

# Post Construction Maintenance Manual

for

## STEWART'S SHOPS

3733 US Highway 9W  
Highland, NY 12528  
Ulster County, New York

May 5, 2021



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## **1.0 Operation and Maintenance Information**

### **1.1 Site Address**

3733 US Highway 9W  
Highland, NY 12528

### **1.2 Descriptive Site Location**

Property is on the Southwest corner of the intersection of US Highway 9W and Chapel Hill Road.

### **1.3 Property Owner**

Stewart's Shops  
PO Box 435  
Saratoga Springs, NY 12855

### **1.4 Property Management**

SAME AS OWNER

## 2.0 Design and Construction Information

### 2.1 Maintenance Mechanism

- ☒ Deed Covenant
- ☐ Maintenance Agreement
  - ☐ Commercial Property
  - ☐ Homeowners Association
- ☐ Maintenance Assumed by Government Entity

List:

### 2.2 Required Inspection

- Inspection by a licensed professional engineer is required in accordance with Inspection Forms in attachments section.
- Local municipality has authority to enter the site to inspect the stormwater management practices. The frequency of municipal inspections has not been determined and shall be at the discretion of the local municipality.

### 2.3 Providers of Maintenance Services

- Coordinator of maintenance activities and inspections – **Stewart's Shops**
- Landscaping and snow removal activities – **TBD** \_\_\_\_\_ (List Company)
- Stormwater Management Practice (SMP) maintenance – **TBD** \_\_\_\_\_ (List Company)
- SMP Inspections and party required to submit report to municipality – **Stewart's Shops**

### 2.4 Emergency Contact

*(Local government authority to contact in case of failure of the stormwater treatment practice that threatens public safety)*

Anthony Giangrosso  
Town of Lloyd  
12 Church Street  
Lloyd, NY 12528  
(845) 691-2735 (phone)

### **3.0 Maintenance and Inspection Responsibilities**

#### **3.1 Permitting Authority**

Town of Lloyd Planning Board

Town of Lloyd  
12 Church Street  
Lloyd, NY 12528  
(845) 691-2144 (phone)  
(845) 691-6672 (fax)

#### **3.2 Design Engineer**

Scott E. Kitchner, PE  
Stewart's Shops  
PO Box 435  
Saratoga Springs, NY 12866  
(518) 581-1201 (phone)  
(518) 581-1209 (fax)

#### **3.3 Contractor**

To Be Determined

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(List Company)

#### **3.4 Emergency Contact**

*(Local government authority to contact in case of failure of the stormwater treatment practice that threatens public safety)*

Anthony Giangrasso  
Town of Lloyd  
12 Church Street  
Lloyd, NY 12528  
(845) 691-2735 (phone)

#### 4.0 Funding Mechanism

☐ Maintenance performed by Municipality and funded through:

☐ General Revenues

☐ Stormwater Utility or other fee assessment

OR

☒ Maintenance performed by Owner and funded or guaranteed through

☐ Performance Bond

☐ Letter of Credit

☐ Escrow Account

☒ Private Funds

☐ Maintenance Agreement, See Attached

☒ Deed Covenant

#### 4.1 Estimated Annual O&M Costs

The estimated cost of maintenance of the stormwater management practice(s) (SMPs) excluding landscaping costs are **\$6,700** per year.

The estimated annual cost is in terms of 2021 dollars. The anticipated annual cost for subsequent years could be estimated using an assumed inflation rate of 3.0%.

## 5.0 Post-Construction Stormwater Management Facilities (Practices)

<b>Practice A: Subsurface Detention Facility</b>	
<b>Site Map Identifying Location of Practice</b>	Refer to Construction Plans
<b>Practice Type</b>	Proprietary (StormTech SC-740)
<b>Contributing Drainage Area</b>	Post Area DA2 (0.923 acres)
<b>Attachments</b>	<ul style="list-style-type: none"><li>• See Exhibit 6.1 for location of Practice A.</li><li>• All or any item(s) indicated on inspection report shall be rectified within one (1) month of report submission.</li></ul>
<b>Frequency</b>	<ul style="list-style-type: none"><li>• Initially every 6 months for the first calendar year then at least once per calendar year or if the rainfall within a 24-hour period exceeds 3.0 inches by a qualified inspector.</li></ul>
<b>Special Needs or Requirements</b>	<ul style="list-style-type: none"><li>• Remove sediment when accumulation exceeds 3 inches in depth.</li><li>• Testing of sediment must be performed per NYSDEC to determine levels of toxic elements within the accumulated sediment prior to being removed and properly disposed of.</li><li>• High pressure water to clean subsurface system.</li><li>• Vacuum truck for sediment removal.</li><li>• Inspectors and maintenance staff may need to be certified in confined space entry.</li></ul>

## Stormwater Practice – Subsurface Storage System Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. StormTech SC-740 Subsurface Stormwater Detention System (Annual or after 3" rainfall event within 24-hour period Initial Year/Semi-Annual (min.) Follow On Years)		
Excessive sediment accumulation		
a. Depth of sediment - basin		
Condition of inlet/outlet pipes		
Condition of discharge location		
Evidence of clogging		
Accumulation of debris		
Condition of inspection ports		

**Comments:**

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**Actions to be Taken:**

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<b>Practice B: Bioretention Filter Bed</b>	
<b>Site Map Identifying Location of Practice</b>	Refer to Construction Plans
<b>Practice Type</b>	Bioretention (F-5 NYSDEC)
<b>Contributing Drainage Area</b>	Post Area DA2/3 (1.127 acres)
<b>Attachments</b>	<ul style="list-style-type: none"> <li>• See Exhibit 6.1 for location of Practice B.</li> <li>• All or any item(s) indicated on inspection report shall be rectified within one (1) month of report submission.</li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>• At least once per calendar year or if the rainfall within a 24-hour period exceeds 3.0 inches by a qualified inspector.</li> </ul>
<b>Special Needs or Requirements</b>	<ul style="list-style-type: none"> <li>• Remove sediment when accumulation exceeds 1 inches in depth on the filter bed.</li> <li>• Testing of sediment must be performed per NYSDEC to determine levels of toxic elements within the accumulated sediment prior to being removed and properly disposed of.</li> </ul>

## Stormwater Practice – Bioretention Filter Bed Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Bioretention Filter (Annual or after 3" rainfall within 24-hour period)		
Excessive sediment accumulation		
Condition of gravel diaphragm		
Condition of mulch layer		
Dead or diseased plant material		
Ponded water (48hrs after storm)		
Excessive veg. growth (>18")		
Accumulation of debris		

**Comments:**

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**Actions to be Taken:**

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## Practice C: Private Closed Drainage System

<b>Site Map Identifying Location of Practice</b>	Refer to Construction Plans
<b>Practice Type</b>	N/A
<b>Contributing Drainage Area</b>	Developed Site (1.185 acres)
<b>Attachments</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>• At least once per calendar year by a qualified inspector.</li> </ul>
<b>Special Needs or Requirements</b>	<ul style="list-style-type: none"> <li>• Remove sediment when accumulation exceeds 6 inches within the piping and/or catch basin sumps. (Estimated every 10 years)</li> <li>• High pressure water to clean subsurface closed drainage system.</li> <li>• Vacuum truck for sediment removal.</li> <li>• Catch basin/manhole frame and grates, mortar and pips (if necessary).</li> <li>• Riprap (if necessary).</li> </ul>

## Stormwater Practice – Privately Owned Closed Drainage System Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Closed Drainage System (Annual)		
Condition of piping		
Excessive sediment accumulation		
Condition of drainage structures		
a. Cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebar exposed)		
d. Joint failures		
e. Water tightness		

**Comments:**

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**Actions to be Taken:**

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## Practice D: Outlet Control Structures

<b>Site Map Identifying Location of Practice</b>	Refer to Construction Plans
<b>Practice Type</b>	N/A
<b>Contributing Drainage Area</b>	Entire Site (varies)
<b>Attachments</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>• At least once per calendar year by a qualified inspector.</li> </ul>
<b>Special Needs or Requirements</b>	<ul style="list-style-type: none"> <li>• Remove sediment when accumulation exceeds 6 inches within outlet structure sumps. (Estimated every 10 years)</li> <li>• Vacuum truck for sediment removal.</li> <li>• Frame and grates, trash racks, mortar (if necessary).</li> </ul>

## Stormwater Practice – Outlet Control Structures Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Outlet Control Structures (Annual)		
Condition of inlet/outlet piping		
Excessive sediment accumulation		
Condition of concrete structure		
f. Cracks or displacement		
g. Minor spalling (<1")		
h. Major spalling (rebar exposed)		
i. Joint failures		
j. Water tightness		
Low flow orifice functional		
Trash rack clear of debris		
Other		

**Comments:**

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**Actions to be Taken:**

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## Practice E: Stormwater Outfalls/Overflow Devices

Site Map Identifying Location of Practice	Refer to Construction Plans
Practice Type	N/A
Contributing Drainage Area	Post Area DA2/3 (1.127 acres)
Attachments	<ul style="list-style-type: none"><li>• None</li></ul>
Frequency	<ul style="list-style-type: none"><li>• At least once per calendar year by a qualified inspector.</li></ul>
Special Needs or Requirements	<ul style="list-style-type: none"><li>• Removal of accumulated debris</li><li>• Additional stone (if necessary).</li><li>• Downstream/adjacent erosion repair (if necessary).</li></ul>

## Stormwater Practice – Stormwater Outfalls/Overflow Devices Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Stormwater Outfalls (Annual)		
Condition of outlet piping		
Condition of end section		
Accumulation of debris in stone		
Displaced stone		
Downstream erosion occurring		
Other		
2. Overflow Devices (Annual)		
Spillway/Weir clogged with debris		
Displaced stone		
Erosion of adjacent embankment		
Animal burrows in adjacent embankment		
Evidence of leakage through embankment		
Cracking, sliding, bulging of embankment		

**Comments:**

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**Actions to be Taken:**

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## Practice F: Hydrodynamic Unit Separator(s)

<b>Site Map Identifying Location of Practice</b>	Refer to Construction Plans
<b>Practice Type</b>	Proprietary (Hydro International First Defense FD-3HC)
<b>Contributing Drainage Area</b>	Post Area DA2 (0.923 acres)
<b>Attachments</b>	<ul style="list-style-type: none"> <li>• See Exhibit 6.1 for location of Practice C.</li> <li>• See Exhibit 6.2 for First Defense Operation &amp; Maintenance Literature for required activities, timing, methods and inspection.</li> <li>• All or any item(s) indicated on inspection report shall be rectified within one (1) month of report submission.</li> </ul>
<b>Frequency</b>	<ul style="list-style-type: none"> <li>• Initially every 6 months for the first calendar year then at least once per calendar year or if the rainfall within a 24-hour period exceeds 3.0 inches by a qualified inspector.</li> </ul>
<b>Special Needs or Requirements</b>	<ul style="list-style-type: none"> <li>• Remove sediment from First Defense when accumulation exceeds 18 inches in depth.</li> <li>• Testing of sediment must be performed per NYSDEC to determine levels of toxic elements within the accumulated sediment prior to being removed and properly disposed of.</li> <li>• Vacuum truck for sediment removal.</li> </ul>

## Stormwater Practice – Hydro International First Defense Model FD-3HC Maintenance and Management Inspection Checklist

Project: Stewart's Shops - Highland

Location: 3733 US Highway 9W – Highland, NY 12528

Site Status: \_\_\_\_\_

Date/Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Hydrodynamic Separator (Tri-Annual Initial Year/Bi-Annual Follow On Years)		
Condition of concrete		
a. Cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebar exposed)		
d. Joint failures		
e. Water tightness		
Excessive sediment accumulation		
Depth of floatables		
Hydrocarbons requiring removal		

**Comments:**

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**Actions to be Taken:**

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## 6.0 EXHIBITS



SITE VICINITY MAP  
SCALE: 1" = 200'



FLOW PATH DA1

22' SHEET FLOW - DENSE GRASS @ 2.0% [4.8 MINUTES]  
TOTAL  $T_c$  = 3.5 MINUTES → MIN.  $T_c$  FOR MODELING = 6.0 MINUTES

FLOW PATH DA2

72' SHEET FLOW - DENSE GRASS @ 2.5% [11.4 MINUTES]  
28' SHEET FLOW - PAVEMENT @ 2.0% [0.5 MINUTES]  
28' SHALLOW CONC. FLOW - PAVEMENT @ 0.5% [0.3 MINUTES]  
TOTAL  $T_c$  = 12.2 MINUTES

FLOW PATH DA3

72' SHEET FLOW - DENSE GRASS @ 2.5% [5.6 MINUTES]  
28' SHEET FLOW - PAVEMENT @ 10.0% [3.1 MINUTES]  
TOTAL  $T_c$  = 8.7 MINUTES

FLOW PATH DA4

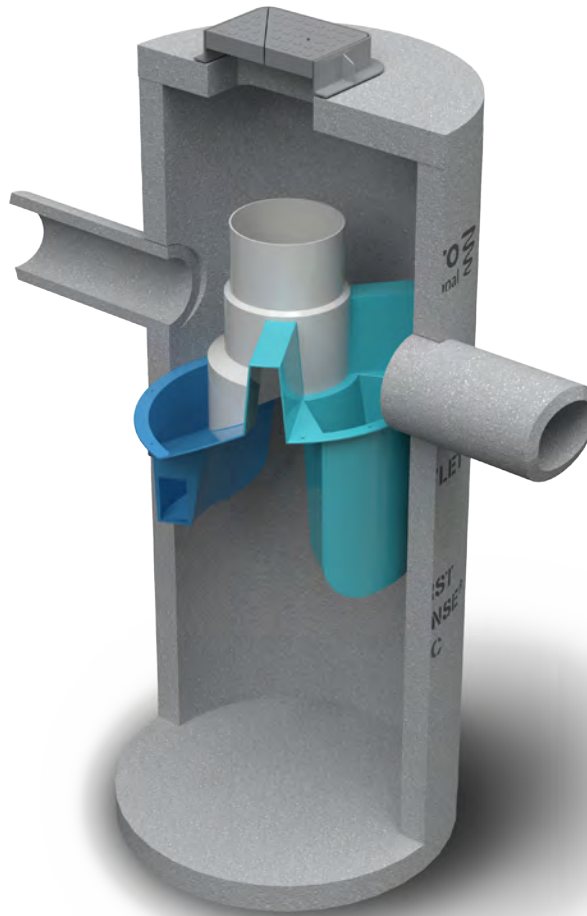
56' SHEET FLOW - DENSE GRASS @ 4.8% [7.2 MINUTES]  
158' SHALLOW CONC. FLOW - PAVEMENT @ 3.0% [0.7 MINUTES]  
7' SHALLOW CONC. FLOW - DENSE GRASS @ 37.0% [0.0 MINUTES]  
113' CHANNEL FLOW - GRASS CHANNEL @ 0.6% [0.7 MINUTES]  
TOTAL  $T_c$  = 8.6 MINUTES

DISCHARGE POINT #1  
(DPI)

DISCHARGE POINT #2  
(DP2)



	STORE NAME, ABBREVIATION & NO.		HIGHLAND - HGLK - 471	
	SITE LOCATION		3733 US HIGHWAY 9W, HIGHLAND, NY 12528	
	DATE	NO.	REVISIONS	
ALTERATIONS TO THIS DOCUMENT BY OTHER THAN AN AUTHORIZED LICENSED PROFESSIONAL ENGINEER IS ILLEGAL AND A VIOLATION OF THE NEW YORK STATE EDUCATION LAW				DRAWN BY: SEK SCALE: AS SHOWN DATE: 4/26/21
		SARATOGA SPRINGS, NY 12866 TEL. (518)581-1200 FAX (518)581-1201		DRAWING NO. SWPPP-2
		TITLE POSTDEVELOPMENT SUBCATCHMENTS		



## Operation and Maintenance Manual

**First Defense® and First Defense® High Capacity**

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Vortex Separator for Stormwater Treatment

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FIRST DEFENSE® BY HYDRO INTERNATIONAL

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**DISCLAIMER:** Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc’s First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

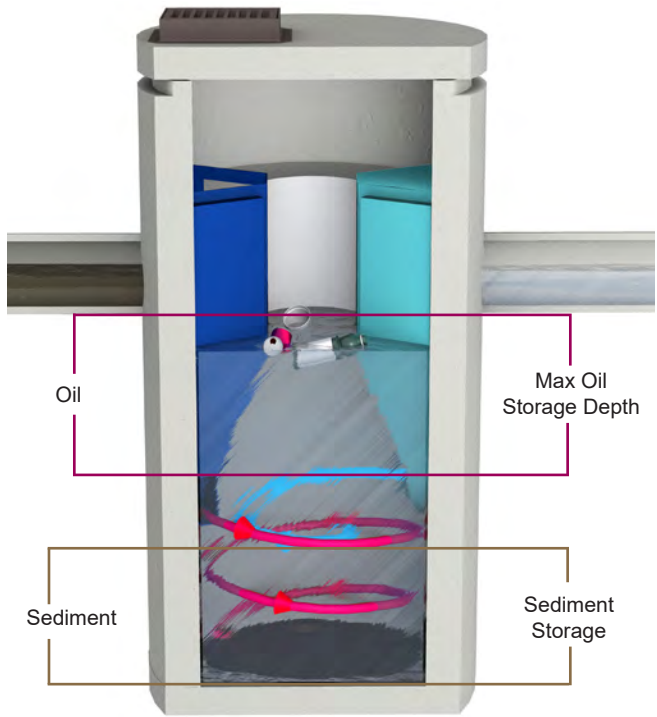


Fig.1 Pollutant storage volumes in the First Defense®.



II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. Built-In Bypass

2. Inlet Pipe

3. Inlet Chute
4. Floatables Draw-off Port

5. Outlet Pipe

6. Floatables Storage
7. Sediment Storage

8. Inlet Grate or Cover

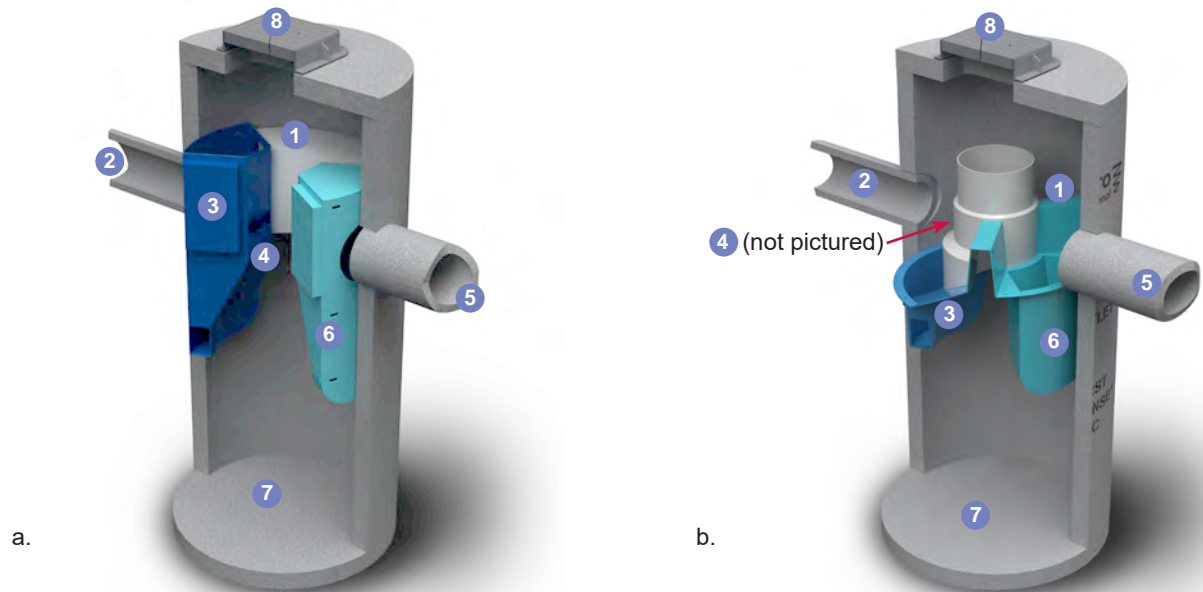


Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates	Peak Online Flow Rate	Maximum Pipe Diameter¹	Oil Storage Capacity	Typical Sediment Storage Capacity²	Minimum Distance from Outlet Invert to Top of Rim³	Chamber Depth
		NJDEP Certified						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd³ / m³)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.85 / 24.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.75 / 1.14
FD-4HC	4 / 1.2	1.50 / 42.4	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	5.00 / 1.52
FD-5HC	5 / 1.5	2.35 / 66.2	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.25 / 1.60
FD-6HC	6 / 1.8	3.38 / 95.7	32 / 906	30 / 750	496 / 1878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	6.25 / 1.90
FD-7HC	7 / 2.1	4.60 / 130.2	40 / 1133	42 / 1067	750 / 2839	2.1 / 1.9	3.0 - 5.5 / 0.9 - 1.7	7.25 / 2.20
FD-8HC	8 / 2.4	6.00 / 169.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	8.00 / 2.43

¹Contact Hydro International when larger pipe sizes are required.  
²Contact Hydro International when custom sediment storage capacity is required.  
³Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

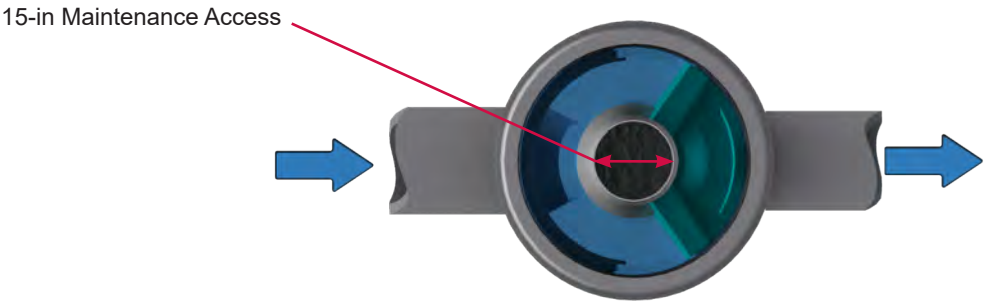


Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.
6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid.
8. Take down safety equipment.
9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.
- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.



Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.
9. Securely replace the grate or lid.



Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	





First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE:    /    /

MODEL SIZE (CIRCLE ONE):    FD-3HC    FD-4    FD-4HC    FD-5HC    FD-6    FD-6HC

FD-7HC    FD-8HC

INLET (CIRCLE ALL THAT APPLY):    GRATED INLET (CATCH BASIN)    INLET PIPE (FLOW THROUGH)



First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments



## Stormwater Solutions

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Fax: (207) 756-6212

[stormwaterinquiry@hydro-int.com](mailto:stormwaterinquiry@hydro-int.com)

[www.hydro-int.com](http://www.hydro-int.com)

Turning Water Around...®

FDHC\_O+M\_H\_1703

Project # \_\_\_\_\_

Sheet # 1 of 2Page # 1 of 2Created By: S. KitchnerDate: 5/5/2021

Checked By: \_\_\_\_\_

Date: \_\_\_\_\_

Revised By: \_\_\_\_\_

Date: \_\_\_\_\_

Checked By: \_\_\_\_\_

Date: \_\_\_\_\_

Project: **Stewart's Shops - Highland**Subject: **Estimated O&M Costs****Estimated Annual Operation and Maintenance Costs Associated with the Stormwater Management Practices (SMPs)**

Estimated Frequency	Maintenance Item	Unit of Measurement	Unit Cost	Estimated Quantity	Cost	Maintenance Interval (Years)	Frequency (Per Year)	Annual Cost
Annual	Inspection and Report by Qualified Professional	Each	\$1,500.00	1	\$1,500.00	1	1.00	\$1,500
	Rain Event Inspection (3" in 24 hour storm)	Each	\$500.00	1	\$500.00	1	1.00	\$500
	Clean, Remove and dispose of sediment/oil from Hydrodynamic Separator	Crew Day	\$2,000.00	1	\$2,000.00	1	1.00	\$2,000
		Disposal	\$1,000.00	1	\$1,000.00	1	1.00	\$1,000
10-Year <sup>2</sup>	Clean, Remove and dispose of Sediment From Closed Drainage System/Subsurface Detention System and Bioretention Filter	Crew Day	\$1,500.00	1	\$1,500.00	10	0.10	\$150
		Disposal	\$1,000.00	1	\$1,000.00	10	0.10	\$100
	Repair Private Closed Drainage System	Lump Sum	\$5,000.00	1	\$5,000.00	10	0.10	\$500

Subtotal: **\$5,750**Contingency (15%): **\$863**Total: **\$6,613**

(1) Included in landscaping contract

(2) Detailed maintenance guidelines are provided in the NYSDEC Stormwater Design Manual and Stormwater Pollution Prevention Plan developed for this project.

(3) Estimated annual costs should be adjusted for inflation, recommend 3% annually (costs are in 2019 dollars)

**Estimated Total Annual Cost<sup>3</sup> Say: \$6,700**

Project # \_\_\_\_\_

Sheet # 2 of 2 Page # 2 of 2Created By: S. Kitchner Date: 5/5/2021

Checked By: \_\_\_\_\_ Date: \_\_\_\_\_

Revised By: \_\_\_\_\_ Date: \_\_\_\_\_

Checked By: \_\_\_\_\_ Date: \_\_\_\_\_

Project: **Stewart's Shops - Highland**Subject: **Estimated O&M Costs****Suggested Annual Funding Accounting for Inflation**Estimated Annual Cost: **\$6,613**

Year	Inflation Rate			
	2.50%	2.75%	3.00%	4.00%
2021	\$6,613	\$6,613	\$6,613	\$6,613
2022	\$6,778	\$6,794	\$6,811	\$6,877
2023	\$6,947	\$6,981	\$7,015	\$7,152
2024	\$7,121	\$7,173	\$7,226	\$7,438
2025	\$7,299	\$7,370	\$7,442	\$7,736
2026	\$7,481	\$7,573	\$7,666	\$8,045
2027	\$7,668	\$7,781	\$7,896	\$8,367
2028	\$7,860	\$7,995	\$8,133	\$8,702
2029	\$8,057	\$8,215	\$8,377	\$9,050
2030	\$8,258	\$8,441	\$8,628	\$9,412
2031	\$8,465	\$8,673	\$8,887	\$9,788
2032	\$8,676	\$8,912	\$9,153	\$10,180
2033	\$8,893	\$9,157	\$9,428	\$10,587
2034	\$9,115	\$9,409	\$9,711	\$11,010
2035	\$9,343	\$9,667	\$10,002	\$11,451
2036	\$9,577	\$9,933	\$10,302	\$11,909
2037	\$9,816	\$10,206	\$10,611	\$12,385
2038	\$10,062	\$10,487	\$10,929	\$12,880
2039	\$10,313	\$10,776	\$11,257	\$13,396
2040	\$10,571	\$11,072	\$11,595	\$13,932
2041	\$10,835	\$11,376	\$11,943	\$14,489
2042	\$11,106	\$11,689	\$12,301	\$15,068
2043	\$11,384	\$12,011	\$12,670	\$15,671
2044	\$11,668	\$12,341	\$13,050	\$16,298
2045	\$11,960	\$12,680	\$13,442	\$16,950
2046	\$12,259	\$13,029	\$13,845	\$17,628
2047	\$12,566	\$13,387	\$14,260	\$18,333
2048	\$12,880	\$13,755	\$14,688	\$19,066
2049	\$13,202	\$14,134	\$15,129	\$19,829
2050	\$13,532	\$14,522	\$15,583	\$20,622