R G PARKINS
Meadowside | Shap Road | Kendal | Cumbria | LA9 6NY
Tel:01539 729393
Email: mail@rgparkins.com

Operation & Maintenance Plan for Sustainable Drainage Systems

Trumpet Road, Cleator Moor

Mr & Mrs A. Casson

Ref: K39288.OM/002

Version	Date	Prepared By	Checked By	Approved By
Original	07 July 2023	T. Melhuish	O. Sugden	O. Sugden

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1 INTRODUCTION

1.1 BACKGROUND

R. G. Parkins & Partners Ltd (RGP) has been appointed by Mr & Mrs A. Casson to provide an Operation and Maintenance plan for the surface water drainage systems for the proposed residential development at Trumpet Road in Cleator Moor.

In reviewing the enclosed information, reference should be made to the latest revisions of the following RGP drawings:

- K39288-10 Foul & Surface Water Drainage Plan – on-site
- K39288-11 Foul & Surface Water Drainage Plan – off-site
- K39288-12 Surface Water Drainage Longitudinal Sections & Manhole Schedules
- K39479-13 General Drainage Construction Details
- K39479-14 Geocellular Attenuation Tank Construction Details

1.2 SUDS COMPONENTS

The residential development at Trumpet Road, utilises a combination of Sustainable Drainage Systems (SuDS) as part of the overall surface water drainage strategy for the site.

- The access road, parking bays and roof areas will be served by a geocellular attenuation tank. A hydrobrake flow control will restrict flows to the Greenfield QBAR. Attenuated flows shall run through a proprietary Hydrodynamic Separator prior to off-site discharge via a 150mm dia. pipeline towards the existing land drainage outfall in the neighbouring land.
- The drainage to the access roads and driveways will comprise conventional gullies and filter drains which will discharge into the new surface water pipes that discharge into the attenuation tank.
- It is proposed the geocellular tank system and all associated upstream/downstream infrastructure shall remain private, and as such will be maintained by a third-party management company, appointed by the site owner.

All drainage systems have been designed to provide sufficient storage for the critical duration, 1 in 100-year design storm event with a 50% allowance for the future effects of climate change.

2 OPERATION AND MAINTENANCE REQUIREMENTS

As with all traditional drainage systems, SuDS need to be inspected and maintained regularly to ensure that they operate correctly and efficiently. If SuDS are not properly maintained, then there is a risk that the components become overloaded during periods of prolonged heavy rainfall potentially resulting in localised flooding within the development. Recommendations for the maintenance of the SuDS components are detailed in the following section.

As part of this process, it is recommended that inspection and maintenance records are retained by the Management Company to track the progressive performance of the SuDS over time. The inspection records should include the following:

- Sediment condition and depth
- Water observations (sheen, smell, etc.)
- Unscheduled maintenance needs
- Components that do not meet performance criteria and require immediate maintenance
- Common problem areas, solutions and general observations
- Aesthetic conditions

For Health and Safety reasons as well as practicality, SuDS systems should be maintained during periods of dry weather wherever possible. Adhering to the recommended maintenance regimes outlined below will minimise the risk of maintenance activities being required when a fault becomes apparent, usually during a rainfall event.

2.1 SURFACE WATER DRAINAGE COMPONENTS

2.1.1 GEOCELLULAR ATTENUATION TANK

Regular inspection and maintenance is important for the effective operation of below ground storage systems. Maintenance responsibility for the tank will be placed with the site owners/third party management company. The following requirements shown in Table 2.1, refer to the recommendations in The SuDS Manual (CIRIA C753) [1].

Table 2.1 Attenuation Storage Maintenance Activities and Schedule.

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Remove sediment from pre- treatment structures	Annually, or as required.
Remedial Actions	Repair inlets	As required
Monitoring	Inspect / check all inlets to ensure they are in good condition and operating as designed	Annually
	Inspect silt traps to ensure silt collection capacity	Monthly for 3 months after installation, then every 3 months and after a significant rainfall event.
	Survey inside of tank for sediment build up and remove if necessary	Every 5 years or as required.

In addition to the recommended maintenance requirements, Hydro International Ltd also provides guidance for the operation and maintenance of their flow control devices, a copy of which is included in Appendix A. Generally, the Hydrobrake will require little, if any maintenance and has a design life in exceedance of the upstream drainage systems. In the unlikely event that the device blocks and the flow control chamber floods, the device is fitted with a pivoting by-pass door which can be accessed and opened from ground level via a pull handle and operating steel rope. This will allow the chamber to be drained down to provide access for maintenance.

2.1.2 HYDRODYNAMIC SEPARATOR

A proprietary hydrodynamic separator will act as an additional form of treatment to the stormwater run-off from roofs, roads and car parking areas. It is to be located directly downstream from the attenuation tanks and flow control chamber.

The hydrodynamic separator will remain private and will be maintained by a third-party management company, appointed by the site owners.

The maintenance requirements for hydrodynamic separators are fairly low due to no moving parts. The only required maintenance as informed by the manufacturer is to employ a vacuum truck to remove floatables trapped on the top and sediment captured in the sump. As the frequency of maintenance can vary significantly between sites it is recommended to check and vacuum every 6 months for the first year and determine the standard maintenance frequency from this. Most typically a maintenance frequency of once per year or following a spill in the drainage facility is adequate.

2.1.3 FILTER DRAINS

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. The trench will be lined with a geotextile to prevent silt blocking the voids in the stone. A perforated pipe is provided near the base of the trench to collect and convey water to the downstream drainage component. Regular inspection and maintenance is required to ensure the effective long-term operation of filter drains. The filter drains will be maintained by a third-party management company, appointed by the site owners. The requirements stated in Table 2.2 refer to the recommendations in The SuDS Manual (CIRIA C753) [1].

Sediments excavated from filter drains that receive runoff from residential roads and roof areas are generally not toxic or hazardous material and can therefore be safely disposed of by either land application or landfilling. However, consultation should take place with the environmental regulator to confirm appropriate waste management protocols and compliance with legislation.

Table 2.2 Filter Drain Maintenance Activities and Schedule.

Maintenance Schedule	Required Action	Recommended Frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface and access chambers	Monthly (or as required)
	Inspect filter drain surface and inlet/outlet pipework for blockages, clogging, standing water and structural damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Six monthly
Occasional maintenance	Remove or control tree roots or vegetation where they are encroaching the sides of the filter drain	As required
	Where there is evidence of high pollution loading at the surface, remove geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

3 REFERENCES

[1] CIRIA, *The SuDS Manual*, Report C753, 2015.

[2] FP McCann, StormCleanser™ Operation and Maintenance Manual

APPENDIX A

Hydro International operation and maintenance guide

Stormcleanser operation and maintenance guide

HYDRO-BRAKE® FLOW CONTROL

MAINTENANCE AND SAFETY DATA SHEET

MAINTENANCE

Normally, little maintenance is required as there are no moving parts within the Hydro-Brake® Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. Hydro-Brake® Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur. The smaller type conical units, below the minimum recommended size, are also available with rodding facilities or vortex suppressor pipes as optional extras.

Following installation of the Hydro-Brake® Flow Control it is vitally important that any extraneous material ie. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced please do not hesitate to contact the company so that an investigation may be made.

Hydro-Brake® Flow Controls are typically manufactured from grade 304 Stainless Steel which has an estimated life span in excess of the design life of drainage systems.

COSHH

Hydro-Brake® Flow Controls are manufactured from Stainless Steel, which is not regarded as hazardous to health and exhibits no chemical hazard when used under normal circumstances for the stated applications.

MANUAL HANDLING

The handling of Hydro-Brake® Flow Controls should be in accordance with current legislation and regulations:

- The Health and Safety at Work etc. Act 1974.
- The Management of Health and Safety at Work Regulations 1999 (amended 2003).
- The Manual Handling Operations Regulations 1992 (amended 2002).

All published and printed by the Health and Safety Executive.

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Hydro International (UK) Ltd
Stormwater Division • Shearwater House • Clevedon Hall Estate • Victoria Road • Clevedon ● BS21 7RD
Tel: 01275 878371 • Fax: 01275 874979 • www.hydro-international.biz

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STH Range of
Hydro-Brake® Flow Controls

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STORMCLEANSER ™

Operation and Maintenance Manual

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INTRODUCTION

This document serves as a comprehensive insight in to the operation as well as a guide to efficient maintenance of the StormCleanser™ Hydrodynamic Vortex Separator, once installed on site. The details and instructions provided are to be followed as mentioned, any deviation could potentially affect the performance of the StormCleanser™. The maintenance guide reflects the frequency based on nominal rainfall conditions and may alter based on regional differences or anomalous rainfall events.

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PLEASE, CONTACT LOCAL YOUR FP MCCANN SPECIALIST ENGINEER OR OUR HEAD OFFICE ON 028 7964 2558 IN CASE OF ANY DOUBT OR OPERATION & MAINTENANCE RELATED ISSUES.

STORMCLEANSER™

Operation and Maintenance Manual

PRODUCT DESCRIPTION

StormCleanser™ provides a cost-effective solution for designers, engineers and contractors involved in the provision of Sustainable Drainage Systems (SuDS). This unit has no moving parts, requires no power, and is constructed within standard precast concrete chambers.
The units come factory fitted in precast chambers and could also be installed on-site as required. The modular stainless steel built assembly is designed to provide installation simplicity. The separator internal assembly is fabricated out of stainless steel (304L/316L), per BSI BS EN 10088-2-2014. Stainless Steel material grade and composition, provides exceptional longevity due to high corrosion resistance. The lifespan of the internal assembly outlasts the lifespan of a typical precast concrete structure (100+ years).

Figure 1 - StormCleanser™ Assembly and Exploded View

WORKING PRINCIPLE

The StormCleanser™ is specifically designed to remove suspended solids, hydrocarbons, and floatable debris from the stormwater run-off.

Water and pollutants enter the system via the inlet pipe, where the internal geometry enables low energy forced vortex flow patterns. This allows the floatables to gather and solids to settle to the bottom of the treatment chamber for subsequent removal.

Settled sediment is retained within the sump storage of the unit, allowing easy access for suction cleaning. Re-suspension of the solids is minimised by the provision of a baffle plate (Catch Skirt), positioned above the sediment storage sump. A central core allows for convenient suction hose entry down to the sump for cleaning and maintenance. If there is a stormwater surge in excess of maximum treatment flow rate, it overflows a weir, bypasses the treatment zone and directly discharges through the outlet pipe. This helps to minimize the effects of scour within the treatment region and prevents wash out of retained sediment downstream.

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Operation and Maintenance Manual

The generic configuration of the StormCleanser™ consists of the following main components:

- Inlet Sub-Assembly
- Core Sub-Assembly
- Catch Skirt
- Sump Unit

INLET SUB-ASSEMBLY:

The internal assembly comprises of the main components diverting the flow tangentially, at an angular velocity designed to be most conducive to separation of sediment particles. The inlet assembly also enables the StormCleanser™ to be configured for different inlet angles with respect to the outlet pipe, ranging from 90° – 270°. Moreover, multiple inlet sub-assemblies could also be stacked to form a multiple inlet configuration of StormCleanser™.

CORE SUB-ASSEMBLY:

The sub-assembly consists of a circular core that provides annular separation zone as well as an outlet channel that discharges the cleaner water out of the system. It also consists of the structural mounting surfaces to enable steadfast and safe installation.

CATCH SKIRT:

The Catch Skirt, also known as sump tray or baffle plate, minimizes the resuspension as well as escape of the captured sediment. The Catch Skirt also hydrodynamically directs the flow vortices towards the sump region.

SUMP UNIT:

The sump or catchment zone is the solids or denser sediment storage region. The separated particles are retained in the sump until cleaned during the maintenance process.

The combination of the discharge rate from surface runoff and the target pollutant load are the key variables governing the diameter of the separator and the height of the base unit respectively. These two values are determined by the designer as per the individual site requirements.

MODELS

The table below provides the maximum treatment flow rates and sediment/oil storage capacities for standard StormCleanser™ units.

Table 1 - StormCleanser™ Performance Table

MODEL	TANK DIAMETER	MAX TREATMENT FLOW RATE	MIN. SEDIMENT STORAGE CAPACITY	MIN. OIL STORAGE CAPACITY	MAX. HEAD LOSS AT TREATMENT FLOW RATE
	(mm)	(L/s)	(m^3)	(L)	(mm)
PRE-SC1200	1200	43	0.50	320	240
PRE-SC1500	1500	67	0.82	630	300
PRE-SC1800	1800	96	1.23	1085	360
PRE-SC2100	2100	131	1.75	1725	420
PRE-SC2400	2400	172	2.38	2575	480
PRE-SC2700	2700	217	3.13	3670	540
PRE-SC3000	3000	268	4.01	5035	600
PRE-SC3600	3600	387	6.20	8703	720
PRE-SC4000	4000	477	8.00	11938	800

Notes: Sediment storage capacity could be extended as required, per the desired maintenance frequency

OPERATION

StormCleanser™ operates without any external power or moving parts, hence seamless and effective operation is a function of hydrodynamics as well as the material and structure. The inlet flow openings are designed to permit passage of large floatable objects, which gather in the region above the main separation zone. The hydraulic losses are minimized by smooth channelling of flow through the annular region, at the specific design velocity. A StormCleanser™ unit consisting of multiple inlets, uniquely, provides flow direction selection to allow the longer unencumbered flow path to be taken and thus avoid any clogging of floatables.

Figure 2 demonstrates the two different separation mechanisms during normal operation. The hydrocarbons and floatables gather at the top by virtue of lower density, and could be accessed and removed first. The solid suspended sediment undergoes vortex separation phenomena and is captured in the sump region, to be extracted conveniently through the central cylindrical opening.

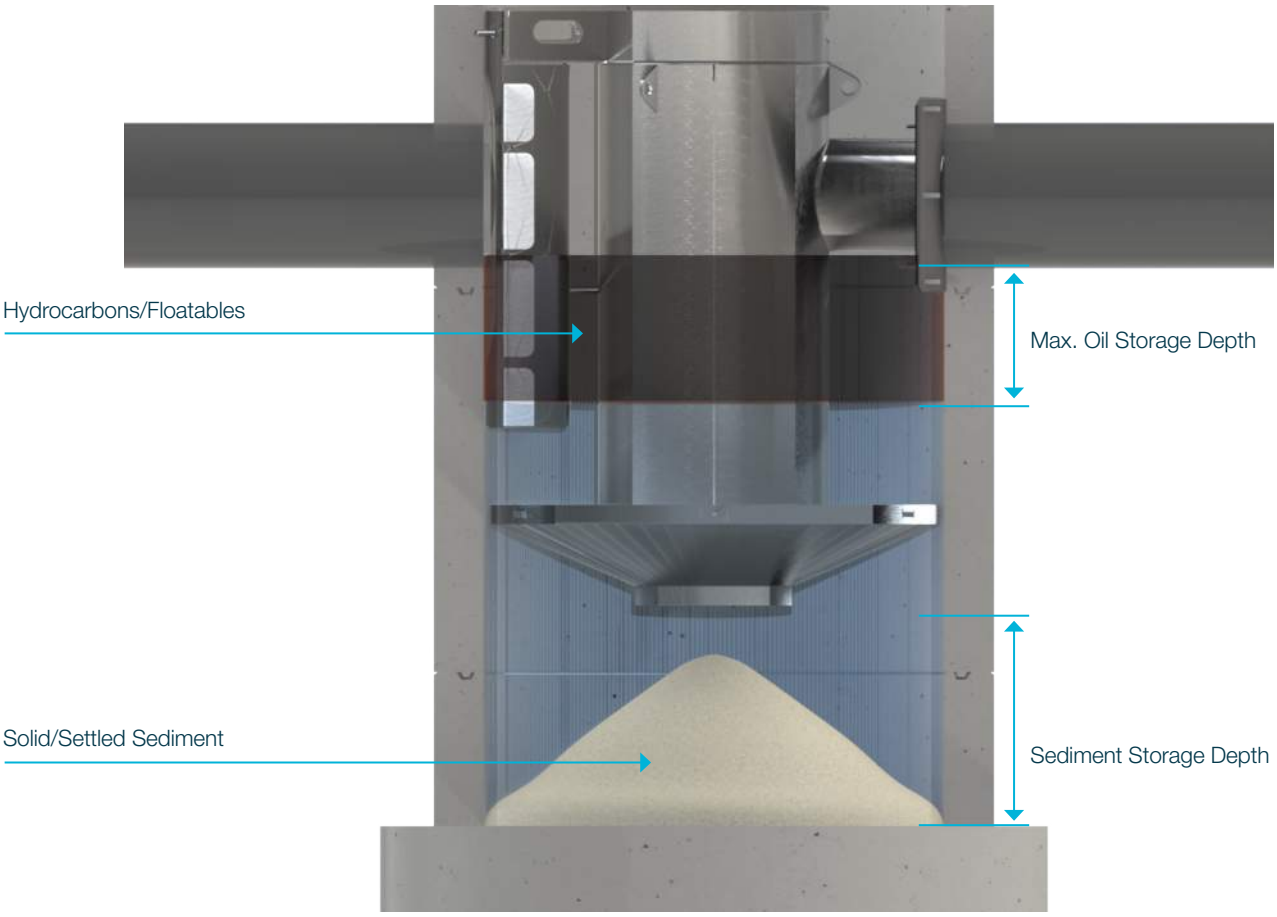

Figure 2 - StormCleanser™ sediment categorization during operation

MAINTENANCE

Periodic checks and removal of stored sediments, floatables, and hydrocarbons is essential to the effective functioning of the StormCleanser™. Failure to provide adequate regular maintenance may limit the performance of the installed unit.

**** Maintenance does not require removal or re-installation of any part in the existing StormCleanser™ assembly. If a part appears damaged, please contact regional FP McCann office.**

MAINTENANCE FREQUENCY

- During installation, the sump unit should be cleaned for any existing mud and debris, collected during storage/pre-installation period
- At the time of installation, the unit should be checked against the installation sheet and information should be logged
- First regular maintenance check is advised between 6-12 months after installation, serving as a preventive check and sets respective periods of maintenance accordingly
- The amount of sediment, floatables, and hydrocarbons for each site is highly variable and could be gauged upon first few maintenance intervals

REQUIRED EQUIPMENT

- There is no confined space entry necessary for inspection or maintenance
- Access slab/lid hardware and tooling
- Vacuum truck with suction hose and tanker for foul water removal
- Pressure wash or cleaning equipment (if required)

**** Safe and environmentally responsible disposal of pollutants is the responsibility of the maintenance contractor**

MAINTENANCE INSTRUCTIONS

1. Lower down the suction hose and extract floatables and hydrocarbons via the annulus region of the separator tank

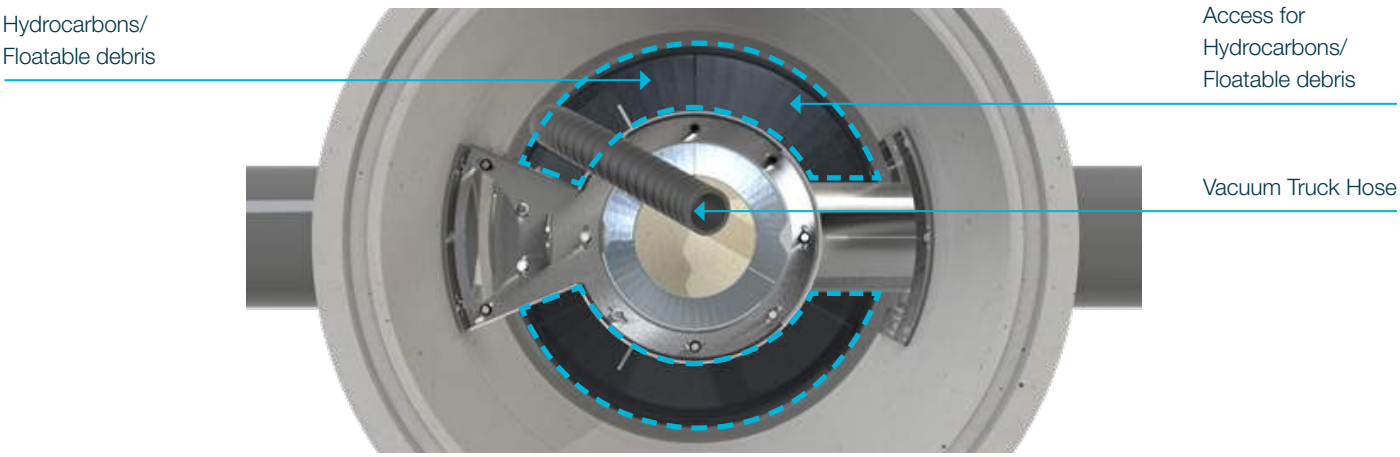

Figure 3 - Vacuum truck access region and cleaning of hydrocarbons and floatable debris

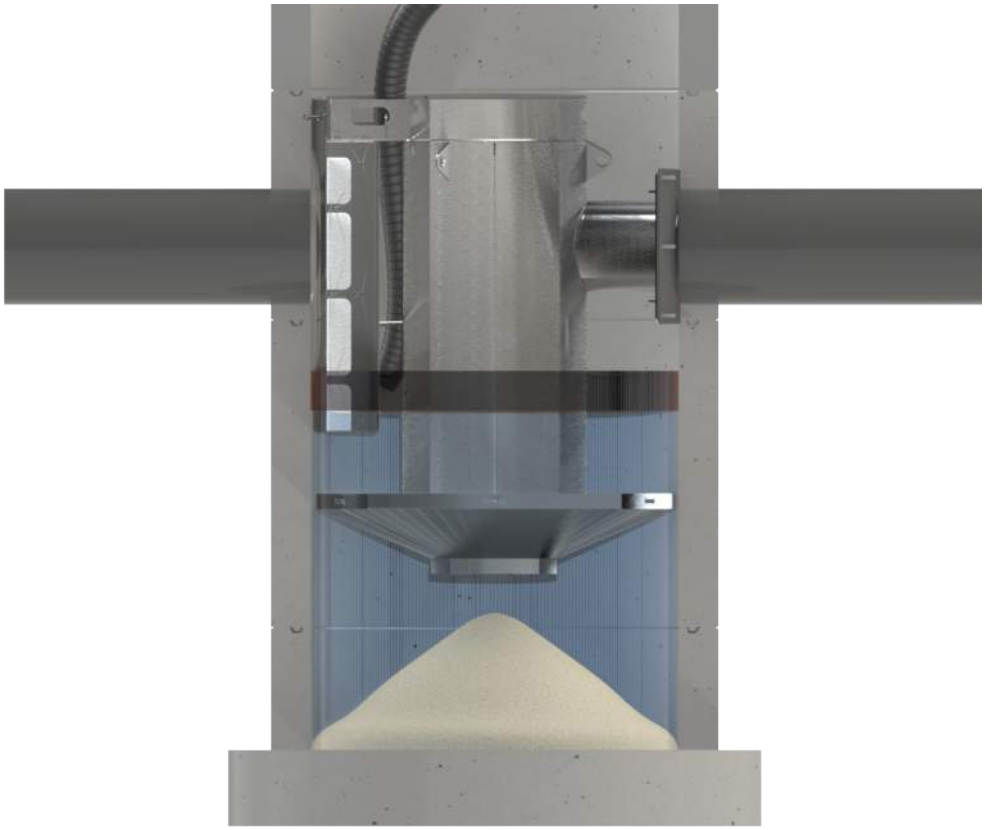

Figure 4 - Section view of vacuum suction hose, during hydrocarbons and floatable debris cleaning (Internal Assembly rendered transparent for visualization)

2. Suction hose should be placed beside the closed end of the inlet assembly to adequately capture all floatable debris and hydrocarbons
3. Once water level reduced down to the Catch Skirt level then lower the suction hose down to the sump region to suck the solid sediment out of the system
4. Continue lowering down the hose as it sucks the sediment until it hits the base of the sump

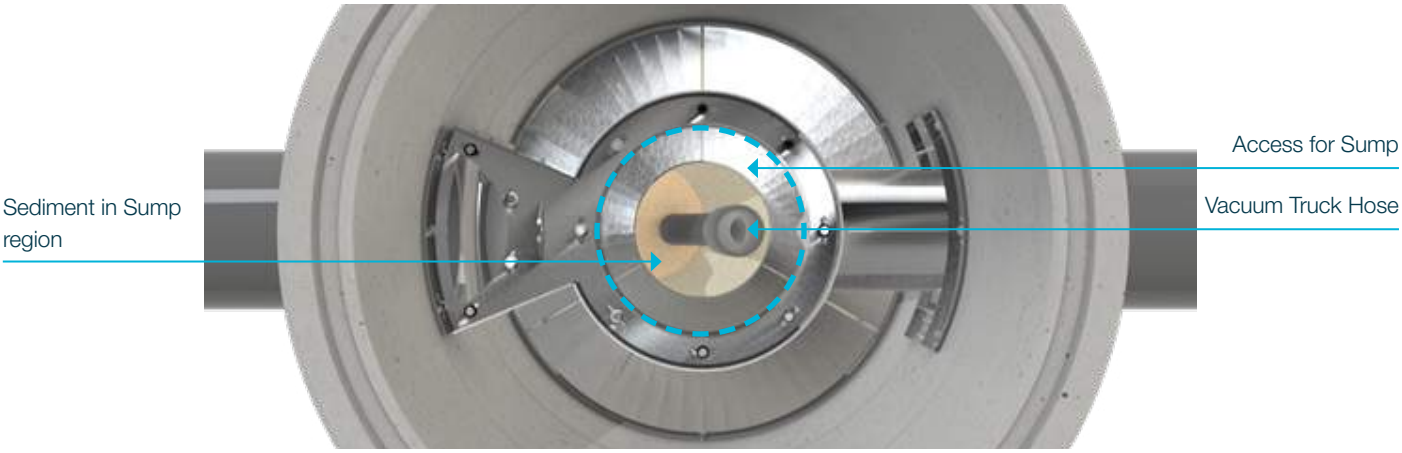

Figure 5 - Vacuum truck access region and cleaning of sediment stored in sump unit

Figure 6 - Vacuum Truck hose in the settled sediment sump region (Internal Assembly rendered transparent for visualization)

5. The sump region would ideally need frequent rotational repositioning of the suction hose against the base, to access the far ends
6. Retrieve the suction hose and check for any anomalies
7. Lastly, securely close the lid of the tank

It is recommended that the units are regularly checked after any unexpected stormwater run-off surges or chemically hazardous spills.

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STORMCLEANSER™ INSTALLATION RECORD

Model Ref#	
Installation Date	
Project Ref	
Installation Site	
Location	

Model	Check
PRE-SC1200	☐
PRE-SC1500	☐
PRE-SC1800	☐
PRE-SC2100	☐
PRE-SC2400	☐
PRE-SC2700	☐
PRE-SC3000	☐
PRE-SC3600	☐
PRE-SC4000	☐

CLIENT DETAILS

Company Name	
Contact Person	
Address	
Telephone	
Fax	

CONTRACTOR DETAILS

Company Name	
Contact Person	
Address	
Telephone	
Fax	

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STORMCLEANSER™ MAINTENANCE RECORD SHEET

MODEL REF#		INSTALLATION DATE		LOCATION	
DATE	NAME	COMPANY	SEDIMENT MASS (KG)	COMMENTS/REMARKS	

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