

CIVIL ENGINEERING
ENVIRONMENTAL
SURVEYING
LANDSCAPE ARCHITECTURE
GEOTECHNICAL

STORMWATER
MANAGEMENT
MAINTENANCE MANUAL

Clinton Commons
Block 14 Lots 32,
Town of Clinton, Hunterdon County,
New Jersey

Prepared For:
Clinton Moebus 34, LLC
123 Route #33 East, Suite 204
Manalapan, New Jersey 07726

May 24, 2021

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PART II - FIELD MANUALS AND MAINTENANCE RECORDS

Field Manual for Surface Infiltration Basin (SWM-1) & Sand Filter (SWM-2)
Maintenance Logs and Inspection Records

Field Manual for Up-Flo Filter. (SWM-3)



PARTY RESPONSIBLE FOR MAINTENANCE:

Clinton Moebus 34, LLC
Address: C/O David Meiskin, 9 kent place, freehold, nj 07728
Contact Person(s): David Meiskin
Phone: 908-415-8900

This plan is recorded in

Deed Book # _____ Page # _____ with _____ County Clerk on Date _____

Last Revised on ____/____/____



PART I - MAINTENANCE PLAN

1. LIST OF STORMWATER MANAGEMENT MEASURES

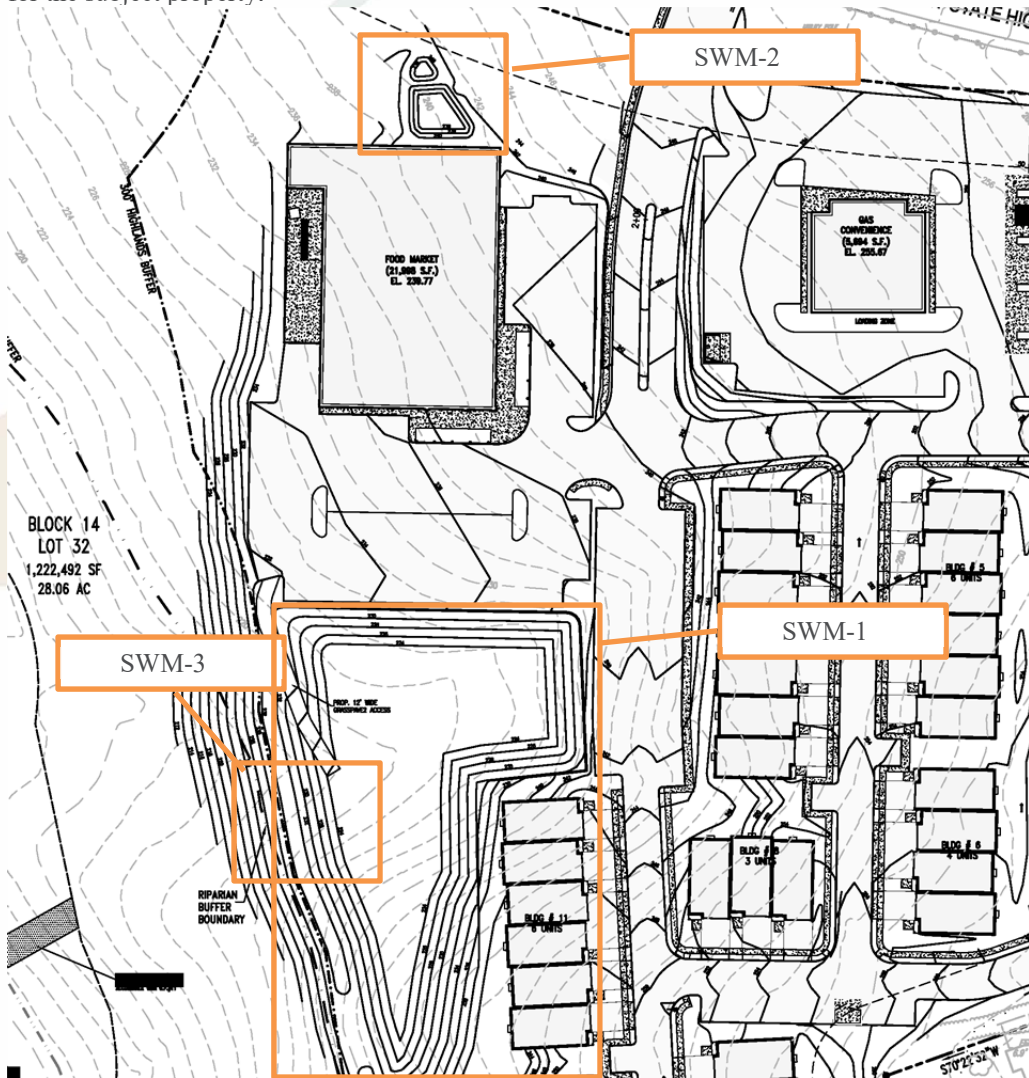
The stormwater management measures incorporated into this development are listed below. The corresponding Field Manuals for the stormwater management measures are located in Part II of the Maintenance Plan.

Type of Stormwater Management Measure	BMP No.	Location Description	State Plan Coordinates / Lat., Long.
Surface Infiltration Basin	SWM-1	Western section of site	N(Y): 658,849 E(X): 378,997
Sand Filter	SWM-2	Northwestern section of site	
Up-Flo Filter	SWM-3	Western Section of Site	N(Y):658,805 E(X): 378,906



2. LOCATION MAP

The map below shows the proposed site improvements and stormwater management measures for the subject property.



BMP No.	Type of Stormwater Management Measure
SWM-1	Surface Infiltration Basin
SWM-2	Sand Filter
SWM-3	Up-Flo Filter structure

3. DESCRIPTION OF STORMWATER MANAGEMENT MEASURES

Surface Infiltration Basin (SWM-1)

Design storm:

- Design Purposes:
 - o Water Quality and Ground Water Recharge
 - o 1.25 inches in 2 hours;
Max WSE: 225.72
Drain Time: 17.78 hours
 - o 2-year storm in 24 hours (3.38 inches)
Max WSE: 227.02
Drain Time: 42.00 hours
 - o 10-year storm in 24 hours (5.0 inches)
Max WSE: 228.10
Drain Time: 42.00 hours
 - o 100-year storm in 24 hours (8.03 inches)
Max WSE: 229.45
Drain Time: 42.00 hours
- Dimensions: 250' (Length) x 170' (Width) x 5.5' (Depth)



4. PREVENTATIVE AND CORRECTIVE MAINTENANCE ACTION PLAN

Preventative Maintenance Actions


Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	Vegetation mowing and removal in growing season.	SWM-1, SWM-2
Quarterly	Trash and debris should be removed immediately as required. Also applies after major storms in excess of 1 inch of rainfall.	SWM-1, SWM-2
Quarterly	Remove weeds and other unwanted vegetation growth in accordance with the landscape plan included with the development drainage for the project site.	SWM-1, SWM-2
Annually	Inspect outflow for evidence of scour and erosion, repair as necessary. Inspect for unwanted vegetative growth. Inspect all structural components for cracking, subsidence, spalling, erosion, and deterioration. Make necessary repairs or corrective action. Inspect discharge location (overflow) and ensure stability of grate and remove trash/debris.	SWM-1, SWM-2
Biennial	Replace the sand layer.	SWM-1, SWM-2
All Times	No heavy equipment all be permitted on the basin surface.	SWM-1, SWM-2
Unscheduled	Quick inspection after every 1" rain and recheck to determine if there is water standing after 72 hours.	SWM-1, SWM-2

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
Repair/replacement of eroded or damaged riprap apron.	SWM-1, SWM-2
Repair/replacement of missing or damaged trash rack.	SWM-1, SWM-2
Revegetation of eroded side slope.	SWM-1, SWM-2
The maximum 'allotted time' for a detention system to drain is 72 hours. If at any time the systems fail to drain within the 'allotted time', immediate corrective measures shall be employed.	SWM-1, SWM-2

- Vegetation health should be inspected biweekly during the first growing season or until vegetation is established. Once, established, these inspections should be continued at least twice annually. Vegetative cover should be maintained at 85%, and if the area vegetation has greater than 50% damage, the area should be reestablished in accordance





with the original specifications. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible. At least one full growing season should have elapsed prior to strip functioning as part of the stormwater management system.

5. INSPECTION AND LOGS OF ALL PREVENTATIVE AND CORRECTIVE MAINTENANCE

Inspection Checklists in the Field Manual for the stormwater management measures on this site include:

- Surface Detention Basin Field Manual

The logs of all inspections, and both preventative and corrective maintenance performed should be attached in the “**Maintenance Logs and Inspection Records**” section. See Part II of the Maintenance Plan

6. MAINTENANCE PERSONNEL, EQUIPMENT, TOOLS, AND SUPPLIES

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
Access cover lifting tool	2
Gloves and safety shoes	2 per employee
Flashlight	2
Safety Cones and/or caution tape	10
Hard Hats and Safety Glasses	1 per employee
Proper Safety Equipment for confined space entry	As needed



7. COST ESTIMATE

General cost for routine maintenance (e.g., quarterly maintenance)

Cost Type	Cost Per Task	No. Time/Year	No. of Components	Total Yearly Cost Estimate
Trim and Mow Grass and Vegetation in stormwater management areas	\$200	8	1	\$1,600
Inspect basin outlets control structures for trash, debris, and sediment (clean/remove as necessary)	\$125	4	1	\$600
Biennial sand replacement	\$3,200		1	\$3,200

General cost – unscheduled maintenance in a year (e.g., inspection after 1 inch of rain)

The frequency of large storm events that require routine maintenance varies from year to year. Therefore, it is possible that the estimated quantities of tasks shown above will vary. In these cases, the ‘Cost per Task’ column may be used to estimate single unscheduled tasks.

8. SAFETY MEASURES AND PROCEDURES

As per NJDEP BMP Manual, procedures and equipment are required to protect the safety of inspection and maintenance personnel.

Qualification for Performing Maintenance in Special Circumstances

Maintenance tasks that require the entry of inlet/outlet structures, manholes, or MTDs are required to be performed by qualified personnel that have the necessary Occupational Safety and Health Administration (OSHA) Confined-Space Entry training and certification.

Safety Procedures

Observational monitoring maintenance of the proposed infiltration basin shall be carried out with the following safety precautions:

- Check for hazardous odors or gasses
- Check for sharp or dangerous debris or trash
- Wear all recommended safety equipment
- Establish traffic cones/signs/caution tape around work area



Maintenance personnel shall follow all other procedures required by local, state, and federal laws and regulations, and the safety instructions provided by the equipment or device manufacturers.

Training Plan and Records

As per NJDEP BMP Manual Ch. 8 (February 2004), maintenance training begins with a basic description of the purpose and function of the overall stormwater management measure and its major components. Such understanding will enable maintenance personnel to provide more effective component maintenance and more readily detect maintenance-related problems. Depending on the size, character, location, and components of each stormwater management measure, maintenance personnel may also require training in specialized inspection and maintenance tasks and/or the operation and care of specialized maintenance equipment. Training should also be provided in the need for and use of all required safety equipment and procedures.

Safety Training

Types of Training:

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable

Content of Training:

- Stormwater Management Basic Training - Purposes and Functions of BMPs. Example Training Material:
 - NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
 - Chapter 9.1 Detention Systems
 - Chapter 9.2 Constructed Wetlands
 - Chapter 9.3 Dry Wells
 - Chapter 9.4 Extended Detention Basins
 - Chapter 9.5 Infiltration Basins
 - Chapter 9.6 Manufactured Treatment Devices
 - Chapter 9.7 Pervious Paving Systems
 - Chapter 9.8 Rooftop Vegetated Cover
 - Chapter 9.9 Sand Filters
 - Chapter 9.10 Vegetative Filter Strips
 - Chapter 9.11 Wet Ponds
 - Chapter 9.12 Grass Swales
 - Chapter 9.13 Subsurface Gravel Wetlands

More training information is available at NJ Stormwater.org
(<http://www.nj.gov/dep/stormwater/training.htm>)

- Vegetation Care. Example Training Material:



- NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping (provides information on vegetation and landscaping for stormwater management measures)
- Other
- Field Manual Usage Training. Example Training Material:
 - Field Manuals attached to this Maintenance Plan
 - Other
- Equipment and Tools Operation Training. Example Training Material:
 - Equipment or tool manufacturer's Operation & Maintenance Manual
 - Other
- Occupational Safety Training. Example Training Material:
 - OSHA Training
 - Equipment or tool manufacturer's Operation & Maintenance Manual
 - Other

9. TRAINING PLAN AND RECORDS

I. Training Plan

Types of Training

- Mandatory Stormwater Management Basic Training and Field Manual Usage Training for new maintenance crews
- Occupational Safety Training
- Subcontractor training, if applicable

Content of Training

- **Stormwater Management Basic Training**
 - Purposes and Functions of BMPs

Example Training Material

- NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
 - Chapter 9.4 Extended Detention Basins
 - Chapter 9.7 Pervious Paving Systems
 - Chapter 9.10 Vegetative Filter Strips
 - Chapter 9.12 Grass Swales

More training information is available at NJ Stormwater.org (<http://www.nj.gov/dep/stormwater/training.htm>)

- Vegetation Care

Example Training Material

- NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping (*provides information on vegetation and landscaping for stormwater management measures*)
- Other



- Field Manual Usage Training

Example Training Material

- Field Manuals attached to this Maintenance Plan
- Other

- Equipment and Tools Operation Training

Example Training Material

- Equipment or tool manufacturer's Operation & Maintenance Manual
- Other

- Occupational Safety Training

Example Training Material

- OSHA Training
- Equipment or tool manufacturer's Operation & Maintenance Manual
- Other

II. Training Records

Training attendance sheets should be attached by the responsible party after each training.



10. ANNUAL EVALUATION OF THE EFFECTIVENESS OF THE PLAN

Per N.J.A.C. 7:8-5.8(g), the Responsible Party designated at the beginning of this report shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan as needed.

The Responsible Party shall evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The following items shall be evaluated at a minimum:

- Whether inspections have been performed as scheduled;
- Whether preventive maintenance has been performed as scheduled;
- Whether the frequency of preventative maintenance needs to increase or decrease;
- Whether the planned resources were enough to perform the maintenance;
- Whether repairs were completed on time;
- Whether the actual cost was consistent with the estimated cost;
- Whether inspection, maintenance, and repair records have been kept.

If actual performance of these items has deviated from the maintenance plan, the Responsible Party should find the causes and implement solutions in a revised maintenance plan.

The following shall be provided to the township engineer prior to April 1st of each year:

- All inspection reports of prior years,
- Description of all maintenance performed on all components of SWM system during prior year.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision



11. DOCUMENTS

The following documents shall be attached prior to issuance of Certificate of Occupancy:

Transfer Agreement

As per N.J.A.C. 7:8-5.8(b), if the maintenance plan identifies a person other than the developer as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

Deed

As per N.J.A.C. 7:8-5.8(d), if the person responsible for maintenance is not a public agency, the maintenance plan and any future revisions shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

As-Built Drawings with Drainage Plans

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), as-built construction plans of the stormwater management measure and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates should be included in this Maintenance Plan.

Landscaping Plan for the Stormwater Management Measures

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if there is a Landscaping Plan for the stormwater management measures, it should be included in this Maintenance Plan.

Permeability Test/Infiltration Test Report

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a permeability test or infiltration test is required and available, the reports for pre-construction and post-construction testing should be included in this Maintenance Plan.

Groundwater Mounding Analysis

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), if a groundwater mounding analysis is required and the groundwater mounding analysis was performed, a copy of the analysis should be included in this Maintenance Plan.

Soil Boring Logs

As per NJDEP BMP Manual Ch.8 (Feb., 2004), if any soil borings were taken prior to construction, a copy of the soil boring logs should be included in this Maintenance Plan.

Local, State, Federal Permits

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information.

The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a



basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

Check Maintenance Guidance in NJDEP Stormwater Management Website for details and links to the relevant permits and program areas (<http://www.njstormwater.org>).

Safety Regulations and Requirements

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), all local ordinances and state and federal regulations regarding occupational safety should be included in this Maintenance Plan.

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), maintenance, repair, and replacement instructions for specialized, proprietary, and nonstandard equipment, tools, supplies, manufacturers' product instructions, and user manuals should be included in this Maintenance Plan.



PART II - FIELD MANUALS

Attachment of Field Manuals for Stormwater Management Measures on this Site

As per N.J.A.C. 7:8-5.8(b)&(e), preventative and corrective maintenance shall be performed to maintain the function of stormwater management measures, including repair or replacement of the structure; removal of sediment, debris or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; repair or replacement of non-vegetated linings, and removal of rodent/wildlife and repair/restoration to damaged affected areas caused by them.

Each Field Manual attached to this Maintenance Plan is a separate document pertaining to one specific stormwater management measure, and should be used by inspections and maintenance crews in order to carry out the maintenance work required by N.J.A.C. 7:8-5.8(e). Design engineers should prepare the field manuals in accordance with the design of each measure and the specific requirements of the site. See the sample field manuals for further guidance.

Field Manual for Surface Infiltration Basin (SWM-1)



Maintenance Logs and Inspection Records

As per N.J.A.C. 7:8-5.8(e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure(s), including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per N.J.A.C. 7:8-5.8(f), the person responsible for maintenance shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

The responsible party shall maintain a record of all maintenance actions performed, including:

- Inspection checklists from each performed inspection
- Preventative maintenance logs
- Corrective maintenance logs, including work orders
- Other maintenance records



SURFACE INFILTRATION BASIN FIELD MANUAL

Development Name: Clinton Moebus 34, LLC

Township, County: Town of Clinton, Hunterdon County, New Jersey

Location of Basin: E(X): 378,997; N(Y): 658,849

Location Description: Western Section of Site

Location Map

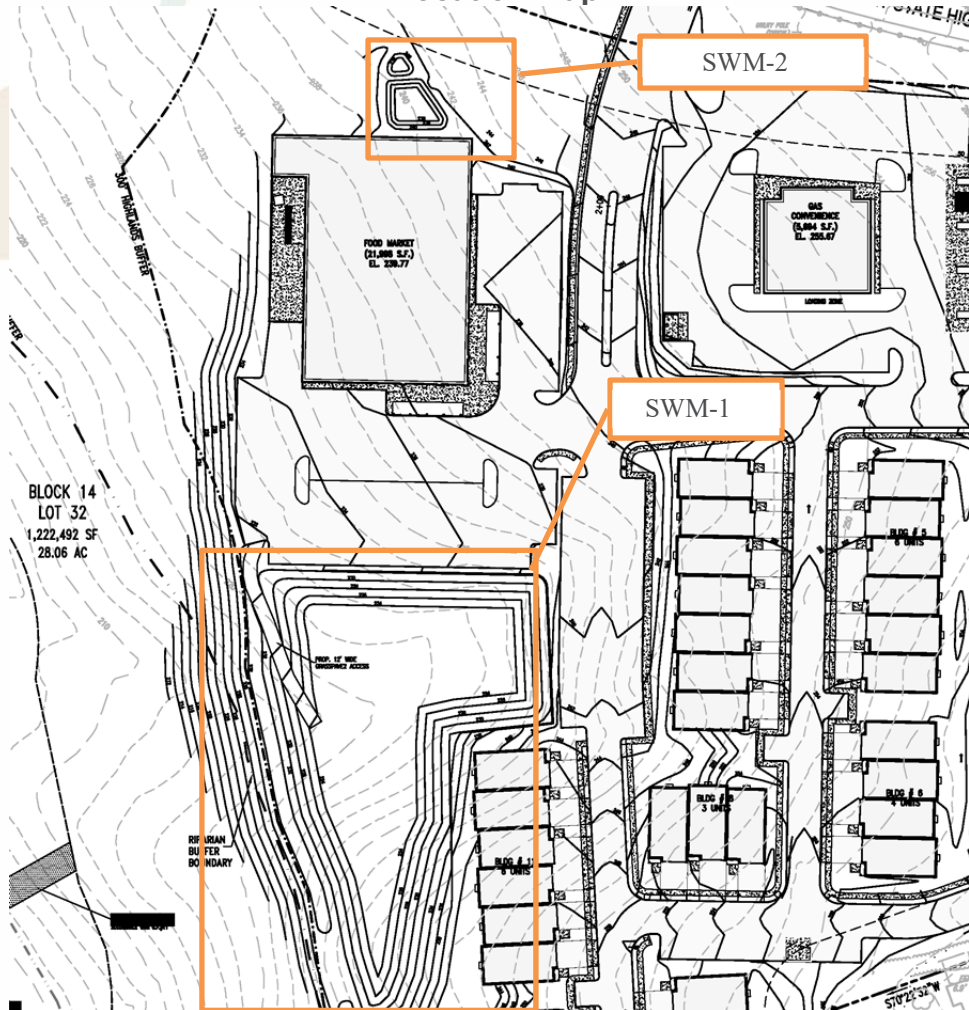




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1. SURFACE INFILTRATION BASIN OVERVIEW

Functionality

An infiltration basin is a stormwater management facility constructed of highly permeable soils, which provides temporary storage of stormwater runoff. Infiltration basins are used to remove pollutants and to infiltrate stormwater. In addition to pollutant removal and groundwater recharge, infiltration may help to reduce increases in both the peak rate and total runoff volume caused by land development. Pollutant removal is achieved through filtration of the runoff through the soil, as well as biological and chemical activity within the soil. The total suspended solids (TSS) removal rate attributed to infiltration basins is 80%.

Proper care and attention in the long-term maintenance of the stormwater management measure is critically important to the safety and health of the public.

Type of BMP – Dry Basin / Infiltration Only

An infiltration basin is a type of *dry* basin. Dry basins must fully drain within 72 hours of the most recent rainfall. Standing water in excess of 72 hours is a sign of basin failure. It may also contribute to mosquito breeding and other health and safety issues. The design drain time shall be closely monitored to ensure that potential failure is recognized early.

This surface infiltration basin is designed for **infiltration only** and is **not** designed for extended detention.



2. BASIN DESIGN INFORMATION

Hydrology Design Targets:

1. This basin is designed with a subsoil permeability rate of 2.74 inches/hour (pre-construction) and _____ inches/hour (post-construction)
2. The **design drain time** is 1.37 hours (Water Quality Storm)
3. The **design drain time** is 42.00 hours (100-Year Storm)
4. The elevation of the seasonal high-water table of this basin was observed on 2/17/20 and it was 10.58 feet below the basin bottom surface, at EL. 210.91 feet.
5. This basin will be discharged to a point in the Western section of the site to ex-stream, 360 feet away from the proposed infiltration basin.

Hydraulic Design Targets:

1. This basin is designed to infiltrate the runoff from the Water Quality Design storm, which generates 30,560 cubic feet of runoff.
2. The invert elevation of the outlet for the design storm is at EL. 225.55 feet. The water surface elevation is at EL. 225.41 feet.
3. The emergency spillway is at EL. 229.50 feet.

Basin Configuration Targets:

1. Pretreatment to the stormwater runoff is provided by overland flow through vegetated area.
2. The basin bottom is covered by a sand layer.
 - The depth of the sand layer is 6 inches, which requires a volume of 8,809 cubic feet of sand.
 - The invert elevation of the sand layer is EL. 224.00 feet
 - The sand layer is designed to be replaced every 24 months.
3. Vegetation
 - The top of sand bed has been designed to have no vegetation. The side slopes of the basin are to be seeded.
4. Outlet Structure Configuration

Outlet Description	Outlet Type	Orifice Size / Weir Length	Invert Elevation
Outlet #1	Orifice	14.0"	225.55
Outlet #2	Orifice	41.0"	226.90
Outlet #3	Spillway	50'	229.50
Outlet #4	Culvert / Discharge Pipe	30"	217.70





Critical Maintenance Features:

1. No heavy equipment on the basin surface or sand layer.
2. Trash racks and discharge outlet shall be cleaned frequently.
3. Grass clipping shall be collected from the basin and properly disposed.

3. VISUAL AID FOR DRY TYPE STORMWATER BASIN INSPECTION



Issue:	The inlet is not properly drained, assuming it has not rained within 72 hours.
Corrective Action:	Clear and remove sediment. Check whether the water table is at or above the bottom of the forebay. Also check the permeability of the underlying soil, if necessary.
Preventative Action:	Routine inspections and removal of sediment from the forebay.



Courtesy of NJDOT

- Issue:** The Inflow pipe is clogged by sediment and vegetation.
- Corrective Action:** Clear and remove sediment and unwanted vegetation.
- Preventative Action:** Routine inspection and removal of sediment and unwanted vegetation.



Courtesy of NJDOT

- Issue:** The Inflow pipe is entirely clogged by sediment and trees.
- Corrective Action:** Clear and remove sediment and trees.
- Preventative Action:** Routine inspection & removal of sediment and unwanted vegetation.



Issue:

The excessive sediment in inflow pipe (shown above) might be caused by a blockage of flow to the basin due to excessive vegetation and overgrown trees.

Corrective Action:

Clear and remove trees and vegetation. If necessary, re-grade the bottom slope to ensure the flow properly spreads over the basin bottom.

Preventative Action:

Routine inspection and removal of sediment and unwanted vegetation.



- | | |
|-----------------------------|---|
| Issue: | Eroded inflow apron. |
| Corrective Action: | Repair apron. |
| Preventative Action: | Routine inspection and rehabilitation, if necessary. |



Issue:

The vegetation loss and the blackish soil may indicate frequent inundation.

Corrective Action:

Check the permeability rate of the soil and the water table elevation.
Replace the soil if necessary.

Preventative Action:

Routine inspection and tilling/aeration, if necessary.



Issue:

The low flow channel has excessive accumulation of sediment and debris. The outflow orifice is clogged by a trash bag and debris. Note that there is no trash rack installed.

Corrective Action:

Check the permeability rate of the soil and the water table elevation.
Replace the soil if necessary.

Preventative Action:

Routine inspection and cleaning.



Issue:	Trash rack is damaged.
Corrective Action:	Repair the trash rack.
Preventative Action:	Routine inspection, especially after large storm events. Tighten any loose bolts and repair structural flaws.



A well-maintained detention basin

4. REFERENCE DOCUMENTS

Documents to be placed in this field manual should include the following:

- As-built Drawings with Drainage Plans
- Soil Boring Logs

5. INSPECTION CHECKLIST / MAINTENANCE ACTIONS FOR SURFACE INFILTRATION BASIN

Checklist (circle one): Quarterly / Annual / Monthly / Special Event Inspection

Checklist No. _____ **Inspection Date:** _____

Date of most recent rain event: _____

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

The inspection items and preventative/corrective maintenance actions listed below represent general requirements. The design engineer and/or responsible party shall adjust the items and actions to better meet the conditions of the site, the specific design targets, and the requirements of regulatory authorities.



		For Inspector	For Maintenance Crew
A Infiltration Bed	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours.	Y__ N__ Recheck to determine if there is standing water after 72 hours. If standing water is present longer than 5 days, report to mosquito commission. Remove any sediment buildup. Replace the sand layer. Work Order # _____
	2	Excessive sediment, silt, or trash accumulation on basin bed	Y__ N__ Clean pretreatment system. Remove silt, sediment, and trash. Work Order # _____
	3	Erosion or channelization is present	Y__ N__ Check whether the flow bypass or diversion device is clogged. Re-grade the infiltration bed. Work Order # _____
	4	Animal burrows/rodents are present	Y__ N__ Pest control. Work Order # _____
	5	Uneven bed	Y__ N__ Use light equipment to resurface the bed. Work Order # _____
	6	Evidence of sinkholes or subsidence	Y__ N__ Monitor for sinkhole development
Note:			



		For Inspector	For Maintenance Crew
B Vegetation	1	Large spot(s) showing bare soil	Y__ N__ Vegetative cover must be maintained at 85%. Revegetate the entire basin if 50% or more vegetation has been lost Check Landscaping plan for guidance (if available) Work Order # _____
	2	Overgrown vegetation	Y__ N__ Mow/trim the vegetation Work Order # _____
	3	Tree growth in the basin	Y__ N__ Clear, trim, or prune the trees according to the original Landscaping Plan Inspect to determine if the tree roots caused any structural damage Work Order # _____

Note:



		For Inspector		For Maintenance Crew
C Basin Embankment and Side Slopes	1	Signs of erosion, soil slide or bulges, seeps and wet spots, loss of vegetation, or erosion on the basin slope	Y__ N__	Check for excessive overland runoff flow through the embankment. Check for any sink hole development Direct the overland runoff to the forebay or pretreatment area Re-stabilize the bank Work Order # _____
	D Outlet	1	Trash or debris accumulation more than 20%	Y__ N__
	2	Trash rack is damaged or rusted greater than 50%	Y__ N__	Repair or replace trash rack Work Order # _____
	3	Trash rack is bent, loose, or missing parts	Y__ N__	Repair or replace component Work Order # _____
	4	Outlet components (e.g., orifice plates or weir plate) skewed, misaligned, or missing	Y__ N__	Repair or replace component Work Order # _____
	5	Discharge pipe apron is eroded or scoured	Y__ N__	Re-stabilize the discharge riprap apron Work Order # _____
		Standing water is present in the outlet structure longer than 72 hours	Y__ N__	Pump out the standing water Work Order # _____
Note:				



	For Inspector		For Maintenance Crew	
E Emergency Spillway	1	Trees or excessive vegetation present	Y__ N__	Remove trees and roots, and restore berms if necessary Work Order # _____
	2	Damaged structure	Y__ N__	Repair Work Order # _____
F Miscellaneous	1	Fence: broken or eroded parts	Y__ N__	Repair or replace Work Order # _____
	2	Gate: missing gate or lock	Y__ N__	Repair or replace Work Order # _____
	3	Sign/plate: tiled, missing, or faded	Y__ N__	Repair or replace Work Order # _____
	4	Excessive or overgrown vegetation blocking access to the basin	Y__ N__	Clear, trim, or prune the vegetation to allow access for inspection and maintenance Work Order # _____



	For Inspector	For Maintenance Crew
Note:		

Follow Up Items (Component No. / Inspection Item No.):

Associated Work Orders: # _____, # _____, # _____, # _____, # _____

Inspector Name

Signature

Date

Report issues to the local authority and mosquito commission as required by local ordinances and regulatory authorities.

File this checklist in the Maintenance Log after performing maintenance.



6. PREVENTATIVE MAINTENANCE RECORD

Corresponding Checklist No. _____
 Component No. _____, Inspection Item No. _____

Work Logs

Activities	Components	Date Completed
Sediment/debris removal Sediment removal should be taken place when the basin is thoroughly dry	A – Basin Bed	
	C – Basin Embankment and Side Slopes	
	D – Outlet	
Vegetation removal	A – Basin Bed	
	C – Basin Embankment and Side Slopes	
	C – Outlet	
	E – Emergency Spillway	

Vegetation is removed by _____ with minimum disruption to the remaining vegetation.

All use of fertilizers, pesticides, mechanical treatments, and other means to ensure optimum vegetation health must not compromise the intended purpose of the stormwater management measure. The fertilizer applied is _____, and _____ is applied _____.

Debris, sediment, and trash are handled (onsite / by _____ (contractor name) to disposal site _____). (See Part I: Maintenance Plan – Disposal Plan Section)

Crew member: _____ / _____ **Date:** _____
 (name/ signature)

Supervisor: _____ / _____ **Date:** _____
 (name/ signature)

File this Preventative Maintenance Record in the Maintenance Log after performing maintenance.



7. CORRECTIVE MAINTENANCE RECORD

1. **Work Order #** _____
Date Issued _____
2. **Issue to be resolved:**
3. The issue was from **Corresponding Checklist** ____, **Component No.** ____,
Inspection Item No. ____.

4. **Required Actions**

Actions	Planned Date	Date Completed

5. **Responsible person(s):**

6. **Special requirements**

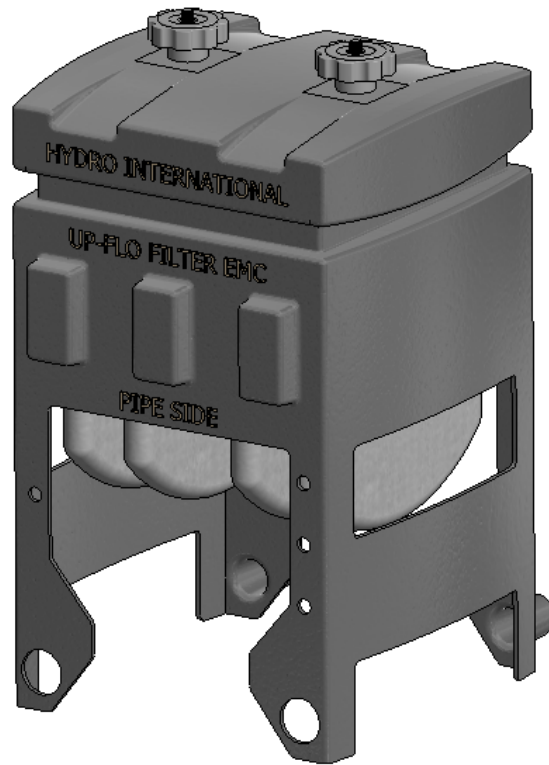
- Time of the season or weather condition _____
- Tools/equipment: _____
- Subcontractor (name or specific type): _____

Approved by _____ / _____ **Date** _____
 (name/signature)

Verification of completion by _____ / _____ **Date** _____
 (name/signature)

File this Corrective Maintenance Record in the Maintenance Log after performing maintenance.





Up-Flo Filter® Extended Maintenance Cartridge Operation and Maintenance Manual

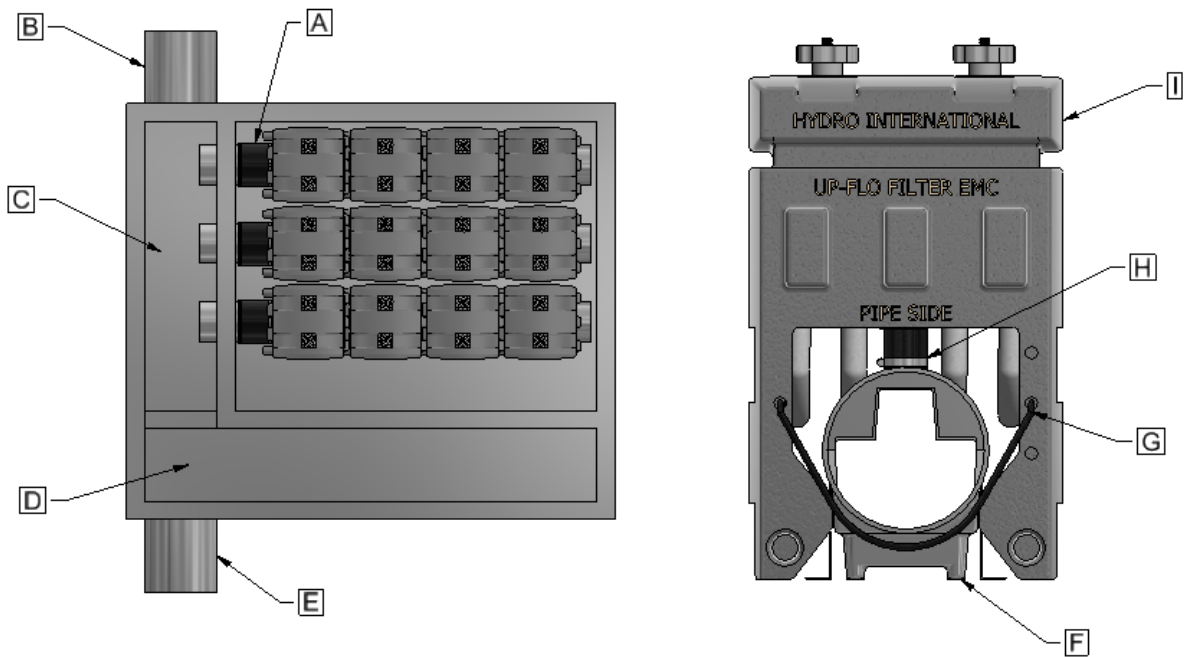
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Overview and Product Description

The Up-Flo® Filter is a modular high-rate stormwater filtration device designed to capture trash, oil, sediment and remove fine pollutants such as particulate metals and nutrients from stormwater runoff. Designed with efficiency, longevity and upkeep in mind, this high performance, low maintenance filter option that offers higher loading rates and longer membrane life for higher quality stormwater for longer periods between servicing. In general, a minimum of two inspections are required per year to monitor sediment and gross pollutant accumulations. In order to achieve an annual TSS removal rate of 80% for the Up-Flo® Filter, the minimum maintenance frequency specified in the maintenance section for replacement of the filter inserts and removal of accumulated sediment from the sump is mandatory.



System Components			
A.	Underdrain Coupling	F.	Underdrain
B.	Outlet Pipe	G.	Cartridge Restraining Cord
C.	Outlet Bay	H.	Cartridge Connection Boot
D.	Inlet Bay	I.	Filter Cartridge
E.	Inlet Pipe		

Figure 1: The Up-Flo® Filter EMC

Operation

Introduction

The Up-Flo® Filter operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirements and is fabricated with durable non-corrosive components. Personnel are not required to operate the unit and maintenance is limited to periodic inspections, sediment and floatables removal and cartridge replacement.

Pollutant Capture

The Up-Flo® Filter is designed to operate as a “treatment train” by incorporating multiple treatment technologies into a single device. Trash and gross debris are removed by sedimentation and screening before they are introduced to the filtration membranes, delaying surface blinding. The Up-Flo® Filter is a wet-sump device. Between storm events, oil and floatables are stored on the water surface separate from the sediment storage volume in the sump.

Best Practices

Good housekeeping upstream of the Up-Flo® Filter can significantly extend maintenance interval. For example, sweeping paved surfaces, collecting leaves and grass trimmings, and protecting bare ground from erosion will reduce loading to the system. The filter cartridges should not be installed until construction activities are complete and site stabilization is effective.

Damage Due to Lack of Maintenance

Delayed maintenance would result in clogged filters. In that situation, an Up-Flo® Filter could go into bypass and there would be no treatment of the incoming stormwater. Replacement of the filter cartridges and removal of sediment from the sump would restore the Up-Flo® Filter to its original treatment efficiency. Establishing and adhering to a regular maintenance schedule ensures optimal performance of the system.

Inspection & Maintenance

Overview

The Up-Flo® Filter protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the proper functioning of the Up-Flo® Filter.

Replacement of filter cartridges must be performed inside the vessel. A vactor truck is required for removal of oils, water, sediment, and to completely pump out the vessel to allow for maintenance inside. If you are not using Hydro International or a trained service provider, you must follow OSHA (or other regional) Confined Space Entry procedures when entering the Up-Flo® vessel.

The minimum required frequency for replacement of the filter cartridges is annually, whereas the minimum required frequency for removal of accumulated sediment from the sump is dependent on the Up-Flo® Filter configuration. Configurations with a larger sediment storage volume per module will require less frequent removal of accumulated sediment. Regardless, whenever sediment depth in the sump is found to be greater than 6 inches (15 cm), sediment removal is required.

Inspection and Maintenance

Routine Inspection

Inspection is a simple process that requires monitoring pollutant accumulations. Maintenance crews should be familiar with the Up-Flo® Filter and its components prior to inspection.

The following instructions are intended for non-Hydro maintenance service providers and/or those intending to maintain their own Up-Flo® Filter:

Routine Inspection Procedures

1. Set up any necessary safety equipment (such as traffic cones) to provide access to the Up-Flo® Filter. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole or vault.
3. Without entering the vessel, look down into the chamber to inspect the inside and to make note of any irregularities.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the chamber.
5. Using a sediment probe such as a Sludge-Judge®, measure the depth of sediment that has collected in the sump of the vessel. Maximum sediment depth is 6 inches (15 cm).
6. 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 or a high standing water level.
7. Securely replace the grate or lid.
8. Remove safety equipment.
9. Contact Hydro International to discuss any irregularities noted during inspection.

Routine Maintenance

The access port located at the top of the manhole or vault provides access to the Up-Flo® vessel for maintenance personnel to enter the vessel and remove and replace filter cartridges. The same access would be used for maintenance personnel working from the surface to vector out sediment, oil, and water (Figure 2). Unless the Up-Flo® Filter has been installed in a very shallow configuration, it is necessary to have personnel with OSHA Confined Space Entry training performing the maintenance that occurs inside the vessel.

Maintenance intervals are determined from monitoring the Up-Flo® Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others.

A vector truck is normally required for oil removal, removal of sediment from the sump, and to dewater the vessel for replacement of the filter cartridges. All inspection and maintenance activities would be recorded in an Inspection and Maintenance Log.

The access port located at the top of the manhole provides unobstructed access for a vector hose and/or skimmer pole to be lowered to the base of the sump.



Figure 2: Sediment is removed from the sump with a vactor hose. Confined space entry is not required for this step.

Maintenance Scheduling

- Call Hydro International to order replacement filter cartridges prior to scheduling maintenance.
- Because filter cartridge replacement requires entry into the Up-Flo® chamber, maintenance events should be scheduled during dry weather.
- Filter cartridge replacement should occur immediately after a contaminated spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc.)
- Crow bar to remove grate or lid
- Vactor truck (flexible hose preferred)
- Pressure nozzle attachment
- OSHA Confined Space Entry Equipment
- Replacement Up-Flo® Filter Cartridges (available from Hydro International)
- Hydro International Up-Flo® Filter Maintenance Log
- Screwdriver (flat head)

Surface Maintenance Procedure

1. Set up any necessary safety equipment (such as traffic cones) around the access of the Up-Flo® Filter. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole or vault.
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Once all floatables and oil have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris from the sump floor.

5. Retract the vacuum hose from the vessel.
6. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oils, and gross debris removed, and the depth of sediment measured. Note any apparent irregularities such as damaged components or blockages.
7. Securely replace the grate or lid. Remove safety equipment.
8. Dispose of sediment and gross debris following local regulations.
9. Dispose of oil and sump water at a licensed water treatment facility or following local regulations.
10. Contact Hydro International to discuss any irregularities noted during cleanout.

Filter Cartridge Replacement

1. Following OSHA or region specific Confined Space Entry procedures, enter the Up-Flo® Filter Chamber.
2. Starting at the end of the filter cartridge row furthest from the Outlet Bay (Figure 1, Item C) remove each Filter Cartridge (Figure 1, Item I) from the Underdrain (Figure 1, Item A) as described below:
 - a. Unfasten Cartridge Restraining Cord (Figure 1, Item G)
 - b. Loosen Cartridge Connection Boot (Figure 1, Item H) using flathead screwdriver
 - c. Remove Filter Cartridge and transfer to surface.
3. Starting at the end of the Underdrain closest to the Outlet Bay, install new Filter Cartridges, supplied by Hydro International.
 - Orient Filter Cartridge with the labeled "Pipe Side" facing away from the Outlet Bay.
 - Tighten Cartridge Connection Boot using flathead screwdriver
 - Fasten Cartridge Restraining Cord
4. Exit the Up-Flo® Filter chamber and securely replace the grate or lid.
5. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oil and gross debris removed, and the depth of sediment measured. Note the number of filter cartridges replaced. Note any irregularities such as damaged components or blockages.
6. Remove safety equipment.
7. Return spent filter cartridges to Hydro International for refurbishment.
8. Contact Hydro International to discuss any irregularities noted during annual maintenance.

Up-Flo® Filter Installation Log

SITE REFERENCE NAME OR NUMBER FOR THIS UP-FLO® FILTER LOCATION:	
SITE NAME:	
SITE LOCATIONS:	
OWNER:	SITE CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: ____ / ____ / ____

TOTAL NUMBER OF UP-FLO® FILTER CARTRIDGES: _____

Up-Flo[®] Filter Inspection Log

Site Name: _____

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site Conditions*: _____

*(Stable, Under Construction, Needing Maintenance, etc.)

Inspection Frequency Key: A=annual; M=Monthly; S=after major storms

Inspection Items		Inspection Frequency	Inspected? (Y/N)	Maintenance Needed? (Y/N)	Comments/Description
Debris Removal	Adjacent area free of debris?				
	Inlets and outlets free of debris?				
	Facility (internally) free of debris?				
Vegetation	Surrounding area fully stabilized?				
	Grass mowed?				
Water retention where required	Water holding chamber(s) at normal pool				
	Evidence of erosion?				
Sediment deposition	Filtration chamber free of sediments?				
	Sedimentation sump not more than 50% full?				
Structural components	Any evidence of structural deterioration?				
	Grates in good condition?				
	Spalling or cracking of structural parts?				
	Outlet/overflow spillway				
Other	Noticeable odors?				
	Any evidence of filter(s) clogging?				
	Evidence of flow bypassing facility?				

Inspector Comments: _____

Overall Condition of Up-Flo® Filter**: Acceptable / Unacceptable

**Acceptable would mean properly functioning; unacceptable would mean damaged or required further maintenance

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below or on the Maintenance Log provided on page 11 of the Up-Flo® Filter Operation & Maintenance Manual:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: (date) _____

Inspected by: (signature) _____

Inspected by: (printed) _____

Up-Flo® Filter Maintenance Log

Site Name: _____

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site Conditions*: _____

*(Stable, Under Construction, Needing Maintenance, etc.)

Estimated volume of oil/floatable trash removed: _____

Sediment depth measured in sump prior to removal: _____

Number of Filter Cartridges replaced: _____

Inspector Comments: _____

Overall Condition of Up-Flo® Filter**: Acceptable / Unacceptable

**Acceptable would mean properly functioning; unacceptable would mean damaged or required further maintenance

Maintained by: (signature) _____

Maintained by: (printed) _____