BLUE BARN
CONSULTING ENGINEERS

76-80 Great South Road
Newmarket, Auckland
Infrastructure Report

Date:
22/06/2022

Document Number:
LD-2240-RP-3090_Rev0

Prepared by:
Blue Barn Consulting Limited

Prepared for:
Dilworth Trust Board

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REVISION HISTORY

The following table outlines the revision history of this document:

REVISION	PUBLICATION DATE	COMMENTS
Revision 0	22/06/2022	For Approval

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1. INTRODUCTION & BACKGROUND

1.1 INTRODUCTION

Blue Barn Consulting Limited (Blue Barn) has been engaged by the Dilworth Trust Board to complete an infrastructure report to support a new multi-storey residential development located on 76 and 80 Great South Road, Newmarket, Auckland (the site). The proposed development will consist of up to approximately 200 apartments and 4 commercial spaces.

This report outlines the provisions for the infrastructure and service connections to support the Resource Consent application for the proposed development.

The scope of this report comprises the following:

- Earthworks
- Accessway
- Stormwater
- Wastewater
- Water Supply
- Utility Services

1.2 SITE INFORMATION

1.2.1 LOCALITY

The site is made up of two lots namely, 76 Great South Road (Lot 42 Deeds Reg 976) and 80 Great South Road (Lot 1 DP 119624), which will be consolidated to facilitate the proposed development. The site is bound by Great South Road along the south-western boundary and Mauranui Avenue along the south-eastern and north eastern boundaries. It is noted that the Kiwirail railway track and the Southern Motorway are located on the north-eastern side of Mauranui Avenue.

FIGURE 1-1: SITE LOCALITY & CONTOUR PLANS – AUCKLAND GEOMAPS (SITE BOUNDED WITH YELLOW LINE)

1.2.2 Existing Land Use and Zoning

The site currently features residential terrace housing on 76 Great South Road and a motel with carparking on 80 Great South Road.

The site is currently zoned as a *Business – Mixed Use Zone* as shown in Figure 1-2 below.

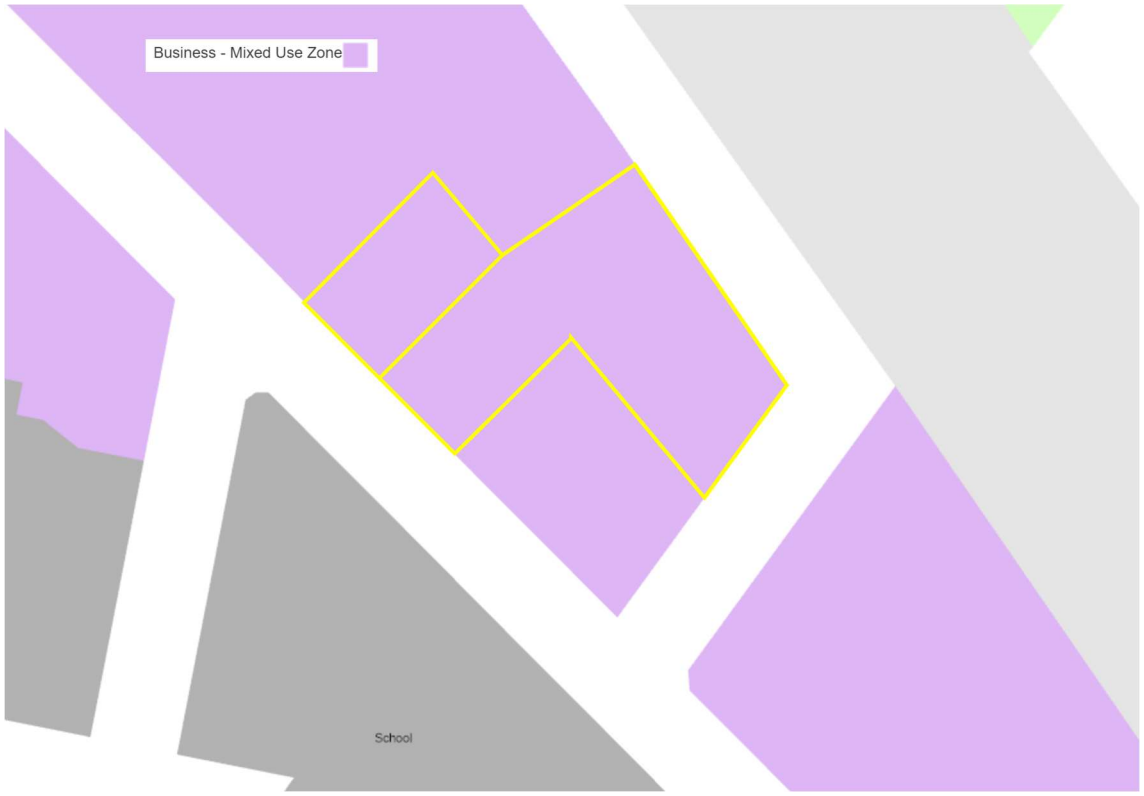

FIGURE 1-2: AUCKLAND UNITARY PLAN - ZONING MAP

1.2.3 Site Coverage & Topography

The topography of the site indicates the site falls from the southern corner to the north with a low point located at the north-eastern corner draining onto Mauranui Avenue as shown in Figure 1-1 above.

The existing buildings and carparking makes up a large percentage of the site and the pervious surface is mostly located around the boundary of the site.

TABLE 1-1: SITE AREA SUMMARY

ADDRESS	SITE AREA
76 Great South Road	994 m^2
80 Great South Road	3,179 m^2

Based on Geomaps information, the total site area is 4,173m^2 and from site investigations and aerial photographs consists of approximately 90% impervious area.

Percussion drilling was undertaken to determine the underlying geology for soakage design. It was found that the underlying material was predominantly basalt. Please refer to Appendix B – Supporting Calculations where the test results have been attached.

A detailed geotechnical investigation has been prepared by ENGEO Limited for the site and will be issued under separate cover. (Project Number 18670.000.001). It is anticipated that CBR values of 4% will be achieved on the site for pavement design parameters.

1.2.4 PROPOSED DEVELOPMENT

It is proposed that all existing site features (buildings and carpark) will be demolished and removed as part of the future development.

Two multi-storey buildings (8-storeys) have been proposed for the site and have been named Great South Road (GSR) Building and Mauranui Building as shown in Figure 1-3: Illustrative Site Plan - JASMAX architect's extract below.

FIGURE 1-3: ILLUSTRATIVE SITE PLAN - JASMAX ARCHITECT'S EXTRACT

The site development will consist of two buildings featuring up to a total of 200 residential dwellings split between the Mauranui and GSR buildings. Indicative plans are summarised in Table 1-2 below. The Mauranui building also features a single-storey basement carpark with car stacking facilities. The two buildings will have a primary access from their respective road frontage but share a private laneway crossing the site from the south-west to north-east.

TABLE 1-2: RESIDENTIAL DWELLING SUMMARY

GREAT SOUTH ROAD BUILDING	MAURANUI BUILDING
74 Residential Dwelling Units: • 30 No. – 1 Bedroom & 1 Bathroom • 8 No. – 2 Bedroom & 2 Bathroom • 28 No. – 2 Bedroom & 1 Bathroom • 8 No. – Studio apartments	115 Residential Dwelling Units: • 85 No. – 2 Bedroom & 1 Bathroom • 15 No. – 2 Bedroom & 2 Bathroom • 7 No. – 3 Bedroom & 2 Bathroom • 8 No. – Studio Apartments

2. EARTHWORKS

2.1 EXISTING SITE AND PROPOSED WORKS

Earthworks are proposed over an area of 4,173m^2, and will include basement excavations for the Mauranui Building, excavation for drainage, soakage, and construction of building platforms and retaining walls. It is expected that the maximum cut depth will be approximately 5.7m for the formation of the basement.

Fill areas are primarily required to create access from the GSR building to the landscaped platform on the Mauranui Building and also to maintain the existing overland flow path running through the site and discharging onto Mauranui Road. This will ensure there is a consistent laneway gradient between Great South Road to Mauranui Avenue. Earthworks will likely involve the excavation of material and placement onto temporary stockpiles and/or directly onto trucks for removal off-site.

Approximate cut/fill volumes have been generated from the Civil 3D model which compares existing ground levels to the subgrade level only. The finished subgrade level is anticipated to be 700mm lower than the basement finished floor level, and 400mm under the laneway and landscaping areas. No bulking factor has been allowed for the cut/fill volumes shown below in Table 2-1 below. Excess material will be removed from site and disposed at a suitable site to be agreed with the contractor.

TABLE 2-1: CUT/FILL VOLUMES

EARTHWORKS	VOLUME (M^3)
Cut	5,630
Fill	1,267

2.2 EROSION AND SEDIMENTARY CONTROL MEASURES

As there is an existing road network located on the high side of the site, the only surface water moving over the site will be the rainfall that falls directly on the site. Clean water will be diverted around the site by the existing road network. Sediment control measures are required for the planned earthworks operations to reduce the potential for the transport of sediments from the site. An Erosion and Sediment Control (ESC) plan has been prepared by Blue Barn for the earthworks to be undertaken to enable the basement, building platforms, accessway and landscaping. The erosion and sediment control has been designed in accordance with Auckland Council Guideline Document 2016/005 (GD05).

Silt fences will be required along the north-eastern and north-western boundaries of the site, where practical, to act as a treatment device for any sheet flow off the site. It is anticipated that the silt fences will only experience low volumes of sheet flow, with the basement excavation drawing the majority of any stormwater flows towards it. Any discharge through the silt fence will flow into the road's stormwater network.

The existing vehicle crossing off Mauranui Avenue will be utilised as site entranceway for construction. A wheel wash or other means to clean soil residue off trucks exiting the site (e.g. water blasting) may be required. Should a wheel wash or other means of cleaning wheels be implemented, it will be positioned in a location where the wash can be retained and settled onsite.

Settling tanks (i.e. Siltbuster) or similar will be used to provide effective dewatering treatment of any water requiring pumping from the basement area. After treatment, water will be discharged to the kerb, and subsequently into the existing local stormwater network.

Refer to Blue Barn Erosion and Sediment Control Plan for the layout of the ESC measures. The ESC measures detailed in this section will be located where they serve the largest practicable catchments and can remain as long as possible (to avoid relocation). These positions, however, are dependent on the contractor's methodology and the staging of works within the site, which may be subject to change throughout the project's duration.

3. VEHICLE ACCESS

3.1 SITE ACCESS

Three new vehicle crossings have been proposed for this site. One on Great South Road and Mauranui Avenue each which connects the private laneway running through the site. The third vehicle crossing will be constructed for access to the basement carpark of the Mauranui building.

The vehicle accesses will be designed to the Auckland Transport Traffic Design Manual (TDM) and will be addressed in detail during the Engineering Plan Approval (EPA) stage.

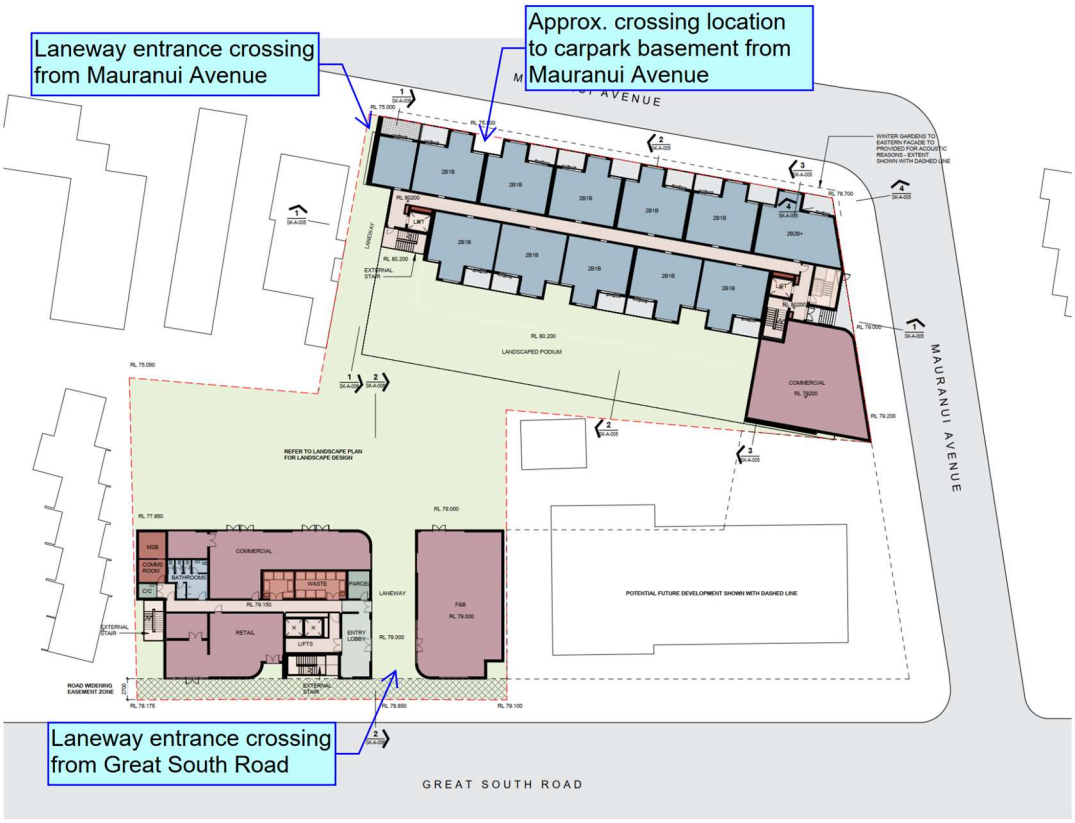

FIGURE 3-1: VEHICLE CROSSING LOCATIONS - JASMAX ARCHITECT'S EXTRACT

4. STORMWATER INFRASTRUCTURE

4.1 OVERLAND FLOW PATH & FLOOD PLAINS

The existing Overland Flow Path (OLFP) routings according to the Auckland Council GIS are shown in Figure 4.1 below. It is noted that the site itself is not affected by any upstream overland flow path as these bypass the site in Mauranui Avenue. There is however a minor overland flow path (less than 4,000m²) that originates within the site and drains towards the northern corner of the site where it drains out towards the major overland flow path located in Mauranui Avenue.

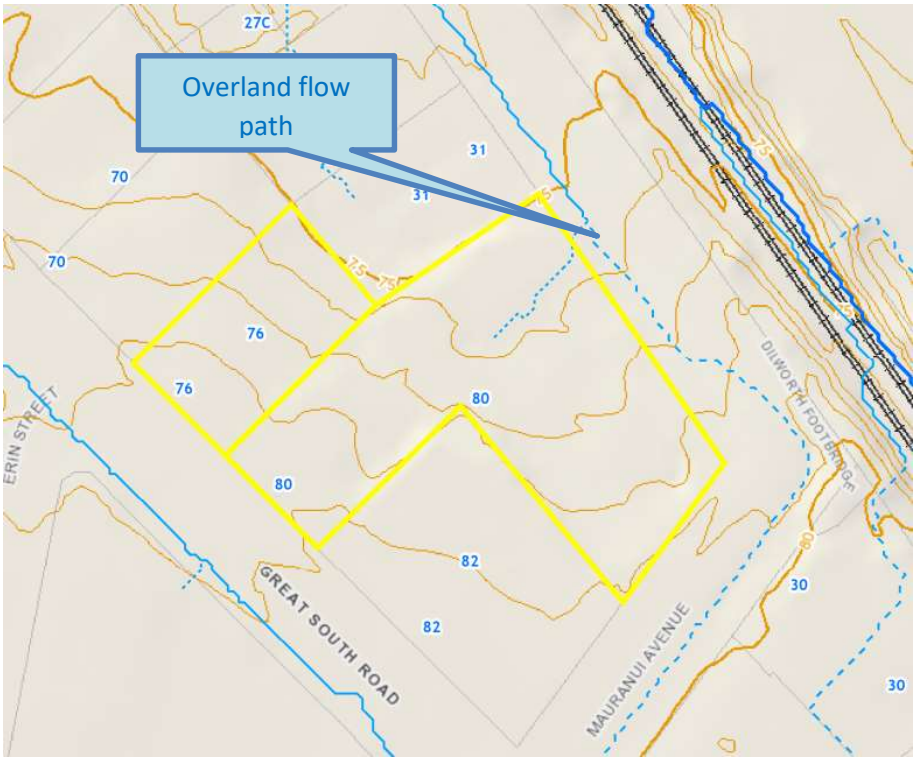

FIGURE 4-1: OVERLAND FLOW PATH (AC GIS)

From a site visit it was noted that the crossfall of the public footpath on the north-eastern boundary of the site is towards Mauranui Avenue which means the OLFP is located along the kerb and channel of the road and not on the boundary of the site.

Reviewing the existing overland flow path located in Mauranui Avenue on the north-eastern boundary of the site it is noted that there is sufficient capacity within the existing road reserve to accommodate the 100 year ARI storm event without the flow extending into the site. The volumes of flow contributing to this catchment was calculated using the Rational Method and based on TP108 rainfall data maps and the updated method for of calculating rainfall intensity which includes for climate change. Refer to Appendix B for the supporting calculations.

Analysis was carried out to calculate the top water level of the flood plain generated by the OLFP in Mauranui Avenue directly adjacent to the proposed entrance to the basement parking, hydraulic capacity calculations using Mannings formula were carried out to estimate the water depths generated by the 1% AEP flow to confirm that these flows would not exceed the height of the vehicle crossing giving access to the basement.

It is noted that our calculations are based on a very conservative flow rate of 562l/s whereas Auckland Council supplied calculations indicate a flow of approximately 440l/s at this point.

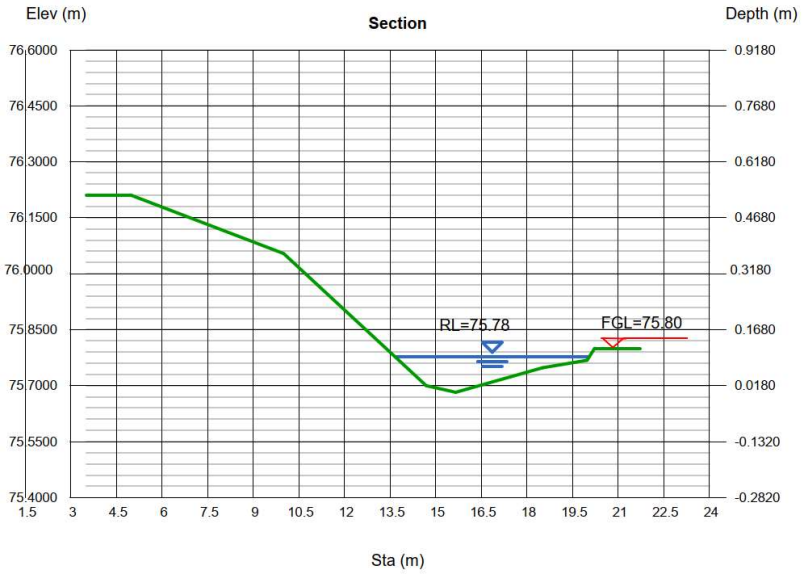

FIGURE 4-2: OVERLAND FLOW PATH IN MAURANUI AVENUE (CROSS SECTION)

FIGURE 4-3: OVERLAND FLOW PATH CATCHMENT AREA

It is noted that the level of the water in the OLFP is RL75.78m during a 100-year ARI event. While this is lower than the floor level of the basement (75.80m), it is proposed that the vehicle crossing final height is increased to RL75.90 at the entrance to the building to ensure there is an additional safety factor to prevent any possibility of stormwater entering the basement. Final details of the vehicle crossing and ramp will be determined during the detailed design stage and Building Consent application.

From the Auckland Council GIS, it is noted that the site appears to be affected by flooding along the north-eastern boundary of 80 Great South Road. However, AECOM prepared a detailed Flood Hazard Mapping Report for the Auckland Isthmus-Epsom Newmarket catchment area, detailing the areas subject to flooding and identifying flood hazard areas. From this report it is noted that the site is not subject to flooding with only a minor portion of the site at the northern corner being located adjacent to a flood sensitive area.

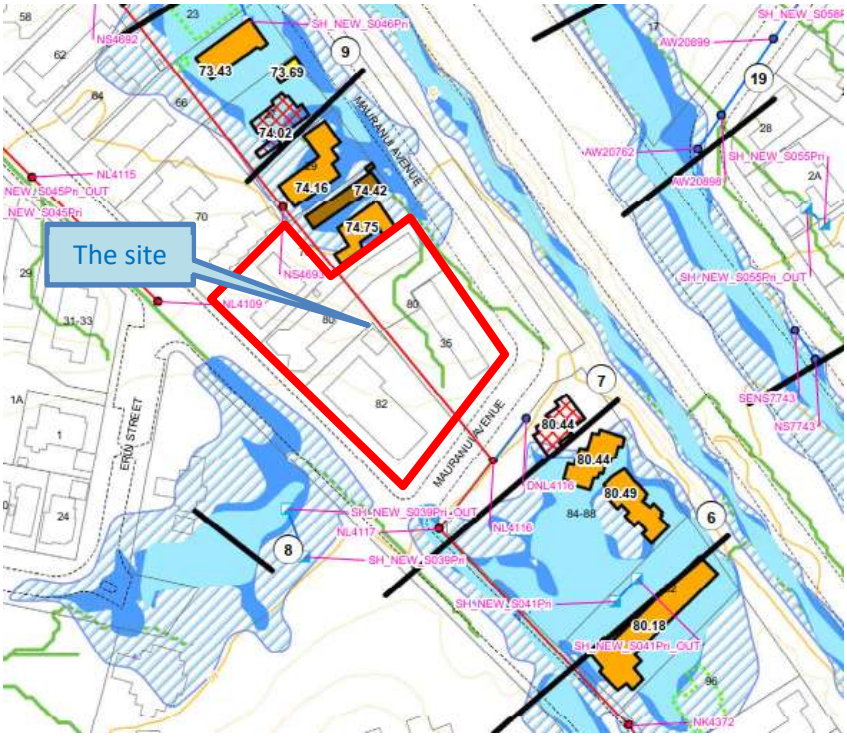

FIGURE 4-4: AECOM FLOOD MAP

Given that the site does not intrude into the floodplain and, considering that additional measures are proposed for managing stormwater on site that will reduce flows towards Mauranui Avenue compared to the existing situation, it is confirmed that there will not be a negative impact on downstream flooding and the downstream properties.

4.2 EXISTING STORMWATER INFRASTRUCTURE

There is an existing 375Ø VC pipe stormwater pipe located on the boundary of the site in Great South Road. However, the two existing properties fall away from Great South Road draining towards Mauranui Avenue. There is no public stormwater network located on the boundary of the site in Mauranui Avenue and currently any stormwater run-off from the site discharges directly onto the street to the north of the site.

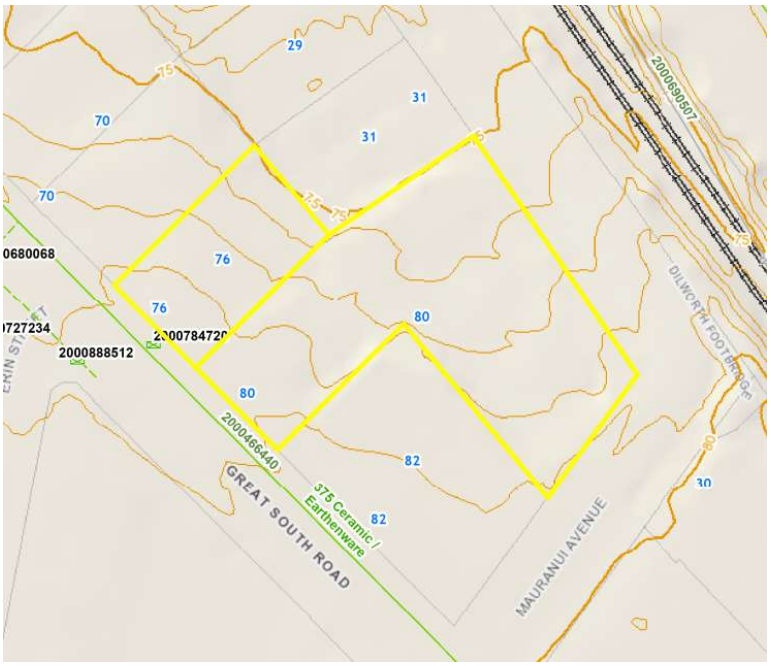

FIGURE 4-5: EXISTING STORMWATER INFRASTRUCTURE

4.3 STORMWATER DISCHARGE (DRAINAGE NETWORK)

As there is no public stormwater network located on the low side of the site it is proposed that a soakage based solution is utilised to manage stormwater runoff from the proposed development.

Intorock Drilling Ltd performed perculation testing of the site on the 25 January 2022. Two boreholes were tested at the locations shown in Figure 4-6 below and the results are as indicated below: Refer to Appendix C for the test results.

ST1 16.8l/s

ST2 19.4l/s

FIGURE 4-6: PERCULATION TEST LOCATIONS

Based on the size of the site it is proposed to utilise three soak holes to manage stormwater run-off from the proposed buildings and impervious areas such as the laneway. The rockbore soakholes were designed using the latest GD07 guidelines. Calculations were based on the lowest flow rate achieved during the perculation testing and applied to all soakholes to ensure there will be sufficient capacity to accommodate the flows generated on the site. Specific testing will be carried out when the final soakholes are prepared to determine final soakage capacity and detention volumes will be adjusted if required. Refer to the calculations in Appendix B.

It is noted that it is intended to utilise some of the storage capacity provided in the detention tank for on-site irrigation. The final sizes of the detention and retention facilities will be provided during the detailed design stage. Based on the storage requirements it is proposed to utilise a combined retention/detention tank with the outflow orifice placed above the retention volume level.

Any stormwater flow that is in excess of the 10-year ARI flows and is not detained will be directed to the internal laneway and discharged onto Mauranui Avenue.

TABLE 4-1: SOAKHOLE CAPACITY AND DETENTION REQUIRED

Soakhole no.	Catchment area	10 Year flow (TP108)	Soakhole Capacity (Factored)	Detention required
1	2062m²	46l/s	14l/s	20,840l
2	1570m²	34l/s	14l/s	2,950l
3	1308m²	14l/s	14l/s	Not required

FIGURE 4-7: SOAKAGE HOLE CATCHMENT AREAS

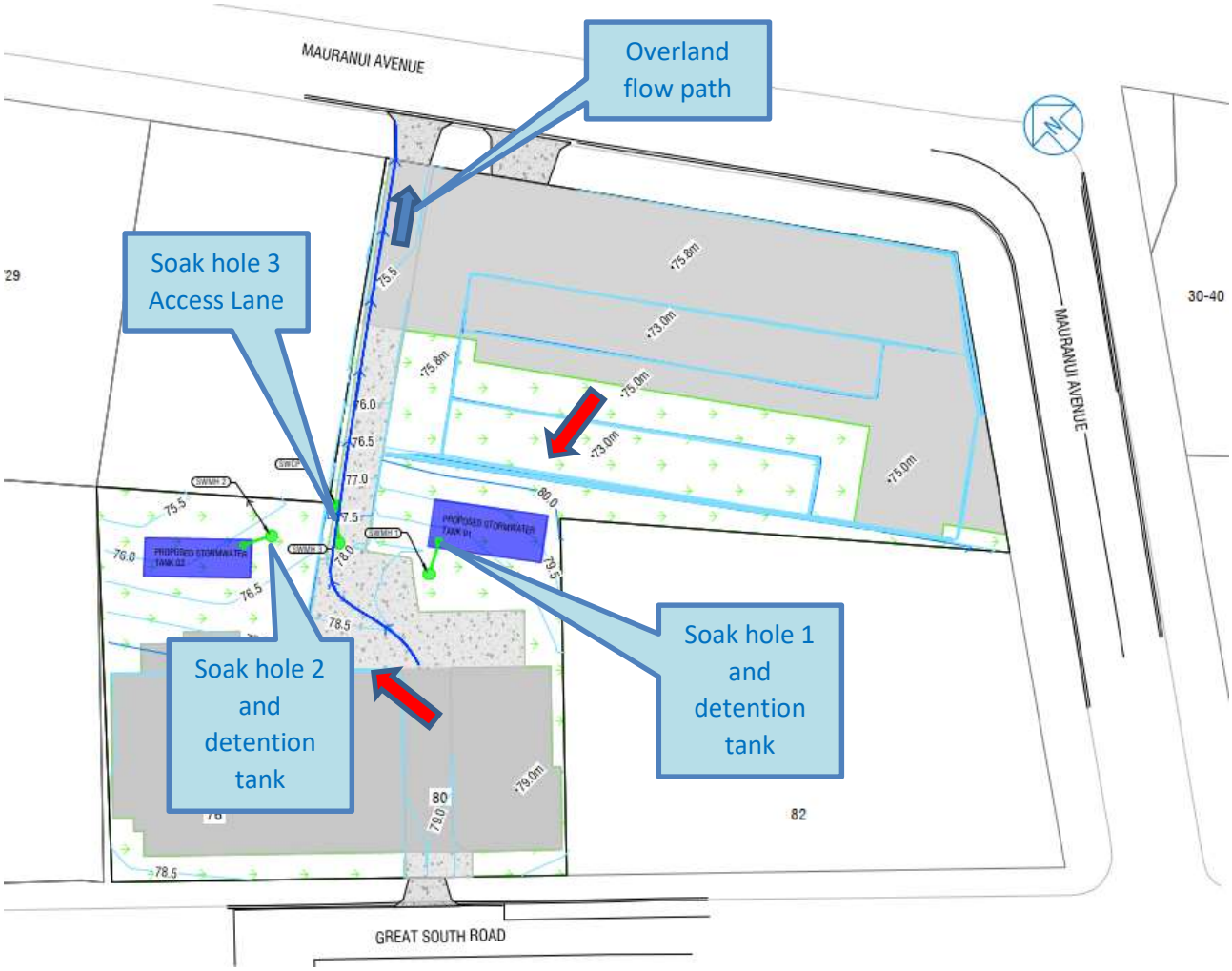

FIGURE 4-8: PROPOSED STORMWATER MANAGEMENT PLAN

5. WASTEWATER INFRASTRUCTURE

5.1 EXISTING WASTEWATER INFRASTRUCTURE

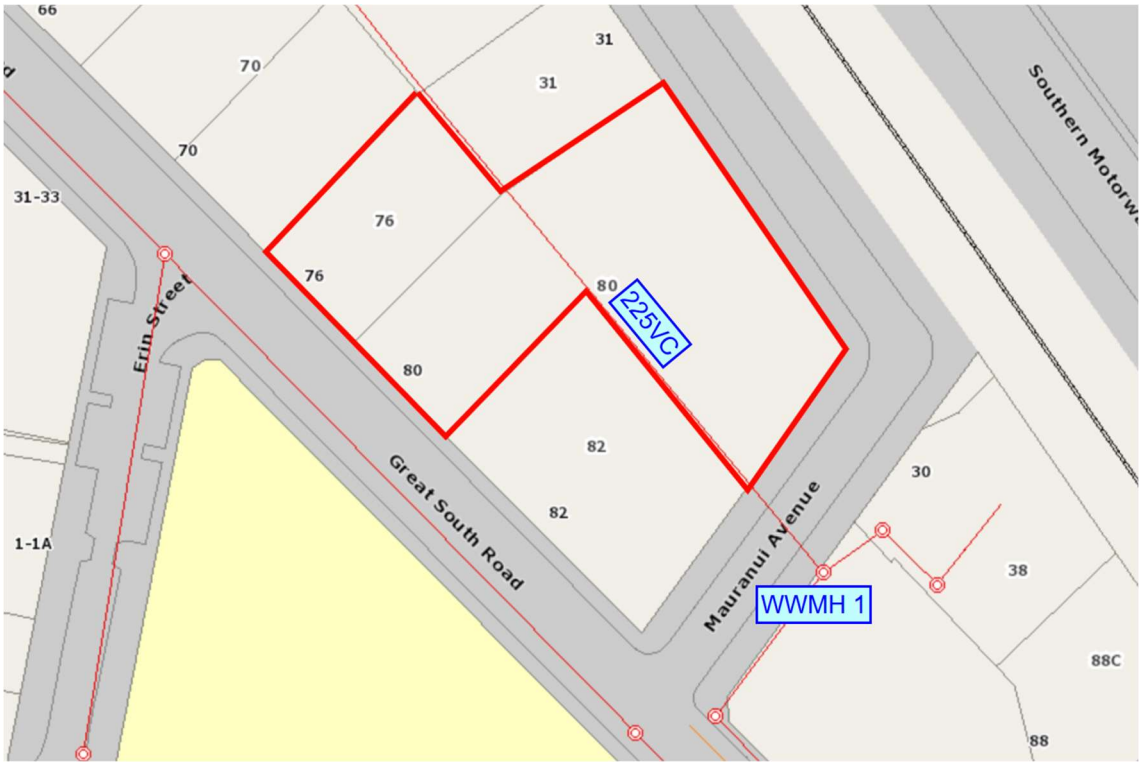

FIGURE 5-1: EXISTING WASTEWATER INFRASTRUCTURE - WATERCARE GIS

TABLE 5-1: EXISTING WASTEWATER INFRASTRUCTURE SUMMARY

INFRASTRUCTURE TYPE	DIAGRAM ID / DETAILS	WATERCARE GIS ID
Wastewater Manhole	WWMH 1	515101
Wastewater Pipe	225 Ø Vitrified Clay	863471

5.2 PROPOSED WASTEWATER DISCHARGE

The existing 225Ø VC pipe that is currently servicing the site will need to be relocated due to the proposed basement required for the Mauranui Building. It is therefore planned to relocate the portion of wastewater affected by the basement into the rear carpark of 82 Great South Road and then re-connect to the public line at the western boundary within 80 Great South Road. Refer to Drawing No. 500.

While the Dilworth Trust Board are the owners of 82 Great South Road, there is a long-term lease in place with a tenant who has confirmed they have no objection to the work taking place.

Given the presence of a retaining wall and power substation located at the north-eastern corner of 82 Great South Road, it is proposed that the majority of the redirected line be installed using horizontal drilling to avoid open trench works. The extent and exact set-out of the trench line will be subject to the private drainage layout in 82 Great South Road. – Note CCTV carried out for inverts and condition (estimated and will be confirmed during survey post-demolition of existing buildings).

The Peak Wet Weather Flow (PWWF) from the pre-development site is estimated to be 0.537 L/s (allowed 38 No. motel rooms fully occupied). Peak Wet Weather Flow (PWWF) from the post-development site is

calculated to be in the order of 6.126 L/s. High level calculations based on Watercare's Code of Practice have been conducted of the wastewater network downstream of the site and it is noted that the proposed 225Ø wastewater pipe has sufficient capacity to accommodate the proposed development.

Downstream analysis of the existing wastewater line up until it upsizes to a 400mm Ø pipe has been carried out and the results show that there is sufficient capacity in this pipeline to accommodate the anticipated increase in flows that would occur due to the proposed development.

Please refer to Blue Barn drawings C-500 for the proposed Wastewater layout.

FIGURE 5-2: PROPOSED WASTEWATER LINE RELOCATION

6. WATER RETICULATION INFRASTRUCTURE

6.1 EXISTING WATER SUPPLY INFRASTRUCTURE

Based on the Watercare GIS database, the site is currently serviced by two 20Ø Polyethylene (PE) service laterals supplied from a 150Ø Cast Iron (CI) water main located in Great South Road. The existing infrastructure is shown in Figure 6-1 and summarised in Table 6-1.

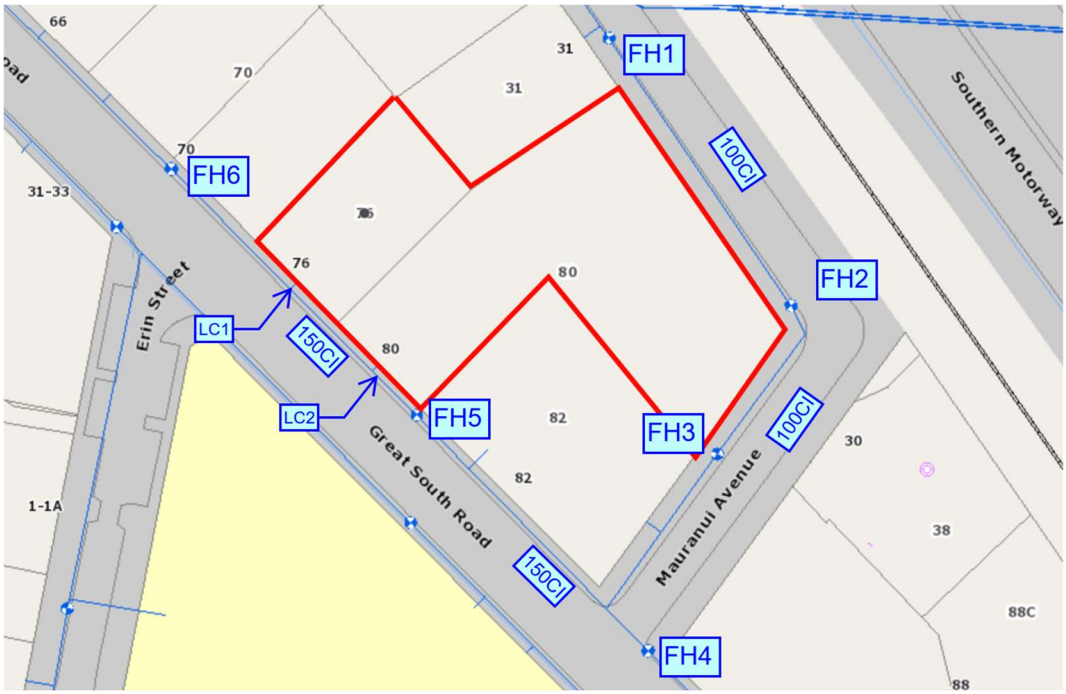

FIGURE 6-1: EXISTING WATER RETICULATION INFRASTRUCTURE - WATERCARE GIS

TABLE 6-1: EXISTING WATER RETICULATION INFRASTRUCTURE SUMMARY

INFRASTRUCTURE TYPE	DIAGRAM ID / DETAILS	WATERCARE GIS ID
Fire Hydrant (FH1)	-	1093570
Fire Hydrant (FH2)	-	1093569
Fire Hydrant (FH3)	-	1093571
Fire Hydrant (FH4)	-	1081074
Fire Hydrant (FH5)	-	1093572
Fire Hydrant (FH6)	-	1086315
Water Pipe	100 Ø Cast Iron	1461715
Water Pipe	100 Ø Cast Iron	1461564
Water Pipe	150 Ø Cast Iron	1422480
Water Pipe	150 Ø Cast Iron	1461907
Lot Connection (LC1)	20 Ø Polyethylene	3844808
Lot Connection (LC2)	20 Ø Polyethylene	3797049

6.2 FIRE FIGHTING WATER SUPPLY

The site has good available access (Less than 60m) to three hydrants located on Great South Road and Mauranui Avenue respectively.

In accordance with Table 1 of SNZ/PAS 4509:2008 – NZ Fire Services Fire Fighting Water Supplies Code of Practice, the development is classed as FW2 for fire-fighting water supply as it will have a sprinkler system provided. This classification requires a minimum water flow of 12.5 l/s from no more than 2 fire hydrants within 135m of the buildings and an additional 12.5 l/s from hydrants within 270m of the buildings.

A hydrant test report was conducted by Nova Flowtec Services for an adjacent site on the 13th February 2020. The hydrant test was undertaken utilizing fire hydrants marked FH1, FH4 as shown in Figure 6-1. The test results confirm there is suitable capacity for firefighting purposes.

A copy of the original Nova FlowTec Services Ltd report prepared in 2020 is included in the Appendix F.

TABLE 6-2: SUMMARY OF HYDRANT TESTING RESULTS

	FH1	FH2	TOTAL FLOW (lps)	PRESSURE (kpa)
				520
Flow (Lps)	12.5		12.5	390
Flow (Lps)	14.7	16.7	31.4	280

The fire-fighting requirements are, therefore, considered compliant with the NZ Fire Fighting Code of Practice (SNZ PAS 4509:2008), assuming the measured pressure in 2020 is considered applicable for this Resource Consent application.

We note a specific fire design assessment will be necessary for the proposed building structure in accordance with NZ Building Code requirements at the Building Consent Stage. This specific fire design will identify the requirements for the apartment building to utilise a sprinkler system for internal fire-fighting capabilities.

6.3 WATER SUPPLY CONNECTION

The existing 150Ø CI public main along Great South Road and the 100Ø public main along Mauranui Avenue are available for connection to service the site.

It is proposed that the two existing 20Ø lot connections (LC1 & LC2) will be capped and abandoned. Two new 100Ø water supply connections, each with a water meter and backflow preventor will be provided for the proposed development on Great South Road and Mauranui Avenue. It is proposed that a bulk site meter with private check meters will be used for water consumption measurements for each building.

A specific hydraulic assessment may be necessary for the proposed building structure to provide sufficient water pressure to service the apartment complex. A private booster system may be required to service the upper floors of the development, and this would be subject to specific design at the Building Consent stage by other specialist consultants.

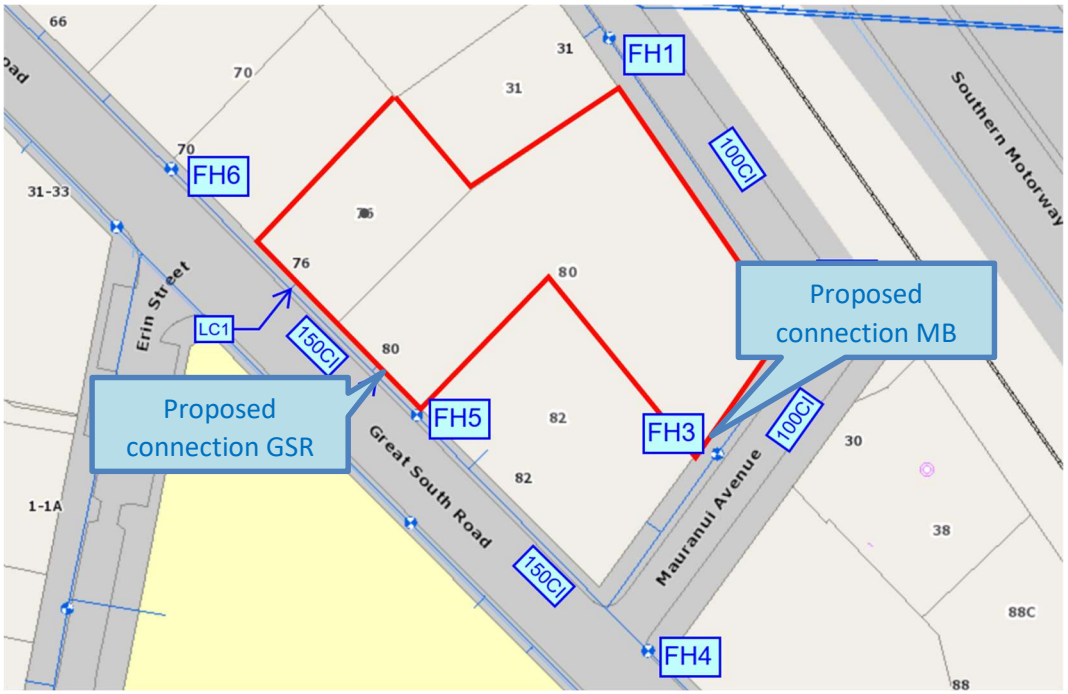

FIGURE 6-2: PROPOSED CONNECTION POINTS

7. UTILITIES

Existing utilities around the site have been identified using before-U-dig documents for telecom, power and gas lines. The capability and specific infrastructure required to facilitate the building with these services will require detailed assessment by their corresponding providers.

7.1 TELECOMMUNICATIONS

Chorus telecommunication lines are available on both Great South Road and Mauranui Avenue for future connections. It is noted a large link box is located at the eastern corner of the site on the footpath of Mauranui Avenue.

7.2 POWER

Low and high voltage cables are available along both Great South Road and Mauranui Avenue for future connections.

It is noted that there is a power sub-station located within the boundaries of the neighbouring 82 Great South Road with a duct bank crossing Mauranui Avenue to it. A substation cable leads to a pillar just outside the boundary of 80 Great South Road which appears to provide low voltage supply to the site.

7.3 GAS

The site is currently serviced by a MP4 50mm PE pipe along Great South Road and MPR 32mm PE along the north-east boundary to Mauranui Avenue. It is however not planned to provide the development with gas and any existing connections to the site will be terminated.

8. CONCLUSIONS

This report has been prepared for the use of Dilworth Trust Board in support of their Resource Consent application for 76 & 80 Great South Road, Remuera.

The site earthworks are not expected to adversely impact the surrounding area subject to the recommended erosion and sediment controls being implemented. These are to be maintained for the duration of the construction period until such time that all exposed earth has been covered or stabilised.

It is planned to provide three separate vehicle access points to the site. Two will be for the one-way private internal access lane running from Great South Road to Mauranui Avenue. The third access point will be for the entrance to the basement parking off Mauranui Avenue.

It is proposed to provide stormwater management on site by means of three soakholes. Testing on site has revealed that the site has good soakage availability with any 10-year ARI flows in excess of the soakhole capacity being detained on site using underground detention tanks. Additional retention capacity will also be provided to allow for irrigation of the landscaping during dry spells. The overland flow path will not be altered and no negative downstream impact of the flood plains or properties is anticipated. As the proposed development will reduce stormwater run-off compared to the existing situation, it is considered the development would have an overall positive impact on any downstream flooding.

The existing wastewater line crossing 80 Great South Road will need to be diverted away from the proposed building due to the planned basement which would impact on this line. It is planned to divert the wastewater main through 82 Great South Road. Both the owners of the 82 Great South Road and the long-term tenants have agreed to this relocation and it is also of benefit to replace the existing line which is in poor condition. It is proposed to install the wastewater line using horizontal drilling methods to minimise impacts on the day to day operations of the tenants. Blue Barn have assessed the downstream capacity of the line and determined there is sufficient capacity available to service the proposed development.

There is water available on the boundary of the site from which connections to service the two buildings can be obtained. Hydrant testing carried out on this system confirm there is capacity for firefighting purposes. Watercare would need to approve the application for the two connections.

There are utility services available on the boundary of the site and the individual service providers will be approached for comment on the capacity of their services to accommodate the proposed development.

It is therefore concluded that the proposed development can be serviced in a way that does not have a negative impact on the surrounding area and environment. Subject to the design and construction being undertaken in accordance with best practises and the relevant guidelines there should be no reason to refuse the application.

9. LIMITATIONS

This report and the accompanying drawings and materials have been prepared solely and exclusively for the benefit of Dilworth Trust Board as our client for the project, 76-80 Great South Road - Civil Works - 02240-01 and the particular brief. This report is strictly limited to the matters referred to herein. No part of this report and the accompanying drawings and materials have may be copied or distributed without Blue Barn Consulting Limited's prior written consent and no third party may rely upon the report for any purposes whatsoever. Due to this fact, any reuse of the data in this report will be at the user's sole risk without any liability on the part of Blue Barn Consulting Limited. To the fullest extent permitted by law, neither Blue Barn Consulting Limited nor any of its employees, contractors or sub-consultants accepts any responsibility or liability whatsoever to any third party, notwithstanding that, with Blue Barn Consulting Limited's approval, the report may be made available to other persons for an application for consent or approval or to fulfil a legal requirement.

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Blue Barn Consulting Limited gives no undertaking to update this report after the final version has been released to the client. This report and the associated services provided by Blue Barn Consulting Limited are otherwise subject to the Consultant Agreement with Dilworth Trust Board dated 24 February 2022.

APPENDIX A – ENGINEERING PLANS

NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.

LEGEND:

DESIGN CONTOUR (MAJOR @2.5m INTERVAL)	20.0
DESIGN CONTOUR (MINOR @0.5m INTERVAL)	20.5
PROPOSED PERVIOUS AREA (LANDSCAPING)	
PROPOSED IMPERVIOUS AREA (ROOF)	
PROPOSED LANEWAY	

PROPOSED DEVELOPMENT		
TOTAL AREA (m^2)	PERVIOUS AREA(m^2)	IMPERVIOUS AREA(m^2)
4,173	1,508	2,665

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	ISSUE FOR CONSENT	SY	-	09/06/2022

CLIENT:

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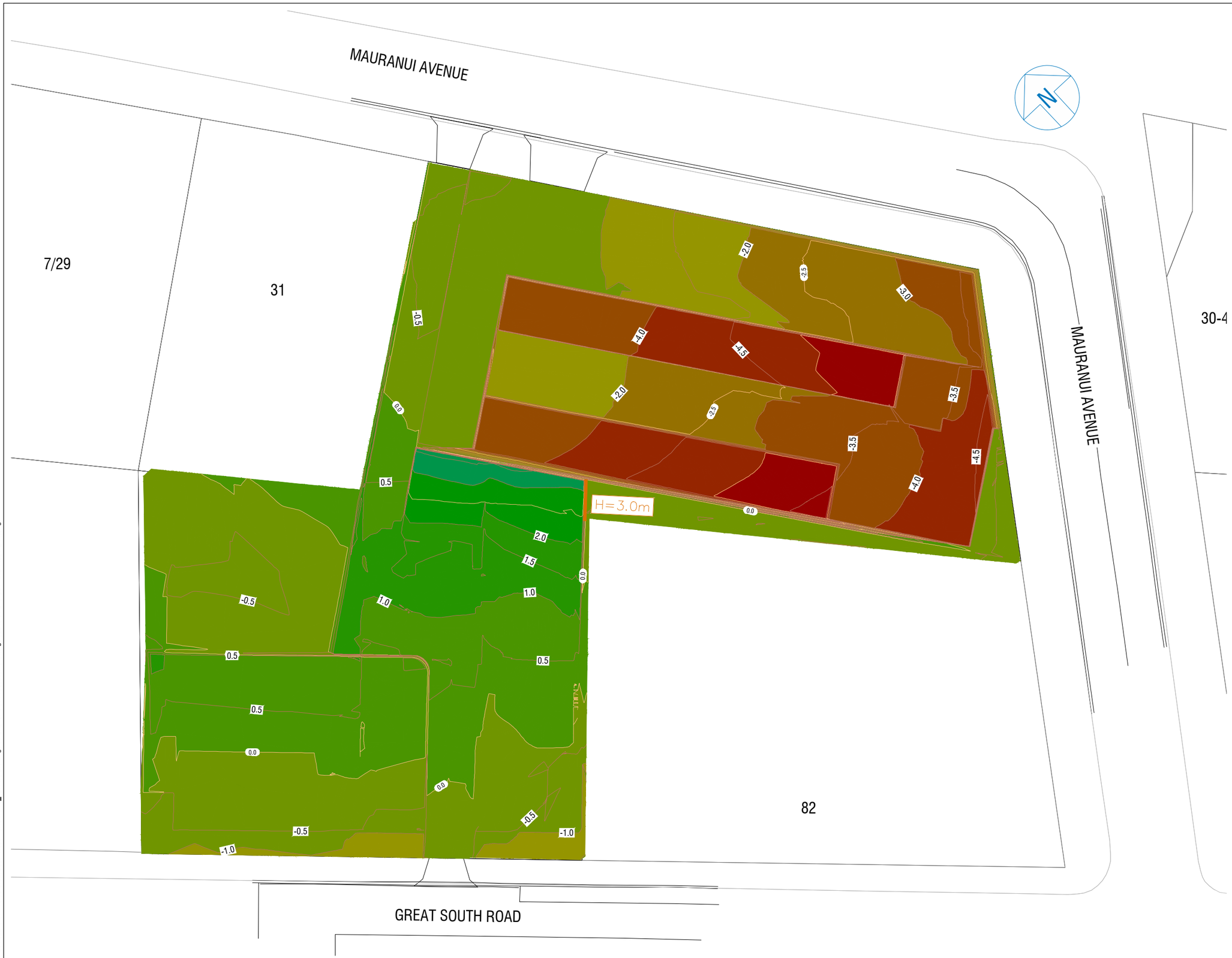
PROJECT:
DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE:
EARTHWORKS
FINISHED GROUND CONTOURS PLAN

DESIGNED: SY	DATE: 09/06/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 14/06/2022	DESIGN CHECK: SD	DATE: 21/06/2022
APPROVED: SD	DATE: 21/06/2022	SCALE: 1:200@A1 1:400@A3	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: FOR CONSENT		
DRAWING NUMBER: 02240-ST1-C-200			REVISION: -

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Tue, 21 Jun 2022 - 10:05am By: SAM.YANG
File Name: C:\12dSdata\BBN\SD\102240-01 - 76-80 Great South Road - Civil Works_221706 Drawings\00 CAD Civil\01 Production Drawings\02240-01-200-EARTHWORKS FG CONTOUR PLAN.dwg



NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.

EARTHWORK CALCULATION

EARTHWORK AREA	4 173m²
CUT AREA	2 885m²
FILL AREA	1 267m²

PROPOSED CUT VOLUME 5,630m³

PROPOSED FILL VOLUME 1,267m3

H=3.0m — PROPOSED RETAINING WALL AND INDICATION OF RETAINED HEIGHT

LEGEND:

Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-6.000	-5.000
2		-5.000	-4.000
3		-4.000	-3.000
4		-3.000	-2.000
5		-2.000	-1.000
6		-1.000	0.000
7		0.000	1.000
8		1.000	2.000
9		2.000	3.000
10		3.000	4.000

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	15/06/2022

CLIENT:

BLUE BARN CONSULTING ENGINEERS
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www.bluebarn.co.nz

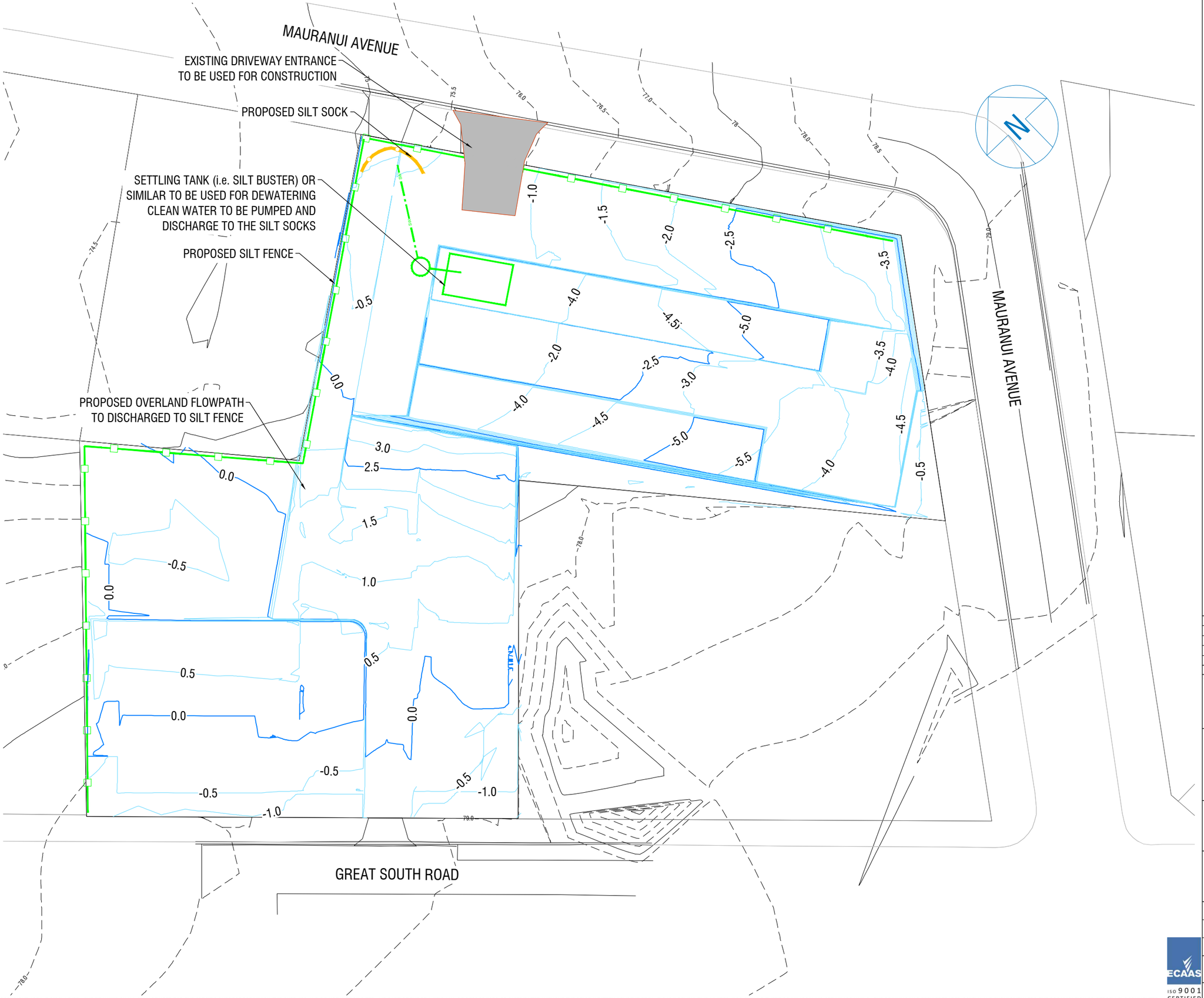
PROJECT:
DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE:
PROPOSED EARTHWORKS
CUT AND FILL PLANS

DESIGNED: SY	DATE: 10/06/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 21/06/2022	DESIGN CHECK: SD	DATE: 21/06/2022
APPROVED: SD	DATE: 21/06/2022	SCALE: 1:200@A1 1:400@A3	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: ---		
DRAWING NUMBER: 02240-01-210			REVISION: -

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Tue, 21 Jun 2022 - 10:28am By: SAM.YANG
File Name: C:\12dSData\BBNAS01\02240-01 - 76-80 Great South Road - Civil Works_2217\06 Drawings\00 CAD Civil\01 Production Drawings\02240-01-210-CUT AND FILL PLAN.dwg



NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.
3. REFERENCE GENERAL NOTES DRAWING < >

LEGEND:

- CUT AND FILL CONTOURS (MAJOR @2.5m INTERVAL) — 25.0
- CUT AND FILL CONTOURS (MINOR @0.5m INTERVAL) — 21.0
- PROPOSED SILT FENCE
- PROPOSED SILT BUSTER
- PROPOSED OVERLAND FLOW
- PROPOSED SILT SOCKS

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	15/06/2022

CLIENT:

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www.bluebarn.co.nz

PROJECT:
DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE:
PROPOSED EARTHWORKS
EROSION AND SEDIMENT CONTROL PLAN

DESIGNED: SY	DATE: 14/06/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 15/06/2022	DESIGN CHECK: SD	DATE: 15/06/2022
APPROVED: SD	DATE: 15/06/2022	SCALE: 1:200@A1 1:400@A3	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: ---		
DRAWING NUMBER: 02240-ST01-C-220			REVISION: -

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Tue, 21 Jun 2022 - 11:49am By: SAM.YANG
File Name: C:\12dSvata\BBNAS01\02240-01 - 76-80 Great South Road - Civil Works_2217\06 Drawings\00 CAD Civil\01 Production Drawings\02240-01-220-EROSION AND SEDIMENT CONTROL.dwg

NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.

LEGEND:

20.0

DESIGN CONTOURS (MAJOR @2.5m INTERVAL)

DESIGN CONTOURS (MINOR @0.5m INTERVAL)

PROPOSED ROOF AREA

PROPOSED LANEWAY

PROPOSED LANDSCAPING AREA

PROPOSED OVERLAND FLOW

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	15/06/2022

CLIENT:

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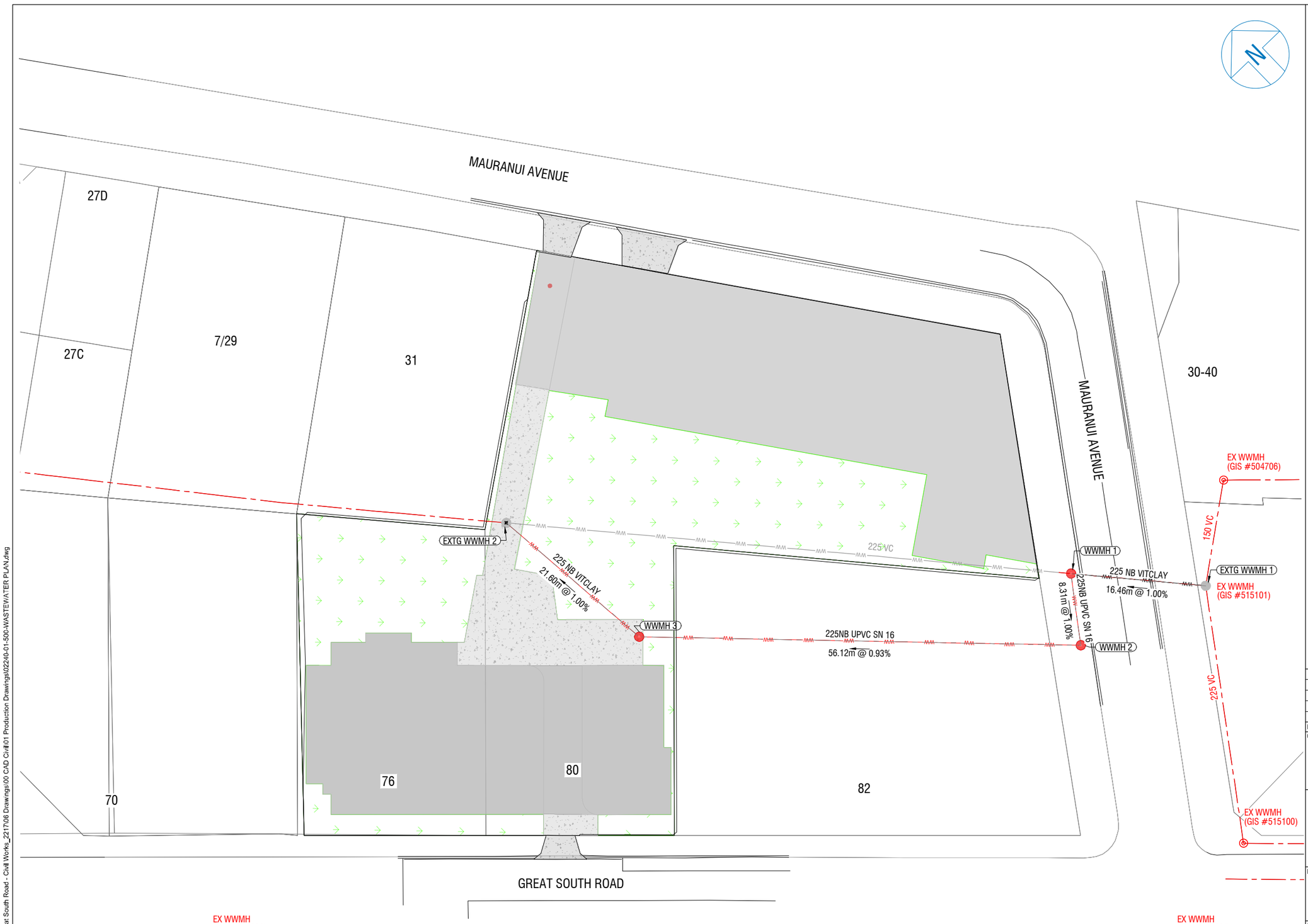
PROJECT:
DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE:
DRAINAGE
STORMWATER LAYOUT PLAN

DESIGNED: SY	DATE: 15/06/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 15/06/2022	DESIGN CHECK: SD	DATE: 15/06/2022
APPROVED: SD	DATE: 15/06/2022	SCALE: 1:200@A1 1:400@A3	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: ISSUE FOR RESOURCE CONSENT		
DRAWING NUMBER: 02240-ST01-C-400			REVISION: -

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Tue, 21 Jun 2022 - 10:53am By: SAM.YANG
File Name: C:\12dSdata\BBNAS01\02240-01 - 76-80 Great South Road - Civil Works_2217\06 Drawings\00 CAD Civil\01 Production Drawings\02240-01-400-STORMWATER PLANS.dwg



NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.
3. INVERT LEVELS FOR EXTG MH 1 AND 2 TO BE CONFIRMED ON TOPO SURVEY. EXISTING PIPES ARE SUBJECT TO RELAYING DEPENDING ON ESTIMATED GRADIENT FROM TOPO SURVEY..
4. EXISTING GROUND LEVELS SHOWN ARE ESTIMATED BASED ON 2015 TOPO AND TO BE CONFIRMED ON TOPO SURVEY.

LEGEND:

- PROJECT SITE BOUNDARY
- PROPERTY BOUNDARY
- EXISTING WASTEWATER MANHOLE
- EXISTING WASTEWATER PIPE
- PROPOSED WASTEWATER PIPE
- PROPOSED WASTEWATER MANHOLE

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	17/06/2022

CLIENT:

BLUE BARN
CONSULTING ENGINEERS
LEVEL 8 | 51 SHORTLAND STREET
PO BOX 587 | SHORTLAND STREET | AUCKLAND 1140 | T: 0800 258 32276
www.bluebarn.co.nz

PROJECT:

TITLE:
DRAINAGE
WASTEWATER LAYOUT PLAN

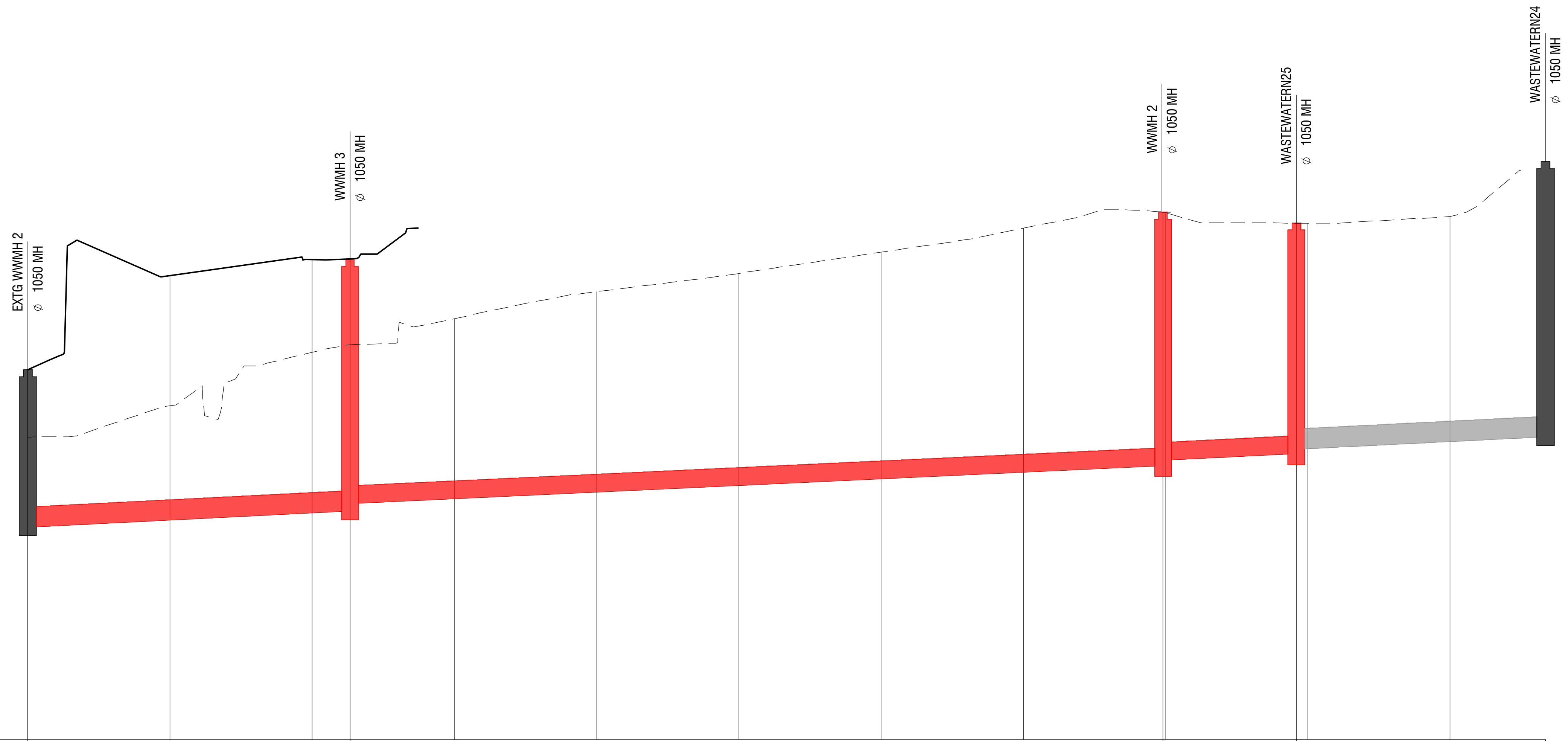
DESIGNED: BC	DATE: 10/05/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 17/06/2022	DESIGN CHECK: SD	DATE: 17/06/2022
APPROVED: SD	DATE: 17/06/2022	SCALE: --- ---	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: ---		
DRAWING NUMBER: 02240-ST01-C-500			REVISION: -

ECAAS ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Fri, 17 Jun 2022 - 4:43pm By: SAM.YANG
File Name: C:\12dSdata\BBNAS01\02240-01 - 76-80 Great South Road - Civil Works_221706 Drawings\00 CAD Civil\01 Production Drawings\02240-01-500-WASTEWATER PLAN.dwg

NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.
3. INVERT LEVELS FOR EXTG MH 1 AND 2 TO BE CONFIRMED ON TOPO SURVEY. EXISTING PIPES ARE SUBJECT TO RELAYING DEPENDING ON ESTIMATED GRADIENT FROM TOPO SURVEY..
4. EXISTING GROUND LEVELS SHOWN ARE ESTIMATED BASED ON 2015 TOPO AND TO BE CONFIRMED ON TOPO SURVEY.



VERT EXAG 1:5
Datum 72.000

COVER	0.98	2.05 / 1.99	3.32 / 3.24	2.99 / 2.90	-0.14
DEPTH TO INVERT	2.18	3.50	3.56	3.24	3.84
INVERT LEVEL	75.01	75.24 / 75.32	75.85 / 75.93	76.02 / 76.10	76.28
LID LEVEL	77.20	78.74	79.41	79.26	80.12
CHAINAGE	0.00	22.65	79.81	89.17	106.68

PIPE LENGTH SIZE & GRADIENT				
	21.60m 225 NB VITCLAY 1.00% (1:100)	56.12m 225NB UPVC SN 16 0.93% (1:108)	8.31m 225NB UPVC SN 16 1.00% (1:100)	16.46m 225 NB VITCLAY 1.00% (1:100)

PROPOSED WW REDIRECTION LINE LONGITUDINAL PROFILE

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	17/06/2022

CLIENT:

BLUE BARN CONSULTING ENGINEERS
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PROJECT: DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE: DRAINAGE
PROPOSED WASTEWATER
LONG SECTION

DESIGNED: BC	DATE: 0/05/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 17/06/2022	DESIGN CHECK: SD	DATE: 17/06/2022
APPROVED: SD	DATE: 17/06/2022	SCALE: 1:200 HORIZ 1:40 VERTI	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS: ---		
DRAWING NUMBER: 02240-ST01-C-501			REVISION: ---

ISO 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Fri, 17 Jun 2022 - 1:51pm By: SAM YANG
File Name: C:\12d\Scala\BBN\IS01\2240-0-01 - 76-80 Great South Road - Civil Works_2217\06 Drawings\00 CAD Civil\01 Production Drawings\02240-01-500-WASTEWATER PLAN.dwg

NOTES:

1. COORDINATES EG; MOUNT EDEN 2000, ETC.
2. THE DRAWING IS SHOWN IN METRES UNLESS STATED OTHERWISE.

LEGEND:

- EXISTING WATERMAIN — W
- PROPOSED WATER CONNECTION
- PROPOSED ROOF AREA
- PROPOSED LANEWAY
- PROPOSED LANDSCAPING AREA

FOR CONSENT

REV.	REVISION DESCRIPTION	BY	APP.	DATE
-	FOR CONSENT	SY	RC	15/06/2022

CLIENT:

BLUE BARN CONSULTING ENGINEERS
LEVEL 8 | 51 SHORTLAND STREET
PO BOX 587 | SHORTLAND STREET | AUCKLAND 1140 | T: 0800 258 32276
www.bluebarn.co.nz

PROJECT:
DILWORTH TRUST BOARD
76-80 GREAT SOUTH ROAD - CIVIL WORKS
RESOURCE CONSENT

TITLE:
WATER SUPPLY
WATER RETICULATION LAYOUT PLAN

DESIGNED: SY	DATE: 15/06/2022	DRAWING CHECK:	DATE:
DRAWN: SY	DATE: 15/06/2022	DESIGN CHECK: SD	DATE: 15/06/2022
APPROVED: SD	DATE: 15/06/2022	SCALE: 1:200@A1 1:400@A3	ORIG. SIZE: A1
PROJECT NUMBER: 02240-01	ISSUE STATUS:		
DRAWING NUMBER: 02240-ST01-C-600			REVISION: -

ECAAS iso 9001 CERTIFIED QUALITY MANAGEMENT

Plotted: Fri, 17 Jun 2022 - 2:46pm By: SAM.YANG
File Name: C:\12dSData\BBNA\S0110224\0-01 - 76-80 Great South Road - Civil Works_221706 Drawings\00 CAD Civil\01 Production Drawings\02240-01-500-Water Reticulation Plan.dwg

APPENDIX B – SUPPORTING CALCULATIONS

BLUE BARN CONSULTING ENGINEERS

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	SY	**DATE:**	13-Jun-22
SUBJECT:	Maranui Ave Flood Modeling	**CHECK BY:**	SD	**DATE:**	21-Jun-22

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Modelling for overland flowpath.

A) Runoff Parameters and Time of Concentration- Post Development

1. Pond Catchment Details

Total Area (ha)	1.286
Pervious Area (ha)	0.514
Impervious Area (ha)	0.772
Channel^{n} factor **C**	0.60
Catchment length **L** (km)	0.300
Catchment slope **Sc**	0.031

Assumptions (if any):
Conservatively assumes no storage even from green rooftops. With Green rooftops eventually discharging into the network, these have been included into the calculation as impervious areas

2. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil Name and Classific.	Area identifier, cover description (cover type, treatment and hydrological condition)	Curve number CN*	Area (ha)	Product CN x Area
	Impervious Area			
	Roofs & Paved	98	0.772	75.6
	Pervious Area			
	Grass / vegetated areas	75	0.514	38.6
	* from Appendix B	**Total**	**1.286**	**114.2**

CN (weighted) = $\frac{\text{total CN x A}}{\text{total area}} = \frac{114.2}{1.2860} =$ **88.8**

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{2.6}{1.2860} =$ **2.0**

3. Time of Concentration

Runoff Factor = $\frac{CN}{200 - CN} = 0.799$

tc = 0.14C x L0.66 x [CN/(200-CN)]-.55 x Sc-0.30 = **0.170** hrs Note: tc = 10 min = 0.17hrs

SCS Lag for HEC-HMS "tp" = 2/3 x tc = **0.113** hrs

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	SY	**DATE:**	13-Jun-22
SUBJECT:	Maranui Ave Flood Modeling	**CHECK BY:**	SD	**DATE:**	21-Jun-22

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Modelling for overland flowpath.

B) Graphical Peak Flow Rate- Post Development

1. Catchment Area (km^2) = 0.01286

2. Calc storage, S = 25.4 x [(1000/CN - 10)] = 32.036

	WQV	EDV	2 year	10 year	100 year
3. Annual Recurrence Interval (ARI)					
4. 24 hour rainfall depth, P_{24} (mm)	-	-	-	145.8	238.3
5. Compute c* = $\frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$ (mm)				0.689	0.785
6. Specific flow rate q* (from Fig. 5.1 below)				0.151	0.184
7. Peak flow rate, q_p = q^*AP_{24} (m^3/sec)				0.283	0.562
8. Runoff depth, Q_{24} = $\frac{(P_{24} - Ia)^2}{(P_{24} - Ia) + S}$ (mm)				117.6	208.1
9. Runoff Volume, V_{24} = 1000 x $Q_{24}A$ (m^3)				1,512	2,676

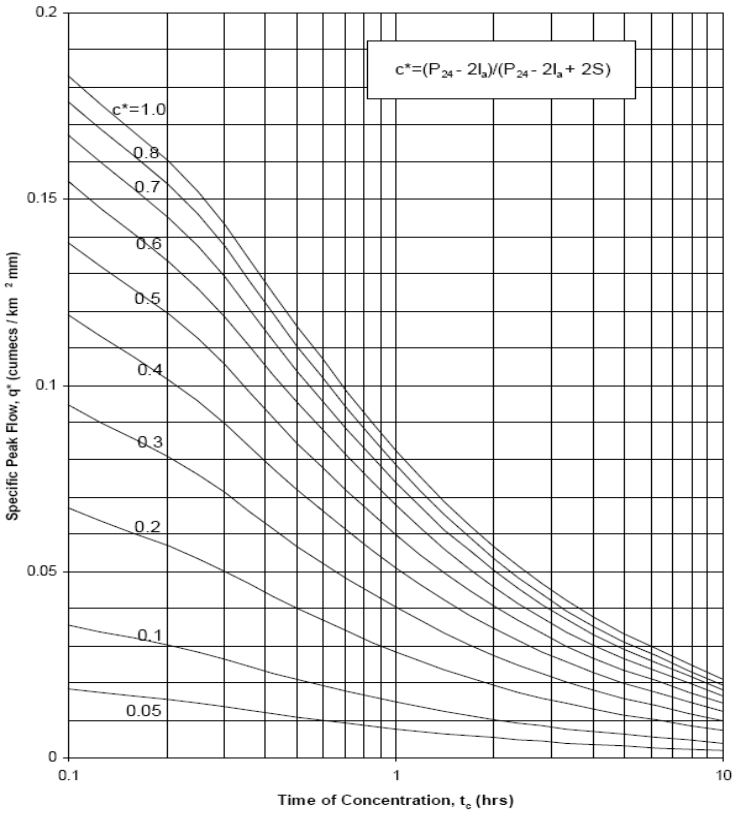


Figure 5.1 - Specific Peak Flow Rate

Figure 5.1, from TP108

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jun 21 2022

100YR OVERLAND FLOWPATH FLOOD MODELING - MAURANUI AVE

User-defined

Invert Elev (m)	= 75.6820
Slope (%)	= 3.1250
N-Value	= 0.013

Calculations

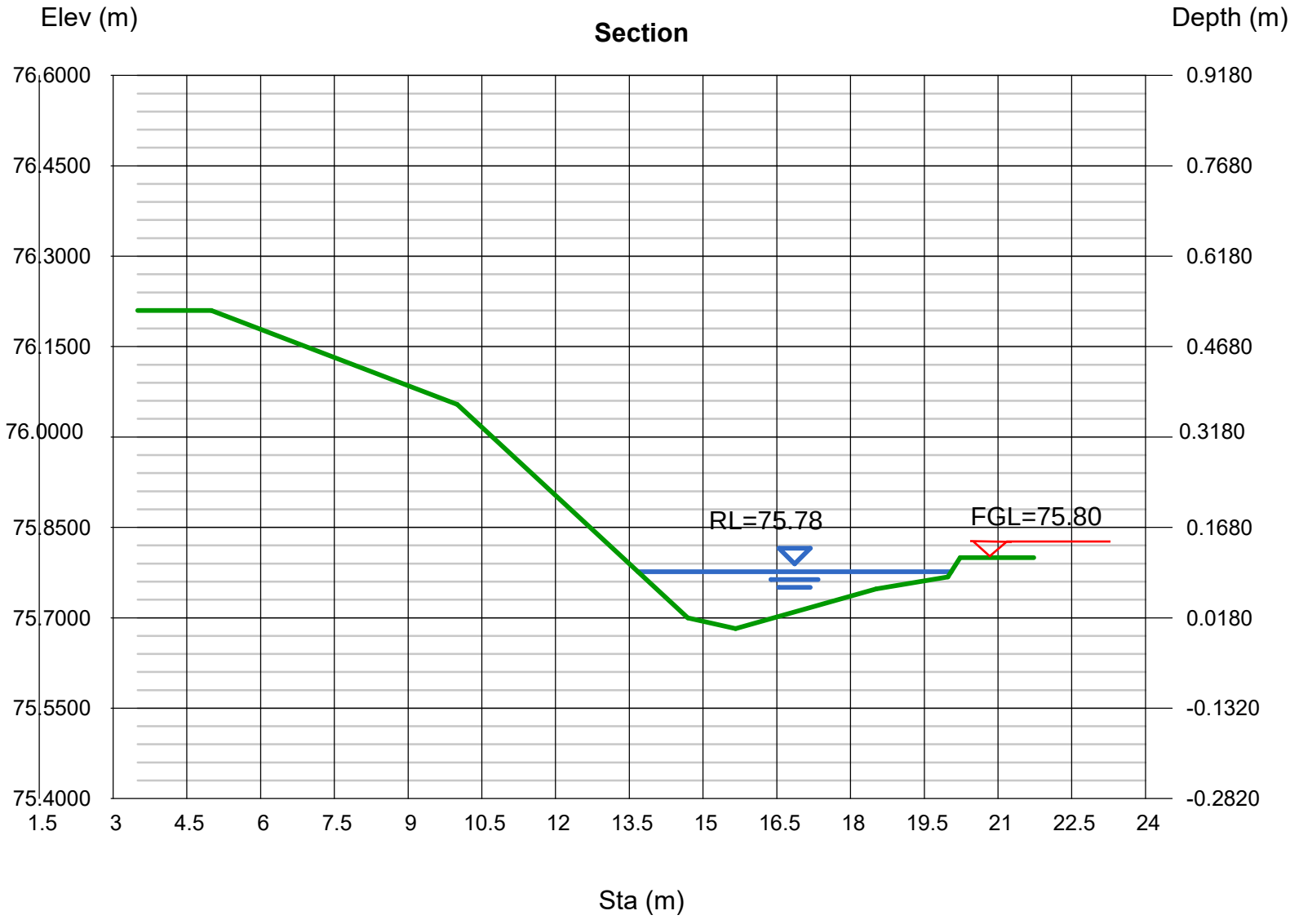
Compute by:	Known Q
Known Q (cms)	= 0.5620

Highlighted

Depth (m)	= 0.0945
Q (cms)	= 0.5620
Area (sqm)	= 0.3247
Velocity (m/s)	= 1.7306
Wetted Perim (m)	= 6.3746
Crit Depth, Yc (m)	= 0.1372
Top Width (m)	= 6.3701
EGL (m)	= 0.2473

(Sta, El, n)-(Sta, El, n)...

(5.0000, 76.2100)-(10.0000, 76.0540, 0.013)-(14.6900, 75.7000, 0.013)-(15.6600, 75.6820, 0.013)-(18.5180, 75.7480, 0.013)-(19.9810, 75.7680, 0.013)-(20.2290, 7



A1- Mauranui Avenue Overland Flowpath Catchment Plan

BLUE BARN CONSULTING ENGINEERS

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

A) Runoff Parameters and Time of Concentration- Post Development

1. Pond Catchment Details

Total Area (ha)	0.206
Pervious Area (ha)	0.077
Impervious Area (ha)	0.130
Channel^{n} factor **C**	0.60
Catchment length **L** (km)	0.150
Catchment slope **Sc**	0.015

Assumptions (if any):
Conservatively assumes no storage even from green rooftops. With Green rooftops eventually discharging into the network, these have been included into the calculation as impervious areas

2. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil Name and Classific.	Area identifier, cover description (cover type, treatment and hydrological condition)	Curve number CN*	Area (ha)	Product CN x Area
	Impervious Area			
	Roofs & Paved	98	0.130	12.7
	Pervious Area			
	Grass / vegetated areas	75	0.077	5.8
	* from Appendix B	**Total**	**0.206**	**18.4**

CN (weighted) = $\frac{\text{total CN x A}}{\text{total area}} = \frac{18.4}{0.2062} =$ **89.4**

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{0.4}{0.2062} =$ **1.9**

3. Time of Concentration

Runoff Factor = $\frac{CN}{200 - CN} = 0.809$

tc = 0.14C x L0.66 x [CN/(200-CN)]-.55 x Sc-0.30 = **0.170** hrs Note: tc = 10 min = 0.17hrs

SCS Lag for HEC-HMS "tp" = 2/3 x tc = **0.113** hrs

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

B) Graphical Peak Flow Rate- Post Development

1. Catchment Area (km^2) = 0.002062

2. Calc storage, S = 25.4 x [(1000/CN - 10)] = 29.974

	WQV	EDV	2 year	10 year	100 year
3. Annual Recurrence Interval (ARI)					
4. 24 hour rainfall depth, P_{24} (mm)	-	-	-	145.8	238.3
5. Compute c* = $\frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$ (mm)				0.703	0.796
6. Specific flow rate q* (from Fig. 5.1 below)				0.153	0.161
7. Peak flow rate, q_p = q^*AP_{24} (m^3/sec)				0.046	0.079
8. Runoff depth, Q_{24} = $\frac{(P_{24} - Ia)^2}{(P_{24} - Ia) + S}$ (mm)				119.1	209.8
9. Runoff Volume, V_{24} = 1000 x $Q_{24}A$ (m^3)				246	433

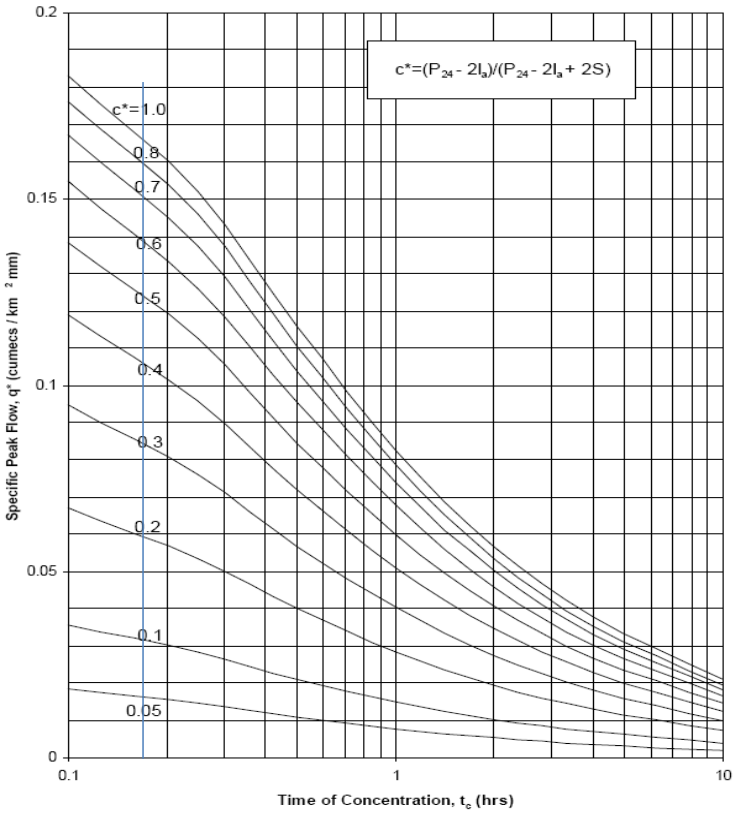


Figure 5.1 - Specific Peak Flow Rate

Figure 5.1, from TP108

BLUE BARN CONSULTING ENGINEERS

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

A) Runoff Parameters and Time of Concentration- Post Development

1. Pond Catchment Details

Total Area (ha)	0.157
Pervious Area (ha)	0.072
Impervious Area (ha)	0.085
Channel^{n} factor **C**	0.60
Catchment length **L** (km)	0.043
Catchment slope **Sc**	0.015

Assumptions (if any):
Conservatively assumes no storage even from green rooftops. With Green rooftops eventually discharging into the network, these have been included into the calculation as impervious areas

2. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil Name and Classific.	Area identifier, cover description (cover type, treatment and hydrological condition)	Curve number CN*	Area (ha)	Product CN x Area
	Impervious Area			
	Roofs & Paved	98	0.085	8.3
	Pervious Area			
	Grass / vegetated areas	75	0.072	5.4
	* from Appendix B	**Total**	**0.157**	**13.7**

CN (weighted) = $\frac{\text{total CN x A}}{\text{total area}} = \frac{13.7}{0.1570} =$ **87.4**

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{0.4}{0.1570} =$ **2.3**

3. Time of Concentration

Runoff Factor = $\frac{CN}{200 - CN} = 0.776$

tc = 0.14C x L0.66 x [CN/(200-CN)]-.55 x Sc-0.30 = **0.170** hrs Note: tc = 10 min = 0.17hrs

SCS Lag for HEC-HMS "tp" = 2/3 x tc = **0.113** hrs

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

B) Graphical Peak Flow Rate- Post Development

1. Catchment Area (km^2) = 0.00157

2. Calc storage, S = 25.4 x [(1000/CN - 10)] = 36.652

	WQV	EDV	2 year	10 year	100 year
3. Annual Recurrence Interval (ARI)					
4. 24 hour rainfall depth, P_{24} (mm)	-	-	-	145.8	238.3
5. Compute c* = $\frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$ (mm)				0.658	0.761
6. Specific flow rate q* (from Fig. 5.1 below)				0.147	0.175
7. Peak flow rate, q_p = q^*AP_{24} (m^3/sec)				0.034	0.065
8. Runoff depth, Q_{24} = $\frac{(P_{24} - Ia)^2}{(P_{24} - Ia) + S}$ (mm)				114.3	204.3
9. Runoff Volume, V_{24} = 1000 x $Q_{24}A$ (m^3)				179	321

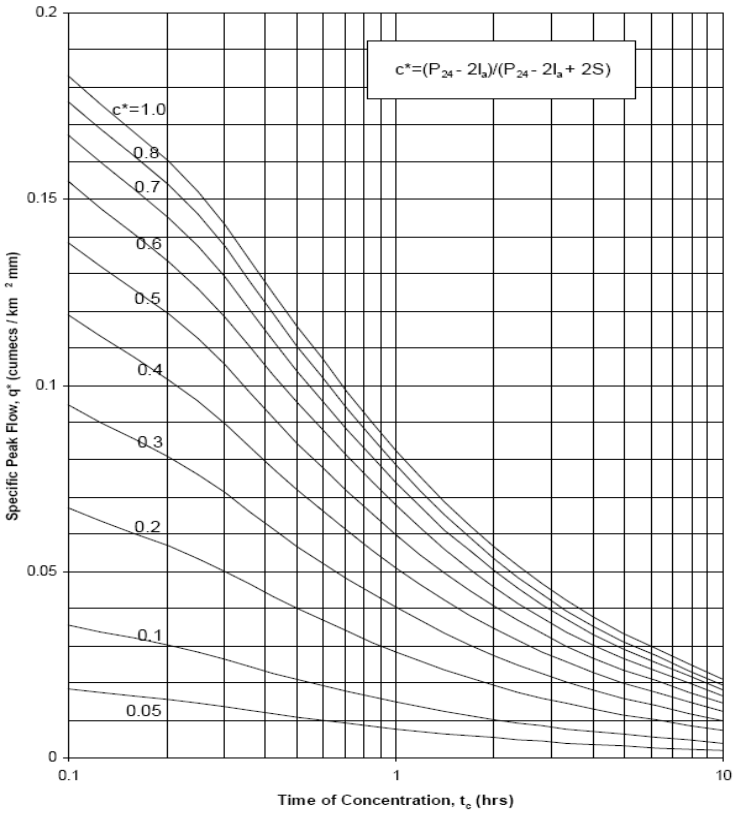


Figure 5.1 - Specific Peak Flow Rate

Figure 5.1, from TP108

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TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

A) Runoff Parameters and Time of Concentration- Post Development

1. Pond Catchment Details

Total Area (ha)	0.131
Pervious Area (ha)	0.129
Impervious Area (ha)	0.002
Channel^{n} factor **C**	0.60
Catchment length **L** (km)	0.150
Catchment slope **Sc**	0.015

Assumptions (if any):
Conservatively assumes no storage even from green rooftops. With Green rooftops eventually discharging into the network, these have been included into the calculation as impervious areas

2. Runoff Curve Number (CN) and Initial Abstraction (Ia)

Soil Name and Classific.	Area identifier, cover description (cover type, treatment and hydrological condition)	Curve number CN*	Area (ha)	Product CN x Area
	Impervious Area			
	Roofs & Paved	98	0.129	12.6
	Pervious Area			
	Grass / vegetated areas	75	0.002	0.2
	* from Appendix B	**Total**	**0.131**	**12.8**

CN (weighted) = $\frac{\text{total CN x A}}{\text{total area}} = \frac{12.8}{0.1308} =$ **97.6**

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{0.6}{0.1308} =$ **4.9**

3. Time of Concentration

Runoff Factor = $\frac{CN}{200 - CN} = 0.954$

tc = 0.14C x L0.66 x [CN/(200-CN)]-.55 x Sc-0.30 = **0.170** hrs Note: tc = 10 min = 0.17hrs

SCS Lag for HEC-HMS "tp" = 2/3 x tc = **0.113** hrs

TP108 Worksheet Calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240		
JOB:	70-80 Great South Road	**CALCS BY:**	Sam Y	**DATE:**	13-Jun-22
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**	Sean D	**DATE:**	

TP108 runoff and volume calculations - Post development

TP108 Worksheet

Project Task: Design soakage for Site. TP108 worksheet applies to ST1 soakhole

B) Graphical Peak Flow Rate- Post Development

1. Catchment Area (km^2) = 0.001308

2. Calc storage, S = 25.4 x [(1000/CN - 10)] = 6.164

	WQV	EDV	2 year	10 year	100 year
3. Annual Recurrence Interval (ARI)					
4. 24 hour rainfall depth, P_{24} (mm)	-	-	-	145.8	238.3
5. Compute c* = $\frac{P_{24} - 2Ia}{P_{24} - 2Ia + 2S}$ (mm)				0.917	0.949
6. Specific flow rate q* (from Fig. 5.1 below)				0.165	0.165
7. Peak flow rate, q_p = q^*AP_{24} (m^3/sec)				0.031	0.052
8. Runoff depth, Q_{24} = $\frac{(P_{24} - Ia)^2}{(P_{24} - Ia) + S}$ (mm)				135.0	227.3
9. Runoff Volume, V_{24} = 1000 x $Q_{24}A$ (m^3)				177	297

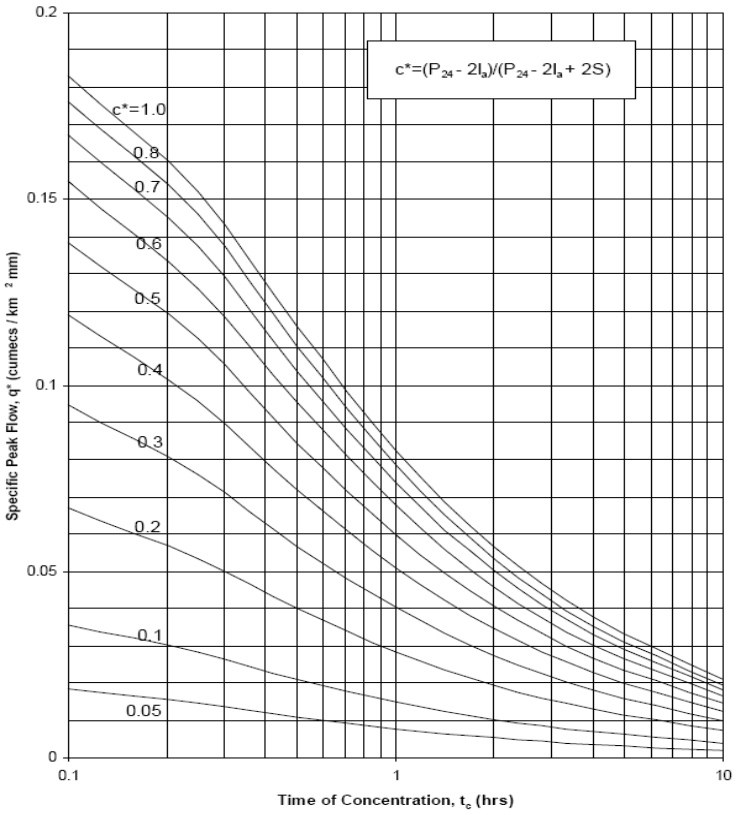
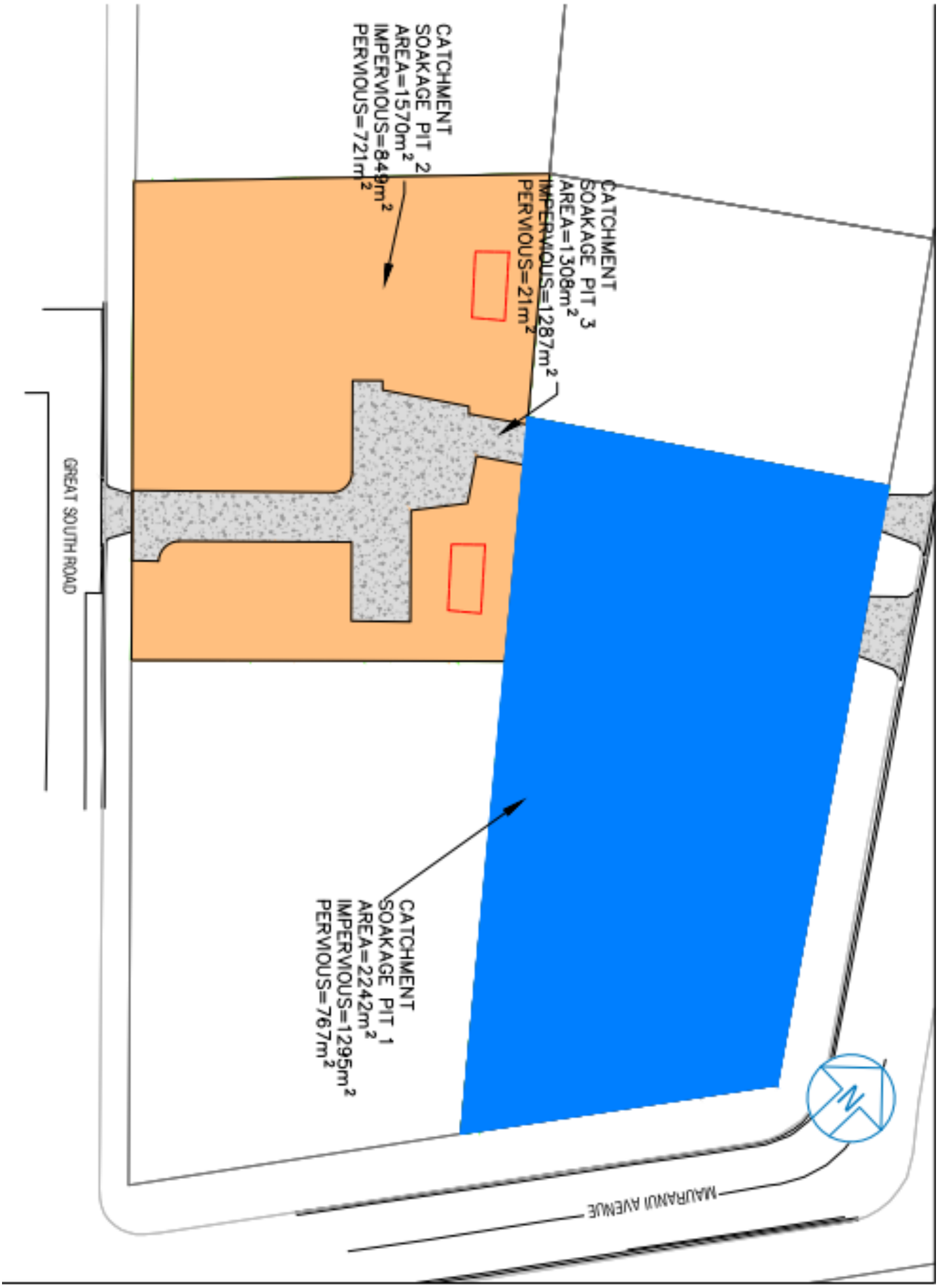


Figure 5.1 - Specific Peak Flow Rate

Figure 5.1, from TP108



B1 – Site Stormwater Catchment Plan (Internal)

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CLIENT	DILWORTH TRUST	**DESIGNED BY**	SY	**DATE**	20/06/2022
PROJECT	78-80 GREAT SOUTH ROAD, EPSOM	**CHECKED BY**	SD	**DATE**	20/06/2022
REVISION	1	**APPROVED BY**	SD	**DATE**	20/06/2022

Site Impervious Area North	1295	m^2
Site Impervious Area South	849	m^2

	Tank 1 (North Building)	**Tank 2 (South Building)**
Peak Discharge (m^3/s)	0.014	0.014
Peak Inflow (m^3/s)	0.0232	0.0152
Detention Volume (m^3) - HMS Modeling	21	3
Retention Volume - TBC	5	5
Orifice Diameter (mm)	65	50

(Assume 10,000L at this point)

Project: SW_detention_tank
Simulation Run: Run 1
Simulation Start: 31 December 1999, 24:00
Simulation End: 1 January 2000, 24:00

HMS Version: 4.8
Executed: 15 June 2022, 22:38

Global Parameter Summary - Subbasin

Area (m^2)

Element Name	Area (m^2)
Imperv	0

Downstream

Element Name	Downstream
Imperv	Detention Tank

Loss Rate: Scs

Element Name	Percent Impervious Area	Curve Number
Imperv	0	98

Transform: Scs

Element Name	Lag	Unitgraph Type
Imperv	10	Standard

Global Results Summary

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Imperv	0	0.02	01Jan2000, 12:00	139.17
Detention Tank	0	0.01	01Jan2000, 12:20	138.47
Sink - 1	0	0.01	01Jan2000, 12:20	138.47

Subbasin: Imperv

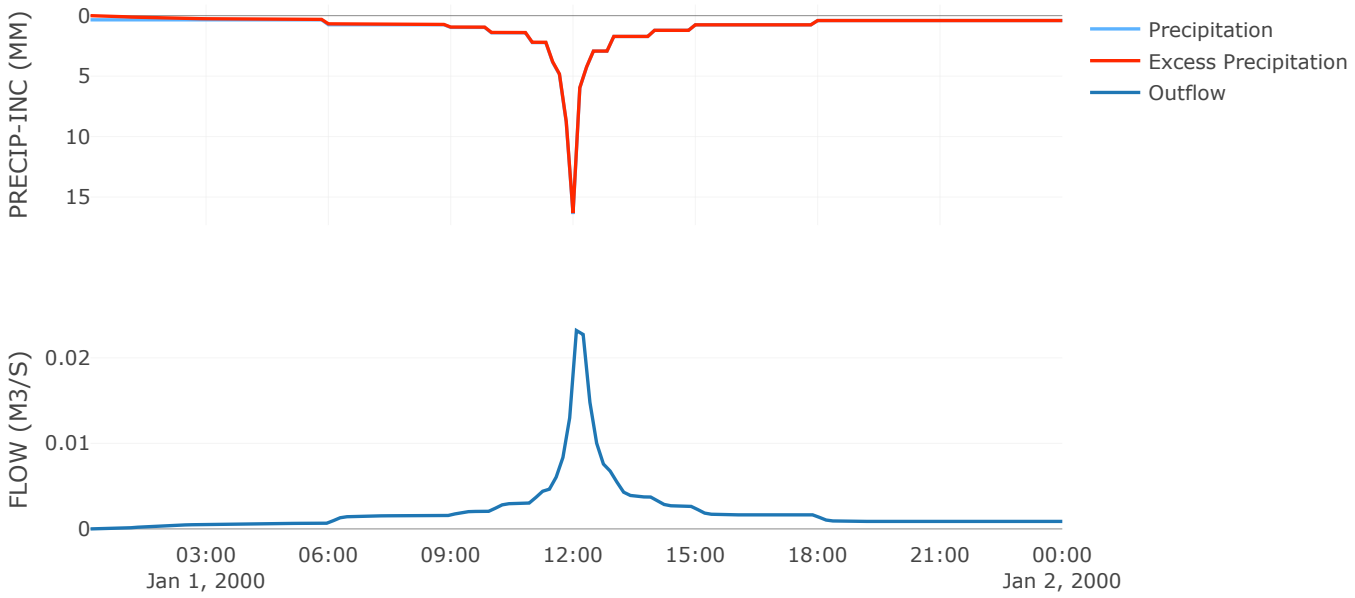
Area (m²) : 0
Downstream : Detention Tank

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	98

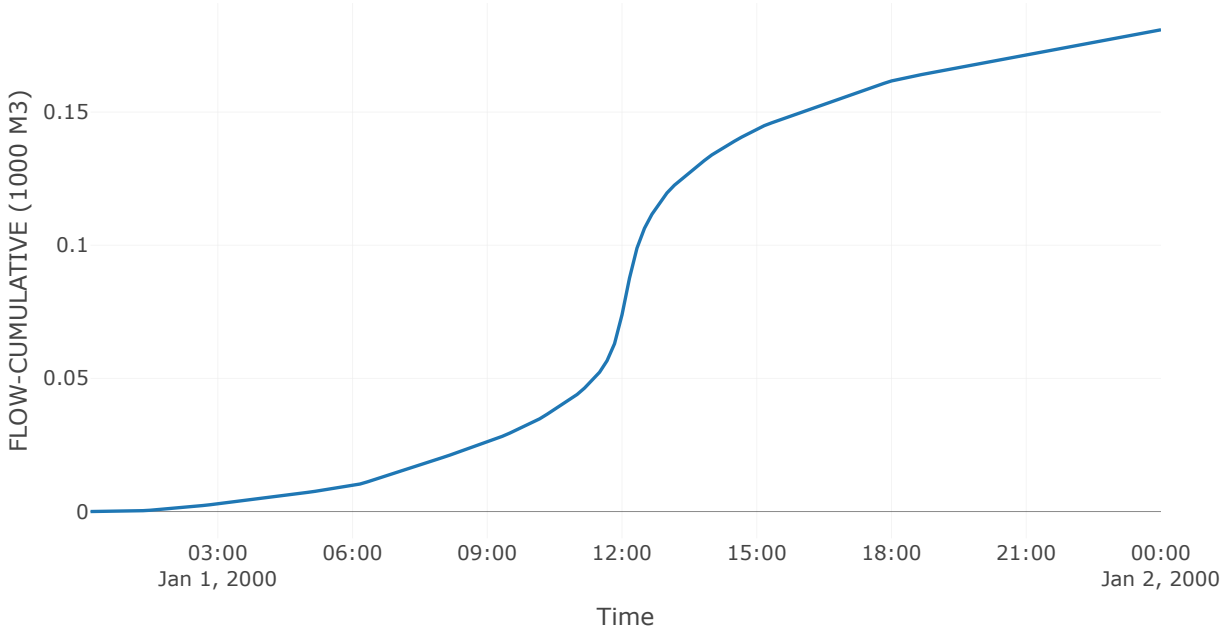
Transform: Scs	
Lag	10
Unitgraph Type	Standard

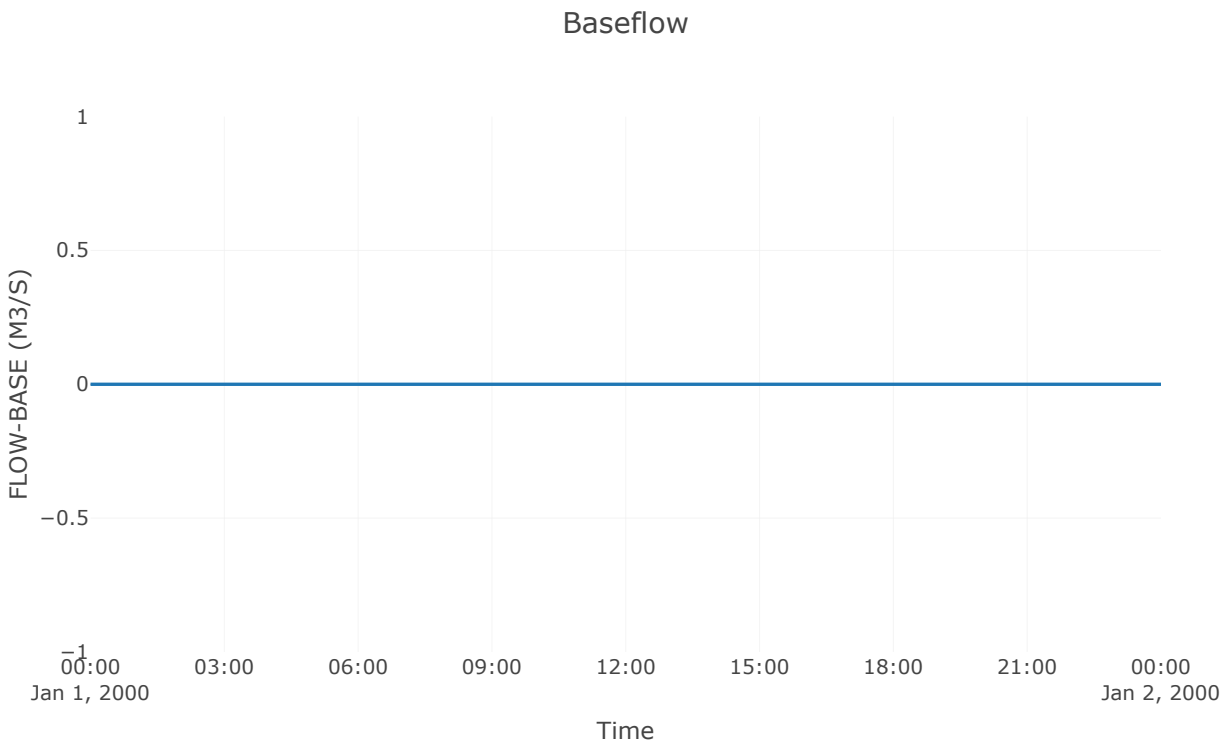
Results: Imperv	
Peak Discharge (M3/S)	0.02
Time of Peak Discharge	01Jan2000, 12:00
Volume (MM)	139.17
Precipitation Volume (M3)	189.53
Loss Volume (M3)	7.85
Excess Volume (M3)	181.67
Direct Runoff Volume (M3)	180.92
Baseflow Volume (M3)	0

Precipitation and Outflow



Cumulative Outflow

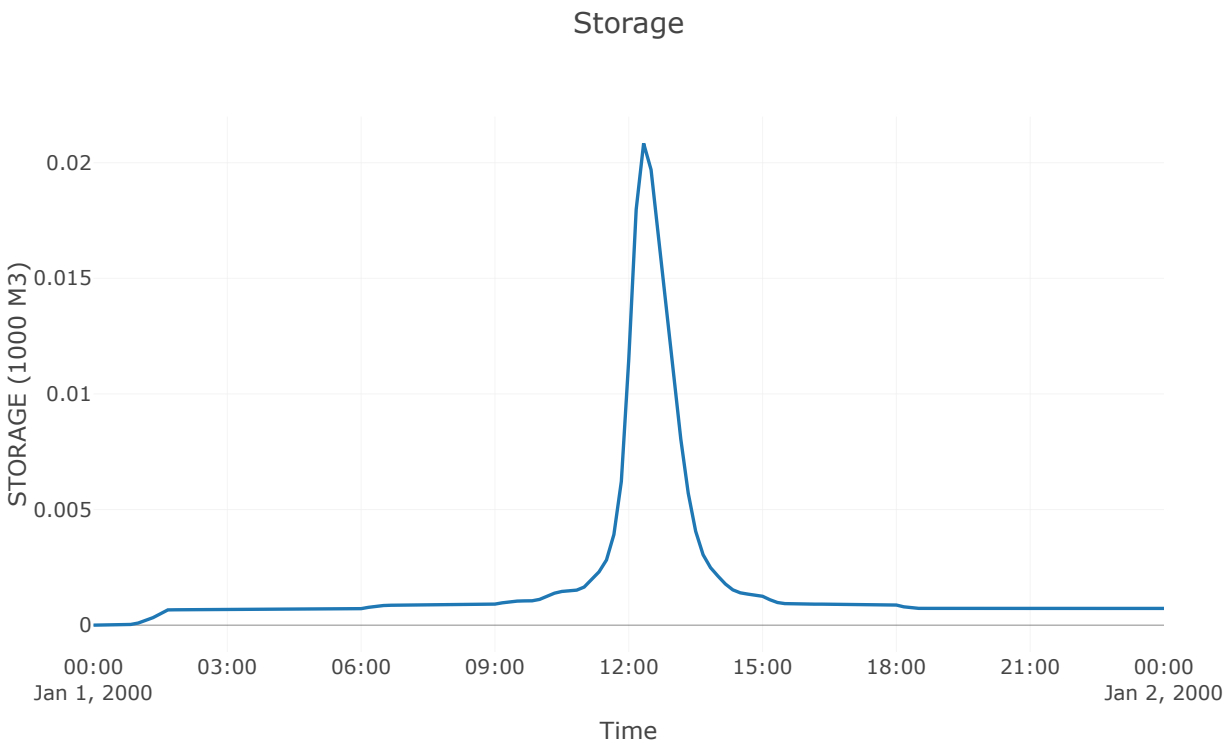


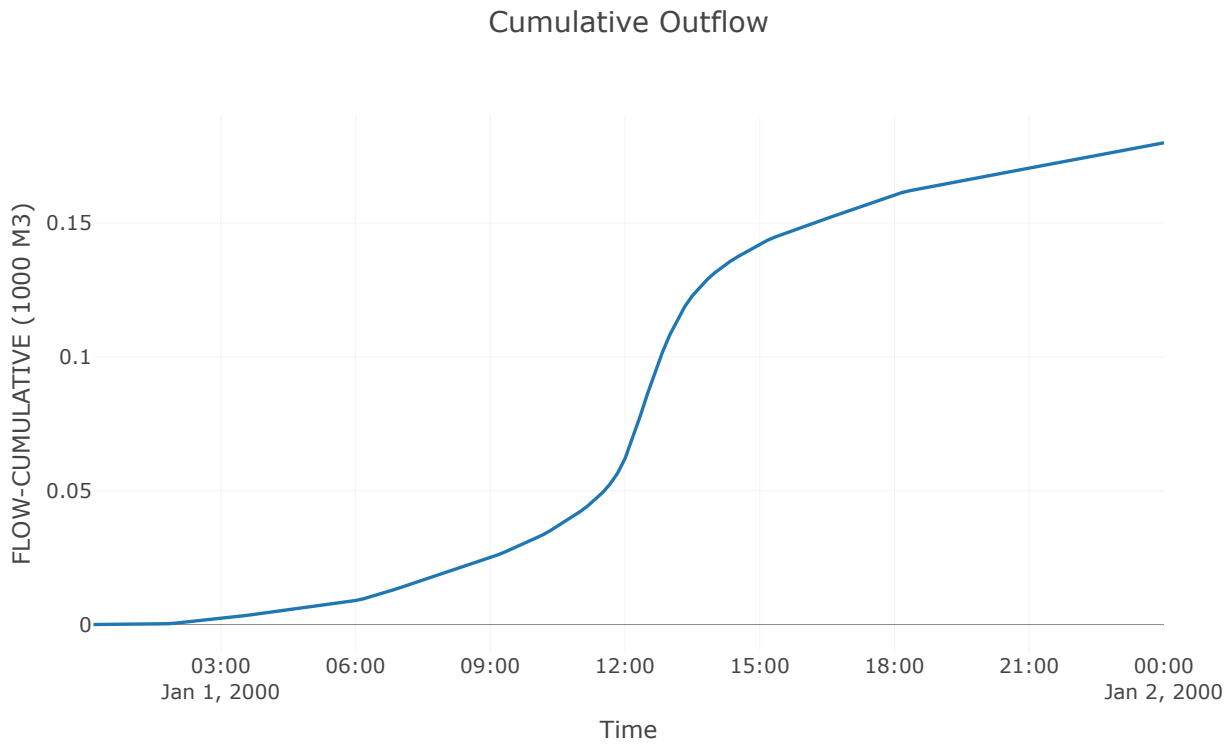

Baseflow
1
0.5
0
−0.5
−1
FLOW-BASE (M3/S)
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

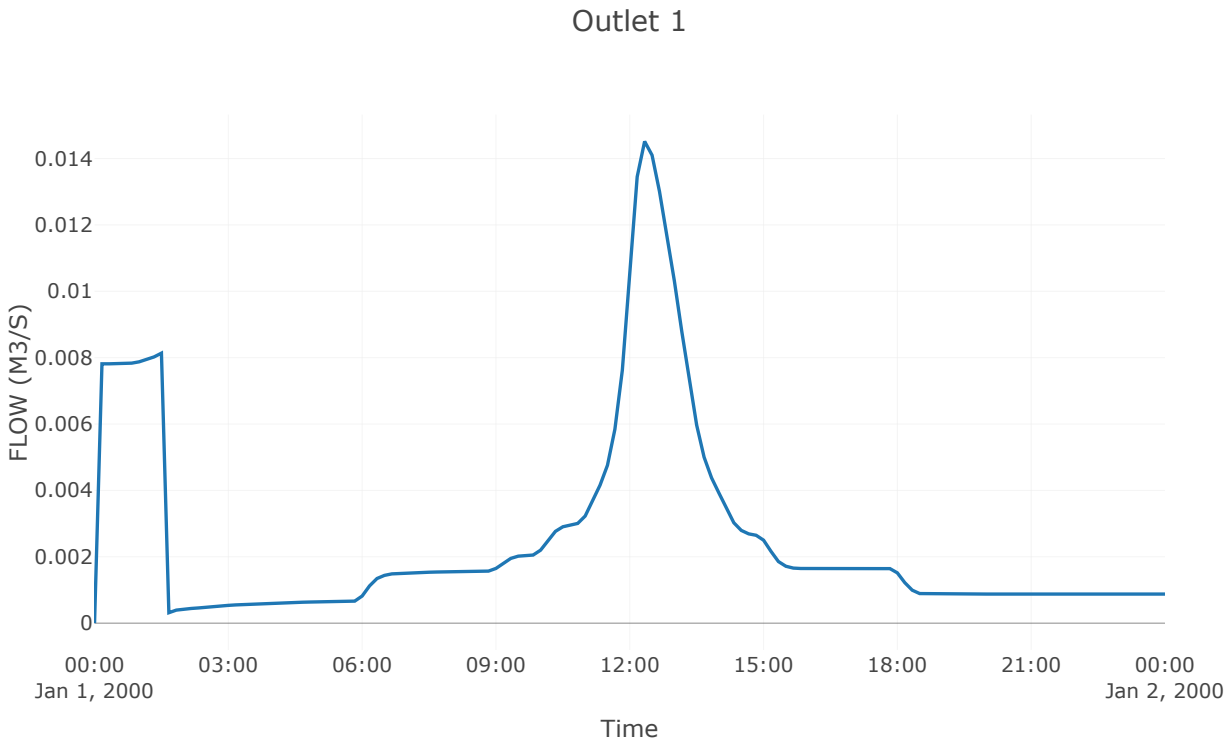
Reservoir: Detention Tank

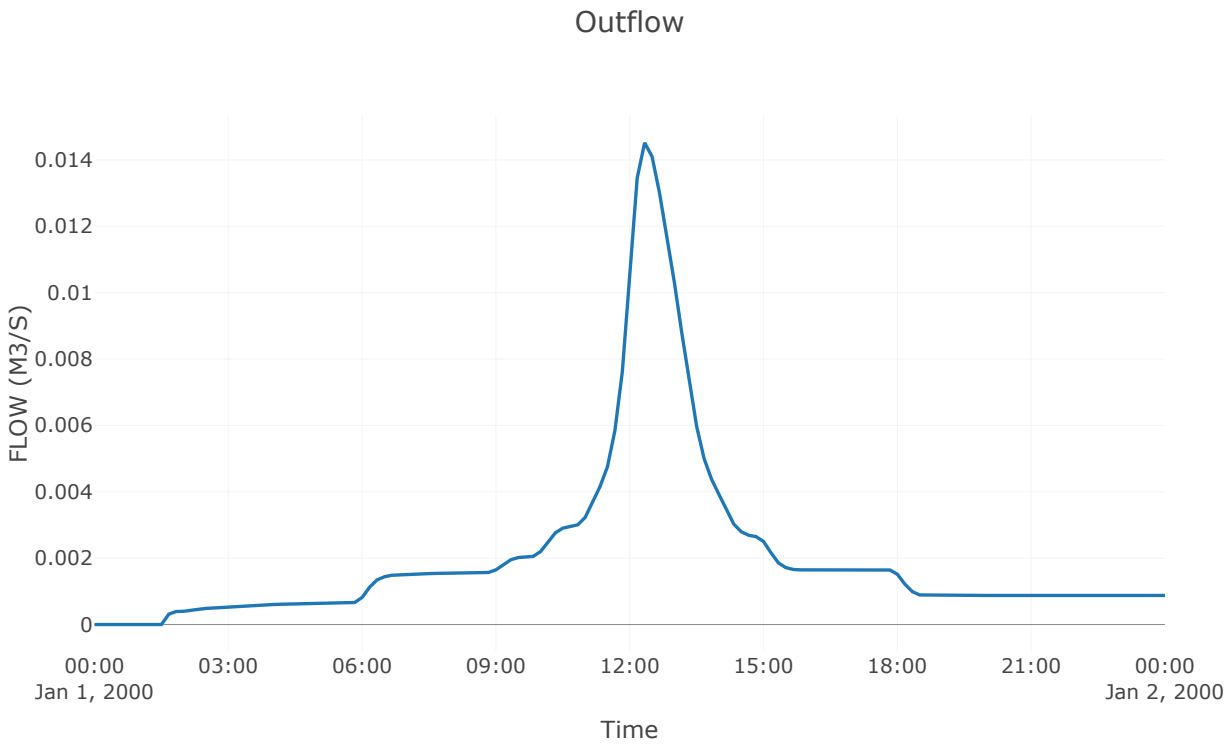
Downstream : Sink - 1

Results: Detention Tank	
Peak Discharge (M3/S)	0.01
Time of Peak Discharge	01Jan2000, 12:20
Volume (MM)	138.47
Peak Inflow (M3/S)	0.02
Time of Peak Inflow	01Jan2000, 12:00
Inflow Volume (M3)	180.92
Maximum Storage (M3)	20.84
Peak Elevation (M)	0.8
Discharge Volume (M3)	180.02


Storage
STORAGE (1000 M3)
0.02
0.015
0.01
0.005
0
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time


Cumulative Outflow
FLOW-CUMULATIVE (1000 M3)
0.15
0.1
0.05
0
03:00
Jan 1, 2000
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

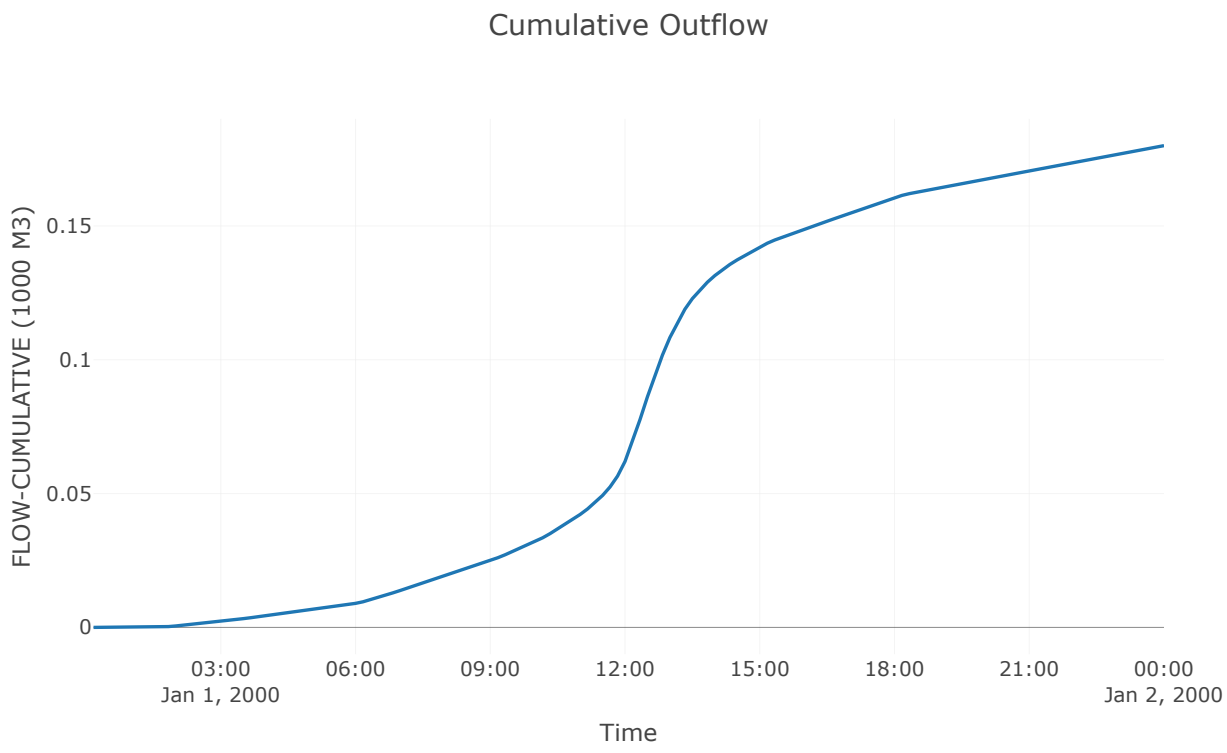

Outlet 1
FLOW (M3/S)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

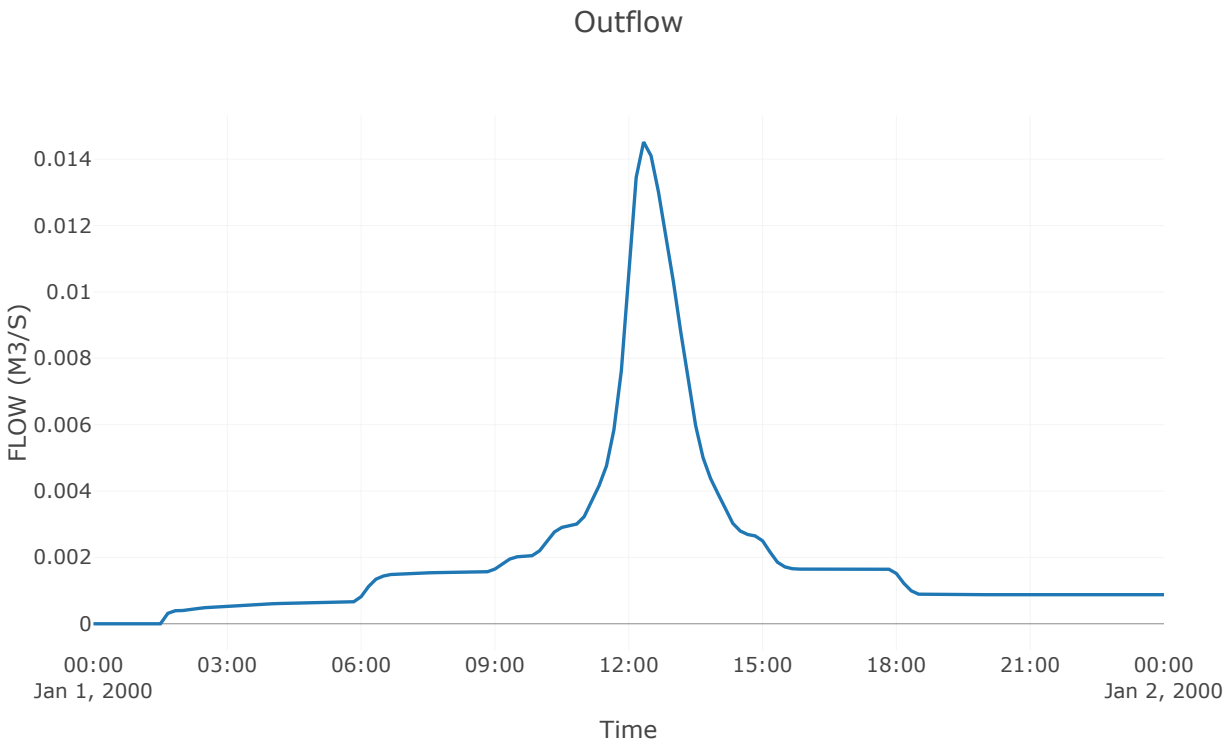

Outflow
FLOW (M3/S)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

Sink: Sink-1

Results: Sink-1

Peak Discharge (M3/S)	0.01
Time of Peak Discharge	01Jan2000, 12:20
Volume (MM)	138.47





Project: Tank_2
Simulation Run: Run 1
Simulation Start: 31 December 1999, 24:00
Simulation End: 1 January 2000, 24:00

HMS Version: 4.8
Executed: 15 June 2022, 23:33

Global Parameter Summary - Subbasin

Area (m^2)

Element Name	Area (m^2)
Imperv	0

Downstream

Element Name	Downstream
Imperv	Detention Tank

Loss Rate: Scs

Element Name	Percent Impervious Area	Curve Number
Imperv	0	98

Transform: Scs

Element Name	Lag	Unitgraph Type
Imperv	10	Standard

Global Results Summary

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Imperv	0	0.02	01Jan2000, 12:00	139.17
Detention Tank	0	0.01	01Jan2000, 12:10	139.05
Sink - 1	0	0.01	01Jan2000, 12:10	139.05

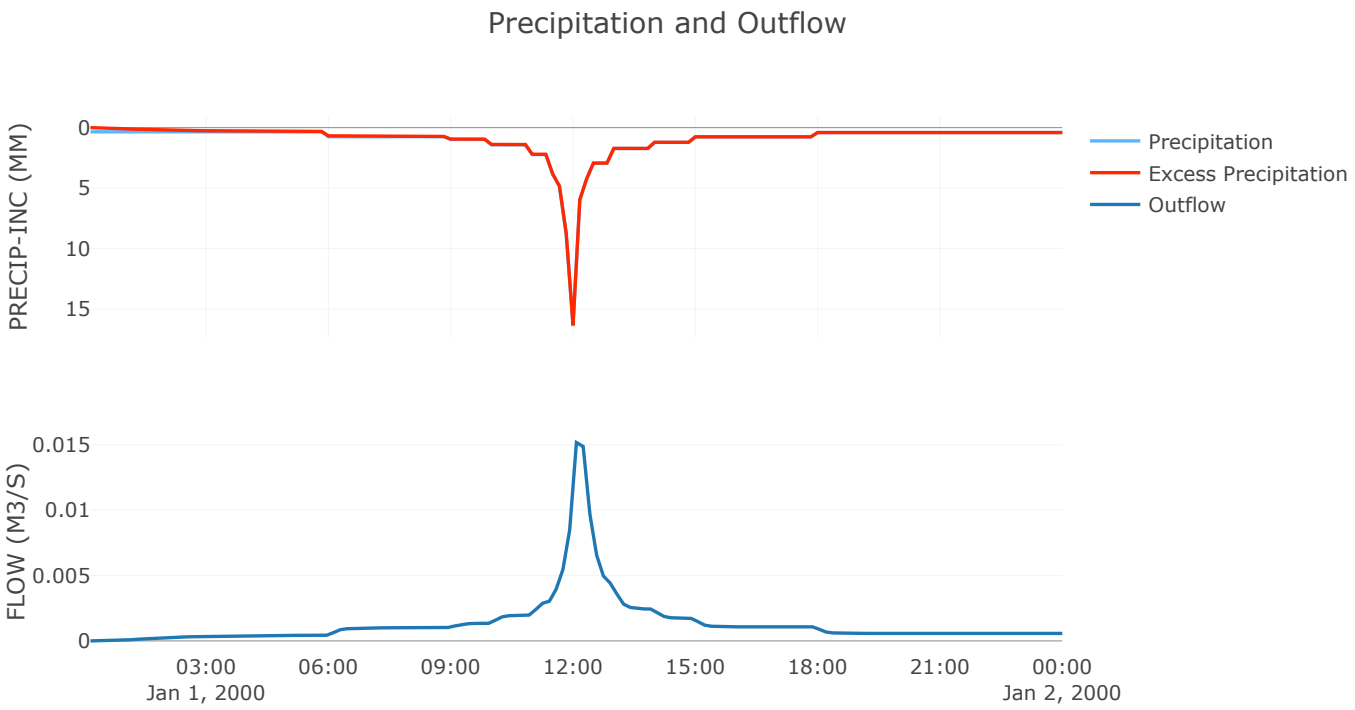
Subbasin: Imperv

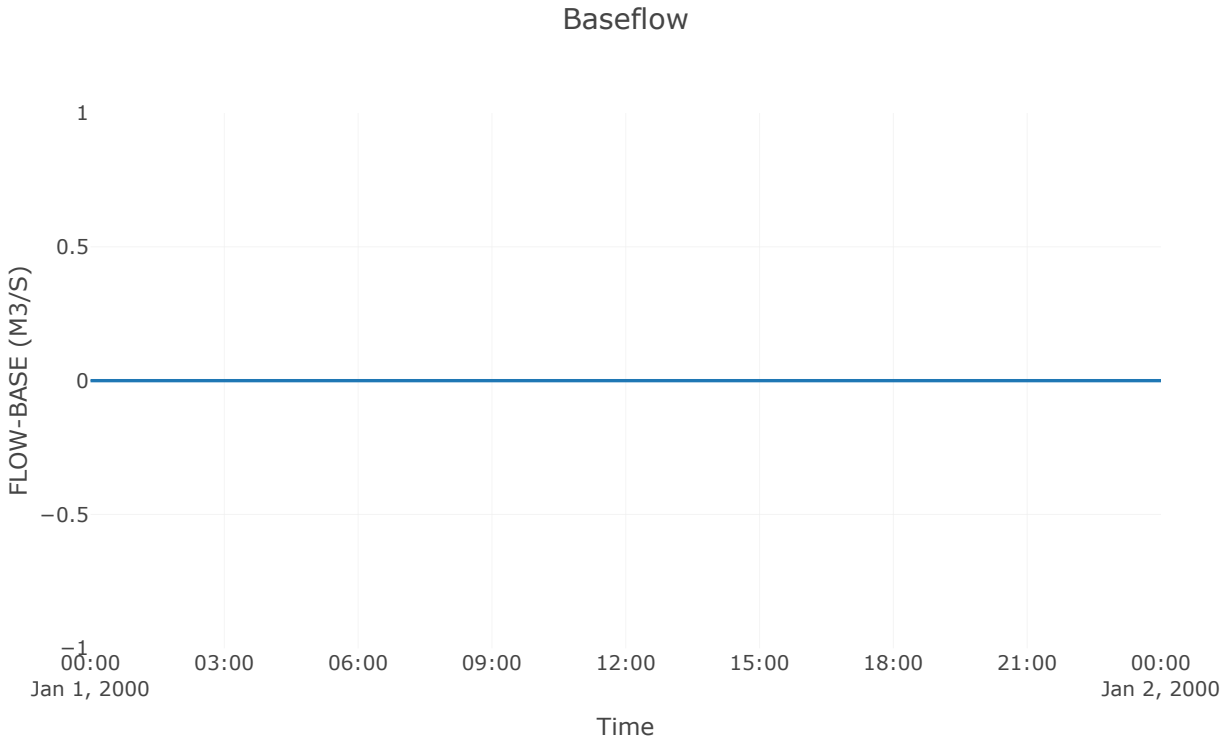
Area (m²) : 0
Downstream : Detention Tank

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	98

Transform: Scs	
Lag	10
Unitgraph Type	Standard

Results: Imperv	
Peak Discharge (M3/S)	0.02
Time of Peak Discharge	01Jan2000, 12:00
Volume (MM)	139.17
Precipitation Volume (M3)	123.92
Loss Volume (M3)	5.14
Excess Volume (M3)	118.79
Direct Runoff Volume (M3)	118.29
Baseflow Volume (M3)	0

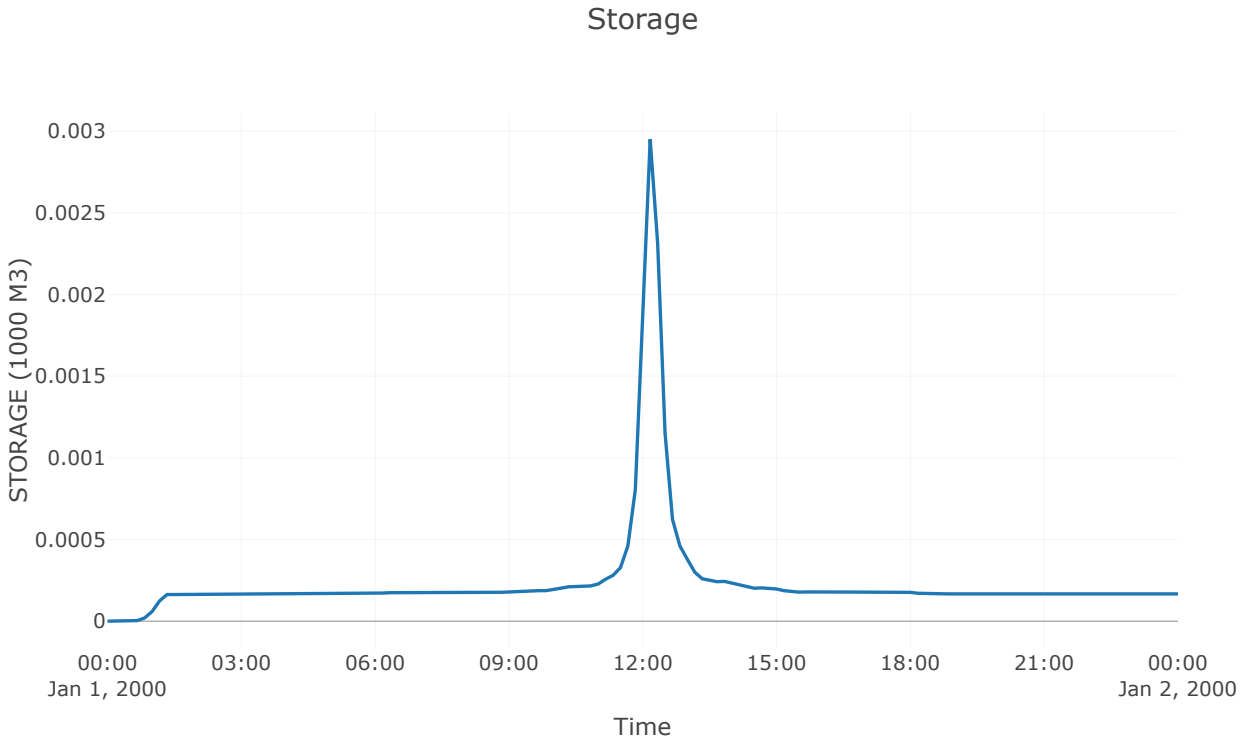

Precipitation and Outflow
PRECIP-INC (MM)
0
5
10
15
Precipitation
Excess Precipitation
Outflow
FLOW (M3/S)
0.015
0.01
0.005
0
03:00
Jan 1, 2000
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000

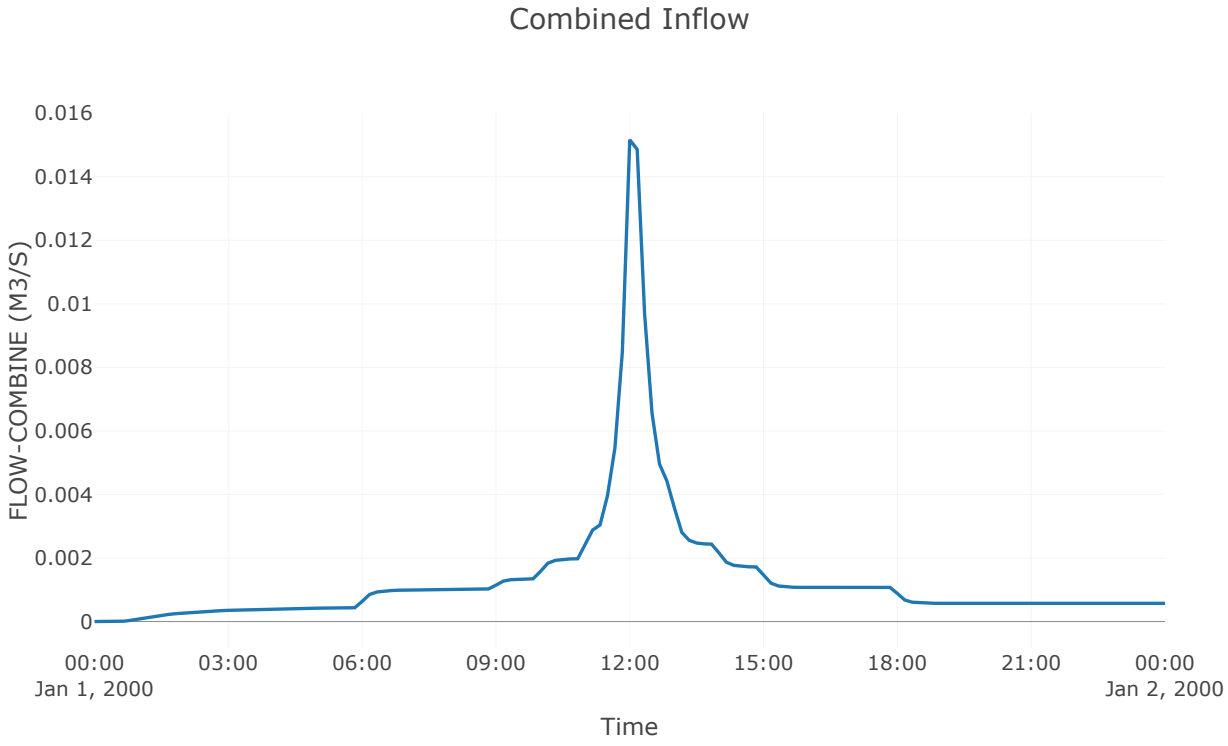

Baseflow
FLOW-BASE (M3/S)
1
0.5
0
−0.5
−1
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

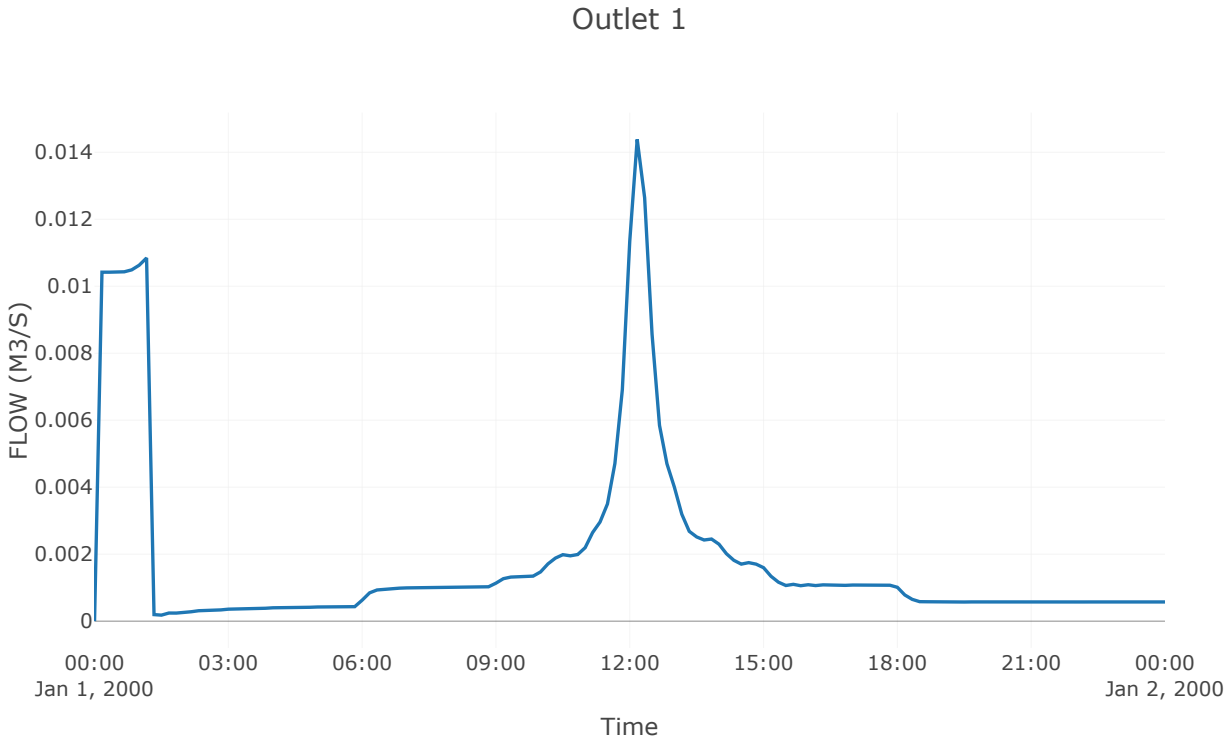
Reservoir: Detention Tank

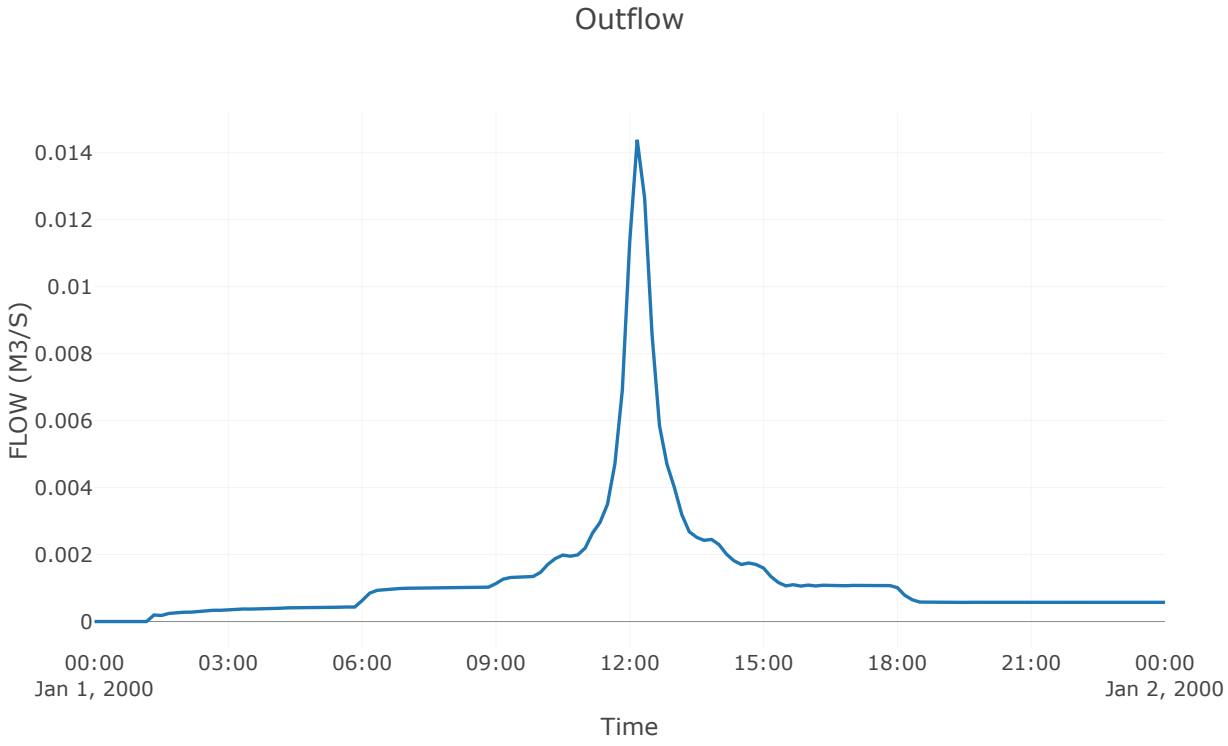
Downstream : Sink - 1

Results: Detention Tank	
Peak Discharge (M3/S)	0.01
Time of Peak Discharge	01Jan2000, 12:10
Volume (MM)	139.05
Peak Inflow (M3/S)	0.02
Time of Peak Inflow	01Jan2000, 12:00
Inflow Volume (M3)	118.29
Maximum Storage (M3)	2.95
Peak Elevation (M)	0.45
Discharge Volume (M3)	118.19


Storage
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
STORAGE (1000 M3)
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time


Combined Inflow
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
FLOW-COMBINE (M3/S)
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

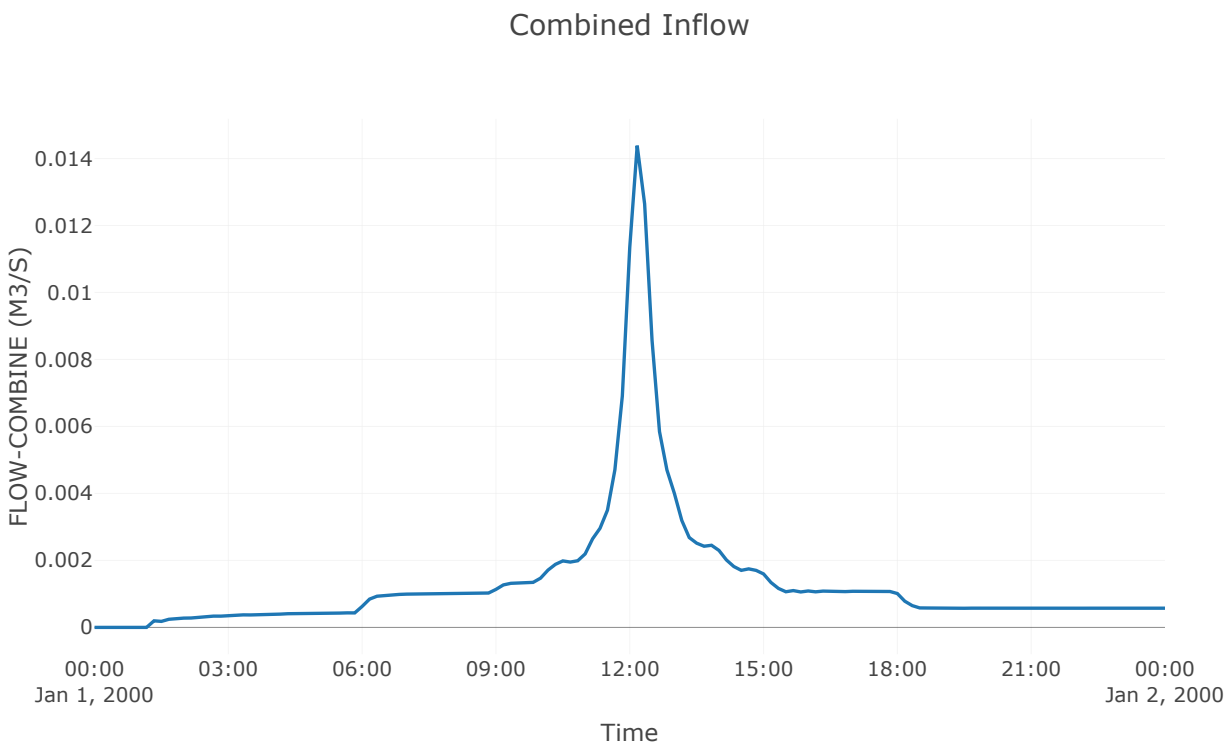

Outlet 1
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
FLOW (M3/S)
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

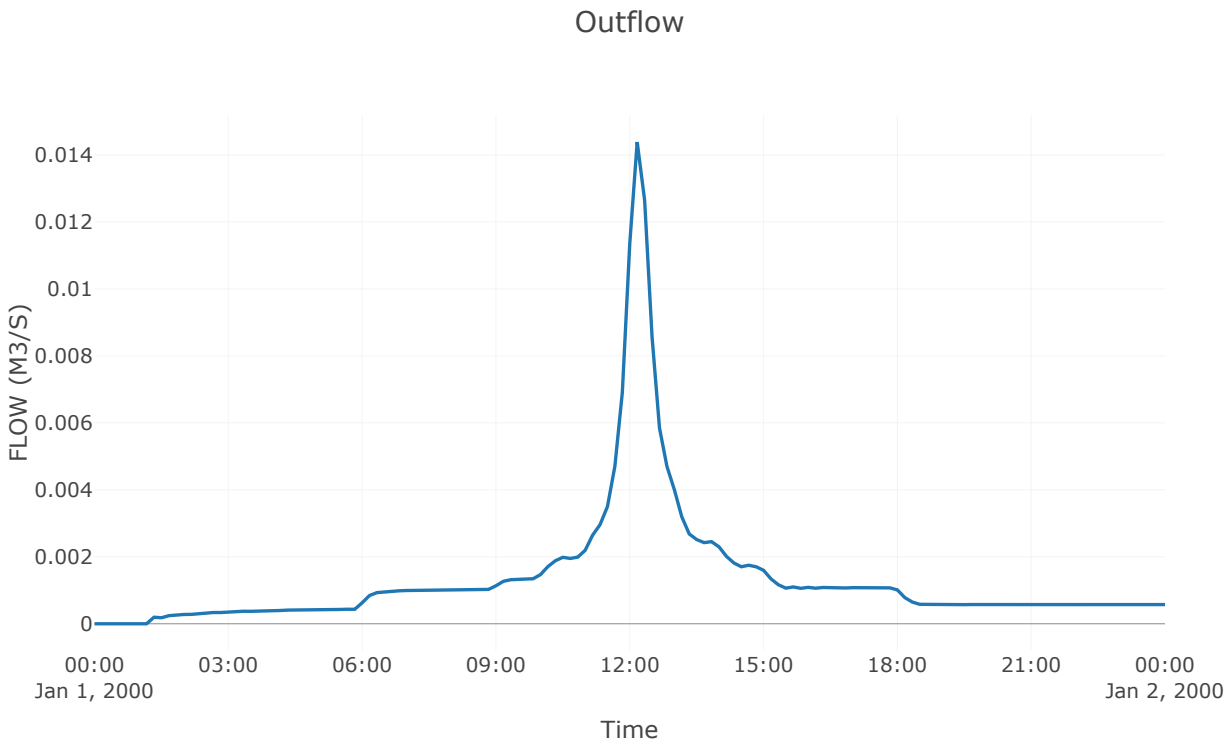

Outflow
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
FLOW (M3/S)
00:00
Jan 1, 2000
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Jan 2, 2000
Time

Sink: Sink-1

Results: Sink-1

Peak Discharge (M3/S)	0.01
Time of Peak Discharge	01Jan2000, 12:10
Volume (MM)	139.05





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Soakage Design

CLIENT:	Dilworth Trust	**JOB No:**	02240-01	**SHEET:**	1	**of**	0
JOB:	70-80 Great South Road	**CALCS BY:**	SY	**DATE:**	13-Jun-22		
SUBJECT:	Stormwater Soakage Design (ST01)	**CHECK BY:**		**DATE:**			

Catchment ID	1	2	3	4
10 Year Rainfall AEP (mm/hr)	97.5			
Standard Error (mm/hr)	8.1			
Actual 10 Yr Rainfall AEP (mm/hr)	105.6			

Catchment Size	0.4173	Ha
Impervious Area	0.1508	Ha
Pervious Area	0.2665	Ha

Soakage Design for **Rockbore** soakage device

Soakhole ID	**Soakage Pit 1**		**Soakage Pit 2**		**Soakage Pit 3**			
Factor of Safety	Level	Factor	Level	Factor	Level	Factor	Level	Factor
Consequence factor	1	**1**	1	**1**	1	**1**		
Quality factor	2	**1.2**	2	**1.2**	2	**1.2**		
Total Factor of Safety		**1.2**		**1.2**		**1.2**		
Flow Rates								
Tested Soakage Rate; Q_{test} (L/s)		16.8		16.8		16.8		
Factored Soakage Rate; Q_{soak} (L/s)		**14.0**		**14.0**		**14.0**		
*Soakage inflows; Q_{demand} (L/s)		34		46		31		
Difference		20.0		32.0		17.0		
Fractured basalt depths								
Min. depth; d_{min_basalt} (m)		4.8		6.4		6.4		
Max. depth; d_{max_basalt} (m)		7.5		10		10		
Achieve min 1.5m MH depth?		YES		YES		YES		
Min. 2m borehole depth?		YES		YES		YES		

*Refer to attached TP108 calculations. (OR Refer to attached rational method pipe calculations)

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Wastewater Pipeline calculations

CLIENT:	Dilworth Trust	**JOB No:**	2240	**SHEET:**	1 of 1
JOB:	76-80 Great South Road	**CALCS BY:**	Bryan C	**DATE:**	20-Apr-22
SUBJECT	Wastewater Pipeline Calculations	**CHECK BY:**	Sean D	**DATE:**	20-Apr-22

Design Assumptions k_s = 1.5 mm

				Pipe Catchment																	
WW Line	**Commercial Identification**	**m2 per person**	**Floor Area per shop**	**No. shops**	**Total m2**	**ADWF (l/s)**	**PDWF Factor**	**PDWF (l/s)**	**PWWF Factor**	**PWWF (l/s)**	**Incoming PDWF Flow**	**Incoming PWWF Flow**	**PDWF Flow in pipe (l/s)**	**PWWF Flow in pipe (l/s)**	**Pipe diameter (mm)**	**Gradient (%)**	**Full pipe velocity (m/s)**	**Full Pipe Capacity (l/s)**	**Part flow capacity %**	**PDWF Velocity (m/s)***	**Pipe reserve capacity (l/s)**	**Notes**
	TOTAL AT OUTLET PIPE GIS ID 863728										17.347	30.766	17.347	30.766	**225**	**1.00%**	**1.15**	**46**	**38%**	**1.01**	**14.9**	
	Office Building/Dry Retail (65L/p/m2) - (1p/50m2)	50	-	-	33750	0.508	2	1.016	5	2.539			1.016	2.539	**225**	**1.00%**	**1.15**	**46**	**2%**	**0.15**	**43.1**	**Majority of commercial areas are car dealerships**
	Office Building/Dry Retail (65L/p/m2) - (1p/15m2)	15	-	-	74500	3.736	2	7.473	5	18.682			5.000	18.682	**225**	**1.00%**	**1.15**	**46**	**11%**	**0.48**	**27.0**	**Conservatively assume all commercial area to be wet retail. Some areas to be motel.**
	Proposed Commercial (Wet Retail)				900	0.156	2	0.313	6.7	1.047			6.700	1.047	**150**	**1.00%**	**0.88**	**15**	**43%**	**0.82**	**14.4**	
WW Line	**Residential Identification**	**People per Dwelling**	**Liters per person per day**	**Dwellings**	**EP**	**ADWF (l/s)**	**PDWF Factor**	**PDWF (l/s)**	**PWWF Factor**	**PWWF (l/s)**	**Incoming PDWF Flow**	**Incoming PWWF Flow**	**PDWF Flow in pipe (l/s)**	**PWWF Flow in pipe (l/s)**	**Pipe diameter (mm)**	**Gradient (%)**	**Full pipe velocity (m/s)**	**Full Pipe Capacity (l/s)**	**Part flow capacity %**	**PDWF Velocity (m/s)***	**Pipe reserve capacity (l/s)**	**Notes**
	Upstream residential area	4	180	55	220	0.458	3	1.375	6.7	3.071			1.375	3.071	**225**	**1.00%**	**1.15**	**46**	**3%**	**0.19**	**42.6**	**Conservatively allow 4 occupancy per dwelling.**
	Total Proposed Residential Flow										3.256	5.427	**3.256**	**5.427**	**150**	**1.00%**	**0.88**	**15**	**21%**	**0.55**	**10.1**	
	Proposed residential (1bed)	2	180	46	92	0.192	3	0.575	5	0.958			0.575	0.958	**150**	**1.00%**	**0.88**	**15**	**4%**	**0.16**	**14.5**	
	Proposed residential (2-3beds)	3	180	143	429	0.894	3	2.681	5	4.469			2.681	4.469	**150**	**1.00%**	**0.88**	**15**	**17%**	**0.48**	**11.0**	

* Peak flow velocities are below Watercares standard for self-cleansing velocity, however the reality of the flow rates through sewers is that higher discharges are likely to be experienced than those calculated which will flush out the pipes on regular occasions.

Table 5.1.2 Design residential occupancy allowances

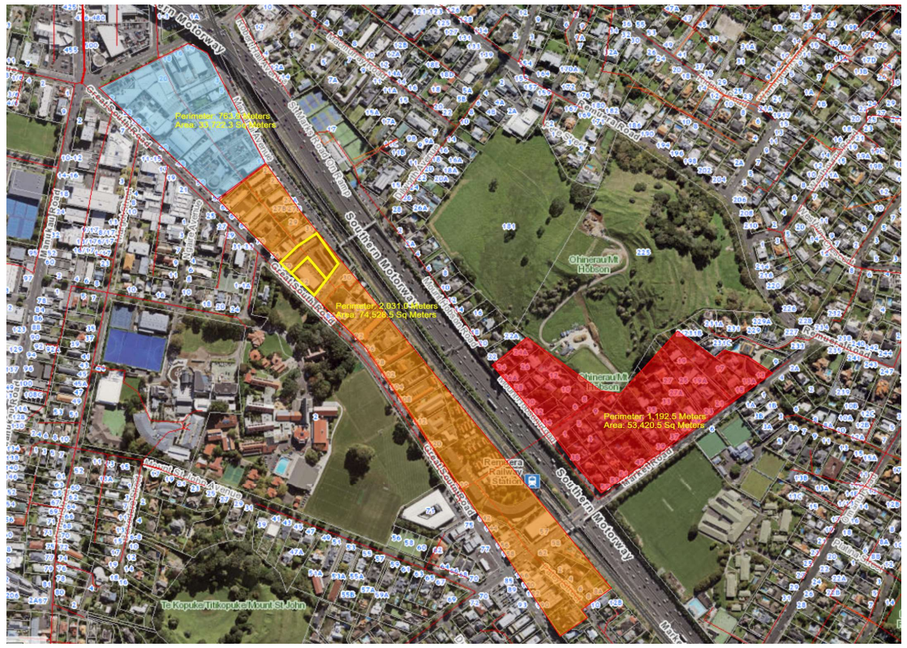
Number of bedrooms (Notes 1 and 2)	*Occupancy for design purposes (i.e. people)*
1	*2*
2-4	*3*
More than 5	*Specific agreement with Watercare*
Unknown	*For high rise apartments (four floors or more) and other residential assume a design occupancy rate of 5 per dwelling unit.*

Table 5.1.3 Commercial - dry retail, office and wet retail design wastewater flow allowance and peaking factors

Commercial activity type	*Design wastewater flow allowance*	*Design wastewater peaking factors*	
		Peaking factor: Self-Cleansing Design Flow (Normal PDWF)	*Peaking factor: Peak Design Flow (PWWF or Exceptional PDWF)*
Dry retail (Note 1) (where kitchen/toilets are not normally made available to customers)	*1 person per 50m² net floor area at 65 litres per person per day.*	*2.0*	*5.0*
Office buildings and dry retail where toilet facilities, etc. are provided to customers.	*1 person per 15m² net floor area at 65 litres per person per day.*	*2.0*	*5.0*
Wet retail (Note 2): Food and or beverage retail/preparation e.g. coffee shop, restaurant, bar, butcher, fresh fruit and vegetable retail.	*15 litres per day per net m² of floor area (including kitchen and dining areas).*	*2.0*	*6.7*

Table 5.1.1 – Design residential design wastewater flow allowance and peaking factors

Residential property type	*Design wastewater flow allowance*	*Design wastewater peaking factors*	
	Litres per person per day (L/p/d)	*Peaking factor: Self-Cleansing Design Flow (Normal PDWF)*	*Peaking factor: Peak Design Flow (PWWF or Exceptional PDWF)*
Up to three storey residential development	*180*	*3.0*	*6.7*
High-rise residential (or mixed-use) buildings four storeys and above	*180*	*3.0*	*5.0*



WASTEWATER ASSUMPTIONS FOR OFFICE COMMERCIAL

For orange areas, reasonal percentage of it is motels and residential making up approx 50% of the area.

Assuming a reasonable number of rooms per motel (20 rooms), this comes out to 3600L/s ADWF. The land area associated to a motel with 20 rooms would be approx 1500m2 which correlated to 6500L/s thus being conservative in assessment.

OTHER ASSUMPTIONS

Wastewater pipe gradients at all locations are unknown and pipe diameters are based on GIS information.

It was found at the target site, existing pipes are approximately at 1% gradient through a CCTV assessment.

Calculations are done to v2.2 of WSL WW CoP

APPENDIX C – PERCULATION TEST RESULTS

Investigation Drilling

Intorock Drilling Ltd
PO Box 79, Drury 2247
Ph: 09 294 6181
info@intorock.co.nz

Date: 25/01/2022
Client: ENGEO
Address: 76-80 Great South Rd, Remuera
Borehole location: As per plan
Description of work: Drill investigation bores
Method of boring: Percussion DTH

PH01

0.0m - 0.3m	Fill Gravel & Sand
0.3m - 2.2m	Ash
2.2m - 7.0m	Basalt Rock
7.0m - 7.9m	Broken Rock
7.9m - 8.8m	Basalt Rock
8.8m - 10.6m	Broken Rock & Cavities
10.6m - 11.3m	Basalt Rock
11.3m - 12.0m	Scoria

E.O.B

PH02

0.0m - 0.1m	Concrete
0.1m - 2.2m	Ash
2.2m - 7.0m	Basalt Rock
7.0m - 7.4m	Broken Rock
7.4m - 7.9m	Basalt Rock
7.9m - 11.5m	Highly Fractured/Broken Rock
11.5m - 12.5m	Broken Rock & Cavities

E.O.B

PH03

0.0m - 0.3m	Fill, Ash & Gravel
0.3m - 0.7m	Basalt Rock
0.7m - 2.8m	Fractured Rock & Ash
2.8m - 5.0m	Basalt Rock
5.0m - 6.1m	Broken Rock & Cavities
6.1m - 6.7m	Basalt Rock
6.7m - 8.7m	Broken Rock & Cavities
8.7m - 10.0m	Basalt Rock

E.O.B

PH04

0.0m - 0.1m	Seal
0.1m - 0.7m	Fill Gravel
0.7m - 3.1m	Ash
3.1m - 4.2m	Highly Fractured/Broken Rock
4.2m - 5.3m	Basalt Rock
5.3m - 8.3m	Broken Rock & Voids
8.3m - 9.0m	Basalt Rock
9.0m - 10.0m	Broken Rock

E.O.B

PH05

0.0m - 1.2m	Fill Gravel
1.2m - 3.9m	Ash
3.9m - 5.7m	Basalt Rock
5.7m - 6.2m	Fractured Rock
6.2m - 7.0m	Basalt Rock
7.0m - 7.4m	Broken Rock
7.4m - 8.5m	Basalt Rock
8.5m - 8.8m	Broken Rock
8.8m - 9.5m	Basalt Rock
9.5m - 11.2m	Broken Rock & Cavities
11.2m - 12.1m	Basalt Rock
12.1m - 12.5m	Highly Fractured/Broken Rock

E.O.B

Investigation Drilling

Intorock Drilling Ltd
PO Box 79, Drury 2247
Ph: 09 294 6181
info@intorock.co.nz

PH06

0.0m - 2.6m	Fill (clay)
2.6m - 5.9m	Basalt Rock
5.9m - 6.8m	Broken Rock & Scoria
6.8m - 9.3m	Basalt Rock
9.3m - 10.0m	Broken Rock & Cavities

E.O.B

PH07

0.0m - 0.1m	Seal
0.1m - 1.0m	Fill Gravel & Ash
1.0m - 3.4m	Ash
3.4m - 3.8m	Broken Rock & Ash
3.8m - 5.1m	Basalt Rock
5.1m - 5.6m	Fractured Rock
5.6m - 6.4m	Broken Rock & Cavities
6.4m - 7.5m	Basalt Rock
7.5m - 8.8m	Broken Rock & Cavities
8.8m - 10.0m	Basalt Rock

E.O.B

PH08

0.0m - 0.1m	Seal
0.1m - 0.4m	Fill Gravel
0.4m - 4.3m	Ash
4.3m - 4.6m	Fractured Rock
4.6m - 6.4m	Basalt Rock
6.4m - 7.0m	Broken Rock & Cavities
7.0m - 7.6m	Basalt Rock
7.6m - 8.3m	Broken Rock & Cavities
8.3m - 8.8m	Fractured Rock
8.8m - 10.0m	Basalt Rock

E.O.B

PH09

0.0m 0.1m	Seal
0.1m - 0.5m	Fill Gravel
0.5m - 2.6m	Ash
2.6m - 3.3m	Ash & Boulders
3.3m - 4.6m	Basalt Rock
4.6m - 6.8m	Broken Rock & Cavities
6.8m - 8.7m	Basalt Rock
8.7m - 9.2m	Broken Rock & Cavities
9.2m - 10.0m	Basalt Rock

E.O.B

Bore Log Sheet

CLIENT: ENGEO **DATE:** 25/01/2022

DESCRIPTION OF WORK: Drill bore for soakage & test

LOCATION: 76-80 Great South Rd, Remuera

METHOD OF BORING: Percussion DTH

BOREHOLE NO: ST1 **BOREHOLE DIA:** 100mm

BOREHOLE ID:

BOREHOLE LOCATION: 6.7m from rear boundary x 7.8m from right boundary

STRATA		FLOW TEST			
Depth	Description	Meter Start	Meter Finish	Duration	L/sec
1m	Fill, Ash & Gravel				
	1.0m Ash & Boulders				
2m	1.4m				
3m	Basalt Rock				
4m					
5m	4.8m				
6m	Broken Rock & Cavities				
7m	6.6m Scoria				
	7.2m Broken Rock				
8m	7.5m **E.O.B**				
9m					
10m					
11m					
12m					
13m					
14m					
15m		Pre	Soak	10 mins	
16m		10,262.64	10,272.72	10 mins	
17m		=	10080 L	/ 600 secs	**16.8 L/sec**
18m					
19m			Full	Delivery	Flow
20m					

90mm PVC pipe 50mm slotted PVC pipe

Notes: Tested with water truck

Flow test result is only relevant to the actual time of testing.

Ph: 09 294 6181 email: info@intorock.co.nz
www.intorockdrilling.co.nz PO Box 79 Drury 2247

Constant Head Percolation Test

Intorock Drilling Ltd

CLIENT: ENGEO **DATE:** 25/01/22

DESCRIPTION OF WORK: Drill bore for soakage & test

LOCATION: 76-80 Great South Rd, Remuera

METHOD OF BORING: Percussion DTH

BOREHOLE NO: ST1 **BOREHOLE DIA:** 100mm

BOREHOLE ID:

BOREHOLE LOCATION: 6.7m from rear boundary x 7.8m from right boundary

FLOW TEST

Presoak duration: 10 minutes **Weather conditions:** Dry

Presoak volume: 3,000L **Tested via:** Water truck

Interval start time (min:sec)	Interval length (seconds) x	Flow meter reading at start of interval	Volume infiltrated during interval (Vi) (litres)	Flow rate during interval =Vi / x (L/sec)
00:00	60	10,262.64	1008	16.8
01:00	60	10263.65	1008	16.8
02:00	60	10264.66	1008	16.8
03:00	60	10265.66	1008	16.8
04:00	60	10266.67	1008	16.8
05:00	60	10267.68	1008	16.8
06:00	60	10268.69	1008	16.8
07:00	60	10269.70	1008	16.8
08:00	60	10270.70	1008	16.8
09:00	60	10271.71	1008	16.8
Meter finish reading		10,272.72	Full Delivery Flow	

Intorock Drilling Ltd Technician on site Callum

Flow test result is only relevant to the actual time of testing.

Ph: 09 294 6181 email: info@intorock.co.nz
www.intorockdrilling.co.nz PO Box 79 Drury 2247

Bore Log Sheet

Intorock Drilling Ltd

CLIENT: ENGEO **DATE:** 25/01/2022

DESCRIPTION OF WORK: Drill bore for soakage & test

LOCATION: 76-80 Great South Rd, Remuera

METHOD OF BORING: Percussion DTH

BOREHOLE NO: ST2 **BOREHOLE DIA:** 100mm

BOREHOLE ID:

BOREHOLE LOCATION: As per plan

STRATA		FLOW TEST			
Depth	Description	Meter Start	Meter Finish	Duration	L/sec
0.1m	Seal				
	Ash				
3.7m					
	Ash (damp)				
5.2m	Basalt Rock				
6.4m	Broken Rock & Cavities				
8.6m	Basalt Rock				
9.7m	Broken Rock & Cavities				
10.0m	**E.O.B**				
		Pre	Soak	10 mins	
		10,248.05	10,259.67	10 mins	
		=	11620 L	/ 600 secs	**19.4 L/sec**
			Full	Delivery	Flow

90mm PVC pipe 50mm slotted PVC pipe

Notes: Tested with water truck

Flow test result is only relevant to the actual time of testing.

Ph: 09 294 6181 email: info@intorock.co.nz
www.intorockdrilling.co.nz PO Box 79 Drury 2247

Constant Head Percolation Test

CLIENT: ENGEO **DATE:** 25/01/22

DESCRIPTION OF WORK: Drill bore for soakage & test

LOCATION: 76-80 Great South Rd, Remuera

METHOD OF BORING: Percussion DTH

BOREHOLE NO: ST2 **BOREHOLE DIA:** 100mm

BOREHOLE ID:

BOREHOLE LOCATION: As per plan

FLOW TEST

Presoak duration: 10 minutes **Weather conditions:** Dry

Presoak volume: 3,000L **Tested via:** Water truck

Interval start time (min:sec)	Interval length (seconds) x	Flow meter reading at start of interval	Volume infiltrated during interval (Vi) (litres)	Flow rate during interval =Vi / x (L/sec)
00:00	60	10,248.05	1162	19.4
01:00	60	10249.21	1162	19.4
02:00	60	10250.37	1162	19.4
03:00	60	10251.54	1162	19.4
04:00	60	10252.70	1162	19.4
05:00	60	10253.86	1162	19.4
06:00	60	10255.02	1162	19.4
07:00	60	10256.18	1162	19.4
08:00	60	10257.35	1162	19.4
09:00	60	10258.51	1162	19.4
Meter finish reading		10,259.67	Full Delivery Flow	

Intorock Drilling Ltd Technician on site Callum

Flow test result is only relevant to the actual time of testing.

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www.intorockdrilling.co.nz PO Box 79 Drury 2247

Legend

- Proposed Soakage Tests
- Proposed Percussion Boreholes
- Proposed Hand Auger Boreholes
- Proposed Scala Penetrometer Tests
- Site Boundary

Contours

- Contours 050m

0 5 m 10 m

ENGEO

Produced by Datanest.earth

Title: Proposed Investigation Location Plan		
Client: Dilworth Trust Board		Figure No: 1 Size: A4
Project: 76-80 Great South Road, Newmarket	Drawn: SM	
Date: 22-12-2021	Checked: DB	
Proj No: 18670.000.002	Scale: 1:500	Version: DRAFT

APPENDIX D – WATERCARE PLANNING ASSESSMENT FORMS

Development Application Form – Water Supply/Wastewater Planning Assessment		
Date of Application	**21/06/2022**	
Address of Development	**76-80 Great South Road, Newmarket, Auckland**	
Layout Plan of Proposed Development clearly showing: • Aerial photograph • Road names • Boundary of development • Preferred point of connection to existing water supply and wastewater asset	 (Attach blue barn WW and WS plans to this form)	
	Description	**Comment**
Current Land Use	Residential (Multi-unit dwellings)	*Residential (Single family dwellings) / Residential (Multi-unit dwellings) / Residential (Multi-storey apartment blocks) / Commercial / Industrial / Other (Please Specify)*
Proposed Land Use	Residential (Multi-storey apartment block) & Commercial	
Total Development Area (Ha.)	*4,173m^2 (0.4173ha)*	
Number of Residential Households (Consent & Ultimate)	Total: 200 dwellings 74 in GSR building 115 in Mauranui building + 11 optional 2B2B	*E.g. 12- storey apartment building with 4 units per storey is 48 residential households.*

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 6 Water Supply

Water Supply Development Assessment		
Average and Peak Residential Demand (L/s)	**GSR Building** **Average Daily Demand** 184 x 200 = 36,800 L/d **Peak day demand** 36,800 L/d x 2 = 73,600 L/d **Peak Hourly demand** (73,600 ÷ 86,400) x 2.5 = 2.13 L/s **Mauranui Building** **Average Daily Demand** 370 x 200 = 74,000 L/d **Peak day demand** 67,400 L/d x 2 = 148,000 L/d	**Buildings maybe serviced by individual principal main.** **GSR Building** 38 single bedroom 36 double bedroom = 184 population occupancy **Mauranui Building** 8 single bedroom 107 double/triple bedroom 11 double bedroom optional = 370 population occupancy Both apartment buildings are 8-storeys. Therefore Daily Consumption is 200 L/p/day. *Day Peak factor = 2* *Hourly Peak factor = 2.5*

	Peak Hourly demand (148,000 ÷ 86,400) x 2.5 = 4.28 L/s	
Average and Peak Non-Residential Demand (L/s)	**GSR Building** **Average Daily Demand** (182.5 ÷ 15) x 65 = 791 L/d **Peak day demand** 791 L/d x 2 = 1,582 L/d **Peak Hourly demand** (1,582 ÷ 86,400) x 2.5 = 0.046 L/s *Noted <25L/min* **Mauranui Building** **Average Daily Demand** (277 ÷ 15) x 65 = 1,200 L/d 210 x 15 = 3,150 L/d 1,200 + 3,150 = 4,350 L/d **Peak day demand** 4,350 L/d x 2 = 8,700 L/d **Peak Hourly demand** (8,700 ÷ 86,400) x 2.5 = 0.252 L/s *Noted <25L/min*	**Reference to Table 6.1.c** Retail spaces have been conservatively assumed to be office areas. **GSR Building** Office Area = 182.5m^2 **Mauranui Building** Office Area = (152.5 + 124.5) = 277m^2 Wet Retail Area = 210m^2 *Day Peak factor = 2* *Hourly Peak factor = 2.5*
Non Residential Demand Typical Daily Consumption Profile / Trend	#NA	*E.g. 24 hr operation / 10 hr (9am – 5pm) / Filling on-site storage at certain frequency)*
Fire- fighting Classification required by the proposed site	FW2	*Refer to New Zealand Standard SNZ PAS 4509:2008*
Hydrant Flow Test Results	☒ Yes ☐ No	*Attach hydrant flow test layout plan and results showing test date & time; location of hydrants tested and pressure logged; static pressure; flow; residual pressure*
Sprinkler System in building?	☒ Yes ☐ No	*Sprinkler design should consider Watercare Level of Service: minimum pressure at 200kPa and minimum flow at 25 l/min. The building owner shall conduct periodic review of sprinkler design.*
Further Water Supply comments		

Refer to Water and Wastewater Code of Practice for Land Development and Subdivision Section 5 Wastewater

Wastewater Development Assessment		
Peak DWF and WWF Residential Design Flows (L/s)	**Site Development Demands only** **Consent ADWF** 554 x 180 = 99,720 L/d 99,720 ÷ 86,400 = 1.154 L/s **Consent PDWF** 1.154 L/s x 3 = 3.46 L/s **Consent PWWF** 1.154 L/s x 5 = 5.77 L/s	**Both buildings serviced by same public main;** **GSR Building** = 184 population occupancy **Mauranui Building** = 337 population occupancy **Optional** = 33 population currency Total occupancy = 554 Both apartment buildings are 8-storeys. Therefore: *PDWF PF = 3* *PWWF PF = 5* *Refer to attached PDF & WW Specific assessment form **for Ultimate PDWF and PWWF** for the downstream pipe of the catchment.*
Peak DWF and WWF Non-Residential Design Flows (L/s)	**Consent ADWF** **Office** (182.5 + 277) ÷ 15 = 30.6 p/day 30.6 x 65 = 1,991 L/d 1,911 ÷ 86,400 = 0.023 L/s **Wet Retail** 210 x 15 = 3,150 L/day 3,150 ÷ 86,400 = 0.036 L/s **Consent PDWF** (0.023 + 0.036) L/s x 2 = 0.119 L/s **Consent PWWF** (0.023 x 5) + (0.036 x 6.7) = 0.356 L/s	**GSR Building** Office Area = 182.5m^2 **Mauranui Building** Office Area = (152.5 + 124.5) = 277m^2 Wet Retail Area = 210m^2 Office Area PDWF PF = 2 Office Area PWWF PF = 5 Wet Retail PDWF PF = 2 Wet Retail PWWF PF = 6.7
Non-Residential Discharge Profile / Trend (i.e. Operations)	#NA	*E.g. 24 hr operation / 10 hr (9am – 5pm) / Other*
New Assets Required for Development	Re-direction of existing public WW line & estimated 4 new WW Manholes to accommodate.	*If applicable please provide supporting calculations and indicative design parameters (ie. Pump Station and rising main or storage)*
Sewer Capacity Check	*Calculation outlined above for development demands.* *Refer to attached PDF & WW Specific assessment form **for Ultimate PDWF and PWWF** for the downstream pipe of the catchment.*	*Capacity assessment at proposed connection point and impact on network*
Further Wastewater comments		

For internal Watercare use only

Date Application Received	
Application Ref No.	
Assigned Connections Engineer	
Prior Developer Correspondence with Watercare	
Neighbouring developments to consider in capacity assessment	

APPENDIX E – PRESSURE LOGGING RESULTS

FW2 Water Classification Test

	Hydrant One	Hydrant Four	Total Flow (Lps)	Pressure (kPa) (Hydrant Two)
			0	520
Flow (Lps)	12.5		12.5	390
Flow (Lps)	14.7	16.7	31.4	280
Date & Time:	13th February 2020 at 1:30pm			
Site Address:	29 Mauranui Avenue, Epsom			
Full Flow Result:	31.4Lps at 280kPa			

Hydrant Map

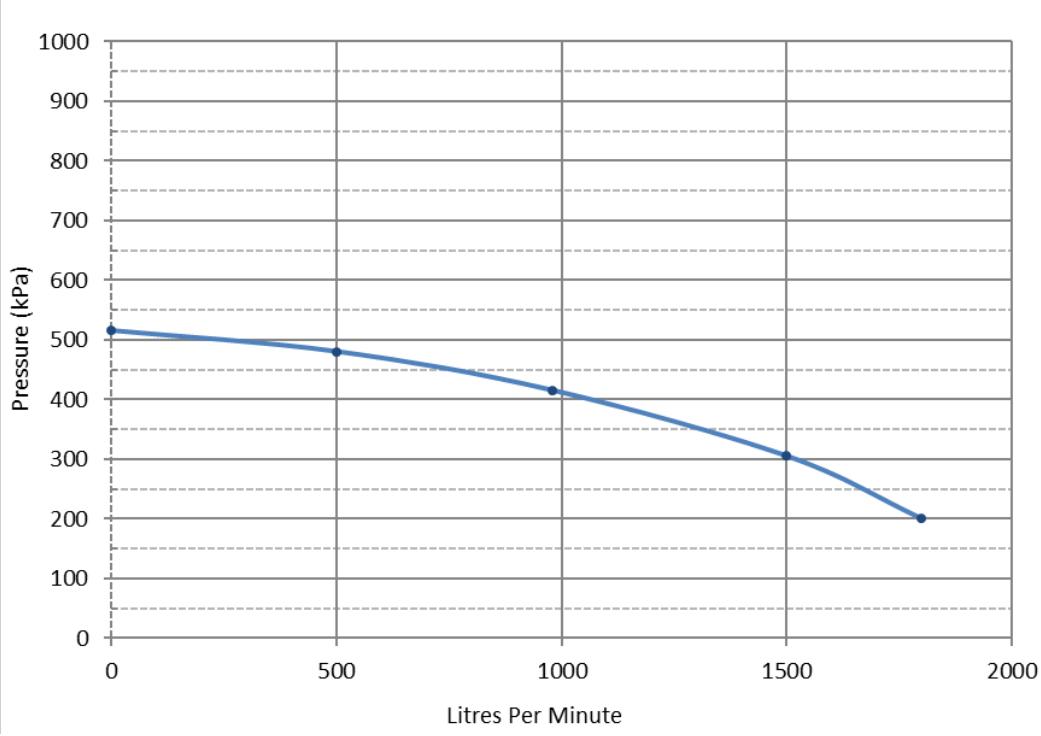
Mains Flow and Pressure Curve

Hydrant locations: Mauranui Ave, Epsom
Date: 13th February 2020
Time: 1:25pm
Flow: Hydrant 1 and Hydrant 3
Residual pressure: Hydrant 2
Maximum flow result: 1800Lpm at 200kPa
Test Supervisor: Jason Goodwin

Data:

Flow (Lpm)	Pressure (kPa)
0	515
500	480
980	415
1500	305
1800	200

Graph:



Notes: The hydrants were not flowed to full capacity during testing.

Report End