Maven Associates believes that the proposed stormwater strategy ensures the outcomes are consistent with Schedule 4 of the regional NDC and relevant mana whenua values.

6.4.2 UPDATED PRINCIPLES

TBC

6.5 PROPOSED STORMWATER MANAGEMENT

6.5.1 GENERAL

The water quality, conveyance, hydrological and flood mitigation outcomes are consistent throughout the PCA. The key outcomes are listed below:

Water quality:

Mitigating the contamination generated from land-use activity via the use of water quality treatment devices designed per council guidelines, best practices, or the relevant device specification.

Traditionally for a light industrial subdivision, each lot will need to provide their own proprietary stormwater devices to treat the stormwater run-off within the site. Each industrial activity may generate different types of contamination. As such, no catchment-wide stormwater treatment devices are proposed for this SMP.

Each light industrial activities will be required to provide a management plan in place for the containment and removal of accident spilling of contamination. This plan shall be reviewed and approved by Auckland Council at land use consent stage. As mentioned in the section above, the water treatment devices will be designed to treat the relevant contamination generated from the site. It would be able to treat the residual of the contaminants from this scenario. However, this will be considered as the last resort and will not be regarded as the main source of treatment for accident spills as this would reduce the life expectancy of the treatment devices and increase the maintenance cost of the devices.

Adopting the design principle from Te Akitai, the preferred water quality treatment for the site will be provided by a rain garden, swale and/or engineered tree pit where the contamination will be treated at source including promoting ground infiltration to mimic the natural water cycle.

Stream hydrology mitigation:

Given the site is located at the end of the catchment and mostly discharges directly toward the Estuary/Tidal area. No hydrological mitigation is deemed to be necessary, except Campana Road and a small area of site which drained toward the existing permanent stream.

5mm water retention is proposed to be provided via rainwater reuse tanks for the roof area. The remaining impervious area for the stormwater management extent will be subject to this 5mm retention requirement where ground soakage is feasible. Water infiltration via ground soakage and water reuse are encouraged to mimic the natural water cycle and reduce runoff if possible.

Flooding:

Overland flow paths (secondary systems) shall be designed with sufficient capacity to accommodate the 1% AEP event for the MPD/adjusted climate change scenario.

Proposed buildings shall be clear of flood hazards and designed as per the stormwater code of practice.

Assets:

- All new public stormwater networks (primary systems) shall be designed to accommodate the 10% AEP event (incl. MPD and climate change) in accordance with the stormwater code of practice.

Receiving Environment:

- Enhancing the riparian margin planting and overall health of the Estuary.
- Safeguarding the Significant Ecological Areas immediately downstream of the PCA

6.5.2 WATER SENSITIVE DESIGN

The key principles of water sensitive design approach can be implemented in the stormwater management framework for this PCA as shown below:

Promoting inter-disciplinary planning and design, through:

- Water-sensitive urban design workshops to be undertaken early with other consultants to develop a master plan based on core WSUD outcomes.

- Develop, share and refine the BPO toolbox with other consultants for resource consent applications.

Undertake consultation with Iwi and Healthy Waters and integrate this feedback into the SMP.

Protect and enhance the values and functions of natural ecosystems, by:

- Protecting and enhancing the riparian planting of the existing streams, wetlands and coastal within the PCA.
- Ensure the base flow for the existing wetland to remain unchanged and provide a high flow by-passing system.

Address stormwater effects as close to the source as possible, through the inclusion of:

- Prevention of contamination generation via the use of inert building materials.

Provision of water quality treatment devices for all impervious areas except roof runoff via the use of rain garden, swale or engineered tree pit. For public roads, the stormwater treatment devices will be located at the source through the use of approved bioretention devices.

Mimic natural systems and processes for stormwater management by:

- Restoring and enhancing the riparian planting to improve the natural hydrological function of the existing streams and coastal yard setback.
- Design stormwater devices and green infrastructure that provides infiltration where practical/possible.

6.5.3 WATER QUALITY

The change of land use from rural to light industrial has the potential to increase the adverse effects on the receiving environment through contamination if left unmitigated. The common contaminations from light industrial areas are listed below:

- Heavy metals
- Oil and grease
- Temperature
- Sediment and suspended solids
- Indicative bacteria
- Nutrients

The proposed strategy will incorporate a WSUD approach and Te Akitai Waiohua principle focusing on reducing or eliminating stormwater contaminants through source control, using stormwater treatment devices consistent with Auckland Council guidelines such as GD01, GD04 and GD05. The water quality principles of this SMP target the mitigation of all contamination generated from land-use activities. This can be achieved with stormwater quality treatment devices developed through the guidance of GD01 & GD05. Please refer to the Tables below for the stormwater treatment approach for the respect activities.

Table 6: Water Quality Treatment Toolbox within the PCA

Stormwater Devices Toolbox for Water Quality		
Activity	Water quality treatment target	Recommended devices
Light industrial communal car park or COAL	• Heavy metal, grease and oil • Suspended solids removal • Water Temperature * • Chemical	• Preferred devices are bioretention devices as per GD01 Or • Proprietary water quality treatment devices
Light industrial roof area	• Metal from roofing material • Organic debris from natural sources • Water Temperature*	• Preferred to eliminate the source of contamination at source through use of inert roof material with leaf guard and water tank to control and remove contamination from the roofing area Or • bioretention devices as per GD01 in conjunction with water reuse tanks to reduce stormwater discharge where possible Or • Proprietary water quality treatment devices
Light industrial hardstand/ driveway and impervious area excluding roof	• Heavy metals, grease and oil • Suspended solids removal • Water Temperature* • Nutrients • Chemical	• Preferred devices are bioretention devices as per GD01 Or • Proprietary water quality treatment devices
High contaminant generating car park	• Heavy metals, grease, and oil • Suspended solids removal • Water Temperature*	• Preferred devices are bioretention devices as per GD01 Or • Proprietary water quality treatment devices
Public local road	• Heavy metals, grease and oil • Suspended solids removal • Water Temperature*	• At source bioretention devices as per GD01
High use road	• Heavy metals, grease and oil	• At source bioretention devices as per GD01

	• Suspended solids removal • Water Temperature*	
Contaminant accident spills	• Heavy metals, grease and oil • Suspended solids removal • Industrial Chemical	• Accident spill management plan in place and to be reviewed and approved by qualified specialists and Auckland Council • Spill kit in the easy-access location
Earthworks	Mitigate the sediment generated from earthworks	• Provide sediment and erosion control in accordance with GD05: ➢ Decant earth bund ➢ Sediment retention pond ➢ Silt fence ➢ Water diversion bund ➢ Filter socks ➢ Stabilised vehicle entrance ➢ Wheel wash station ➢ Chemical Treatment • Reducing the earthworks area where possible to not disturb the natural ground soakage capacity. • Adopting a higher standard of sediment and erosion control to reduce the sediment run-off to be discharged toward the receiving environment

**Water temperature: The water treatment processes in bio-retention and proprietary treatment devices can help normalize water temperatures. Typically located underground, these devices act as heat sinks, effectively removing and regulating water temperatures to prevent adverse environmental impacts. By incorporating these mechanisms, the development can mitigate potential harm to the ecosystem and maintain environmental equilibrium.*

The preference would be a treatment train approach where a mixture of devices as mentioned in the table above be used in conjunction to complement each other and provide a higher water treatment quality outcome if feasible.

6.5.4 WATER QUANTITY

The intended urbanisation of the PCA will increase the impervious area which will in turn increase stormwater runoff (both flow rates and volume) leaving the site, and ultimately increases the risk of flooding downstream. The existing impervious areas of the sub-catchments within the PCA range from 0 to 47%. The post-development impervious area will be increased to a range between 70 and 80%. Given the PCA is located at the end of the stormwater catchment and discharges directly toward the estuary/tidal area where no capacity issue is expected, water quantity mitigation is deemed to be unnecessary.

To prevent erosion at the discharge point, the stormwater

6.5.4.1 Hydrological Mitigation

As mentioned earlier, a small portion of the PCA is subject to SMAF 1 control. The rest of the PCA is not subject to SMAF 1 control. This is because most of the catchment within the PCA discharges directly to the estuary without entering intermediate or permanent streams, noting that as the estuary is part of the coastal environment there is no capacity issue for receiving the stormwater runoff volume. However, a 5mm water retention is recommended. For the roof area, the 5mm retention can be provided via non-potable rainwater reuse tanks. The remaining impervious area within the stormwater management area can be achieved using bio-retention devices such as unlined rain gardens, swales or engineered tree pits where the ground soakage is more than 2mm/hr as per GD01 recommendation. In the instant where this soakage rate is not achievable. No retention is required for these areas.

In terms of Campana Road, it is naturally discharged toward an existing stream located outside of the PCA. It is suggested that the existing SMAF 1 control for Campana Road remain unchanged. And stormwater management devices to be provided will be proposed to support the redevelopment of this road to meet the schedule 4 requirements of the NDC

An indicative sizing for the non-potable reuse tank has been formulated and is presented in the table below. This sizing serves as a guideline for future development, providing valuable information for planning purposes. It is worth noting that this is a minimum requirement as per the 5mm retention requirement. Future development is encouraged to provide larger reuse tanks where possible.

Table 7: Non-potable Reuse Tank Size per Indicative Roof Area

Non-potable reuse tank sizing per roof catchment area	
Roof size	Rainwater reuse tank size
1,000 m^2	5 m^3
5,000 m^2	25 m^3
10,000 m^2	50 m^3
15,000 m^2	75 m^3
20,000 m^2	100 m^3

6.5.4.2 Riparian Planting

Planting of riparian margins assists in evapotranspiration and infiltration of stormwater, improves ground water retention, maintains coastal edge slope and estuary health within the PCA. Riparian planting is a key part of the water cycle progress. It initiates the natural water intake and infiltration through roots, promotes the water evaporation through leaves, protects the stream banks via roots, and slows down the surface water by obstructing the flow. Planting enhances the water quality overall by absorbing any nutrients or heavy metals within the stormwater run-off. Planting of native trees will also enhance the ecosystem. As such these key measurements are proposed for the PCA:

- Minimum of 10 m riparian planting to be provided along the coastal esplanade, existing streams and natural wetlands.
- Provide riparian planting along overland flow paths where possible.
- Stormwater outfall structures to be designed in accordance with Auckland Council Technical Report 2013/018 - Hydraulic Energy Management to dissipate hydraulic energy along riparian planting routes.
- Promote the use of native species for coastal riparian planting.

Within the extent of this PCA there are various coastal riparian yards, through a multiple-discipline design approach, these riparian yards will be preserved and enhanced to achieve improved freshwater, flora and fauna habitat, and amenities outcomes.

6.5.5 FLOODING MANAGEMENT

6.5.5.1 Downstream Flooding Management

The PCA is abutting the estuary hence no downstream flooding effect assessment is required. However, there is a risk of coastal inundation storm surge which imposes a minimum floor level requirement for the PCA. This matter will be assessed at the resources consent stage where a development plan becomes available for the PCA.

6.5.5.2 Onsite Flood Management

The PCA has a network of major overland flow paths and localised floodplain areas. This on-site constraint has been considered within the precinct and zoning plans developed for the PCA. Flood risks will be avoided within the PCA through the following recommendations:

- All building platforms are to be located outside of the flood plain extent in the 100-year ARI MPD plus 1m sea rise with the climate change scenario.
- A minimum floor level will be set for each dwelling in accordance with the Building Code and Auckland's Stormwater Code of Practice.
- Infrastructure to be located outside of the 100-year flood plain area plus 1 m sea rise, unless designed to be flood resilient.
- A network of secondary flow paths will be designed to convey future 100-year flows.

6.5.6 CONVEYANCE

The stormwater run-off generated from the PCA will be conveyed via primary and secondary stormwater systems. These systems will be designed in accordance with the current Stormwater Code of Practice.

Primary stormwater system:

This system consists of mainly manmade assets such as road kerbs, catchpits, manholes and pipes. This system will be designed to convey the stormwater runoff generated for up to a 10-year storm event. The water runoff will be collected from each sub-catchment by a combination of road catchpits, and lot connections before discharging into the existing stream networks/secondary flow paths.

It is a preference to have an outlet for each lot within the PCA to convey its stormwater run-off toward the coastal environment. This approached is adopted to mitigate the potential downstream/ received environment from erosion due to a significant increase of stormwater run-off discharge through combining multiple catchment which was not the case pre-development. These outfall structures will be privately owned and subject to the approval by Auckland Council at land use consent stage.

The secondary stormwater system:

The secondary stormwater system will consist of man-made assets such as roading networks, engineering swales and formed overland flow paths.

This system will be designed with the capacity to convey the run-off generated from the PCA in storm events up to the 100-year ARI. The existing stream networks on site will be investigated and improved to ensure there is adequate capacity to convey the 100-year ARI flow under the Maximum Probable Development (MPD) scenario including climate change adjustment.

The secondary flow path alignment will follow the existing overland flow path route in the PCA.

6.5.7 DEVELOPMENT STAGING

*****To be addressed at Resource Consent stage*****

6.6 HYDRAULIC CONNECTIVITY

*****To be addressed at Resource Consent stage***'**

6.7 ASSET OWNERSHIP

All proposed public stormwater networks and management devices located within land, road or park reserves will be vested to, owned, and maintained by Auckland Council or the relevant CCO (Healthy Waters, Auckland Transport).

All stormwater management devices in the public road reserve shall be vested to, owned and maintained by Auckland Transport.

All public roadways and related assets within public reserves will be owned by Auckland Transport.

Communal Stormwater devices and networks treating JOALs and common area are to be owned and maintained by Body Corporates/Resident Associations or Lot owners.

Private stormwater networks and private water quality treatment devices will be owned and maintained by its respect landowner and will not be vested to Auckland Council.

6.8 ONGOING MAINTENANCE REQUIREMENTS

All public stormwater extensions to serve the site, pipes and manholes forming the extent thereof, are to be maintained by Auckland Council. All private devices are to be maintained by related Body Corporates/Resident Associations or lot owners.

An operation and maintenance schedule and plans shall be prepared for all proposed private stormwater quality & management devices at the building consent stage. These manuals shall be made available to the landowner to ensure that the maintenance of these private devices is adhered to.

Operation and maintenance plans will be provided for all stormwater management devices that will be vested with Auckland Council. This will be required as a condition of any approved consent.

6.9 IMPLEMENTATION OF STORMWATER NETWORK

It is expected that the new stormwater network will be constructed progressively as the PCA is developed, stormwater devices will be required to be built at the cost of the developer, ensuring the device can cater or be developed to serve the full MPD catchment. Provisions on protecting the downstream network shall be met through implementing temporary sediment and erosion controls to ensure stormwater discharge is properly treated and discharged during construction.

The methodology for the implementation of the proposed networks is as follows:

- Bulk Earthworks completed.
- Construction/relocation of public stormwater/wastewater infrastructure.
- Construction of private drainage under accessways.
- Stabilisation of the site and construction of accessways.
- Vesting of newly constructed public drainage assets.
- Construction of residential dwellings and associated private drainage.

The specific design and implementation of the stormwater network and associated devices will be subject to detailed design at the future resource consent stage. The details of this will be included in future SMPs that will be required in support of the resource consent(s). This SMP sets out the high-level framework for the PCA, to which any future SMP will adhere.

6.10 DEPENDENCIES

*****Not applicable within this SMP*****

6.11 TYPICAL STORMWATER MANAGEMENT OUTCOME FOR THIS STORMWATER MANAGEMENT PLAN

A typical stormwater management approach has been developed to demonstrate the expected outcome and approach to compliance with this proposed SMP. A lot-based approach has been prepared and shown in Figure 13 below:

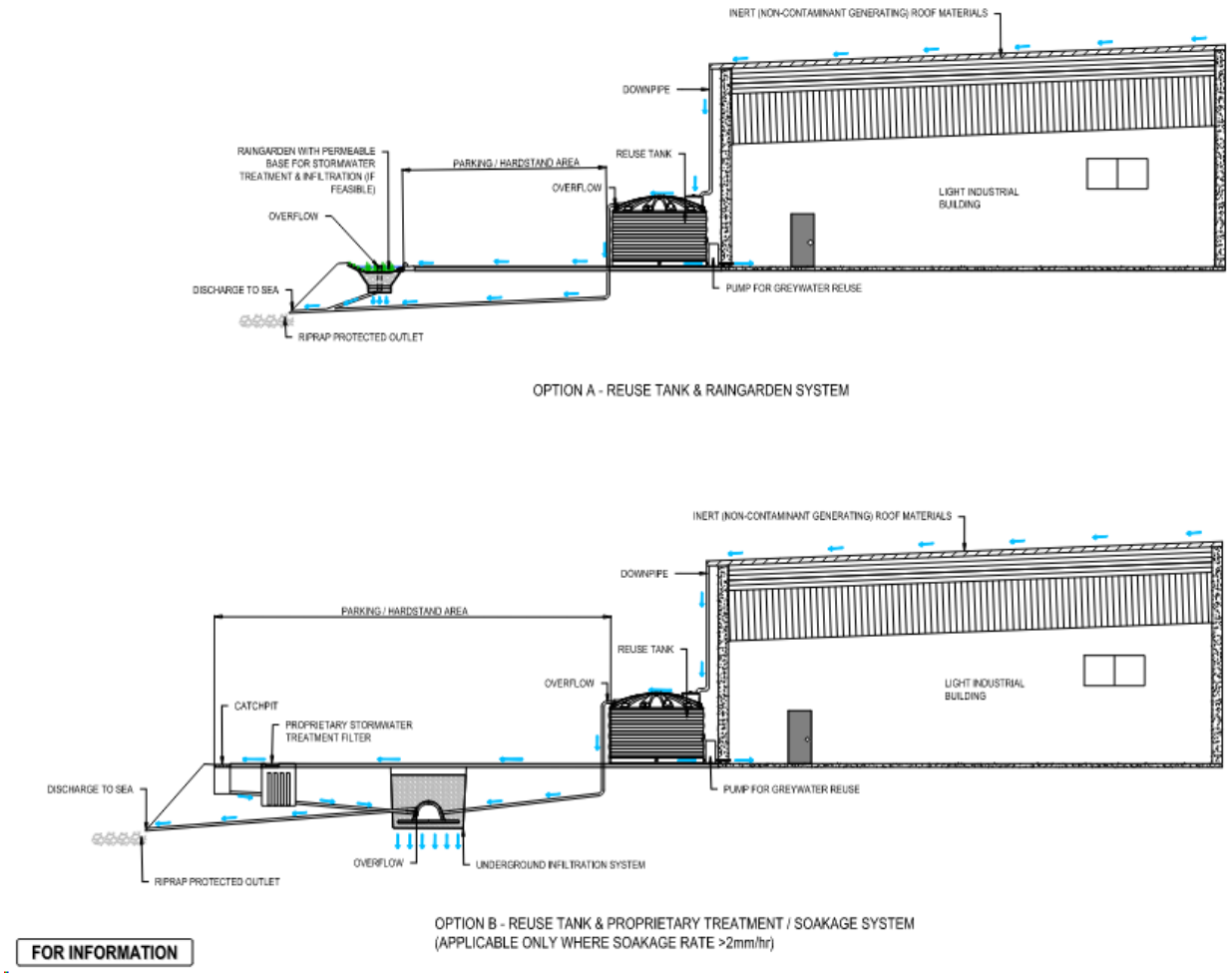


Figure 13: Typical Stormwater Management Approach within the Lot for the SMP Area.

As demonstrated in the typical plan above, two options are prepared for the SMP area where the building roof is constructed with inert material where the run-off will be captured by the reuse tank. This tank will be sized for 5mm of runoff retention as required by this SMP.

The run-off from other impervious areas, such as hardstand and driveway, will be directed to the rain garden/bio-retention devices or proprietary devices for water quality treatment. The rain garden can be sized to provide the 5mm retention for the impervious areas where ground soakage is more than 2mm/hr.

In the event of proprietary devices being proposed, a ground soakage trench is required to store and dispose of the 5mm of retention via ground infiltration. If ground infiltration is not feasible, the 5mm retention for these areas is not required.

In regard to Campana Road which is subject to SMAF 1 control, a swale design has been suggested to provide both water quality and SMAF 1 hydraulic mitigation. Please refer to the typical design in Figure 14 below:

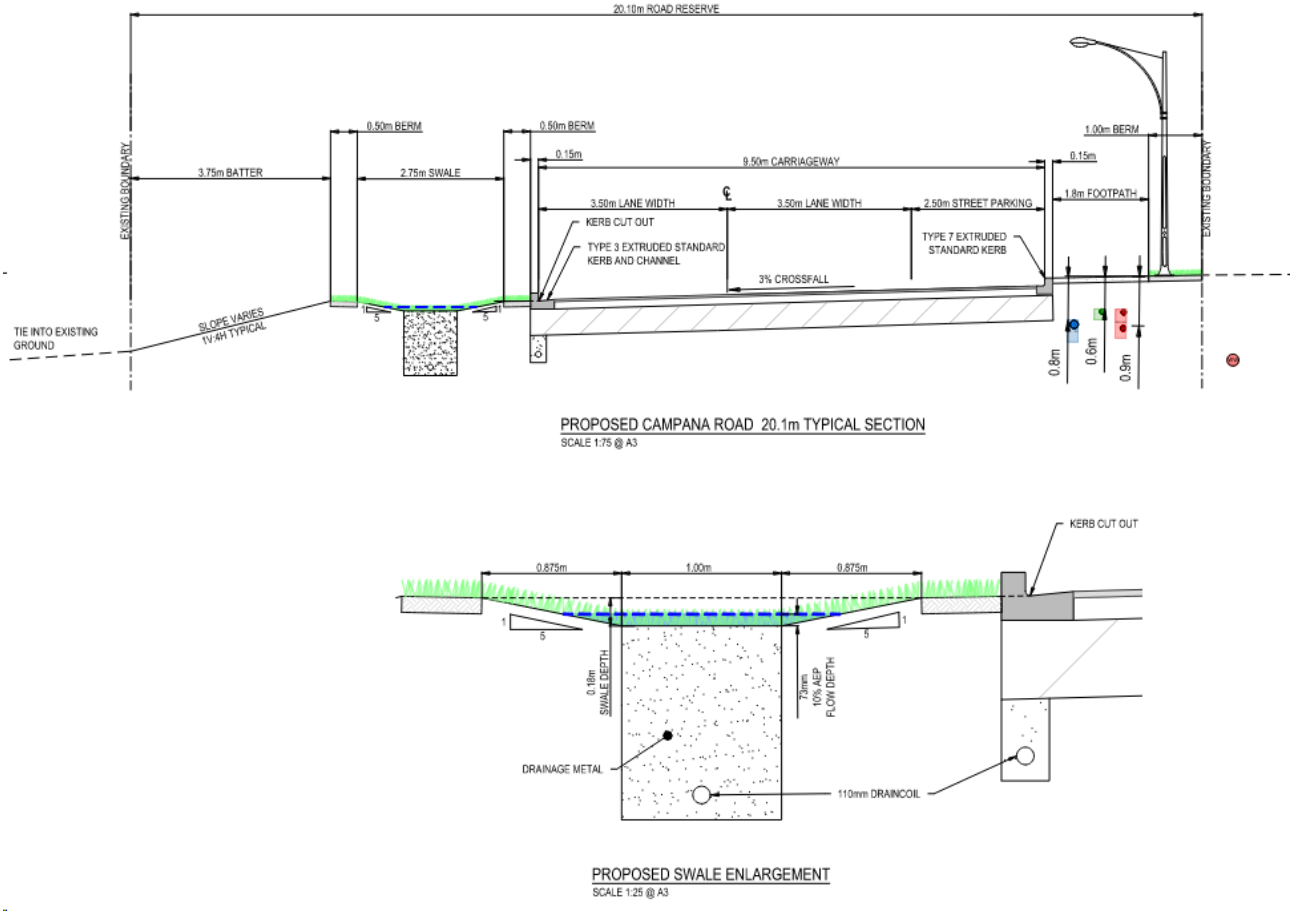


Figure 14: Typical Stormwater Management Approach on Campana Road

6.12 RISKS

Table 10: Risk Matrix for the PCA

What is the risk to the proposed stormwater management?	How can this be mitigated / managed?	What other management / mitigation could be used?	When does this risk need to be addressed?	What is the resultant level of risk?
The effectiveness of downstream stream erosion protection	Detailed stream bank investigation to ensure that existing stream has adequate capacity and there is no known risk of erosion	SMAF 1 hydrological mitigation will provide stream erosion protection on the frequent rainfall event which has been detailed in the chapter 6.2.4.1.	Through the implementation of this SMP	moderate
The possibility of ground infiltration on the PCA	Detailed ground soakage testing through the PCA	n/a	Detailed investigation at resource consent stage	low
The ground stabilities due to the use of ground soakage devices	Detailed site geotechnical investigation	n/a	Detailed investigation at resource consent stage	low
The water quality discharge from the plan change area does not meet NDC requirement	Implementing the water quality treatment guidelines as set out in chapter 6.5.3 of this SMP. This will ensure that the water quality discharge from the plan change area meet the design criteria from NDC.	Promoting the water quality treatment train and water sensitive design throughout all phrases of the development	Through the implementation of this SMP	Low
Riparian planting fails to thrive and damaged during large storm event	Promote the use of indigenous plant species to be used for the riparian planting to ensure survival rate of the riparian planting.	n/a	Resources consent stage when the development layout has been confirmed.	Low

	Ensure a maintenance plan is put in place for annual survey and maintenance of the riparian yard planting, or after a large storm event			
An increase in provision for climate change due to revision of the Stormwater Code of Practice (SWCoP)	Working closely with Healthy Waters flood modelling team to analyse the findings of revised modelling and adopt a new management strategy if required.	n/a	If the SWCoP is revised	Low

7 DEPARTURES FROM REGULATORY OR DESIGN CODES

There are no known departures from Auckland regulatory and design standards.

8 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE WORK

8.1 CONCLUSIONS

This SMP for the Campana Road PCA has been developed based on AUP regulatory policies, Auckland Council stormwater-specific guidelines and the overarching NDC requirements.

The overarching principle of the SMP is to implement an integrated stormwater management approach, which includes:

- Recognising the key constraints and opportunities on site and wider catchment.
- Devising an integrated stormwater management approach to facilitate light industrial development and optimise available land.
- Emphasising a water-sensitive design approach that:
  - Manages the impact of land use change from rural to light industrial
  - Protects and enhances stream, wetland and coastal edge planting
- Mitigate the generation and discharge of contaminants/sediments into the sensitive receiving environments downstream of the PCA.
- Facilitating development and protecting key infrastructure, people and the environment from significant flooding events.
- To achieve these outcomes, the proposed stormwater management approach will be:
  - Provide water quality treatment via at-source stormwater devices for all contaminated impervious area
  - Provide SMAF 1 hydrological mitigation for Campana Road
  - Provide 5mm retention for all roof area
  - Provide 5mm retention for the remain impervious area where ground soakage is possible
  - No hydraulic mitigation for the SMP area is recommended, due to the PCA location at the end of the wider stormwater catchment as there is no added benefit such as in improving downstream flooding.
  - Protect, restore, enhance, and incorporate streams, wetlands and overland flow paths as elements of future primary and secondary stormwater conveyance systems.

The detailed design of the proposed stormwater management approach, including device selection, sizing and location will be addressed at the resource consent stage of the plan change area.

Based on the investigations that have been completed at this stage, it is expected that stormwater effects from the PCA can be appropriately and adequately managed consistently with the requirements of the AUP and NDC. The plan change can, therefore, proceed with all stormwater management matters mitigated through the recommendations of this SMP.

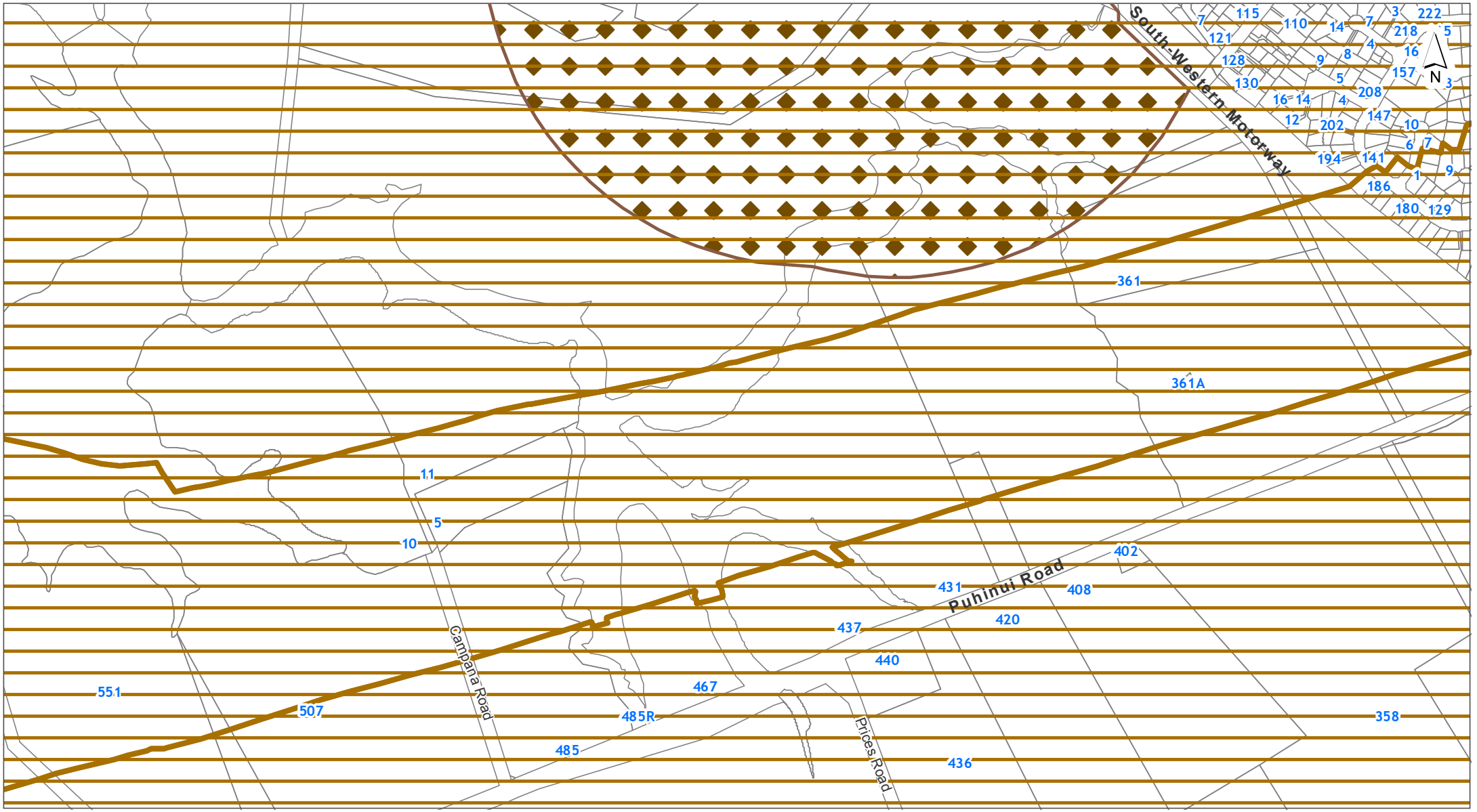
8.2 RECOMMENDATIONS

This SMP sets out the stormwater management framework for the PCA. Detailed design at the resources consent stage will be required to demonstrate compliance with this SMP. This SMP will be adopted under the Healthy Waters Region-wide NDC and will authorise the future stormwater discharge from the PCA.

Further recommendations to support the next phases of development within the Campana Road development are listed below:

- The design recommended within this SMP will provide a guide for site-specific stormwater management design which will support the future development within the PCA.
- Specific design and implementation of the stormwater network and associated devices will adhere to the design outcomes set out in this Plan Change SMP.
- Targeted percolation testing in support of resource consent(s) is recommended to confirm the ground soakage ability of the site to aid the process of incorporating the ground infiltration element into the stormwater design.

APPENDIX A – PLANS OF EXISTING SITE FEATURES



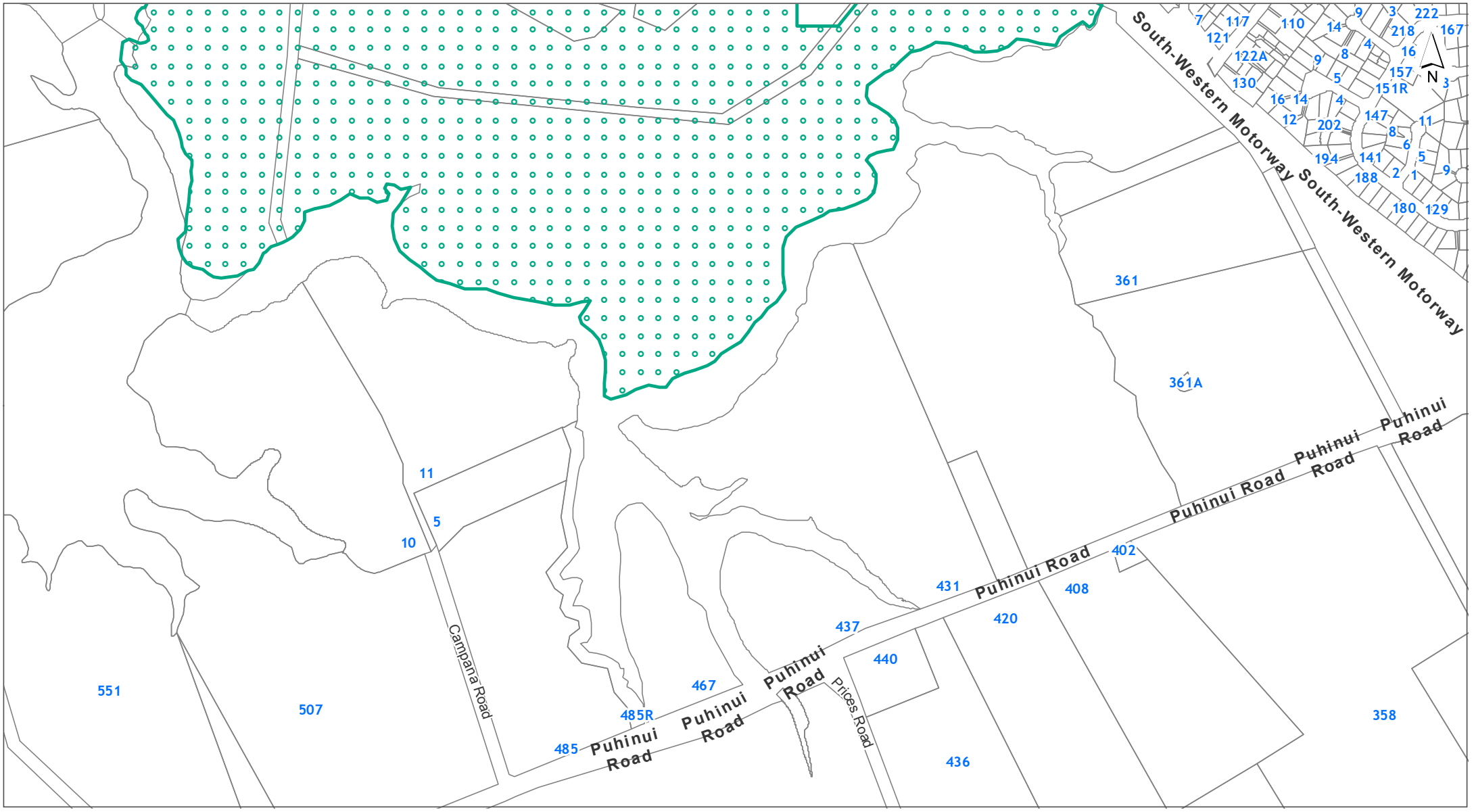
Infrastructure
Significant Ecological Areas Overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau



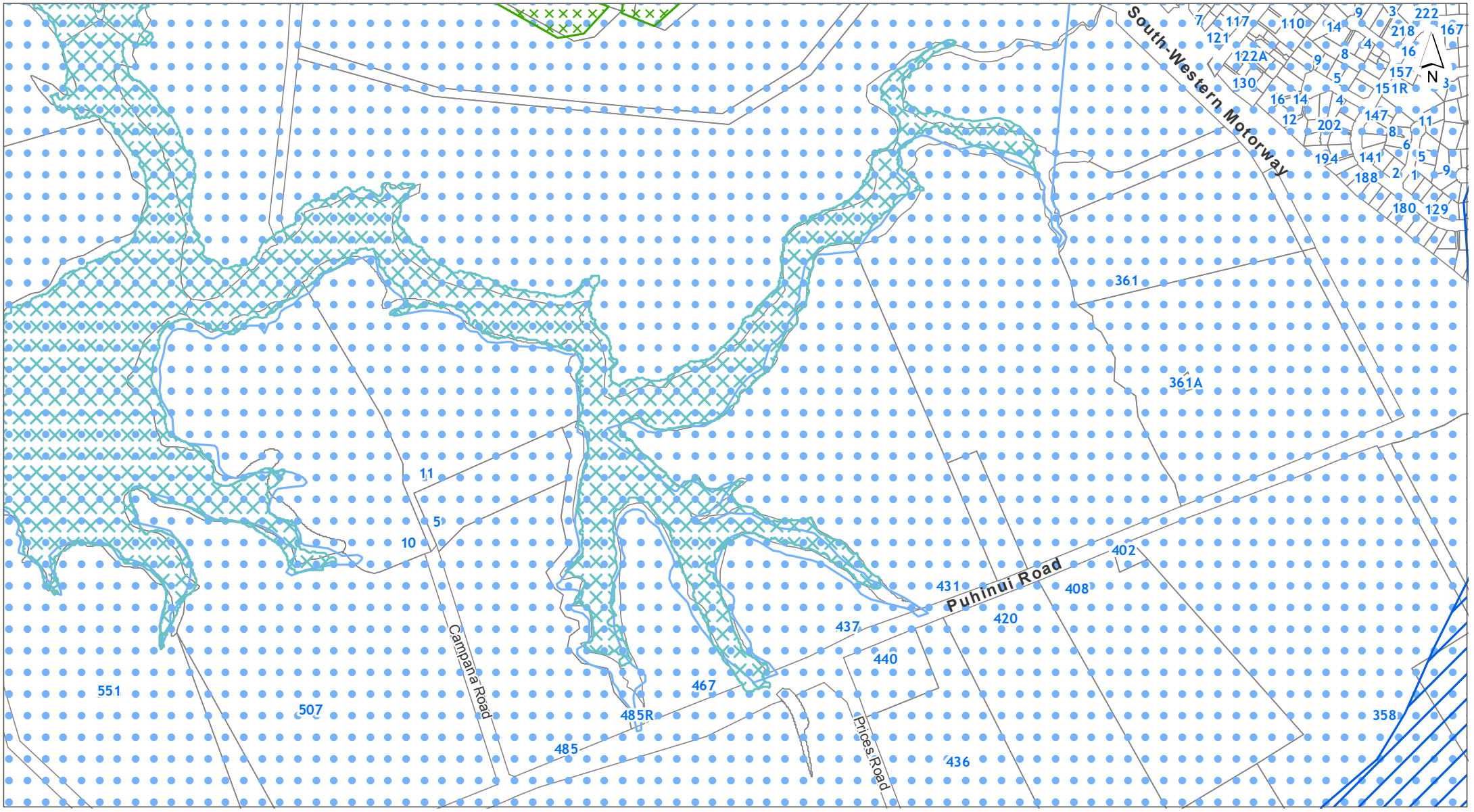
Natural Heritage
Significant Ecological Areas Overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau



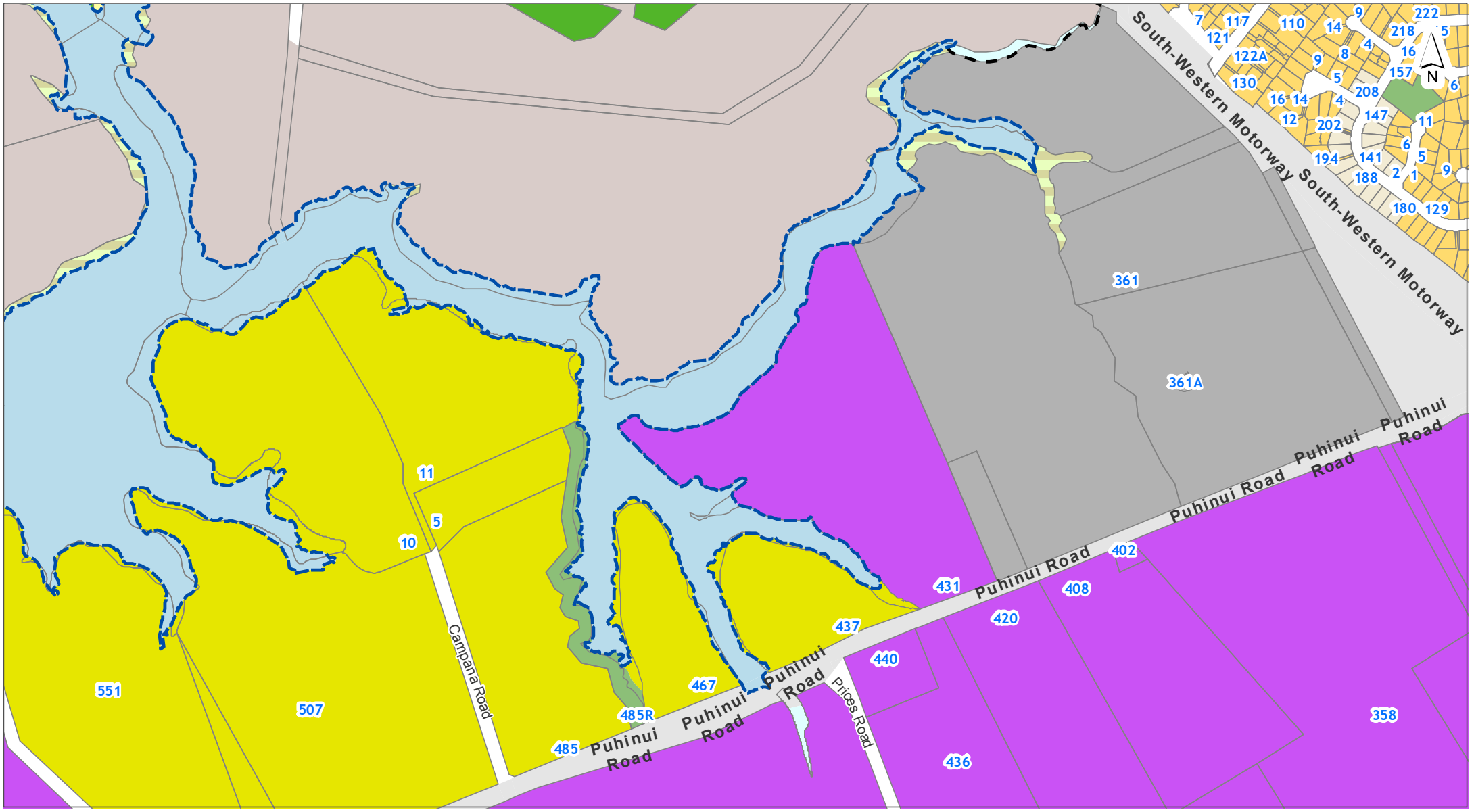
Natural Resources
Significant Ecological Areas Overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau



Zones and Rural Urban Boundary
Significant Ecological Areas Overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Auckland Unitary Plan Operative in part 15th November 2016 - LEGEND

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Date: 16/01/2024

NOTATIONS

Appeals to the Proposed Plan

Appeals seeking changes to zones or management layers

Proposed Modifications to Operative in part Plan

Notice of Requirements

Proposed Plan Changes

Tagging of Provisions:

[i] = Information only

[rp] = Regional Plan

[rcp] = Regional Coastal Plan

[rps] = Regional Policy Statement

[dp] = District Plan (only noted when dual provisions apply)

ZONING

Residential

- Residential - Large Lot Zone
- Residential - Rural and Coastal Settlement Zone
- Residential - Single House Zone
- Residential - Mixed Housing Suburban Zone
- Residential - Mixed Housing Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone

Business

- Business - City Centre Zone
- Business - Metropolitan Centre Zone
- Business - Town Centre Zone
- Business - Local Centre Zone
- Business - Neighbourhood Centre Zone
- Business - Mixed Use Zone
- Business - General Business Zone
- Business - Business Park Zone
- Business - Heavy Industry Zone
- Business - Light Industry Zone

Open space

- Open Space - Conservation Zone
- Open Space - Informal Recreation Zone
- Open Space - Sport and Active Recreation Zone
- Open Space - Civic Spaces Zone
- Open Space - Community Zone
- Water [i]

Rural

- Rural - Rural Production Zone
- Rural - Mixed Rural Zone
- Rural - Rural Coastal Zone
- Rural - Rural Conservation Zone
- Rural - Countryside Living Zone
- Rural - Waitakere Foothills Zone
- Rural - Waitakere Ranges Zone

Future Urban

- Future Urban Zone
- Green Infrastructure Corridor (Operative in some Special Housing Areas)

Infrastructure

- Special Purpose Zone - Airports & Airfields
  Cemetery
  Quarry
  Healthcare Facility & Hospital
  Tertiary Education
  Māori Purpose
  Major Recreation Facility
  School
- Strategic Transport Corridor Zone

Coastal

- Coastal - General Coastal Marine Zone [rcp]
- Coastal - Marina Zone [rcp/dp]
- Coastal - Mooring Zone [rcp]
- Coastal - Minor Port Zone [rcp/dp]
- Coastal - Ferry Terminal Zone [rcp/dp]
- Coastal - Defence Zone [rcp]
- Coastal - Coastal Transition Zone

Precincts

Rural Urban Boundary

Indicative Coastline [i]

Overlays

Natural Resources

- Terrestrial [rp/dp]
- Marine 1 [rcp]
- Marine 2 [rcp]

Significant Ecological Areas Overlay

- Water Supply Management Areas Overlay [rp]
- Natural Stream Management Areas Overlay [rp]
- High-Use Stream Management Areas Overlay [rp]
- Natural
- Urban
- High-Use Aquifer Management Areas Overlay [rp]
- Quality-Sensitive Aquifer Management Areas Overlay [rp]
- Wetland Management Areas Overlay [rp]

Infrastructure

- Airport Approach Surface Overlay
- Aircraft Noise Overlay
- City Centre Port Noise Overlay [rcp / dp]
- Quarry Buffer Area Overlay
- National Grid Subdivision Corridor
- National Grid Substation Corridor
- National Grid Yard Compromised
- National Grid Yard Uncompromised

National Grid Corridor Overlay

Mana Whenua

- Sites & Places of Significance to Mana Whenua Overlay [rcp/dp]

Built Environment

- Identified Growth Corridor Overlay

Natural Heritage

- Verified position of tree
- Unverified position of tree
- Group of Trees

Notable Trees Overlay

- Outstanding Natural Features Overlay [rcp/dp]
- Outstanding Natural Landscapes Overlay [rcp/dp]
- Outstanding Natural Character Overlay [rcp/dp]
- High Natural Character Overlay [rcp/dp]
- Viewshafts
- Height Sensitive Areas

Regionally Significant Volcanic Viewshafts & Height Sensitive Areas Overlay [rcp/dp]

- Regionally Significant Volcanic Viewshafts Overlay Contours [i]
- Locally Significant Volcanic Viewshafts Overlay [rcp/dp]
- Locally Significant Volcanic Viewshafts Overlay Contours [i]
- Modified
- Natural

Ridgeline Protection Overlay

- Local Public Views Overlay [rcp/dp]
- Extent of Overlay
- Subdivision Schedule

Waitakere Ranges Hertage Area Overlay

Historic Heritage & Special Character

- Historic Heritage Overlay Place [rcp/dp]
- Historic Heritage Overlay Extent of Place [rcp/dp]
- Special Character Areas Overlay Residential and Business
- Auckland War Memorial Museum Viewshaft Overlay [rcp/dp]
- Auckland War Memorial Museum Viewshaft Overlay Contours [i]
- Stockade Hill Viewshaft Overlay – 8m height area
- Stockade Hill Viewshaft [i]

Controls

- Key Retail Frontage
- General Commercial Frontage

Building Frontage Control

- Adjacent to Level Crossings
- General
- Motorway Interchange Control

Vehicle Access Restiction Control

- Centre Fringe Office Control
- Height Variation Control
- Parking Variation Control
- Level Crossings With Sightlines Control
- Arterial Roads
- Business Park Zone Office Control
- Hazardous Facilities
- Infrastructure

Emergency Management Area Control

- Macroinvertebrate Community Index
- Flow 1 [rp]
- Flow 2 [rp]

Stormwater Management Area Control

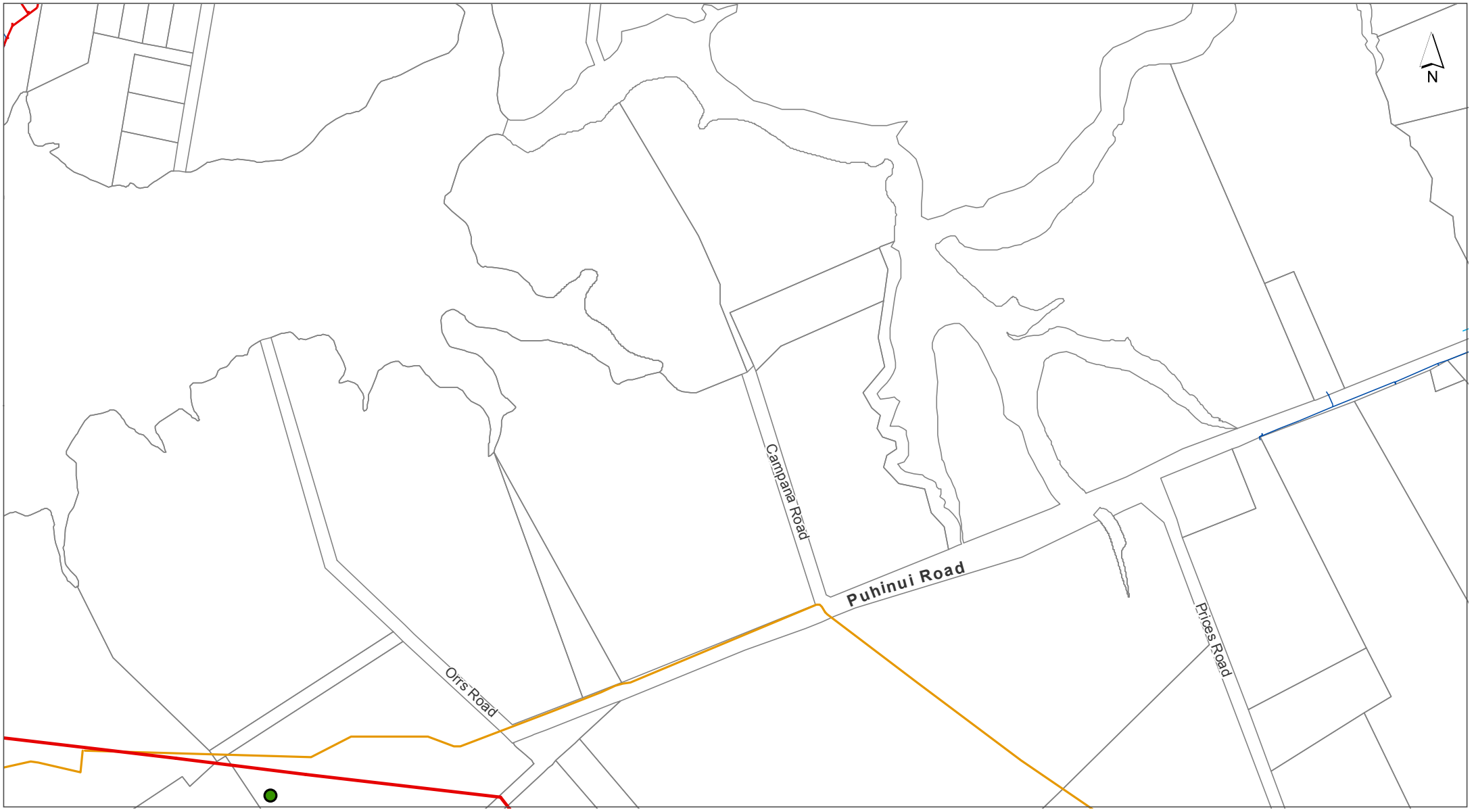
- Subdivision Variation Control
- Indigenous Vegetation 749.7 ha
- Freshwater Wetland 14.6 ha

Kawau Island Rural Subdivision SEAs Control

- Surf Breaks [rcp]
- Cable Protection Areas Control [rcp]
- Coastal Inundation 1 per cent AEP Plus 1m Control

Designations

- 123 Designations
- 200 Airspace Restriction Designations



Underground Services
Capmana Road Plan Change

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Auckland Council — Utilities and Underground Services — Legend

Stormwater

Note: Unless otherwise specified in the text below, the *colour* of a Stormwater symbol is determined by the ownership or useage status, using the following colour scheme:
Public , **Private** or **Abandoned**

- Treatment Device
- Septic Tank
- Septic Tank (Hi-Tech)
- Soakage System
- Inspection Chamber
- Manhole (Standard / Custom)
- Inlet & Outlet Structure
- Inlet & Outlet (No Structure)
- Catchpit
- Spillway
- Safety Benching
- Culvert / Tunnel
- Subsoil Drain
- Gravity Main
- Rising Main
- Connection
- Fence
- Lined Channel
- Watercourse
- Overland Flowpath (Public)
- Overland Flowpath (Private)
- Forebay (Public)
- Forebay (Private)
- Treatment Facility (Public)
- Treatment Facility (Private)
- Pump Station
- Planting
- Embankment
- Viewing Platform
- Bridge
- Erosion & Flood Control (Other Structure)
- Erosion & Flood Control (Wall Structure)

Water

- Valve
- Hydrant
- Fitting
- Other Watercare Point Asset
- Other Watercare Linear Asset
- Local Pipe (Operational-NonPotable)
- Local Pipe (Operational-Potable)
- Local Pipe (Operational Not Vested)
- Local Pipe (Abandoned / Not Operational)
- Transmission Pipe (Operational-NonPotable)
- Transmission Pipe (Operational-Potable)
- Transmission Pipe (Not Operational)
- Transmission Pipe (Proposed)
- Pump Station
- Reservoir
- Other Structure (Local)
- Chamber (Transmission)
- Water Source (Transmission)
- Other Watercare Structures and Areas

Wastewater

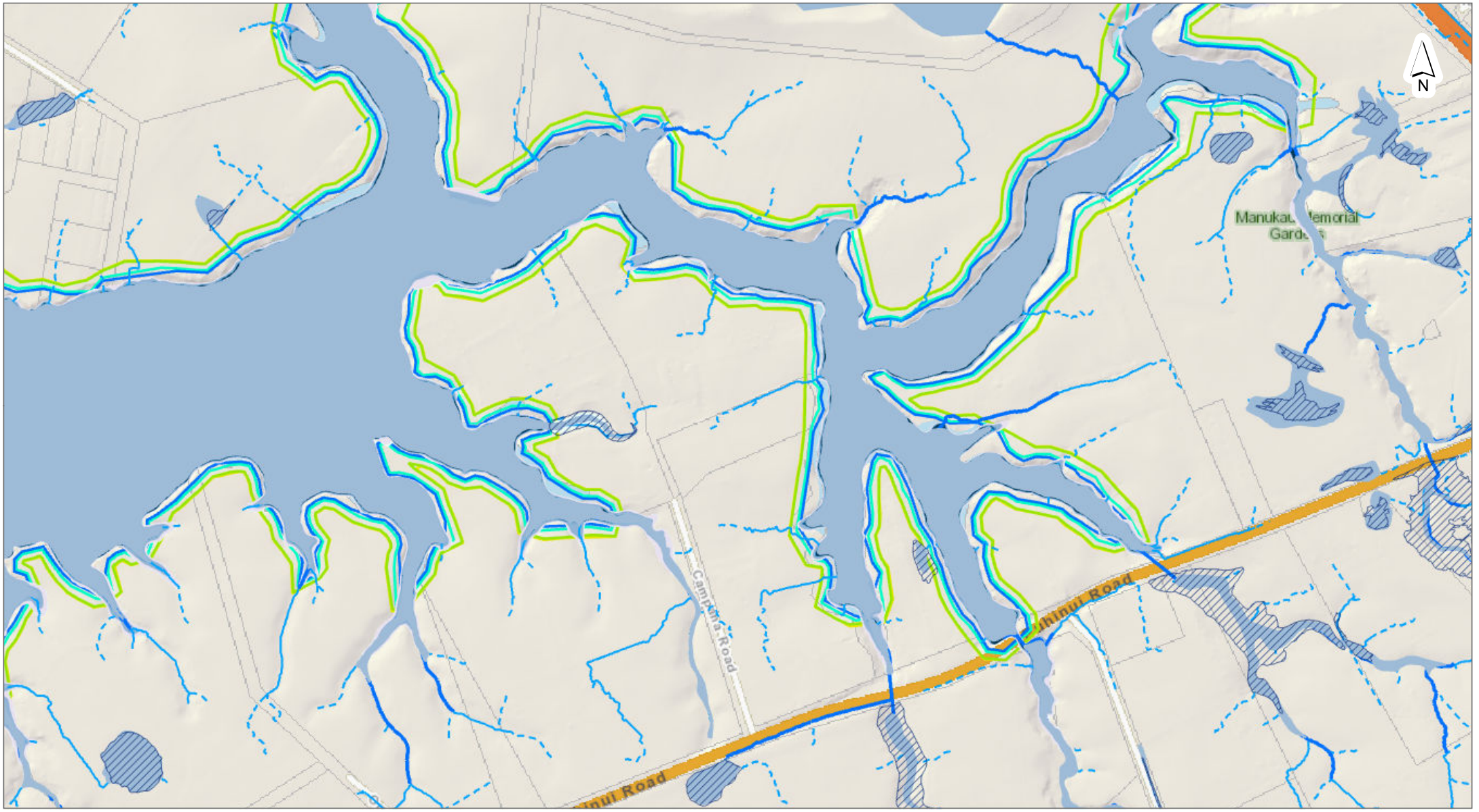
- Fitting
- Fitting (Non Watercare)
- Manhole
- Pipe (Non Watercare)
- Local Pipe (Operational)
- Local Pipe (Operational Not Vested)
- Local Pipe (Abandoned / Not Operational)
- Transmission Pipe (Operational)
- Transmission Pipe (Not Operational)
- Transmission Pipe (Proposed)
- Chamber
- Structure (Non Watercare)
- Pump Station
- Wastewater Catchment

Utilities

- Transpower Site
- Pylon (Transpower)
- 110 kv - Electricity Transmission
- 220 kv - Electricity Transmission
- 400 kv - Electricity Transmission
- Aviation Jet A1 Fuel Pipeline
- Liquid Fuels Pipeline [Marsden to Wiri]
- Gas Transmission Pipeline
- High-Pressure Gas Pipeline
- Medium-Pressure Gas Pipeline
- Indicative Steel Mill Slurry Pipeline
- Indicative Steel Mill Water Pipeline
- Fibre Optic Cable (ARTA)
- Contour Interval

Legend updated: 21/09/2020

Auckland Council
Te Kaunihera o Tāmaki Makaurau



Natural Hazard

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Flood Prone Areas

Flood Prone Areas

Flood Plains

Flood Plains

Overland Flow Paths - 100ha and above (25,000)

Overland Flow Paths - 100ha and above (25,000)

Overland Flow Paths - 3ha to 100ha (25,000)

Overland Flow Paths - 3ha to 100ha (25,000)

Overland Flow Paths - 1ha to 3ha (15,000)

Overland Flow Paths - 1ha to 3ha (15,000)

Overland Flow Paths - 4000m2 to 1ha (8,000)

Overland Flow Paths - 4000m2 to 1ha (8,000)

5 year return

5 year return

20 year return

20 year return

50 year return

50 year return

100 year return

100 year return

50 year return 1m sea level rise

50 year return 1m sea level rise

100 year return 1m sea level rise

100 year return 1m sea level rise

50 year return 2m sea level rise

50 year return 2m sea level rise

100 year return 2m sea level rise

100 year return 2m sea level rise

Coastal Inundation (1% AEP)

1% AEP

1% AEP plus 1m sea level rise

1% AEP plus 2m sea level rise

ASCIE 2050 (RCP8.5)

ASCIE 2050 (RCP8.5)

ASCIE 2080 (RCP8.5)

ASCIE 2080 (RCP8.5)

ASCIE 2130 (RCP8.5)

ASCIE 2130 (RCP8.5)

ASCIE 2130 (RCP8.5+)

ASCIE 2130 (RCP8.5+)

Place Names

Place Name (25,000)

Place Name (25,000)

Public Open Space Names (8,000)

Public Open Space Names (8,000)

Place Name Search

Place Name Search

Rail Stations

Rail Stations (8,000)

Rail Stations (8,000)

Railway Lines

Railway (25,000)

Railway (25,000)

Auckland Council Boundary

Auckland Council Boundary

Roads

Roads (8,000)

Motorway

Motorway Under Construction

Secondary Arterial Road

Secondary Arterial Road Under Construction

Primary Arterial Road

Primary Arterial Road Under Construction

Collector Road

Collector Road Under Construction

Local Road

Local Road Under Construction

Property

Property

Rate Assessment

Rate Assessment

Parcels

Parcels

Coastline

Base Region (CRS)

Land Outside

Water

Region Cache Public Open Space Extent

Region Cache Public Open Space Extent

LIDAR2006 1m DEM Hillshade

High : 254 - Low : 0

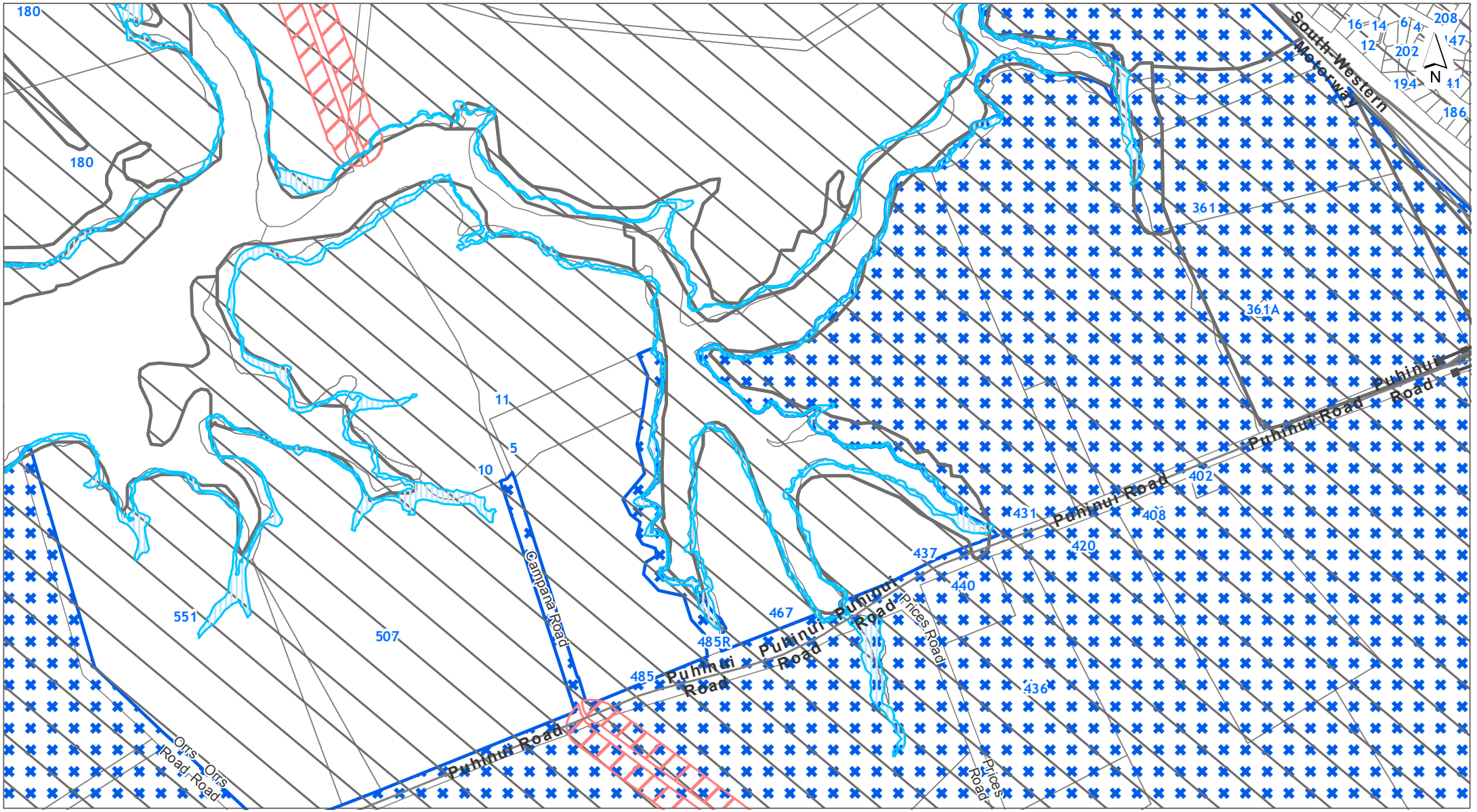
NZ Hillshade

High : 254 - Low : 0

Legend

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau



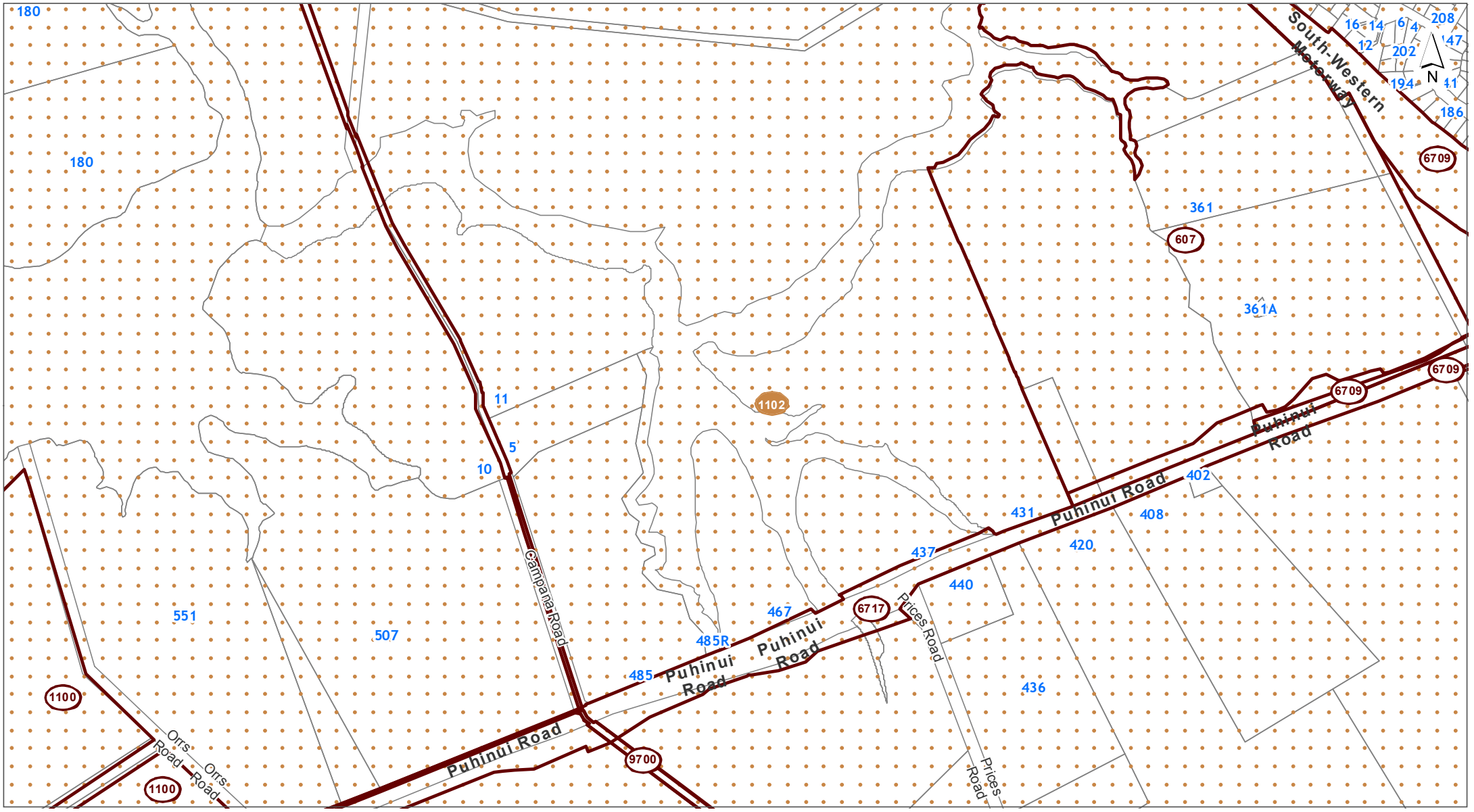
Controls
SMAF 1 overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau



Designations
SMAF 1 overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Historic Heritage and Special Character
SMAF 1 overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Mana Whenua
SMAF 1 overlay

0 50 100 150
Meters

Scale @ A4
= 1:8,000

Date Printed:
23/01/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Auckland Unitary Plan Operative in part 15th November 2016 - LEGEND

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Date: 16/01/2024

NOTATIONS

Appeals to the Proposed Plan

Appeals seeking changes to zones or management layers

Proposed Modifications to Operative in part Plan

Notice of Requirements

Proposed Plan Changes

Tagging of Provisions:

[i] = Information only

[rp] = Regional Plan

[rcp] = Regional Coastal Plan

[rps] = Regional Policy Statement

[dp] = District Plan (only noted when dual provisions apply)

ZONING

Residential

- Residential - Large Lot Zone
- Residential - Rural and Coastal Settlement Zone
- Residential - Single House Zone
- Residential - Mixed Housing Suburban Zone
- Residential - Mixed Housing Urban Zone
- Residential - Terrace Housing and Apartment Buildings Zone

Business

- Business - City Centre Zone
- Business - Metropolitan Centre Zone
- Business - Town Centre Zone
- Business - Local Centre Zone
- Business - Neighbourhood Centre Zone
- Business - Mixed Use Zone
- Business - General Business Zone
- Business - Business Park Zone
- Business - Heavy Industry Zone
- Business - Light Industry Zone

Open space

- Open Space - Conservation Zone
- Open Space - Informal Recreation Zone
- Open Space - Sport and Active Recreation Zone
- Open Space - Civic Spaces Zone
- Open Space - Community Zone
- Water [i]

Rural

- Rural - Rural Production Zone
- Rural - Mixed Rural Zone
- Rural - Rural Coastal Zone
- Rural - Rural Conservation Zone
- Rural - Countryside Living Zone
- Rural - Waitakere Foothills Zone
- Rural - Waitakere Ranges Zone

Future Urban

- Future Urban Zone
- Green Infrastructure Corridor (Operative in some Special Housing Areas)

Infrastructure

- Special Purpose Zone - Airports & Airfields
  Cemetery
  Quarry
  Healthcare Facility & Hospital
  Tertiary Education
  Māori Purpose
  Major Recreation Facility
  School
- Strategic Transport Corridor Zone

Coastal

- Coastal - General Coastal Marine Zone [rcp]
- Coastal - Marina Zone [rcp/dp]
- Coastal - Mooring Zone [rcp]
- Coastal - Minor Port Zone [rcp/dp]
- Coastal - Ferry Terminal Zone [rcp/dp]
- Coastal - Defence Zone [rcp]
- Coastal - Coastal Transition Zone

Precincts

Rural Urban Boundary

Indicative Coastline [i]

Overlays

Natural Resources

- Terrestrial [rp/dp]
- Marine 1 [rcp]
- Marine 2 [rcp]

Significant Ecological Areas Overlay

- Water Supply Management Areas Overlay [rp]
- Natural Stream Management Areas Overlay [rp]
- High-Use Stream Management Areas Overlay [rp]
- Natural
- Urban
- High-Use Aquifer Management Areas Overlay [rp]
- Quality-Sensitive Aquifer Management Areas Overlay [rp]
- Wetland Management Areas Overlay [rp]

Infrastructure

- Airport Approach Surface Overlay
- Aircraft Noise Overlay
- City Centre Port Noise Overlay [rcp / dp]
- Quarry Buffer Area Overlay
- National Grid Subdivision Corridor
- National Grid Substation Corridor
- National Grid Yard Compromised
- National Grid Yard Uncompromised

National Grid Corridor Overlay

Mana Whenua

- Sites & Places of Significance to Mana Whenua Overlay [rcp/dp]

Built Environment

- Identified Growth Corridor Overlay

Natural Heritage

- Verified position of tree
- Unverified position of tree
- Group of Trees

Notable Trees Overlay

- Outstanding Natural Features Overlay [rcp/dp]
- Outstanding Natural Landscapes Overlay [rcp/dp]
- Outstanding Natural Character Overlay [rcp/dp]
- High Natural Character Overlay [rcp/dp]
- Viewshafts
- Height Sensitive Areas

Regionally Significant Volcanic Viewshafts & Height Sensitive Areas Overlay [rcp/dp]

- Regionally Significant Volcanic Viewshafts Overlay Contours [i]
- Locally Significant Volcanic Viewshafts Overlay [rcp/dp]
- Locally Significant Volcanic Viewshafts Overlay Contours [i]
- Modified
- Natural

Ridgeline Protection Overlay

- Local Public Views Overlay [rcp/dp]
- Extent of Overlay
- Subdivision Schedule

Waitakere Ranges Hertage Area Overlay

Historic Heritage & Special Character

- Historic Heritage Overlay Place [rcp/dp]
- Historic Heritage Overlay Extent of Place [rcp/dp]
- Special Character Areas Overlay Residential and Business
- Auckland War Memorial Museum Viewshaft Overlay [rcp/dp]
- Auckland War Memorial Museum Viewshaft Overlay Contours [i]
- Stockade Hill Viewshaft Overlay – 8m height area
- Stockade Hill Viewshaft [i]

Controls

- Key Retail Frontage
- General Commercial Frontage

Building Frontage Control

- Adjacent to Level Crossings
- General
- Motorway Interchange Control

Vehicle Access Restiction Control

- Centre Fringe Office Control
- Height Variation Control
- Parking Variation Control
- Level Crossings With Sightlines Control
- Arterial Roads
- Business Park Zone Office Control
- Hazardous Facilities
- Infrastructure

Emergency Management Area Control

- Macroinvertebrate Community Index
- Flow 1 [rp]
- Flow 2 [rp]

Stormwater Management Area Control

- Subdivision Variation Control
- Indigenous Vegetation 749.7 ha
- Freshwater Wetland 14.6 ha

Kawau Island Rural Subdivision SEAs Control

- Surf Breaks [rcp]
- Cable Protection Areas Control [rcp]
- Coastal Inundation 1 per cent AEP Plus 1m Control

Designations

- 123 Designations
- 200 Airspace Restriction Designations

Table 3-5: Extreme sea-level at Onehunga.

Elevations are relative to AVD-46 including +0.22 m offset for baseline mean sea level (present-day estimate). C.I. = confidence interval. Elevations calculated from tide-gauge data.

AEP	0.39	0.18	0.10	0.05	0.02	0.01	0.005
ARI	2	5	10	20	50	100	200
Median	2.48	2.56	2.62	2.70	2.83	2.93	3.04
Lower 95th C.I.	2.47	2.55	2.61	2.68	2.78	2.87	2.95
Upper 95th C.I.	2.48	2.57	2.64	2.73	2.87	3.01	3.16

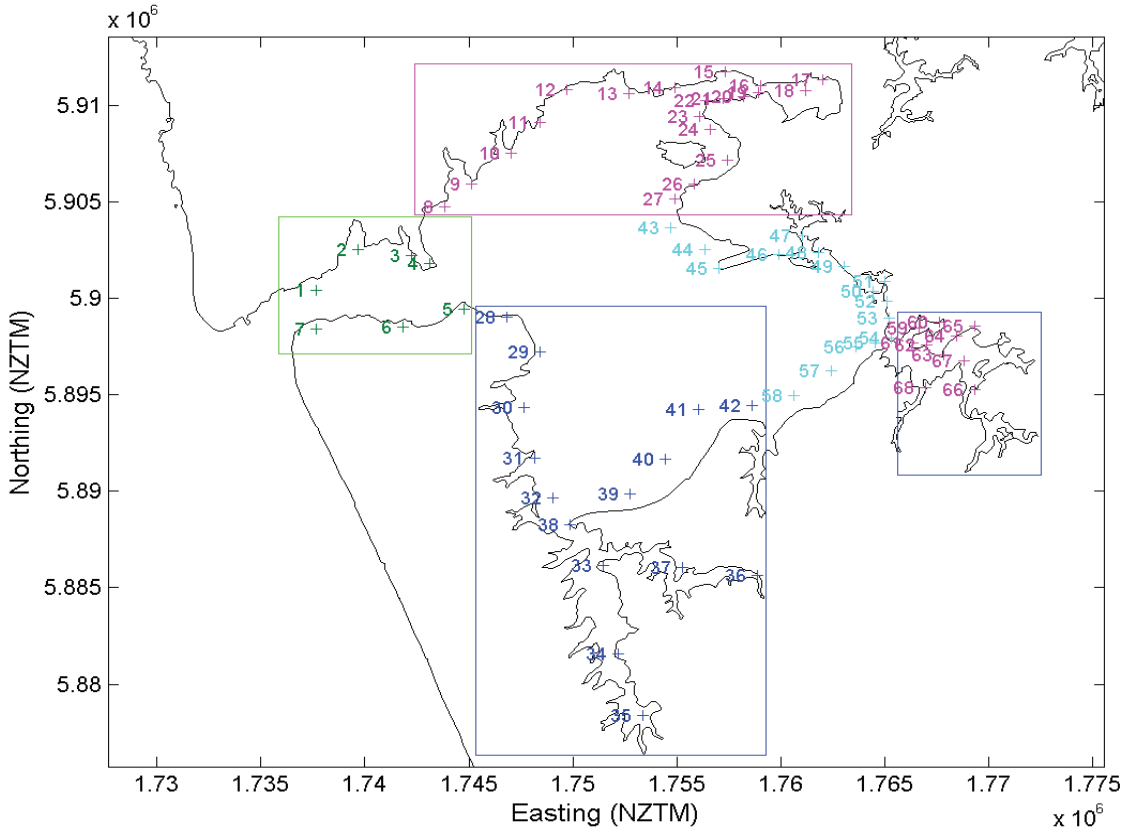


Figure 3-15: Locations of extreme sea-level calculations in the Manukau Harbour.

(Colour-coding corresponds to Table 3-6.)

Site	Easting (NZTM)	AEP:	0.39	0.18	0.1	0.05	0.02	0.01	0.005
		ARI:	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr
		Northing (NZTM)							
27	1754934	5905159	2.42	2.48	2.53	2.61	2.75	2.86	2.97
28	1746847	5899044	2.32	2.36	2.39	2.43	2.51	2.61	2.71
29	1748450	5897247	2.37	2.41	2.45	2.49	2.58	2.68	2.78
30	1747655	5894346	2.38	2.42	2.46	2.50	2.60	2.71	2.82
31	1748160	5891747	2.44	2.48	2.53	2.58	2.71	2.83	2.95
32	1749064	5889649	2.49	2.55	2.61	2.68	2.83	2.95	3.08
33	1751470	5886154	2.53	2.58	2.63	2.72	2.89	3.03	3.17
34	1752179	5881555	2.63	2.70	2.77	2.86	3.04	3.18	3.32
35	1753385	5878358	2.67	2.74	2.82	2.93	3.12	3.26	3.42
36	1758871	5885667	2.68	2.75	2.82	2.93	3.12	3.26	3.41
37	1755270	5886061	2.67	2.72	2.78	2.88	3.05	3.20	3.34
38	1749867	5888251	2.49	2.54	2.59	2.67	2.84	2.97	3.11
39	1752763	5889856	2.44	2.49	2.55	2.64	2.81	2.95	3.08
40	1754460	5891659	2.45	2.50	2.56	2.65	2.82	2.95	3.09
41	1756055	5894262	2.43	2.48	2.54	2.62	2.79	2.93	3.06
42	1758654	5894467	2.43	2.49	2.55	2.64	2.82	2.95	3.09
43	1754737	5903659	2.41	2.46	2.51	2.56	2.65	2.73	2.82
44	1756339	5902562	2.42	2.48	2.52	2.58	2.67	2.76	2.86
45	1757041	5901563	2.43	2.48	2.52	2.57	2.68	2.77	2.87
46	1759939	5902269	2.49	2.55	2.60	2.66	2.77	2.87	2.96
47	1761037	5903271	2.55	2.61	2.66	2.72	2.83	2.92	3.02
48	1761839	5902372	2.55	2.61	2.67	2.73	2.85	2.95	3.05
49	1763040	5901675	2.54	2.61	2.67	2.74	2.87	2.97	3.07
50	1764443	5900377	2.56	2.62	2.69	2.77	2.90	3.01	3.12
51	1765042	5900879	2.57	2.64	2.71	2.79	2.92	3.02	3.13
52	1765144	5899879	2.56	2.63	2.69	2.78	2.92	3.03	3.14
53	1765246	5898979	2.56	2.62	2.69	2.77	2.92	3.05	3.17
54	1765347	5897979	2.55	2.62	2.68	2.77	2.92	3.05	3.18

APPENDIX B –TE AKATIA WAIOHUA PRINCIPLE

Campana Landowners Plan Change

Sub-precinct principles to address Te Ākitai Waiohua values (20/12/2023)

1. Support overall reliance on the Puhinui Precinct objectives and policies as they provide the framework for appropriate rules, standards and assessment.
2. *Stormwater*
   a. Policy (3)(e) provides a framework for integrated stormwater management (along with the Auckland-wide provisions) requiring SMAF and quality treatment
   b. The principle discussed was to imitate the natural water system through a hierarchy of at-source management via infiltration (bio-retention) as the first principle and then appropriate management if that is not possible. Encourage water sensitive design and innovative stormwater solutions such as green roofs.
   c. Important to reduce increased discharge to the Waokauri Creek and ensure quality treatment for 100% impervious areas and suggest this approach will need a sub-precinct standard and assessment criteria
   d. Note Assessment Criteria I432.8.2(c)(iii) provides for some elements of providing for infiltration to avoid earthworks compacting available areas suitable for infiltration. Not sure how or whether this has been applied in any of the recent developments.
3. *Cultural values*
   a. Policies (2) and (3) provide a suitable framework to rely on generally.
   b. Support a sub-precinct policy that reflects the likelihood of archaeological finds during earthworks. The following is still reasonably generic but could support a range of precinct provisions:

      Require development to avoid where practicable or minimise the impacts of land disturbance on cultural, heritage and ecological values while enabling light industrial activities.

   c. Auckland-wide plan provisions only relate to scheduled sites or accidental discovery protocols
   d. The question is whether the archaeology needs to be scheduled. CFG to assess against the RPS criteria for historic heritage and if warrants scheduling or is better managed through precinct provisions. If scheduled will enable all relevant provisions of Chapter D17 to apply, meaning provisions are not needed here.
   e. If not scheduled alternative approach could be to:
      i. Identify extent (to be determined by CFC) on precinct plan and develop specific provisions to include:
         - Non complying activity for earthworks
         - Restricted discretionary activity for planting
         - Assessment criteria
      ii. Standards requiring no activity within areas identified as archaeological sites and requirement for Archaeological Management Plan as per Wiri Precinct depending on the outcome of CFG work because this may actually be achieved now and then we should consider what needs to be included in the precinct to imbed that.
      iii. Assessment criteria

f. Subject to consideration of archaeological impacts apply at least a 50m coastal yard consistent with sub-precincts A and H which adjoin the creek. Potential open space zoning can be dealt with later.
g. Need to identify risk areas and potential impacts from development as it relates to potential archaeology in particular
h. Keen to understand the visibility of the site from the Pūkaki Marae and how the provisions manage any visual effects – noting that there is a direct line of site to the western area of the site. This could further support the higher amenity area below Wetland D. Planting and landscaping may also address this.

4. *Ecology*
   a. Concern that the NPSFM and NESF cannot be solely relied upon given the Government's direction to review these. Therefore consider including provisions in the precinct to strengthen protection of wetlands which was missed in the original precinct.
   b. Consider whether reclamation of wetland needs to be included in the activity table or can rely on Auckland-wide provisions.
   c. Consider including standard and assessment criteria that requires higher standard of earthworks management to avoid sedimentation discharge into the receiving environment (SEA-M2).

CAMPANA ROAD PROPOSED PLAN CHANGE - CLAUSE 23 RESPONSE

CLIENT: CAMPANA LAND OWNERS CONSORTIUM

This memo is provided in response to letter "RE: Clause 23(1) Resource Management Act 1991 Further Information – Private Plan Change request" dated 8 May 2024 provided by Auckland council in relation to the proposed private plan change at Campana Road, Puhinui. The response is provided covers items SW1 – SW5 & GW1 for which are detailed below.

SW1 – STREAM EROSION

Stream erosion – watercourse 14 & 33

Information Concern
SMP section 6.5.1 notes that the majority of the site discharges to the coast and no hydrology mitigation is required. However a portion of the site will discharge to "Watercourse 14" and 33 – that matter needs to be assessed. This should consider the state of the stream and the vulnerability of the stream to erosion. Mitigation could consider inclusion of instream measures or of flow mitigation depending which is more appropriate for the stream in this location.

Information Request SW1 - watercourse 14 & 33
Please provide information on the potential effects of changes in stormwater runoff flows to the streams and discuss any mitigation needed to protect the streams from erosion.

Maven Response:

Engagement with Te Akitai Waiohua was undertaken to develop stormwater management principles and values for the SMP. As a result the following provision has been included within the SMP which will also ensure that the effects of stream erosion will be mitigated by reducing the runoff from frequent rain events.

- is considered the BPO.

Frequent Rain Event Management – Hydrology mitigation SMAF 1 is not required for most of the PCA area except Campana Road which discharges toward an existing stream. Stormwater reused tanks are proposed for all roof areas which will provide a minimum of 5mm retention. For the hardstand/ driveway and other impervious areas, 5mm of retention is required where ground soakage is feasible. This approach is in line with Te Akitai Waiohua Principle.

SW2 - STORMWATER MITIGATION – CAMPANA ROAD

Stormwater mitigation - Campana Road

Information Concern
Swales have not been a preferred asset in the road corridor by AT on other projects and without the asset owner in principle approval this may not be a viable option to provide the required mitigation.

Information Request SW2 - Stormwater mitigation - Campana Road
Please confirm that the proposed swale has been discussed with Auckland Transport as the future asset owner of this device.

Maven Response:

Swales have initially been proposed on Campana due to the following:

- A Wiri oil underground pipeline located within the existing road reserve and swales provide a conveyance mechanism without piping so reduces any reduces any disturbance within the proximity to this.
- Provides a means of treatment and ground infiltration given the limited space within the road reserve to achieve SMAF1 compliance

We do note that Campana Road is an existing road reserve and applicant is receptive to amending cross section to align with alternative Auckland Transport requirements if so required but no feedback was received from them to date. This could be achieved through retaining walls and alternative devices to comply with the SMAF requirements.

SW3 - STORMWATER NETWORK & FLOOD MANAGEMENT - INFORMATION

Stormwater network and flood management - Information

Information Concern

Further information is required in respect of the Stormwater network and flood management measures required to support future development.

Information Request SW3 - Stormwater network and flood management

Please:

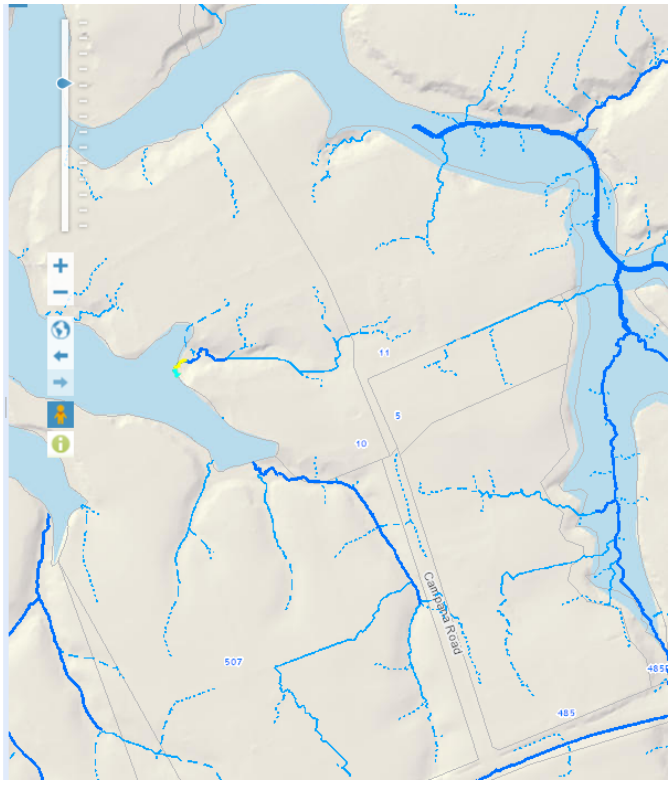
- **provide a plan to show indicative layout of the proposed public stormwater network.**
- **provide a plan to show post earthworks overland flow paths and areas that will have ponding of water with a flow rate of over $2m^3/s$.**
- **provide the indicative number and location of private and public coastal/stream outfalls intended to serve the proposed plan change area.**

Maven Response:

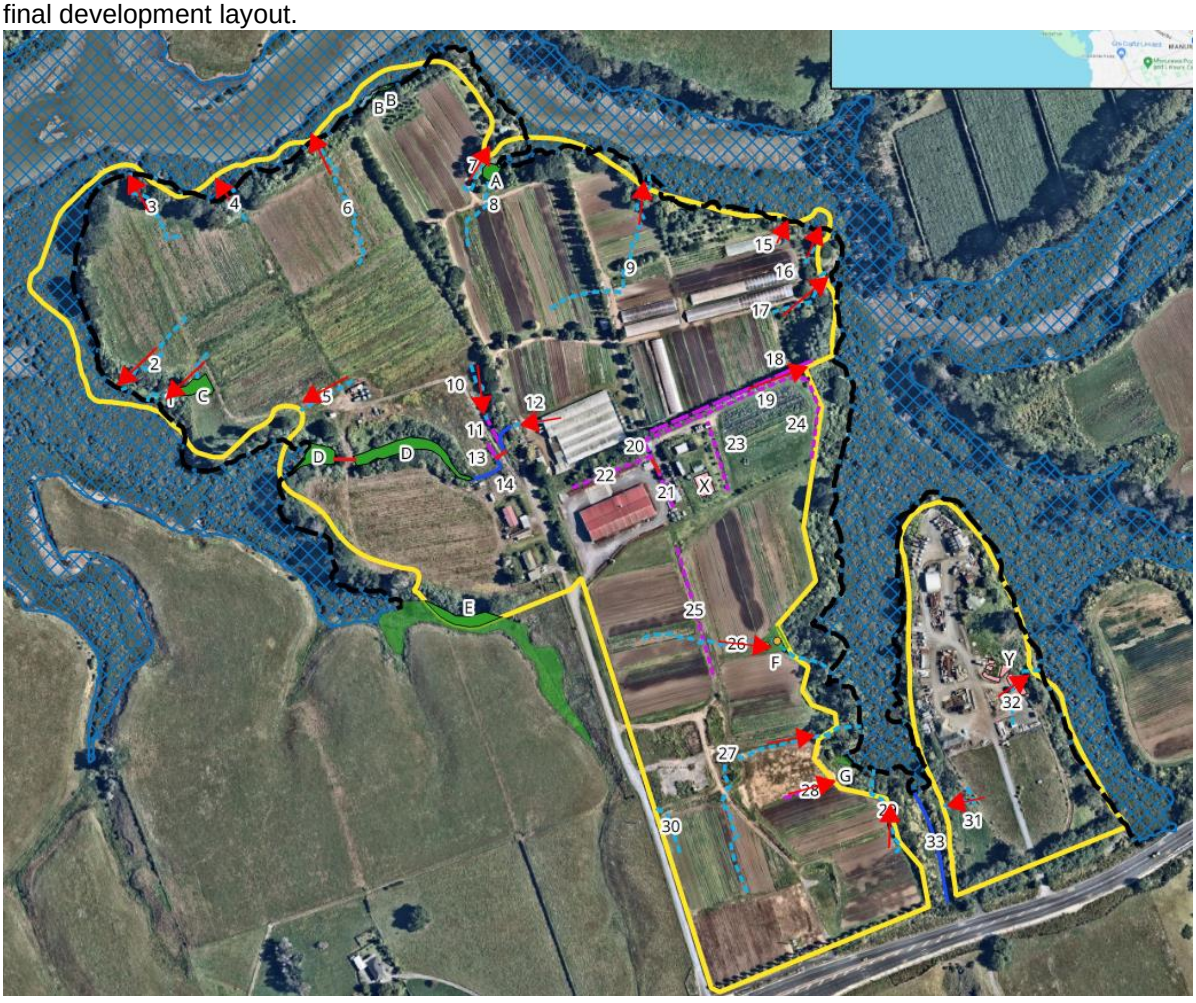
- A development masterplan has not been developed as part of the plan change application as subdivision of the sites is not yet proposed. It is expected that this will be completed under a future resource consent application. It is however anticipated that the extent of public piped networks (if any) would be limited to the Campana Road reserve and that on lot pipework would be private lines and outfalls to the existing OLFP discharge points within the site that would be subject to relevant assessment under a resource consent process.
- Specific flooding analysis of the site has not been undertaken due to the coastal nature and discharge from the site not presenting any potential for downstream issues and the gradients and levels of the site not presenting any specific channellings. Specific analysis of OLFP's and ponding will be completed in a future detailed design and resource consent process once a more detailed development proposal in line with the new zoning provisions has been completed and final earthworks modelling determined. It is however noted that under the existing Auckland Council modelling for 100 yr scenario with Climate Change that the largest catchment within the PCA relates to a peak flow of 1.8m3/s with a 64.5% impervious area for context. Although impervious areas and catchments may differ as part of future development we anticipate that this level of analysis can be managed under a subsequent resource consent process.

Overland Flow Paths - 3ha to 100ha (25,000)

Attribute	Value
Peak Flow 100yr Future 3.8 degree (m3/s)	1.8
Peak Flow 10yr Future 3.8 degree (m3/s)	1.07
Peak Flow 2yr Future 3.8 degree (m3/s)	0.5
Catchment Area (m2)	49151
Impervious Future (%)	64.5
Impervious Existing (%)	19.33
CN average Future	83.52
CN average Existing	65.1
ToC Future (min)	0.34
ToC Existing (min)	0.42
Slope (%)	2.11
Peak Flow 100yr Existing (m3/s)	0.76
Peak Flow 10yr Existing (m3/s)	0.39
Peak Flow 2yr Existing (m3/s)	0.15
Channelisation Factor	1
Max Flow Length (m)	505.49
Rainfall 100yr Existing (mm)	197.37
Rainfall 10yr Existing (mm)	129.61
Rainfall 2yr Existing (mm)	74.02
Rainfall 95th Existing (mm)	32.82
Rainfall 90th Existing (mm)	23.98
Catchment Areas Group	3ha to 100ha
OLFP Segment Length (m)	12.33
Line ID	3554464



- We expect the indicative outfall locations to be as shown by the red arrows (20 locations) below on the extract of Appendix B from Viridis Ecological Impact Assessment to the modelled OLFP's and intermittent drains. Although this will be subject to a detailed design process based on determination of final development layout.



SW4 – STORMWATER QUALITY

Stormwater quality treatment

Information Concern

Section 6.4.1 of the Stormwater Management Plan proposes excluding roofs from needing water quality treatment if constructed from inert materials. However Table 6.5.3 states an expectation for the provision of bioretention or proprietary devices. The SMP has outlined that stormwater quality treatment and containment/removal of potential accidental spill of contamination will be addressed by each future lot. Further details are required of potential measures that may be implemented to address stormwater quality for future development. This should be based on an assessment of the likely site size and development type to be established, i.e. on what basis measures on the current water quality strategy is made.

Information Request SW4 – Stormwater quality treatment

Please:

- **clarify and confirm what/if mitigation is proposed for roofs within the Plan Change area.**
- **provide clarification whether the proposed approach is feasible for all developable land with consideration of landform of the area, whether there will be some area that no treatment will be provided, and the risks involved of discharging contaminants to the receiving environment.**
- **provide indicative quantities of raingardens, proprietary devices, swales and tree pit required to serve the future developable land, and comment whether alternative solutions have been considered.**

Maven Response:

- Quality Treatment for roof areas is not proposed if they are to be constructed of inert materials. This will then then be collected in a tank (sized for at least 5mm storage) which is dedicated to grey water reuse. Section 6.4.1 of SMP also states that as an alternative option the below will be implemented which could include bioretention or proprietary devices as applicable.

Or,

- An alternative level of mitigation determined through a SMP that:
  - applies an Integrated Stormwater Management Approach (as per above);
  - meets the NDC Objectives and Outcomes in Schedule 2; and
  - is considered the BPO.

- The proposed approach will be feasible to all developable land and the final proposal can be catered to ensure that the requirements of the SMP can be achieved.
- The uses of light industrial land is variable and the final development proposal is not yet determined hence the provision of the toolbox is more appropriate at time of plan change application. A more specific detailed layout of stormwater would be provided within future resource consent applications, and subject to review at such time. The SMP does provide adequate flexibility such that solutions can be explores within future developments If valid for the proposal.

SW5 – PIPING OF STREAM

Piping of streams

Information Concern

For adequate assessment, further details are required of the intermittent stream intended to be piped as part of the planned development.

Information Request SW5 - Piping of streams

Please provide further detail of the intermittent stream intended to be piped as part of the planned development.

Maven Response:

There are no intermittent streams recorded within the site that are proposed to be piped. Any permanent streams that are present will have sufficient setbacks in accordance with ecological guidelines. Extract from Viridis report below.

6.1.3 Streams

Small catchment sizes within the site means that there are few streams. Only two permanent streams, and no intermittent streams, have been identified within the PPC area.

GW1 – POTENTIAL GROUNDWATER EXTRACTION

Potential Groundwater Extraction

Information Concern

Chapter 8.0 of the submitted Infrastructure Report indicates that the proposed development will be serviced by a new public water network extension, consistent with the intended upgrades identified within Watercare's scheme. No information has been provided as to whether the applicant has considered an alternative water supply should there be delays to the planned upgrades by Watercare for the area. If it is considered that groundwater abstraction may be an option, high level assessments of potential water use requirements and information on the availabilities of groundwater from the underlying aquifers is required.

Information Request GW1 - Potential Groundwater Extraction

Please confirm that no need is envisaged for an alternative or back-up water supply plan, in the event that there are delays to the intended Watercare upgrades.

Maven Response:

There are existing groundwater take consents on the site as referenced in Babbage Report 66766- Freska Produce Wiri Hydrogeological Setting Final dated 28 September 2023. It is envisioned that these may be used for an interim servicing strategy for a portion of the light industrial land while Watercare upgrades occur. As per the Babbage report, the allowable groundwater take for 11 Campana Road is 25,000m3/year which is equivalent to 68.5m3/day. Figure 3 in the Babbage report also indicates there is an additional 3 active groundwater takes within the proposed plan change area which could contribute. Based on Maven Wastewater and Water Servicing Strategy Report 285001 dated 15/11/2023 the peak daily demand for water is 588,280l/day (588m3/day) based on Watercare code of practice. The proposed SMP also requires that buildings within the light industrial land also provide for rainwater harvesting for non-potable reuse which will

reduce demand. Although the combination of the above is not expected to provide servicing to the max probable development of the site, it should be assumed that this may be an appropriate measure for consideration as an interim servicing strategy. This would need to be further detailed at resource consent stage with full details of the final proposed land use and details of the allowable groundwater take within the plan change area.

CLOSING

We trust the above will meet your satisfaction and please feel free to contact the undersigned for additional clarification if required.

Ryan Wyllie (CPEng)

Associate

CAMPANA ROAD PROPOSED PLAN CHANGE - CLAUSE 23 RESPONSE

CLIENT: CAMPANA LAND OWNERS CONSORTIUM

This memo is provided in response to letter "RE: Clause 23(2) Resource Management Act 1991 Further Information – Private Plan Change request" dated 11 October 2024 provided by Auckland council in relation to the proposed private plan change at Campana Road, Puhinui. The response is provided covers items SW1, SW4 & SW5 for which are detailed below.

SW1 – STREAM EROSION

SW 1

The Clause 23 response simply restates there will be a 5mm retention for roofs (and maybe for hardstand), with no detention. The impact of the runoff on the stream and whether the proposed mitigation will be sufficient is not assessed.

Requests for information

Please provide information as to whether detention for hydrology mitigation is to be provided, and if not, the reasons for that.

Please provide information on the potential for stream erosion (including any ecological consequences).

Maven Response:

Watercourse 14 is the only stream set to receive stormwater runoff from the development. According to Viridis Ltd's ecological assessment, this stream is classified as low value and is primarily fed by a subsoil drain from the Wiri Oil main passing through the site. Similar to strategies for wetland protection, the base flows will be managed to maintain consistent levels, with high flows designed to bypass the stream when possible. If bypassing is not feasible, stream erosion will be controlled through tree planting along the riparian yard. The stream's catchment area is relatively small, with the lower portion affected by coastal inundation, so any increase in flow within this stream bed is expected to be minor. Please refer to the SMP Rev B provision in this regard as shown in figure below. On the basis of the above we are not proposing to provide hydrology mitigation for this region as we do not expect it to be necessary given the above and the small catchment area.

Protection of existing natural wetlands and watercourse – the design shall consider the existing natural catchment of existing natural wetlands and watercourse located on site. The catchment area of these wetland post-development shall be kept to similar size if practicable to mimic the same base flow and pre-development environment. If this is not possible, engineering design intervention is required to mitigate the impact on these existing wetlands/ watercourse to ensure the design outcome will provide a similar base flow toward these wetlands/watercourse and the high flow will be diverted to prevent scouring. The 10m riparian yard setback and riparian yard planting are proposed around the existing natural wetland/ watercourse to provide a buffer zone to protect and enhance these natural wetlands/watercourse.

Figure 1: wording within the SMP Rev B related to stream protection

SW4 – STORMWATER QUALITY

SW4

The response is acknowledged however it is noted that the SMP will need to be updated to remove the inconsistency in the wording.

Maven Response:

Please refer to SMP Revision B for the updated wording and the latest approach concerning water quality treatment requirements for roof areas. It's important to note that additional solutions have also been provided, allowing future site owners to adapt based on their specific needs. A figure abstract from SMP Rev B, shown below, highlights these options.

Water Quality –

Treatment of all contaminants generating impervious areas by a water quality treatment device designed in accordance with GD01/TP10 for the relevant contaminants.

The roof run-off from the SMP area is to be excluded from the water quality requirement if it is to be constructed with inert material

Or,

- An alternative level of mitigation determined through a SMP that:
  - applies an Integrated Stormwater Management Approach (as per above);
  - meets the NDC Objectives and Outcomes in Schedule 2; and
  - is considered the BPO.

Figure 2: Updated wording in terms of water quality treatment requirement for the roof area

Light industrial roof area	• Metal from roofing material • Organic debris from natural sources • Water Temperature*	• Preferred to eliminate the source of contamination at source through use of inert roof material with leaf guard and water tank to control and remove contamination from the roofing area Or • bioretention devices as per GD01 in conjunction with water reuse tanks to reduce stormwater discharge where possible Or • Proprietary water quality treatment devices

Figure 3: Updated toolbox option for the stormwater treatment approach for roof stormwater run-off

The uses of light industrial land is variable and the final development proposal is not yet determined hence the provision of the toolbox is more appropriate at time of plan change application. A more specific detailed layout of stormwater would be provided within future resource consent applications, and subject to review at such time. The SMP does provide adequate flexibility such that solutions can be explores within future developments If valid for the proposal.

SW5 – PIPING OF STREAM

SW 5

It is unclear from the information provided what intermittent streams are intended to be piped (this may also be an ecology concern).

Request for information

Please provide information on what intermittent streams are intended to be piped.

Maven Response:

This matter has been addressed in the previous response by Maven. However we have reattached the response below for ease of reference.
There are no intermittent streams recorded within the site that are proposed to be piped. Any permanent streams that are present will have sufficient setbacks in accordance with ecological guidelines. Extract from Viridis report below. If there is misalignment in the understanding of what is being asked please feel free to directly contact ryanw@maven.co.nz to align expectations.

6.1.3 Streams

Small catchment sizes within the site means that there are few streams. Only two permanent streams, and no intermittent streams, have been identified within the PPC area.

SW7 – INDICATIVE STORWMTER OUTLET

Indicative stormwater outlets

The SMP refers to maintaining flows into the existing wetlands. However the indicative outlets shown in the Clause 23 response show discharges directly to the coast.

There are a large number of intended outfalls. Multiple private outfalls will potentially become problematic as there will be a coastal esplanade reserve around the whole site (Local boards are not keen on multiple outfalls in public land).

Requests for information

Please clarify how it is intended to maintain flows into the existing wetlands.

6

Please clarify whether consideration has been given to future consent difficulties arising from multiple private outfalls crossing public land.

Maven Response:

This question refers to Maven's previous response dated 17/09/24. For convenience, we've attached the indicative drawing again. It seems this question may have arisen due to concerns around wetlands A and C, where downstream arrows appear. These arrows simply indicate the ultimate outfall location based on the existing overland flow path.

The approach outlined in SMP Revision B addresses these scenarios comprehensively. Specifically, the plan includes an engineered low-flow or base-flow directed to these wetlands, ensuring no adverse effects occur in the post-development context. Additionally, an engineered high-flow bypass will be implemented to prevent any potential inundation of these wetlands due to increased post-development stormwater runoff. This high-flow bypass is expected to discharge directly toward the estuary.

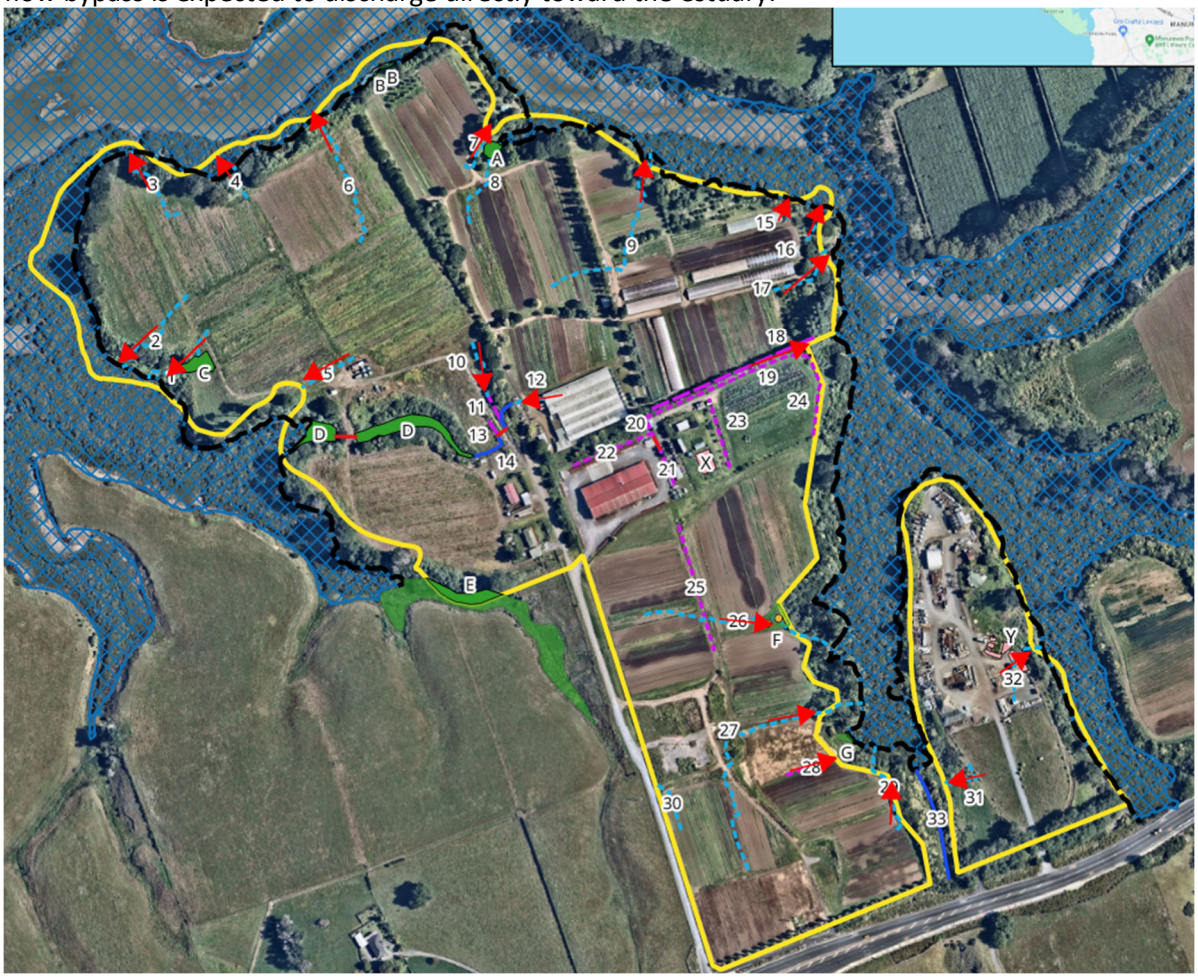


Figure 4: indicative outfall location which attached in previous reponse

Protection of existing natural wetlands and watercourse – the design shall consider the existing natural catchment of existing natural wetlands and watercourse located on site. The catchment area of these wetland post-development shall be kept to similar size if practicable to mimic the same base flow and pre-development environment. If this is not possible, engineering design intervention is required to mitigate the impact on these existing wetlands/ watercourse to ensure the design outcome will provide a similar base flow toward these wetlands/watercourse and the high flow will be diverted to prevent scouring. The 10m riparian yard setback and riparian yard planting are proposed around the existing natural wetland/ watercourse to provide a buffer zone to protect and enhance these natural wetlands/watercourse.

Figure 5: wording within the SMP Rev B related to wetland protection

Regarding the concern of multiple private outfalls, the revised SMP Revision B highlights an opportunity to consolidate some of these outfalls, provided there is no risk of erosion. The SMP advocates for retaining the

existing stormwater catchments to avoid concentrated runoff, which we believe could lead to downstream erosion over time.

Private outfall locations can be adjusted to lie with inside the site just prior to the future esplanade reserve, with precise locations to be determined during the detailed design phase. It is expected that these outfall will be place prior the vesting of the esplanade reserved and will be in line with the existing overland flow path.

It is a preference to have an outlet for each lot within the PCA to convey its stormwater run-off toward the coastal environment. This approached is adopted to mitigate the potential downstream/ received environment from erosion due to significant increased of stormwater run-off discharge through combining multiple catchment which was not the case pre development. These outfall structures will be privately owned and subject to the approval by Auckland Council at land use consent stage.

Figure 6: wording within the SMP Rev B related to outfall design and location

SEDIMENT AND EROSION CONTROL PROVISION FROM SMP

Following a further email from Peter Reaburn dated 16/10/2024, additional feedback was provided by Jason Smith regarding our current earthwork design principles for the SMP area. This feedback raised the following questions:

&#61623 Over-sizing Sediment Retention Ponds, as the larger size of the pond could lead to wind re-suspension of sediments from the storage area and thus actually increase sediment discharged to the receiving environment.

Maven Response:

Noted, we have revised our SMP to align with this request, referencing GD05 as our best-practice guideline. The sediment erosion pond will be appropriately scaled rather than oversized.

- Erosion and sediment control measures will be designed and maintained in accordance with GD05.
- Adopting a minimum of 2% of the contributing catchment area to size for all sediment retention ponds (SRP) regardless of the site slope. Increasing the forebay volume to capture and store more sediment.
- Incorporated drop-out pit within the SRP catchment to reduce the sediment load on the SRP similar to the treatment train approach used in stormwater treatment.
- Silt control measures will need to be installed on-site before or during (as specified) earthworks commencement.
- All silt control measures will be checked and confirmed acceptable by the Engineer and relevant council compliance and monitoring specialists before relevant earthworks commence.

26 Maven Associates Ltd

Figure 7: wording within the SMP Rev B related to sediment and erosion control principal

&#61623 The inclusion of a Decanting Earth Bund (**DEB**) within the catchment of a SRP. DEBs are sized at 2% of their contributing catchment which under industry best practice guidelines (GD05) is maximised at 0.3 ha, leading to a storage volume of 60 m^3. Whereas a SRP is suitable for catchments up to 5 ha. Hence the DEB is not providing any additional treatment function and is likely to quickly become overwhelmed.

Maven Response:

The intention was to position the DEB at the upper reach of the SRP catchment, ensuring the maximum catchment area for the DEB remains within 3,000m². This configuration aimed to enhance treatment for

sediment-laden runoff. However, recognizing the potential for confusion during construction, we've decided to remove this requirement. Please refer to Figure 7 above for the updated wording.

CLOSING

We trust the above will meet your satisfaction and please feel free to contact the undersigned for additional clarification if required.

Ken Ha

Senior Engineer