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Flat Bush Primary School Notice of Requirement

Flood Assessment

Final

Prepared for The Ministry of Education

Document Control

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Project Name: Flat Bush Primary School Notice of Requirement

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Revision History

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Draft	12/09/2022	Amanda Ling	Alice Monk	
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Reviewed by:

Reviewer: Alice Monk **Signature:** 

Released by:

Reviewer: Mark Lowe **Signature:** 

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1. Introduction

Morphum Environmental Ltd (Morphum) was engaged by The Ministry of Education (The Ministry) to undertake a flood assessment to support a Notice of Requirement for a proposed school development at 121 Murphys Road, Flat Bush (hereon development site).

Auckland Council (AKLC) Geomaps indicates the development site is subject to 1% Annual Exceedance Probability (AEP) overland flow and flood plains. The purpose of this assessment is to identify if there are any current or future flood issues that may require onsite mitigation and to advise on flood hazards that may impact the site's use as a school, as well as, consideration of any flood impacts on the wider catchment as a result of the proposed development of the site for educational purposes.

1.1. Development Site Overview

AKLC Geomaps indicates the development site is currently within the Residential – Mixed Housing Urban Zone. The property area is 3.0608 Ha. The site topography falls towards the southeast, with steeper land along the southern boundary. An unnamed tributary of the Ōtara Creek flows along the entire southern boundary of the site (approximately 296 m), running in a west-to-east direction. The site is within the Ōtara Creek / Flat Bush catchment. The AKLC Geomaps 1% AEP Over Land Flow Path (OLFP) and flood plain are shown to be contained within the stream corridor adjacent to the site. The OLFP is indicated to have an approximate catchment area of 21.9 Ha. The development site is shown in Figure 1.

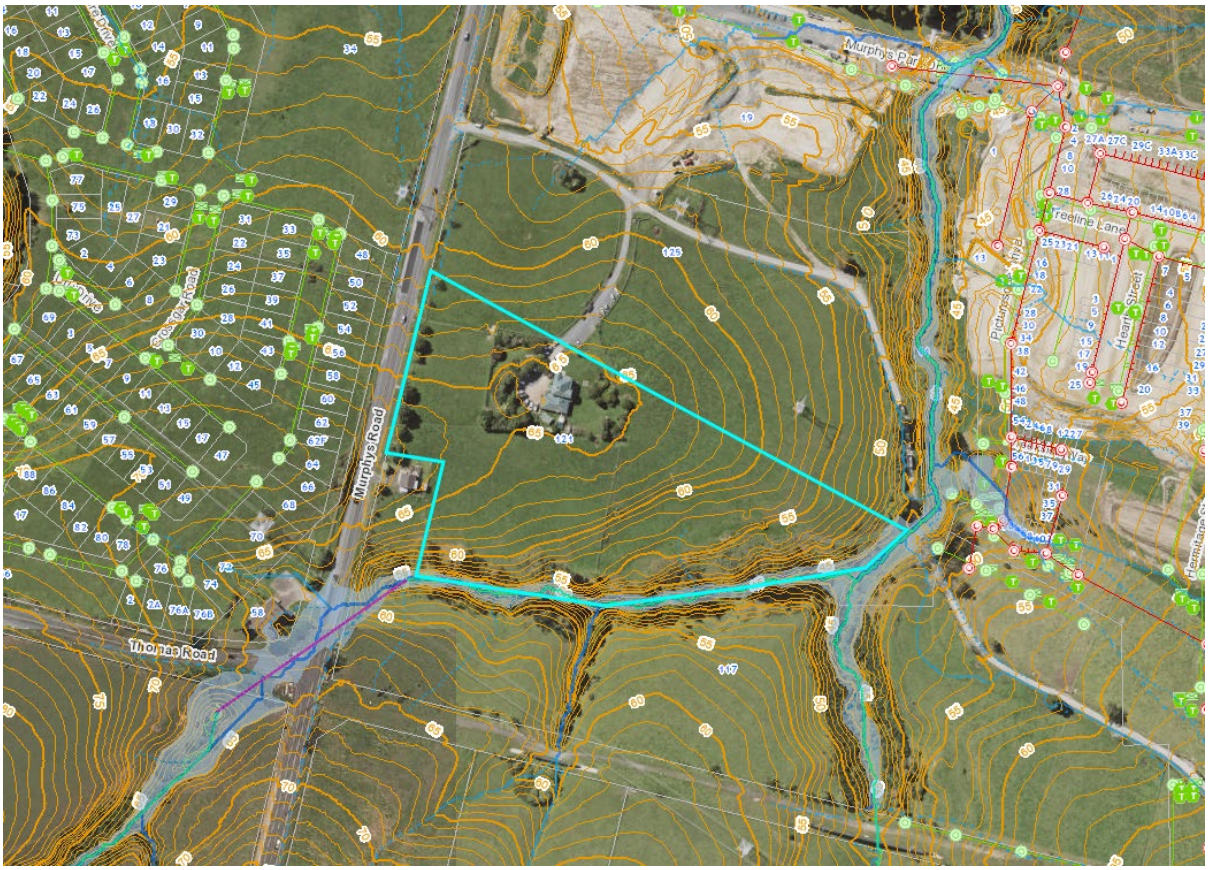


Figure 1: Development site location. Source; AKLC Geomaps accessed 16/08/2022.

2. Flooding

2.1. Site Visit

Morphum undertook a site visit on 16th August 2022 to assess the potential 1% AEP flood risk of the property. There is a steep drop along the development site's southern boundary; falling towards the watercourse. The watercourse was observed to follow the path indicated on Council Geomaps, from Murphys Road (west) eastward across the southern side of the site, before traversing north towards a large existing culvert under Murphys Park Drive.

Figure 2: Site photo, looking towards the west.

Figure 3: Site photo, looking towards the east.

Figure 4: Site photo, looking along the southern boundary, facing west.

Figure 5: Culvert under Murphys Park Drive.

2.2. Flood Assessment

An enquiry was made to the AKLC Healthy Waters Catchment Planning team for the latest flood hazard model information and any flood mitigation requirements or constraints to be aware of. The response from AKLC Healthy Waters confirmed:

- The latest flood information available was the flood plain in Council Geomaps.
- The Auckland Unitary Plan (AUP) Stormwater Management Area Flow 1 (SMAF1) hydrology mitigation and treatment of High Contaminant Generating Areas is required.

• No requirement for additional attenuation to be provided (other than aforementioned).

The stormwater management assessment for the SMAF 1 hydrology and water quality treatment is being undertaken separately and does not form part of this flood assessment.

As per the advice given by AKLC Healthy Waters, the OLFP and flood plain on Geomaps (based on the Flood Hazard Model 2015 completed by Tonkin and Taylor) was analysed. The flood plain level is indicated to reach RL 56 m at the upstream reach of the watercourse, at Location A in Figure 6. The flood plain level is indicated to reach RL 46 m at the downstream end of the watercourse east of the site, at Location B in Figure 6. As per the Council Stormwater Code of Practice freeboard requirements, the finished floor level of buildings will be at least 500 mm above the flood level. Refer to Appendix 1 for correspondence with AKLC Healthy Waters.

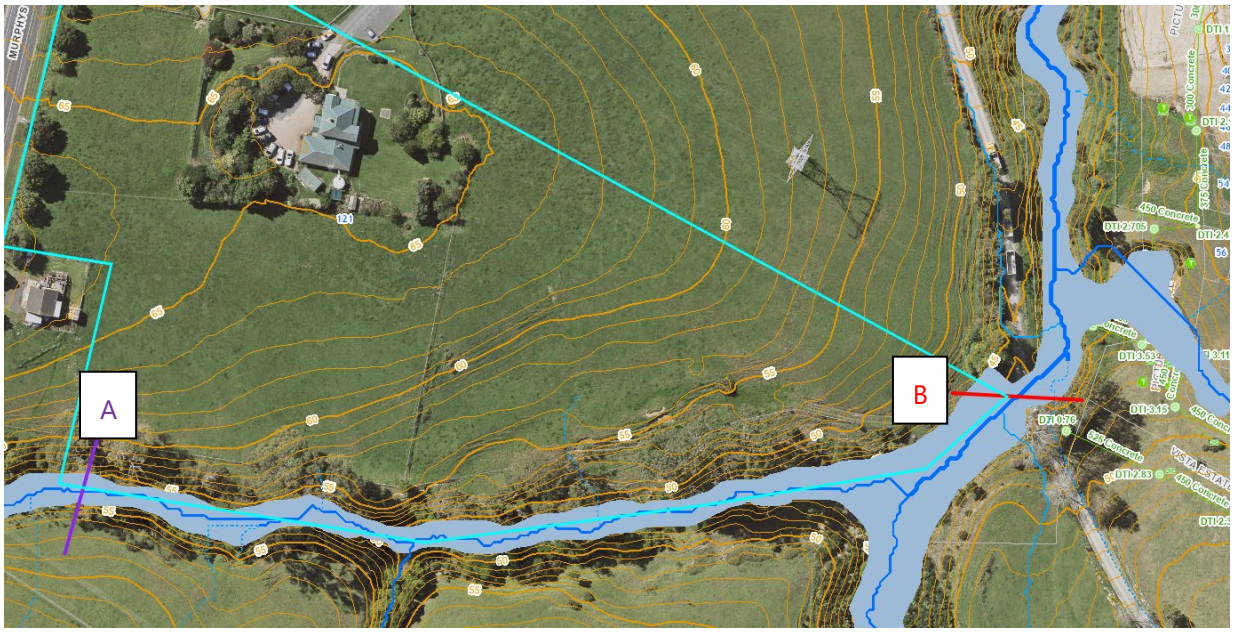


Figure 6: Locations of flood levels analysed.

The Flood Hazard Model assumes Maximum Probable Development (MPD), which for the Residential – Mixed Housing Urban zone is 60% permitted impervious coverage. Based on an approximated 9,400 m^2 of impervious area proposed for the school development, this is 31% impervious site coverage. This would be within the 60% impervious coverage for the MPD parameter that the flood hazard model accounted for. Thus, the 1% AEP runoff from the development is not expected to increase the flood level or extent than what is currently shown on Geomaps.

The flood hazard model indicates that downstream of the site, the OLFP and flood plain is contained within the stream corridor prior continuing through Murphys Bush Reserve, except for along an OLFP shown on the lots adjoining the (now constructed) Vista Estate Boulevard. However, the mapped flood plain in this area is assumed to be incorrect given that land development has occurred since the model's completion in 2015. Refer to Figure 7 and Figure 8.

Based on the site visit and desktop analysis, the flood hazard risk to the school development, as well as the effect on upstream and downstream properties, is low.

Figure 7: OLFP and flood plain extent downstream of the site. Source: Geomaps 07/09/2022,

Figure 8: Site photo looking east from the site, with Vista Estate Boulevard development in the distance.

An analysis of the pre-development and post-development impervious area was undertaken to calculate the pre and post development peak flows and volumes for the 10% and 1% AEP 24-hour duration storm events to demonstrate the scale of flood impact by the development. The calculations assume a 31% imperviousness post development. The calculated peak flows and generated runoff volumes for the 10% and 1% AEP discharged from the site are detailed in Table 1 and Table 2 respectively. The rainfall depth including climate change factor (temperature increase of 2.1-degree Celsius as per the Council Stormwater Code of Practice) has been used for the pre-development scenario to provide a comparison of the change based on the effect from the proposed development impervious area.

Table 1: 10% AEP runoff calculations.

Parameters	Pre-development scenario	Post-development scenario
Rainfall depth including climate change factor (mm)	164	164
Impervious area (m^2)	1,109	9,400
Peak flow (m^3/s)	0.47	0.58
Volume (m^3)	2,484	3,067
Peak flow change (m^3/s)		+ 0.11
Volume change (m^3)		+ 582

Table 2: 1% AEP runoff calculations.

Parameters	Pre-development scenario	Post-development scenario
Rainfall depth including climate change factor (mm)	263	263
Impervious area (m^2)	1,109	9,400
Peak flow (m^3/s)	0.94	1.09
Volume (m^3)	4,951	5,777
Peak flow change (m^3/s)		+ 0.15
Volume change (m^3)		+ 826

The calculated change from the pre and post development scenario for the 10% AEP peak flow is an increase of 0.11 m^3/s and the change in volume is an increase of 582 m^3. In accordance with Council's Stormwater Code of Practice, the proposed stormwater network would be sized to accommodate the 10% AEP peak flow generated from the development. As the site requires AUP SMAF1 equivalent hydrological

mitigation for the new impervious areas, detention of the runoff up to the 95th percentile rainfall event will be provided. This will aid in providing some attenuation of flows. The associated increase in velocity from the additional post-development flows would be managed by velocity dissipation devices, such as rock riprap aprons, installed at the outfall of the new stormwater network. Retention of the first 5 mm of rainfall would be required as part of the hydrological mitigation and would aid in retaining some of the additional post-development runoff volume generated onsite.

The calculated change in 1% AEP peak flow is an increase of 0.15 m^3/s and the change in volume is an increase of 826 m^3. Runoff greater than the 10% AEP flows would flow overland across the site towards the creek. There is substantial existing riparian vegetation along the stream banks which is anticipated to remain. The riparian planting will help to slow the runoff sheet flows into the stream and minimise erosion, preferential flow path generation and scour.

Geomaps indicates the OLFP within the stream corridor has a catchment area of 21.9 Ha. Assuming the MPD scenario maximum permitted impervious coverage within the AUP zones the catchment covers, an estimated 1% AEP peak flow of 8 m^3/s is generated from the upstream catchment. The additional 1% AEP flow (0.15 m^3/s) from the post-development site is approximately 2% of the total flow (8 m^3/s) being conveyed through the OLFP corridor.

It is anticipated the post-development runoff would not exacerbate existing flood hazards nor create new flood hazard on downstream properties, based on the scale of peak flow increase and additional volume calculated.

Please refer to Appendix 3 for the detailed engineering calculations.

2.3. Auckland Unitary Plan E36.9 Hazard Risk Assessment

A flood hazard risk assessment for the 1% AEP flood event has been undertaken and assessed against the following criteria outlined in section E36.9 of the AUP:

(a) the type, frequency, and scale of the natural hazard and whether adverse effects on the development will be temporary or permanent.

121 Murphys Road is currently subject to flooding hazards associated with an overland flow path and flood plain in the 1% AEP storm event. There is an incised watercourse along the site's southern boundary that conveys the existing stream flows. The flood level is indicated at RL 56 m and the flood waters are predicted to be contained within the existing corridor. The 1% AEP peak flow from the proposed development is 1.09 m3/s, a 0.15m3/s increase above the pre-development scenario. The increase is relatively small considering it makes up 2% of the 1% AEP MPD peak flow (8 m^3/s) from the upstream OLFP catchment.

The proposed development impervious area will be within the limits of the AKLC Geomaps flood model assumptions and as such is not expected to cause an increase in flood water level or extent beyond those estimated by the flood hazard model, which is generally contained with the stream corridor. Thus, the proposed development is not anticipated to exacerbate existing flood hazards nor create new flood hazard affecting other properties upstream or downstream of the development site.

(b) the type of activity being undertaken and its vulnerability to natural hazard events.

The proposed development is for a new school and includes classroom buildings, parking area, playing courts and fields. The proposed buildings will be provided with a minimum 500 mm freeboard above the

flood level, as per Council Stormwater Code of Practice requirements. The development would unlikely be affected by the 1% AEP overland flows through the watercourse.

(c) the consequences of a natural hazard event in relation to the proposed activity and the people likely to be involved in that activity.

The flood waters would be contained within the watercourse and unlikely reach the building platform of the proposed school development considering the elevation of the development site location. As the development is for a school, the regular users onsite would be children, teachers, and parents.

(d) the potential effects on public safety and other property.

The flood waters are contained entirely within the watercourse. Proposed development building platforms would be provided with more than the required 500 mm freeboard, above the flood level. It is recommended fencing is provided along the development site's southern boundary to restrict unsupervised access to the watercourse by the children in attendance of school onsite.

(e) any exacerbation of an existing natural hazard risks or creation of a new natural hazard risks.

The 1% AEP peak flow from the proposed development is 1.09 m3/s, an additional 0.15m3/s from the pre-development scenario. The additional flow from the site is relatively minor considering it is 2% of the total MPD 1% AEP peak flows (8 m3/s) from the upstream OLFP catchment. Thus, the development is not expected to exacerbate the existing flood hazards nor create new hazard risk to the development site, or to other properties upstream and downstream of the site.

(f) whether any building, structure or activity located on land subject to natural hazards near the coast can be relocated in the event of severe coastal erosion, coastal storm inundation or shoreline retreat.

Not applicable. The property is not located near the coastline and thus not subject to coastal hazards.

(g) the ability to use of non-structural solutions, such as planting or the retention or enhancement of natural landform buffers to avoid, remedy or mitigate the hazard, rather than hard engineering solutions or protection structures.

Healthy Waters confirmed flood attenuation is not required for the development site, thus no mitigation is proposed. There is substantial existing riparian vegetation along the stream banks which should be maintained to assist in contaminant reduction and velocity reduction of runoff from the site, and minimise erosion, preferential flow path generation and scour.

(h) the design and construction of buildings and structures to mitigate the effects of natural hazards.

As per above, no mitigation is required.

(i) the effect of structures used to mitigate hazards on landscape values and public access.

As per above, no mitigation is required.

(j) site layout and management to avoid or mitigate the adverse effects of natural hazards, including access and exit during a natural hazard event.

The development is likely to be located within the north-western portion of the property. The building platforms will be located outside of the flood plain. Safe access to and egress from the site would be maintained during a flood event as the OLFP would be contained within the watercourse.

(k) the duration of consent and how this may limit the exposure for more or less vulnerable activities to the effects of natural hazards including the effects of climate change.

The Council Geomaps Flood Hazard Model is for the 1% AEP rainfall event and includes rainfall depth adjusted for climate change effect to account for a 2.1-degree Celsius temperature increase, which is in accordance with the Council Stormwater Code of Practice. The engineering calculations used 1% AEP and 10% AEP rainfall depths adjusted for climate change effect in accordance with the Stormwater Code of Practice. The percentage increases for the 1% AEP and 10% AEP rainfall depths are 16.8% and 13.2% respectively.

(l) any measures and/ or plans proposed to mitigate the natural hazard or the effects of the natural hazard.

As per above, no mitigation is required.

3. Conclusions and Recommendations

- Morphum was engaged by The Ministry to prepare a Flood Assessment to support a Notice of Requirement for a proposed school development at 121 Murphys Road, Flat Bush.
- Council Geomaps indicates the development site is subject to 1% AEP overland flow and flood plains. However, the flood extent is limited to an incised stream corridor along the southern boundary of the site. The flood level is at approximately RL 56 m. The development will be located outside the flood plain as shown on Council Geomaps and buildings will be provided with a minimum 500 mm freeboard above the flood level.
- The 1% AEP peak flow from the proposed development is 1.09 m^3/s, an additional 0.15 m^3/s from the pre-development scenario. The total 1% AEP peak flow from the upstream OLFP catchment is 8 m^3/s. The additional flow from the site is relatively small, considering it is 2% of the total upstream overland flows.
- The proposed development impervious area will be within the permitted impervious coverage of the AUP zone and would be accounted for by the Geomaps Flood Hazard Model that incorporates the MPD scenario. Based on this, the 1% AEP runoff from the development is not expected to increase the flood level or extent than what is currently shown on Geomaps. Thus, the proposed development is not anticipated to exacerbate existing flood hazards on properties upstream and downstream of the development site, nor create new flood hazards.
- It is recommended fencing is installed along the southern perimeter of the site to prevent unsupervised access to the stream by children in attendance at the school.

Appendix 1 AKLC Healthy Waters Correspondence

Amanda Ling

From: Danny Curtis <danny.curtis@aucklandcouncil.govt.nz>
Sent: Wednesday, 10 August 2022 8:11 AM
To: Amanda Ling
Cc: HWDevelopment
Subject: Development Enquiry - 121 Murphys Road, Flat bush

Good morning, Amanda

Further to your recent enquiry regarding flood information that may impact 121 Murphys Road, Healthy Waters advises that the latest flood information that we have is available to download through interrogating the floodplain in GeoMaps.

Stormwater management of the site will need to consider as a minimum SMAF 1 hydrology mitigation and treatment of High Contaminant Generating Areas as per the Auckland Unitary Plan. There is no requirement for additional attenuation to be provided.

We trust this information enables you to proceed with your project.

Best regards as always

Danny

Danny Curtis | Principal Catchment Planning
Healthy Waters | Infrastructure & Environmental Services
Mobile +64 21 579 861
Auckland Council, Level 17, Auckland House, 135 Albert Street, Auckland, 1010

Visit our website: www.aucklandcouncil.govt.nz

Appendix 2 Council Geomaps Site Location

121 Murphys Rd, Flat Bush

0 10 20 30
Meters

Scale @ A4
= 1:2,500

Date Printed:
16/08/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Rivers and Permanent Streams

Open Watercourse

Piped Watercourse

Culvert

Pond

Overland Flow Paths

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)

Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Flood Plains

Flood Plains

Wastewater

Local Network

Wastewater Manhole GIS ID Label (Local)

Wastewater Manhole GIS ID Label (Local)

Wastewater Manhole (Local)

Wastewater Manhole (Local)

Wastewater Pipe GIS ID Label (Local)

Wastewater Pipe GIS ID Label (Local)

Wastewater Pipe (Local)

Operational

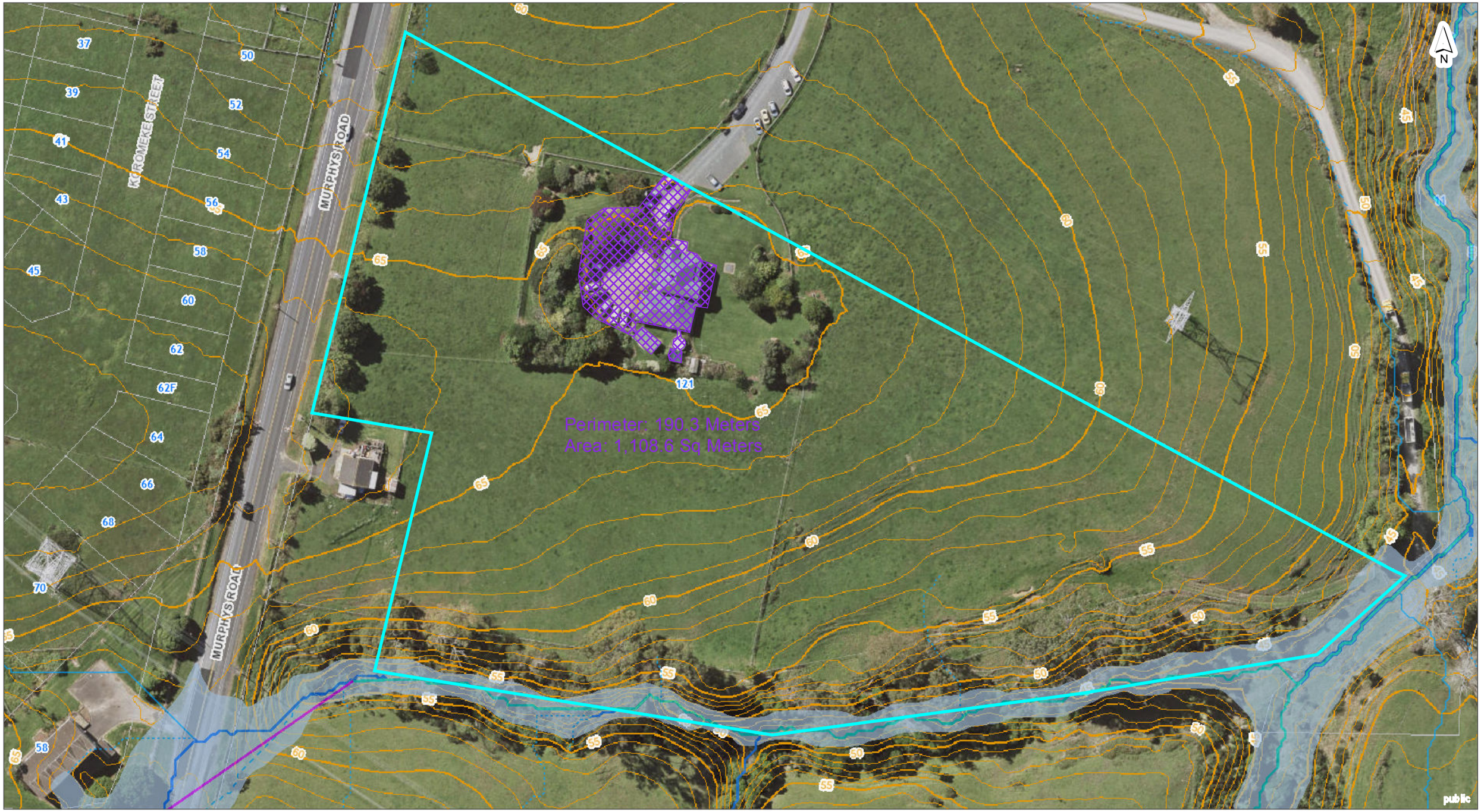
Operational Not Vested

Legend

Date Printed:
16/08/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Appendix 3 Engineering Calculations



121 Murphys Road

0 10 20 30
Meters

Scale @ A3
= 1:1,000

Date Printed:
5/09/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Coastal marine area/ river boundary point

Coastal marine area/ river boundary point

Rivers and Permanent Streams

Open Watercourse

Piped Watercourse

Culvert

Pond

Overland Flow Paths

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)

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

Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Flood Plains

Flood Plains

Stormwater Catchments

Stormwater Catchments

Address

Address

Contours 2016

Contours 0m

Contours 0m

Contours 1m Intervals

Contours 100m

Contours 100m

Contours 50m

Contours 50m

Contours 25m

Contours 25m

Contours 10m

Contours 10m

Contours 5m

Contours 5m

Contours 2m

Contours 2m

Contours 1m

Contours 1m

Place Names

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 (2,500)

Railway (2,500)

Auckland Council Boundary

Auckland Council Boundary

Roads

Roads (1,000)

Motorway

Motorway Under Construction

Secondary Arterial Road

Secondary Arterial Road Under Construction

Primary Arterial Road

Primary Arterial Under Construction

Collector Road

Collector Road Under Construction

Local Road

Local Road Under Construction

Property

Property

Rate Assessment

Rate Assessment

Parcels

Parcels

Coastline

Aerial 2019 2020 Rural Image

Red: Band_1

Green: Band_2

Blue: Band_3

Aerial 2022 Rural Image

Red: Band_1

Green: Band_2

Blue: Band_3

Aerial 2017 Urban Image

Red: Band_1

Green: Band_2

Blue: Band_3

Aerial 2010 2011 Rural Image

Red: Band_1

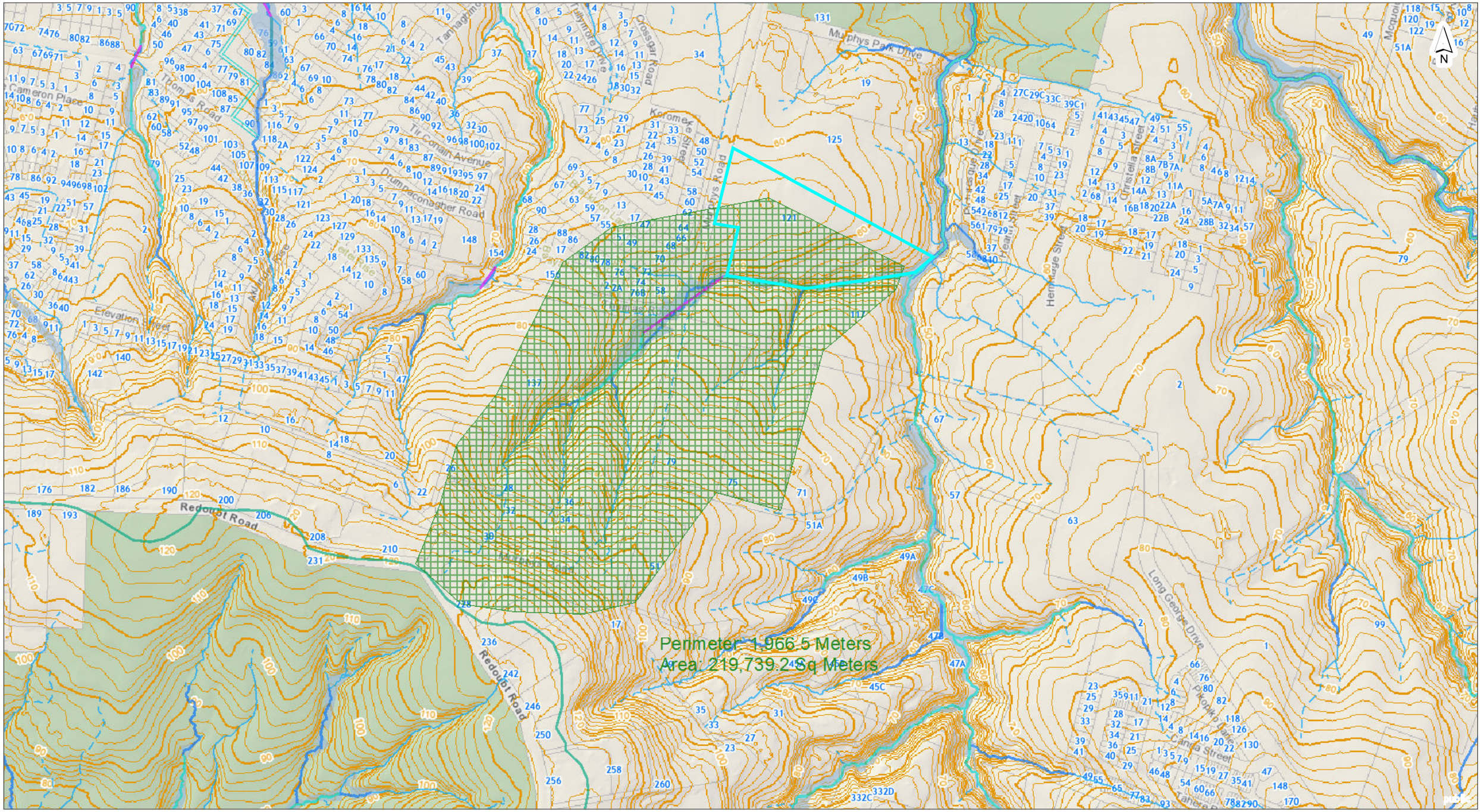
Green: Band_2

Blue: Band_3

Legend

Date Printed:
5/09/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau



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Height datum: Auckland 1946.

121 Murphys Road

0 50 100 150
Meters

Scale @ A3
= 1:5,000

Date Printed:
5/09/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Coastal marine area/ river boundary point

Coastal marine area/ river boundary point

Rivers and Permanent Streams

Open Watercourse

Piped Watercourse

Culvert

Pond

Overland Flow Paths

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

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

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

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Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Overland Flow Paths - 2000m2 to 4000m2 (5,000)

Flood Plains

Flood Plains

Stormwater Catchments

Stormwater Catchments

Address

Address

Contours 2016

Contours 0m

Contours 0m

Contours 1m Intervals

Contours 100m

Contours 100m

Contours 50m

Contours 50m

Contours 10m

Contours 10m

Contours 2m

Contours 2m

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 (5,000)

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:
5/09/2022

Auckland Council
Te Kaunihera o Tāmaki Makaurau

MORPHUM environmental

Project: Murphys Rd School
Author: AL
Reviewer: 0

TP108 Calculations

Catchment ID		**Site-10yr**	**Site-10yr**	**Site-100yr**	**Site-100yr**	**Stream OLFP**
Storm ID		**Pre 10 yr**	**Post 10 yr**	**Pre 100 yr**	**Post 100 yr**	**Post 100 yr**
Permeable area	m^2	29,499	21,208	29,499	21,208	114,975
Impermeable area	m^2	1,109	9,400	1,109	9,400	104,025
Total area	m^2	30,608	30,608	30,608	30,608	219,000
Event depth	mm	164.1	164.1	262.8	262.8	262.8
Initial abstraction	mm	4.8	3.5	4.8	3.5	2.6
Permeable area curve number		61	61	61	61	61
Impermeable area curve number		98	98	98	98	98
Site curve number		62	72	62	72	79
Potential maximum retention	mm	153.4	97.0	153.4	97.0	69.3
Runoff depth	mm	81.2	100.2	161.8	188.7	205.5
Volume	**m^3**	**2,484.1**	**3,066.5**	**4,951.4**	**5,776.8**	**44,999.5**
Channelisation factor		1.00	0.60	1.00	0.60	0.60
Catchment length	km	0.171	0.171	0.171	0.171	0.894
Catchment slope	m/m	10.5%	10.5%	10.5%	10.5%	8.5%
Time of concentration	hr	0.17	0.17	0.17	0.17	0.21
Runoff index		0.33	0.45	0.45	0.57	0.65
Specific peak flow rate		0.09	0.12	0.12	0.14	0.14
Peak flow	**m^3/s**	**0.4674**	**0.5819**	**0.9380**	**1.0898**	**7.9902**