Warren Smith
Consulting Engineers

6th December 2022

CIVIL ENGINEERING SERVICES

Western Sydney University Bankstown City Campus

Stormwater Quality Management Plan

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CIVIL ENGINEERING SERVICES

1. INTRODUCTION

Warren Smith Consulting Engineers (WSCE) has been engaged by Built Holdings Pty Ltd to prepare a Stormwater Quality Management Plan (SQMP) for the new Western Sydney University Bankstown City Campus to satisfy the Development Consent Condition D25 (ref: SSD-9831) as outlined below.

Condition D25 – Stormwater Quality Management Plan

Prior to the commencement of operation, a Stormwater Operation and Maintenance Plan (SOMP) is to be submitted to the satisfaction of the Certifier. The SOMP must ensure the proposed stormwater quality measures remain effective and contain the following:

(a) maintenance schedule of all stormwater quality treatment devices;

(b) record and reporting details;

(c) relevant contact information; and

(d) Work Health and Safety requirements.

2. PROPOSED WATER QUALITY TREATMENT SYSTEM

In order to provide adequate treatment of stormwater runoff, treatment solutions have been provided to remove suspended solids, hydrocarbons and nutrients prior to being discharged from the development site.

2.1 Potential Pollutants Generated

The pollutants that could be potentially generated as a result of the development use are as follows:-

- Litter;
- Hydrocarbons;
- Sediment; and
- Nutrients (Nitrogen and Phosphorus).

The development has been modelled to demonstrate the performance of the stormwater treatment system utilising a program called MUSIC (Model for Urban Stormwater Improvements Conceptualisation). MUSIC models the proposed stormwater treatment devices and estimates their respective performance against the performance targets of the project. The pollutants modelled in MUSIC are Gross Pollutants (GP), Hydrocarbons, Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN).

2.2 Stormwater Treatment Plan

The proposed site treatment will utilise OceanGuard filter baskets by Ocean Protect, which intercept surface runoff at the pit grates and filter the runoff prior to entering the piped stormwater system. It is proposed that four (4) grated stormwater pits on site will be fitted with OceanGuard filter baskets. The OceanGuard is fitted with a monofilament 200 micron pore size filter bag that removes gross pollutants such as sediment, trash and debris as well as suspended solids. An oil baffle will also be installed within Pit 4/1 located at the downstream end of the stormwater system to assist in the removal of free oils. Please refer to Figure 2.1 below for an illustration of a typical OceanGuard filter basket.

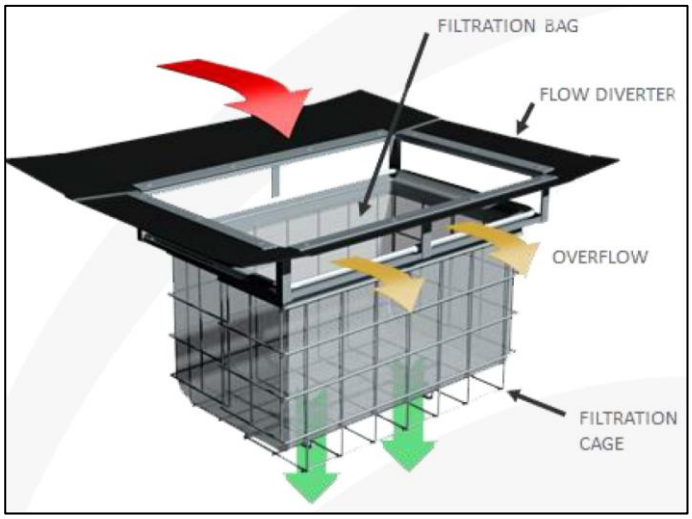

Figure 2.1: Typical OceanGuard Filter Basket

With regard to hydrocarbon removal, research has shown (Walker, Allison, Wong, Wootton, 1999) that 70% of free oils can be associated with solids in the stormwater and that over a period of dry weather conditions with the highest oil content was found in the sediment range of 200 to 400 microns. The removal mechanism for the OceanGuard filter basket is direct screening and hence removal of particles greater than the screen opening is guaranteed and under this condition would remove 70%.

Any free oil can be physically separated from the water through surface attachment. By introduction of an oil baffle within Pit 4/1 at the downstream end of the stormwater system, free oils will be further separated from the water and able to be safely removed by regular maintenance. In summary, it is expected that 90% of free oils would typically be achieved.

3. MAINTENANCE OF STORMWATER SYSTEM

The pit and pipe network shall be inspected at intervals after a major storm event and not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum:

1. Check that all grates, covers and lintels are in sound condition and are undamaged. Any signs of deterioration should be noted.
2. Check all pits for accumulation of sediment, debris or litter.
3. If pits are found to be affected by sediment, debris or litter, an assessment should be made as to whether the upstream and downstream pipes require cleaning.
4. Inspect outlet and ensure it is in a sound, undamaged condition.

Maintenance of the pit and pipe system should be undertaken as required following the above inspections. Typical maintenance procedures that would need to be undertaken include:

1. Remove sediment, debris and litter from pits including lintels.
2. Remove sediment or other foreign material from pipes.

4. MAINTENANCE OF TREATMENT DEVICES

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.

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

Maintenance of the 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 water quality treatment device.

4.1 Maintenance Schedule & Replacement Frequency

For detailed maintenance procedures, please refer to the Ocean Protect Operation & Maintenance Manual for the OceanGuard, attached to this SQMP.

It is recommended that OceanGuards be inspected and maintained 2-4 times annually. Pending the outcome of these inspections additional maintenance servicing may be required.

4.2 Record and Reporting Details

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.

5. WORK HEALTH AND SAFETY REQUIREMENTS

Pollutants collected by the OceanGuards have the potential 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 the OceanGuards will 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.

Whilst performing maintenance on the treatment devices, 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:

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

5.1 Stormwater Pits

Access to pits will require removing (heavy) access covers/ grates, but it will not be necessary to enter a confined space.

5.2 OceanGuards

Access to pits containing the OceanGuards within the development will require removing (heavy) access covers/grates, but it will not be necessary to enter a confined space.

6. WASTE MANAGEMENT AND DISPOSAL

The accumulated pollutants found in the OceanGuards 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 within the OceanGuard 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.

7. TRAFFIC CONTROL INFORMATION

As discussed in Section 5, pollutants have the potential to be harmful and so Work Health and Safety (WH&S) guidelines should be adhered to. 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 treatment device being maintained is in, or near areas with high vehicular/pedestrian activity.

For areas through the site where access to treatment devices is required, adequate signage is to be provided to direct pedestrian away from the work area.

The maintenance contractor shall provide a site-specific traffic control plan for approval by the building operator prior to undertaking any maintenance.

7.1 Supplier & Maintenance Service Contact Information

Ocean Protect offer maintenance services for their products such as OceanGuards and have developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Ocean Protect's maintenance personnel are fully trained and carry certification for confined space entry.

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

OCEAN PROTECT

OceanGuard™

Operations & Maintenance Manual

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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 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, total suspended solids and attached pollutants as either a standalone technology or as part of a treatment train with our StormFilter or Jellyfish Filtration products. OceanGuard pit baskets are highly effective, easy to install and simple to maintain.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of each 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 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 pit insert, 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:

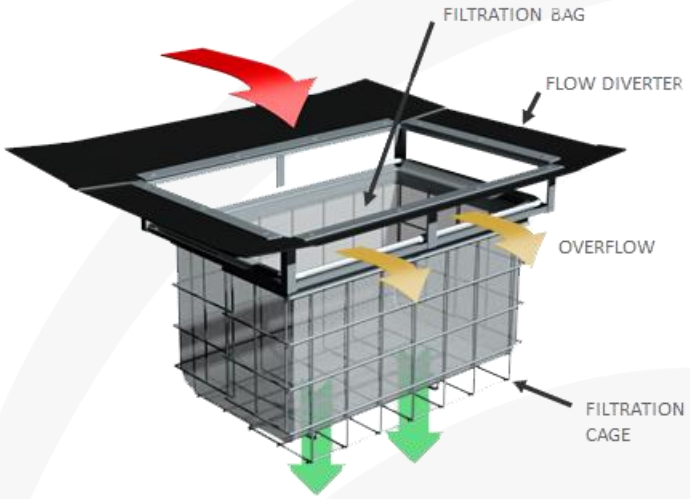
- Puncture resistant gloves
- Steel capped safety boots,
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

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 pit insert 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 dry. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

Maintenance Procedures

To ensure that each OceanGuard pit insert achieves optimal performance, it is advisable that regular maintenance is performed. Typically the OceanGuard requires 2-4 minor services annually, 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.

	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	2-4 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 device 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 pit insert
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 pit insert
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 system, 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 Reasons 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 OceanGuards internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. 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 insert 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 pit insert 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 system 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