EMKC^3 MANAGEMENT PTY LTD MEL 2 – 85 SHARPS ROAD

CIVIL STORMWATER DESIGN REPORT

Prepared for: EMKC^3 Management Pty Ltd
By: **en**struct group Pty Ltd
Revision: B

MEL 2 Sharps Road, Tullamarine

CIVIL STORMWATER DESIGN REPORT

ISSUE AUTHORISATION

PROJECT: MEL 2

Address: 85 Sharps Road, Tullamarine

Project No: 213226

Rev	Date	Purpose of Issue / Nature of Revision	Prepared by	Reviewed by	Issue Authorised by
A	28/08/24	FOR DEVELOPMENT APPLICATION	SCO	SP	PAL
B	18/12/24	FOR DEVELOPMENT APPLICATION	NS	SP	PAL
C	19/12/24	CLIENT UPDATE	NS	SP	PAL

Executive Summary

enstruct have been engaged by EMKC^3 Management Pty Ltd to provide civil engineering design and stormwater design for the MEL 2 Project. This report relates to the civil engineering stormwater elements of the works, and will discuss the following key items:

- Onsite Stormwater Detention (OSD)
- Water Sensitive Urban Design
- Flooding
- Stormwater Overland Flow
- Legal point of discharge
- Erosion and Sediment control

The proposed stormwater infrastructure will connect into existing internal drainage within the site. However, due to the topography of the land this is split into two catchment areas.

Two OSD tanks have been designed to ensure the post development discharge rate is no greater than the pre-development discharge rate for the 10% AEP storm event. Preliminary tanks sizing calculations indicate the storage size of 200m^3 and 27m^3 storage volume will be required.

Water Sensitive Urban Design measures have been considered and implemented via a treatment train of proprietary devices. These include 21x 690mm StormFilter cartridges, 8x OceanGuard pit inserts,2x 20kL rainwater tank, two CS2250 Cascade Separators, and an open channel grassed swale.

Preliminary investigation suggests the site is not flood affected.

Contents

1 Stormwater Design

enstruct group have been engaged by EMKC[3] Management Pty Ltd as civil and structural engineering consultants on the MEL 2 Project.

This report:

- Outlines and assesses the condition of existing civil assets on site and provides civil engineering guidance to meet the requirements of any future works on the site.
- Establishes the design concept for the civil engineering components of the project including stormwater drainage, Sediment and Erosion Control Plan and Water Sensitive Urban Design.
- Defines the performance requirements for a stormwater management plan, considering the respective components of the stormwater drainage system and water quality target parameters within the proposed development to suit the anticipated and applicable local authority requirements.

1.1 The Site

The existing site located at 85 Sharps Road, Tullamarine, within the Brimbank City Council Local Government Area in Victoria.

The site shown in Figure 1 below, is bounded by Sharps Road to the North, and Keilor Park Drive to the West. The application site has an approximate area of 80651m^2. The site slopes generally in the southwestern direction; however, the northwestern portion of the site slopes towards the northwestern corner.

Figure 1: Site Location (Source: NearMap – July 2024)

2 Existing Site Services

The site currently contains existing industrial and related hardstand areas which are to be demolished as part of this proposal. As part of a Dial Before You Dig (DBYD) enquiry, services have been located in Sharps Road and Keilor Park Road as well as electrical and telecommunication cables that traverse through the site. Whilst attempts have been made to identify all services which will be impacted from the proposed design via DBYD there is still the possibility that unknown services are encountered during any future demolition or construction.

2.2 Existing Stormwater

Council stormwater assets exist along Keilor Park Drive and Sharps Road as seen in Figure 2. There is a stormwater drainage easement along the southeastern boundary of the site, as shown in the survey.

Site investigations uncovered that majority of the western portion of the site is directed towards existing 900dia drains in the southwestern corner of the site that outfall to Keilor Park Road. It is likely that the northeastern portion of the site drains towards the existing 600dia. drain contained within the easement.

Brimbank Council GIS shows an existing 300dia. drain crossing the southern portion of the site, however advice obtained from Brimbank Council is that this drain does not exist.

Figure 2: Stormwater infrastructure adjacent to site (Source: Brimbank City Council)

3 Proposed Development

The proposed development includes seven multi-storey data halls facilities (shells) with adjoining gantry areas. Additionally, a new loop road and loading dock area will be constructed. The remaining area is allocated for substation, and additional plant. The proposed development application site is about 80,760 m^2, of which 45,100m^2 makes up the Data Hall Facilities and 24,400 m^2 for the loop road and car parking. See Figure 3 below for further details.

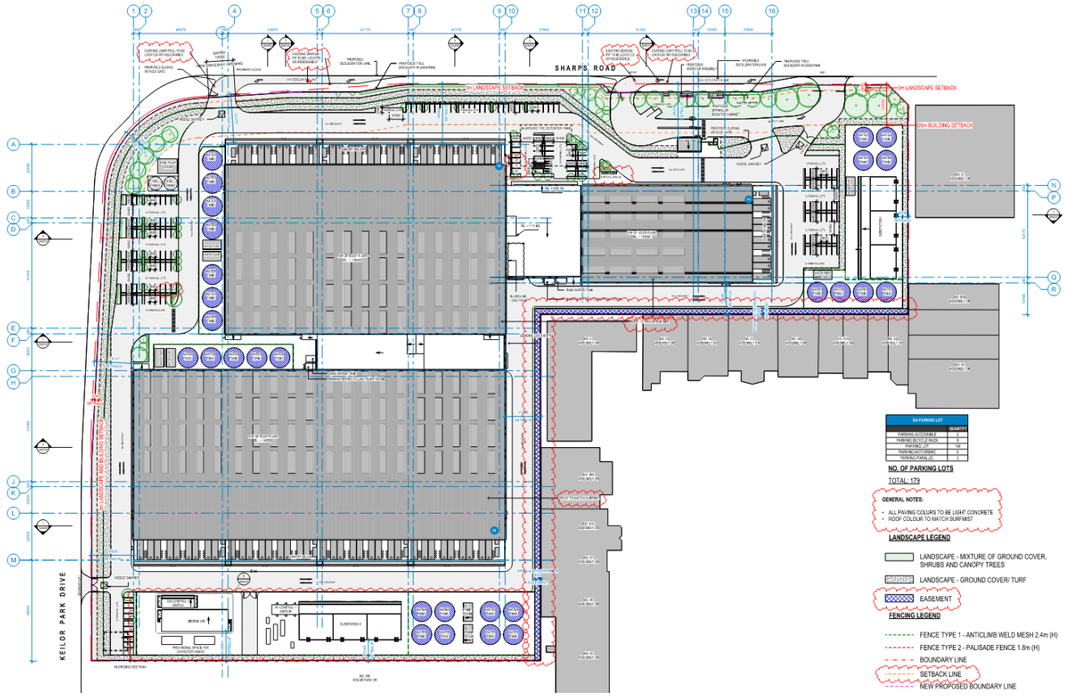


Figure 3: Proposed Ground Floor Plan (Source: Greenbox – 17.12.24)

4 Stormwater Design

The stormwater design must be in accordance with Australian Standards, Brimbank City Council Engineering Guidelines for the Design and Construction of Roads and Drainage Works, Melbourne Water, VicRoads, Australian Rainfall and Runoff (2019), and the Environment Protection Authority (EPA) of Victoria.

In general, all drainage pipework and tanks will be designed using 10% AEP flows which correspond to 83.3mm/hr for Melbourne to ensure that site facilities are available for use in all weather conditions up to a 10% AEP storm event. Pipes and pits will need to be designed to satisfy the minimum provisions of AS 3500.3. They must be designed to convey, at least, the 5% Annual Exceedance Probability (AEP) flows. Where pipe capacity is exceeded i.e. greater than 5% AEP, stormwater will be conveyed as overland flow. Overland flow paths are to be designed to convey at the minimum 1% AEP stormwater flows with a Velocity x Depth to be less than 0.4m^2/s. Any drainage affecting road assets is to be designed and constructed in accordance with AustRoad Design Guidelines - Drainage- Part 5, and Road Design Guidelines - Standard Drawings- Part 9.

Prior to stormwater pipeline design, the geotechnical report indicated where the depth of basalt rock is less than 3m, a soil class of Be – Rock is likely to apply and where it is more than 3m, a soil class of Ce – Shallow Soil is likely to apply.

Pipeline design will provide minimum cover relevant to selected material.

4.3 Legal Point of Discharge

Correspondence with Brimbank City Council indicates a connection into the existing internal drainage is suitable as this drains to a Legal Point of Discharge. The point of connection is into a 525mm dia. pipe along that runs south along the eastern boundary of the site. This pipe is within a drainage easement as indicated on the survey. Appendix A contains the Legal Point of Discharge notice from Council.

Site investigations uncovered that majority of the western portion of the site is directed towards drainage pits in the southwestern corner of the site that outfall to Keilor Park Road. It is intended to use the 900dia. connection for the western Shells A-G and roadway.

Additionally, the vehicle entrance/exit along Sharps Road will need to bypass the site and be directed towards the existing drainage along Sharps Road, subject to Council and VicRoads approval.

4.4 Onsite Stormwater Detention (OSD)

Council has indicated that for industrial sites provision for OSD is assessed on a case-by-case basis upon obtaining a planning permit.

Stormwater detention can be achieved through the use of an OSD tank. The tank is to be located at the lowest point of the catchment to ensure all surface flows will be directed to the OSD, even in the event of a pipe system failure. OSD is to be located away from any natural watercourses and Overland Flow Paths (OLFP) from catchments external to the site and are not to be inundated by a natural watercourse or externally sourced OLFP in any events up to and including the 1% AEP storm event.

As part of this preliminary design, enstruct have sized OSD tanks based upon council best practice guidelines. Considering the site falls towards two different locations, two OSD tanks have been designed to store the 10% AEP volume in line with council's guidelines for commercial/industrial sites.

Without the sites known permissible site discharge (PSD) which is to be confirmed at planning permit stage, the stormwater discharge from the post development site is to be limited to the pre-development flow for the 10% AEP. It is noted this is subject to approval from Brimbank City Council. Preliminary tank sizing calculations indicate that a total storage volume of 227m^3 will be required. The western tank

is the larger of the two at 200m^3 and the eastern tank is sized at 27m^3. Drainage calculations are to be provided to a VicRoads pre-qualified consultant to be independently verified and demonstrate no significant impact on the roadway drainage assets (i.e. flows from the development are restricted to pre-development levels).

Whilst there is no preference for OSD Tank construction materials, the tank is to be structurally sound and maintain the ability to hold and retain water prior to its discharge into the connecting stormwater system. Due to space constraints on site, the eastern OSD tank has been indicatively located under the loading dock for Shell H, which will require a structurally designed slab above.

The proposed OSD locations can be seen in the civil drawings attached separately.

4.5 Flooding

The site is not identified as being flood prone and is not affected by the 1% AEP storm event flood extents as confirmed by Melbourne Water. Refer to Appendix B for correspondence.

4.6 Overland Flow Paths

If the piped in-ground stormwater system fails due to blockage or other obstruction, stormwater flows will be conveyed as overland flow. The overland flow is to be directed away from buildings, along the internal roadways and towards the site's boundary.

The overland flow path is to be designed such that storm flows in excess of a 10% AEP storm event can discharge from the site without causing property damage and/or soil erosion. The flow paths shall also not exceed safe Depth x Velocity products of 0.4m^2/s for pedestrians and vehicles.

4.7 Stormwater Quality Targets

Similarly to OSD, Water Sensitive Urban Design (WSUD) measures are assessed on a site-by- site basis. However, as a conservative approach at this preliminary design stage enstruct have proposed stormwater quality measures in line with Brimbank Council's best practice guidelines. The sites stormwater will pass through suitable pollution control devices to achieve the required water quality removal rates. The devices will remove gross pollutants, suspended solids, and reduce nutrient runoff including nitrogen and phosphorous. The mechanical pollution control devices will require ongoing maintenance. Pollutant removal devices will require at least a yearly inspection and maintenance.

It is proposed that a series of pollution control devices will need to be provided to remove contamination from stormwater runoff to the required level, prior to discharge. It is expected that the devices will include litter screens in pits, and an end of line treatment device to remove nitrogen and phosphorus contaminants etc. prior to discharge to the Council stormwater system. This system is preferred as it will be able to achieve pollutant reductions required, is easily maintained, and does not require extensive maintenance.

Pollutant removal rates will be in accordance with best practice and meet the of the requirements from Council and Melbourne Water. Refer to Table 3 for these pollutant reduction targets.

Pollutant	Stormwater Reduction Target
Total Suspended Solids	80% reduction in the post development mean annual load
Total Phosphorous	45% reduction in the post development mean annual load
Total Nitrogen	45% reduction in the post development mean annual load
Gross Pollutants	70% of the typical urban annual litter load

Table 3: Post Construction Reduction Targets per Melbourne Water

4.7.1 MUSIC Model

A preliminary water quality analysis has been undertaken by enstruct to develop the WSUD strategy for the proposed development. The water quality modelling for this study was undertaken using the industry standard software model MUSIC X (Model for Urban Stormwater Improvement Conceptualisation) Version 1.3.0. The MUSIC model layout representing the proposed WSUD strategy for the development and results are shown in Figure 7 and Figure 8.

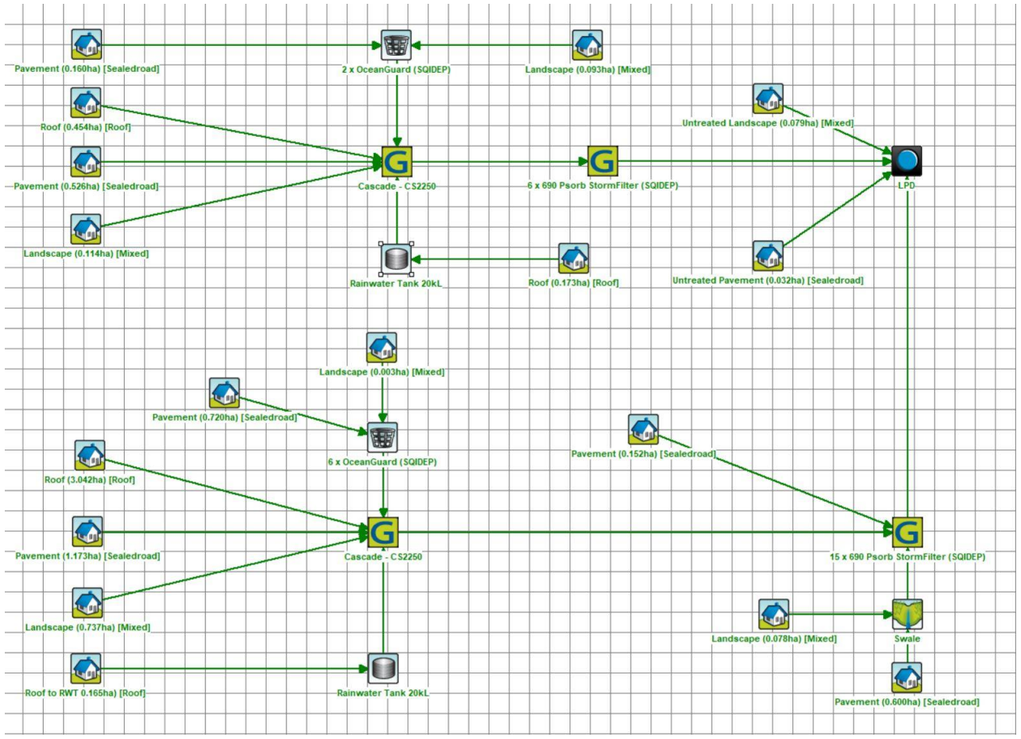
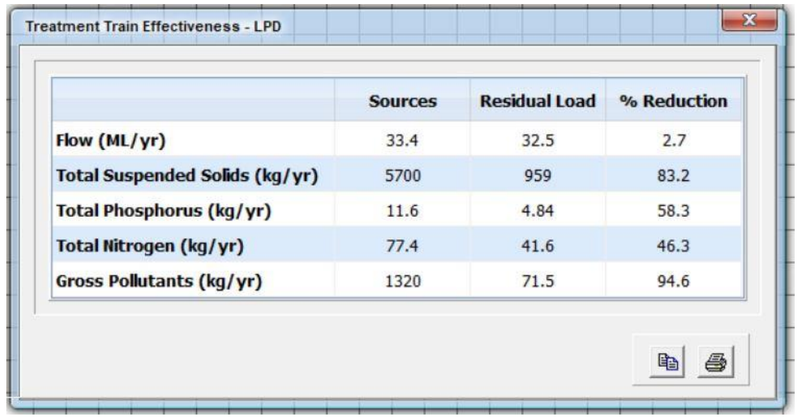


Figure 7: MUSIC Model Layout



	Sources	Residual Load	% Reduction
Flow (ML/yr)	33.4	32.5	2.7
Total Suspended Solids (kg/yr)	5700	959	83.2
Total Phosphorus (kg/yr)	11.6	4.84	58.3
Total Nitrogen (kg/yr)	77.4	41.6	46.3
Gross Pollutants (kg/yr)	1320	71.5	94.6

Figure 8: MUSIC Pollutant Reduction Results

The analysis indicates that 21 x 690mm StormFilter cartridges, 8x OceanGuard pit inserts, 2x 20kL rainwater tank, open channel grassed swale, and two CS2250 Cascade Separators integrated as an offline treatment device to treat low flows. This train of devices will treat the stormwater to suitable pollutant requirements, prior to site discharge. Refer to Appendix C for music catchment breakdown, Appendix D for stormwater design plan and Appendix E for the MUSIC Model Report.

4.7.2 StormFilter Cartridges

Water quality filters are proposed inside the eastern OSD tank onsite. Cartridges draw stormwater into the filter media to facilitate treatment to reduce contaminants of Nitrogen, Phosphorous and Suspended Solids before discharge from the OSD tank onto the downstream system. It is proposed to install 21 cartridges inside the eastern OSD tank. Incoming stormwater will be directed into a filtration chamber to be treated by the cartridges, prior to discharging into the existing Council stormwater system. As the StormFilter cartridges draw water upwards from the base of the tank, oil and hydrocarbons are able to remain on the surface of the water and avoid being discharged from the tank. Refer to Appendix F for details and maintenance information.

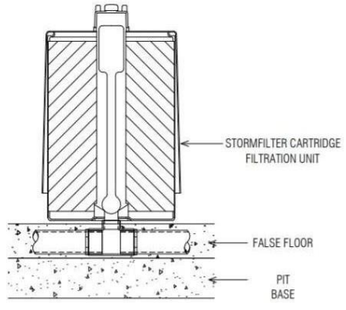


Figure 9: StormFilter Cartridge Detail

4.7.3 Cascade Separator

It is proposed that the western and eastern catchments are treated through an offline proprietary device such as a Cascade separator. This is used to achieves high sediment capture and retention while also removing, trash, and debris from stormwater runoff. Refer to Appendix G for details and maintenance information.

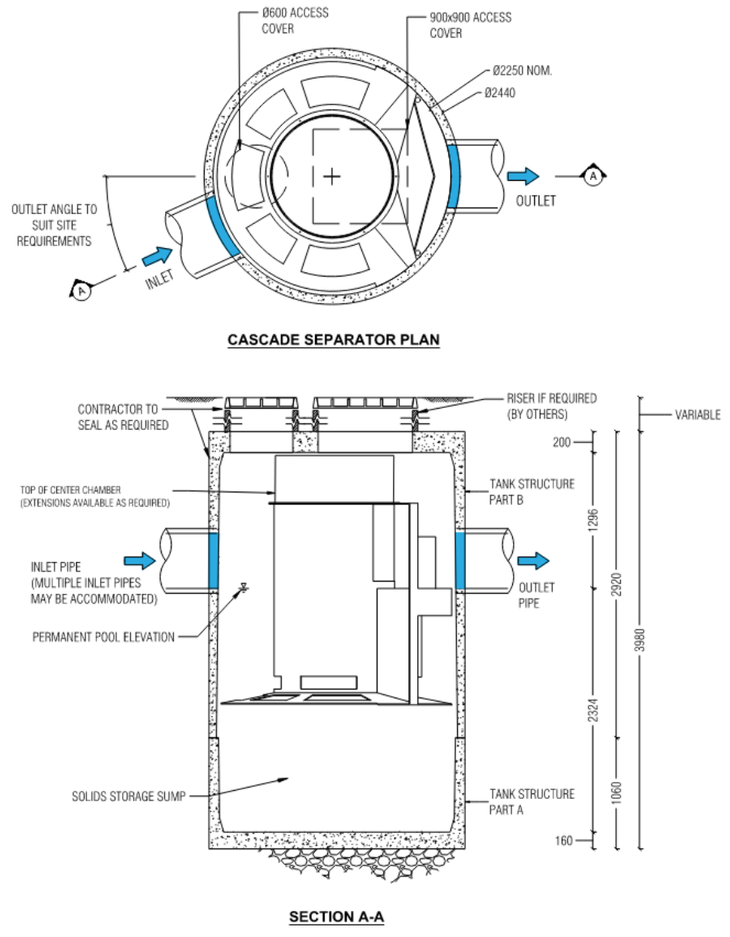


Figure 10: CS2250 Cascade Separator Detail (Source: OceanProtect)

4.7.4 Rainwater Tanks

At this preliminary stage hydraulic engineers have sized two 20kL rainwater tanks for respective roof areas to drain to. In addition to water savings, rainwater tanks will help reduce runoff volume from the proposed development during small storms and associated stormwater pollutants that would discharge from the site. Overflows from the rainwater tanks will discharge into proposed stormwater network for further treatment. Refer to Hydraulic engineer for further detail on rainwater tank volume and reuse. Refer to section 6 for maintenance information.

4.7.5 Open channel grassed swale

It is proposed that the southern part of the eastern catchments is treated through an open channel grassed swale. This is used to remove organic matter and soil particles by setting, filtration and infiltration into the subsoil. Refer to Appendix H for details and maintenance information.

4.8 Erosion and Sediment Control

During construction and while the site is disturbed, erosion prevention and sediment control measures will be required. Erosion prevention generally involves managing stormwater by diverting overland flow around construction areas as well as collecting stormwater within the construction zone and directing to sediment control devices. Devices likely to be incorporated are silt removal fences, catch drains, and water flow dissipation and discharge control devices such as sandbags and basins.

Erosion prevention and sediment removal strategies need to be inspected regularly during construction works, cleaned and maintained after storm events, and modified to suit construction work progress, decanting and demolition.

The erosion and sediment control measures adopted for the development during the construction phase will be designed in accordance with Council guidelines and Soils and Construction – Managing Urban Stormwater (Landcom), as referenced by the Environmental Guidelines for Major Construction Sites (EPA Victoria).

An erosion and sediment control plan has been provided in the Civil drawings.

5 Site Management Measures (Construction Phase)

To prevent the infiltration of litter, sediments and other pollutants from entering the stormwater system, Melbourne Water suggest the use of various sediment management measures which can be utilised on site to provide drainage structure protect. As drainage is constructed on site, any inlets into the system should be protected. The following measures are compatible with a development of this nature and may be implemented onsite during construction works to prevent polluting the stormwater system:

- Silt Fences – are temporary, permeable barriers of geo-textile installed in a trench and supported by star pickets or wooden posts. This provides treatment from sediment as the velocity of the runoff is sufficiently slowed down whereby it no longer has the energy to hold particles in suspension. Filtration is also provided as runoff passes through the silt fence.

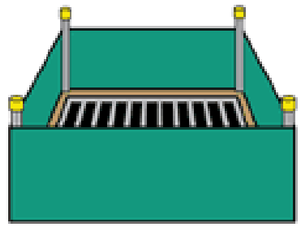


Figure 11: Silt Fence (Reference: Melbourne Water)

- Gravel Sausages and RockLogs – are permeable sacks (geo-textile, synthetic netting or wire) pre-filled or filled by the user with materials such as coarse sand or aggregate up to 50mm used most commonly to protect kerb inlets. Treatment from sediment is similar to that of silt fences.

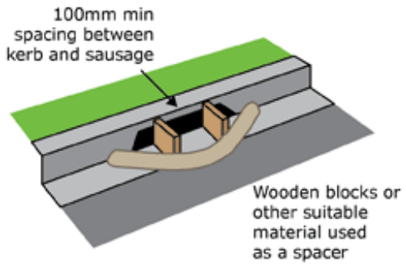


Figure 12: RockLogs (Reference: Melbourne Water)

- Drain Wardens – traps sediment on silt fence material, which is laid under and held in place by the grate, as run-off flows through it into the stormwater system.

Figure 13: Drain Warden (Reference: Melbourne Water)

- Rumble Grids – remove sediment stuck to the tyres and chassis of vehicles through vibration. Many prefabricated rumble grids are able to open the tread on tyres to increase the amount of sediment removed from them. Rumble grids should be located at all vehicular access points to the site.

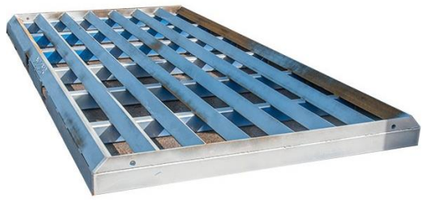


Figure 14: Rumble Grid (Reference: Orange Hire)

Prior to the commencement of works the engaged contractor is to submit a construction management plan to the satisfaction of the responsible authority whereby more detail regarding how the above and/or other sediment management measures will be incorporated into the construction site.

6 Maintenance Procedures

Melbourne Water recommends that WSUD assets should generally be inspected every three months with higher levels of maintenance required within the first two years after construction. WSUD assets should be inspected while stormwater is flowing through the system to identify and fix any problems observed.

The rainwater reuse tank and roof catchment discharging to it shall be inspected and maintained as follows in accordance with the Department of Health's 'Guidance on use of rainwater tanks' document.

Table 4: Inspection and Maintenance Activities for Rainwater Tanks (Reference: Department of Health)

Component	Key Activities	Frequency
Gutters	Will need cleaning as well as inspection. If inspection finds large amounts of leaf material or other debris, then the inspection and cleaning frequency may need to be increased.	6 months
Roof	Check for the presence of accumulated debris including leaf and other plant material. Accumulated material should be cleaned. If tree growth has led to overhanging branches these should be pruned.	6 months
Tank Inlets, Insect-Proofing and Leaf Filters	If necessary these should be cleaned and repaired.	6 months
Tank and Tank Roof	Check structural integrity of the tank including the roof and access cover. Any holes or gaps should be repaired.	6 months
Internal Inspection	Check for evidence of access by animals, birds or insects including the presence of mosquito larvae. If present, identify and close access points. If there is any evidence of algal growth (green growth or scum on or in the water), find and close points of light entry.	
	In addition to 6 monthly inspections, tanks should be inspected every 2-3 years for the presence of accumulated sediments. If the bottom of the tank is covered with sediment the tanks should be cleaned.	2-3 Years
Pipework	Check for structural integrity. Sections of pipework that are not self-draining should be drained. Buried pipework, such as with 'wet systems', can be difficult to drain or flush. Where possible drainage points should be fitted.	6 months

7 Conclusion

The proposed stormwater infrastructure will connect into existing internal drainage within the site. However, due to the topography of the land this is split into three catchment areas.

Two OSD tanks have been designed to ensure the post development discharge rate is no greater than the pre-development discharge rate for the 10% AEP storm event. Preliminary tank sizing calculations indicate that an 227m^3 storage volume will be required across the site.

Water Sensitive Urban Design measures have been considered and implemented via a treatment train of proprietary devices. These include 21 x 690mm StormFilter cartridges, 8x OceanGuard pit inserts, 2x 20kL rainwater tank, a swale, and two CS2250 Cascade Separators.

Preliminary investigation suggests the site is not flood affected.

APPENDIX A
Legal Point of Discharge Council Correspondence

T 9249 4000
W brimbank.vic.gov.au
E info@brimbank.vic.gov.au

PO BOX 70
Sunshine Victoria 3020

301 Hampshire Road
Sunshine Vic 3020

Property Information Advice

Legal Point of Discharge (LPD) & Stormwater Drainage

Applicants Details

Name: **Sine O'Sullivan**

Company Name: **Wsp Australia**

Applicant's Address: **680 George Street**

Contact Details

Phone: 02 9934 7510 Mobile:

Email: Sine.OSullivan@wsp.com

Property Details

Street Address: **85 Sharps Road Tullamarine VIC 3043**

Existing Stormwater Pipe Details

According to Council's records stormwater drainage **does exist** within the property			
Rear ☐	Side (left) ☑	Side (Right) ☐	Centre ☐ / Front ☐
Diameter: Dia. mm	Diameter: **525,600** mm	Diameter: Dia. mm	Diameter: Dia. mm
Offset(boundary): Offset M	Offset(boundary): **NA** M	Offset(boundary): Offset M	Offset(boundary): Offset M
Depth to Invert: Depth M	Depth to Invert: **NA** M	Depth to Invert: Depth M	Depth to Invert: Depth M

☐ Details of the stormwater pipes in neighbouring properties are requested.

According to Council's records stormwater drainage N/A in Neighbouring properties		
Rear ☐	Side (left) ☐	Side (Right) ☐
Diameter: Dia. mm	Diameter: Dia. mm	Diameter: Dia. mm
Offset(boundary): Offset M	Offset(boundary): Offset M	Offset(boundary): Offset M
Depth to Invert: Depth M	Depth to Invert: Depth M	Depth to Invert: Depth M

Notes:

1. This information is provided as a guide only and Council records **DO NOT** depict as-constructed conditions. The applicant **MUST** verify on site as to the existence of the drain and its size, offset and depth to invert where applicable; and undertake a survey to determine that the invert level is such that stormwater from the property can discharge freely into it and that the drain is not adversely affected by the proposed development.
2. Applications for **Building Over/In An Easement** are to be made by **the owner**. Please apply online by visiting Council's website www.brimbank.vic.gov.au.
3. Works undertaken in the Road Reserve or Council Easement require the appropriate permits to be obtained from Council at the relevant fees.

Approved Legal Point of Discharge (LPD)

The proposed development is to connect to the existing internal drainage provided that :

1. The existing internal property drainage is connected to an approved point of discharge (the Relevant Building Surveyor must confirm that it does connect to the Council underground drain or pit) ; and

2. The existing internal drainage has sufficient capacity (as determined by the Relevant Building Surveyor) to carry the additional stormwater flows.

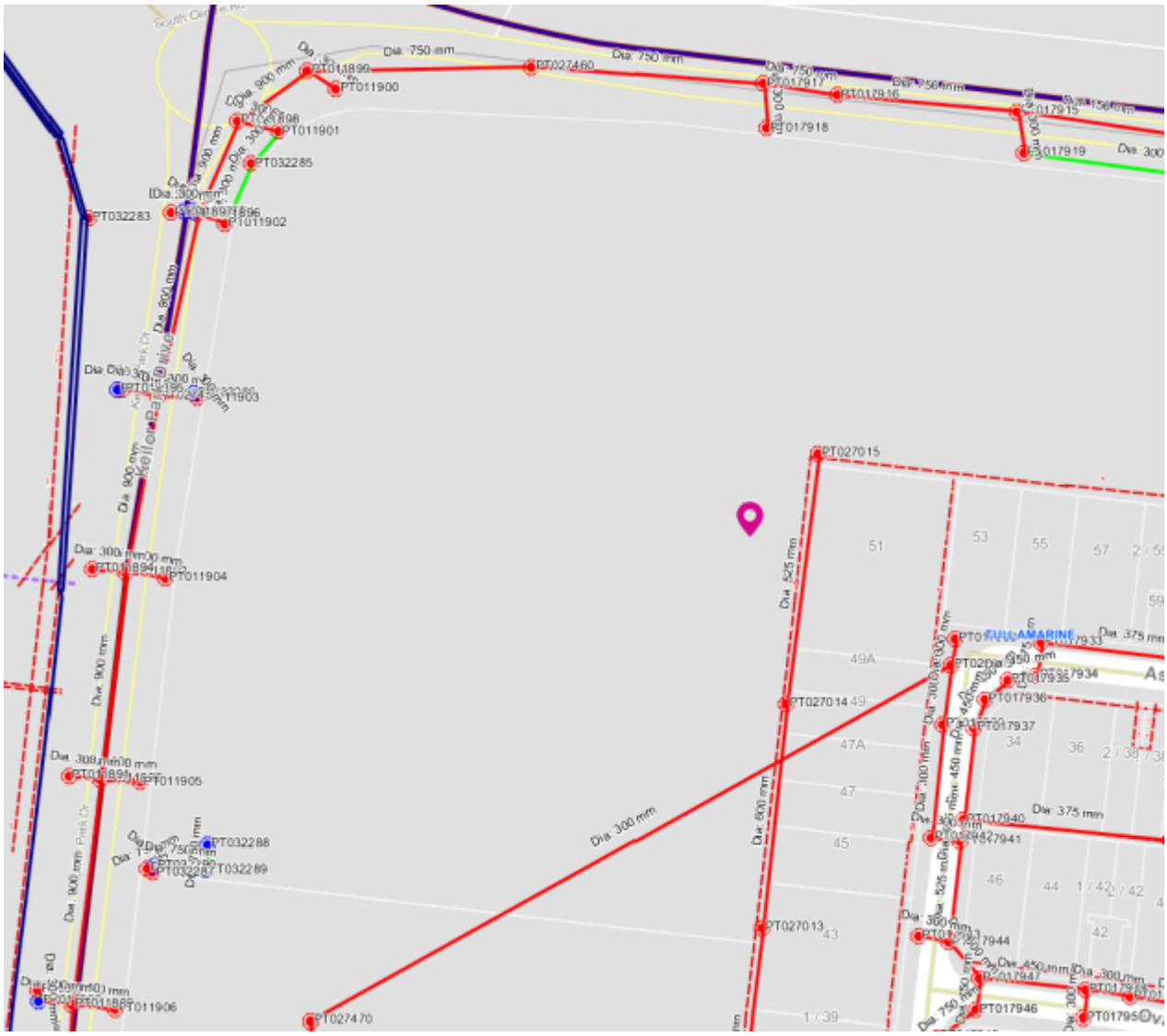
Landfill Information: **Council does not have any plan to indicate fill** however you should obtain your own Soil Engineer's report regardless

Land Liable to Flooding (LLF): **not requested**

Date: 16/07/2024 Issued By: Shruthi Rajkumar Confirm No: **1271032**

PLAN ATTACHMENT – Legal Point of Discharge (**LPD**) Advice

Property Address: **85 Sharps Road Tullamarine VIC 3043**



Notes:

1. Complete accuracy of this plan is not guaranteed
2. Details shown should be checked and proved on-site before any work is carried out
3. All Utility Authorities should be contacted regarding the existence of any underground services

Pellew, Sehon

From: Shruthi Rajkumar <ShruthiR@brimbank.vic.gov.au>
Sent: Thursday, 5 December 2024 9:00 AM
To: Sensuk, Nan
Cc: Pellew, Sehon
Subject: RE: Council drains external to property - 85 Sharps Road Tullamarine [Filed 05 Dec 2024 10:56]

Categories: Filed by Mail Manager

Hi Nan,

As advised in my below previous email, 300mm diameter pipe shown in the screenshot as crossing the property boundary does not exist.

Regards,

Shruthi Rajkumar
Drainage and Services Technical Officer | Engineering and Infrastructure Services

Brimbank Community and Civic Centre - 301 Hampshire Road, Sunshine
T +61 3 9249 4000 | **F** +61 3 9249 4351 | www.brimbank.vic.gov.au

Receiving this email outside of your normal working hours? Managing work and life responsibilities is unique for everyone. There is no expectation to monitor, read, respond or follow up on this email outside your normal hours of work.

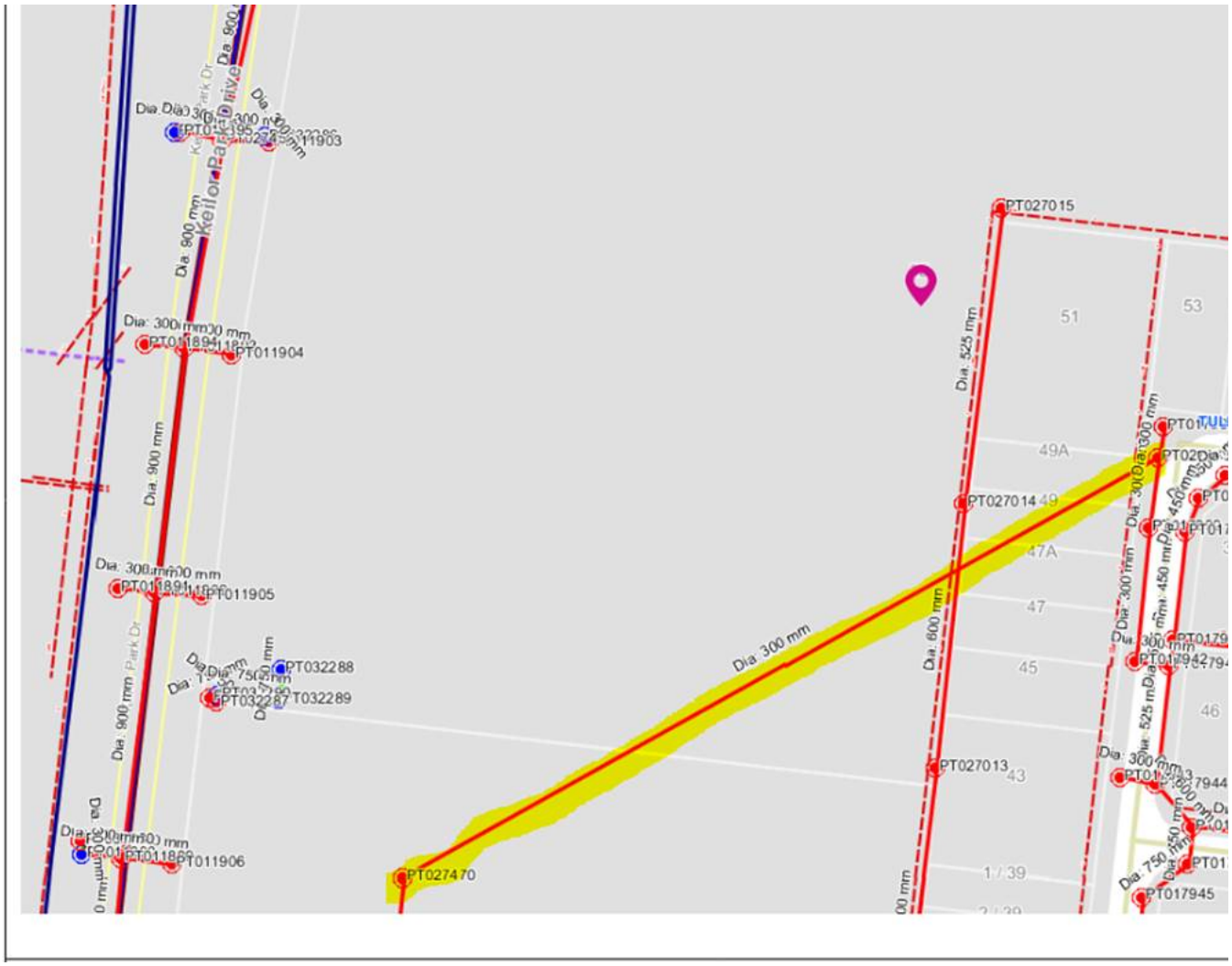
Brimbank City Council respectfully acknowledges and recognises the Wurundjeri and Bunurong peoples as the Traditional Custodians of this land and pays respect to their Elders past, present and future.

From: Sensuk, Nan <Nan.Sensuk@wsp.com>
Sent: Wednesday, 4 December 2024 5:56 PM
To: Shruthi Rajkumar <ShruthiR@brimbank.vic.gov.au>
Cc: Pellew, Sehon <Sehon.Pellew@wsp.com>
Subject: RE: Council drains external to property - 85 Sharps Road Tullamarine

Hi Shruthi,

Would you please help us clarify a few things in regard to this 300dia. drain running across north east to south west of the site (highlighted below).

- What does this drain service?
- Are you able to provide runoff catchments that flows into this drain?
- Are there any as built drawings that relate to this drain?



Kind regards

Nan Sensuk
Project Engineer - Civil

T: +61396229861
M: +61 3 9622 9861
Nan.Sensuk@wsp.com

WSP Australia Pty Limited
Level 15, 28 Freshwater Place
Southbank, VIC, 3006
Australia

wsp.com/au

WSP acknowledges that every project we work on takes place on First Peoples lands. We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

From: Shruthi Rajkumar <ShruthiR@brimbank.vic.gov.au>
Sent: Thursday, 4 July 2024 12:34 PM
To: O'Sullivan, Sine <Sine.OSullivan@wsp.com>
Subject: Council drains external to property - 85 Sharps Road Tullamarine

Hi,

Please find the attached property information as requested.

Please note that the 300mm diameter pipe shown in the screenshot as crossing the property boundary does not exist.

Regards,

Shruthi Rajkumar
Drainage and Services Technical Officer | Engineering and Infrastructure Services

Brimbank Community and Civic Centre - 301 Hampshire Road, Sunshine
T +61 3 9249 4000 | **F** +61 3 9249 4351 | www.brimbank.vic.gov.au

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-LAEmHhHzdJzBlTWfa4Hgs7pbKl

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APPENDIX B

Melbourne Water Correspondence

01 July 2024

Sine O'Sullivan
WSP Australia
680 George Street
Sydney NSW 2000

Dear Sine,

Proposal: Flood level certificates
Site location: Lot No 95, 85 SHARPS ROAD TULLAMARINE 3043

Melbourne Water reference:MWA-1336530
Date referred: 01/07/2024

Flooding may be associated with the Melbourne Water regional drainage system and/or the local Council drainage systems. Information available at Melbourne Water indicates that the property is not subject to flooding from Melbourne Water's drainage system, based on a rainfall event which has a 1% Annual Exceedance Probability (AEP), that is, a 1% probability of being equalled or exceeded in any one year. To determine if a property is subject to flooding from the local Council drainage system you will need to contact the relevant Council for flood information.

For the purposes of the Building Code of Australia - Building in Flood Hazard Areas, there is no applicable flow rate velocity associated with the above property. Melbourne Water does not have any information in relation to flow velocities associated with the local Council drainage system.

Important to note:

Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This letter does not constitute approval for any proposed development for planning or building.

To obtain more information or Melbourne Water's requirements for any proposed development, please contact our Customer Service Centre on 131 722 or make an application here.

The property may be affected by flooding from lesser and more frequent flood events or from the local drainage system. To determine if your property is affected by the local drainage system, please consult your local council.

Melbourne Water ABN 81 945 386 953
990 La Trobe Street Docklands VIC 3008
PO Box 4342 Melbourne VIC 3001 Australia
T 131 722 F +61 3 9679 7099
melbournewater.com.au

The flood level advice provided is based on the most accurate information currently available. This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

For more information in relation to flooding or additional services that Melbourne Water can provide please visit our website.

For general development enquiries contact our Customer Service Centre on 131 722.

Regards,

Melbourne Water Corporation
Customer Service Centre

Melbourne Water ABN 81 945 386 953
990 La Trobe Street Docklands VIC 3008
PO Box 4342 Melbourne VIC 3001 Australia
T 131 722 F +61 3 9679 7099
melbournewater.com.au

APPENDIX C
MUSIC CATCHMENT BREAKDOWN

A0

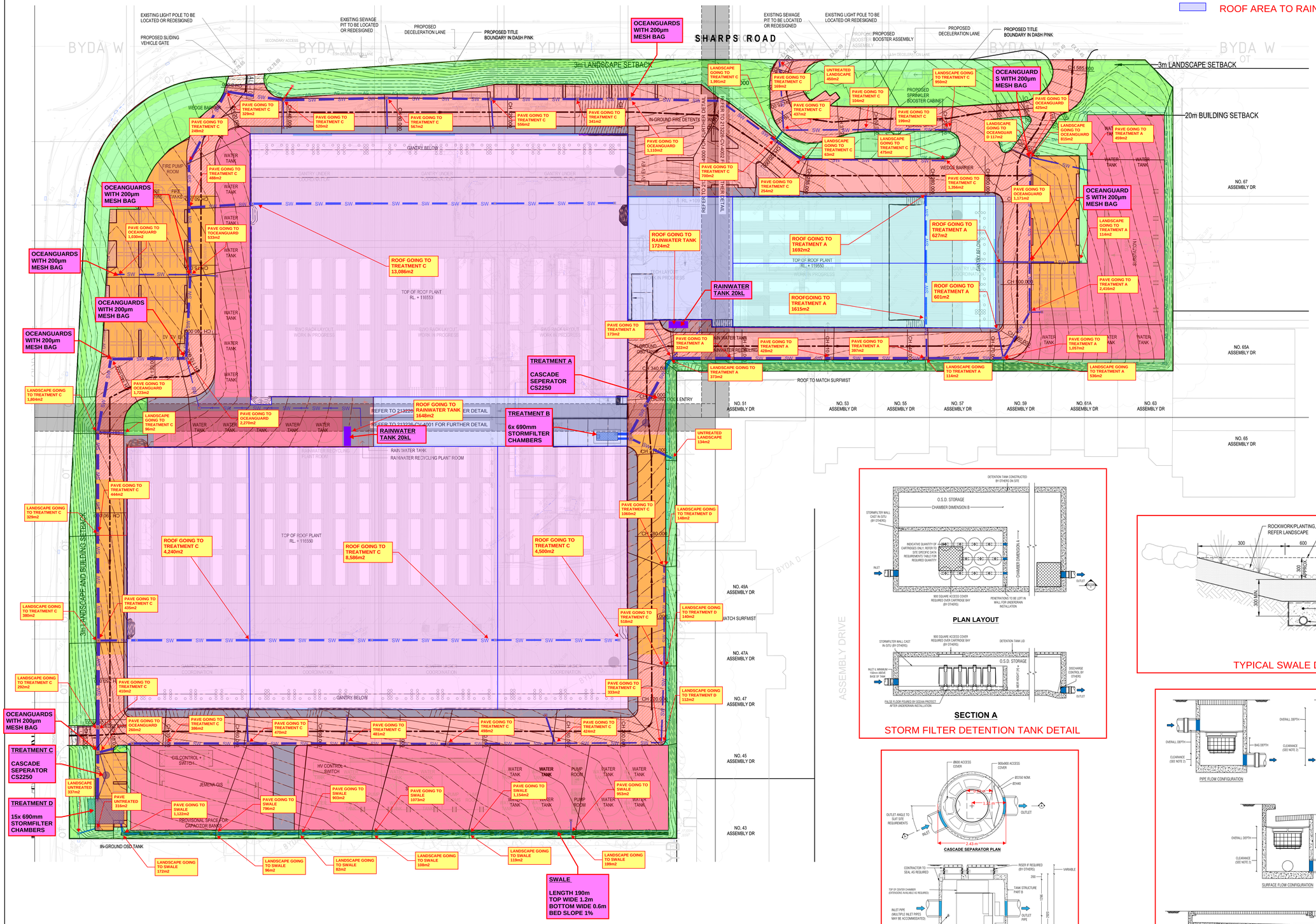
PAVEMENT AREA

LANDSCAPE AREA

ROOF AREA TO TREATMENT A

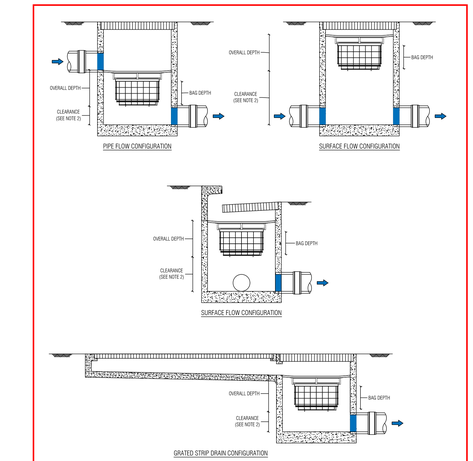
ROOF AREA TO TREATMENT C

ROOF AREA TO RAINWATER TANK



TYPICAL SWALE DETAIL

CASCADE SEPERATOR CS2250 DETAIL



OCEAN GUARD TYPICAL ARRNAGEMENT DETAIL

NOT FOR CONSTRUCTION

SCALE 1:500

0 10 20 30 m

rev	date	description	drn	ch'k
02	30.09.24	30%SCHEMATIC DESIGN ISSUE	NS	SP
01	28/08/24	ISSUE FOR DA	SCO	PAL

enstruct group pty ltd
Level 4, 2 Glen Street
Milsons Point NSW 2061
Australia

Telephone (02) 8904 1444
Facsimile (02) 8904 1555
http: // www.enstruct.com.au

enstruct

project

EMKC³ MEL 2

85 SHARPS ROAD, TULLAMARINE

drawing title

GENERAL ARRANGEMENT ULTIMATE PLAN

status

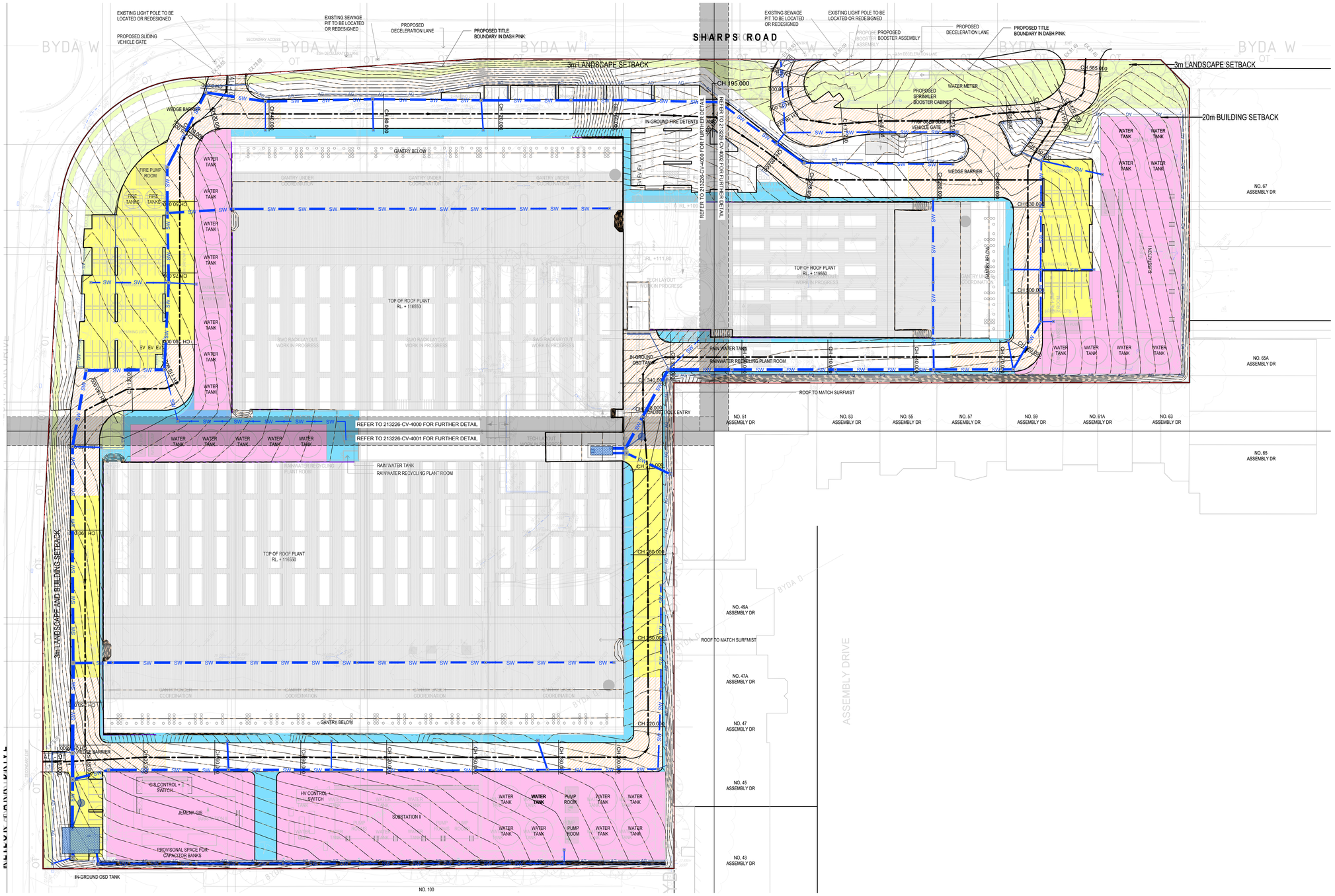
FOR TENDER

scale at A0	drawn	checked	approved
1:500	N SENSUK	S PELLEW	

project no.	drawing no.	rev.
213226	213226-CV-3001	02

APPENDIX D
STORMWATER DESIGN PLAN

A0



SCALE 1:500

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rev	date	description	drn	ch'k
02	30.09.24	30%SCHEMATIC DESIGN ISSUE	NS	SP
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enstruct

project
EMKC³ MEL 2

85 SHARPS ROAD, TULLAMARINE

drawing title
GENERAL ARRANGEMENT ULTIMATE PLAN

status
FOR TENDER

scale at A0	drawn	checked	approved
1:500	N SENSUK	S PELLEW	

project no.	drawing no.	rev.
213226	213226-CV-3001	02

NOT FOR CONSTRUCTION

APPENDIX E
MUSIC MODEL REPORT

Melbourne Water

Date Completed: 17-12-24
MUSIC Guideline Audited: 2024 Guidelines
MUSIC Version Audited: 6.2 or 6.3
Filename is PS213226_MUSIC _241217.mrt
PDF Download

Source Nodes

Parameter	User Input	Check	Guideline	Comments
Roof (0.454ha) (Node 1) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Pavement (0.526ha) (Node 2) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Landscape (0.114ha) (Node 3) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Roof (3.042ha) (Node 4) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative

Source Nodes

				of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Pavement (1.173ha) (Node 5) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Landscape (0.737ha) (Node 6) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Pavement (0.600ha) (Node 7) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ

Source Nodes

Mean (log mg/L)				
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Landscape (0.078ha) (Node 8) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Pavement (0.720ha) (Node 14) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Pavement (0.160ha) (Node 15) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ

Source Nodes				
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Untreated Landscape (0.079ha) (Node 16) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Untreated Pavement (0.032ha) (Node 17) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Roof to RWT 0.165ha) (Node 19) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Roof (0.173ha) (Node 22) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	1.3	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ

Source Nodes

Stormflow Total Phosphorus Mean (log mg/L)	-0.89	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.3	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Landscape (0.093ha) (Node 23) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Pavement (0.152ha) (Node 24) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest
Stormflow Total Suspended Solids Mean (log mg/L)	2.43	not one of	2.2;1.301;2.431;1.882	Should be default unless road, roof or published data. FAQ
Stormflow Total Phosphorus Mean (log mg/L)	-0.3	not one of	-0.45;-0.886;-0.301;-0.680	Should be default unless published data. FAQ
Stormflow Total Nitrogen Mean (log mg/L)	0.34	not one of	0.42;0.301;0.342;0.224;0.243	Should be default unless published data. FAQ
Baseflow Total Suspended Solids Mean (log mg/L)	1.2	not one of	1.1;1.1;1.1;0.96	Should be default unless published data. FAQ
Baseflow Total Phosphorus Mean (log mg/L)	-0.85	not one of	-0.82;-0.82;-0.82;-0.731	Should be default unless published data. FAQ
Baseflow Total Nitrogen Mean (log mg/L)	0.11	not one of	0.32;0.32;0.32;0.346;0.455	Should be default unless published data. FAQ
Landscape (0.003ha) (Node 27) Music Help				
Field Capacity (mm)	80	not equal	50	Use of 50 mm recommended in MW guidelines based on comparison of a range of calibrated models across Melbourne. Variations should be justified and preferably based on a calibrated model representative of the catchment, soils and climate of the area of interest

Treatment Nodes

Parameter	User Input	Check	Guideline	Comments
Rainwater Tank 20kL (Node 18) Music Help				
Hi-flow bypass rate (cum/sec)	100	=	100	Note - High flow bypass rate is set to default of 100 m3/s. This means all flows reaching inlet will pass through the rainwater tank. treatment. Consider whether high flow bypass should be set to gutter capacity or check if there may be a secondary link on an upstream treatment bypassing flows around this tank.
Annual Demand Distribution		not one of	PETSubRain;	It is recommended that PET - Rain is generally used in preference to PET based distribution for systems where the irrigation system will shut off during rain. PET may be used for automated timer systems without rain detection. A monthly distribution may be used in place of PET - Rain where a user estimated distribution is preferred, the suitability of this should be checked.

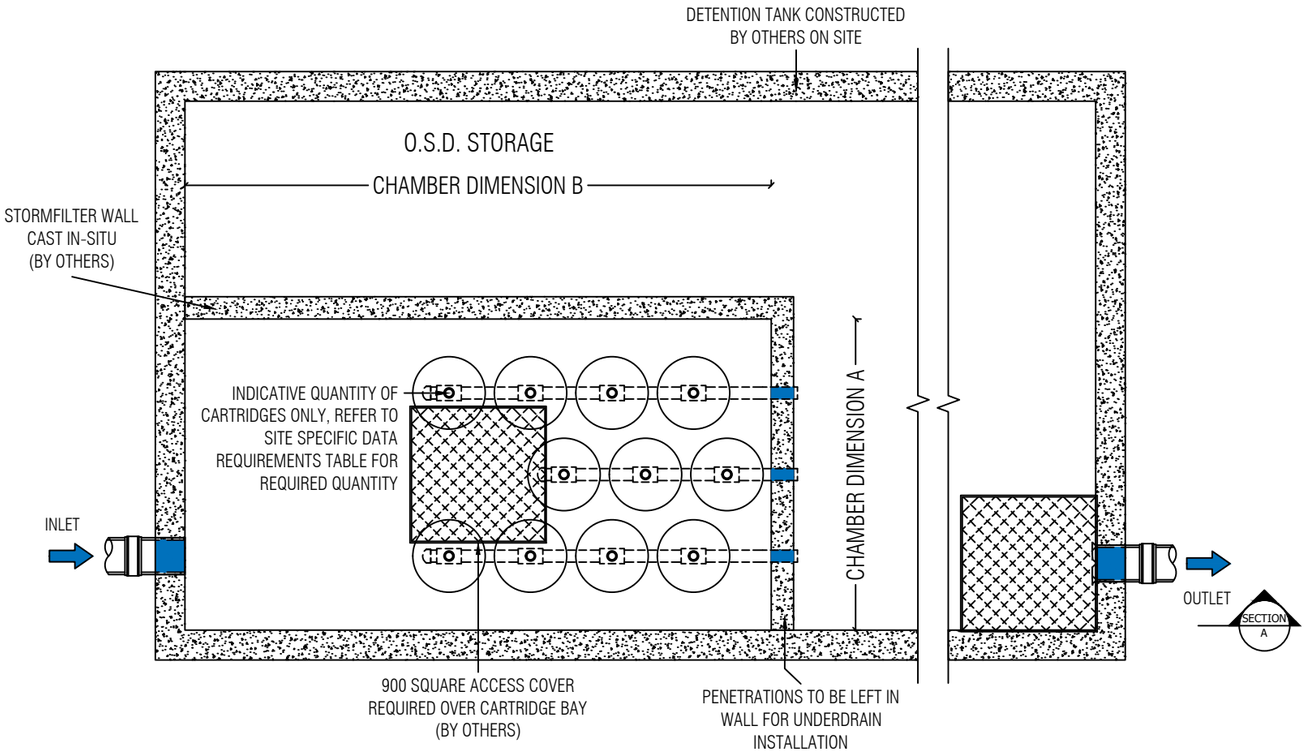
Treatment Nodes				
Daily Demand Value (ML/day)	0.002	not equal		Check reuse demands are justified and reasonable.
Swale (Node 20) Music Help				
Extended detention depth (m)	0.5	>	0.35	Deep average depth, check for any safety issues. FAQ
Vegetation height (m)	0.25	>	0.1	Vegetation height greater than 0.1 m. Typical ranges are 10-100mm for mown grass, 100-400mm for other vegetation. Review proposed vegetation and maintenance plan.
Rainwater Tank 20kL (Node 21) Music Help				
Hi-flow bypass rate (cum/sec)	100	=	100	Note - High flow bypass rate is set to default of 100 m3/s. This means all flows reaching inlet will pass through the rainwater tank. treatment. Consider whether high flow bypass should be set to gutter capacity or check if there may be a secondary link on an upstream treatment bypassing flows around this tank.
Annual Demand Distribution		not one of	PETSubRain;	It is recommended that PET - Rain is generally used in preference to PET based distribution for systems where the irrigation system will shut off during rain. PET may be used for automated timer systems without rain detection. A monthly distribution may be used in place of PET - Rain where a user estimated distribution is preferred, the suitability of this should be checked.
Daily Demand Value (ML/day)	0.002	not equal		Check reuse demands are justified and reasonable.

Catchment Details				
Parameter	User Input	Check	Guideline	Comments
Node PS213226_MUSIC MODEL_241217 does not have any errors. (Node 6 Minutes)				

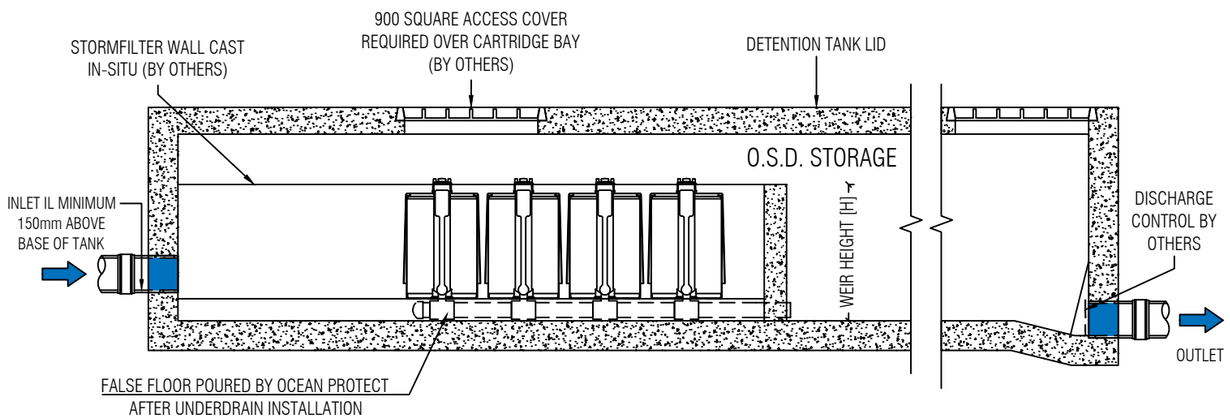
APPENDIX F

STORMFILTER DETAILS AND OPERATIONS & MAINTENANCE MANUAL

NOT FOR CONSTRUCTION



PLAN LAYOUT

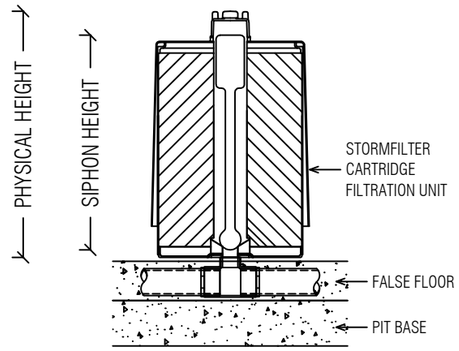


SECTION A

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



STORMFILTER CARTRIDGE DETAIL

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.

OCEAN PROTECT
PHONE: 1300 354 722
www.oceanprotect.com.au

OCEAN PROTECT
STORMFILTER SYSTEM
DETENTION TANK ARRANGEMENT
SPECIFICATION DRAWING

LAST MODIFIED: 07-03-19

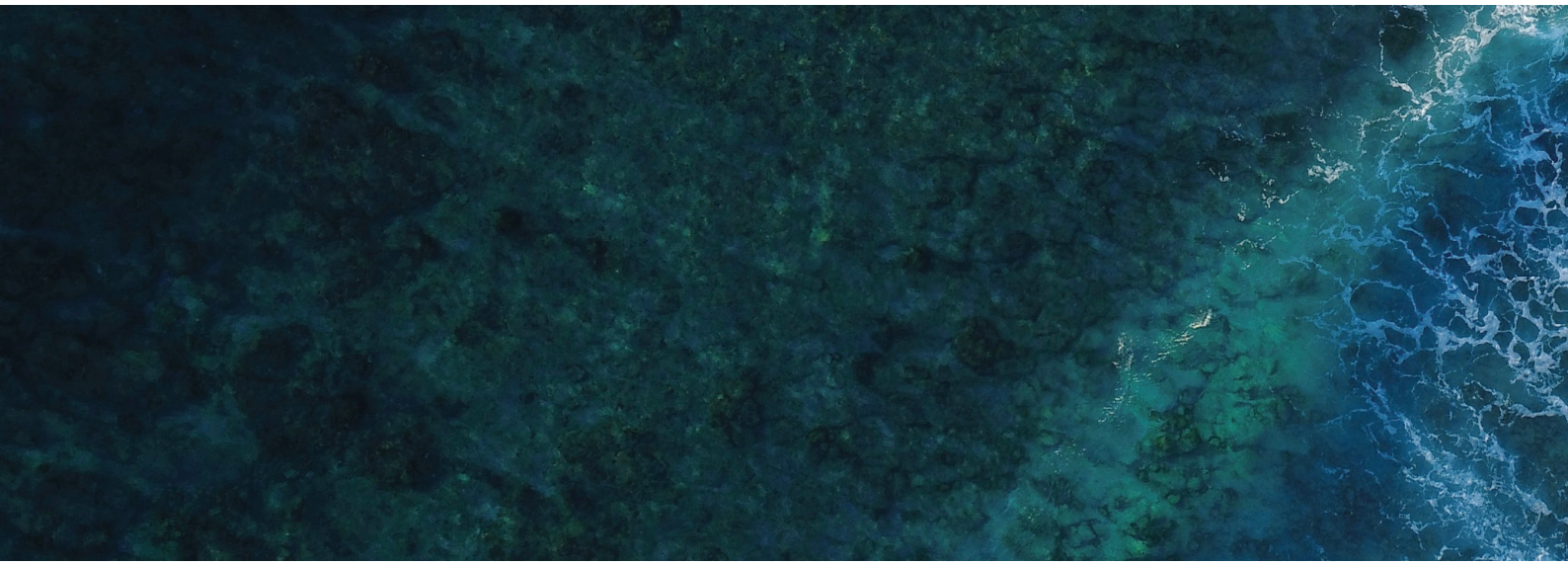
OCEAN PROTECT

StormFilter®

Operations & Maintenance Manual

Stopping Pollution Entering Waterways

11/24



www.oceanprotect.com.au

Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the StormFilter®, as recommended by us.

The StormFilter® is designed and sized to meet stringent regulatory requirements. It removes the most challenging target pollutants (including total suspended solids, soluble heavy metals, oil, particulate and soluble nutrients) using a variety of media. For more than two decades, StormFilter® has helped clients meet their regulatory needs and, through ongoing product enhancements, the design continues to be refined for ease of use and improved performance.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most of all ensures the long term effective operation of the StormFilter®.

Health and Safety

Access to a StormFilter® system requires removing access covers/grates, and it is necessary to enter a confined space. Pollutants collected by the StormFilter® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your StormFilter® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel. As a result, it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the StormFilter®, precautions should be taken in order to minimise (or, if possible, prevent) contact with sediment and other captured pollutants by maintenance personnel. The following personal protective equipment (PPE) is subsequently recommended (but not limited to):

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities, it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site-specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst some aspects of StormFilter® maintenance can be performed from surface level, there will be a need to enter the StormFilter® system (confined space) during a major service. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry applications.

How does it work?

During a storm, runoff percolates through the filtration media and starts filling the cartridge central tube. The air inside the hood is purged through a one-way check valve as the water rises. When water reaches the top of the float, buoyant forces pull the float free and allow filtered water to exit the cartridge.

A siphon is established within each cartridge that draws water uniformly across the full height of the media profile ensuring even distribution of pollutants and prolonged media longevity.

As the storm subsides and the water level in the structure starts falling, a hanging water column remains under the cartridge hood until the water level reaches the scrubbing regulators at the bottom of the hood. Air then rushes through the regulators breaking the siphon and creating air bubbles that agitate the surface of the filter media causing accumulated sediment to settle on the treatment chamber floor. This unique surface-cleaning mechanism helps prevent surface blinding and further extends cartridge life.

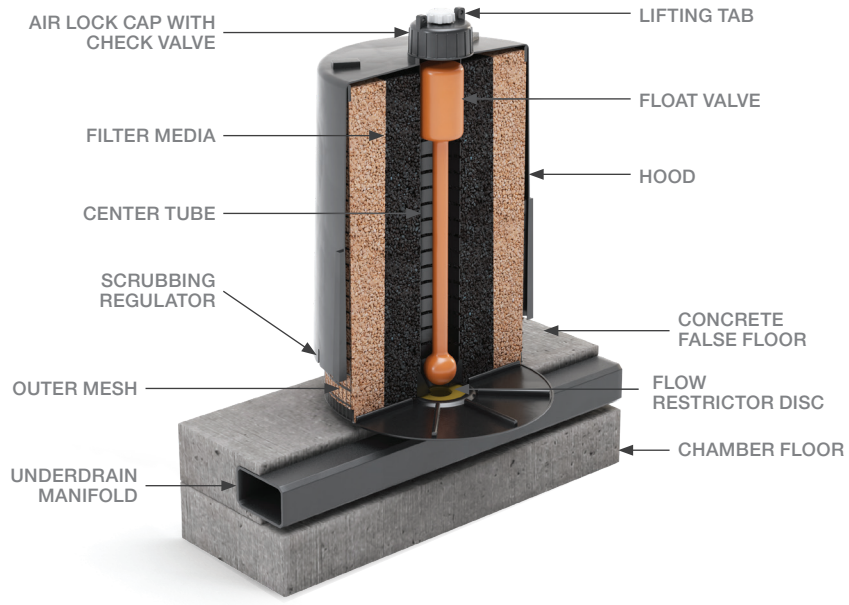


Figure 1: StormFilter® components

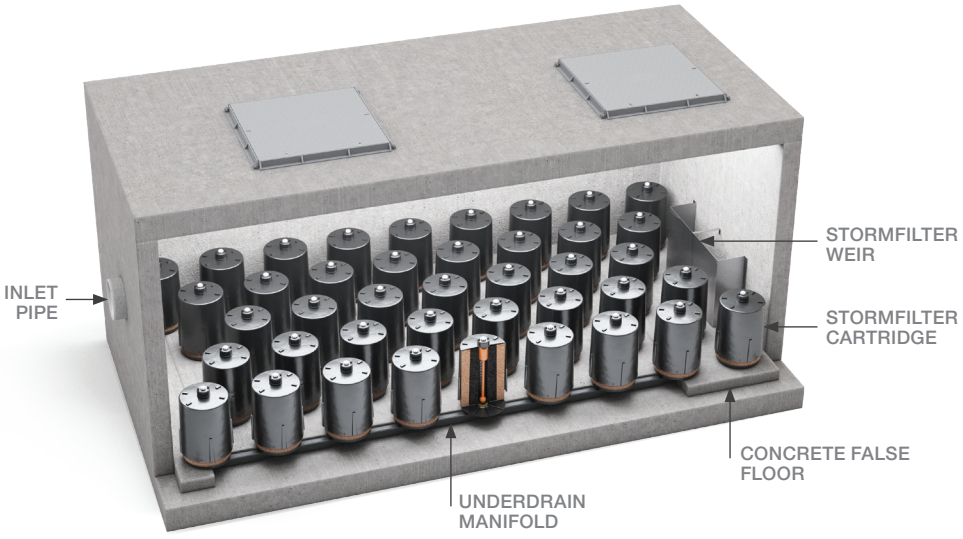


Figure 2: Example conceptual diagram of a StormFilter® system

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the StormFilter® requires an inspection every 6 months with a minor service at 12 months. Additionally, as the StormFilter® cartridges capture pollutants the media will eventually become occluded and require replacement (expected media life is 1-3 years).

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the StormFilter®.

Service Type	Description of Typical Activities	Frequency
Inspection	Visual Inspection of cartridges & chamber Remove larger gross pollutants Perform minimal rectification works (if required)	Every 6 Months
Minor Service	Evaluation of cartridges and media Removal of accumulated sediment (if required) Wash-down of StormFilter® chamber (if required)	Every 12 Months
Major Service	Replacement of StormFilter® cartridge media	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Inspection

The purpose of the inspecting the StormFilter® system is to assess the condition of the StormFilter® chamber and cartridges. When inspecting the chamber, particular attention should be taken to ensure all cartridges are firmly connected to the connectors. It is also an optimal opportunity to remove larger gross pollutants and inspect the outlet side of the StormFilter® weir.

Minor Service

This service is designed to ensure the ongoing operational effectiveness of the StormFilter® system, whilst assessing the condition of the cartridge media.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. Evaluate StormFilter® cartridge media (if exhausted schedule major service within 6 months)
4. Measure and record the level of accumulated sediment in the chamber (if sediment depth is less than 100 mm skip to step 9)
5. Remove StormFilter® cartridges from the chamber
6. Use vacuum unit to removed accumulated sediment and pollutants in the chamber
7. Use high pressure water to clean StormFilter® chamber
8. Re-install StormFilter® cartridges
9. Replace access cover(s)

Major Service (Filter Cartridge Replacement)

For the StormFilter® system a major service is reactionary process based on the outcomes from the minor service, specifically the evaluation of the cartridge media.

Trigger Event	Maintenance Action
Cartridge media is exhausted[1]	Replace StormFilter® cartridge media[2]

[1] Multiple assessment methods are available, contact Ocean Protect for assistance

[2] Replacement filter media and components are available for purchase from Ocean Protect

This service is designed to return the StormFilter® device back to optimal operating performance.

1. Establish a safe working area around the access point(s)
2. Remove access cover(s)
3. By first removing the head cap, remove each individual cartridge hood to allow access to the exhausted media
4. Utilise a vacuum unit to remove exhausted media from each cartridge
5. Use vacuum unit to remove accumulated sediment and pollutants in the chamber
6. Use high pressure water to clean StormFilter® chamber
7. Inspect each empty StormFilter® cartridges for any damage, rectify damage as required
8. Re-fill each cartridge with media in line with project specifications
9. Re-install replenished StormFilter® cartridges
10. Replace access cover(s)

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the StormFilter® unit should be inspected and cleaned. Specifically, all captured pollutants and liquids from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. Additionally, it will be necessary to inspect the filter cartridges and assess them for contamination – and, depending on the type of spill event, it may be necessary to replace the filtration media.

Blockages

In the unlikely event that flooding occurs upstream of the StormFilter® system, the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the upstream diversion structure (if applicable) ensuring that it is free of debris and pollutants
2. Inspect the StormFilter® unit checking the underdrain manifold as well as both the inlet and outlet pipes for obstructions (e.g. pollutant build-up, blockage), which if present, should be removed

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the StormFilter® after a major storm event. The focus is to inspect for damage and abnormally high sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants should be removed and disposed

.

Disposal of Waste Materials

The accumulated pollutants found in the StormFilter® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filter media has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience, Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of StormFilter®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement media for cartridges.

For more information please visit www.oceanprotect.com.au

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

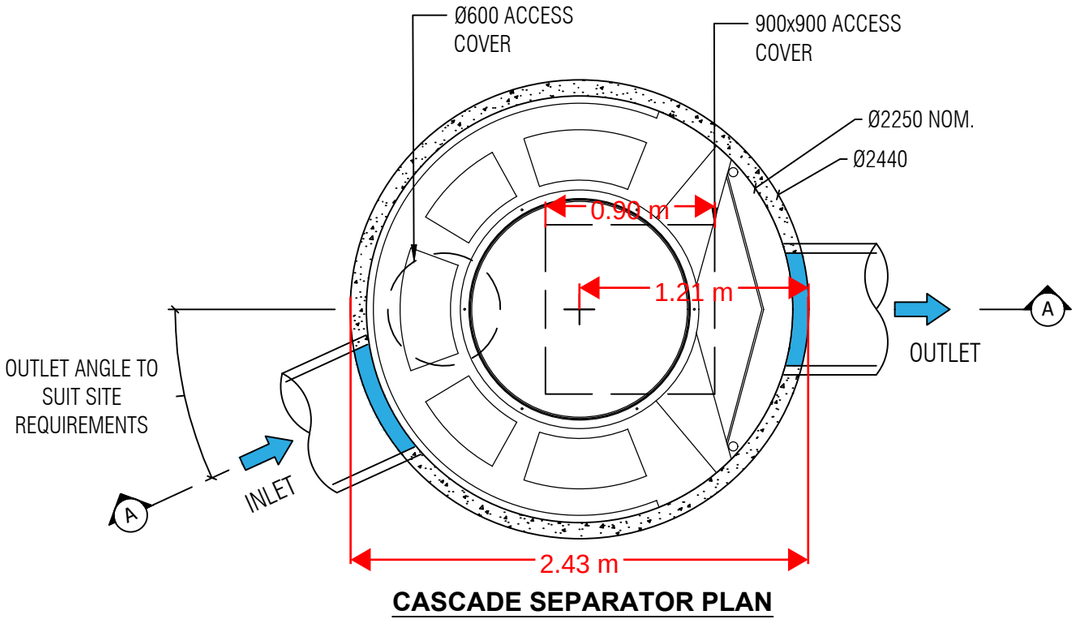
Call 1300 354 722

www.oceanprotect.com.au

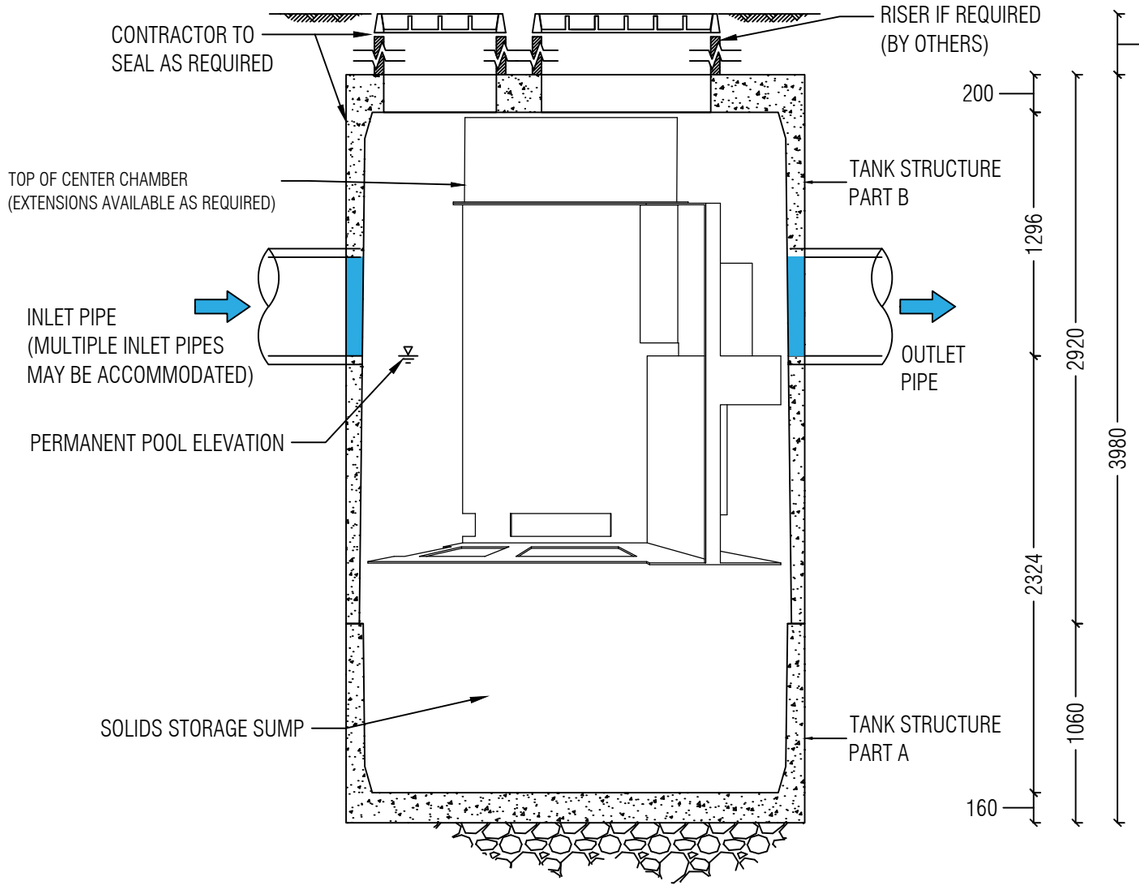
APPENDIX G

CASCADE SEPARATOR DETAILS AND OPERATIONS & MAINTENANCE MANUAL

NOT FOR CONSTRUCTION



CASCADE SEPARATOR PLAN

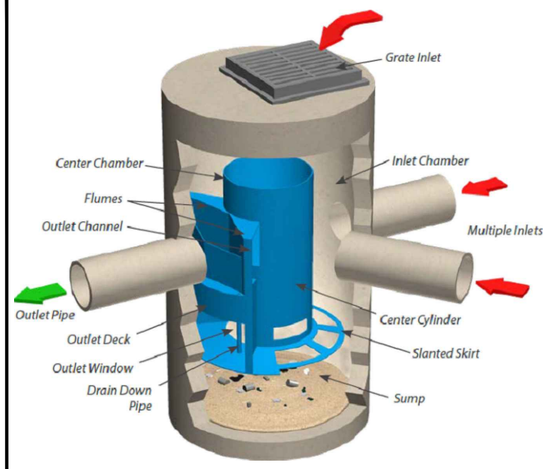


SECTION A-A

CASCADE SEPARATOR DESIGN TABLE

TO BE INSTALLED ONLINE THE TOTAL INLET PIPE FLOW RATE MUST BE LESS THAN THE SPECIFIED UNITS LISTED MAXIMUM TOTAL FLOW RATE; THE UNIT MUST BE PLACED OFFLINE WHERE THE INLET FLOW RATE EXCEEDS THIS VALUE.

TREATABLE FLOWRATE [L/s]	174
MAXIMUM TOTAL FLOWRATE [L/s]	845
WEIR HEIGHT [mm]	815



SITE SPECIFIC DATA REQUIREMENTS

TOTAL FLOWRATE THROUGH INLET [L/S]	[ ]

PIPE DATA:	I.L.	MATERIAL	DIAMETER
INLET PIPE	[ ]	[ ]	[ ]
OUTLET PIPE	[ ]	[ ]	[ ]

UPPER TANK WEIGHT	2280KG
LOWER TANK WEIGHT	6670KG

NOTE: TANK SUPPLIED IN TWO PARTS; PARTS A & B TO BE JOINED ON SITE

GENERAL NOTES

1. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF THE PROJECT.
2. PRECAST STRUCTURE SUPPLIED WITH CORE HOLES TO SUIT OUTER DIAMETER OF NOMINATED PIPE SIZE / MATERIAL.
3. PRECAST STRUCTURE SHALL MEET W80 WHEEL LOAD RATING ASSUMING A MAXIMUM EARTH COVER OF 1.5m AND A GROUND WATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
4. PRECAST STRUCTURE SHALL BE DESIGNED FOR DURABILITY WITH A B2 EXPOSURE CLASSIFICATION AS PER AS3600:2018, SPECIFICALLY TABLE 4.10.3.3, CONCRETE CHARACTERISTIC STRENGTH> 50MPa AND CONCRETE COVER 30mm
5. PRECAST STRUCTURE SHALL BE DESIGNED FOR LOADS IN ACCORDANCE WITH AS 5100.2
6. CONCRETE TO COMPLY WITH SPECIFICATION RMS R53, PRODUCTION ASSESSMENT
7. TOLERANCES TO AS3610
8. ALL WATER QUALITY TREATMENT DEVICES REQUIRE PERIODIC MAINTENANCE. REFER TO OPERATION AND MAINTENANCE MANUAL FOR GUIDELINES AND ACCESS REQUIREMENTS.
9. SITE SPECIFIC PRODUCTION DRAWING WILL BE PROVIDED ON PLACEMENT OF ORDER.
10. DRAWING NOT TO SCALE.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE SPECIFIC DESIGN CONSIDERATION AND SHALL BE SPECIFIED BY THE SITE CIVIL ENGINEER.

B. CONTRACTOR TO PROVIDE ALL EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING DETAIL PROVIDED SEPARATELY).

C. CONTRACTOR TO INSTALL AND LEVEL THE STRUCTURE, APPLY SEALANT TO ALL JOINTS AND TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES.

E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT SCREEN & SEPARATION CYLINDER COMPONENTS DURING INSTALLATION

OCEAN PROTECT

PHONE: 1300 354 722 www.oceanprotect.com.au

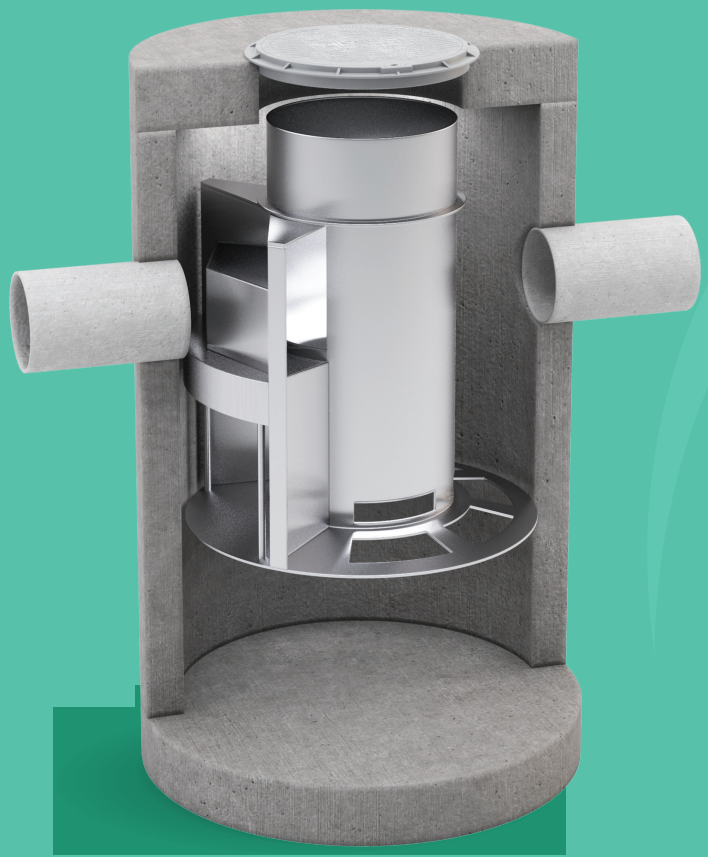
OCEAN PROTECT
CASCADE SEPARATOR 2250
STANDARD PRODUCT DRAWING

LAST MODIFIED: 16-03-20

OCEAN PROTECT

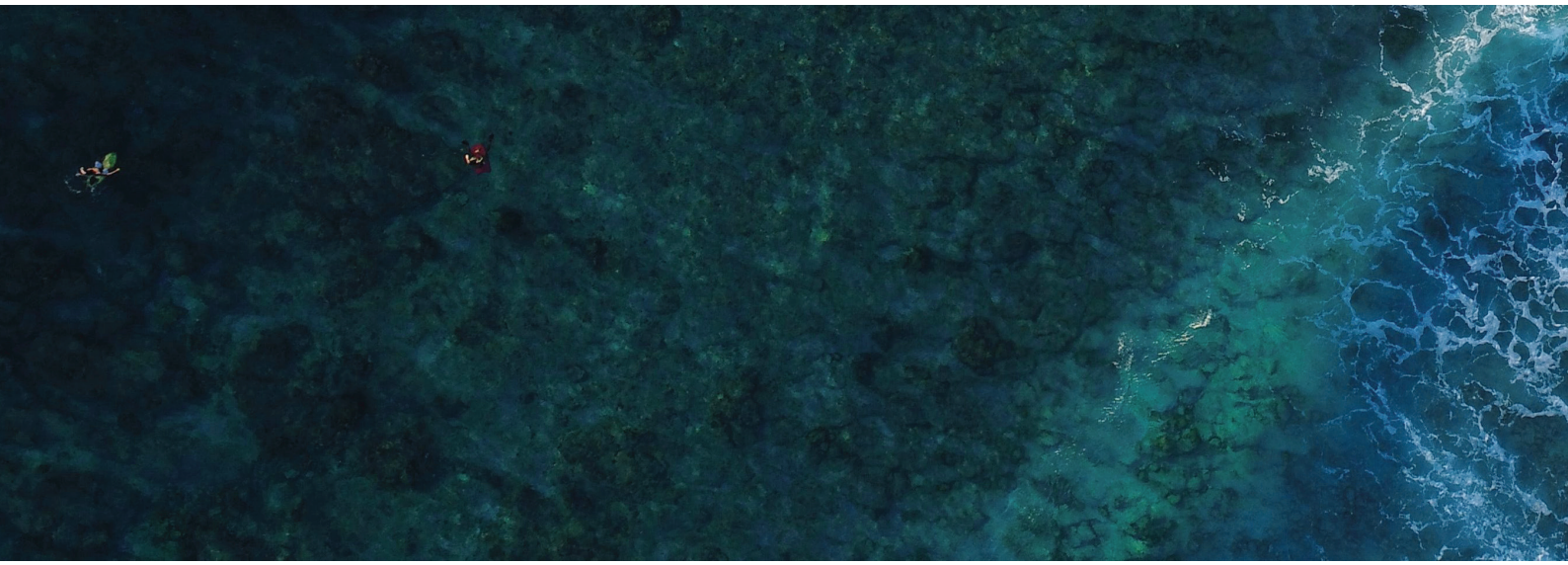
Cascade Separator®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways

09/22



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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The Cascade Separator® is a vortex type engineered stormwater management device designed to remove hydrocarbons and sediment with associated pollutants from stormwater runoff. It removes all particles 5 mm and greater from stormwater flows, including neutrally buoyant material such as rubbish and debris.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of any stormwater treatment device is essential to ensuring that it works properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It's also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up).

Health and Safety

Access to a Cascade Separator® unit requires removing heavy access covers/grates, additionally it might become necessary to enter into a confined space. Pollutants collected by the Cascade Separator® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your OceanSave require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the Cascade Separator®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst the minor maintenance for the Cascade Separator® can be performed from surface level, there will be a need to enter the pit (confined space) during major services. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification in confined space entry requirements.

How does it work?

The internal flow controls of the Cascade Separator® are illustrated in *Figure 1*. Low, frequently occurring storm flows enter the device via one or more inlet pipes, or a surface grate. Once inside the device, water is directed to two separate inlet flumes. As a result of the directional flow into the centre tube via the flumes, vortices are created operating in opposite directions. This innovative design is unlike any other device on the market and facilitates enhanced particle separation. The downward swirling vertical water column allows for sediment to settle into the sump and water to exit through an outlet window. Flow that eventually exceeds the capacity of the flumes can also exit over the flume without re-suspending previously captured pollutants. The system incorporates a partially perforated slanted skirt that equalizes the pressure between the storage and treatment zone while reducing the potential for scour. The skirt also allows transport of sediment and debris into the sump zone which improves ease of maintenance since all captured material can be removed through the centre tube.

The outlet deck incorporates two drain down pipes that extend downward and allow the system to drain to the outlet pipe invert elevation after the storm event has subsided, while preventing captured hydrocarbons from leaving the system.

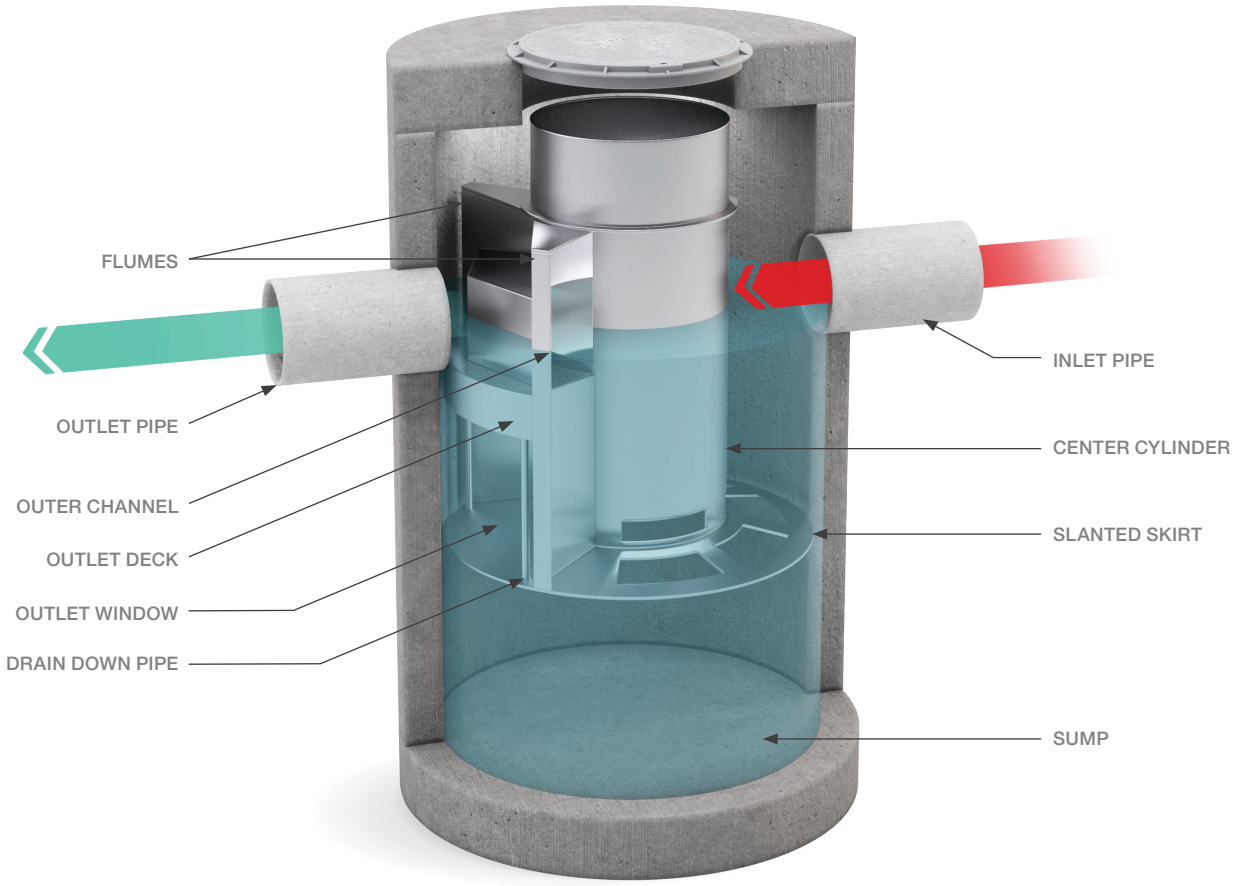

Figure 1: Cascade Separator® components

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the Cascade Separator® requires a minor service every 6 months and a major service every 12 to 24 months.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the Cascade Separator®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Visual inspection of internals Removal of larger pollutants at the inlet bay Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants	At 12 Months

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to assess the condition of the device and record necessary information that will inform the activities to be undertaken during a major service.

1. Establish a safe working area around the access point
2. Remove access cover
3. Visually inspect the inlet chamber
4. Remove large floatable pollutants with a net
5. Measure and record sediment depth
6. Replace access cover

Major Service

This service is designed to return the Cascade Separator® device back to optimal operating performance.

1. Establish a safe working area around the access point
2. Remove access cover
3. Using a vacuum unit remove any floatable pollutants
4. Decant water until water level reaches accumulated sediment
5. Remove accumulated sediment and gross pollutants with vacuum unit (if required)
6. Use high pressure water to clean flumes, centre tube and sump area (if required)
7. Replace access cover

When determining the need to remove accumulated sediment from the Cascade Separator® unit, the specific sediment storage capacity for the size of unit should be considered (see table below).

Model	Diameter (m)	Sediment Storage Capacity (m^3)	Oil Storage Capacity (litre)
CS-1200-050	1.2	0.5	530
CS-1500-080	1.5	0.8	1040
CS-2300-180	2.25	2.4	4270
CS-3300-380	3.25	4.4	8340

Additional Types of Maintenance

The standard maintenance approach is designed to work towards keeping the Cascade Separator® system operational during normal conditions. From time to time events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the Cascade Separator® unit that potentially received flow should be inspected and cleaned. Specifically all captured pollutants from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event.

Blockages

The Cascade Separator® internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. In the unlikely event that flooding occurs around or upstream of the device location the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

1. Inspect the inlet aperture, ensuring that it is free of debris and pollutants
2. Decant water from Cascade Separator® unit in preparation for confined space entry
3. Inspect the screen and flume as well as both inlet and outlet pipes for obstructions, if present remove any built up pollutants or blockages

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the Cascade Separator® after a significant major storm event. The focus is to inspect for higher than normal sediment accumulation that may result from localised erosion, where necessary accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

The accumulated pollutants found in the Cascade Separator® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the system has been exposed to any hazardous or unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience, Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of the Cascade Separator® we offer long term pay-as-you-go contracts and pre-paid once off servicing.

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www.oceanprotect.com.au

APPENDIX H
SWALE DETAILS

INSTRUCTION SHEET

Building a swale

healthy waterways
Raingardens

What is a swale?

Building a swale is a simple way to help the environment and the health of our local waterways.

A swale is a small channel that conveys water from one point to another. When planted with grasses or native vegetation, swales can be positioned to collect stormwater from driveways and other hard surfaces such as roofs.

Swales help to reduce the amount of stormwater entering our rivers and creeks.

Too much stormwater entering our waterways can lead to erosion of river beds and banks, and provide unfavourable conditions for many plant and animal species.

Please note: A certified plumber must be used for stormwater connections and modifications.

Did you know that you can even use a swale to convey stormwater to a raingarden built elsewhere in your backyard?

State Government Victoria

Melbourne Water

Looking after your swale

Once established, swales are very low maintenance especially when planted with native plant species. They don't need to be watered or fertilised. However, a few simple tips can help your swale mature and function well.

- Some weeding may need to take place until plants have matured.
- Evenly distribute water flow into the swale to limit erosion from heavy rainfall. Strategically placed rocks may help with this. Alternatively a flow spreader can be attached to the end of the downpipe.
- Inspect your swale regularly – replace plants and repair erosion when necessary.
- Check that the swale is operating as you intend by ensuring that the water is draining away, checking the downpipe and overflow for blockages.

Materials List – what you need to build your swale

The following table details the materials required to create a $2m^2$ long swale. While item prices may vary depending on the materials you select, building a $2m^2$ swale is likely to cost between $150 and $200 (plus the cost of a plumber).

QUANTITY	MATERIAL
$0.3m^3$	Topsoil
12	Plants (150mm pots)
$0.05m^3$	20mm Fine Crushed Rock
$1m^2$	Large flat rocks (100-200mm diameter)
$0.1m^3$	Gravel mulch
$1m^2$	PVC liner (under rockwork near downpipe) or geotextile (optional)
10	100 – 300mm diameter rocks (optional)
1	90mm diameter uPVC 90 degree bend or 2x 45 degree bends
1	90mm diameter uPVC grated end cap
1 l/m	90mm diameter uPVC pipe*

l/m = lineal metres m^2 = square metres m^3 = cubic metres mm = millimetres
** Length subject to change based on location of existing stormwater pipe.*

Plant List – the best plants for your swale

The following plants will grow well in swales in and around greater Melbourne.

BOTANICAL NAME	COMMON NAME	CONDITIONS	SIZE (H x W) (cm)
Anigozanthos species	Kangaroo Paw	Full sun	30-90 x 100-120
Blechnum nudum	Fishbone Water-fern	Full sun to partial shade	50-100 x 40-80
Calocephalus lacteus	Milky Beauty-Heads	Full sun to partial shade	15-30 x 10-30
Carex appressa	Tall Sedge	Full sun to partial shade	80-100 x 120
Carpobrotus modestus	Pigface	Full sun	20cm high and spreading
Chrysocephalum apiculatum	Common Everlasting	Full sun	30-90 x 10-30
Derwentia perfoliata	Digger's Speedwell	Full sun to partial shade	20-40 x 30-60
Dianella species	–	Full sun to partial shade	60-120 x 40-150
Ficinia nodosa	Knobby Club-Rush	Full sun	50-150 x 60-200
Juncas amabilis	Hollow Rush	Full sun to partial shade	20-120 x 20-50
Juncas flavidus	Yellow Rush	Full sun to partial shade	40-120 x 20-100
Leucaphyta brownii	Cushion Bush	Full sun, salt tolerant	100 x 200
Lomandra species	–	Full sun to partial shade	60-120 x 50-100
Melaleuca ericifolia	Swamp Paperback	Full sun to partial shade	4m high x 3m wide
Myoporum parvifolium	Creeping Boobialla	Full sun	20-30 x 300
Patersonia occidentalis	Native Iris	Sun to partial shade	20-40 x 30-60
Pratia perdunculata	Matter Pratia	Partial shade	50-150 x 1.8-5
Wahlenbergia communis	Tufted Bluebell	Full sun	15-50 x 15

Building your swale

Step 1 – getting started

Location

A swale can be built where there are existing earth areas (i.e. grass or a garden bed). The start of the swale should be located under the downpipe that you plan to divert.

Note – see Melbourne Water's Downpipe Diversion Instruction Sheet for further information melbournewater.com.au.raingardens

Provided the swale slopes away from the downpipe, it can even be built to meander through your backyard.

Stormwater diversion

To ensure that the area is not flooded during construction, your local plumber should determine how and when to divert the downpipe. A temporary diversion may be required. Your plumber will also be able to determine the depth and location of the stormwater outlet for the overflow.

You may also consider building a swale to carry stormwater from the diverted downpipe to a stormwater surface pit located on your property. Before commencing any works, you should consider where this is located.

All connections from and into the existing stormwater pipes need to be done by a licensed plumber.

Underground services

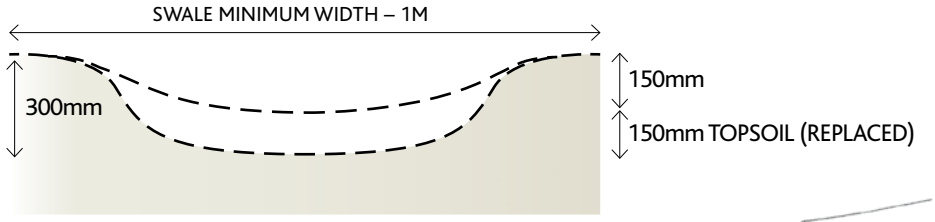
Be aware of any underground services (gas, electricity, water) that run near your house or under your garden as this will determine where you can excavate. Swales should not be built over or in close proximity to a septic system.

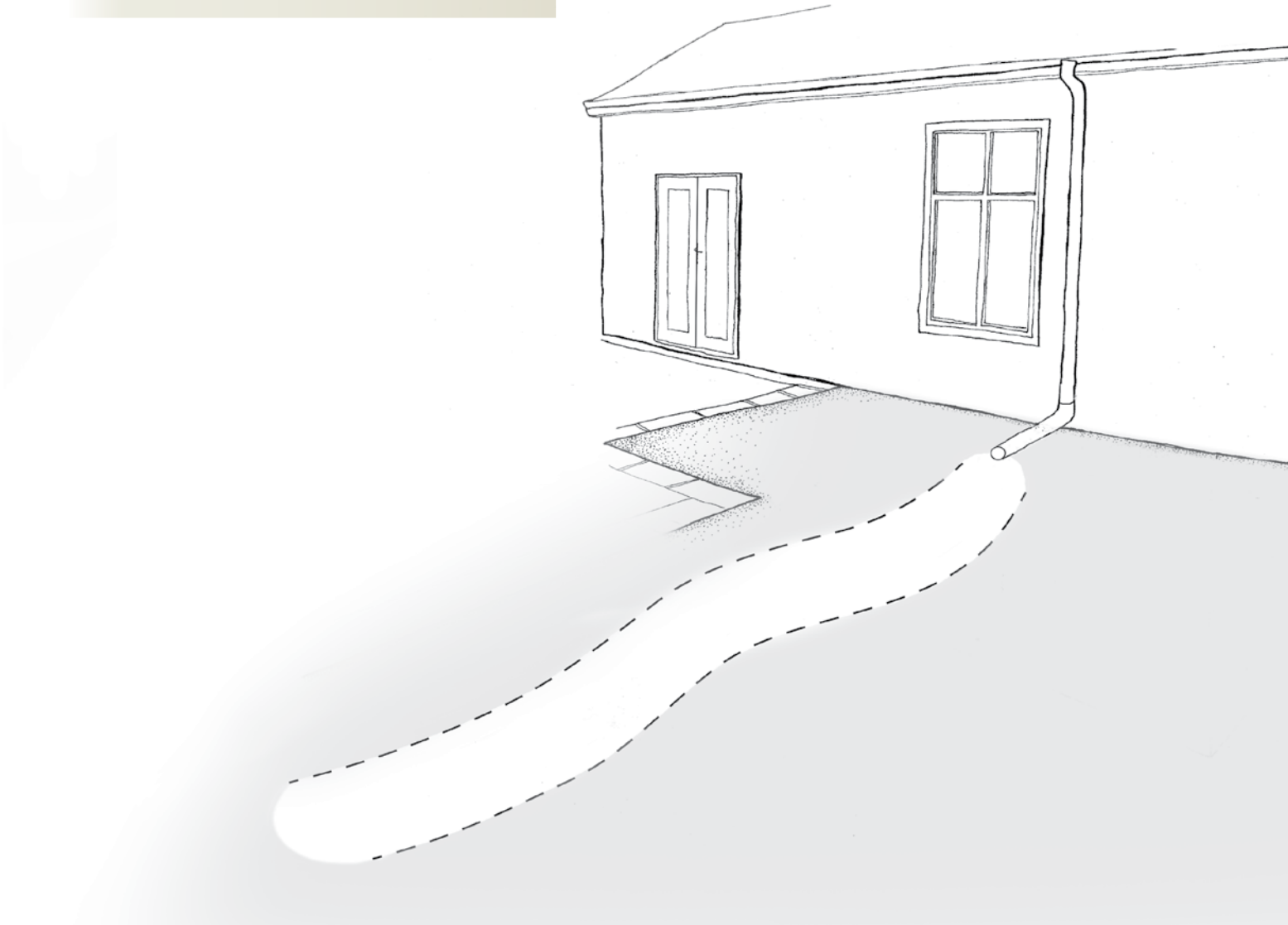
Materials

See *Materials List* for information about what you need to build a swale.

Size

You need to determine a shape for the swale that best suits your garden. The dimensions of a swale should be approximately 1m wide x 150mm deep, shaped in a trapezoidal or triangle formation. A swale can be any length provided you can maintain a slope away from the downpipe without the swale becoming too deep.





Step 2 – excavation

- Once you have determined the location and shape of the swale. Locate the existing stormwater outlet, determine its depth and excavate a 200mm wide trench from the existing stormwater drain to the nominated overflow point (i.e. at the end of the swale).
- Strip the first 150mm of topsoil from the area and put it aside to be reused later.
- Excavate a further 150mm. This will allow for topsoil replacement later in the process.
- Unless the swale is discharging to an existing stormwater surface pit, an inground raingarden or infiltration raingarden, it will need to be fitted with an overflow pipe connected back into the stormwater system. While you will need to engage a plumber to manage the connection work, the general steps are as follows:
- Once the trench is prepared, your plumber will connect the overflow pipe back into the stormwater drain.
- The top of the overflow should be set at the end of the swale, 50mm above the gravel mulch and covered with a grated cap to ensure debris does not enter the stormwater system.

Remember – all connections from and into the existing stormwater pipes need to be done by a licensed plumber.

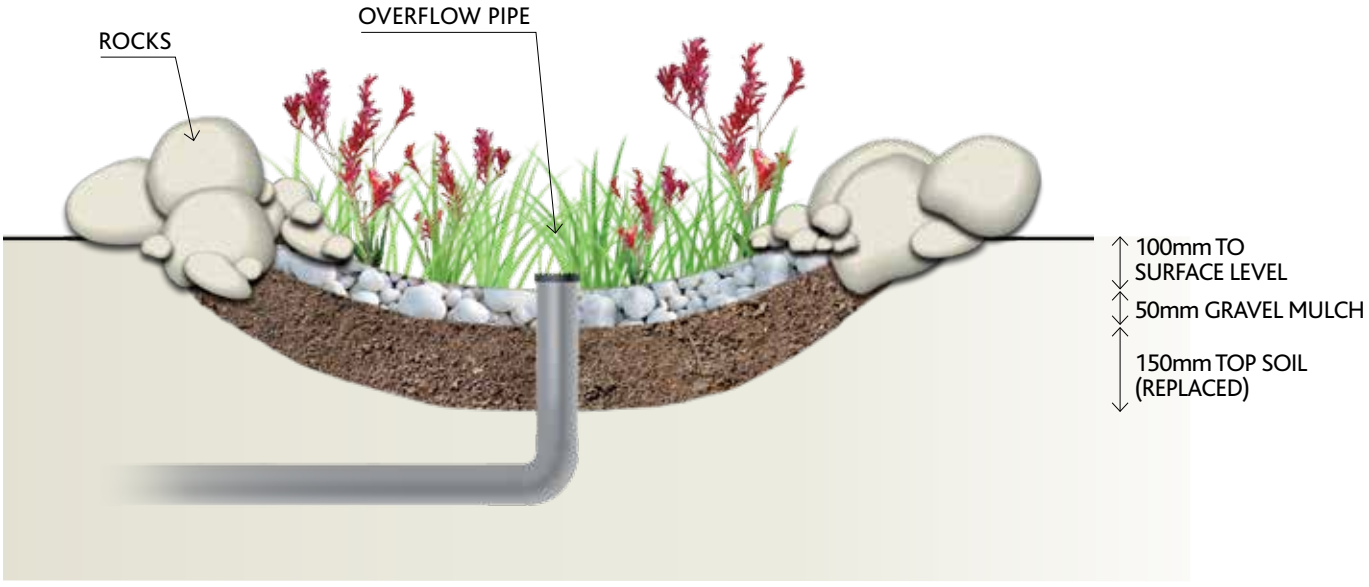
Optional step

You may want to feature rockwork along the edges of the swale. This should be done prior to replacing the topsoil. Ensure that the rocks are embedded into the ground to prevent erosion underneath.

Step 3 – soil and rock work

- Add 150mm of topsoil into the excavated swale ensuring that the topsoil is formed into the final swale shape.
- Place some large, flat, angular rocks where the water from the downpipe will discharge into the swale. Place smaller rocks in between the large rocks to fill any gaps. This will create an interlock between the large and small rocks. It is very important to fill any gaps in the rockwork to avoid erosion. Alternatively, a flow spreading device can be fitted to the downpipe.
- If you wish, you may add a PVC liner or geotextile fabric underneath the rockwork for added protection.

Did you know the legal point of discharge is the point at which your property discharges to stormwater? This point is specified by council and should not be altered without council approval.



Step 4 – pipe adjustments, plants and mulch

Pipe adjustments

Your plumber will redirect the downpipe into the trench using pipe bends where required.Two 45 degree pipes connected together will provide a much gentler and more even flow of water and reduce the risk of erosion. A 90 degree bend pipe will do as an alternative.

Plants and mulch

In general, plants that grow well in a swale –

- like dry conditions but can tolerate temporary wet periods
- are perennial rather than annual
- have an extensive fibrous root system.

A wide range of plants are suitable for swales and your local nursery will be able to guide you on what is right for your area. There are also particular plants that are really good at removing pollutants from stormwater. These include –

- *Carex appressa*
- *Lomandra longifolia*
- *Juncus flavidus*
- *Melaleuca ericifolia*
- *Goodenia ovata*

50% of your swale should be planted with these species, the other 50% can be made up of plants that like a dry environment with intermittent wet periods. It is important that the plants you select are suitable for the amount of sun and shade on your swale. See the *Plant List* for information about suitable swale plants.

Regardless of the type of plants you select, it is important to plant the swale densely. As a guide, you will need six plants per m² of swale. So if your swale is 2m long, you will need 12 plants.

Set the plants at roughly 6 plants per m², and plant into the topsoil. Spread gravel mulch to a depth of 50mm. Water the plants in – complying with your local water restrictions – to complete the installation process.

Need help?
If you have questions about building a swale, your landscape gardener or local plumber may be able to help. For more information visit melbournewater.com.au/raingardens

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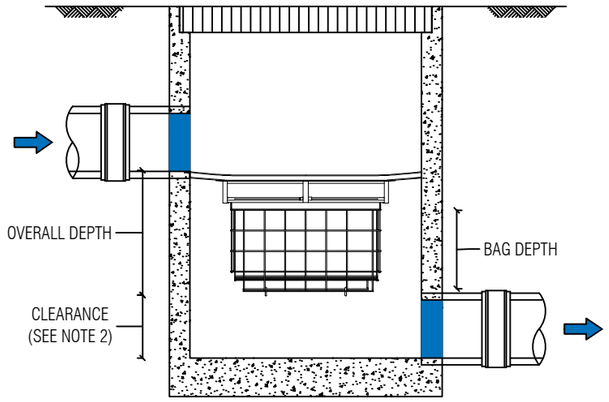
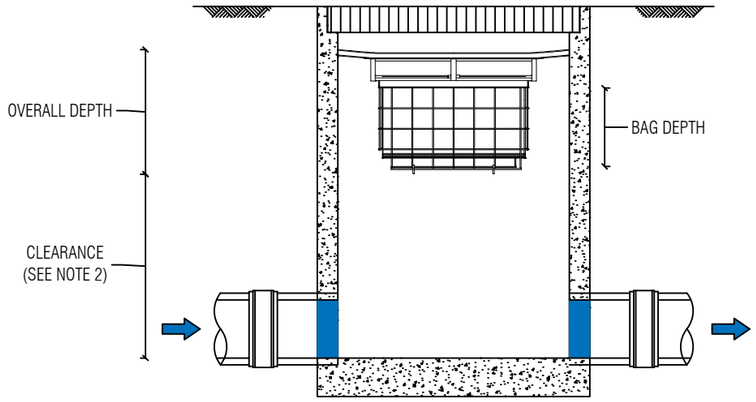
APPENDIX I

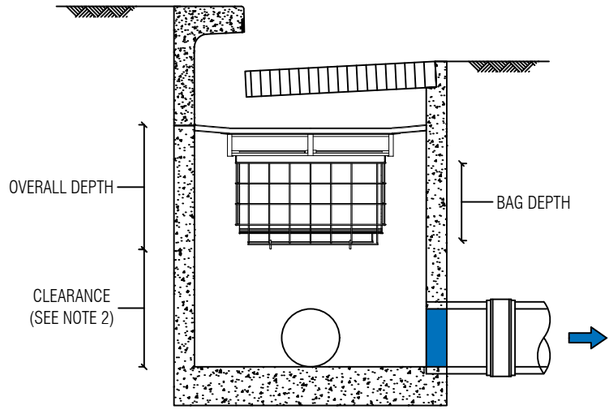
OCEANGUARD OPERATIONS AND MAINTENANCE MANUAL



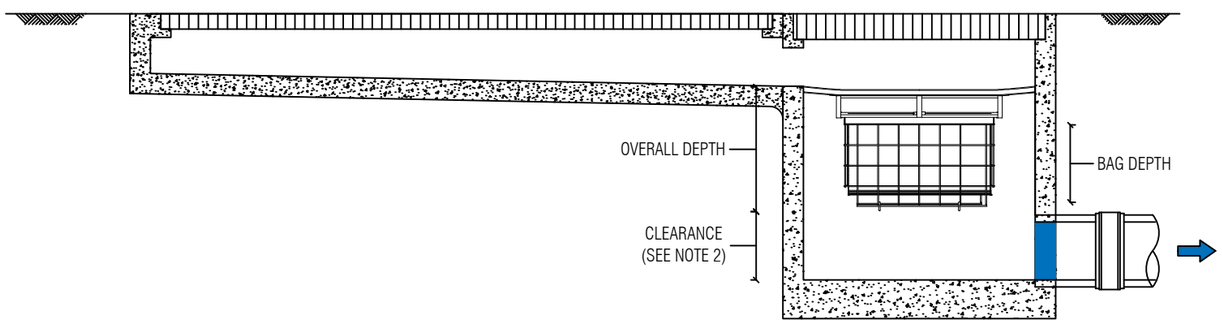
PIPE FLOW CONFIGURATION



SURFACE FLOW CONFIGURATION



SURFACE FLOW CONFIGURATION

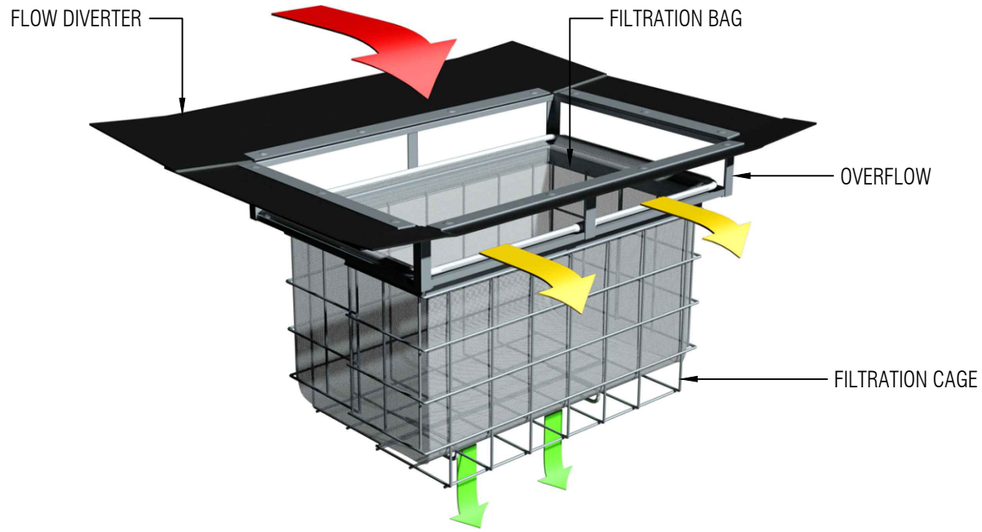


GRATED STRIP DRAIN CONFIGURATION

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

		DEPTH ID		
		1	2	3
PLAN ID	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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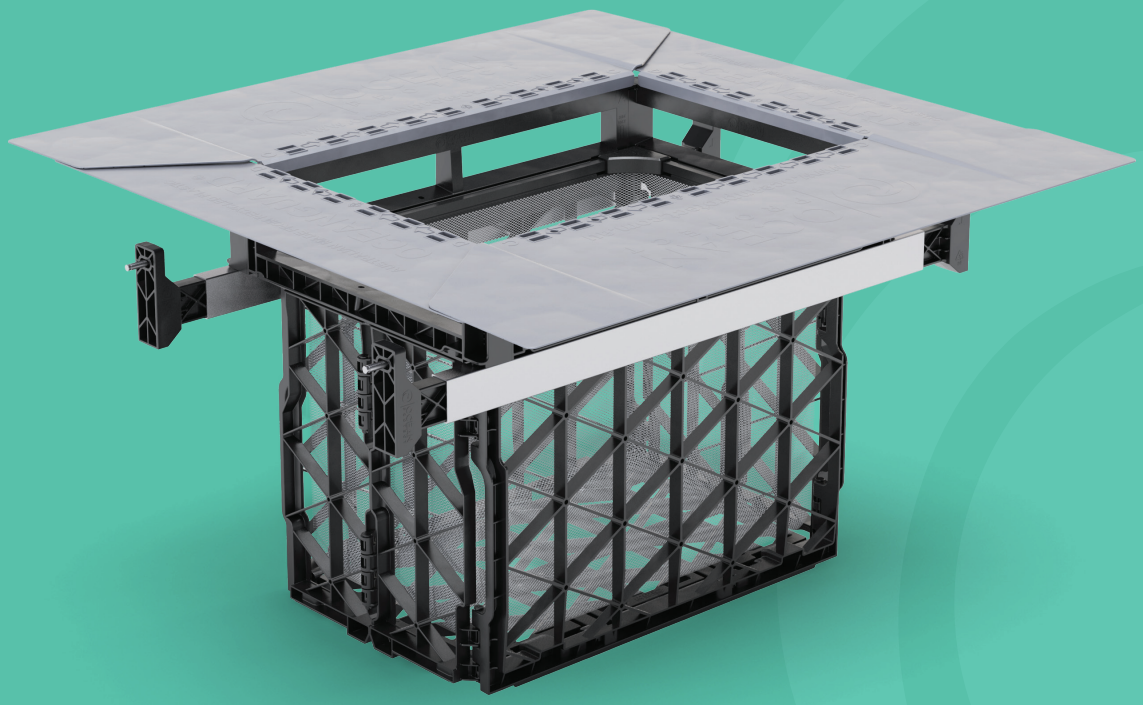
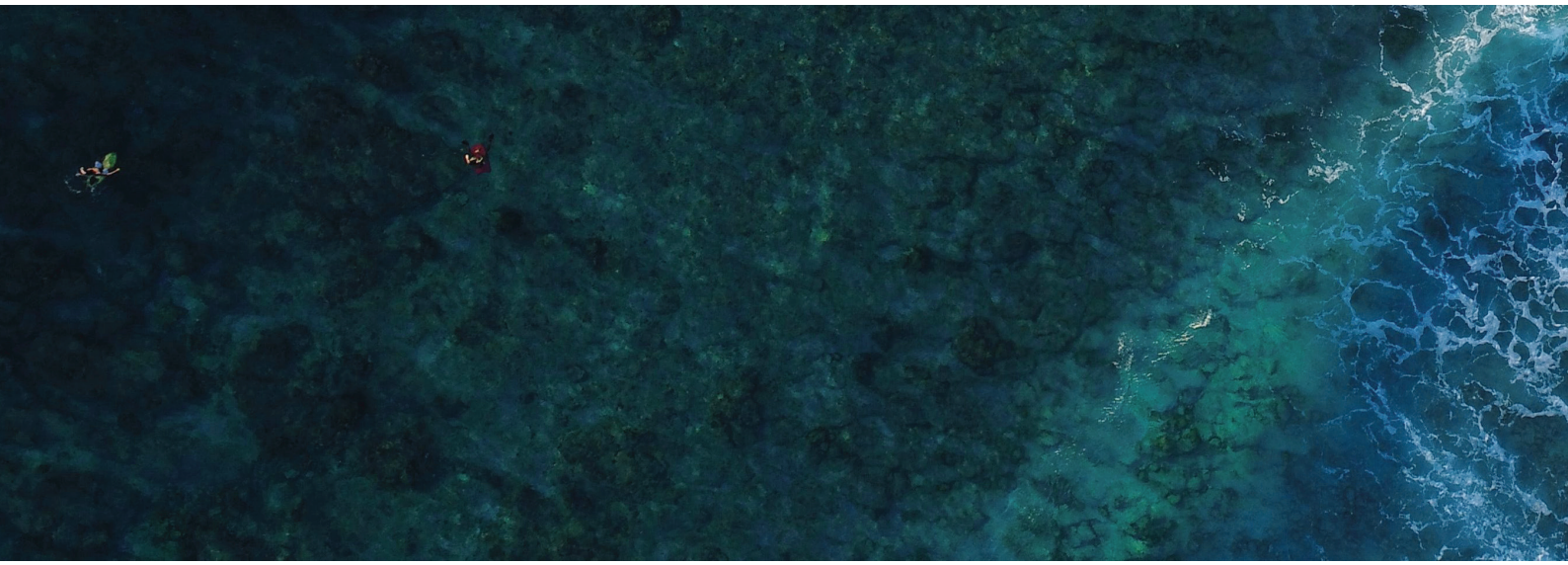
OceanGuard®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways

09/22



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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes for the OceanGuard® as recommended by the manufacturer (Ocean Protect).

The OceanGuard® technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of filtration liners, designed to remove gross pollutants, solids, and other attached pollutants as either a standalone technology or as part of a 'treatment train' (e.g. with StormFilter®, Jellyfish® or biofiltration). OceanGuards are highly effective, easy to install and simple to maintain.

Stormwater professionals should note that Ocean Protect is not permitted to supply OceanGuard® technologies to provide pre-treatment to proprietary stormwater treatment assets that are not provided by Ocean Protect.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It is also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up), but most importantly ensures the long term effective operation of the OceanGuard®.

Health and Safety

Access to pits containing an OceanGuard® typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard® require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the OceanGuard®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

The OceanGuard® is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification for confined space entry.

How does it work?

OceanGuard® is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard® has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).

During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard® ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard® filtration bag. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

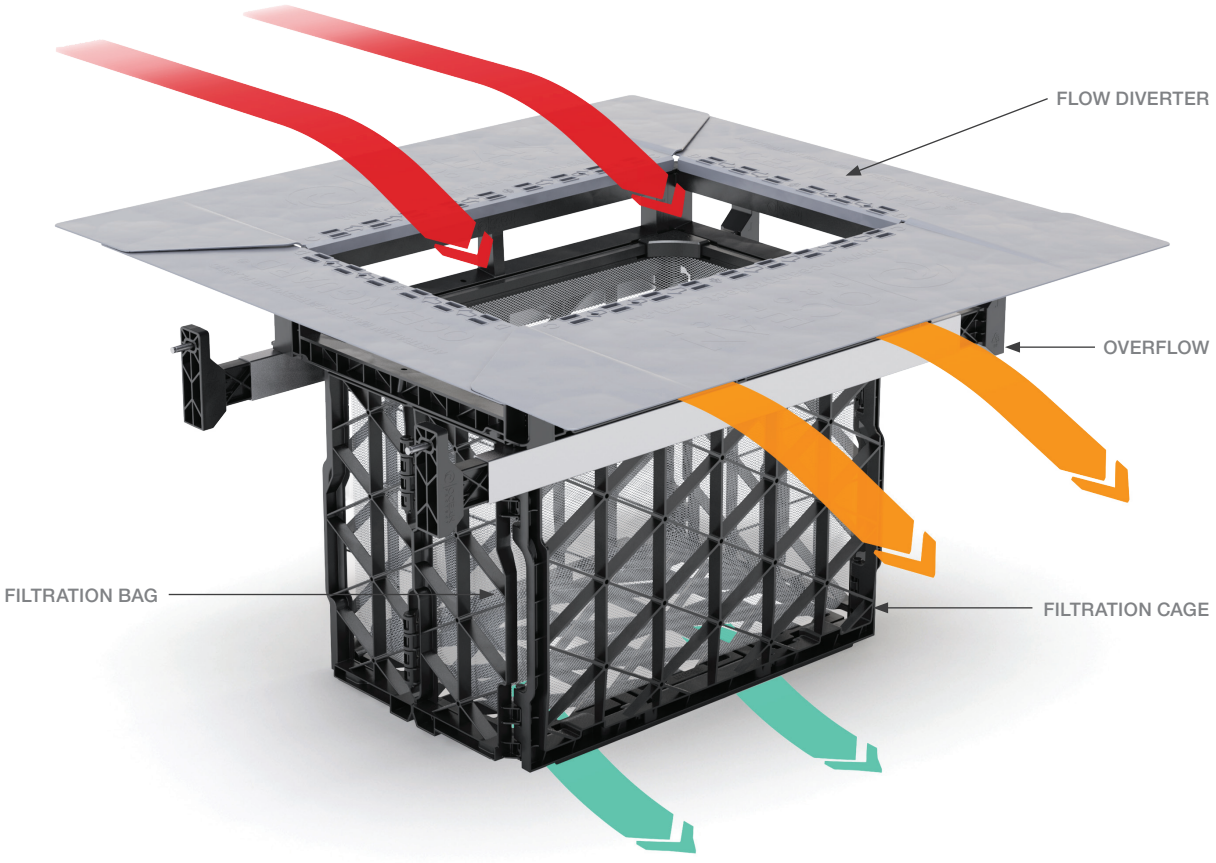

Figure 1: OceanGuard® components

Maintenance Procedures

To ensure that each OceanGuard® achieves optimal performance, it is advisable that regular maintenance is performed. The OceanGuard® requires 1-6 minor services annually (3 to 4 typical). Pending the outcome of these inspections, additional maintenance servicing may be required.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the OceanGuard®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	1-6 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to return the OceanGuard® back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Use two lifting hooks to remove the filtration bag
4. Empty the contents of the filtration bag into a disposal container
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

1. Establish a safe working area around the OceanGuard®
2. Remove access cover/grate
3. Vacuum captured pollutants from the filtration bag
4. Remove filtration bag
5. Inspect and evaluate the filtration bag
6. Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
7. Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
8. Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard®, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components[1]

[1] Replacement filtration bags and components are available for purchase from Ocean Protect

Additional Types of Maintenance

Occasionally, events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, all OceanGuard® pits that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuard's internal high flow bypass functionality is designed to minimise the potential of blockages/ flooding and this configuration has been field proven for over twenty years. Flooding caused by an OceanGuard® style of pit basket is extremely rare and in the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

1. Inspect the OceanGuard® flow diverter, ensuring that they are free of debris and pollutants
2. Perform a minor service on the OceanGuard®
3. Remove the OceanGuard® to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard® after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

The accumulated pollutants found in the OceanGuard® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of our OceanGuard®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

For more information please visit www.oceanprotect.com.au

Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

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