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DRAFT SITE SPECIFIC OPERATIONS AND MAINTENANCE MANUAL

No.21-25 WOODRIFF STREET, PENRITH

JOB REF. E286341

DATE: 12TH OCTOBER, 2016

PREPARED BY: YOUSSEF RIAD

APPROVED BY: SCOTT SHARMA

SIGNED

APPLICABLE TO STOMWATER 360 PRODUCTS

MAINTENANCE ACTION	FREQUENCY	RESPONSIBILITY	PROCEDURE
STORMFILTER UNIT			
Inspect Stormfilter Unit for blockage of screen, build up of sedimentation and trapped grease and oil.	Fortnightly or following Rain Period	Maintenance Contractor	Remove lids to pollutant trap and inspect screen basket for build up of trash, remove as necessary. Check for build up of sediment and silt and trapped oil and arrange for pollutant trap to be pumped out if necessary. Water pumped out of pollutant trap shall be disposed of in accordance with the EPA requirement guidelines.
Check filter screens/baffles for corrosion	Annually	Maintenance Contractor	Remove pollutant trap lid and examine screen for rust or corrosion, especially at corners or welds. Replace screen if necessary with correct proprietary screen.
Inspect Stormfilter Unit walls (internal and external, if appropriate) for cracks.	Annually	Maintenance Contractor	Remove lids to inspect walls. Pump out water from trap and inspect walls. Contact trap manufacturer for Repairs as required. Clear vegetation from external walls if necessary and repair as required.
REFER TO ATTACHED OPERATION AND MAINTENANCE MANUAL FROM STORMWATER 360 AUSTRALIA			
ENVIROPOD			

All persons who access and maintain the StormFilter Chamber facility must adequately be accredited by the WorkCover Authority of NSW and have certification in accordance with the Occupational Health and Safety Act, 1983. A completed training accreditation for 'Works within a Confined Space' is also required.

Appendix A: Stormwater 360 - Stormfilter/Enviropod Operations &

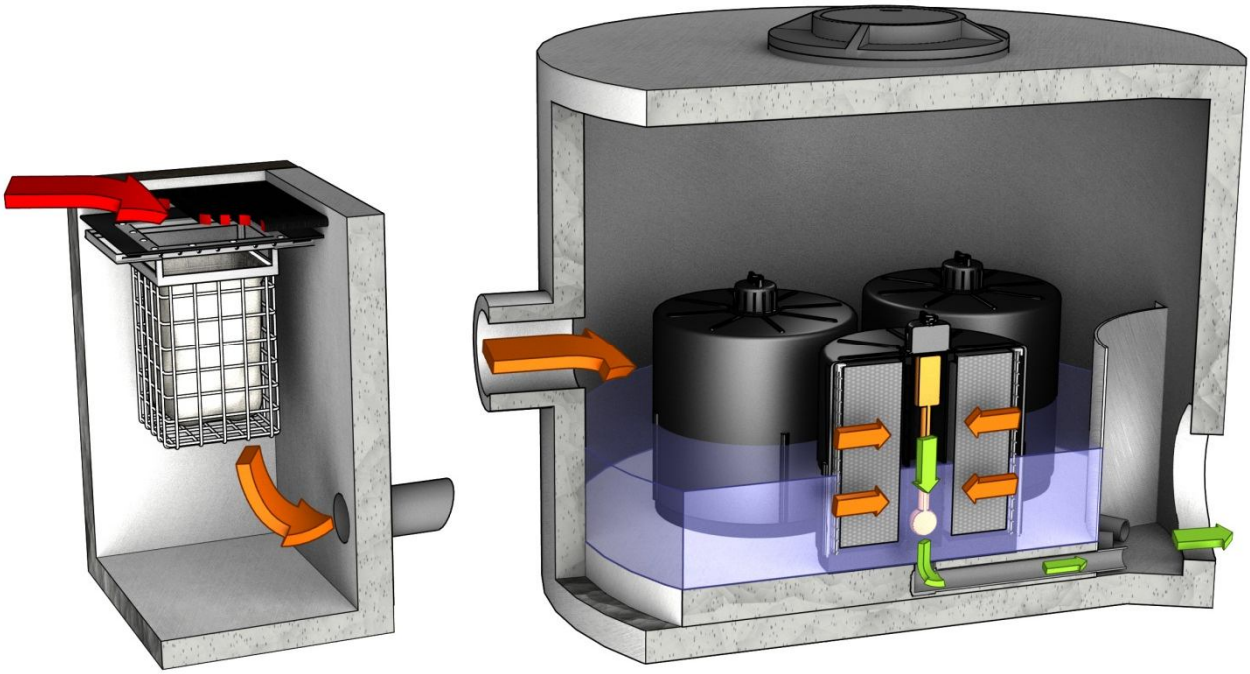
Maintenance Guidelines

StormFilter / EnviroPod

SFEP Treatment Train

Operations and Maintenance

For: _____



Note: **This guideline should be used as a part of the site stormwater management plan and is to be read in conjunction with the site specific Maintenance Schedule.**

Document Set ID: 7377516
Version: 1, Version Date: 18/10/2016

Client: _____

Contact: _____Phone:_____

Engineer:_____

Contact: _____Phone:_____

Address of Device: _____

Items: SFEP Treatment Train

1		
1		
2		

Frequency of Inspections and Maintenance:

	Inspections (time/year)	***Major Maintenance***
EnviroPods	2 (and after major storm)	3-4 months
StormFilters	*1 (after 25mm rain event)*	*12 months*

Maintenance Estimate Annual Cost:

StormFilters:		
Enviropods:		

Document Set ID: 7377516
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1. INTRODUCTION

The following report details the recommended methods for cleaning and maintaining the Enviropod Stormwater Gully Pit Insert. The aspects associated with cleaning included in this manual are methods for grate removal, filter bag cleaning, unit inspection, filter bag rejuvenation and the re-installation of the filter bags. This plan should be used in conjunction with the appropriate traffic management plans and site safety plans produced for each project. Other Stormwater360 (IES) documents which IES staff should use in conjunction with this report include the IES Employee Health and Safety Manual. It is recommended that contractors develop their own health and safety plans for activities to ensure that the workers are placed in a safe work environment.

Enviropod filter in service.

Each stormwater treatment device must be inspected and maintained regularly to ensure it is working properly throughout the estimated design life. During each inspection and clean, details of the mass, volume and type of material observed should be record to provide ongoing data for future management plan revisions and the optimisation of the maintenance frequency. It is essential that maintenance (including inspections, recording and reporting) be carried out in a systematic manner and is carried out by qualified and experienced personnel. It is also advisable that the treatment device owner has a nominated person responsible for overseeing the management process.

Maintenance is an essential component of stormwater management enabling ongoing at source control of stormwater pollution. Maintenance will also prevent failures such as structural failure (e.g. prevents blocked outlets) or aesthetic failure (e.g. debris accumulation). All stormwater treatment devices require maintenance to ensure the ongoing performance of the system.

This document consists primarily of the processes and tasks associated with the hand maintenance and inductor maintenance procedures. It does not include detail of the traffic management requirements or occupational health and safety requirements. Contractors or IES staff should utilise their own Employee Health and Safety Manual, which details the policies and procedures for safe work.

2. Health and Safety

Cleaning of Enviropod filters and Stormfilters is a specialist activity. Material collected can be harmful if not handled correctly. Sediments may contain heavy metals and carcinogenic substances as well as harmful objects such as broken glass and syringes. It is essential that Occupational Safety and Health guidelines are followed at all times, and that the following steps are carried out to ensure safe and successful maintenance operations.

In additional to the hazards associated with the cleaning handling of material in the filter bags, there also hazards associated with traffic at the work site, the removal of the grate, pedestrians and other non-worker personnel, and general work place hazards associated with working outdoors.

The procedures indicated in the Operations section of this manual are recommend as the safest and most efficient manner in conducting the maintenance of Enviropod Units (Section 3), however contractors and cleaning staff may vary the procedure in response to the site conditions, varying work practices or general preferences in the cleaning techniques. Please note that procedures outlined in this manual are not exhaustive, and that any changes should still comply with general safe work practices.

2.1 Personnel Health and Safety

All contractors and staff shall comply with all current Health and Safety Legislation and take all practicable steps to:

- Comply with all applicable laws, regulations and standards.
- Ensure that all employees, contractors and visitors are informed of and understand their obligations in respect of current Health and Safety Legislation.
- Ensure that employees understand and accept their responsibility to practice and promote a safe and healthy work environment.

All relevant precautions must be taken to prevent contact with sediment and litter when maintaining filters. The following personal protective equipment (PPE) safety equipment should be worn:

- Puncture resistant gloves.
- Steel capped safety boots.
- Fluorescent safety vest.
- Overalls or similar skin protection.
- Safety apron. (if necessary)*
- Eye protection. (if necessary)*

*Higher personal safety conditions may be required when maintaining units that may contain more hazardous material, for example pits where syringes have be observed or pits located in areas associated with such activities.

2.2 Traffic Control

All stormwater collection pits are typically situated either in/on roads and car parks or adjacent to roads in the footpath or swales. Traffic control requirements at each of these locations is typically the same, with most of the state and local road authorities requiring the same controls implemented whether the work is to be conducted on the road or on the road reserve.

As traffic requirements vary based on the road usage and the specific road configuration, traffic control plans should be prepared for each site. Given that maintenance is typically a quick process, the contractor should liaise with the relevant road authority to determine the specific road safety requirements for each location to ensure that on site workers can conduct the cleaning operations safely and efficiently, while complying with all laws and regulations.

NSW RTA working on roads safety manual indicates the signage requirements, placement of barricades or witches hats and the positioning of traffic control personnel. In addition to standard safety requirements IES recommends that the maintenance vehicle be used to increase safety, through shielding the work area from oncoming traffic.

Plate 1 indicates the vehicle placed to shield the work area with cones placed around the vehicle. Plate 2 indicates at head on view, note the vehicle is positioned to allow access to the drive, whilst still blocking the pit from on-coming traffic. The vehicle has a flashing light on the roof and the hazard lights switched on.

Plate 1 Vehicle positioned near pit, preventing traffic from passing close to the pit.

Plate 1 Head-on view, indicating the placement of the vehicle near the pit.

2.3 Confined Spaces

Confined spaces poses a serious safety hazard for all personnel, however during the normal maintenance procedures there should be no reason to enter a confined space. All maintenance procedures are able to be conducted from the surface. Confined space entry procedures are not included as part of this manual, for IES employees confined space entry procedures are included as part of the IES Safety Manual. It is recommend that all contractors evaluate their own needs for confined space entry and compliance with Occupation Health and Safety regulations.

When repairs or maintenance activities cannot be conducted from the surface, the contractor/cleaner should evaluate the need to enter the confined space, considering all alternative options. Where there is a need to proceed in a confined space, only staff with current confined space training shall operate in a confined space. Appropriate measures and controls shall be put in place to meet confined space entry requirements. Safety equipment must be worn where deemed necessary and where gas or oxygen hazard occurs, staff trained in its use will only use BA gear. **Non-trained staff must not go into confined spaces**.

3. Operations

This section details the specific activities required to clean the Enviropod units. Please note it has been written for use by someone who has never encountered a stormwater pit or an Enviropod unit, providing a step by step process for each of the cleaning stages.

3.1 Maintenance & Monitoring of Enviropod filters

To ensure that the unit performs optimally, the material collected by the filter bag should be emptied when the level of material is no more than approximately **half to two thirds** of the total bag depth or when there is evidence of material overflow. Although the bag has greater storage area, it is recommended that it is not left to fill completely prior to empting, for the following reasons; the bags are capable of retaining a heavy mass of material (in excess of 50kg); material near the top of the bag can be resuspended during high to extreme rainfall events; and blockage of the overflow sections can occur, when material is allowed to build up above the filter bag.

It is also recommended that additional monitoring should be conducted following moderate to extreme rainfall events, in particular, when preceding months have had little to no rainfall. This monitoring is considered necessary to accommodate for higher volumes of runoff generated during major rainfall events, an anticipated greater accumulation of surface contamination during low rainfall periods and to ensure that the units have not been damaged due to high pipe velocities.

3.2 Stormwater Pit Cover Removal

3.2.1 Hinged Pit Grates

To open a hinged pit grate follow the following steps:

1. Insert the lifting hooks beneath the grate. (Position indicated in Plate 2)
2. Check hinge point is not damaged and debris is not caught in the hinge area.
3. Note many cast iron hinges are not hinged securely (to enable the removal of the grate). This may result in the pit grate not being able to sit in an open position. Additionally the hinge pins may also be damaged or corroded, which may allow for the pit grate to fall into pit. Such pit grates can be removed using the method indicated below for non-hinged grates.
4. Fully open pit grate, ensuring that the grate will stay in the open position without any external forces applied. Grates which do not remain open without being held should be removed or secured during cleaning or maintenance activities. Plate 3 and Plate 4 indicate the grate being opened and grate resting freely in the open position, respectively.

Plate 2 Lifting the grate

Plate 3 Opening Grate

Plate 4 Fully open grate

Plate 5 Lowing grate

3.2.2 Non-Hinged Pit Grates

To remove a non-hinged pit grate:

1. Place lifting hooks beneath grate, where possible in the four corners of the grate (Plate 6). Concrete lids may have Gatic lifting points, a key arrangement or holes in the lid, as such special equipment, such as Gatic lifters may be required.
2. Position each person either side of the grate. (Plate 7)
3. Lift the grate, ensuring that good heavy lifting posture is used at all times.
4. Place the grate on an angle on the gutter, to allow for the lifting hooks to be removed. (Plate 8)
5. For extremely heavy one piece grates and concrete Gatic covers, insert the lifters in place and slide the lids back. Note some lids may still require two people. (Picture required)

Plate 6 Insert hook near edge of grate

Plate 7 Position each lifter either side of the grate

Plate 8 Lift grate and move grate to one side

Plate 9 Lift grate above the support frame

Plate 10 Reinstated non hinged grate

3.3 Cleaning Methods

One of the following methods of maintenance should be used for the servicing of these Enviropod Filters:

- Hand Maintenance.

3.3.1 Cleaning using Inductor Truck

The following steps indicate a safe and efficient method to clean the Enviropod using an Inductor:

1. Open gully pit. (See Section **Error! Reference source not found.**)
2. Place the inductor hose over the material collected in the filter bag and switch on the inductor.
3. Using the inductor hose suck all of the sediment, organic leaf material, litter etc., collected in the filter bag
4. Allow the filter bag to be sucked up into the inductor hose for a few seconds to allow for the filter mesh pores to be cleaned. Care is to be taken by the operator not to damage the filter, i.e. ensure that there are no sharp edges on the inductor hose.
5. If material has built up around the overflows, use the inductor hose to clear the accumulated material.
6. Remove filter bag from the pit.
7. Sediment retained in the gully pit grate is to be removed.
8. Back opening channels are to be cleared of any debris to ensure flow is not hindered. Debris can be collected using the inductor truck.
9. All gully pit waste is to be removed from the pit.
10. Check the Enviropod unit. (See Section 0)
11. Check filter bag. (See Section 0)
12. Reinstate filter bag and gully pit lids.

Plate 11 Cleaning an Enviropod using the inductor method

Gully pit sediments under no circumstances are to be backwashed into the gully pit.

3.3.2 Hand Maintenance

The following steps indicate a safe and efficient method to clean the Enviropod manually by hand:

1. Open gully pit. (See Section **Error! Reference source not found.**)
2. Place the lifting hooks in the lifting loops of the filter bag. (See Plate 12)
3. For extremely heavy and overfilled bags either use a hydraulic lifting arm to lift the bag, or remove excess material using a shovel or similar piece of equipment. IES prefers the use of a post hole shovel, due to the reduced strain on the back when digging and the ability of the shovel to grab material vertically. (Insert Picture)
4. Lift the bag vertically off the supporting frame, ensuring that no undue pressure is placed on the filter bag. (See Plate 13)
5. Lift the bag clear of the stormwater pit. (See Plate 14)
6. Position the bag over the truck or other collection vehicle, taking hold of the loops at the base of the bag. (See Plate 15 and Plate 16)
7. Lift and empty the filter bag by holding the bottom lifting loops only. (See Plate 17)
8. Completely empty the filter bag. (See Plate 18)
9. Brush the filter bag with a stiff brush to remove bound sediment from the filter pores. (See Plate 19)
10. Check the filter bag. (See Section 0)
11. Check the Enviropod unit. (See Section 0)
12. Reinstate filter bag, ensuring bag is installed the correct way. (See Plate 20 and Plate 21)
13. Reinstate gully pit lids. (See Plate 22 and Plate 23)

Plate 12 Place the lifting hooks through the bag loops

Plate 13 Lift the bag from the cage and support frame

Plate 14 Lift the bag from the stormwater pit

Plate 15 Lift the bag onto the collection vehicle

Plate 16 Grab the bottom lifting loops

Plate 17 Lifting the bottom bag loops empty the filter bag

Plate 18 Completely empty the contents of the filter bag

Plate 19 Brush the pores filter bag with a stiff brush

Plate 20 Reinstall filter bag

Plate 21 Ensure that the unit is positioned correctly, with the lifting loops on the inside

Plate 22 Correctly installed filter bag

Plate 23 Installed filter bag and sealed pit

3.4 Unit Inspection

After the Enviropod filter bag is removed, emptied and cleaned, the following should be checked to ensure that the unit has not been damaged:

- All connections and joints should be checked and broken rivets replaced (See Plate 24);
- The plastic pit seals should be inspected for unit movement or damage (See Plate 30); and
- The cage should be inspected for damage or movement (See Plate 31).

The overflow diversion channels, and the area between the Enviropod cage and pit wall should also be inspected for the accumulation of debris. Any observed debris should be removed and disposed of off-site. Accumulated material within the outlet pipe may need to be flushed.

Note: If the units are not cleaned regularly the mobilisation of material collected in the Enviropod unit may occur, as such cleaning of the units in accordance with this management plan is required. As this plan is based on observations and data collected during the monitoring period, ongoing adjustment of the cleaning frequency is generally required to improve the overall efficiency in the removal of collected material and prevent material overflow.

Plate 24 Check seals are pushed against the pit walls

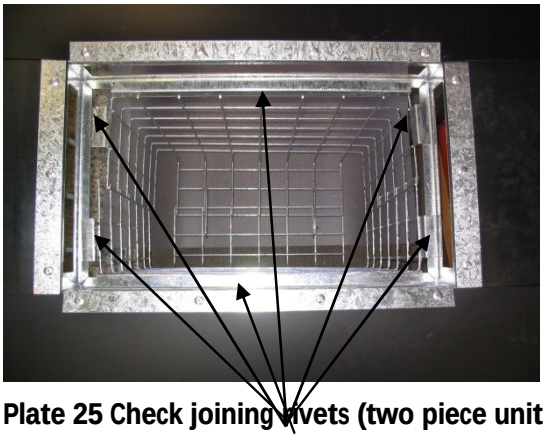

Plate 25 Check joining rivets (two piece unit shown above)

3.5 Filter Bag Inspection and Rejuvenation

Following the emptying and cleaning of the filter bags, the filter bag should be inspected to evaluate the bag condition. Given the nature of stormwater the filter bag from some Enviropod units can become considerably clogged with fine sediment. Filters can also be damaged by various objects in stormwater as well as fauna. Sharp objects such as sticks combined with high velocity water and a large mass in the filter bag can cause small tears in the filter material. Animals such as rats have also been known to chew through fine mesh filter bags located in gully pits near takeaway food outlets.

3.5.1 Clogged Filters

Clogged filter bags can be clean using several different methods. If the bag cleaning techniques described in the general maintenance sections above are not able to clean the filter bags the following options should be considered:

- Using a stiff brush and a bucket of soapy water scrub the filter bag surface.
- Remove filter bags from the pit and wash the bags using a high pressure water spray. Care has to be taken to not transfer the contamination elsewhere. Waste water from the process should be collected of and disposed of correctly.
- Remove the filter bags from the pits and the support rings and wash the bags in an industrial washing machine.

The final option presented above typically results in the bags appearing like new, with no visible stain or pore clogging within the filter mesh.

Plate 26 Slightly clogged filter bag, indicated by the brown stain on in the centre of the bag

Plate 27 A clean used filter bag

3.5.2 Damaged Filters

Damaged filters can often be repaired, provided the damage is small. Small tears in the fabric may occur do to several reasons, however the overall strength & structure of the nylon fabric typically prevents small tears becoming much larger. Although the bag is unlikely to tear further care must be used when clean torn bags as not to spill the collected material into the pit.

Small tears maybe repaired by either sewing the tear back together, with additional fabric to increase the strength of the stitching, or by sewing a patch of the filter material onto the filter bag. The filter bags may need to be replaced if large tears are present, as the filter bag is no longer able to function as intended.

3.6 Disposal of Material

All gully pit wastes from the site are to be taken off site and disposed of at a transfer station or similar approved disposal site. Stormwater Sediments can contain Lead, Copper, Zinc, Mercury, hydrocarbons and PCBs, which are harmful to both humans and the receiving environment. Appropriate sampling and laboratory analysis may be required to classify the material as suitable for reuse, or disposal under appropriate local guidelines.

4. Emergency Procedures

4.1 Spill Procedures

In the event of a spill discharging into any gully pit all sediment is to be extracted and the filter bags are to be removed and replaced with rejuvenated filter bags. Normal operation procedures apply to additional cleaning as a result of spills.

4.2 Blockages

In the unlikely event of surface flooding around a gully pit fitted with an Enviropod the following steps should be carried out:

Check Enviropod over flow bypass. The Enviropod filter has been designed with an overflow mechanism built into the filter box. If surface flooding still exists check the overflow slots underneath the rubber seal. If debris is lodged in the overflow slots these can be easily cleared by hand or steel rod.

If overflow is clear and surface flooding still exists remove Enviropod and check outlet pipe for blockages.

Removal of the Enviropod may be difficult if the filter is clogged and the Enviropod is holding water. If the filter is clogged, brush the side walls of the filter with a yard broom or similar. This will dislodge particles trapped at the interface allowing contained water to flow through the filter.

If the outlet pipe is blocked, it is likely that a gully sucker truck will be required to unblock it. Debris should be removed from the Enviropod with the gully sucker truck before removal of the Enviropod filter.

If a gully sucker truck is not available and the Enviropod needs to be removed by hand, follow the steps below:

- Remove excess debris by hand or brush the side of the filter.
- Lift and place filter ring through the filter box and into cage.
- Remove Filter box.
- Lift cage containing filter bag and ring out of the pit.
- Unblock outlet pipe.

SECTION 1

1.1 DESCRIPTION

StormFilter is a passive, flow-through stormwater filtration system. It consists of vaults that house rechargeable cartridges filled with a variety of filter media. The filter systems are installed in-line with storm drains. The StormFilter works by passing stormwater through media-filled cartridges, which trap particulates and adsorb materials such as dissolved metals and hydrocarbons. After being filtered through the media, the treated stormwater flows into a collection pipe or discharges into an open channel drainage way. StormFilter is offered in three different configurations: cast-in-place, precast and linear. The precast and linear models utilize pre-manufactured vaults. The cast-in-place units are customized for larger flows and may be either covered or uncovered underground units.

1.2 OPERATION

1.2.1 Purpose

The StormFilter is a passive stormwater filtration system designed to improve the quality of stormwater runoff from the urban environment before it enters receiving waterways.

Through independent third party studies, it has been demonstrated that the StormFilter is highly effective for treatment of first flush flows and flow-paced flows during the latter part of a storm. In general, StormFilter's efficiency is highest when pollutant concentrations are highest. The primary target pollutants for removal are: sediments (TSS), soluble metals, soluble phosphorus, nitrates, and oil and grease.

1.2.2 Sizing

The StormFilter® is typically sized to treat the peak flow of a water quality design storm as it passes through the filter. The peak flow is determined by calculations based on the contributing watershed hydrology and using a design storm magnitude. The design storm is usually based on the regulatory requirements set by the local stormwater management agency. The particular size of a StormFilter is determined by the number of filter cartridges (see Figure 4) required to treat the peak stormwater flow. Each cartridge is designed to treat a peak flow of 1 Litre/second. For example: a peak design stormwater flow rate of 10L/s would require that 10 cartridges be used in the treatment vault.

Because of the highly porous nature of the granular filter media, the flow through a newly installed cartridge is restricted to 1L/s, using a restrictor disc, to ensure adequate pollutant-media contact time.

1.2.3 Basic Function

The StormFilter is designed to siphon stormwater runoff through a filter cartridge containing media. The variety of media available can be designed to act as a mechanical filter to remove sediments, as an ion exchanger to remove dissolved heavy metals, and as an absorber to remove oils and greases.

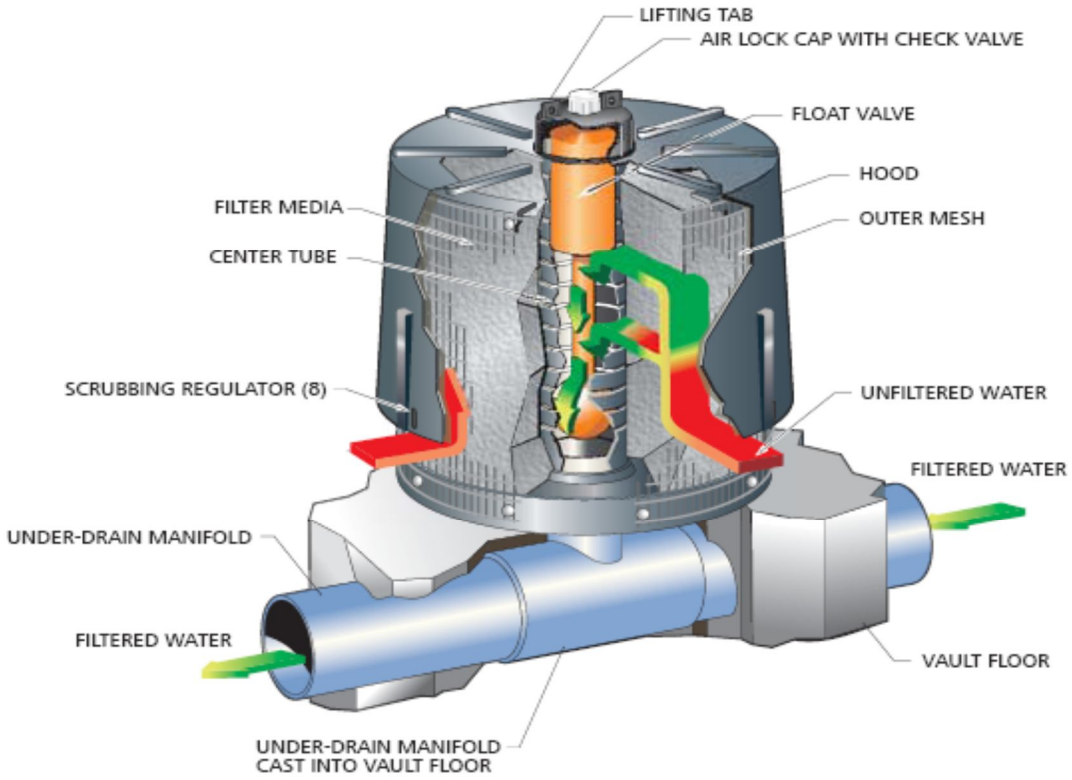

Figure 4. Filter Cartridge

1.2.4 Priming System Function

The treated stormwater collects in the centre tube of the cartridge, which is equipped with a self-priming siphon system. Figure 1 illustrates this system. The key component of the system is the plastic float. The float consists of a ball located at the base leading up to a larger portion, which provides increased buoyancy. Initially the ball rests in a seat effectively closing off the port to the drainage manifold.

As a result, the filter fills the centre drainage tube until the water level has risen high enough to purge the air from the filter cartridges and displaces the float. At a water depth of 22 inches the float pulls loose and allows the filtered water to drain out through the manifold. This effectively "primes" a siphon within the drainage tube and greatly increases the potential across the filter. The priming system increases StormFilter's ability to be loaded with sediment. A related feature is the cartridge "hood". This hood maintains the siphon effect by preventing air from being drawn into the cartridge until the external water level drops below the bottom of the hood.

Cartridges are connected to the manifold with a plastic connector. Since some media used is potentially buoyant, a threaded connector affixed to the manifold with compression bolts is necessary to ensure the cartridge isn't lifted out of place. For the heavier leaf media, a slip connector is used.

StormFilter is also equipped with flow spreaders that trap floating debris and surface films, even during overflow conditions. Depending on individual site characteristics, some systems are equipped with high and/or low flow bypasses. High flow bypasses are installed when the calculated peak storm event generates a flow that overcomes the overflow capacity of the system. This is especially important for precast systems. Low flow bypasses are sometimes installed to bypass continuous inflows caused by ground water seepage, which usually do not require treatment. All StormFilter units are designed with an overflow. The overflow operates when the inflow rate is greater than the infiltration capacity of the filter media.

1.2.5 Maintenance Overview

The primary purpose of the StormFilter is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness. Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. To assist the owner with maintenance issues, Stormwater360 provides detailed Operation & Maintenance Guidelines with each unit.

Stormwater360 can provide maintenance services completely, or in part. Available services include tracking of installed systems, advising the system's owner of maintenance needs, and notification of the regulatory agency once the system has been maintained.

Maintenance is usually performed in the dryer periods to rejuvenate the filter media and prepare the system for the next rainy period. Maintenance activities can also be required in the event of a chemical spill or excessive sediment loading due to site erosion or extreme storms. It is good practice to inspect the system after severe storm events.

END OF SECTION 1

SECTION 2

RECOMMENDED MAINTENANCE AND EXPECTED PERFORMANCE

2.1 TYPES OF MAINTENANCE

Presently, procedures have been developed for two levels of maintenance: Inspection/minor maintenance and major maintenance. Inspection/minor maintenance activities are combined since the minor maintenance does not require special equipment and typically little or no materials are in need of disposal. Inspection/minor maintenance typically involves opening the flow restricting valves (to pre-set levels) and cleanup of vegetation and debris. Major maintenance typically includes cartridge recharging. Major maintenance may involve disposal of materials that require consideration of regulatory guidelines. Depending on the particular unit configuration and equipment used, major maintenance may require an understanding of OSHA rules. Table 1 summarizes the primary activities associated with StormFilter maintenance.

Table 1: StormFilter

Facility Component Requiring Maintenance	Maintenance Activity	When Maintenance Activity Is Required	Expected Facility Performance After Maintaining
StormFilter® Cartridges and Containment Structure	Trash and Debris Removal	Floatable objects or other trash is present in the filter. Remove to avoid hindrance of filtration and eliminate unsightly debris and trash.	Permanent removal from storm system.
	Cartridge Replacement and Sediment Removal	1. Media has been contaminated by high levels of pollutants, such as after a spill.	1. New media is able to effectively treat stormwater.
Drainage System Piping	Flushing With Water	Drainage system is obstructed by debris or sediment.	Outflow is not restricted.

2.2 MAINTENANCE ACTIVITIES

2.2.1 Maintenance Activity Timing

Two scheduled inspections/maintenance activities should take place during the year. During the minor maintenance activities (routine inspection, debris removal), the type of major maintenance required is determined and, if required for disposal, samples of the sediments and media are obtained. The next scheduled date is to perform major maintenance activities (replacement of the filter cartridges and associated sediment removal). In addition to the scheduled activities, it is important to check the condition of the filter after major storms to check for damage caused by high flows and to check for high sediment accumulation, which may be caused by localised erosion in the drainage area. It may be necessary to adjust maintenance activity scheduling depending on the actual operating conditions encountered by the system.

2.2.2 Maintenance Activity Frequency

The primary factor controlling timing of maintenance for the StormFilter is sedimentation. A properly functioning system will remove solids from water by trapping these particulates within the porous structure of the media. The flow through the system will naturally decrease as more and more solids are trapped. Eventually the flow through a system will be low enough to require replacement of the cartridges. Sediment should be removed from upstream trapping devices on an as needed basis to prevent material from being re-suspended and discharged to the system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction should be inspected and maintained more often than those in fully established areas. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after large storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual filter.

2.3 MAINTENANCE CREW REQUIREMENTS

Table 4 lists the anticipated crew requirements for maintenance operations. Removal of water and sediments during major maintenance activities can be accomplished using either a pump and water truck or a vacuum truck. All applicable safety (OH & S) and disposal regulations should be followed. A general description of the maintenance activities follows.

Table 4: ANTICIPATED CREW REQUIREMENTS

	Inspection/Minor Maintenance	Major Maintenance: Sediment Removal	Major Maintenance: Cartridge Replacement
Labourer	1		1
Skilled Worker	1	1	1
Vacuum/Water Truck Operator		1	0/1
Total	**2***	**2***	**2/3***
Special Requirements	Knowledge of Proper StormFilter Function	Knowledge of Disposal Requirements	Knowledge of Cartridge Removal and Installation Procedures

* May require OH & S trained person if/when vault entry occurs.

2.4 MAINTENANCE METHODS

2.4.1 Minor Maintenance/Inspection (Twice A Year)

Minor maintenance typically will involve the steps below, however if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately. **In the case of a spill, the worker should abort maintenance activities until the proper guidance has been obtained.**

Steps for Minor Maintenance

1. Maintenance to be performed by a skilled worker familiar with StormFilter units.

2. If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open doors. Also set up appropriate safety equipment for work near roadways.

3. Inspect the external condition of the unit and take notes concerning defects/problems.

4. Open the doors to the vault and allow the system to air out for 5-10 minutes.

5. **Without entering the vault**, inspect the inside of the unit, including components.

6. Take notes about the external and internal condition. This includes inspecting pit penetrations, walls, lids, ladders & grates etc.

7. Give particular attention to recording the level of sediment build-up on the floor of the vault in the forebay (or pre-treatment bay), and on top of the internal components. If flow is occurring, note the level of water and estimate the flow rate per drainage pipe. Record all observations.

8. Remove large loose debris and trash using a pole with a grapple or net on the end.

9. Close and fasten the door, and remove safety equipment.

10. Finally, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loadings of other materials to the system.

2.4.2 Major Maintenance Inspection (Once a Year)

The primary goal of the major maintenance inspection is to assess the condition of the cartridges relative to the level of sediment loading. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, large amounts of sediments should be present and very little flow will be discharging from the drainage pipes. It is likely that the cartridges need to be replaced. Major maintenance inspection will typically involve the steps below. However, if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately. **In the case of a spill, the worker should abort maintenance activities until the proper guidance has been obtained**.

Steps for Pre-Major Maintenance Inspection

1. Maintenance to be performed by a skilled worker familiar with StormFilter units.

2. If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open doors. Also, set up appropriate safety equipment for work near roadways.

3. Inspect the external condition of the unit and take notes concerning defects/problems.

4. Open the doors to the vault and allow the vault to air out for 5-10 minutes.

5. Without entering the vault, give the inside of the unit, including components, a general condition inspection.

6. Take notes about the external and internal condition.

7. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.

8. Remove large loose debris and trash using a pole with a grapple or net on the end.

9. If the visit is during a storm, make the flow observations discussed above.

10. Close and fasten the door, and remove safety equipment.

11. Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.

12. Review the condition reports from the previous minor and major maintenance visits and schedule for cartridge replacement if needed.

2.4.3 Major Maintenance: Sediment Removal & Cartridge Replacement (& Emergency)

Major maintenance/filter cartridge replacement typically involves the steps below. However, if it appears that a spill of some type has occurred, the local hazard control agency and Stormwater360 should be notified immediately. **In the case of a spill, the worker should abort maintenance activities until the proper guidance has been obtained.** Depending on the configuration of the particular system, a worker may be required to enter the vault to perform some tasks. If vault entry is required, OH & S rules for general confined space entry must be strictly adhered to. Filter cartridge replacement should occur during dry weather and it may be necessary to plug the filter inlet pipe if base flows exist. Standing water present in the vault should be regarded as polluted and contained during this operation by temporarily capping the manifold connectors.

Steps For Cartridge Replacement Maintenance

1. Depending on the particular unit, one or two utility workers and a hauling truck operator will deliver the replacement cartridges to the site. Information concerning how to obtain the replacement cartridges is available from Stormwater360.

2. If applicable, set up safety equipment to protect pedestrians from fall hazards presented by open doors. Also, set up appropriate safety equipment for work near roadways.

3. Inspect the external condition of the unit and take notes concerning defects/problems.

4. Open the doors to the vault and allow the system to air out for 5-10 minutes.

5. Without entering the vault, give the inside of the unit, including components, a general condition inspection.

6. Make notes about the external and internal condition.

7. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.

8. Remove large loose debris and trash using a pole with a grapple or net on the end.

9. Ensuring safe working procedures are met, off load the replacement cartridges (16-39kgs each) and set aside.

10. Remove the top cap (threaded), upper seal and float from the cartridge. Repeat procedure for every cartridge within StormFilter vault. Place items in a large plastic container to be lifted form the vault.
Note: * Confined space entry may be required on StormFilter systems. In this case, please ensure that appropriate Confined Space entry training and subsequent certification has been undertaken and valid, and work procedures are strictly adhered to. If you are unsure, do not enter the vault and contact Stormwater360 immediately.

11. Using a cordless drill and 8mm hex head, remove the three screws located around the top perimeter of the cartridge hood. Place screws in the large plastic container and, once full or completed, remove plastic container form vault.

12. Move the Vacuum truck near the StormFilter vault on the down wide side. Be sure that the Vacuum truck is not too close to the vault so as the fumes will not enter the vault. Make sure that the last 500mm of the nozzle is approx. 100-125mm in outside diameter.

13. Feed vacuum nozzle into cartridge bay and start vacuum truck. Remove cartridge hood and place nozzle directly onto filter media. Completely remove media from each cartridge and repeat process for every cartridge in vault.

14. Once completed unthread cartridges from vault floor and place hood back on cartridges

15. Using the appropriate lifting cap, attach the cable and remove the cartridge (up to 10kgs. each) from the vault. Personnel standing under suspended cartridges is strictly prohibited. Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless maintenance activities are being performed by Stormwater360 and damage is not related to discharges to the system.

16. Set the used cartridge aside or load onto the hauling truck.

17. Repeat steps 14 to 15 once all cartridges have been removed.

18. Remove deposited sediment from the floor of the vault and, if large amounts are present, from the forebay. This can be accomplished by using the Vacuum truck

15 Once the sediments are removed, it is necessary to assess the condition of the vault, particularly the manifold and the connectors. These are short sections of 2-inch schedule 50 PVC, or threaded schedule 80 PVC that should protrude above the floor of the vault. If required, apply a light coating of FDA approved silicon grease to the outside of the exposed portion of the connectors. This ensures a watertight connection between the cartridge and the drainage pipe. Replace any damaged connectors.

16. Using the boom, crane, or tripod, lower and install the new cartridges (typically 16-17kgs. for perlite cartridges). Once again, take care not to damage connections.

17. Close and fasten the door, and remove safety equipment.

18. Make notes about the local drainage area relative to ongoing construction, erosion problems, or high loadings of other materials to the system.

19. Finally, dispose of the residual materials in accordance with applicable regulations. Make arrangements to return the used cartridges to Stormwater360.

2.4.4 Related Maintenance Activities (Performed on an as-needed basis)

StormFilter units are often just one of many components in a more comprehensive stormwater drainage and treatment system. The entire system may include catch basins, detention vaults, sedimentation vaults and manholes, detention/retention ponds, swales, artificial wetlands, and other miscellaneous components. In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities. In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil and grease loading, and discharges of inappropriate materials.

2.5 TYPICAL EQUIPMENT REQUIRED FOR MAINTENANCE ACTIVITIES

Typical equipment required for conducting maintenance is shown in Table 5. Some of the materials listed are suggestions rather than requirements. It should be noted that there is more than one way to accomplish some tasks. Owners with available labour and equipment resources may desire to use alternative methods. However, it is advisable that guidance from Stormwater360 be obtained prior to using alternative techniques.

Table 5: MAINTENANCE EQUIPMENT REQUIREMENTS

Maintenance Equipment Required		
Minor Maintenance	**Pre-Major Maintenance Inspection**	**Major Maintenance Cartridge Replacement**
Safety Equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats.	Safety Equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats.	Safety Equipment*: First aid, cones, barricades, flagging, flares, tape, vests, hard hats.
Work Clothes: Rubber boots, overalls, and gloves.	Work Clothes: Rubber boots, overalls, and gloves.	Work Clothes: Rubber boots, overalls, and gloves.
Door Bolt, Wrench, proprietary lifters (e.g. Gatic) and Miscellaneous Tools.	Door Bolt, Wrench, proprietary lifters (e.g. Gatic) and Miscellaneous Tools.	Door Bolt, Wrench, Pentasocket and Miscellaneous Tools.
Tape Measure	Tape Measure	Tape Measure
Flashlight	Flashlight	Flashlight
Grapple or Net Pole	Grapple or Net Pole	Grapple or Net Pole
Record Keeping Forms	Record Keeping Forms	Record Keeping Forms
Trash/Debris Container	Trash/Debris Container	Vacuum Truck
		Replacement Cartridges
		Cartridge Hauling Truck
		Crane, Tripod and Hoist, or Other Lifting Device (150kg minimum capacity)
		Shovels
		Extra 50mm PVC cartridge connectors
		Spare Flow Restrictor disks
		Trash/Debris Container
		Vault Inlet Pipe Plug
		Dolly
		PVC Pipe Cutter
		Ladder
		Cartridge Installation and Removal Sling

*** Confined space equipment may be required for vault entry. This equipment must be used by personnel with the appropriate OH & S training. This equipment typically includes: Atmospheric testing devices, atmospheric purging and ventilating devices, and entry, exit, and rescue assisting devices.**

2.6 MATERIAL DISPOSAL

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in a manner that will not allow the material to affect surface or ground water. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. It is not appropriate to discharge these materials back to the stormwater drainage system. Part of arranging for maintenance to occur should include coordination of disposal of solids (landfill coordination) and liquids (municipal vacuum truck decant facility, local wastewater treatment plant, on-site treatment and discharge). Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals. Disposal methods or reuse of the media contained in the cartridges will be determined by Stormwater360. If the material has been contaminated with any unusual substance, the cost of special handling and disposal will be the responsibility of the owner.

Enviropod Service Receipt

Site:
Contractor:
Location:
Year:

Job Number:
Receipt Number:
Week Serviced:

Service Frequency:
Enviropods on Site:

Enviropods Cleaned:
Bags Checked:
Frames and Seals Checked:
Overflows Checked
Tonnage:

If Damaged, Action:
If Damaged, Action:
If Blocked, Cleaned:

Comments

This service has been performed in accordance with Enviropod Management Plan (EMP) for above site. Please file this receipt with EMP and keep on site for compliance inspections.

Signature:

Position:

Enviropod Maintenance Form

Client: **Bag:** **NOTE:** **See maps for detailed location.**

Project: **Date:**

ENVIROPOD Sites

Pit No.	Map No.	Location	Bag Size	Date	% Organics	% Litter	% Sediment	Fullness - F, 1/2, 1/4 or 0	Notes	Grate
1										
2										
3										
4										
5										
6										
7										
8										
9										
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Sample StormFilter Minor Maintenance Inspection Data Sheet

Date: _____ **Location**: _____

System Size: _____ **TYPE:** **Cast-In-Place** **Precast** **Linear**

Personnel: _____

System Observations

Media Months in Service: _____

Oil and Grease in Forebay: _____

Sediment Depth in Forebay:_____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

_____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged? (Yes _____ No _____) How Deep? _____

StormFilter Minor Maintenance Activities (check off if done and give description)

Remove Trash and Debris: _____

Minor Structural Repairs: _____

Drainage Area Report

Excessive Oil and Grease Loading (Yes _____ No _____) Source: _____

Sediment Accumulation on Pavement (Yes _____ No _____) Source: _____

Erosion of Landscaped Areas (Yes _____ No _____) Source: _____

Items Needing Further Work: _____

_____

_____

Comments: _____

Sample StormFilter Major Maintenance Inspection Data Sheet

It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, large amounts of sediments should be present, very little flow will be discharging from the drainage pipes, and it is likely that the cartridges need to be replaced during major maintenance.

Date: _____ **Location**: _____

System Size: _____ **TYPE: Cast-In-Place Precast Linear**

Personnel: _____

System Observations

Media Months in Service: _____

Oil and Grease in Forebay: _____

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged? (Yes _____ No _____) How Deep? _____

Drainage Area Report

Excessive Oil and Grease Loading (Yes _____ No _____) Source: _____

Sediment Accumulation on Pavement (Yes _____ No _____) Source: _____

Erosion of Landscaped Areas (Yes _____ No _____) Source: _____

Comments: _____

_____

_____

_____

Review the condition reports from the previous minor and major maintenance visits.

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Sample StormFilter Major Maintenance/Cartridge Replacement Data Sheet

Date: _____ **Location**: _____

System Size: _____ **TYPE: Cast-In-Place Precast Linear**

Personnel: _____

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Media Months in Service: _____

Oil and Grease in Forebay: _____

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil and Grease Loading (Yes _____ No _____) Source: _____

Sediment Accumulation on Pavement (Yes _____ No _____) Source: _____

Erosion of Landscaped Areas (Yes _____ No _____) Source: _____

StormFilter Cartridge Replacement Maintenance Activities (check off it done and give description)

Remove Trash and Debris (Yes _____ No _____) Details: _____

Replace Cartridges (Yes _____ No _____) Details: _____

Sediment Removed (Yes _____ No _____) Details: _____

Quantity of Sediment Removed (estimate?): _____

Minor Structural Repairs (Yes _____ No _____) Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes/Problems: _____

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