Appendix C

Stormwater Management Report

PROPOSED STORMWATER MANAGEMENT REPORT

FOR

BENTLEY STUDIOS LIMITED

96 BEACH HAVEN ROAD/13 CRESTA AVENUE

BEACH HAVEN

Job Number: 200626-01 **Issue Date:** **16 June 2022**

Document Control Record

Document Prepared By:
Airey Consultants Limited
Level 1, Fountain Lane North, Botany Town Centre
PO Box 39 101, Howick, Auckland 2145

Client:
Bentley Studios Limited
PO Box 12428
Chartwell, Hamilton

T +64 9 238 9817
E natalien@aireys.co.nz – Natalie Naidoo
W www.aireys.co.nz

Quality Assurance Statement		
		Signature
Prepared by:	Natalie Naidoo	

Revision Schedule				
Rev. No	Date	Description	Prepared by	Approved by
0	15.09.2021	Draft Issue	NNN	MTW
1	27.09.2021	Resource Consent Issue	NNN	MTW
2	16.06.2022	Resource Consent Issue - RFI	NNN	MTW

Contents

1. INTRODUCTION

Airey Consultants Ltd have been engaged to design stormwater detention in support of a Resource Consent for the proposed development at 96 Beach Haven Road and 13 Cresta Avenue, Beach Haven. The client wishes to construct 81 new units under a unit title subdivision.

2. LOCATION

The subject site comprises of the following two parcels of land totalling 7,147.00m².

96 Beach Haven Road	Lot 1 DP 157383	Area = 2,251m2
13 Cresta Avenue	Lot 2 DP 157383	Area = 4,896m2

3. TOPOGRAPHY

The subject site slopes in a Northerly direction towards 29 Cresta Avenue, with gradients ranging from 4% in the central portion of the site, to approximately 6% towards the Northern section of the site.

A 100-year overland Flowpath is present within the site currently flowing along a depression on the Western side of the site and thereafter existing into the property at 15 Cresta Avenue.

4. EXISTING STORMWATER

According to a topographical survey prepared by Easdale Surveyors and Auckland Council Geomaps, there is an existing 300mmØ public stormwater line running along the southern boundary and the Western boundary of the site. This line connects to an existing 750mmØ public stormwater line running in a North-westerly direction through 13 Cresta Avenue. Please refer to Appendix B, Existing Site Features.

Table of Public Stormwater Manholes and Lines traversing the Proposed Development boundary as follows:

Asset Type	Legacy Asset ID	Size
Stormwater Line	Null	300mmØ
Stormwater Manhole	Null	1050mmØ
Stormwater Line	Null	300mmØ
Stormwater Manhole	Null	1500mmØ
Stormwater Line	NSC_483772	750mmØ

Stormwater Manhole	Null	-
Stormwater Line	NSC_483770	750mmØ

5. IMPERVIOUS & PERVIOUS AREAS

In the horizontal plane, the proposed impervious and pervious areas for the subject site are as follows:

SURFACE	AREA (m^2)
Roof/Balcony Areas (m^2)	1,835
Driveway/Paved Areas (m^2)	2,257
Total Impervious Area (m^2)	4,092
Total Pervious Area (m^2)	3,055
Total Gross Area (m^2)	**7,147**

6. RUNOFF MODEL

A HEC-HMS model was used to calculate runoff from the catchments for both pre-development and post-development scenarios. The model included routing of the post development flows through detention storage so that peak discharges could be controlled back to pre-developed conditions.

Time of concentration was calculated using the time of concentration formula in the Auckland Council Stormwater guideline (TP108) with the minimum value of 10 minutes adopted.

GNS Geology maps indicates the site is located within clay soils belonging to the Waitemata group. This consists of interbedded, graded sandstone and siltstone or mudstone, massive mudstone and sandstone, local intercalated volcanic grit, breccia and conglomerate, and minor bioclastic limestone.

As per TP108, the runoff Curve Number (CN) for such geology shall be 74. The CN used for impervious areas shall be 98. Rainfall depth has been extracted from TP108 10 Year ARI rainfall map with climate change applied. The rainfall depth entered into HEC-HMS has been 24 hours normalised as per required by TP108.

The below table shows the hydrological model parameters for the sub-catchments in both the pre and post development scenario:

	HEC INPUT				
Catchment	Area (km²)	CN	Initial Abstraction (mm)	Lag Time (min)	10% AEP Rainfall (mm)
Bike Bin	0.00012209	98	0	6.67	158.48
Block A	0.00053896	98	0	6.67	158.48
Block B	0.00039131	98	0	6.67	158.48
Block C	0.00039131	98	0	6.67	158.48
Block D	0.00039132	98	0	6.67	158.48
CAW	0.001857	98	0	6.67	158.48
Driveway By -Passing Tank	0.0004	98	0	6.67	158.48
Post-Permeable	0.002731	74	5	6.67	158.48
Pre-Impermeable	1.00E-06	98	0	6.67	158.48
Pre-Permeable	0.007146	74	5	6.67	158.48

7. 10% AEP STORM EVENT

This design has also been carried out in accordance with the Auckland Unitary Plan stormwater mitigation requirements, providing detention of the 10% AEP storm event, incorporating 2.1°C climate change to limit post developed flows to no more than pre developed flows.

Based on the 10% AEP storm event, we have determined the runoff rate from our HEC-HMS model to be 0.1314 m^3/s in the pre-development scenario and 0.1153 m^3/s in the post development scenario.

8. DETENTION VOLUME

Detention volume is stored on-site and gradually released over time to ensure the post-development runoff is less than or equal to pre-development runoff

We have calculated that the maximum storage, based on the HEC-HMS model, required for the 10% AEP storm event (including 2.1°C climate change). With HEC-HMS being a routing model, the continuous inflow and outflow from the areas have been considered for every time step.

To discharge the detention volume over time, we propose the below orifice design at the outlet of each tank:

	Proposed Detention System	Number of Tank Required	Orifice	Volume Achieved
Block A	Ø1.2m, 13000L Underground Promax Tank (or equivalent)	1	1 x 50mm @ base of tank	13,000 L
Block B – D	Ø1.9m, 15000L Underground Promax Tank (or equivalent)	2	1 x 75mm @ base of tank	30,000 L
Common Accessway	Ø1.2m, 15000L Underground Promax Tank (or equivalent)	1	1 x 100mm @ base of tank	15,000 L
TOTAL				**58,000 L**

9. HEC-HMS BASIN MODEL

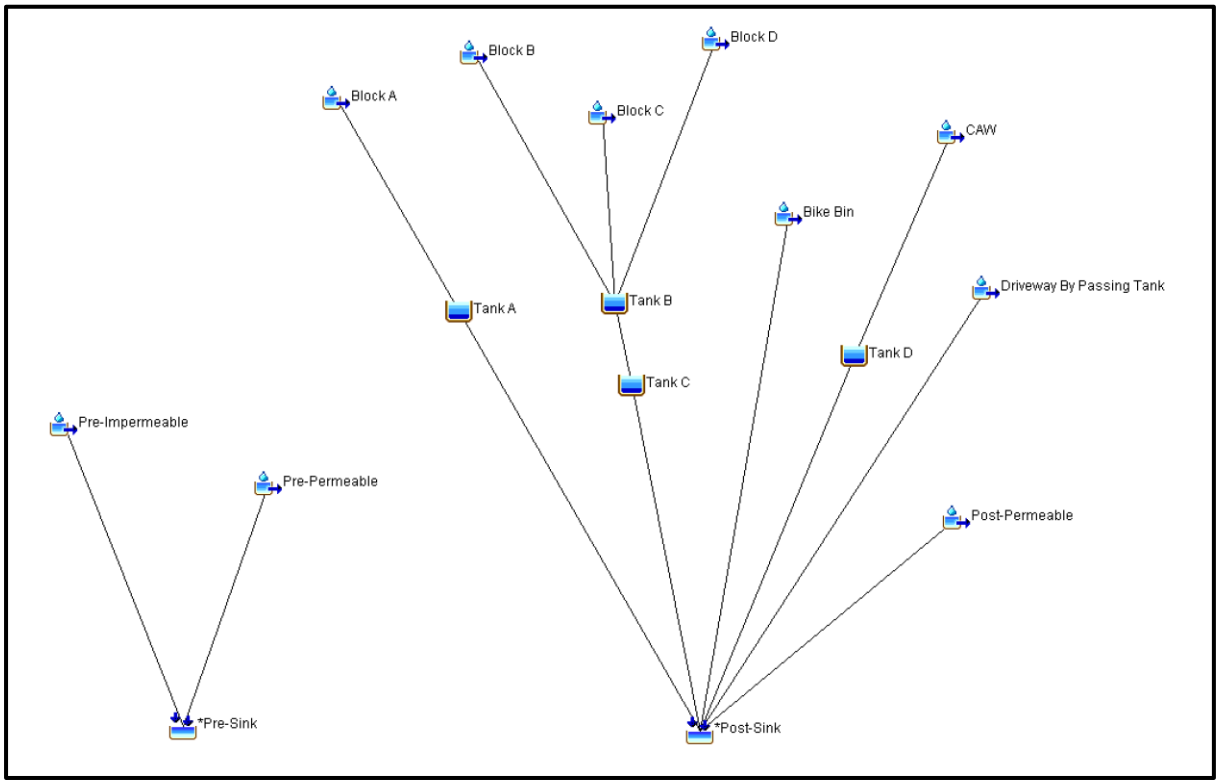


Figure 1: HEC-HMS Basin Model

With reference to Site Plan (Drawing No. RC100, enclosed within Appendix A) and the above HEC-HMS Basin Model, Block A will drain into an individual underground tank of 13,000L in volume, dedicated to capture only the roof runoff. The proposed tank for Block A will discharge the water via the Ø50mm orifice at the base of the tank. The peak discharge, over the TP108 24-hour normalised rainfall, is 5.6

L/s at 12 hours 17 minutes into the rainfall event. Without the detention tank, the peak discharge from the roof of Block A would be 14.2 L/s at 12 hours 2 mins into the rainfall event.

Block B, C and D are located adjacent to each other; hence, all three blocks have been designed to drain into two underground tanks with a volume of 15,000L each. A single orifice of Ø75mm is proposed at the base of the tank to limit post-development flow back to pre-development conditions. The un-detained combined roof runoff from the three blocks would be 30.9L/s at 12 hours and 2 mins. The peak discharge from the detention tank is 18.5 L/s at 12hours 20 minutes into the rainfall event.

With the single largest post developed impervious area of 2,257m^2, being the common accessway, a single underground tank of volume 15,000L is proposed to capture and manage the stormwater runoff from the accessway.

1,857m² of the total common accessway area will detained in the proposed 15,000L tank with the remaining 400m² of the common accessway being discharged directly into the proposed treatment device, namely a Hynds Upflo system (or equivalent event. The detained peak discharge through the detention tank is 29.4L/s and takes place at 12 hours and 10 mins into the rainfall event.

All peak flow runoffs would enter the public stormwater system at 12 hours and 2 mins into the normalised rainfall event. The proposed detention systems delay the time at which the peak flows enter the public system and reduce the peak discharge rate from the site to less than the predevelopment runoff rate. Please refer to appendix A for detailed Engineering Calculations.

10. WATER QUALITY

Due to the downstream receiving environment being located within a Significant Ecological Area (SEA) under the Auckland Unitary Plan, Section D9 and increase of impervious area from the proposed development, stormwater treatment will be provided to runoff from all paved impervious surfaces by an Auckland Council Approved stormwater treatment device designed in accordance with Auckland Council Guideline Document GD01 2017/001 (GD01) along with the requirements of Schedule 4 of the Networks Discharge Consent for Large Brownfield Areas.

An at source, water sensitive stormwater management device, namely the Hynd Upflo System (or equivalent) is proposed. The Upflo system is designed to remove 90% total suspended solids (TSS) with a mean particle size of 20 microns.

The Up-Flo® filter is approved by Auckland Council for use in all public and private developments. Please refer to further details enclosed within Appendix A, Engineering Calculations.

Stormwater quality treatment is not required to the roofed areas as the construction does not involve any high contaminant yielding roofing, spouting, cladding material or architectural features. Inert Building Materials are proposed for the new dwellings, including colour steel roofing, plastic guttering and downpipes etc.

11. CONCLUSION

Based on our assessment and calculations, we propose the following hydrologic mitigations for the proposed development at 96 Beach Haven Road and 13 Cresta Avenue, to support Auckland Unitary Plan requirements as follows:

- Roof and common accessway runoff water shall be detained in proposed Underground Promax Tanks (or equivalent). The tank sizes proposed are 1 x 13,000L and 3 x 15,000L Promax Tanks (or equivalent). With the understanding that Promax tanks come with a 100mm sump, we propose an orifice to be fitted at the base of each of the tanks. Please refer to appendix A for Engineering Calculations.

- As with most stormwater management devices, the quality of the water entering the system will determine the level of cleaning and servicing required by the owner over time. To ensure trouble-free usability, Airey Consultants Limited proposes the installation of leaf diverters, first-flush devices and pre-system filtration to prevent gross solids and organic material from entering the stormwater detention tank.

We request Auckland Council review the enclosed documentation and approve the proposal. Please find plans and calculations enclosed in the Appendices.

Report prepared by

Natalie Naidoo
Civil Engineer
BE(Civil)
Airey Consultants Ltd

Reviewed and approved by

Mike Williams
Director
CPEng(NZ), CMEngNZ, IntPE(NZ), BE(Civil)
Airey Consultants Ltd

Appendix A

Engineering Calculations

ENGINEERING CALCULATIONS

Job: STORMWATER MANAGEMENT DESIGN

Location: 96 Beach Haven Road and 13 Cresta Avenue, Beach Haven

Client	**Bentley Studios Limited**
Job No.	**200626-01**
Date	**15 September 2021**
Design Engineer	**Samson Weng**
Contact Phone	**(09) 238-9817**
Email	**samsonw@aireys.co.nz**

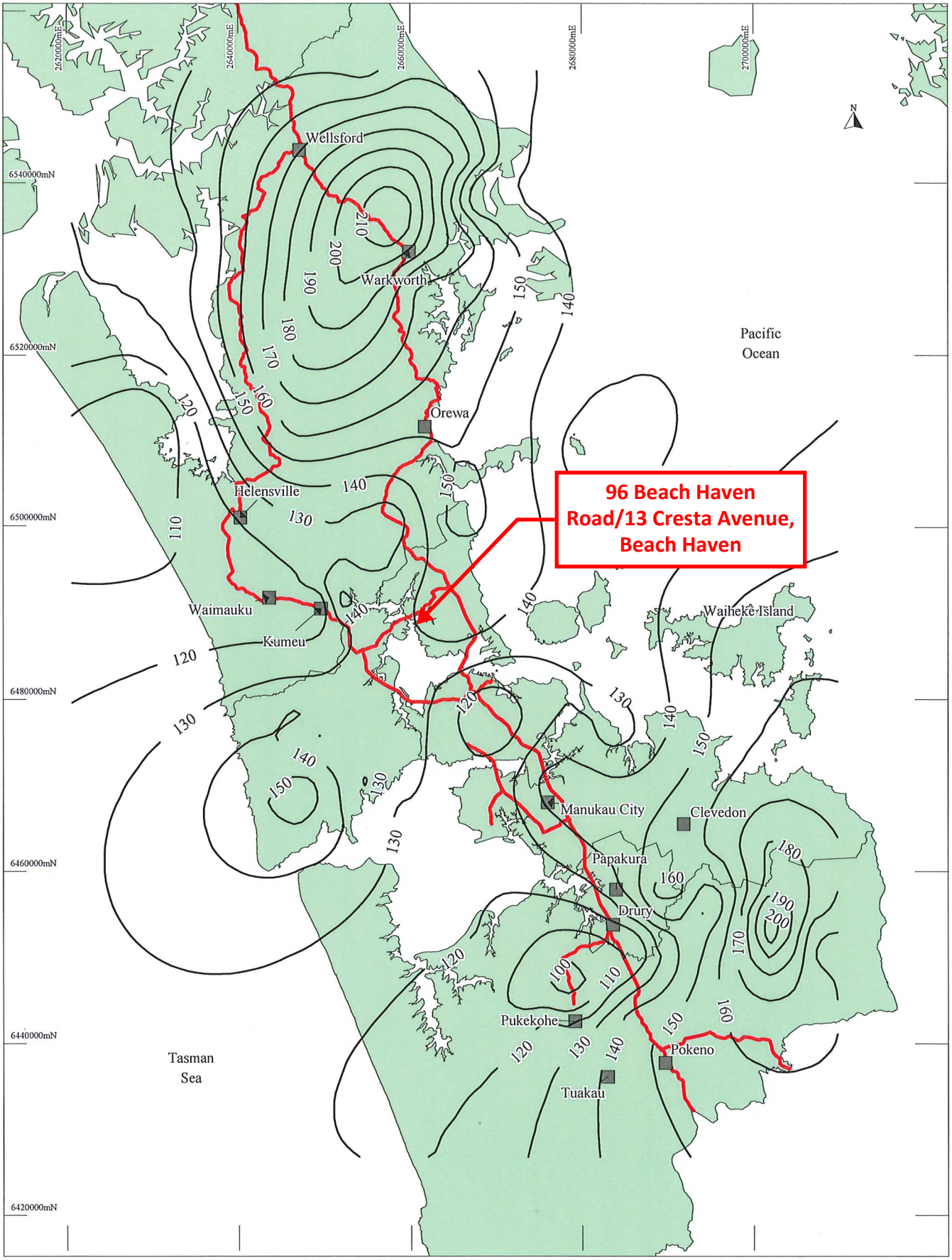
96 Beach Haven Road/13 Cresta Avenue - Locality Plan

0 10 20 30
Meters

Scale @ A3
= 1:1,000

Date Printed:
23/03/2021

Auckland Council
Te Kaunihera o Tāmaki Makaurau



A

Auckland *Regional* Council

Legend: — 90 — Rainfall Contour (mm)

State Highways

Figure A.3
10 Year ARI
Daily Rainfall Depth

Scale: 1:600,000 (at A4)
(Revised 25/08/1999)

Workspace: N:(civil)\2512507757\gis\mapinfo\wor\10yrari.wor Date: 25/08/1999

TP108 Rainfall

Job location: 96 Beach Haven Road/13 Cresta Avenue, Beach Haven

Rainfall Depth	140	mm
ARI	10	years

Duration hr	**Duration** mins	**Depth** mm	**Intensity** mm/hr (Q_{10})
0.166	10.0	**18.26**	**109.99**
0.333	20.0	**28.08**	84.31
0.5	30	**34.63**	69.26
1	60	**48.81**	48.81
2	120	**65.93**	32.96
6	360	**100.79**	16.80
12	720	**129.32**	10.78
24	1440	**158.48**	6.66
48	2880	**319.50**	6.66
72	4320	**479.24**	6.66

Detention tank size calculation

Job location: 96 Beach Haven **Lot :** Block A

Enter Runoff Areas

	A(m^2)	C	AxC	
roof	538.96	0.90	485.064	m^2
paved	0	0.85	0	m^2
grass	0	0.30	0	m^2
	539		485	m^2

Pre-Development Rate

	A(m^2)	C	AC	
Roof	0	0.90	0.00	m^2
Paved	0	0.85	0.00	m^2
Grass	538.96	0.30	161.69	m^2
	538.96		161.69	m^2
Q			4.94	l/s

Rainfall Depth 140 mm **ARI** 10 max discharge 4.94 l/s

Duration hr	Duration mins	Depth mm	Intensity mm/hr (Q_{10})	Q l	Total volume in l	Total volume out l*0.65	difference (storage)
0.166	10.0	18.26	109.99	8856.1	8856	1919	6937
0.333	20.0	28.08	84.31	13618.5	13619	3849	9769
0.5	30	34.63	69.26	16796.7	16797	5780	11017
1	60	48.81	48.81	23676.9	23677	11559	12118
2	120	65.93	32.96	31979.1	31979	23118	8861
6	360	100.79	16.80	48891.2	48891	69355	-20464
12	720	129.32	10.78	62728.3	62728	138710	-75981
24	1440	158.48	6.66	76872.9	76873	277419	-200546

max storage reqd 12118 l

Tank Size Calculation

Tank Size 13000 L
Min Number of Tanks 1

Storage Volume Required	12118	L
Tank Height	1.2	m
Min. Storage Volume Achieved	13000	L

Orifice Plate Size Required

Permissible Site Discharge	4.94	L/s
Water Head (centre of orifice to top of H_2O)	1.178	m
Orifice Diameter	45	mm
Orifice area	0.00159	m^2
Q	4.74	L/s
number of orifices	1	<- which is equal to number of dwellings with Tank

Total Site Discharge

Q = 4.74 L/s OK

Detention tank size calculation

Job location: 96 Beach Haven **Lot :** Block C - D

Enter Runoff Areas

	A(m^2)	C	AxC	
roof	1173.94	0.90	1056.546	m^2
paved	0	0.85	0	m^2
grass	0	0.30	0	m^2
	1174		1057	m^2

Pre-Development Rate

	A(m^2)	C	AC	
Roof	0	0.90	0.00	m^2
Paved	0	0.85	0.00	m^2
Grass	1173.94	0.30	352.18	m^2
	1173.94		352.18	m^2
Q			10.76	l/s

Rainfall Depth 140 mm **ARI** 10 max discharge 10.76 l/s

Duration hr	Duration mins	Depth mm	Intensity mm/hr (Q_{10})	Q l	Total volume in l	Total volume out l*0.65	difference (storage)
0.166	10.0	18.26	109.99	19289.9	19290	4179	15110
0.333	20.0	28.08	84.31	29663.3	29663	8384	21279
0.5	30	34.63	69.26	36585.9	36586	12589	23997
1	60	48.81	48.81	51572.0	51572	25178	26394
2	120	65.93	32.96	69655.6	69656	50355	19300
6	360	100.79	16.80	106492.7	106493	151066	-44573
12	720	129.32	10.78	136632.2	136632	302131	-165499
24	1440	158.48	6.66	167441.4	167441	604263	-436821

max storage reqd 26394 l

Tank Size Calculation

Tank Size 15000 L
Min Number of Tanks 2

Storage Volume Required	26394	L
Tank Height	1.9	m
Min. Storage Volume Achieved	30000	L

Orifice Plate Size Required

Permissible Site Discharge	10.76	L/s
Water Head (centre of orifice to top of H_2O)	1.870	m
Orifice Diameter	60	mm
Orifice area	0.00283	m^2
Q	10.62	L/s
number of orifices	1	<- which is equal to number of dwellings with Tank

Total Site Discharge

Q = 10.62 L/s OK

Detention tank size calculation

Job location: 96 Beach Haven **Lot :** CAW

Enter Runoff Areas

	A(m^2)	C	AxC	
roof	0	0.90	0	m^2
paved	2581	0.85	2193.85	m^2
grass	0	0.30	0	m^2
	2581		2194	m^2

Pre-Development Rate

	A(m^2)	C	AC	
Roof	0	0.90	0.00	m^2
Paved	0	0.85	0.00	m^2
Grass	2581	0.30	774.30	m^2
	2581		774.30	m^2
Q			23.66	l/s

Rainfall Depth 140 mm **ARI** 10 max discharge 23.66 l/s

Duration hr	Duration mins	Depth mm	Intensity mm/hr (Q_{10})	Q l	Total volume in l	Total volume out l*0.65	difference (storage)
0.166	10.0	18.26	109.99	40054.3	40054	9189	30865
0.333	20.0	28.08	84.31	61593.8	61594	18433	43161
0.5	30	34.63	69.26	75968.4	75968	27677	48291
1	60	48.81	48.81	107085.9	107086	55355	51731
2	120	65.93	32.96	144635.4	144635	110710	33926
6	360	100.79	16.80	221125.3	221125	332130	-111004
12	720	129.32	10.78	283708.0	283708	664260	-380552
24	1440	158.48	6.66	347681.3	347681	1328519	-980838

max storage reqd 51731 l

Tank Size Calculation

Tank Size 15000 L
Min Number of Tanks 4

Storage Volume Required	51731	L
Tank Height	1.9	m
Min. Storage Volume Achieved	60000	L

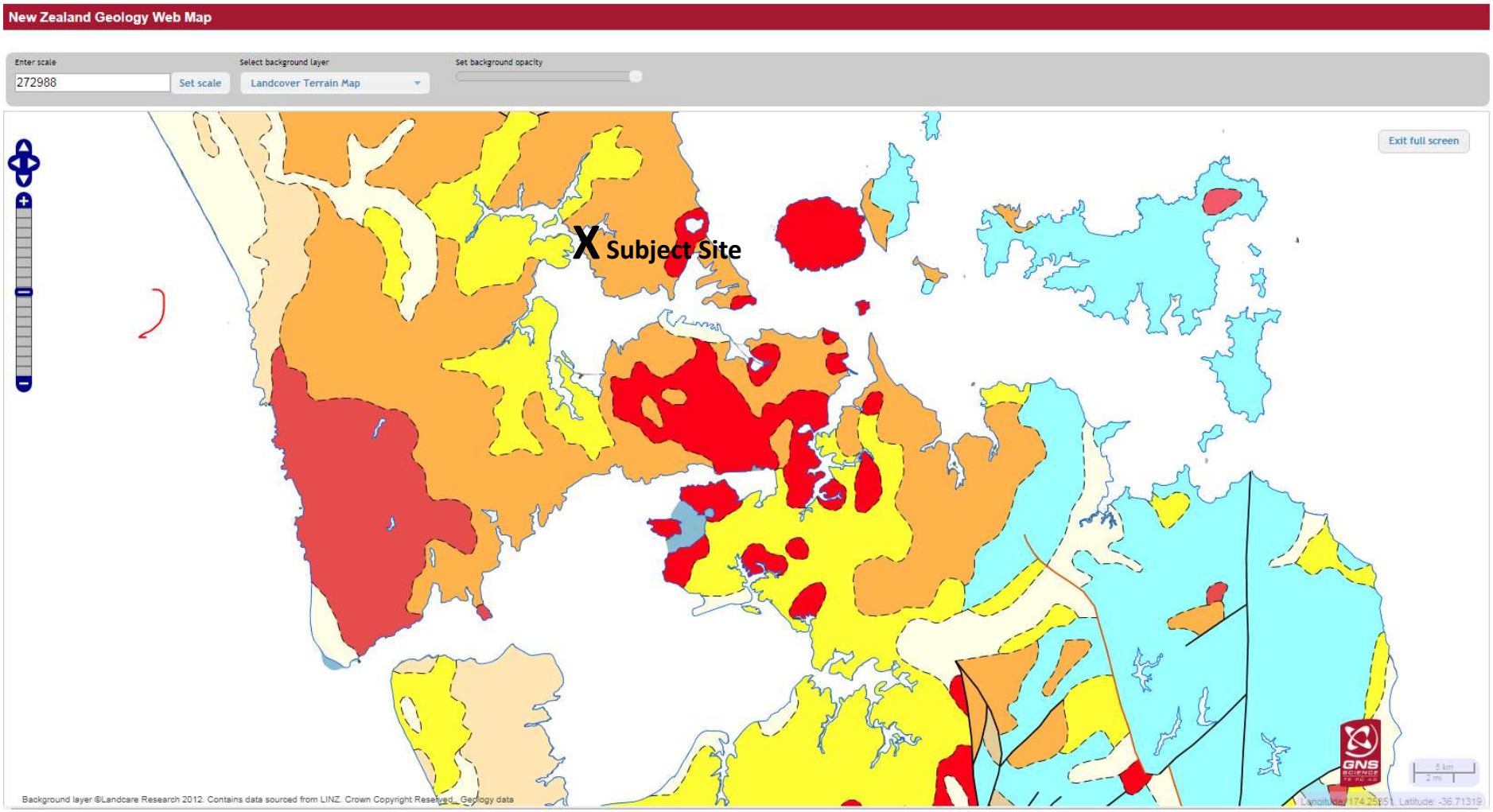
Orifice Plate Size Required

Permissible Site Discharge	23.66	L/s
Water Head (centre of orifice to top of H_2O)	1.856	m
Orifice Diameter	89	mm
Orifice area	0.00622	m^2
Q	23.27	L/s
number of orifices	1	<- which is equal to number of dwellings with Tank

Total Site Discharge

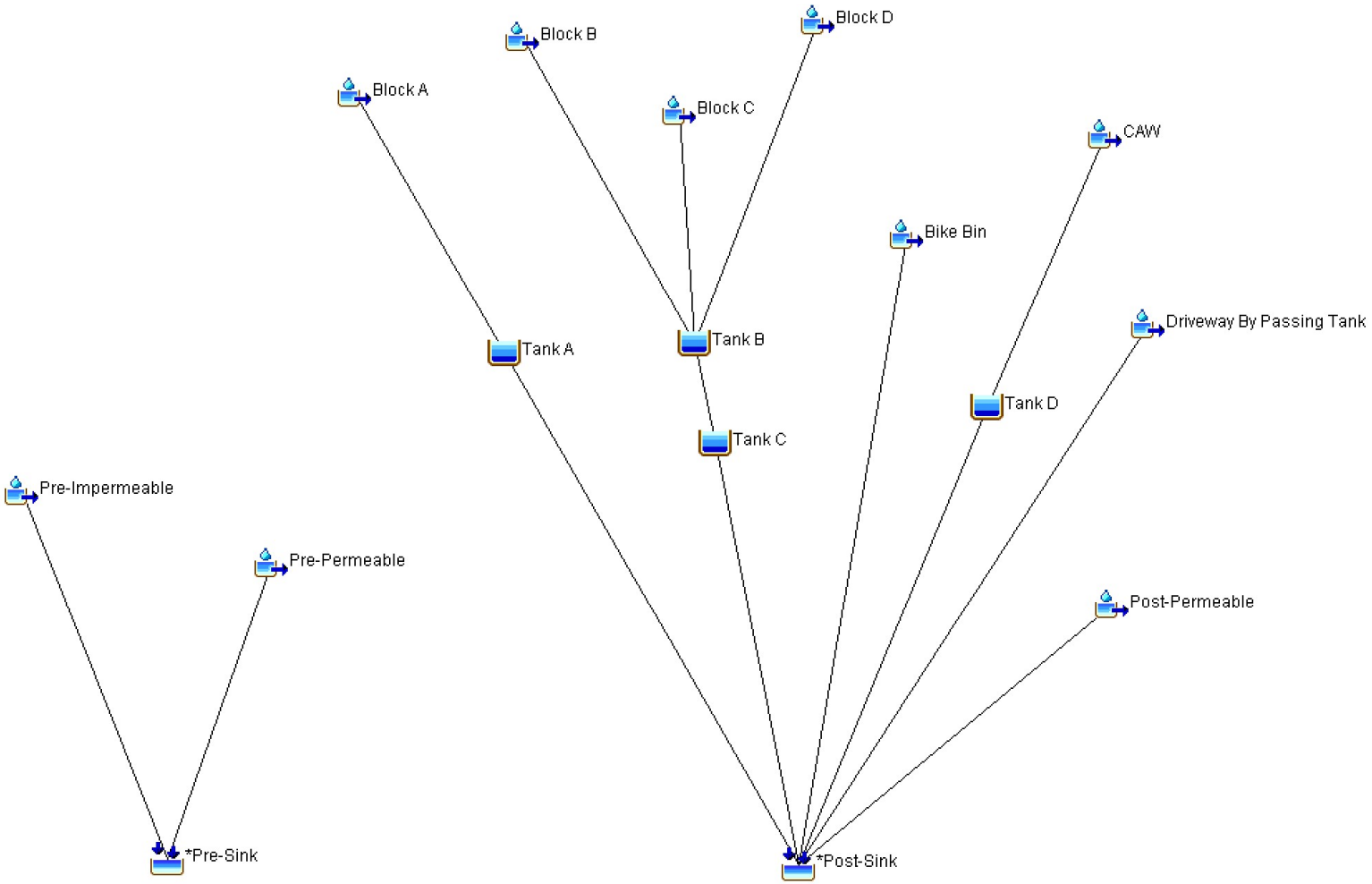
Q = 23.27 L/s OK

GNS - Auckland Geology Map: 96 Beach Haven Road



BROWN AREAS: TP108 Clay - Runoff Curve Number CN=74

Plot symbol	eM
Name	Waitemata Group
Description	Interbedded, graded sandstone and siltstone or mudstone, massive mudstone and sandstone; local intercalated volcanic grit, breccia and conglomerate, and minor bioclastic limestone.
Geologic history	Early Miocene
Simple name	Zealandia Megasequence Mainly Marine Sedimentary Rocks (Neogene)



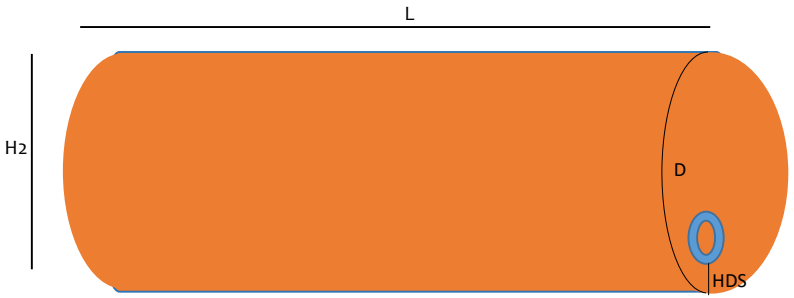
HEC-HMS Basin Model

	HEC-HMS Basin Model Catchment Inputs				
Catchment	**Area (km²)**	**CN**	**Initial Abstraction (mm)**	**Lag Time (min)**	**10% AEP Rainfall (mm)**
Bike Bin	0.00012209	98	0	6.67	158.48
Block A	0.00053896	98	0	6.67	158.48
Block B	0.00039131	98	0	6.67	158.48
Block C	0.00039131	98	0	6.67	158.48
Block D	0.00039132	98	0	6.67	158.48
CAW	0.001857	98	0	6.67	158.48
Driveway By Passing Tank	0.0004	98	0	6.67	158.48
Post-Permeable	0.002731	74	5	6.67	158.48
Pre-Impermeable	1.00E-06	98	0	6.67	158.48
Pre-Permeable	0.007146	74	5	6.67	158.48

Cylinder tank Horizontal

Tank Parameters

Tank diameter D =	1200	mm
Length L =	11.5	m
Height of dead storage HDS =	0	mm
Height of 1:10 yr storage H2 =	1200	mm
Storage in pipe Sp =	13.01	m3
Tank cross-sectional area = Axs =	1.13	m2
Total storage (St) =	13.01	m3
Angle A=2xAcos((D/2-HDS)/(D/2)) =	0.00	radians
Area of sector A=A1=Axs x A/2/pi =	0.00	m2
Area trian A=A2=(D/2-HDS)^2xtan(A/2)=	0.00	m2
Dead storage vol=VDS=(A1-A2)xL=	**0.00**	**m3**
1:10 yr volume =	**13.01**	***m3 (peak storage)***
Number of Tanks:	1	
1:10yr Outlet orifice diameter (mm):	50	mm
Single Orifice Area:	0.0019635	m2
Total Orifice Area:	0.0019635	m2
Total Tank Volume:	**13.01**	**m3**

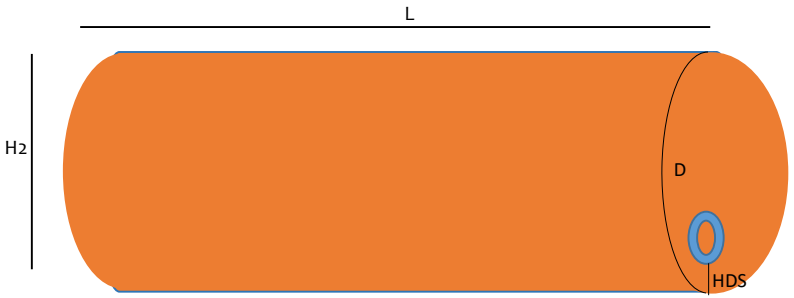


Height from Base (m)	Total Volume (1000 m³)
0	0.0000000
0.06	0.0002431
0.12	0.0006769
0.18	0.0012234
0.24	0.0018518
0.3	0.0025427
0.36	0.0032817
0.42	0.0040569
0.48	0.0048582
0.54	0.0056765
0.6	0.0065031
0.66	0.0073297
0.72	0.0081480
0.78	0.0089493
0.84	0.0097245
0.9	0.0104635
0.96	0.0111544
1.02	0.0117828
1.08	0.0123293
1.14	0.0127631
1.2	0.0130062
1.26	0.0330062
1.32	0.0530062
1.38	0.0730062
1.44	0.0930062
1.5	0.1130062

Cylinder tank Horizontal

Tank Parameters

Tank diameter D =	1900	mm
Length L =	5.3	m
Height of dead storage HDS =	0	mm
Height of 1:10 yr storage H2 =	1900	mm
Storage in pipe Sp =	15.03	m3
Tank cross-sectional area = Axs =	2.84	m2
Total storage (St) =	15.03	m3
Angle A=2xAcos((D/2-HDS)/(D/2)) =	0.00	radians
Area of sector A=A1=Axs x A/2/pi =	0.00	m2
Area trian A=A2=(D/2-HDS)^2xtan(A/2)=	0.00	m2
Dead storage vol=VDS=(A1-A2)xL=	**0.00**	**m3**
1:10 yr volume =	**15.03**	***m3 (peak storage)***
Number of Tanks:	1	
1:10yr Outlet orifice diameter (mm):	50	mm
Single Orifice Area:	0.0019635	m2
Total Orifice Area:	0.0019635	m2
Total Tank Volume:	**15.03**	**m3**

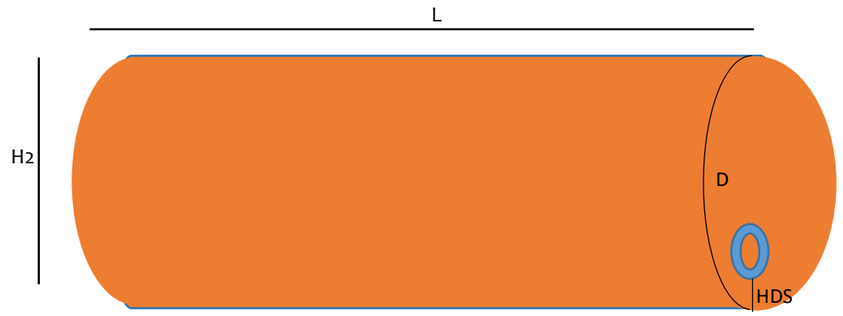


Height from Base (m)	Total Volume (1000 m³)
0	0.0000000
0.095	0.0002809
0.19	0.0007821
0.285	0.0014134
0.38	0.0021395
0.475	0.0029378
0.57	0.0037916
0.665	0.0046872
0.76	0.0056130
0.855	0.0065585
0.95	0.0075135
1.045	0.0084686
1.14	0.0094140
1.235	0.0103398
1.33	0.0112355
1.425	0.0120892
1.52	0.0128875
1.615	0.0136136
1.71	0.0142450
1.805	0.0147461
1.9	0.0150270
1.995	0.0350270
2.09	0.0550270
2.185	0.0750270
2.28	0.0950270
2.375	0.1150270

Cylinder tank Horizontal

Tank Parameters

Tank diameter D =	1200	mm
Length L =	13.3	m
Height of dead storage HDS =	0	mm
Height of 1:10 yr storage H2 =	1200	mm
Storage in pipe Sp =	15.04	m3
Tank cross-sectional area = Axs =	1.13	m2
Total storage (St) =	15.04	m3
Angle A=2xAcos((D/2-HDS)/(D/2)) =	0.00	radians
Area of sector A=A1=Axs x A/2/pi =	0.00	m2
Area trian A=A2=(D/2-HDS)^2xtan(A/2)=	0.00	m2
Dead storage vol=VDS=(A1-A2)xL=	**0.00**	**m3**
1:10 yr volume =	**15.04**	***m3 (peak storage)***
Number of Tanks:	1	
1:10yr Outlet orifice diameter (mm):	100	mm
Single Orifice Area:	0.0078540	m2
Total Orifice Area:	0.0078540	m2
Total Tank Volume:	**15.04**	**m3**



Height from Base (m)	Total Volume (1000 m^3)
0	0.0000000
0.06	0.0002812
0.12	0.0007828
0.18	0.0014148
0.24	0.0021416
0.3	0.0029407
0.36	0.0037953
0.42	0.0046919
0.48	0.0056186
0.54	0.0065650
0.6	0.0075210
0.66	0.0084770
0.72	0.0094233
0.78	0.0103501
0.84	0.0112466
0.9	0.0121012
0.96	0.0129003
1.02	0.0136271
1.08	0.0142591
1.14	0.0147608
1.2	0.0150419
1.26	0.0350419
1.32	0.0550419
1.38	0.0750419
1.44	0.0950419
1.5	0.1150419
1.56	0.1350419
1.62	0.1550419
1.68	0.1750419
1.74	0.1950419
1.8	0.2150419
1.86	0.2350419

Basin Name: 96 Beach Haven
Element Name: Tank A

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	0.025
*Area (M2)	0.0019635
*Coefficient:	0.62

UG Ø1.2m 13000L Promax Tank, Ø50mm Orifice (Tank A)

Basin Name: 96 Beach Haven
Element Name: Tank B

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	0.05
*Area (M2)	0.0078540
*Coefficient:	0.62

UG Ø1.9m 15000L Promax Tank, Ø100mm Balancing Pipe (Tank B)

Basin Name: 96 Beach Haven
Element Name: Tank C

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	0.0375
*Area (M2)	0.0044179
*Coefficient:	0.62

UG Ø1.9m 15000L Promax Tank, Ø75mm Orifice (Tank C)

Basin Name: 96 Beach Haven
Element Name: Tank D

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	0.05
*Area (M2)	0.0078540
*Coefficient:	0.62

UG Ø1.2m 15000L Promax Tank, Ø100mm orifice (Tank D)

Basin Name: 96 Beach Haven
Element Name: Tank A

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	1.15
*Area (M2)	0.0078540
*Coefficient:	0.62

UG Ø1.2m 13000L Promax Tank, Ø100mm Overflow (Tank A)

Basin Name: 96 Beach Haven
Element Name: Tank B

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	1.85
*Area (M2)	0.0078540
*Coefficient:	0.62

UG Ø1.9m 15000L Promax Tank, Ø100mm Overflow (Tank B, C)

Basin Name: 96 Beach Haven

Element Name: Tank D

Method:	Orifice Outlet
Direction:	Main
Number Barrels:	1
*Center Elevation (M)	1.15
*Area (M2)	0.0078540
*Coefficient:	0.62

UG Ø1.2m 15000L Promax Tank, Ø100mm Overflow (Tank D)

Project: 96 Beach haven Simulation Run: Simulation01

Start of Run: 01Jan2020, 00:00
End of Run: 03Jan2020, 00:00
Compute Time: 14Sep2021, 18:04:05

Basin Model: 96 Beach Haven
Meteorologic Model: 10% AEP
Control Specifications: TimeSeries

Show Elements: All Elements Volume Units: (•) MM ( ) 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Pre-Permeable	0.0071460	0.1314	01Jan2020, 12:03	97.049
Pre-Impermeable	1.0E-6	0.0000	01Jan2020, 12:02	153.461
Post-Permeable	0.0030550	0.0562	01Jan2020, 12:03	97.049
CAW	0.0018570	0.0489	01Jan2020, 12:02	153.461
Tank D	0.0018570	0.0294	01Jan2020, 12:10	153.460
Block A	.00053896	0.0142	01Jan2020, 12:02	153.461
Tank A	.00053896	0.0056	01Jan2020, 12:17	153.462
Block D	.00039132	0.0103	01Jan2020, 12:02	153.461
Block C	.00039131	0.0103	01Jan2020, 12:02	153.461
Block B	.00039131	0.0103	01Jan2020, 12:02	153.461
Tank B	0.0011739	0.0226	01Jan2020, 12:08	153.468
Tank C	0.0011739	0.0185	01Jan2020, 12:20	153.478
Driveway By Passing Tank	.0004	0.0105	01Jan2020, 12:02	153.461
Bike Bin	.00012209	0.0032	01Jan2020, 12:02	153.461
*Post-Sink	0.0071470	0.1153	01Jan2020, 12:03	129.350
*Pre-Sink	0.0071470	0.1314	01Jan2020, 12:03	97.057

10% AEP Modelling Result

Up-Flo Filter
Design Programme - North Island

PROJECT TITLE & DESCRIPTION	**96 Beach Haven Road**
CUSTOMER/CLIENT AND/OR REPRESENTING CONSULTING BODY	**Aireys Consultants Ltd** **Natalie Naidoo**

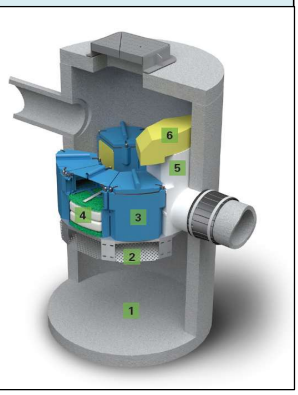
Computed	Checked
21 Jun 2021	21 Jun 2021
Rumana Sayyad	
Released	21 Jun 2021

Area Information (m2)			**Run-off Coefficient(C)**
Area (asphalt aand concrete paved surfaces)	*A(paved)*	**1,490**	**0.95**
Area (roofed)	*A(roof)*	**-**	**0.95**
Unsealed roads	*A(un)*	**-**	**0.50**
Parks, playgorunds, gardens, lawns	*A(grass)*	**-**	**0.50**
Industrial, commercial, shopping areas, town house developments	*A(ind)*	**-**	**0.65**
Residential areas	*A(res)*	**-**	**0.50**
Computed total treatment area	A_T	**1,416**	
Total Runoff area	*At*	**1,490**	

Flow rate calculation	
Standard rainfall intensity (mm/hr)	**10.00**
Site Rain fall flow rate (l/s)	**3.9**
Up-Flo module design	
No of Up-Flo units	**1**
No. of Up-Flo Filter modules	**3**
Max treatment flowrate through Up-Flo(l/s)	**4.7**
Filter media used	**CPZ**
Height of Bypass unit (mm)	**750**
Total runoff area per module (m2)	**497**

Result	
Water Treatment Result Treated Rainfall/ Total Rainfall	**90%**
Minimum 80% of the rainfall treated	
Water Quality Result Weighted TSS Removal rainfall/ Total rainfall	**77.4%**
Minimum 75% TSS removal achieved	

UP-FLO FILTER COMPONENTS	
1	Sump
2	Angled Stainless Steel Screen
3	Filter Module
4	Media Pack
5	Outlet Module
6	Bypass Siphon with Floatables Baffle



PRODUCT ATTRIBUTES	
-	Designed to remove 90% TSS with a mean particle size of 20 microns
-	Recognised by councils for achieving greater than 75% TSS removal
-	Self Activating
-	Low head requirement to drive flows through media
-	Small footprint
-	Modular design allows for easy retrofit installations

NOTES	
-	Please note that the max flow through the Up-Flo when inline is 115l/s, should the design flow/peak flow for the site exceed this value then the system must be installed in an offline configuration of a weir chamber or similar set up.
-	Also note that it is best practice to have these systems installed in an Offline configuration when exceeding internal bypass flows.
-	Please note that if you are looking at the Up-Flo filter as a replacement to a different filter system; that the Up-Flo Filter may differ in terms of (but not limited to) chamber size, min invert of outlet depth and flow rates compared to the device that is specified. Contractor to confirm suitability.
-	If a PS1 is required there will be an additional charge for this.
-	Please note that each Up-Flo Filter chamber comes complete with a concrete lid, ductile iron cover and frame.

INDICATIVE LIST PRICE

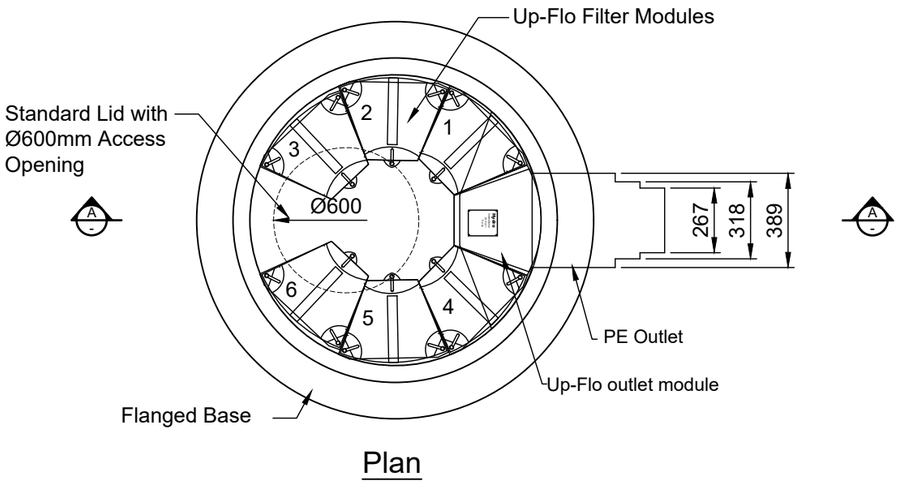
Product description	**Product Code**	**Traffic loading**	**List price**
Ø1200 x 1800mm High flanged base Up-Flo filter with 3 modules	**UP-FLO.3CKIT**	**HD-60**	**$14,805 + GST + Freight**

Please note that the list price does not include the cost of weir chamber required for installing an Up-Flo filter in an offline configuration

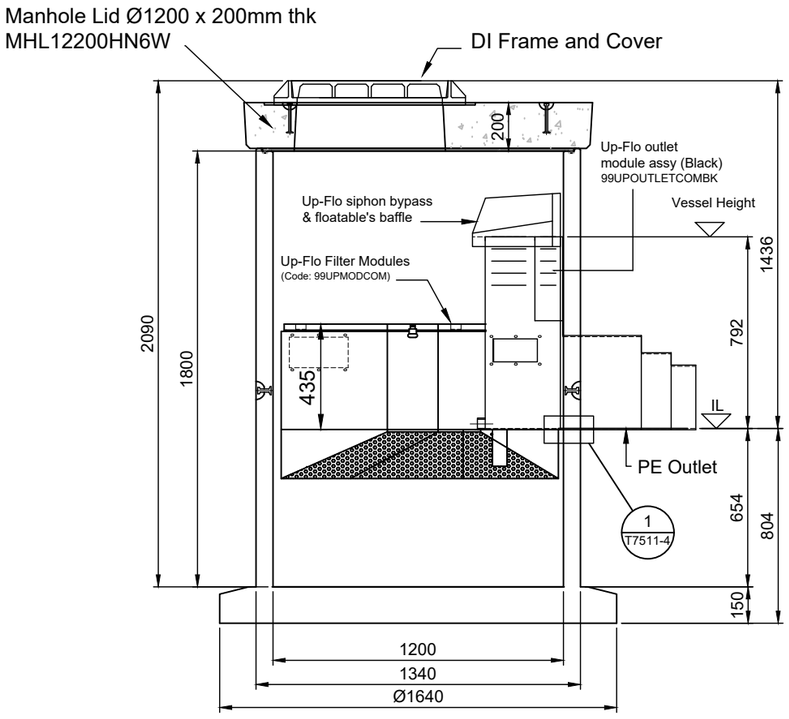
MAINTENANCE / SERVICING

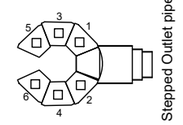
The Frequency of maintenance is determined by the contaminant loadings entering the system, which relates to the activity on site, site practices and the catchment size

Activity	**Indicative Frequency for mid level catchment area**
Installation of media bags	The default is for Up-Flo filters to be supplied to site with media pre-installed. If you request otherwise, please arranage with Hynds Order Manager
Inspection	Regularly During the first year of installation. Every 6 months after the first year of installation
Floatables Removal	Twice per year or as needed (Following a spill in the drainage area)
Sediment Removal	Twice per year or as needed (Following a spill in the drainage area)
Medial Bag Replacement	Once per year or as needed (Following a spill in the drainage area)



Plan



ITEM	DESCRIPTION - MATERIAL	CODE	UNIT WEIGHT (T)	
1	Ø1200mm FB Up-Flo Filter			
☐	with 1 module	UP-FLO.1KIT	2.040	
☐	with 2 modules	UP-FLO.2KIT	2.052	
☐	with 3 modules	UP-FLO.3KIT	2.065	
☐	with 4 modules	UP-FLO.4KIT	2.076	
☐	with 5 modules	UP-FLO.5KIT	2.088	
☐	with 6 modules	UP-FLO.6KIT	2.100	LOCATION INDICATOR
	Stepped (BK) OUTLET (O/D's 267mm, 318mm & 389mm)			
2	MH Lid Ø1200 200Hmm Ø605 Hole	MHL12200HN6W	0.509	☑
3	Ductile Iron Cover & Frame Ø600mm	DIMIMCFHS	0.058	☑

* PLEASE TICK THE NUMBER OF MODULES REQUIRED.

* STANDARD MODULE LOCATIONS ARE INDICTED ABOVE IF THE LOCATION OF THE MODULES IS IMPORTANT, PLEASE USE THE ABOVE LOCATION INDICATOR TO SELECT YOUR PREFERENCE.

NOTE:

1. The Up-Flo Filter can contain 1 to 6 modules. The invert level of optional inlet/s can be a minimum of 240mm above the invert level of the outlet pipe. Inlet pipework is installed by the contractor on site.
2. The standard PE outlet pipe provides the following optional outside diameters: 389mm / 318mm / 267mm. The contractor simply trims the outlet back to the size required.
3. Some dimensions could change to accommodate a site constraint situation. Please contact Hynds for technical assistance.
4. The orientation and elevation of the inlet pipe can be adjusted to suit site requirements. Refer to the site plan for orientation.
5. If the outlet invert depth to the ground level is >1436mm, the contractor will need to provide an appropriate riser to suit the on-site requirements.
6. The unit includes an 1200Ø x 1800mmH flanged based manhole chamber,150mm thick concrete lid and a 600Ø ductile iron cover & frame is Hynds standard supply throughout NZ.
7. If the Up-Flo is installed in an offline configuration and is connecting to a weir chamber - please note that the weir panel height within the weir chamber must match the height of the UpFlo outlet "Vessel Height" as shown on drawing. Height between invert of outlet stub to Vessel Height is 792mm

I AUTHORISE **HYNDS PIPES SYSTEMS LTD** TO PROCEED WITH THE MANUFACTURING OF THIS PRODUCT SPECIAL AS DETAILED ABOVE.
I ACKNOWLEDGE THAT ANY SPECIALS, ONCE MANUFACTURED, ARE DEEMED TO BE MY (CUSTOMERS) PROPERTY & ARE NON REFUNDABLE. PLEASE NOTE COSTS ARISING FROM CHANGES REQUESTED AFTER SIGNING THIS DRAWING WILL BE BORNE BY THE CUSTOMER.

NAME :- ..... SIGNATURE :- .....

DATE :- .....

NOTES:

1. HD60 Traffic loading
2. Consult Engineer where exposure classification C or U is required (Saltwater Tidal/Splash Zone or other aggressive environment).

MATERIALS	
VOL (m^3/unit) =	
WT (ton/unit) =	Refer Table
CODE =	Refer Table

REVISIONS

REV #:	REVISION DESCRIPTION:	DATE:	DRAWN:
1	Issued For Construction	16 Dec 2019	GH
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PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-272 7485
email: technicalservices@hynds.co.nz

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:
Hynds Stormwater
-
Up-Flo 1-6 Moudule
Standard Drawing

SERVICE DETAIL:
Up-Flo Filter Ø1200x1800 (PDEP)
1 to 6 Modules
FB1200x1800mm
General Arrangement

REFERENCE/QUOTE NUMBER:	25948	
DRAWN: GH SIGNATURE:	DESIGN: GH SIGNATURE:	CHECKED: ZS SIGNATURE:
SCALE: N.T.S PAPER SIZE: A3	Note: Do not scale drawing if in doubt **ASK!!!**	DATE: 4-Jun-20
DRAWING NUMBER: T7511 GA	SHEET NUMBER: GA of --	REVISION NUMBER: 1