

**TECHNICAL REPORT**  
**STORMWATER MAINTENANCE REPORT**

**HOLTEC OFFICE BUILDING**  
**BLOCK 511, LOTS 1,77-87, 90-93**  
**BLOCK 512, LOTS 55-74, 33-53, 109, 110, 113-117**  
**BLOCK 514, LOTS 3-6, 9-32, 100-107, 118, 120, 145-149, 121, 150-155**  
**BLOCK 515, LOT 1**  
**CITY OF CAMDEN**  
**CAMDEN COUNTY, NEW JERSEY**



**Prepared For:**

Holtec Technology Center, LLC  
1 Holtec Boulevard  
Camden, New Jersey 08104

**Prepared By:**

Pennoni  
2 Aquarium Drive, Ste 320  
Camden, New Jersey 08103  
T:856-668-8600  
[www.pennoni.com](http://www.pennoni.com)

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Joseph Raday, PE  
New Jersey License No. 24GE043768



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**STORMWATER MANAGEMENT MEASURES**  
**MAINTENANCE PLAN**

Development Name: Holtec Office Building

Address: 1 Holtec Boulevard

Township, County: City of Camden, Camden County, NJ

Block 511, Lots 1, 77-94

Block 512, Lots 33-75, 109, 110, 113-117

Block 514, Lots 3-6, 9-32, 100-107, 118, 120, 121, 144-155

Block 515, Lot 1,2,3,4,4.15, 5-12

**Party Responsible for Maintenance:**

Owner: Holtec Technology Center, LLC

Address: 1 Holtec Boulevard  
Camden, New Jersey 08104

Contact Person(s): Mr. Steve Trendler, Facilities Manager

Phone: (856)797-0900 Ext 3701

Maintenance Company: Municipal Maintenance Co,

Address: 1352 Taylors Lane  
Cinnaminson, New Jersey 08077

Contact Person(s): Mr. Ryan Cotter

Phone: (856)786-9434

Prepared by: Pennoni Associates Date: 10/12/2023

Last Revised on 08/23/2024



## **1.0 PROJECT OVERVIEW**

This Operation and Maintenance Manual has been prepared in support of the stormwater management facilities for Holtec Office Building, City of Camden, Camden County, NJ.

The party responsible for maintenance shall be:

**Owner:**

Holtec Technology Center, LLC  
1 Holtec Boulevard  
Camden, New Jersey 08104  
(856)797-0900 Ext 3701 / Mr. Steve Trendler, Facilities Manager

**Maintenance Company:**

Municipal Maintenance Co,  
1352 Taylors Lane  
Cinnaminson, New Jersey 08077  
Contact Person(s): Mr. Ryan Cotter  
Phone: (856)786-9434

The site is located on the following Block and Lot:

Block 511, Lots 1, 77-94  
Block 512, Lots 33-75, 109, 110, 113-117  
Block 514, Lots 3-6, 9-32, 100-107, 118, 120, 121, 144-155  
Block 515, Lot 1,2,3,4,4.15, 5-12

NJ State Plane Coordinates of each facility is indicated below:

Manufactured Treatment Device			
Vortechs Device 110A	-	N 394,308	E 318,297
Manufactured Treatment Device			
Vortechs Device 110B	-	N 394,308	E 318,310
Manufactured Treatment Device			
Filtterra Unit A	-	N 394,098	E 318,298
Manufactured Treatment Device			
Filtterra Unit B	-	N 394,025	E 318,307
Manufactured Treatment Device			
Filtterra Unit C	-	N 394,003	E 318,307
Manufactured Treatment Device			
Filtterra Unit	-	N 394,060	E 317,340
Manufactured Treatment Device			
Filtterra Unit #1	-	N 394,044	E 317,568

Manufactured Treatment Device

Exist. Filterra Unit #2

-

N 394,188

E 317,571

Each facility location relative to the site has been indicated on the Facility Location Map on page 3 and 4.

The inspection, maintenance and repair report shall be updated and kept on file at the City of Camden and Holtec's maintenance office.

The person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and deed as needed.

The person responsible for maintenance shall retain and make available, upon request by any public entity with administrative, health, environmental or safety authority over the site, the maintenance plan and the documentation required.

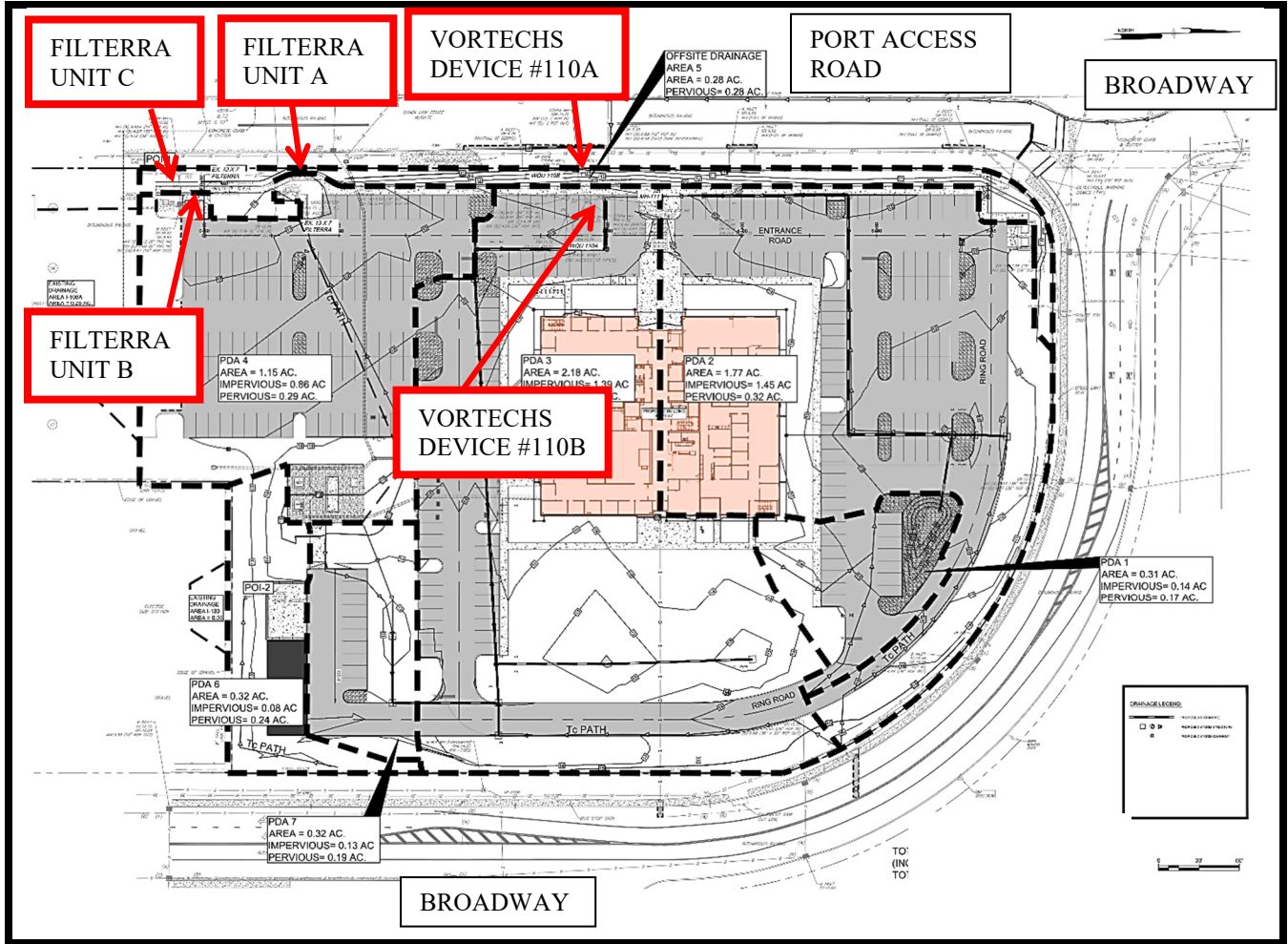
To the extent feasible by law, the City will at all reasonable times have a right of ingress and egress over the easement area and the right to enter the easement area via any road or parking lot located within any common area owned by the Grantor to inspect the system located in the easement area.

Except in the case of an emergency, the City will provide not less than seven (7) days prior notice to the performing any inspection or monitor of the System in accordance with approved plan. The applicant agrees that the failure to timely object after receiving notice from the City constitutes consent to inspection of the property within the timeframe specified in the notice.

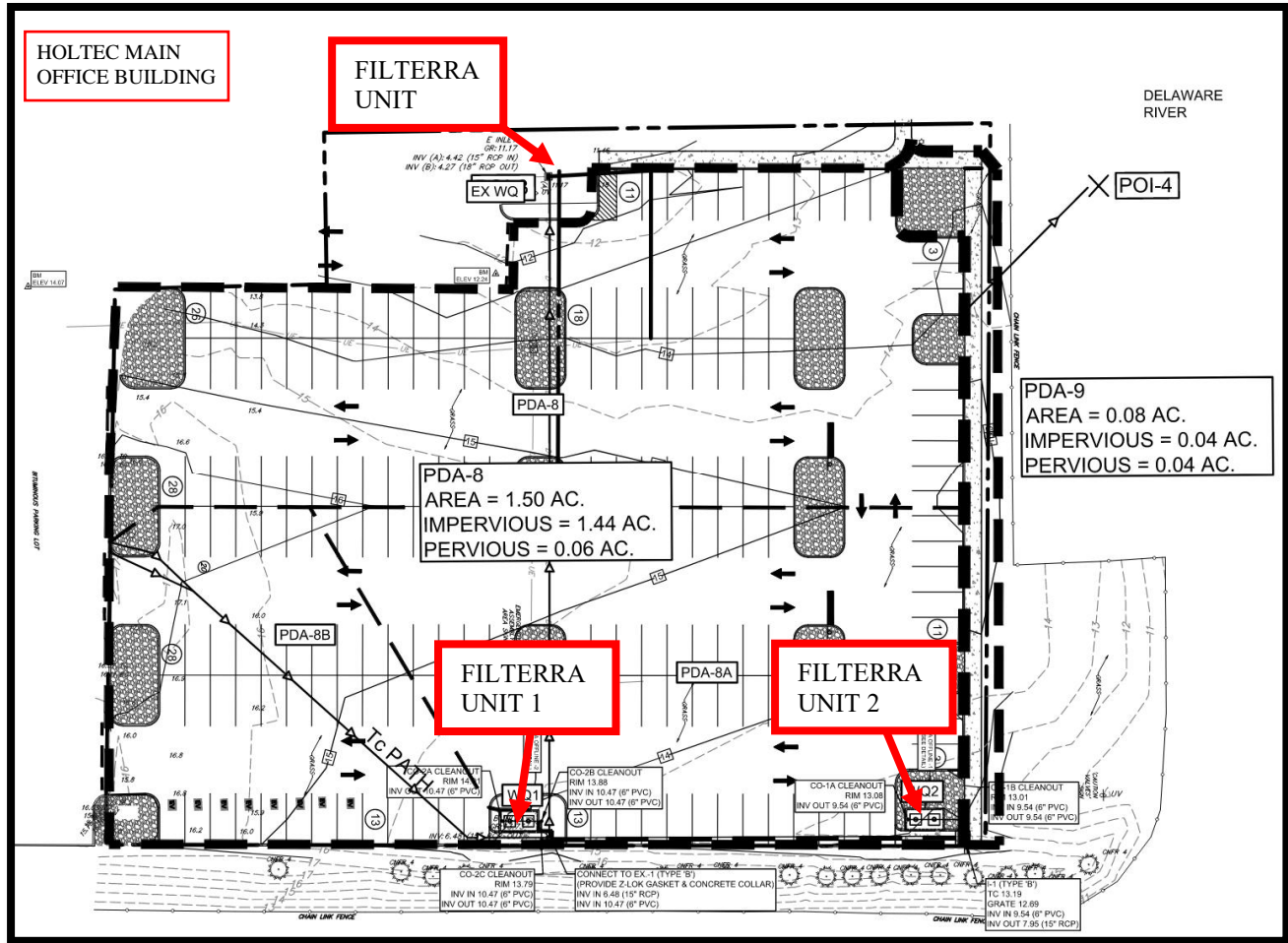
If, after reasonable notice by the City, the applicant fails to maintain the System in accordance with the approved Manual and the Maintenance Plan, the City may perform any maintenance needed to correct a condition that impacts the effectiveness of routine maintenance and operations of the system and collect any costs incurred as a result from each owner of the System and in the same manner as real property taxes are collected. In addition, the City may seek reimbursement under any other method legally available to collect debts owed.

The applicant agrees to indemnify and save the City harmless from any and all claims for direct damages to persons or property arising from inspections performed by the City.

# Facility Location Map



# Facility Location Map



## **2.0 STORMWATER SYSTEM OVERVIEW**

Area 1 consists of runoff from the easterly parking area and open space area. The runoff flows to a proposed bioretention basin #1. The basin discharges to stormwater collection system within the site to the existing green-infrastructure (GI) MTD. The existing GI MTD discharges to an existing stormwater conveyance system which extends along the westerly side of the site (POI-1) and discharges to the Delaware River.

Area 2 consists of runoff from the northerly half of the building area, landscaped/lawn area, sidewalks, parking lot area and a section of the proposed Entrance Road. The runoff flows to a proposed stormwater collection system and through Vortechs Device #110A/#110B for quality treatment. The runoff then continues through the existing drainage system and discharges to Delaware River.

Area 3 consists of runoff from the southerly half of the building area, landscaped/lawn area, sidewalks, parking lot area and sections of the proposed Ring Road and Entrance Road. The runoff flows to a proposed stormwater collection system and through Vortechs Device #110A/#110B for quality treatment. The runoff then continues through the existing drainage system and discharges to Delaware River.

Area 4 consists of runoff from the pole barn structure and associated parking area, landscape/lawn area, stoned equipment area, sidewalks, and a portion of Entrance Road. The runoff flows to a proposed stormwater collection system and through Filterra Units #A, #B, and #C for quality treatment. The runoff then continues through the existing drainage system and discharges to Delaware River

Area 5 includes runoff from lawn and sidewalk area that bypasses the proposed stormwater collection system. Then continues offsite to the existing drainage system located in Port Access Road.

Area 6 consists of runoff from landscape/lawn area and collects into an existing inlet. The runoff continues through the existing drainage system and discharges to Delaware River.

Area 7 consists of a proposed parking area for the pole barn and is located on the southerly side of the site. The stormwater runoff drains in a northerly direction and is collected by the proposed stormwater conveyance system, which extends through the site to Holtec Boulevard and discharges to the Delaware River.

Area 8 consists of a proposed parking area located in a northeasterly direction from Holtec's main office building. The stormwater runoff drains in a northeasterly direction towards two (2) proposed Filterra water quality inlets and in a westerly direction towards two (2) existing Filterra water quality inlets located onsite.

The proposed stormwater collection system will connect into the existing stormwater system that extends through Holtec's site and discharges directly to the Delaware River.

Area 9 consists of proposed sidewalk and grass area along the northeasterly corner of the main office building site. The stormwater runoff drains in a northwesterly direction to the Delaware River.

### **3.0 MAINTENANCE/INSPECTIONS**

The following summarizes general maintenance items, which should be addressed on an annual basis:

1. Removal of debris and sediment;
2. General maintenance and repairs to the infiltration areas and vegetated swales;

An inspection, maintenance and repair report will be updated annually by the municipality.

### **4.0 GENERAL MAINTENANCE**

All facilities expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four (4) times annually as well as after every storm exceeding one (1) inch of rainfall. Such components may include bottoms, riprap aprons and inflow points.

### **5.0 REGULAR MAINTENANCE ITEMS**

Regular maintenance items, as itemized in the checklist enclosed as Appendix B. includes the following items:

1. Removal and Disposal of Trash and Debris: Immediately following any significant rainfall event, as well as after every storm exceeding 1 inch of rainfall and at least once every 3 months, all trash and debris should be removed from the impoundment area.
2. Sediment Removal and Disposal: Accumulated sediment should be removed before it threatens the operation or storage volume of the facility. Sediment volume should be monitored on a quarterly basis to assure the outlets are not blocked.

Disposal of sediment should be in accordance with current Borough standards and regulations of the New Jersey Department of Environmental Protection.



## Corrective Maintenance

Corrective maintenance should be provided as soon as practicable after a situation that requires attention is reported. Corrective maintenance includes repair of damage caused by vandalism, removal of debris and sediment that threatens the operational capacity of the facility, and corrections of any problems that jeopardize the safety or operation of the facility.

## Maintenance Inspection

An inspection of the facility should be made a minimum of once every year in order to determine the effectiveness of the maintenance work and the condition of the facility. In addition, an inspection should be made whenever a severe storm warning is issued in order to determine the readiness of the facility.

## Records

Included in this report as Appendix B, are checklists and logs for use by maintenance personnel and inspectors. These should be utilized every time maintenance or inspection is performed on the facility. The reports should be appropriately filed and used to determine effectiveness of the existing maintenance and inspection schedules, and also used a guide to revise the schedules as necessary to effectively maintain the operational integrity of the facility.

## **6.0 BEST MANAGEMENT PRACTICES (BMPS)**

The NJDEP Stormwater Management Regulations (N.J.A.C. 7:8) have been adopted to address the adverse impacts of land development. The stormwater management measures taken to meet these requirements are collectively known as Best Management Practices (BMPs). BMPs can be non-structural, as in the minimization of impervious surfaces, or structural, as in the construction of stormwater management facilities discussed in this manual.

### **6.1 GREEN INFRASTRUCTURE MANUFACTURED TREATMENT DEVICE**

#### Definition

A green infrastructure manufactured treatment device is a stormwater treatment system used to address stormwater runoff quality impacts of site development.

#### Purpose

Green infrastructure manufactured treatment devices will remove 80% total suspended solids.

## Maintenance

### 1. Inspection

Inspect the unit and the surrounding area with photographs. All structural components must be inspected at least once annually for cracking and deterioration or more frequently if specified in the manufacturers MTD Operations and Maintenance Manual.

### 2. Sediment/Debris Removal

Sediment removal should take place when the MTD is thoroughly dry. Disposal of debris, trash and sediment or other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste disposal regulations.

### 3. Vegetation

Examine the plant's health and replace if necessary. Prune as necessary to encourage growth in the correct directions. Vegetative cover must be maintained at 85%.

A minimum of one inspection during the growing season and one inspection during the non-growing season is required to ensure the health of the vegetation.

## **6.2 NON-GREEN MANUFACTURED TREATMENT DEVICE**

### Definition

A manufactured treatment device is a prefabricated stormwater treatment structure to remove pollutants from stormwater runoff.

### Purpose

The manufactured treatment device is a hydrodynamic vortex separator designed to provide high removal efficiencies of settleable solids and their associated pollutants, oil, and floatables over a wide range of flow rates.

## Maintenance

### 1. Sediment Removal and Disposal

Inspect your manufactured treatment device every six months during the first year of operation to determine your site-specific rate of pollutant accumulation. Maintenance events may include inspection, oil & floatables removal, and sediment removal. Accumulated sediment should be removed at a minimum of once per year and/or following a spill in the drainage area. Sediment shall be removed when it accumulates to a depth of 36". Dried sediment must be manually removed by maintenance crews.

Disposal of debris, trash and sediment or other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste disposal regulations.

### 2. Floatables Removal and Disposal

Floatables cleanout is typically done in conjunction with sediment removal. A commercially owned sump-vac is used to remove captured sediment and floatables.

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 vacuum hose and skimmer pole to be lowered to the base of the sump.

### 3. Other Maintenance criteria

The manufactured treatment device should be inspected and maintained in accordance with the manufacturer's instructions and/or recommendations and any maintenance requirements associated with the device's certification by NJDEP Office of Innovation Technology.

## **6.3 STORMWATER INLETS AND PIPES**

### Definition

Inlet structures are box structures with grate openings to receive surface water which is then conveyed through the underground stormwater pipe system.

### Purpose

The primary function of an inlet structure is to allow water to enter the storm drainage system. Inlets also serve as access points for cleaning and inspection.

## Maintenance

### 1. Sediment Removal and Disposal

Inspect your structures every six months during the first year of operation to determine your site-specific rate of pollutant accumulation. Maintenance events may include inspection, floatables removal and sediment removal.

Disposal of debris, trash and sediment or other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste disposal regulations.

### 2. Other Maintenance criteria

Regular inspections of inlets and storm pipes should take place approximately three times per year, with additional inspections advised after major weather events. Inspection of the drainage flow paths should be performed to check for blockages. All drains must remain free of foreign objects.

Pipes should be checked for settlement at the joints, which may cause leakage and undermining of the system. Inspections in locations that are not easily accessible may be performed by video inspection of the system.

## **6.1 BIORETENTION AREA**

The following is taken from the Rain Garden Manual of New Jersey by the Rutgers Cooperative Extension Water Resources Program:

### Definition

A bioretention area is a landscaped/grassed depression that captures, filters and infiltrates stormwater runoff. The rain garden/bioretention area removes nonpoint source pollutants from stormwater runoff while recharging groundwater.

### Purpose

A bioretention area has two main goals. The first goal is to serve as a functional system to capture, filter and infiltrate stormwater runoff at the source and the second goal is to be an aesthetically pleasing garden/grass area.

## Maintenance

### 1. Vegetation

Grasses within the bioretention area must be carefully maintained so as not to compact the soil, and through handheld equipment. The vegetative cover should be maintained at 85%.

### 2. Sediment/Debris Removal

Occasionally use a flat shovel to remove any excess sediment, leaves, or debris that may accumulate.

Grass clippings shall be collected and properly disposed of. Precautions must be taken to prevent planting bed soil compaction and sediment contamination by runoff.

Sediment removal should take place when the bioretention area is thoroughly dry. Disposal of debris, trash and sediment or other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste disposal regulations.

### 3. Structural Components

All structural components must be inspected for cracking, erosion and deterioration at least annually. The 4" perforated underdrains shall be inspected for clogging.

### 4. Other Maintenance criteria

The maintenance plan must indicate the approximate time it would normally take to drain the maximum design storm runoff volume below the bottom of the basin. This normal drain or drawdown time should then be used to evaluate the infiltration area's actual performance.

If significant increases or decreases in the normal drain time are observed, the basin's bottom surface, subsoil and both groundwater and tailwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the infiltration area.

The bottom of a bioretention area should be inspected at least monthly as well as after each storm event exceeding one inch of rainfall. The permeability rate of the soil below the infiltration area may also be retested periodically.

## **7.0 SAFETY OF INSPECTION AND MAINTENANCE PERSONNEL**

Maintenance personnel may require training in maintenance tasks. Inspectors are expected to be dressed in protective clothing and use the appropriate equipment and safety gear in accordance with OSHA regulations and procedures when performing their tasks. Equipment should always be operated safely and in accordance with manufacturers specifications. Call utility companies before initiating any maintenance activity involving any excavation.

## **8.0 MISCELLANEOUS ITEMS**

### a. Emergency Conditions

Recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure are to be determined on an as-needed basis after each subsequent inspection.

### b. Specialized Stormwater Management Measures

Maintenance, repair, and replacement instructions for specialized, proprietary, and non-standard measure components, in addition to manufacturer's product installation guides and user manuals, have been included and referenced, if applicable, on the design plans for the project. Refer to specific product guides and user manuals for specific detail regarding the respective item.

### c. Disposal and Recycling Sites

Approved disposal and recycling sites and procedures for sediment, trash, debris, and other material removed from the stormwater management measures during maintenance operations shall be utilized and have been referenced herein and on the design plans for the project.

### d. As-Built Construction Plans

As-built construction plans of the stormwater management measures and copies of pertinent construction documents, such as laboratory test results, permits, and completion certificates are required for verification for the associated measures to function properly and in accordance with the approved design.

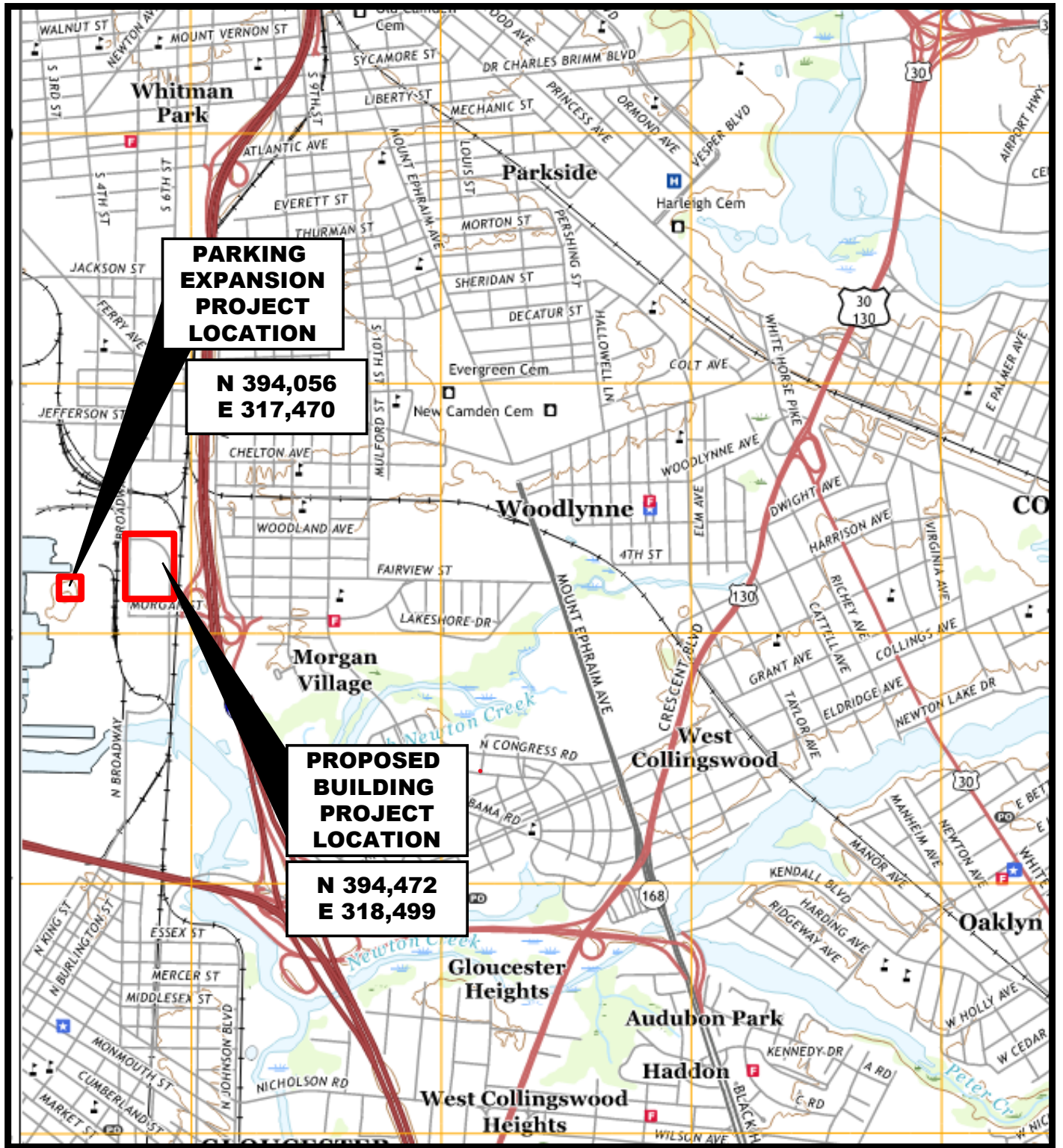
As-built construction plans will be available through the responsible party denoted in the report.

e. Permits for Maintenance Activities


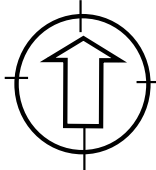
There are currently no permits required from the New Jersey Department of Environmental Protection for the maintenance activities associated with the proposed drainage system as outlined herein. However, compliance with all regulations and requirements pertaining to the disposal of sediment, trash, debris and other removed material is required.







USGS 7.5 Min. Camden Quadrangle, Camden County, New Jersey

 PENNONI ASSOCIATES INC. 2 AQUARIUM DRIVE, SUITE 320 CAMDEN, NEW JERSEY 08103	HOLTEC OFFICE BUILDING BLOCKS 511,512,514 & 515 CITY OF CAMDEN, CAMDEN COUNTY NEW JERSEY		
	Job No. USATX22001	Scale: 1"=2,000'	



## **APPENDIX A**

- **TOOLS AND EQUIPMENT**
- **MAINTENANCE CATEGORIES**



## **TOOLS AND EQUIPMENT**

The following is a list of required inspection equipment for routine operation and maintenance procedures and inspections:

1. A clipboard, a pencil and the inspection checklist. The checklist is included in Appendix B.
2. A standard 6-foot collapsible ruler.
3. A camera. Photographs or observed portions of the basin will provide a measure of performance when comparing past and present maintenance practices or conditions.
4. A probe. A stiff light stick or rod with a blunt tip of sufficient strength to penetrate soil.
5. A weed whacker. Can be used to clear non-visible areas and to perform routine maintenance of the green infrastructure MTD.
6. A flashlight. Can be used to observe the inside of outlet pipes and structural components.

Maintenance may include the use of equipment including the following:

1. Wheelbarrow.
2. Safety Equipment and Personal Protective Equipment
3. Crow bar or other tool to remove grate or lid
4. Pole with skimmer or net
5. Trash bag for removed floatables
6. Vacuum truck.
7. Ladder

Sources of the following materials should be identified for immediate use of warranted repairs by the inspection:

1. Clean sand or gravel for filling erosion rills and gullies.
2. Topsoil mixture, fertilizer and seed.
3. Large stone riprap for emergency repairs caused by erosion.
4. Synthetic geotextile fabric, netting and stakes to prevent seed and topsoil from blowing away.

## MAINTENANCE CATEGORIES

1. **Immediate Maintenance:** demands immediate attention and usually requires construction equipment and professional guidance. Immediate maintain is characterized by the following:
  - a. A blocked inlet pipe or outlet pipe.
  - b. Following a spill in the drainage area.
  - c. Foul odor.
  - d. Clogged drains.
  
2. **Corrective Maintenance:** should be performed as soon as possible after an inspection. Corrective maintenance consists of the following:
  - a. A simple probe can be used to determine the level of accumulated solids stored in the sump.
  - b. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation.
  
2. **Continuing Maintenance Manufactured Treatment Device:** will occur on a regular basis and can be performed during the inspection or in accordance with the maintenance schedule outlined above. Continuing maintenance includes:
  - a. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths as indicated in the manufacturer's operation manual.
  - b. Inspection may be conducted during any season of the year.
  
3. **Continuing Maintenance Manufactured Treatment Device:** will occur on a regular basis and can be performed during the inspection or in accordance with the maintenance schedule outlined above. Continuing maintenance includes:
  - a. Trimming, weeding and fertilizing
  - b. Mulching of the green infrastructure MTD
  - c. Inspection may be conducted during any season of the year.

## **MAINTENANCE INSPECTION**

An inspection of the facilities should be made a minimum of once every three months in order to determine the effectiveness of the maintenance work and the condition. In addition an inspection should be made whenever a severe weather warning is issued in order to determine the readiness of the facilities.

Reports should be appropriately filed and used to determine the effectiveness of the existing maintenance and inspection schedules and also used as a guide to revising the schedules as necessary to maintain the operational integrity.





## **APPENDIX B**

- **BASIN INSPECTION AND MAINTENANCE COSTS**
- **INSPECTION CHECKLISTS**
- **MAINTENANCE CHECKLISTS**
- **MAINTENANCE LOGS**
- **MANUFACTURERS INFORMATION**
- **CORRECTIVE MAINTENANCE RECORD**



ENGINEER'S ESTIMATE OF BASIN INSPECTION AND MAINTENANCE COSTS HOLTEC INTERNATIONAL CITY OF CAMDEN CAMDEN COUNTY, NEW JERSEY						
Item #	Description	Rate	Unit	Total Units	Frequency Per Year	Item Total
1	Grass Trimming	\$ 300.00	LS	1	15	\$4,500.00
2	Landscape Maintenance (GI MTD)	\$ 250.00	LS	5	2	\$2,500.00
3	Landscape Maintenance Materials	\$ 250.00	LS	5	1	\$1,250.00
4	General Maintenance	\$ 200.00	LS	8	2	\$3,200.00
5	Visual Inspection	\$ 175.00	LS	8	2	\$2,800.00
6	Trash and Debris Removal	\$ 200.00	LS	8	As Needed	\$1,600.00
7	Preventive Maintenance	\$ 200.00	LS	8	1	\$1,600.00
8	Corrective Maintenance	\$ 225.00	LS	8	1	\$1,800.00
9	Vacuum Clean MTD	\$ 750.00	LS	2	2	\$3,000.00
10	Vacuum Clean Subsurface Pipes	\$ 1,500.00	LS	1	1	\$1,500.00



<b>TOTAL ANNUAL</b>	<b>\$23,750.00</b>
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## Inspection Checklist Filterra Manufactured Treatment Device

<b>Name of Facility:</b>	Holtec International
<b>Location:</b>	City of Camden, Camden County, Nj
<b>Date of Inspection:</b>	
<b>Weather:</b>	

**Manufactured Treatment**

Facility Item	OK	Routine	Urgent	Comments
A. Inlet				
B. Rim and Cover				
C. Outlet/Overflow				
D. Vault				
D. Mulch Cover				
E. Vegetation				
G. Structural Deterioration				
H. Odors				
I. Other				

- (1) The item checked is in good condition and the maintenance program is adequate.
- (2) The item checked requires attention but does not present an immediate threat to the facility function or other facility
- (3) The item checked requires immediate attention to keep the facility operational or to prevent damage to other facility components.
- (4) Provide explanation if "Routine" or "Urgent" is checked.



## Filterra Manufactured Treatment Device Maintenance Checklist

<b>Name of Facility:</b>	Holtec International
<b>Location:</b>	City of Camden, Camden County, NJ
<b>Date of Inspection:</b>	
<b>Weather:</b>	

### Preventive Maintenance

Facility Item	Required	Completed	Comments
A. Vault			
B. Inlet			
C. Outlet			
D. Mulch			
E. Access Areas			
F. Other			

### Vegetation

Facility Item	Required	Completed	Comments
A. Pruning			
B. Removal			
C. Other			

### Trash and Debris Removal

Facility Item	Required	Completed	Comments
A. Chamber			
B. Inlet			
C. Outlet			
D. Access Areas			
E. Mulch			
F. Other			





## Filterra Manufactured Treatment Device Maintenance Checklist

### Sediment Removal

Facility Item	Required	Completed	Comments
A. Vault			
B. Inlet			
C. Outlet			

### Other Maintenance

A.			
B.			
C.			

### Corrective Maintenance

Facility Item	Required	Completed	Comments
A. Removal of Debris and Sediment			
B. Structural Repairs			
C. Trim/Prune Vegetation			
D. Replace mulch cover			
E. Elimination of Trees/Brush			
F. Other			



# Filterra Manufactured Treatment Device Maintenance Checklist

Aesthetic Maintenance

Facility Item	Required	Completed	Comments
A. Grass Trimming			
B. Weeding			
C. Other			

**Remarks:**



## Filtterra Manufactured Treatment Device Maintenance Log

Name of Facility: Holtec International  
 Location: City of Camden, Camden County, NJ

### Preventive Maintenance

#### Trash and Debris Removal

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Adjacent area free of debris								
B. Inlets and Outlets								
C. Vault								
D. Mulch								
E. Other								

#### Sediment Removal

A. Other								
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#### Mosquito Habitat Removal

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Inlets								
B. Bottom								
C. Other								

#### Other Preventive Maintenance

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Noticeable Odors								
B. Evidence of flow bypassing facility								
C. Evidence of flow not draining facility								

#### Corrective Maintenance

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Removal of Debris and Sediment								
B. Structural Repairs								
C. Other								

**Remarks:**



## Manufactured Treatment Device Maintenance Checklist

<b>Name of Facility:</b>	Holtec International
<b>Location:</b>	City of Camden, Camden County, NJ
<b>Date of Inspection:</b>	
<b>Weather:</b>	

**Preventive Maintenance**

Facility Item	Required	Completed	Comments
A. Chamber			
B. Inlet			
C. Outlet			
D. Perimeter			
E. Access Areas			
F. Other			

**Trash and Debris Removal**

Facility Item	Required	Completed	Comments
A. Chamber			
B. Inlet			
C. Outlet			
D. Access Areas			
E. Inlets			
F. Other			





## Manufactured Treatment Device Maintenance Checklist

### Sediment Removal

Facility Item	Required	Completed	Comments
A. Chamber			
B. Inlet			
C. Outlet			

### Other Maintenance

A.			
B.			
C.			

### Corrective Maintenance

Facility Item	Required	Completed	Comments
A. Removal of Debris and Sediment			
B. Structural Repairs			
G. Mosquito Control			
H. Erosion Repair			
I. Elimination of Trees/Brush			
J. Other			



# Manufactured Treatment Device Maintenance Checklist

## Aesthetic Maintenance

Facility Item	Required	Completed	Comments
A. Grass Trimming			
B. Weeding			
C. Other			

**Remarks:**



## Manufactured Treatment Device Maintenance Log

<b>Name of Facility:</b>	Holtec International
<b>Location:</b>	City of Camden, Camden County, NJ

### Preventive Maintenance

#### Trash and Debris Removal

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Adjacent area free of debris								
B. Inlets and Outlets								
C. Chamber								
D. Pipes								
E. Other								

#### Sediment Removal

A. Other								
----------	--	--	--	--	--	--	--	--

#### Mosquito Habitat Removal

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Inlets								
B. Bottom								
C. Other								

#### Other Preventive Maintenance

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Noticeable Odors								
B. Evidence of flow bypassing facility								
C. Evidence of flow not draining facility								

#### Corrective Maintenance

Facility Item	Date	Date	Date	Date	Date	Date	Date	Date
A. Removal of Debris and Sediment								
B. Structural Repairs								
C. Other								

<b>Remarks:</b>
-----------------



# **Filterra Vault**

# **Owner's Manual**

(Precast Vault Configurations)



**filterra**<sup>®</sup>

Bioretention Systems

**C NTECH**<sup>®</sup>  
ENGINEERED SOLUTIONS

This Owner's Manual applies to all precast Filterra Configurations,  
including Filterra Bioscape Vault and Filterra HC.











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# Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system’s biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser’s responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and a final site assessment of unit condition (mulch replacement, debris removal, and pruning of vegetation) scheduled between 6 and 12 months after activation, upon request.

## Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at [www.ContechES.com](http://www.ContechES.com).

## Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices.
- Planting of the system’s vegetation (provided by the purchaser).
- Placement of pretreatment mulch layer using mulch acceptable for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch acceptable for use in Filterra systems. More information is available in the Filterra Activation Package.



## Minimum Requirements

The minimum requirements for Filterra Activation are as follows:

**1. The purchaser must have procured vegetation meeting the requirements outlined in the Filterra Activation Package.**

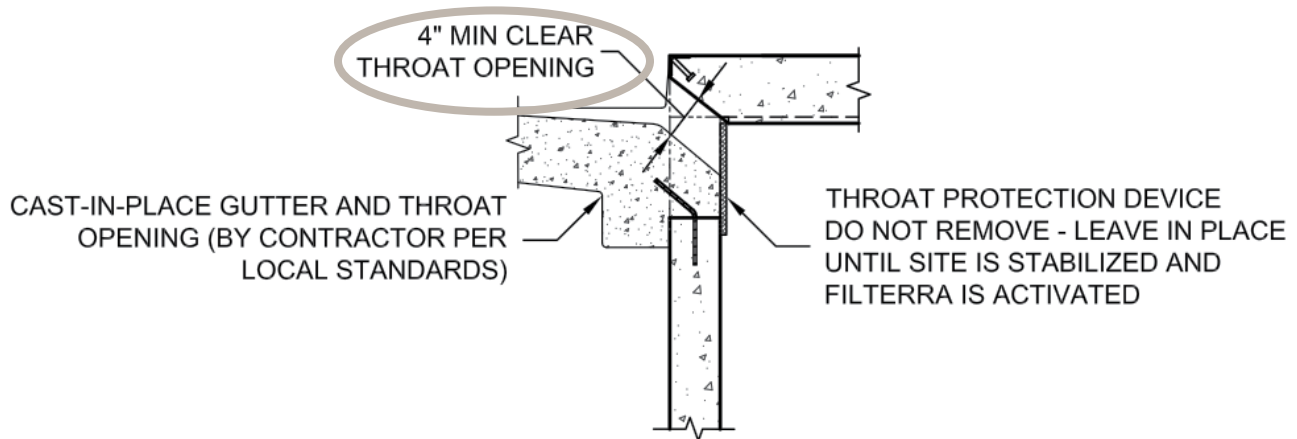
2. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



3. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.



4. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



The Filterra Activation Package is available on the Contech website ([www.ContechES.com/filterra](http://www.ContechES.com/filterra)) and ensures that the proper conditions are met for Contech to perform the Activation service. Vegetation meeting Contech's requirements must be provided at time of Activation. If the site does not meet the conditions required for Activation, or acceptable vegetation is not provided by the purchaser at time of Activation, a charge of \$1,500 will be invoiced to the purchaser.



## Filterra Plant Selection Overview

A Plant List is available on the Contech website highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

More information is available in the Filterra Activation Package.

## Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Final Site Assessment services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

## Final Site Assessment

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. A final site assessment is included by the manufacturer, upon request, on all Filterra systems between 6 and 12 months after activation. This includes a final assessment of unit condition, debris removal, mulch replacement, and pruning of vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the final site assessment, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.



## Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

## When to Maintain?

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; in regions with less rainfall often only (1) one visit per annum is sufficient. Varying land uses can affect maintenance frequency. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the maintenance provider of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.





## Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not included as part of the final site assessment. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

## Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

## Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft <sup>2</sup> )	Volume at 3" (ft <sup>3</sup> )	# of 2 ft <sup>3</sup> Mulch Bags
4	4	16	4	2
6	4	24	6	3
8	4	32	8	4
6	6	36	9	5
8	6	48	12	6
10	6	60	15	8
12	6	72	18	9
13	7	91	23	12

Other sizes not listed - 1 bag per 8 ft<sup>2</sup> of media.

# Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



## 1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes		no
Damage to Box Structure	yes		no
Damage to Grate	yes		no
Is Bypass Clear	yes		no

If yes answered to any of these observations, record with close-up photograph (numbered).



## 2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

## 3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes		no
Cups/ Bags	yes		no
Leaves	yes		no
Buckets Removed	_____		



- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____



#### 4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

#### 5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions



Record on Maintenance Report the following:

Height above Grate	_____	(ft)
Width at Widest Point	_____	(ft)
Health		healthy   unhealthy
Damage to Plant		yes   no
Plant Replaced		yes   no



#### 6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.



#### 7. Complete paperwork

- Deliver Maintenance Report.
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

# Plant Care for Filterra® Systems

After Activation, the Contractor is responsible for proper care of the vegetation until the site is handed over to the Owner. After that, it is the Site Owner's responsibility to care for the vegetation. Contech recommends the following care for the plants:

1. To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
2. Plant staking may be required.
3. With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
4. Contech recommends irrigation of the Filterra® Vegetation. The following guidance will help to ensure the vegetation is properly irrigated.

## Irrigation Recommendations:

- Each Filterra® system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra® plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed\*\*.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required.

*\*\* Five gallons per square yard approximates 1 inch of water. Therefore for a 6' x 6 foot Filterra® approximately 20-60 gallons of applied water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate. Then calculate the time needed to irrigate the Filterra®, For example if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6'x6' filter.*

## Plant Replacement:

In some cases, plants will require replacement. Please follow the procedures below to ensure a properly functioning Filterra® system.

1. Remove the existing plant, and leave as much of the Filterra® media in place as possible.
2. Select a replacement per the Filterra® Activation Package.
3. Prior to removing the plant from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
4. Cut away any roots which are growing out of the container drain holes.
5. Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively, the pot can be cut away to minimize root ball disturbance.
6. Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
7. Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
8. All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
9. Reinstall or add mulch to a depth of 3" per Contech's mulch specifications for Filterra® systems.

# Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.

## Filterra Inspection & Maintenance Log

Filterra System Size/Model: \_\_\_\_\_ Location: \_\_\_\_\_

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	5 - 5 gal Buckets	3"	Lowe's Premium Brown Mulch	4'	Galaxy Magnolia	- Standing water in downstream structure	- Removed blockage in downstream structure



# Appendix 1 – Filterra® Vault Activation Package

## FILTERRA® VAULT ACTIVATION PACKAGE



The Filterra system will be (or has been) delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and a Final Site Assessment (assessment of unit condition, mulch replacement, debris removal, and pruning of vegetation) scheduled between 6 months and 1 year after Activation, upon request.

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

- Removal of construction runoff protection devices
- Planting of the system's vegetation (provided by the purchaser)
- Placement of pretreatment mulch layer using mulch acceptable for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch acceptable for use in Filterra systems. The purchaser should request Activation from Contech after the site is stabilized, but prior to turning over the site to the owner. Please allow 1-2 weeks to schedule Activation.

The purchaser must ensure that the site is acceptable for Filterra Activation. A checklist (included as page 3 of this document) must be completed and submitted to the Contech Activation Coordinator. The minimum 4 requirements for Filterra Activation are as follows:

1. The purchaser must have sourced vegetation meeting the requirements outlined in "Plant Selection for Filterra Systems" starting on page 4 of this document.



\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.



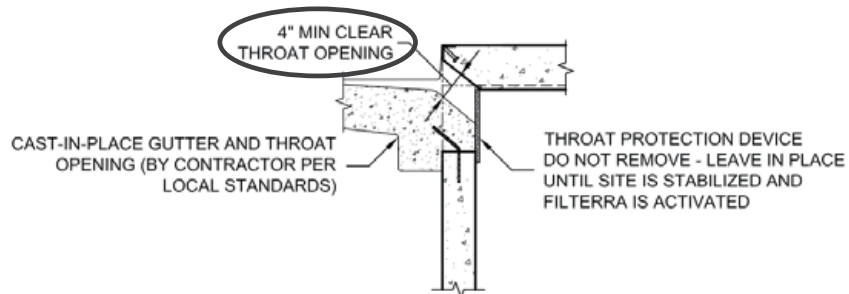
2. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



3. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.



4. Where curb inlets are included as part of the Filterra system, Filterra throat opening should be at least 4" clear in order to ensure adequate capacity for inflow and debris.



\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.



# Filterra® Vault Activation Checklist



Project Name: \_\_\_\_\_ Company: \_\_\_\_\_

Site Contact Name: \_\_\_\_\_ Site Contact Phone/Email: \_\_\_\_\_

Site Owner/End User Name: \_\_\_\_\_ Site Owner/End User Phone/Email: \_\_\_\_\_

Preferred Activation Date: \_\_\_\_\_ (provide 2 weeks minimum from date this form is submitted)

Site Designation	Top Opening Type	Final Pavement Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height (where applicable)	Vegetation Sourced by Contractor
	<input type="checkbox"/> Tree Grate <input type="checkbox"/> Full Grate (No tree opening) <input type="checkbox"/> Bioscape Vault (Open Planter)	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Species on FT Plant List <input type="checkbox"/> Container Grown (15 gal. max) <input type="checkbox"/> 4' Tall Min. (Tree grate units only) _____ Qty provided
	<input type="checkbox"/> Tree Grate <input type="checkbox"/> Full Grate (No tree opening) <input type="checkbox"/> Bioscape Vault (Open Planter)	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Species on FT Plant List <input type="checkbox"/> Container Grown (15 gal. max) <input type="checkbox"/> 4' Tall Min. (Tree grate units only) _____ Qty provided
	<input type="checkbox"/> Tree Grate <input type="checkbox"/> Full Grate (No tree opening) <input type="checkbox"/> Bioscape Vault (Open Planter)	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Species on FT Plant List <input type="checkbox"/> Container Grown (15 gal. max) <input type="checkbox"/> 4' Tall Min. (Tree grate units only) _____ Qty provided
	<input type="checkbox"/> Tree Grate <input type="checkbox"/> Full Grate (No tree opening) <input type="checkbox"/> Bioscape Vault (Open Planter)	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Verified	<input type="checkbox"/> Species on FT Plant List <input type="checkbox"/> Container Grown (15 gal. max) <input type="checkbox"/> 4' Tall Min. (Tree grate units only) _____ Qty provided

Attach additional sheets as necessary.

NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.

\_\_\_\_\_  
Signature Date

\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.





# Planting Selection for Filterra® Vault Systems

All Filterra systems require vegetation for proper long-term performance. As indicated in the Activation Package, the Contractor is responsible for sourcing the proper vegetation prior to Activation. Contech or a Contech representative will install the vegetation during the Activation process.

Contractors should identify the Top Opening style for each Filterra requiring Activation on the Activation Checklist. Contech offers three types, which are detailed on page 5 of this document:

- Vault with Tree Grate
- Vault with Full Grate
- Bioscape / Open Planter

Contractors must ensure the vegetation meets the following 4 requirements:

1. Select plant(s) as specified in the engineering plans and specifications AND that are listed on Contech's Configuration Specific Plant Lists\*\*.
2. All plants MUST be container-grown in nursery containers no larger than 15 gallons. Crated and/or Ball/Burlap plants are NOT permitted.
3. For Vaults with Tree Grates, plant height must be 4' Minimum, from soil surface to top of plant.
4. Provide plant quantities per the following guidance:
  - Vault with Tree Grate – 1 per Tree Grate
  - Vault with Full Grate – 4-5 Small or Extra Small Grasses per Full Grate
  - Bioscape – Quantities should be selected based on plant palette options found starting on page 6 of this document.



If Contech or Contech's representative shows up for Activation and any of the 4 requirements above are not met, Activation cannot be performed and the Contractor will be billed a \$1,500 Unprepared Site fee\*.

Some additional vegetation recommendations for the best possible Activation and Installation are as follows:

- Select plant(s) with full root development but not to the point where root bound.
- For Filterra systems with a Tree Grate, select plants with taller trunks. Lower branches can be pruned away provided there are sufficient branches above the grate for tree or shrub development.
- For Filterra systems with a Tree Grate, plant(s) should have a single trunk at installation.
- Plant species shall not have a mature height greater than 30 feet.

\*\* In some cases, Contech may consider alternate plant species as approved by the Product Manager. Please list the plant name in the space below and submit this sheet to your Contech Activation Coordinator. If the plant species is approved, either the Product Manager or the Activation Coordinator will sign the form and return to you for inclusion with your Activation Checklist.

Requested Plant Species: \_\_\_\_\_ Approved: \_\_\_\_\_

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

\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.



# Filterra® Top Opening Examples

## Filterra® Vault with Tree Grate

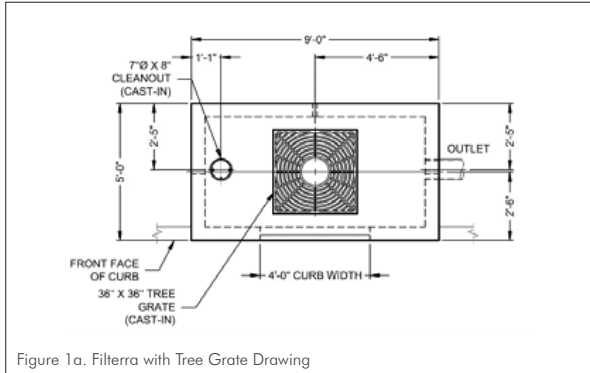


Figure 1a. Filterra with Tree Grate Drawing



Figure 1b. Filterra with Tree Grate Photo (not yet planted)

## Filterra® Vault with Full Grate

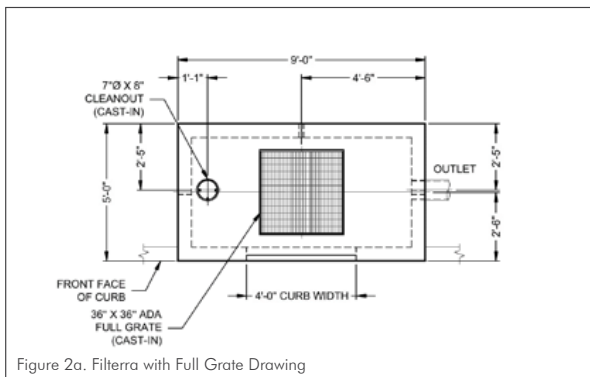


Figure 2a. Filterra with Full Grate Drawing



Figure 2b. Filterra with Full Grate Photo

## Filterra® Bioscape Vault

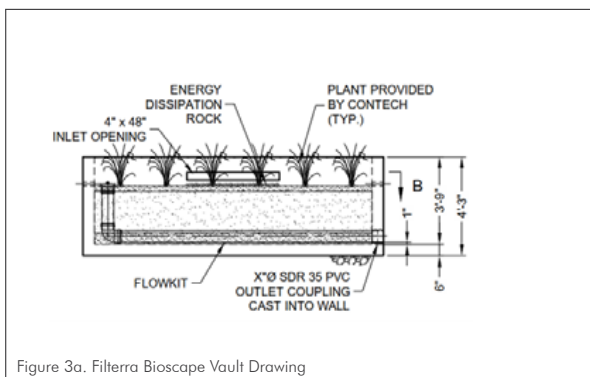


Figure 3a. Filterra Bioscape Vault Drawing







Figure 3b. Filterra Bioscape Vault Photo

\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.



# Filterra® Bioscape Vault Plant Palettes

































**KEY:** (refer to plant lists for species sizing)

	<b>A. EXTRA SMALL GRASS</b>
	<ul style="list-style-type: none"> <li>• Up to 2' mature spread</li> <li>• 1-2 gallon typical (1 gal. minimum)</li> </ul>
	<b>B. SMALL GRASS/SHRUB</b>
	<ul style="list-style-type: none"> <li>• 2'-4' mature spread</li> <li>• 1-7 gallon typical</li> </ul>
	<b>C. MEDIUM SHRUB</b>
	<ul style="list-style-type: none"> <li>• 4'-6' mature spread</li> <li>• 1-7 gallon typical</li> </ul>
	<b>D. LARGE SHRUB OR EXTRA LARGE SHRUB OR TREE</b>
	<ul style="list-style-type: none"> <li>• 6' mature spread and greater, 30' max. mature height</li> <li>• Up to 15 gallon maximum</li> </ul>

**NOTE:** For larger vaults and in-ground Filterra Bioscape systems, palettes can be scaled (i.e. Qty 6 of the 22x8 Palette can be used for a 1056 sf Filterra Bioscape).

**MIX & MATCH SUBSTITUTION OPTIONS:**

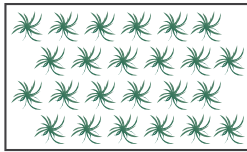
- 1 Large Shrub or Extra Large Shrub or Tree
  - 2 Medium Shrubs
  - 4 Small Grass/SHrubs
  - 12 Extra Small Grasses
- 1 Medium Shrub
  - 2 Small Grass/SHrubs
  - 6 Extra Small Grasses
- 1 Small Grass/SHrub
  - 3 Extra Small Grasses

<b>4x4 Media Bay</b>	A. 	B. 	C. 			
<b>4x6/6x4 Media Bay</b>	A. 	B. 	C. 			
<b>4x8/8x4 &amp; 4.5x7.83/7.83x4.5 Media Bay</b>	A. 	B. 	C. 	D. 		
<b>6x6 Media Bay</b>	A. 	B. 	C. 	D. 		
<b>6x8/8x6 Media Bay</b>	A. 	B. 	C. 	D. 		
<b>6x10/10x6 &amp; 8x8 Media Bay</b>	A. 	B. 	C. 	D. 		
<b>6x12/12x6 Media Bay</b>	A. 	B. 	C. 	D. 		
<b>7x13/13x7/12x8 &amp; 14x8 Media Bay</b>						
	A. 20	B. 6	C. 3	D. 2		

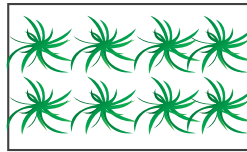
\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.



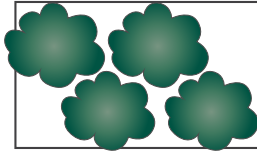
16x8 & 15x9  
Media Bay



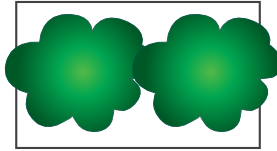
A. 24



B. 8

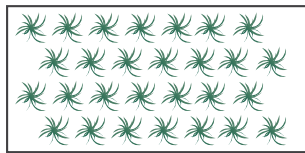


C. 4

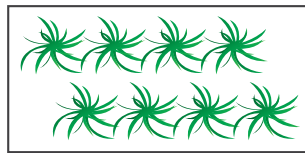


D. 2

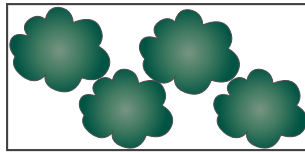
18x8 Media Bay



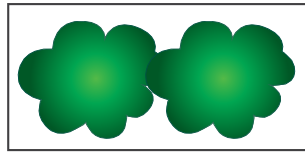
A. 28



B. 8

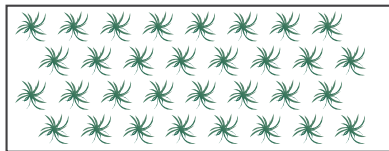


C. 4

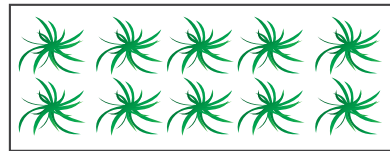


D. 2

20x8 Media Bay



A. 32



B. 10

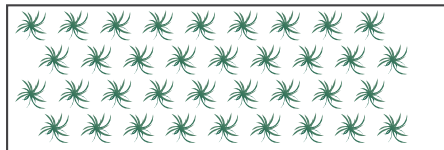


C. 5

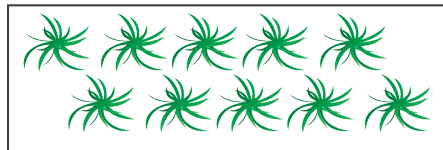


D. 3

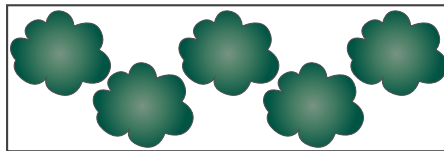
22x8 Media Bay



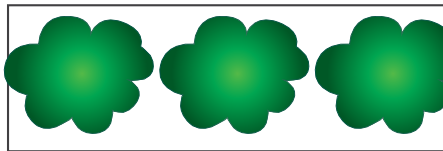
A. 36



B. 10



C. 5



D. 3

\* UNPREPARED SITE FEE NOTE: A charge of \$1500.00 will be invoiced for each activation visit requested by customer where Contech determines that the site does not meet the conditions required for Activation AND/OR acceptable plants are not provided by the contractor. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized activations will void the system warranty and waive manufacturer supplied activation and final inspection.





## Appendix 2 – Filterra® Tree Grate Opening Expansion Procedure

The standard grates used on all Filterra configurations that employ Tree Grates are fabricated with a 6" opening that is designed with a breakaway section that can be removed, allowing the grate opening to be expanded to 12" as the tree matures and the trunk widens.

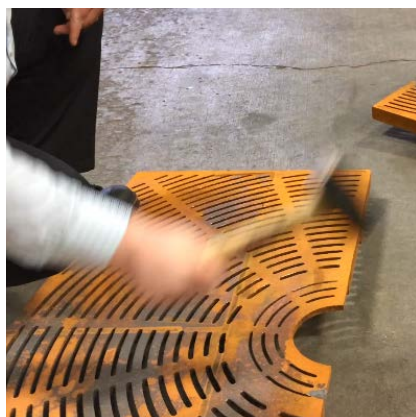
The following tools are required to expand the opening:

- Mini sledgehammer (3 lb. or greater)
- Safety Glasses / Goggles

The following guidelines should be followed to properly expand the tree opening from 6" to 12":



1. Remove the grate from the Filterra frame, place it flat on a hard surface, and support the grate by stepping on the edge or using other weighted items such as a few mulch bags if this is being done during a Filterra maintenance event. Put on safety glasses/goggles. Align the mini sledgehammer as shown in the figure to the left. The head of the sledgehammer should be aimed just inside the wide cast iron bar between the larger grate section and the breakaway section.



2. Repeatedly hit the grate at this spot with the mini sledgehammer.



3. After several hits, the breakaway section should snap cleanly off of the larger grate section. Reinstall the grate into the Filterra grate frame. Recycle or dispose of the breakaway section per local guidelines.

# Vortechs<sup>®</sup> Guide Operation, Design, Performance and Maintenance



## Vortechs®

The Vortechs system is a high-performance hydrodynamic separator that effectively removes finer sediment (e.g. 50-microns ( $\mu\text{m}$ ), oil, and floating and sinking debris). The swirl concentration operation and flow controls work together to minimize turbulence and provide stable storage of captured pollutants. Precast models can treat peak design flows up to 30-cfs (850-L/s); cast-in-place models handle even greater flows. A typical system is sized to provide a specific removal efficiency of a predefined particle size distribution (PSD).

### Operation Overview

Stormwater enters the swirl chamber inducing a gentle swirling flow pattern and enhancing gravitational separation. Sinking pollutants stay in the swirl chamber while floatables are stopped at the baffle wall. Vortechs systems are usually sized to efficiently treat the frequently occurring runoff events and are primarily controlled by the low flow control orifice. This orifice effectively reduces inflow velocity and turbulence by inducing a slight backwater that is appropriate to the site.

During larger storms, the water level rises above the low flow control orifice and begins to flow through the high flow control. Any layer of floating pollutants is elevated above the invert of the Floatables Baffle Wall, preventing release. Swirling action increases in relation to the storm intensity, while sediment pile remains stable. When the storm drain is flowing at peak capacity, the water surface in the system approaches the top of the high flow control. The Vortechs system will be sized large enough so that previously captured pollutants are retained in the system, even during these infrequent events.

As a storm subsides, treated runoff decants out of the Vortechs system at a controlled rate, restoring the water level to a dry-weather level equal to the invert of the inlet pipe. The low water level facilitates easier inspection and cleaning, and significantly reduces maintenance costs by reducing pump-out volume.

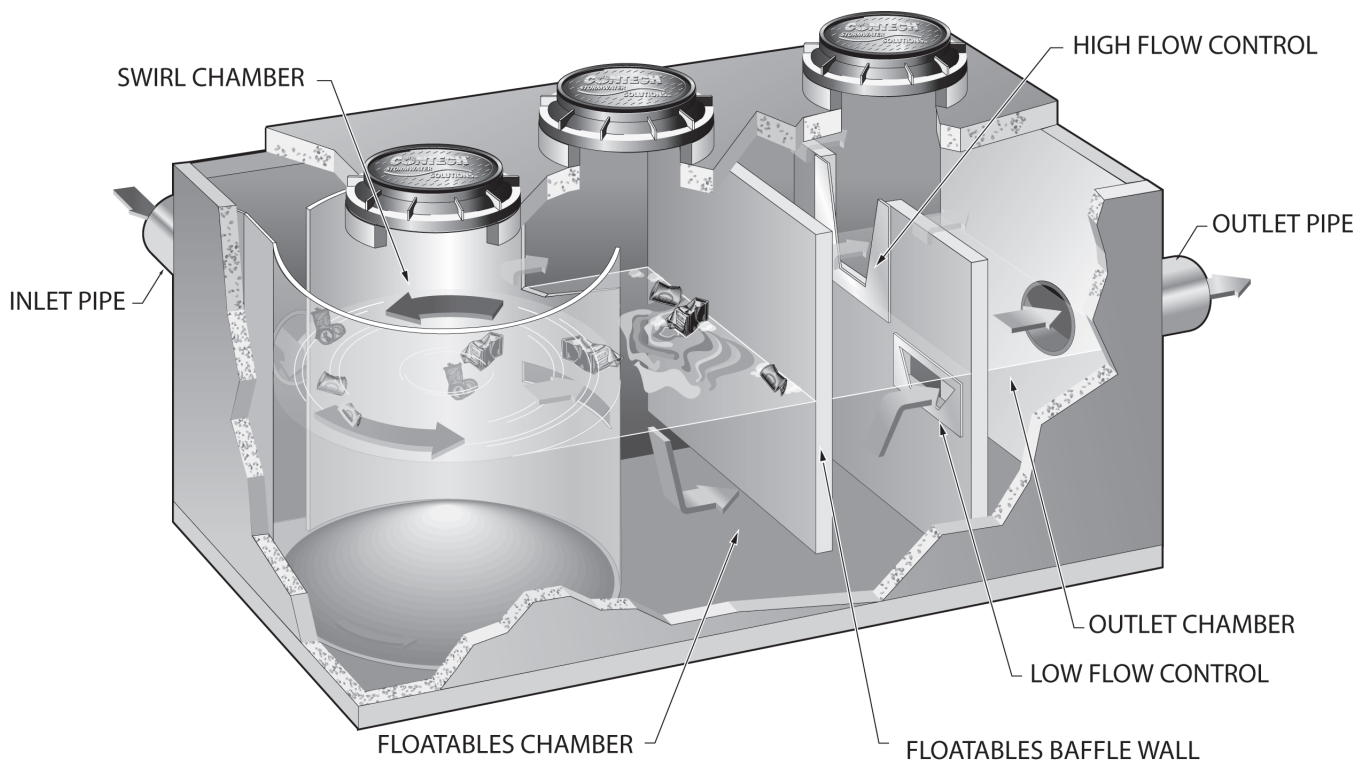
### Design Basics

Each Vortechs system is custom designed based on site size, site runoff coefficient, regional precipitation intensity distribution, and anticipated pollutant characteristics. There are two primary methods of sizing a Vortechs system. The first is to determine which model size provides the desired removal efficiency at a given flow for a defined particle size or PSD. The second and more in depth method is the summation of Rational Rainfall Method™ which uses a summation process described below in detail and is used when a specific removal efficiency of the net annual sediment load is required.

Typically Vortechs systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for either 50- $\mu\text{m}$  particles, or a particle gradation found in typical urban runoff (see performance section of this manual for more information).

#### The Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.





Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes or hourly and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed Vortechs system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Once a system size is established, the internal elements of the system are designed based on information provided by the site engineer. Flow control sizes and shapes, sump depth, oil spill storage capacity, sediment storage volume and inlet and outlet orientation are determined for each system. In addition, bypass weir calculations are made for off-line systems.

## Flow Control Calculations

### Low Flow Control

The low flow control, or orifice, is typically sized to submerge the inlet pipe when the Vortechs system is operating at 20% of its treatment capacity. The orifice is typically a Cippoletti shaped aperture defined by its flat crest and sides which incline outwardly at a slope of 1 horizontal to 4 vertical.

$$Q_{\text{orifice}} = C_d \cdot A \cdot \sqrt{2gh}$$

Where:

$Q_{\text{orifice}}$  = flow through orifice, cfs (L/s)

$C_d$  = orifice coefficient of discharge = 0.56 (based on lab tests)

$A$  = orifice flow area, ft<sup>2</sup> (m<sup>2</sup>) (calculated by orifice geometry)

$h$  = design head, ft (m) (equal to the inlet pipe diameter)

$g$  = acceleration due to gravity (32.2-ft/s<sup>2</sup> (9.81-m/s<sup>2</sup>))

The minimum orifice crest length is 3-in (76-mm) and the minimum orifice height is 4-in (102-mm). If flow must be restricted beyond what can be provided by this size aperture, a Fluidic-Amp™ HydroBrake flow control will be used. The HydroBrake allows the minimum flow constriction to remain at 3-in (76-mm) or greater while further reducing flow due to its unique throttling action.

### High Flow Control

The high flow control, or weir, is sized to pass the peak system capacity minus the peak orifice flow when the water surface elevation is at the top of the weir. This flow control is also a Cippoletti type weir.

The weir flow control is sized by solving for the crest length and head in the following equation:

$$Q_{\text{weir}} = C_d \cdot L \cdot (h)^{3/2}$$

Where:

$Q_{\text{weir}}$  = flow through weir, cfs (L/s)

$C_d$  = Cippoletti weir coefficient = 3.37 (based on lab testing)

$h$  = available head, ft (m) (height of weir)

$L$  = design weir crest length, ft (m)

### Bypass Calculations

In most all cases, pollutant removal goals can be met without treating peak flow rates and it is most feasible to use a smaller Vortechs system configured with an external bypass. In such cases, a bypass design is recommended by Contech Engineered Solutions for each off-line system. To calculate the bypass capacity, first subtract the system's treatment capacity from the peak conveyance capacity of the collection system (minimum of 10-year recurrence interval). The result is the flow rate that must be bypassed to avoid surcharging the Vortechs system. Then use the following arrangement of the Francis formula to calculate the depth of flow over the bypass weir.

$$H = (Q_{\text{bypass}} / (C_d \cdot L))^{2/3}$$

Where:

$H$  = depth of flow over bypass weir crest, ft (m)

$Q_{\text{bypass}}$  = required bypass flow, cfs (L/s)

$C_d$  = discharge coefficient = 3.3 for rectangular weir

$L$  = length of bypass weir crest, ft

The bypass weir crest elevation is then calculated to be the elevation at the top of the Cippoletti weir minus the depth of flow.

### Hydraulic Capacity

In the event that the peak design flow from the site is exceeded, it is important that the Vortechs system is not a constriction to runoff leaving the site. Therefore, each system is designed with enough hydraulic capacity to pass the 100-year flow rate. It is important to note that at operating rates above 100-gpm/ft<sup>2</sup> (68-Lps/m<sup>2</sup>) of the swirl chamber area (peak treatment capacity), captured pollutants may be lost.

When the system is operating at peak hydraulic capacity, water will be flowing through the gap over the top of the flow control wall as well as the orifice and the weir.



# Performance

## Full Scale Laboratory Test Results

Laboratory testing was conducted on a full scale Vortechs model 2000. The 150- $\mu\text{m}$  curve demonstrates the results of tests using particles that passed through a 60-mesh sieve and were retained on a 100-mesh sieve. The 50- $\mu\text{m}$  curve is based on tests of particles passing through a 200-mesh sieve and retained on a 400-mesh sieve (38- $\mu\text{m}$ ). A gradation with an average particle size (d50) of 80- $\mu\text{m}$ , containing particles ranging from 38–500- $\mu\text{m}$  in diameter was used to represent typical stormwater solids. (Table 1)

Particle Size Distribution ( $\mu\text{m}$ )	Percentage of Sample Make-Up
<63	42%
63 - 75	4%
75 - 100	9%
100 - 150	7%
150 - 250	11%
>250	27%

Table 1: Particle gradation of typical urban runoff used for efficiency curve

As shown, the Vortechs system maintains positive total suspended solids (TSS), defined by the tested gradations, removal efficiencies over the full range of operating rates. This allows the system to effectively treat all runoff from large, infrequent design storms, as well as runoff from more frequent low-intensity storms.

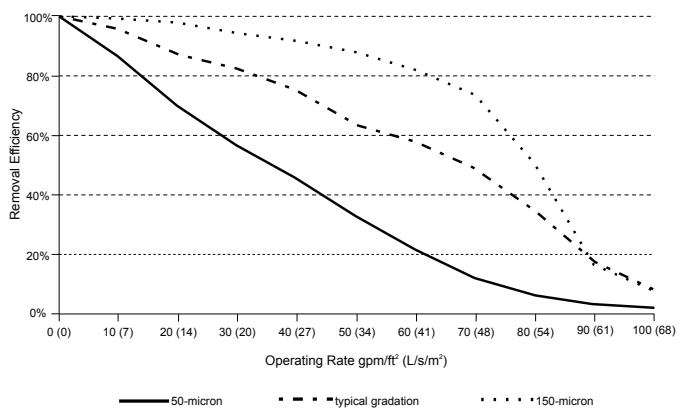


Figure 1: Vortechs model 2000 Removal Efficiencies

Typical Vortechs systems are designed to treat peak flows from 1.6-cfs (45-L/s) up to 30-cfs (850-L/s) online without the need for bypass. However, external bypasses can be configured to convey peak flows around the system if treatment capacity is exceeded. The system can also be configured to direct low flows from the last chamber of the system to polishing treatment when more stringent water quality standards are imposed. In all configurations, high removal efficiencies are achieved during the lower intensity storms, which constitute the majority of annual rainfall volume.

Full report available at [www.conteches.com/vortechs](http://www.conteches.com/vortechs).

## Laboratory Testing

Full reports available at [www.conteches.com/vortechs](http://www.conteches.com/vortechs)

Technical Bulletin 1: Removal Efficiencies for Selected Particle Gradations

Technical Bulletin 2: Particle Distribution of Sediments and the Effect on Heavy Metal Removal

Technical Bulletin 3: Sizing for Net Annual Sediment Removal

Technical Bulletin 3a: Determining Bypass Weir Elevation for Off-Line Systems

Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method

Technical Bulletin 5: Oil Removal Efficiency

## Field Monitoring

Following are brief summaries of the field tests completed to date.

Full reports available at [www.conteches.com/vortechs](http://www.conteches.com/vortechs)

## DeLorme Mapping Company

### Yarmouth, ME

#### Contech Engineered Solutions

Prior to this premier field test of the Vortechs system, Contech developed an extensive body of laboratory data to document total suspended solids (TSS) removal efficiency. Contech performed this field study in order to compare the performance predicted using laboratory data to the performance of a correctly sized system in the field.

The study site was the headquarters of DeLorme Mapping in Yarmouth, Maine. The building, driveway, parking lot and ancillary facilities were constructed in 1996. A Vortechs model 11000 was installed to treat runoff from the 300-space, 4-acre (1.62-ha) parking lot.

Testing Period	May 1999 to Dec 1999
# of Storms Sampled	20
Mean Influent Concentration	328-mg/L
Mean Effluent Concentration	60-mg/L
Removal Efficiency	82%

The main purpose of the DeLorme study was to verify that the sizing methodology developed from our full-scale laboratory testing was valid and an accurate means of predicting field performance. The results of the study confirmed our sizing methodology.

## Village Marine Drainage

### Lake George, NY

#### New York State Department of Environmental Conservation, Division of Water

The New York State DEC used funds obtained in a Section 319 grant to initiate a study of the effectiveness of the Vortechs system to remove sediment and other pollutants transported

by stormwater to Lake George, Lake George Village, New York. "Since the 1970s, when there was a rapid increase in the rate and concentration of development along the southwestern shores of Lake George, we have been concerned about the impact of stormwater discharges into the lake," said Tracy West, co-author of the study.

Testing Period	Feb 2000 to Dec 2000
# of Storms Sampled	13
Mean Influent Concentration	801-mg/L
Mean Effluent Concentration	105-mg/L
Removal Efficiency	88%

The study concluded that the Village and Town of Lake George should consider installing additional Vortechs systems in areas where sedimentation and erosion have been identified as non-point source pollution problems.

**Harding Township Rest Area  
Harding Township, NJ  
RTP Environmental Associates**

This third party evaluation was performed under a U.S. Environmental Protection Agency grant, administered by the New Jersey Department of Environmental Protection. A. Roger Greenway, principal of RTP Environmental Associates, Inc., conducted the study in conjunction with Thonet Associates, which assisted with data analysis and helped develop best management practices (BMP) recommendations.

The Vortechs model 4000 was sized to handle a 100-year storm from the 3 acre (1.21 ha) paved parking area at the Harding Rest Stop, located off the northbound lane of I-287 in Harding Township, New Jersey.

Testing Period	May 1999 to Nov 2000
# of Storms Sampled	5
Mean Influent Concentration (TSS)	493-mg/L
Mean Effluent Concentration (TSS)	35-mg/L
Removal Efficiency (TSS)	93%
Mean Influent Concentration (TPH)	16-mg/L
Mean Effluent Concentration (TPH)	5-mg/L
Removal Efficiency (TPH)	67%

The study concluded that truck rest stops and similar parking areas would benefit from installing stormwater treatment systems to mitigate the water quality impacts associated with stormwater runoff from these sites.

**Timothy Edwards Middle School  
South Windsor, CT**

**UCONN Department of Civil & Environmental Engineering**

This study of the Vortechs system was published as a thesis by Susan Mary Board, as part of the requirements for a Master of Science degree from the University of Connecticut. Her objective was to determine how well the Vortechs system retained pollutants from parking lot runoff, including total suspended solids (TSS), nutrients, metals, and petroleum hydrocarbons.

A Vortechs model 5000 was installed in 1998 to treat runoff from the 82-space parking lot of Timothy Edwards Middle School. The entire watershed was approximately 2 acres (0.81 ha), and was 80% impervious.

Testing Period	Jul 2000 to Apr 2001
# of Storms Sampled	weekly composite samples taken
Mean Influent Concentration	324-mg/L
Mean Effluent Concentration	73-mg/L
Removal Efficiency	77%

Additionally, the Vortechs system was particularly effective in removing zinc (85%), lead (46%), copper (56%), phosphorus (67%) and nitrate (54%).

The study concluded that the Vortechs system significantly reduced effluent concentrations of many pollutants in stormwater runoff.



## Maintenance

The Vortechs system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., unstable soils or heavy winter sanding will cause the swirl chamber to fill more quickly but regular sweeping will slow accumulation.

### Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is provided on the following page, and is also available on [conteches.com](http://conteches.com).

The Vortechs system should be cleaned when inspection reveals that the sediment depth has accumulated to within 12 to 18 inches (300 to 450 mm) of the dry-weather water surface elevation. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

### Cleaning

Cleaning of the Vortechs system should be done during dry weather conditions when no flow is entering the system. Clean-out of the Vortechs system with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. If such a truck is not available, a "clamshell" grab may be used, but it is difficult to remove all accumulated pollutants using a "clamshell".

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads to solidify the oil since these pads are usually much easier to remove from the unit individually and less expensive to dispose of than the oil/water emulsion that may be created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Cleaning of a Vortechs system is typically done by inserting a vacuum hose into the swirl chamber and evacuating this chamber of water and pollutants. As water is evacuated, the water level outside of the swirl chamber will drop to a level roughly equal to the crest of the lower aperture of the swirl chamber.

Floating pollutants will decant into the swirl chamber as the water level is drawn down. This allows most floating material to be withdrawn from the same access point above the swirl chamber. Floating material that does not decant into the swirl chamber during draw down should be skimmed from the baffle chamber. Sediment may accumulate outside the swirl chamber. If this is the case, it may be necessary to pump out other chambers. It is advisable to check for sediment accumulation in all chambers during inspection and maintenance.

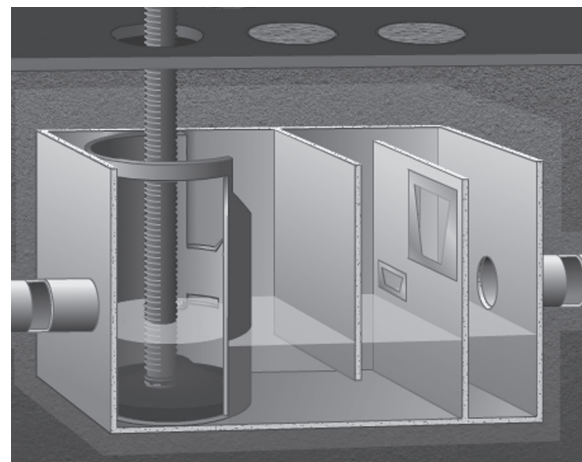
These maintenance recommendations apply to all Vortechs systems with the following exceptions:

1. It is strongly recommended that when cleaning systems larger than the Model 16000 the baffle chamber be drawn down to depth of three feet prior to beginning clean-out of the swirl chamber. Drawing down this chamber prior to the swirl chamber reduces adverse structural forces pushing upstream on the swirl chamber once that chamber is empty.
2. Entry into a Vortechs system is generally not required as cleaning can be done from the ground surface. However, if manned entry into a system is required the entire system should be evacuated of water prior to entry regardless of the system size.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the Vortechs system should be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Vortechs systems. To find a CCMP in your area please visit [www.conteches.com/maintenance](http://www.conteches.com/maintenance).





## Vortechs Inspection & Maintenance Log

Vortech Model: \_\_\_\_\_ Location: \_\_\_\_\_

Date	Water depth to sediment	Floatable layer thickness	Describe maintenance performed	Maintenance personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.







800-338-1122  
www.conteches.com

## Support

- Drawings and specifications are available at [www.conteches.com](http://www.conteches.com).
- Site-specific design support is available from our engineers.

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