

Operations and Maintenance Manual

for

108, 112, 118, 122-126 South Avenue East

& 32 High Street

Block 478, Lots 2, 3, 4, 5 & 6

2 Chestnut Street

Township of Cranford

Union County, New Jersey



Prepared for Applicant/Owner:

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Iron Ore Properties

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April 6, 2023 | FPA No. 16753.001

1800 Route 34, Suite 101, Wall Township, NJ 07719

Stormwater Management Measures Maintenance Plan & Field Manuals

Development Name: South Avenue Mixed-Use Development

Address: Tract 1: 108-126 South Avenue East
and 32 & 42 High Street
Tract 2: 2 Chestnut Street

Block(s) / Lot(s): Tract 1: Block 478; Lots 2, 3, 4, 5, and 6
Tract 2: Block 483, Lots 17.01 & 18

Township, County: Cranford Township, Union County

Party Responsible for Maintenance:

Iron Ore Properties, LLC

Address: 55 Bleeker Street, 2nd Floor

Contact Person(s): Brandon K. Boffard Phone: 973-376-4605

Prepared by: French & Parrello Associates, P.A. Date: 04/03/2023

This plan is recorded in

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

Last Revised on ___/___/_____

NOTE

This Maintenance Plan is intended to be editable and adjustable in accordance with the design of stormwater management measures, the site conditions, and the special needs of responsible party. The Engineer should supplement information and best management practice to assist the responsible party to perform maintenance.

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Part II- Field Manuals and Maintenance Records

Field Manual for (Underground Concrete Detention Basin)

Field Manual for (Filtterra HC Peak Diversion Unit)

Maintenance Logs and Inspection Records

Part I- Maintenance Plan

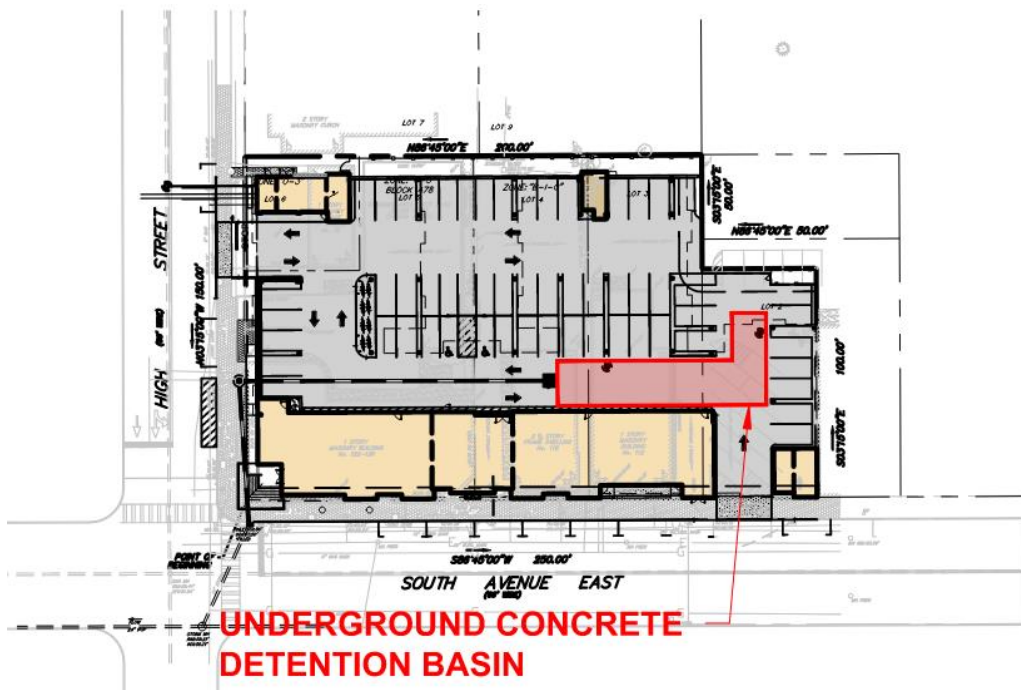
List of Stormwater Management Measures

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

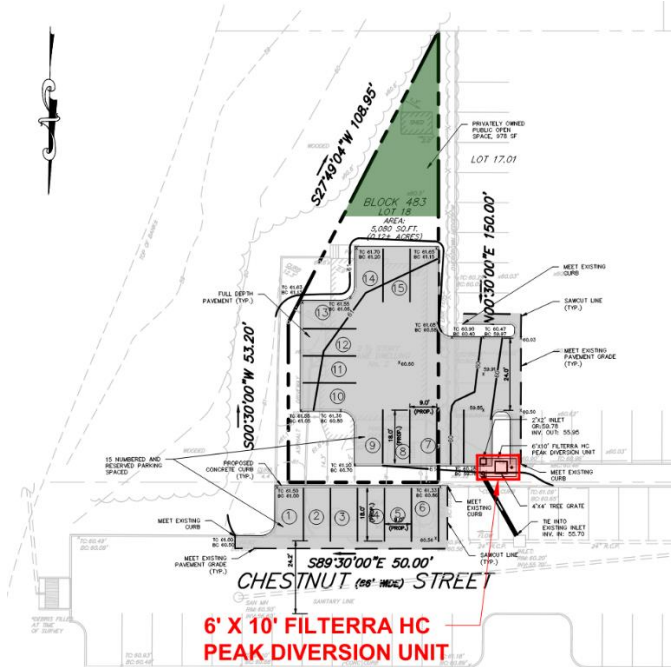
Type of Stormwater Management Measure	BMP No.	Location Description	State Plane Coordinates / Lat., Long.
Underground Concrete Detention Basin	Basin 1	Tract 1: Northwest corner of proposed parking lot	E(X): 546,576 N(Y): 663,358
Filterra HC Peak Diversion Unit	WQ #1	Tract 2: Northwest corner of proposed parking lot	E(X): 547,068 N(Y): 663,122

Location Maps

Tract 1:



Tract 2:



No.	Type of Stormwater Management Measure
Basin #1	Underground Concrete Detention Basin
WQ #1	Filtterra HC Peak Diversion Unit

Description of Stormwater Management Measures

Name of the stormwater management measure: Basin #1

Design storm: 100-Yr Storm

- Design Purposes:
 - o Detention
- Dimensions: 2,000 SF (Area) x 36" (Depth)

Name of the stormwater management measure: Filterra HC Peak Diversion Unit

Design storm:

- Design Purposes:
 - o (Water quality)
 - o 1.25 inches in 2 hours
- Dimensions: 6' Width x 10' Length

Preventative and Corrective Maintenance Action Plan

As per N.J.A.C. 7:8-5.8(b) & (e), preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including, but not limited to, repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of non-vegetated linings.

As per NJDEP BMP Manual Ch. 8 Feb. 2004), maintenance plans should include specific preventative and corrective maintenance tasks such as removal of sediment, trash, and debris; mowing, pruning, and restoration of vegetation; restoration of eroded areas; elimination of mosquito breeding habitats; control of aquatic vegetation; and repair or replacement of damaged or deteriorated components.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include recommended corrective responses to various emergency conditions that may be encountered at the stormwater management measure. It should be noted that if the stormwater management measure includes a Class I or II dam as defined in the NJDEP Dam Safety Standards at N.J.A.C. 7:20, an emergency action plan for the dam is also required. See N.J.A.C. 7:20-1.7(f) for more information.

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), the maintenance plan should address the maintenance of access points to the stormwater management measures in accordance with the following:

- all components of the stormwater management measures must be readily accessible for inspection and maintenance;
- trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure via roadways, paths, and ramps, including paths through perimeter vegetation to permanent pools, aquatic benches, and safety ledges to allow for the inspection and control of mosquito breeding; and
- the exact limits of inspection and maintenance easements and rights-of-way should be specified on stormwater management measure plans and included in the maintenance plan.

List preventative maintenance actions and the corrective maintenance actions in the tables provided below.

Preventative Maintenance Actions

Frequency	Preventative Maintenance Actions	Stormwater Measures/ No.
Monthly	<ul style="list-style-type: none"> Remove any debris or sediment 	Underground Basin
Quarterly	<ul style="list-style-type: none"> Sediment removal, vacuum sweeping 	Underground Basin
Semiannual	<ul style="list-style-type: none"> Inspect components expected to receive and/or trap debris and sediment for clogging 	Underground Basin and Filtterra HC Peak Diversion Unit
Annual	<ul style="list-style-type: none"> Inspect structural components for cracking, subsidence, spalling, erosion, and deterioration 	Underground Basin and Filtterra HC Peak Diversion Unit
Annual	<ul style="list-style-type: none"> Inspect vegetated areas for erosion, scour, and unwanted growth 	Filtterra HC Peak Diversion Unit
Unscheduled	<ul style="list-style-type: none"> Quick inspection after every 1" rain 	Underground Basin and Filtterra HC Peak Diversion Unit

Corrective Maintenance Actions

Potential Corrective Maintenance Actions	Stormwater Management Measures/No.
<ul style="list-style-type: none">• Repair/replacement of outlet pipes or orifices• Sediment Removal	Underground Basin
<ul style="list-style-type: none">• Proper positioning of erosion control stones by Filterra HC inlet to allow for entry of trash during a storm event• Correct placement of Filterra HC grates• Proper pruning of plant to encourage growth in correct directions	Filterra HC Peak Diversion Unit

Inspection and Logs of All Preventative and Corrective Maintenance

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

As per NJDEP BMP Manual Ch. 8 (Feb, 2004), a maintenance plan shall include a schedule of regular inspections and tasks, and detailed logs of all preventative and corrective maintenance performed on the stormwater management measure, including all maintenance-related work orders. The person with maintenance responsibility must retain and, upon request, make available the maintenance plan and associated logs and other records for review by a public entity with administrative, health, environmental, or safety authority over the site.

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

- Underground Concrete Detention Basin
- Filterra HC Peak Diversion Unit

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

Maintenance Personnel, Equipment, Tools, and Supplies

Maintenance Personnel/Equipment/Tools/Supplies

Personnel/Equipment/Tools Name	Quantity
General maintenance crew	1
Appropriate PPE	1
Camera	1
Bucket	1
Shovel	1
Broom	1
Pruners	1
Hoe/Rake	1
Tape Measure	1
T-bar / crowbar (for tree grate movement)	1

Specialized, proprietary or nonstandard equipment, tools and supplies, if applicable

Name of the specialized, proprietary or nonstandard equipment, tools and supplies	Source
Additional Filterra engineered soil media, as needed	Filterra

Disposal Plan

Disposal/Recycling Procedures

- Dewatering procedures and requirements
Maintenance of unit/sediment removal shall take place when all runoff has drained from basins / storm sewer system and are all dry.
- Unloading procedures and requirements
Disposal of debris, trash, sediment, and all other waste material should be done at an approved disposal/recycling site and in accordance with all applicable local, state, and federal regulations

Disposal Field – Offsite

Description of the Offsite Disposal:

Disposal of the debris, trash, sediment, and all other waste material should be done at an approved disposal/recycling site and in accordance with all applicable local, state, and federal regulations. The facilities operator or contractor shall be responsible for contracting a company to dispose all materials off-site.

Cost Estimate

As per N.J.A.C.7:8-5.8(b), cost estimates of maintenance tasks, including, but not limited to, sediment, trash and debris removal must be included in the maintenance plan. Below is an illustration of a cost breakdown and estimation for maintenance of stormwater management measures. The design engineer should estimate the cost based on the expected maintenance required for each stormwater management measure. The actual costs may vary with factors such as local requirements, equipment, personnel, weather, and maintenance methods.

COST ESTIMATES

Cost Overview

The design engineer should list the maintenance tasks and break down the costs for each maintenance task.

Cost Type	Cost	Details
Annual Contract to perform all routine and unscheduled maintenance	\$2,000	
Annual Contract to perform corrective measures	\$5,000	

Safety Measures and Procedures

As per NJDEP BMP Manual Ch. 8 (Feb. 2004), maintenance plans should include procedures and equipment required to protect the safety of inspection and maintenance personnel.

Safety Regulations and Requirements

Attach all local ordinance(s) and state and federal regulations regarding occupational safety after this section

Safety Tools, Equipment and Garments

Safety Tools and Equipment	Location	Responsible Person/Contact #

Emergency Procedures

List all first aid and emergency contacts and contact numbers.

Training Plan and Records

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

I. Training Plan

Types of Training

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

Content of Training

- **Stormwater Management Basic Training**
 - Purposes and Functions of BMPs
- Example Training Material
- NJDEP Stormwater BMP Manual, Chapter Nine: Structural Stormwater Management Measures
 - Chapter 9.6 Manufactured Treatment Devices

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

- Vegetation Care
- Example Training Material
- NJDEP Stormwater BMP Manual, Chapter Seven: Landscaping
(*provides information on vegetation and landscaping for stormwater management measures*)
 - Other
- Field Manual Usage Training

Example Training Material

- Field Manuals attached to this Maintenance Plan
- Other

- Equipment and Tools Operation Training

Example Training Material
 - Equipment or tool manufacturer’s Operation & Maintenance Manual
 - Other

- Occupational Safety Training

Example Training Material
 - OSHA Training
 - Equipment or tool manufacturer’s Operation & Maintenance Manual
 - Other

II. Training Records

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

Attach training attendance sheets from each training

Annual Evaluation of the Effectiveness of the Plan

As per N.J.A.C. 7:8-5.8(g), the person responsible for maintenance shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

The responsible party should evaluate the effectiveness of the maintenance plan by comparing the maintenance plan with the actual performance of the maintenance. The items to evaluate may include, but not limited to,

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

If actual performance of those items has been deviated from the maintenance plan, the responsible party should find the causes and implement solutions in a revised maintenance plan.

Annual Evaluation Records

Evaluator(s)	Date of Evaluation	Decision
		<input type="checkbox"/> Maintain current version OR <input type="checkbox"/> Revise current version Revision date _____ (also update the last revision date on the cover page) <input type="checkbox"/> Requires a new deed recording (also update the last recording information on the cover page)
		<input type="checkbox"/> Maintain current version OR <input type="checkbox"/> Revise current version Revision date _____ (also update the last revision date on the cover page) <input type="checkbox"/> Requires a new deed recording (also update the last recording information on the cover page)
		<input type="checkbox"/> Maintain current version OR <input type="checkbox"/> Revise current version Revision date _____ (also update the last revision date on the cover page) <input type="checkbox"/> Requires a new deed recording (also update the last recording information on the cover page)

Documents

Transfer Agreement

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

Deed

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

As-Built Drawings with Drainage Plans

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

Landscaping Plan for the Stormwater Management Measures

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

Permeability Test/Infiltration Test Report

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

Groundwater Mounding Analysis

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

Soil Boring Logs

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

Local, State, Federal Permits

As per NJDEP BMP Manual Ch. 8 (Feb., 2004), local, state, or federal permits related to the stormwater management measures for this development should be included in this Maintenance Plan. See Cost Estimate Section of This Maintenance Plan for more information. The requirement to obtain State permits depends on specific circumstances, such as, but not limited to, the specific design of the stormwater management measures, the maintenance

actions, the access and disturbance, the disposal methods, the location of disposal, the method to empty a basin, the method to dredge the basin, the pollutants in the basin, the damages to the basin, and the method to repair the basin.

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

Safety Regulations and Requirements

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

Devices/Tools/Equipment Operation and Maintenance Manual and Warranties

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

Attach Documents Here

Part II- Field Manuals

Attachment of Field Manuals for Stormwater Management Measures on this Site

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

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

Field Manual for Underground Concrete Detention Basin
Field Manual for Filterra HC Peak Diversion Unit

Maintenance Logs and Inspection Records

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

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

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

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

Basin #1 on the Location Map

Development Name: South Avenue Mixed-Use Development

Township, County: Cranford, NJ 07016

Location of Basin: E: 546,576; N: 663,358

Location Description: Northwest corner of proposed parking lot

Location Map

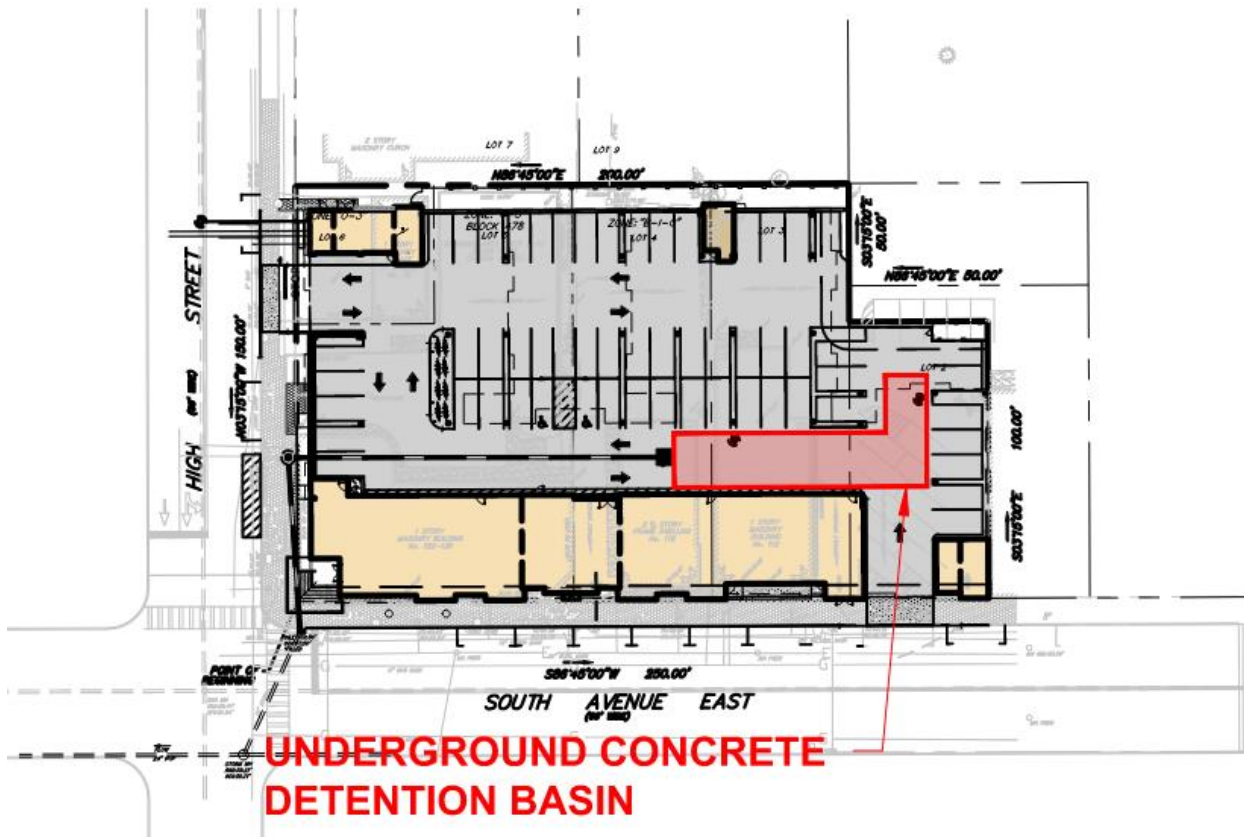


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Basin #1 Overview

Functionality

A detention basin is a stormwater management facility which provides temporary storage of stormwater runoff.

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

Type of BMP – Dry Basin

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

Basic Design Information

Hydrology Design Targets

1. The design drain time for the water quality storm is:
 Less than 5 hours.
2. The overflow from this basin will be discharged to the existing storm sewer system.

Hydraulic Design Targets

1. The bottom of the basin is at elevation 58.5.

Critical Maintenance Features

Collected sediment, if any, shall be removed with vacuum truck and disposed of.

Reference Documents

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

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

Attach Reference Documents Here

**Inspection Checklist / Maintenance Actions
Basin #1**

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

Checklist No. _____ Inspection Date: _____

Date of most recent rain event: _____

Rain Condition (circle one):

Drizzle / Shower / Downpour / Other _____

Ground Condition (circle one):

Dry / Moist / Ponding / Submerged / Snow accumulation

	For Inspector		For Maintenance Crew
Component No. Component Name	Inspection Item and Inspection Item No.	Result	Preventative / Corrective Maintenance Actions
A Basin Through Inspection ports	1	Standing water is present after the design drain time The observed drain time is approximately _____ hours.	Y___ N___ Recheck to determine if there is standing water after 72 hours If standing water is present longer than 5 days, report to mosquito commission. Remove any sediment buildup with vacuum truck. Work Order # _____
	2	Excessive sediment, silt, or trash accumulation within distribution pipes	Y___ N___ Clean pretreatment system Remove silt, sediment, and trash Work Order # _____
Note:			

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

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

Inspector Name Signature Date

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

File this checklist in the Maintenance Log after performing maintenance.

Preventative Maintenance Record

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

Work Logs

Activities	Components	Date Completed
Sediment/debris removal Sediment removal should take place when the basin is thoroughly dry		
Other		

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

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

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

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

Corrective Maintenance Record

1. Work Order # _____ Date Issued _____

2. Issue to be resolved:

3. The issue was from Corresponding Checklist No. _____, Component No. _____, Inspection Item No. _____.

4. Required Actions

Actions	Planned Date	Date Completed

5. Responsible person(s):

6. Special requirements

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

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

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

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

Filterra HC Owner's Manual



filterra[®]
Bioretention Systems

C NTECH[®]
ENGINEERED SOLUTIONS





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Introduction

Thank you for your purchase of the Filterra® HC Bioretention System. Filterra HC is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra HC 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 HC system.

Included with your purchase is Activation of the Filterra HC system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra HC systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra HC box sizing (per local regulations) 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 HC units as shown in approved plans. A comprehensive installation manual covering all Filterra configurations is available at www.ContechES.com.

Activation Overview

Activation of the Filterra HC 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
- Placement of pretreatment mulch layer using mulch certified for use in Filterra HC 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 certified for use in Filterra HC systems.



Minimum Requirements

The minimum requirements for Filterra HC Activation are as follows:

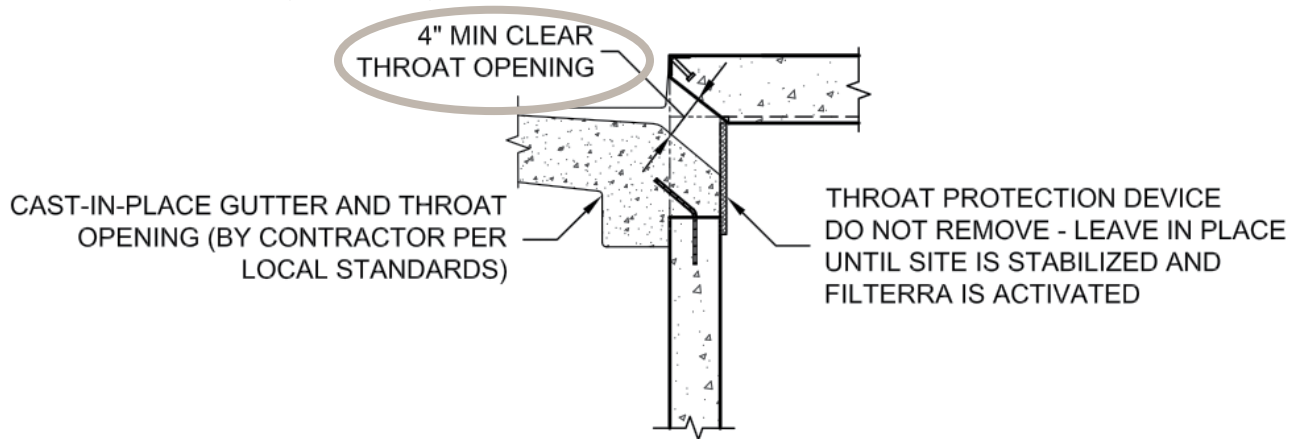
1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



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



3. Filterra HC throat opening (if applicable) should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra HC Plant Selection Overview

Plant Lists are 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 HC system. Plants installed in the Filterra HC 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 HC system.

The “Planting Requirements for Filterra HC Systems” document is included as an appendix and discusses proper selection and care of the plants within Filterra HC systems.

Warranty Overview

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

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

Routine Maintenance Guidelines

Routine maintenance is included by the manufacturer on all Filterra HC systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra HC systems also contain diversion bypass or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance 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 the media in the Filterra HC system.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra HC 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 Filterra HC system is also subjected to various materials entering the inlet, including trash, silt, leaves, etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra HC system flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

If the system is not maintained on regular intervals, is subject to a catastrophic spill or other event, or subject to unusual pollutant loading, full media bed replacement could be required. Please contact Contech for further evaluation if you feel this may be necessary.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

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; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. 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) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.



Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra HC (where the cleaned runoff drains to, such as drop inlet) and block off the inlet of the Filterra HC. 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 HC 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 & pruning or replacement as necessary
6. Clean area around Filterra HC
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 near 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 for the Filterra HC system, available from the Supplier.

	Available Filterra® HC Media Bay Sizes (feet)	Filter Surface Area (ft ²)	Mulch Volume at 3" Depth (ft ²)	# of 2 ft ² Mulch Bags
Standard Configuration Filtrerra and Filterra Bioscape Vaults	4x4	16	4	2
	4x6 or 6x4	24	6	3
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	9	5
	6x6	36	9	5
	6x8 or 8x6	48	12	6
	6x10 or 10x6	60	15	8
	6x12 or 12x6	72	18	9
	7x13 or 13x7	91	23	12
	14x8	112	28	14
	16x8	128	32	16
	18x8	144	36	18
	20x8	160	40	20
22x8	176	44	22	
Peak Diversion Filtrerra Vaults	4x4	16	4	2
	4.5x5.83 or 5.83x4.5 (Nominal 4x6/6x4)	26.24	7	4
	6x6	36	9	5
	6x8	48	12	6
	6x10 or 10x6	60	15	8
	7x10	70	18	9
	8x10.5	84	21	11
	8x12.5	100	25	13
	Custom and/or Filterra Bioscape	Media Area in ft ²	0.25 x (Media Area in ft ²)	0.125 x (Media Area in ft ²)

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 HC 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 HC 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 HC inlet to allow for entry of trash during a storm event.
- Replace Filterra HC 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 HC

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



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

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 HC.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra HC HC.	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 HC.		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 HC Inspection & Maintenance Log

Filterra HC 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® 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	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
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		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Attach additional sheets as necessary.

NOTE: A charge of \$500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra HC systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

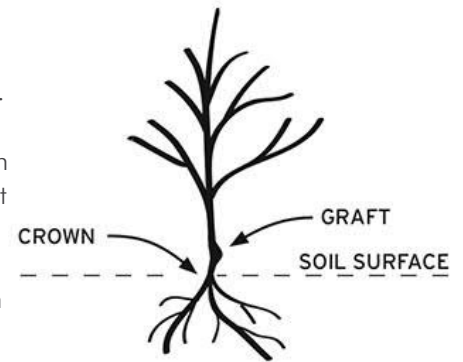
Signature _____

Date _____

Appendix 2 – Planting Requirements for Filterra® HC Systems

Plant Material Selection

- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra HC systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra HC systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25-30 feet.
- A 7-15 gallon container size shall be used.
- For precast Filterra HC systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts



Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- 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.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- 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.
- 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.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra HC system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra HC 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 HC 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. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water. Therefore, for a 6' by 6' Filterra HC approximately 20-60 gallons of 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 HC system. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.





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