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PROPOSED RESIDENTIAL DEVELOPMENT

No.182-186 Gertrude Street, North Gosford

Water Cycle Management Report (DA)

PREPARED FOR:

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As specified in Gosford City Council DCP 2013 Chapter 6.7- Water Cycle Management”, all developments are required to produce a Water Cycle Management Report.

The purpose of this report is to minimise the impact of development on the natural predeveloped water cycle. This will lead to more sustainable outcomes that will protect the environment.

The following items will be addressed in the Report:

- **Overland Flow & Flooding;**
- **Water saving targets;**
- **Retention targets;**
- **On-Site Detention targets;**
- **Stormwater Quality targets;.**

- **No.182-186 Gertrude Street, North Gosford (lot 1, 24, 25 DP 17128, 1591)**
- **Subject Site is Zoned R1 general residential.**
- **Site falls to the West.**
- **Existing council pit/pipe system located at western side of site on Gertrude Street.**

Refer Survey Plan below

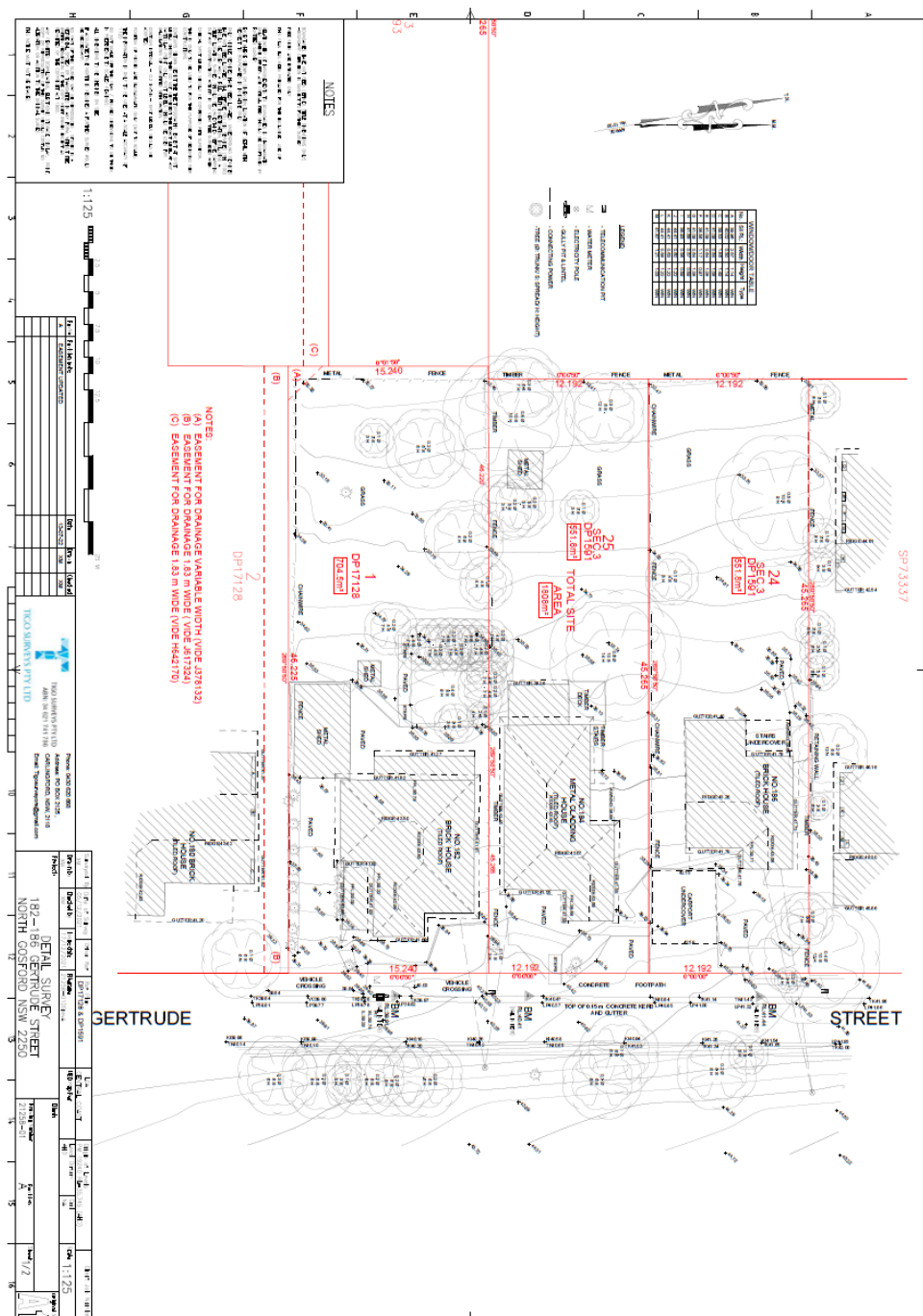


Figure 1 **Survey Plan**



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3 PROPOSED DEVELOPMENT

Prepared by: Jason He (MIEAust CPENG NER)

Prepared date: 25 October 2022

Revision: A

Residential flat building comprising of 39 units over 7 storeys including two levels of basement carpark. All existing dwellings to be demolished to accommodate the proposed development.

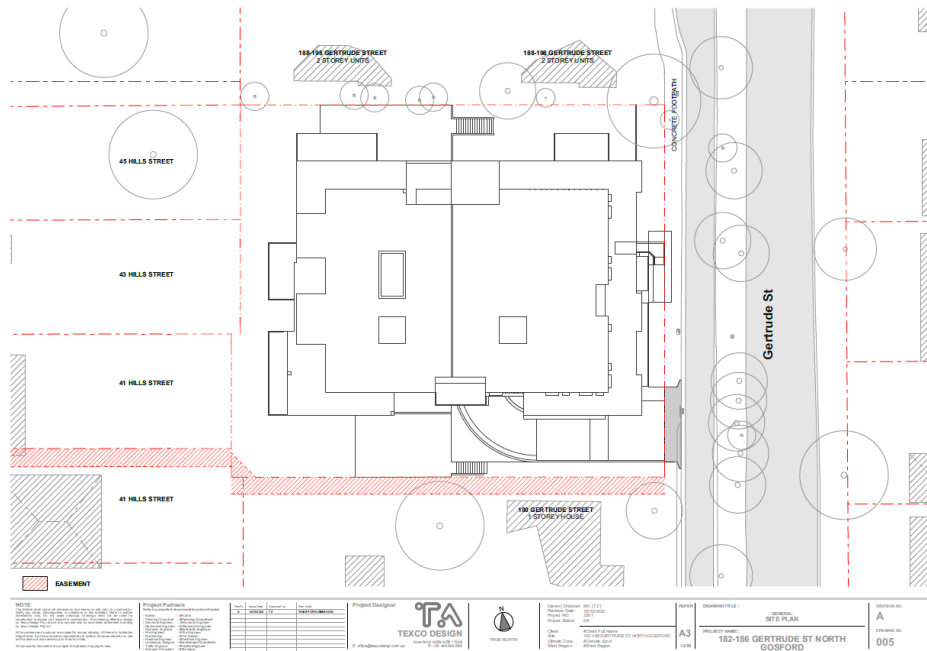


Figure 2 Site Plan

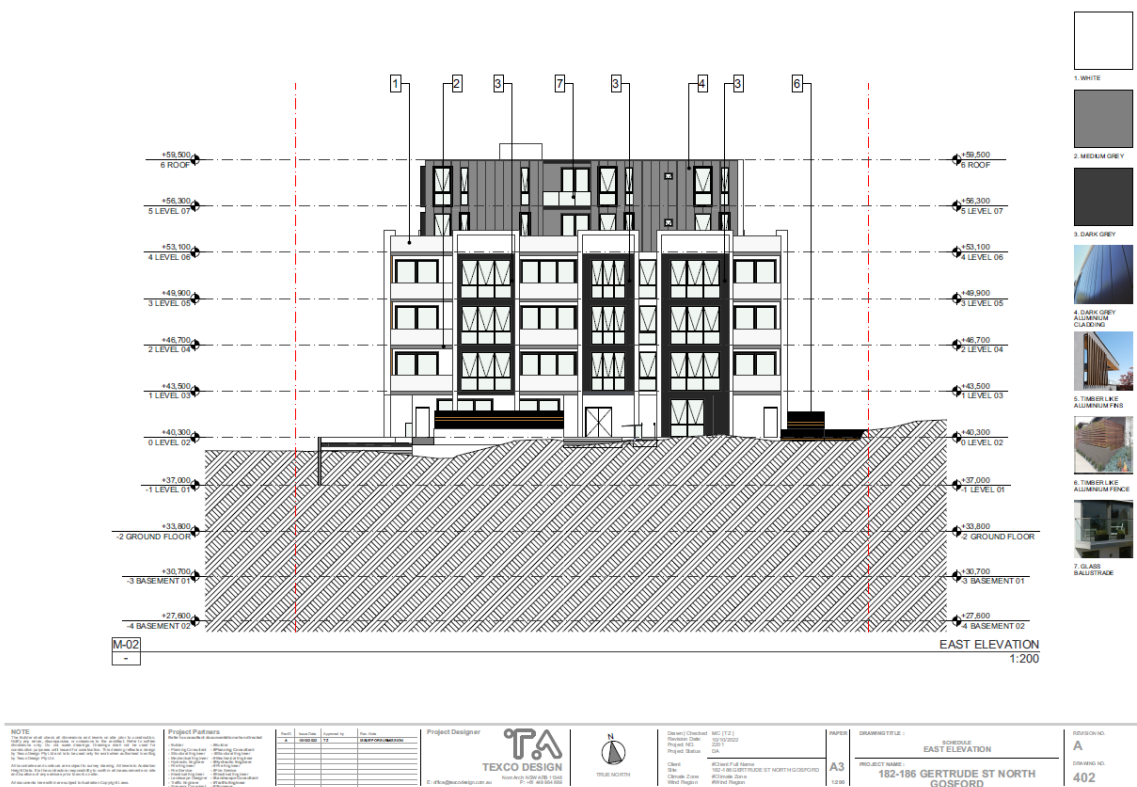


Figure 3 Front Elevation View



4 OVERLAND FLOW AND FLOODING

The site is affected by overland flooding from the local upstream catchment. The runoff from the localised upstream catchment traverses overland through the low-lying areas of the catchment until it reaches Gertrude Street. The existing top of kerb is falling downward towards the boundary line. Existing sag point on Gertrude Street is at the existing Kerb Inlet Pit location. When flood water exceeds the capacity of the capacity of in-ground drainage pipe, water will top the kerb line then enter the subject site.

As confirmed by Central Coast Councils Development Flooding Engineer, Andrew Dewar, flood depth at the site is ranging from 150mm-200mm during PMF flood event. During 1%AEP storm event, the flood depth is generally less than 100mm across the entire site which is considered negligible. Refer to the Flood Information Letter below.

Proposed Level 2 Floor is at the Gertrude Street level. The floor level of RL40.300 is more than 500mm above the flood level as detailed in the Councils Flood Information.

The Ground Floor level and Level 1 floor level are both more than 200mm above the external ground, which provides flood protection to the habitable floor level **up to PMF storm event**.

To provide the protection to the basement, the driveway boundary level will be filled to minimum 200mm above the opposite kerb invert levels. The proposed driveway boundary level RL39.94 is 200mm above the adjacent kerb invert level (RL39.74). The basement will be protected from flood water ingress during PMF flood events.

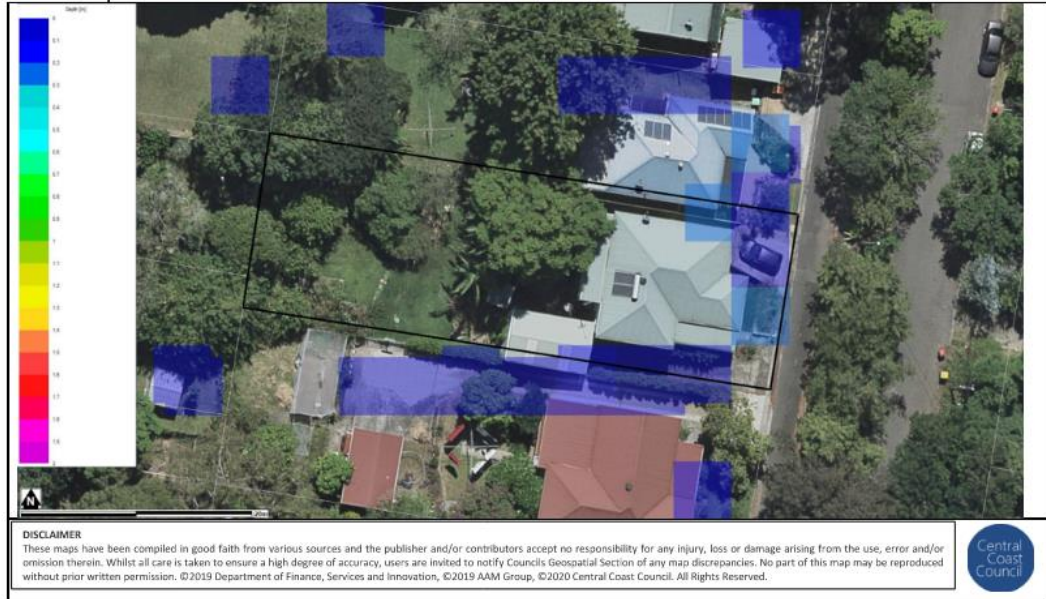
All basement Fire Stairs accessing external area are to be minimum 200mm above external ground level to prevent water from entering the basement.

Therefore, the proposed development is deemed comply with flood planning control.

182 Gertrude St, North Gosford Councils Flood Information, dated 6th June 2022:

Flood Information Certificate

PMF Flood Depth

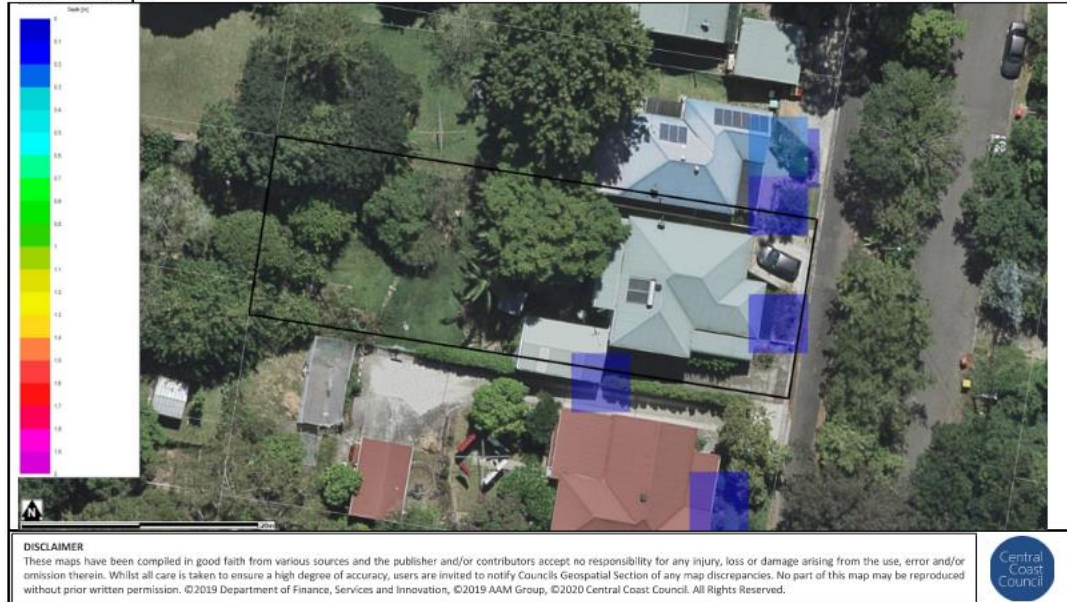


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   Central Coast Council
P 1300 463 954 | E ask@centralcoast.nsw.gov.au

Flood Information Certificate

1% AEP Flood Depth



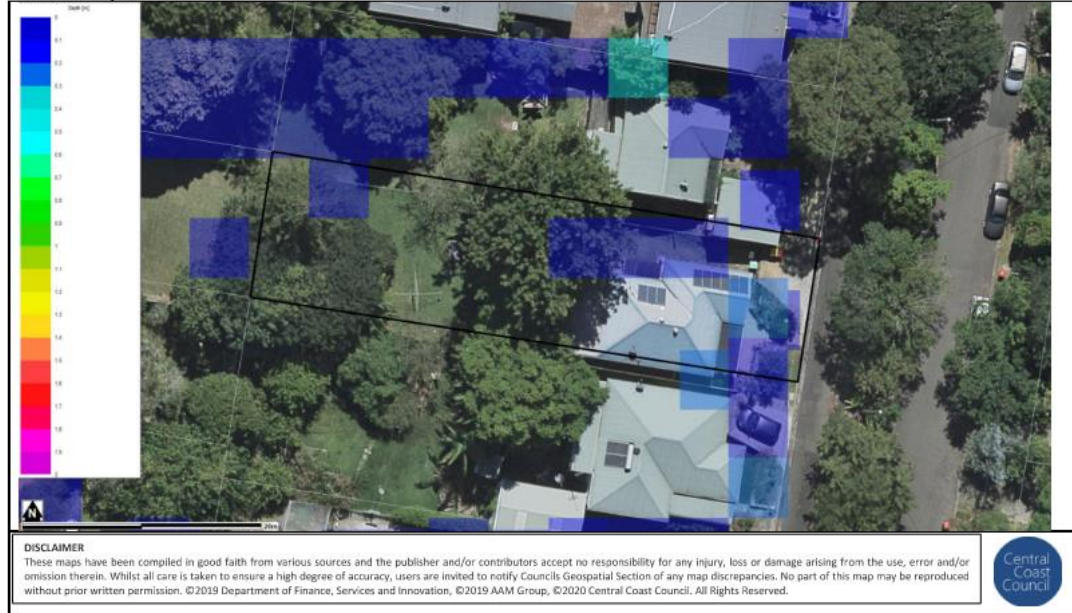
8

   Central Coast Council
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184 Gertrude St, North Gosford Councils Flood Information, dated 6th June 2022:

Flood Information Certificate

PMF Flood Depth



6



Central Coast Council

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Flood Information Certificate

1% AEP Flood Depth



8



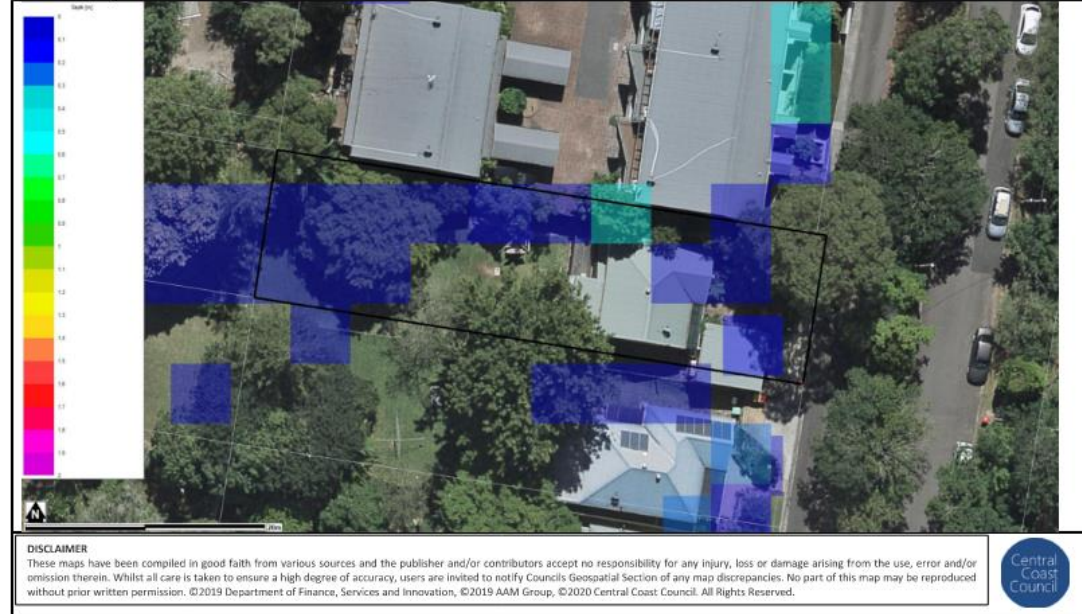
Central Coast Council

P 1300 463 954 | E ask@centralcoast.nsw.gov.au

186 Gertrude St, North Gosford Councils Flood Information, dated 6th June 2022:

Flood Information Certificate

PMF Flood Depth

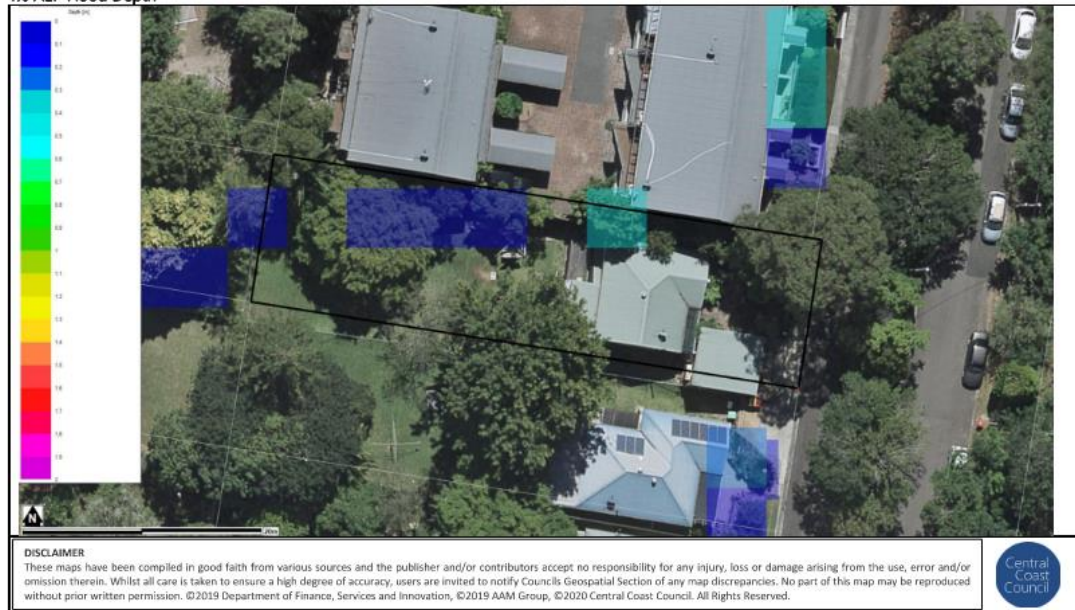


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8

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5 WATER SAVING TARGETS

Prepared by: Jason He (MIEAust CPENG NER)

Prepared date: 25 October 2022

Revision: A

Proposed development to be in accordance with BASIX requirements including:

- **4 star toilet flushing systems**
- **3 star shower heads**
- **4 star kitchen taps**
- **5 star bathroom taps**
- **34,000L rainwater tank**
- **Rainwater used for toilet flushing, washing machine, irrigation & car washing.**

6 RAINWATER RETENTION REQUIREMENTS

Gosford Council 'deemed to comply' stormwater retention volume targets based on Table 2 of the Water Cycle Management Policy provides the following volumes:

V = Stormwater retention volume

A = total site area (1808m²)

F = 69% Fraction impervious (1247.52m²)

Therefore, **$V = 0.01 \times A \times (0.02F)^2$**
V = 34.43m³

Therefore, the Total Stormwater Retention Volume Provided = 35.00m³.

50% of the rainwater tank volume is used to offset On-Site Detention Volume required, provided that rainwater Re-Use shall be used for toilet flushing, washing machine, irrigation & car washing.

**7 ON-SITE DETENTION TARGETS**

On-Site Detention (OSD) has been provided to limit post development flows to less than pre-development (greenfield) flows for storm events ranging from 50% AEP to 1% AEP storm events.

Refer following DRAINS data and summary sheet

PSD COMPUTATION SUMMARY			
LGA:	CENTRAL COAST COUNCIL		
DURATION: 1% AEP	PRE-DEVELOPMENT FLOW:	0.1100	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0200	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	90.00	L/s
	DRAINS' MODELLING - resulting discharge rate	36.00	L/s
DURATION: 2% AEP	PRE-DEVELOPMENT FLOW:	0.0920	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0170	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	75.00	L/s
	DRAINS' MODELLING - resulting discharge rate	32.00	L/s
DURATION: 5% AEP	PRE-DEVELOPMENT FLOW:	0.0720	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0130	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	59.00	L/s
	DRAINS' MODELLING - resulting discharge rate	28.00	L/s
DURATION: 10% AEP	PRE-DEVELOPMENT FLOW:	0.0560	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0100	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	46.00	L/s
	DRAINS' MODELLING - resulting discharge rate	25.00	L/s
DURATION: 20% AEP	PRE-DEVELOPMENT FLOW:	0.0400	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0070	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	33.00	L/s
	DRAINS' MODELLING - resulting discharge rate	21.00	L/s
DURATION: 50% AEP	PRE-DEVELOPMENT FLOW:	0.0200	m ³ /s
	POST-DEVELOPMENT BY-PASS FLOW:	0.0040	m ³ /s
	Hence, PERMISSIBLE SITE DISCHARGE:	16.00	L/s
	DRAINS' MODELLING - resulting discharge rate	16.00	L/s
OSD REQUIRED VOLUME = 52.20m³			
OSD REQUIRED VOLUME (OFFSET FROM RWT) = 35.20m³			
and			
Orifice Diameter = 120mmdia			

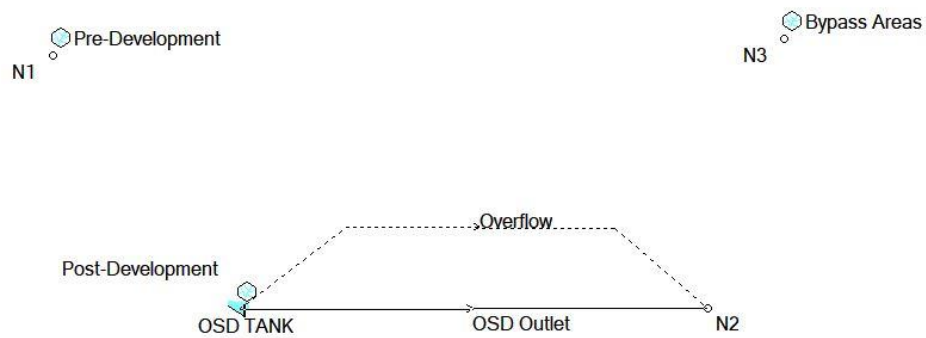


Figure 7 DRAINS Layout

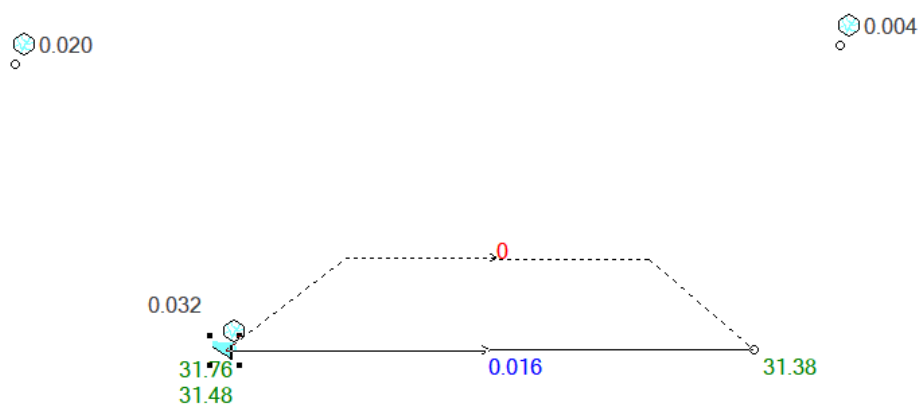


Figure 8 DRAINS Result (50% AEP)

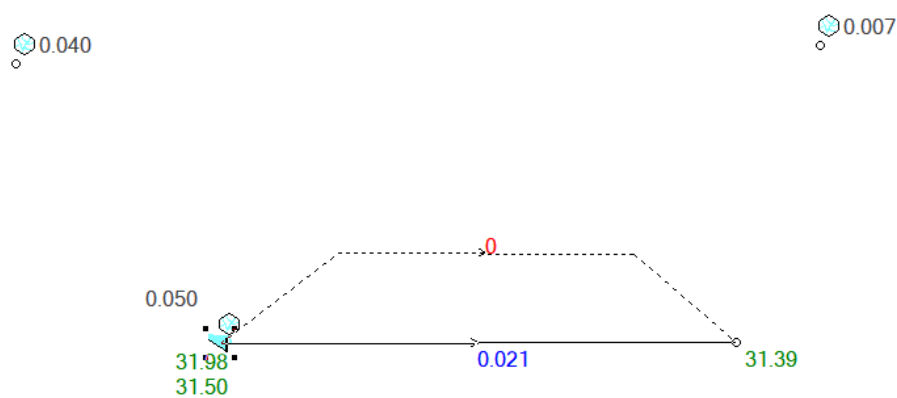


Figure 9 DRAINS Result (20% AEP)

0.056

0.010

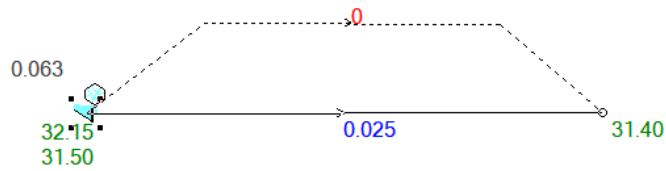


Figure 10 DRAINS Result (10% AEP)

0.072

0.013

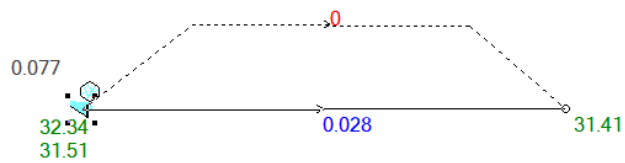


Figure 11 DRAINS Result (5% AEP)

0.092

0.017

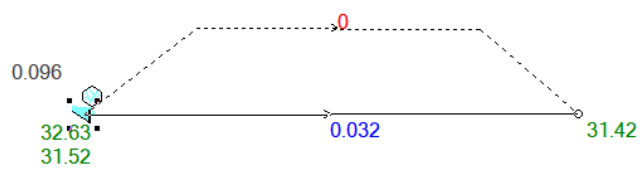


Figure 12 DRAINS Result (2% AEP)

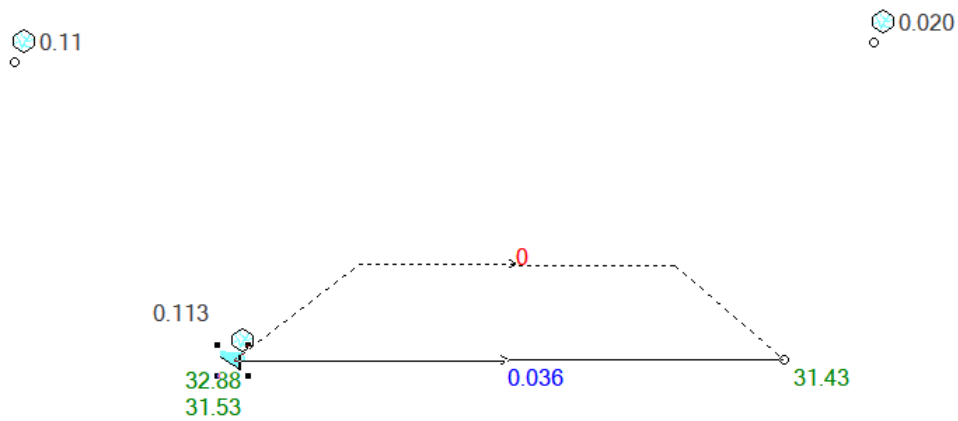


Figure 13 DRAINS Result (1% AEP)

8 STORMWATER QUALITY TARGETS

Water Quality improvement measures are required to improve the quality of stormwater runoff, which will also improve the health of creeks/waterways and enhance urban amenity.

The proposed development achieves the minimum reductions in total pollutant load listed below:

- 80% reduction in solids- Suspended solids & gross pollutants
- 45% reduction in nutrients- total phosphorus & total nitrogen

The following Water Sensitive Urban design (WSUD) measures are proposed for the subject site:

- 3 x Tall(690) PSorb cartridge StormFilter system within a 6m² StormFilter chamber, inside an OSD (refer to detail in Appendix A)
- 5 x OceanGuard with 200micron mesh bags (OG-200) for bypass landscape areas at the rear of the site (refer to detail in Appendix A)

MUSIC Modelling

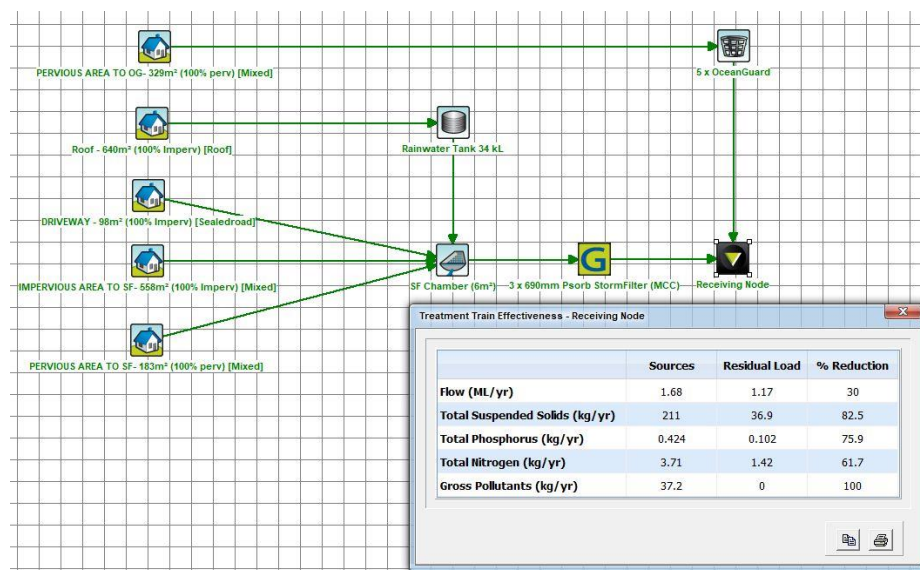
The Water Quality modelling for the proposed development was undertaken using MUSIC v6.3.0.

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) was developed by the Co-operative Research Centre (CRC) for Catchment Hydrology and is designed to evaluate conceptual stormwater treatment designs by simulating the performance of stormwater quality improvement measures and comparing with water quality targets.

The adopted MUSIC parameters were as follows:

- Rainfall Station 059040 Coffs Harbour MO, 6 Minute Time Step From 1999 to 2003
- Water by Design's MUSIC Modelling Guidelines Version 1.0 - 2010 utilizing modified % impervious area, rainfall threshold, soil properties & pollutant concentration
- No drainage routing between nodes.

MUSIC modelling results are presented in the following Image.





The primary purpose of the media filtration system is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, these pollutants must be periodically removed to restore the system to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site.

Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. Similarly, the system should be inspected after major storm events. Ocean Protect selects easy-to-access treatment systems that have been designed for minimal maintenance. However regular cleaning and device maintenance are necessary to remove pollutants and ensure the proper performance of your stormwater management system and compliance with the local regulations.

Recommended maintenance:

- StormFilter – 12 months
- OceanGuard – 4 months

APPENDIX A

- **MUSIC link Report**
- **Ocean Protect Specification Drawings**



MUSIC-link Report

Project Details

Project: 182-186 Gertrude Street, North Gosford
Report Export Date: 14/09/2022
Catchment Name: 19005 - 182-186 Gertrude Street
Catchment Area: 0.181ha
Impervious Area*: 71.82%
Rainfall Station: 86062 SYDNEY
Modelling Time-step: 6 Minutes
Modelling Period: 1/01/1974 - 31/12/1993 11:54:00 PM
Mean Annual Rainfall: 1297mm
Evapotranspiration: 1261mm
MUSIC Version: 6.3.0
MUSIC-link data Version: 6.34
Study Area: Upland
Scenario: Central Coast Development

Company Details

Company: JCO Consultants Pty Ltd
Contact: Jason He
Address: Suite 801C, No.1 Rider Boulevard Rhodes
Phone: 0450 622 389
Email: Jason@jcoconsultants.com.au

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness

Node: Receiving Node	Reduction
Flow	30%
TSS	82.5%
TP	75.9%
TN	61.7%
GP	100%

Treatment Nodes

Node Type	Number
Sedimentation Basin Node	1
Rain Water Tank Node	1
Generic Node	1
GPT Node	1

Source Nodes

Node Type	Number
Urban Source Node	5

Comments

The 'SF Chamber' node has been modified to represent the below ground filtration chamber. Default 'K' values have been manually adjusted to 1 to eliminate any performance from the actual tank, which would already be accounted for in the Filter Generic Node Target Elements. Not doing this would represent a duplication of the chamber attenuation effect. (For any questions, please contact Ocean Protect on 1300 354 722)

NOTE: A successful self-validation check of your model does not constitute an approved model by Central Coast Council
MUSIC-link now in MUSIC by eWater – leading software for modelling stormwater solutions

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
GPT	5 x OceanGuard	Hi-flow bypass rate (cum/sec)	None	99	0.1
Receiving	Receiving Node	% Load Reduction	None	None	30
Receiving	Receiving Node	GP % Load Reduction	90	None	100
Receiving	Receiving Node	TN % Load Reduction	45	None	61.7
Receiving	Receiving Node	TP % Load Reduction	45	None	75.9
Receiving	Receiving Node	TSS % Load Reduction	80	None	82.5
Sedimentation	SF Chamber (6m)	Exfiltration Rate (mm/hr)	0	0	0
Sedimentation	SF Chamber (6m)	Extended detention depth (m)	0.25	1	0.77
Sedimentation	SF Chamber (6m)	High Flow Bypass Out (ML/yr)	None	None	0
Urban	DRIVEWAY - 98m (100% Imperv)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	DRIVEWAY - 98m (100% Imperv)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	DRIVEWAY - 98m (100% Imperv)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	DRIVEWAY - 98m (100% Imperv)	Stormflow Total Nitrogen Mean (log mg/L)	0.34	0.34	0.34
Urban	DRIVEWAY - 98m (100% Imperv)	Stormflow Total Phosphorus Mean (log mg/L)	-0.3	-0.3	-0.3
Urban	DRIVEWAY - 98m (100% Imperv)	Stormflow Total Suspended Solids Mean (log mg/L)	2.43	2.43	2.43
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	IMPERVIOUS AREA TO SF- 558m (100% Imperv)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	PERVIOUS AREA TO OG- 329m (100% perv)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Baseflow Total Nitrogen Mean (log mg/L)	0.11	0.11	0.11
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Baseflow Total Phosphorus Mean (log mg/L)	-0.85	-0.85	-0.85
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Baseflow Total Suspended Solids Mean (log mg/L)	1.2	1.2	1.2
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Stormflow Total Nitrogen Mean (log mg/L)	0.3	0.3	0.3
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Stormflow Total Phosphorus Mean (log mg/L)	-0.6	-0.6	-0.6
Urban	PERVIOUS AREA TO SF- 183m (100% perv)	Stormflow Total Suspended Solids Mean (log mg/L)	2.15	2.15	2.15
Urban	Roof - 640m (100% Imperv)	Baseflow Total Nitrogen Mean (log mg/L)	0.32	0.32	0.32
Urban	Roof - 640m (100% Imperv)	Baseflow Total Phosphorus Mean (log mg/L)	-0.82	-0.82	-0.82
Urban	Roof - 640m (100% Imperv)	Baseflow Total Suspended Solids Mean (log mg/L)	1.1	1.1	1.1

NOTE: A successful self-validation check of your model does not constitute an approved model by Central Coast Council
MUSIC-Link now in MUSIC by eWater – leading software for modelling stormwater solutions

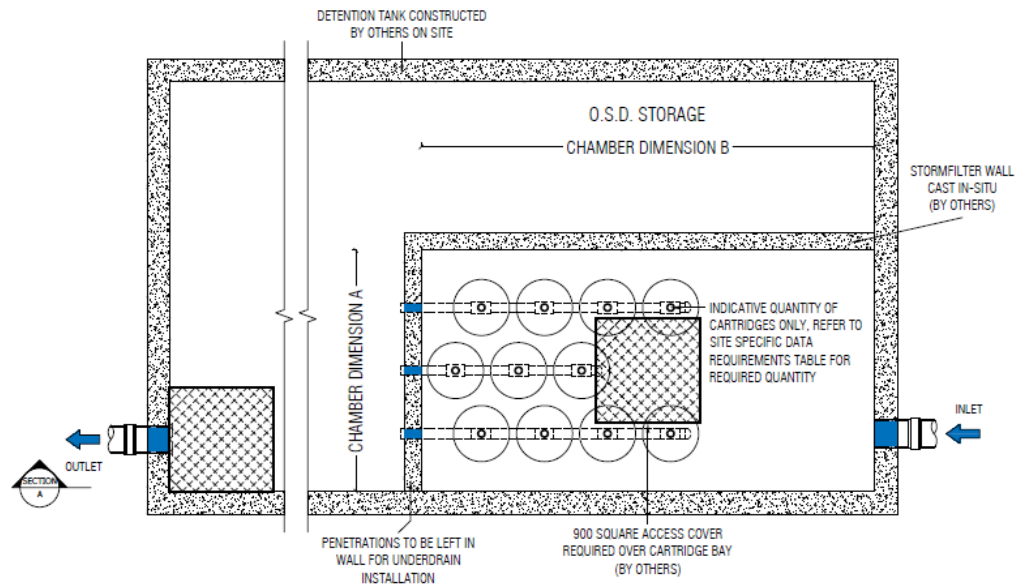


Failing Parameters

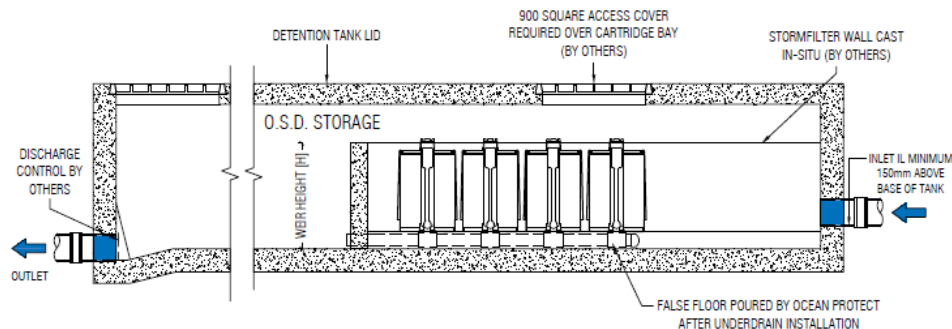
Node Type	Node Name	Parameter	Min	Max	Actual
Sedimentation	SF Chamber (6m \diamond)	Notional Detention Time (hrs)	8	12	0.342
Sedimentation	SF Chamber (6m \diamond)	Total Nitrogen - k (m ³ /yr)	500	500	1
Sedimentation	SF Chamber (6m \diamond)	Total Phosphorus - k (m ³ /yr)	6000	6000	1
Sedimentation	SF Chamber (6m \diamond)	Total Suspended Solids - k (m ³ /yr)	8000	8000	1

Only certain parameters are reported when they pass validation

NOTE: A successful self-validation check of your model does not constitute an approved model by Central Coast Council
MUSIC-link now in MUSIC by eWater – leading software for modelling stormwater solutions



PLAN LAYOUT

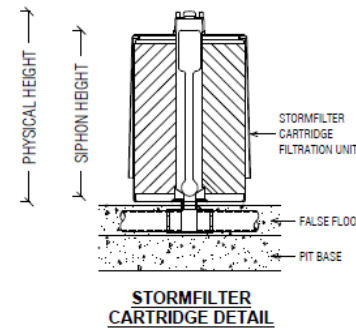


SECTION A

STORMFILTER DESIGN TABLE

- STORMFILTER TREATMENT CAPACITY VARIES BY NUMBER OF FILTER CARTRIDGES INSTALLED.
- THE STANDARD CONFIGURATION IS SHOWN. ACTUAL CONFIGURATION OF THE SPECIFIED STRUCTURE(S) PER CERTIFYING ENGINEER WILL BE SHOWN ON SUBMITTAL DRAWING(S).
- FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF-CLEANING. RADIAL MEDIA DEPTH SHALL BE 178mm.

CARTRIDGE NAME / SIPHON HEIGHT (mm)	690	460	310
CARTRIDGE PHYSICAL HEIGHT (mm)	840	600	600
TYPICAL WEIR HEIGHT [H] (mm)	920	690	540
CARTRIDGE FLOW RATE FOR ZPG MEDIA (L/s)	1.6	1.1	0.7
CARTRIDGE FLOW RATE FOR PSORB MEDIA (L/s)	0.9	0.46	0.39



SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	[]
NUMBER OF CARTRIDGES REQ'D	[]
SIPHON HEIGHT (310 / 460 / 690)	[]
MEDIA TYPE (ZPG / PSORB)	[]
WATER QUALITY FLOW RATE (L/S)	[]
DIMENSION A	[]
DIMENSION B	[]

TOTAL CARTRIDGE BAY AREA (A x B)
TO MATCH AREA REQUIRED BY MUSIC
MODELLING OR COUNCIL SPECIFIC
REQUIREMENTS

GENERAL NOTES

1. INLET AND OUTLET PIPES TO BE IN ACCORDANCE WITH APPROVED PLANS.
2. A HIGH FLOW BYPASS ARRANGEMENT OR DISSIPATION STRUCTURE MAY BE REQUIRED TO MINIMISE RE-SUSPENSION OF SOLIDS OR ANY SIGNIFICANT INERTIAL FORCES ON THE CARTRIDGES.
3. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
4. SITE SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED ON PLACEMENT OF ORDER.
5. THE INVERT LEVEL OF THE INLET PIPE MUST BE GREATER THAN THE RL OF THE FALSE FLOOR WITHIN THE CARTRIDGE CHAMBER.
6. CONCRETE STRUCTURE AND ACCESS COVERS DESIGNED AND PROVIDED BY OTHERS. ACCESS COVERS TO BE A MINIMUM 900 X 900 ABOVE CARTRIDGES. OH&S REGARDING ACCESS COVERS AND TANK ACCESS TO BE ASSESSED BY OTHERS ON SITE.
7. THE STRUCTURE THICKNESSES SHOWN ARE FOR REPRESENTATIONAL PURPOSES.
8. DRAWINGS NOT TO SCALE.

INSTALLATION NOTES

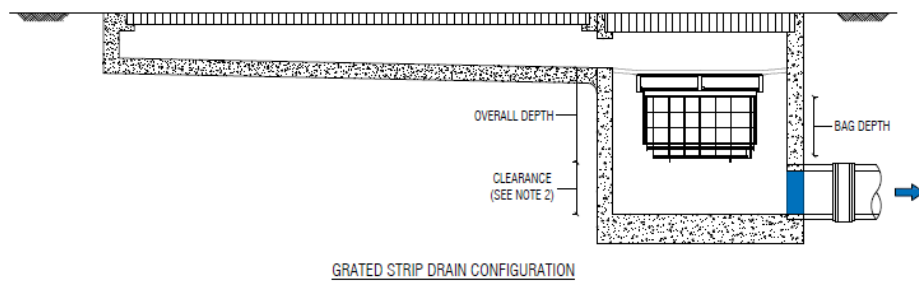
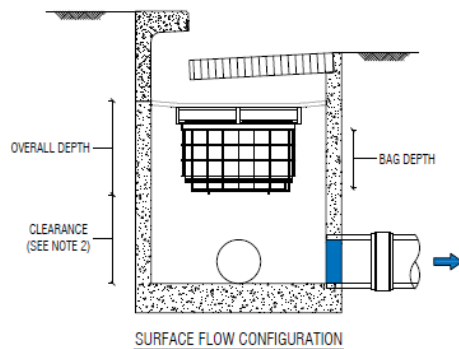
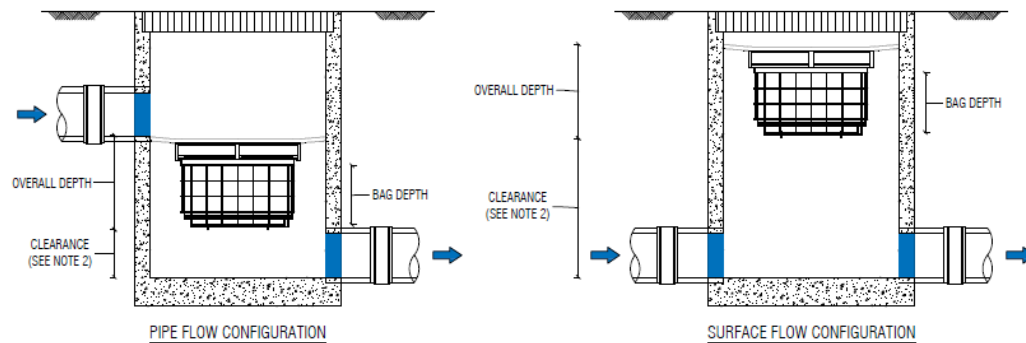
1. UNDERDRAIN AND FALSE FLOOR INSTALLED BY OCEAN PROTECT.



PHONE: 1300 354 722

www.oceanprotect.com.au

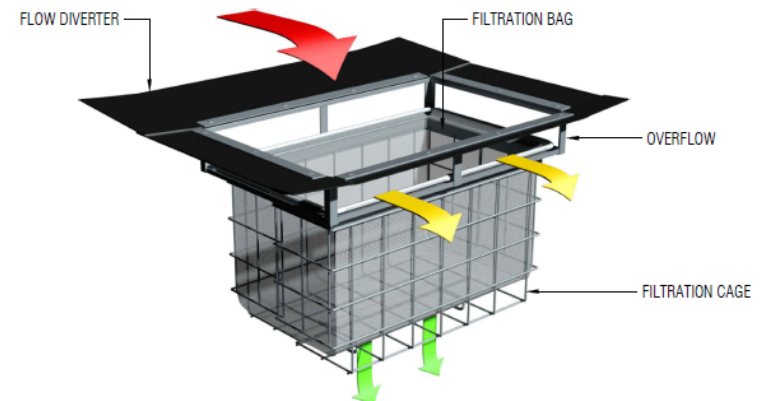
OCEAN PROTECT
STORMFILTER SYSTEM
DETENTION TANK ARRANGEMENT
SPECIFICATION DRAWING



PLAN ID	MAXIMUM PIT PLAN DIMENSIONS
S	450mm x 450mm
M	600mm x 600mm
L	900mm x 900mm
XL	1200mm x 1200mm

DEPTH ID	BAG DEPTH	OVERALL DEPTH
1	170	270
2	300	450
3	600	700

PLAN ID	DEPTH ID		
	1	2	3
S	■	■	■
M	■	■	■
L	■	■	■
XL	■	■	■



GENERAL NOTES

1. THE MINIMUM CLEARANCE DEPENDS ON THE CONFIGURATION (SEE NOTE 2) AND THE LOCAL COUNCIL REQUIREMENTS.
2. CLEARANCE FOR ANY PIT WITHOUT AN INLET PIPE (ONLY USED FOR SURFACE FLOW) CAN BE AS LOW AS 50mm. FOR OTHER PITS, THE RECOMMENDED CLEARANCE SHOULD BE GREATER OR EQUAL TO THE PIPE OBVERT SO AS NOT TO INHIBIT HYDRAULIC CAPACITY.
3. OCEAN PROTECT PROVIDES TWO FILTRATION BAG TYPES:- 200 MICRON BAGS FOR HIGHER WATER QUALITY FILTERING AND A COARSE BAG FOR TARGETING GROSS POLLUTANTS.
4. DRAWINGS NOT TO SCALE.



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