



# Contech Engineered Solutions Filtration Solutions

## NEWSC Filtration Systems Workshop December 6, 2018

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Stormwater Consultant – WI & IL

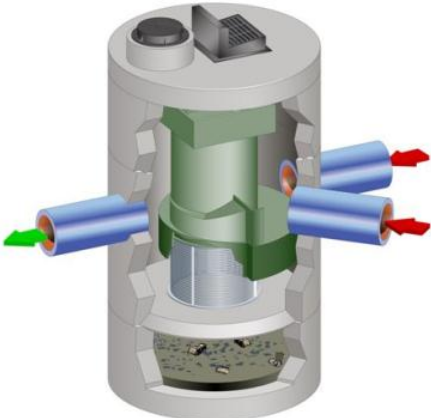
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# Filtration Applications

- Standalone Treatment BMP
  - New Development
  - Redevelopment
- LID Pretreatment
  - Subsurface Infiltration
  - Rainwater Harvesting
- Polishing Treatment BMP
  - Downstream of Detention System



# Two Levels of Manufactured Treatment Devices



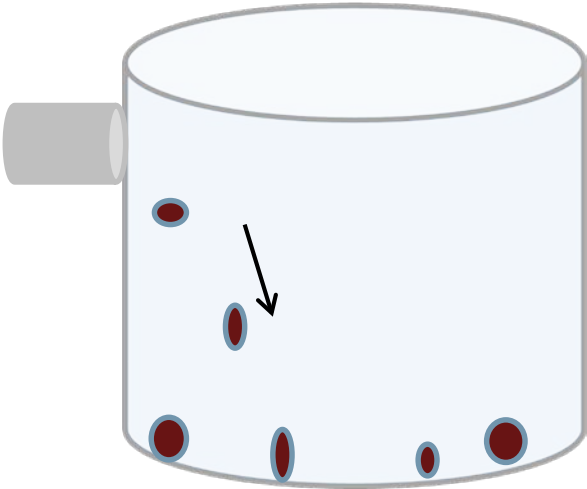
	Hydrodynamic Separation	Filtration
Pollutants of Concern	TSS	TSS, Nutrients, Metals
Targeted Particle Size Distribution	> 50 micron	< 50 micron
Placement Relative to Detention	<ul style="list-style-type: none"> <li>Upstream for effective performance</li> </ul>	<ul style="list-style-type: none"> <li>Upstream or downstream</li> </ul>



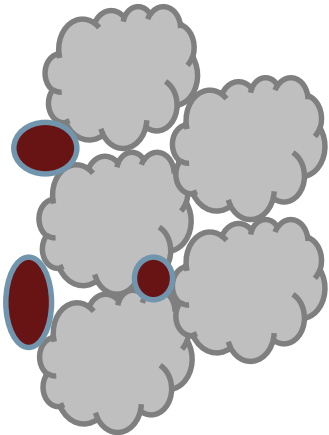
# Filtration Mechanisms

- Three primary mechanisms to removal Phosphorus from runoff:

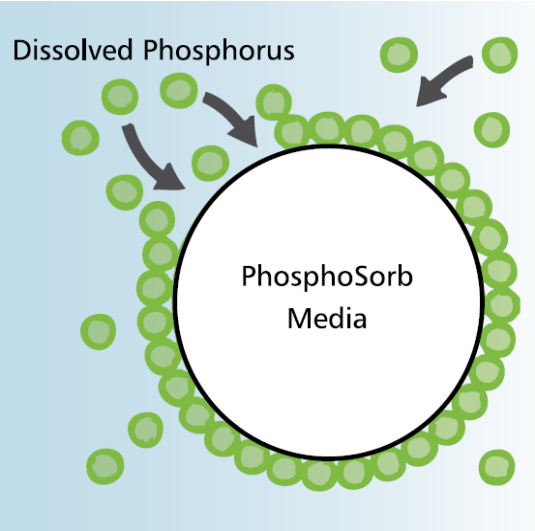
**Sedimentation**



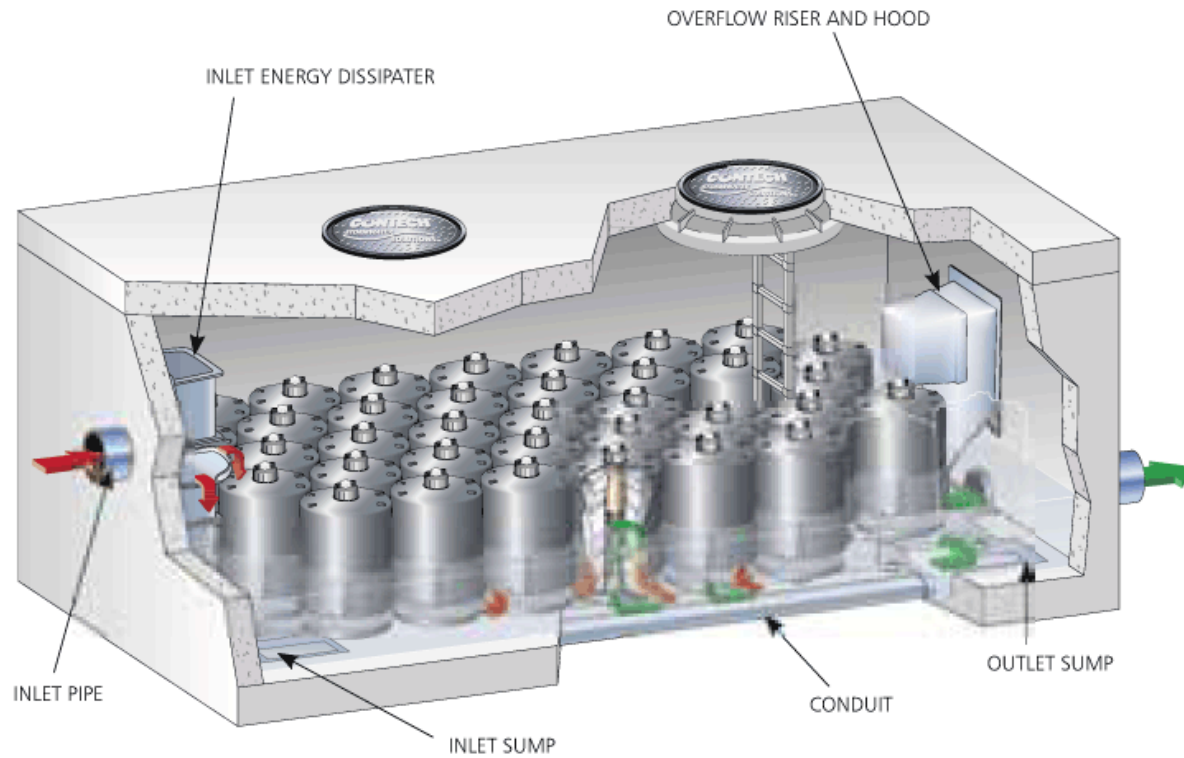
**Physical Filtration**



**Reactive Filtration**



# Contech Media Filtration Systems



StormFilter



Jellyfish Filtration System



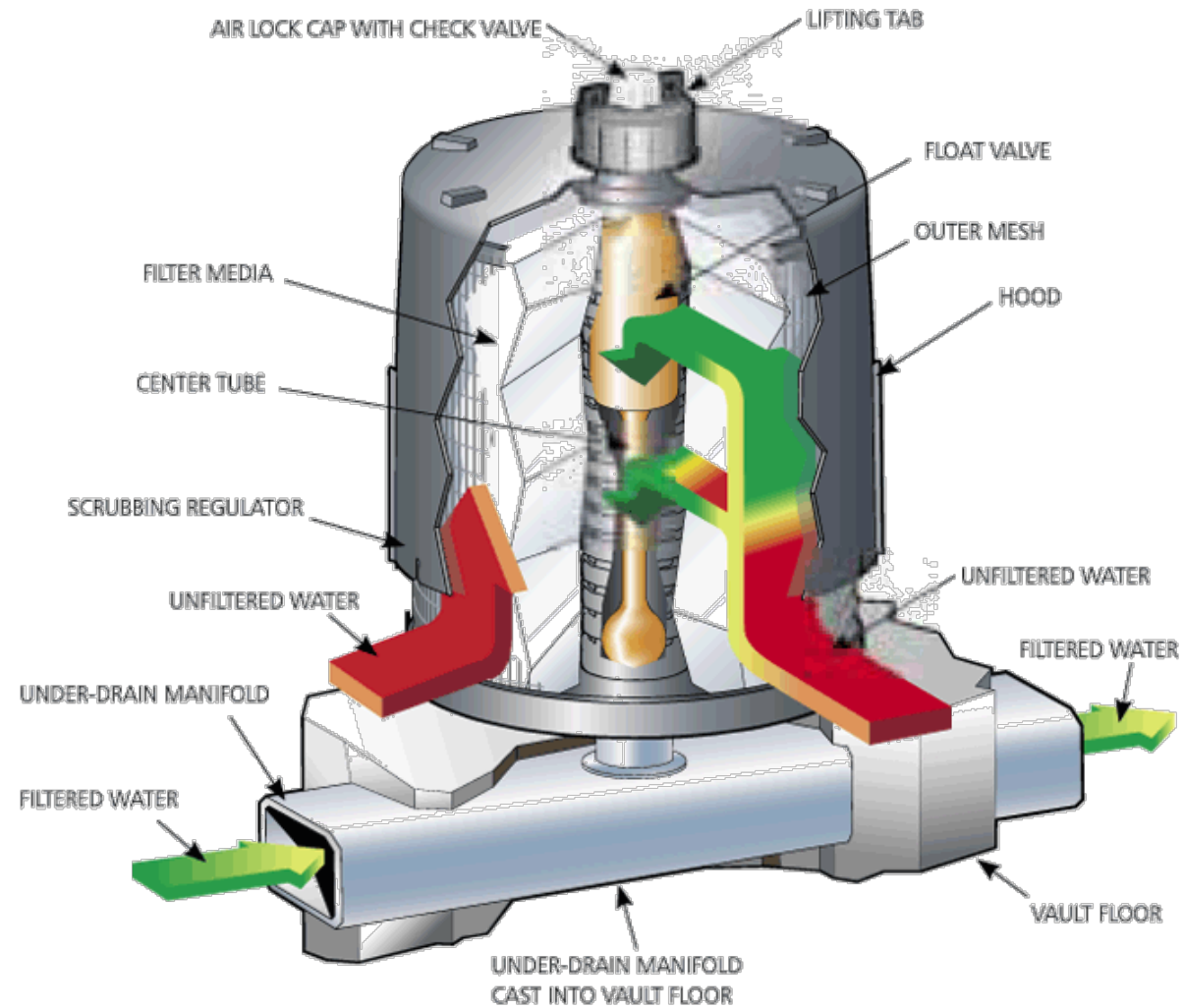
# StormFilter – Proven Performance

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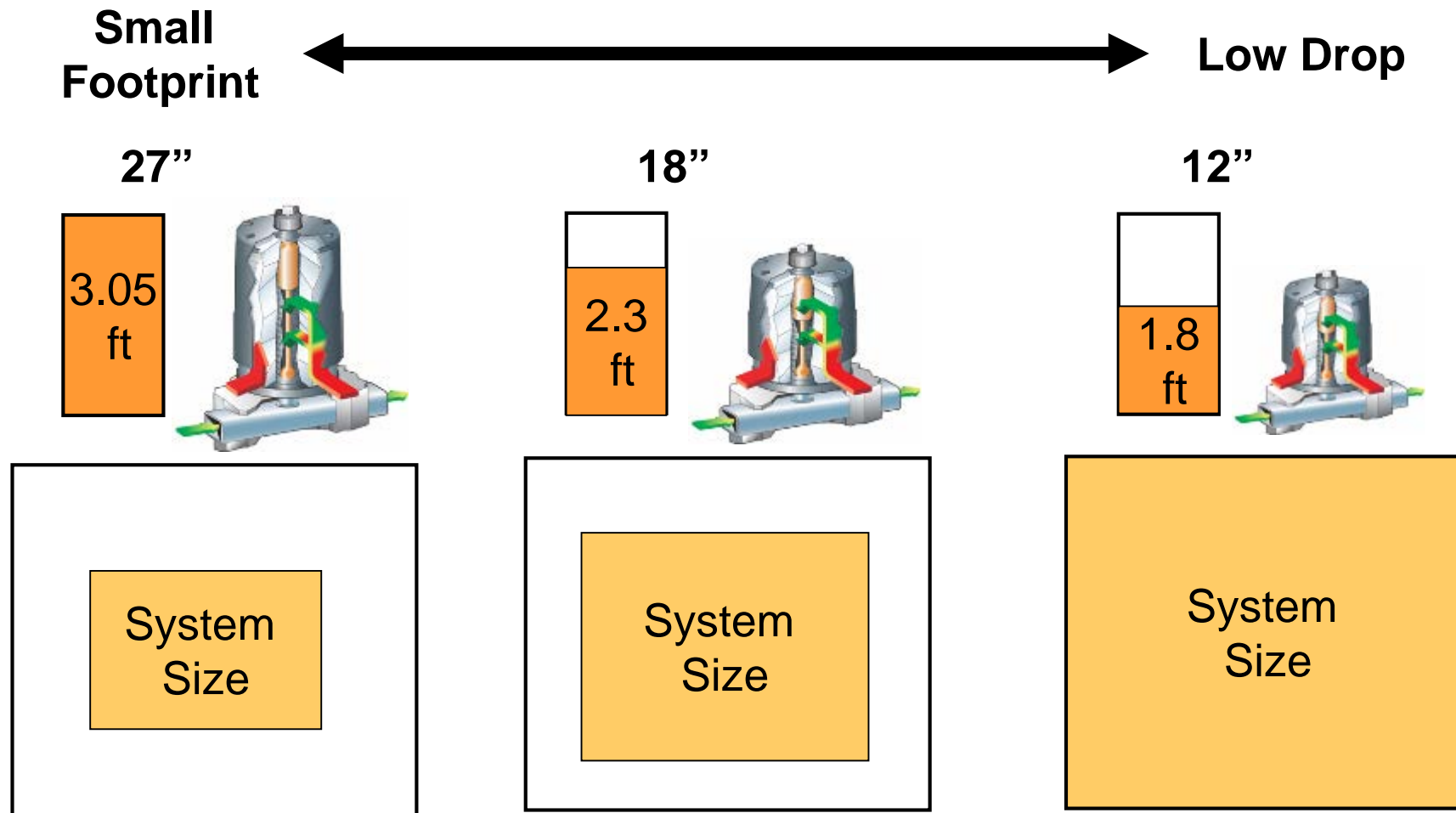
- WA DOE - Technology Assessment Protocol – Ecology (TAPE)
  - 22 qualified (32 total) storms sampled to achieve ZPG approval for Basic (TSS) treatment @ 1 gpm/ft<sup>2</sup> (01/05)
  - 17 qualified (25 total) storms sampled to achieve Phosphosorb approval for Basic (TSS) & phosphorus treatment @ 1.67 gpm/ft<sup>2</sup> (11/15)
- NJ DEP Laboratory Protocol for TSS Removal by Filtration MTD
  - NJCAT - State of New Jersey, Corporation for Advanced Technology
  - NJDEP Final Certification for TSS removal using perlite @ 2 gpm/ft<sup>2</sup> (12/16)
- Notable approvals: NCDEQ, VADEQ, NYSDEC, MDDOE

**New Wisconsin DNR Filter Protocol may reference NJ and/or WA approvals**

# StormFilter Cartridge



# Three Cartridge Options





# Media Filtration



	PhosphoSorb™	Perlite	CSF® Leaf Media	ZPG
Sediments	■	■	■	■
Phosphorous	■			■
Oil and Grease	■	■	■	■
Soluble Metals	■		■	■
Organics			■	■
Nutrients	■	■	■	■

# StormFilter Vault



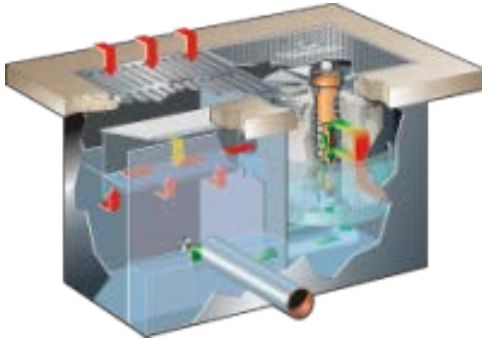


# StormFilter Configurations

## CatchBasin



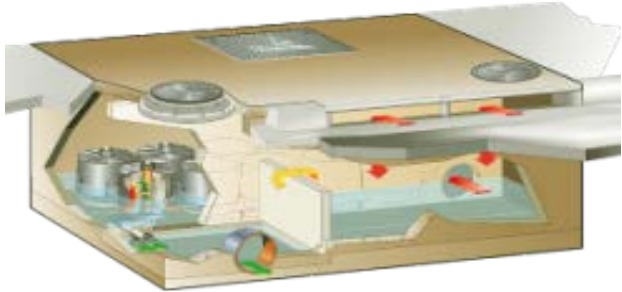
Up to 0.13 cfs  
at 15 gpm per cartridge  
(4 l/s at 0.95 L/s per cartridge)



## Curb Inlet



Up to 0.50 cfs  
at 15 gpm per cartridge  
(14 l/s at 0.95 L/s)





# StormFilter Configurations

## Downspout



Single-stage  
Up to 0.07 cfs at  
15 gpm per cartridge  
(2 l/s at 0.95 L/s per cartridge)



Dual-stage  
Up to 0.07 cfs  
at 15 gpm per cartridge  
(2 l/s at 0.95 L/s per cartridge)



# High Flow StormFilter Configurations



Panel Vaults

High Flow  
6.0+ cfs capacity  
(170+ l/s)



CON/SPAN®



Cast-In-Place



Box Culverts



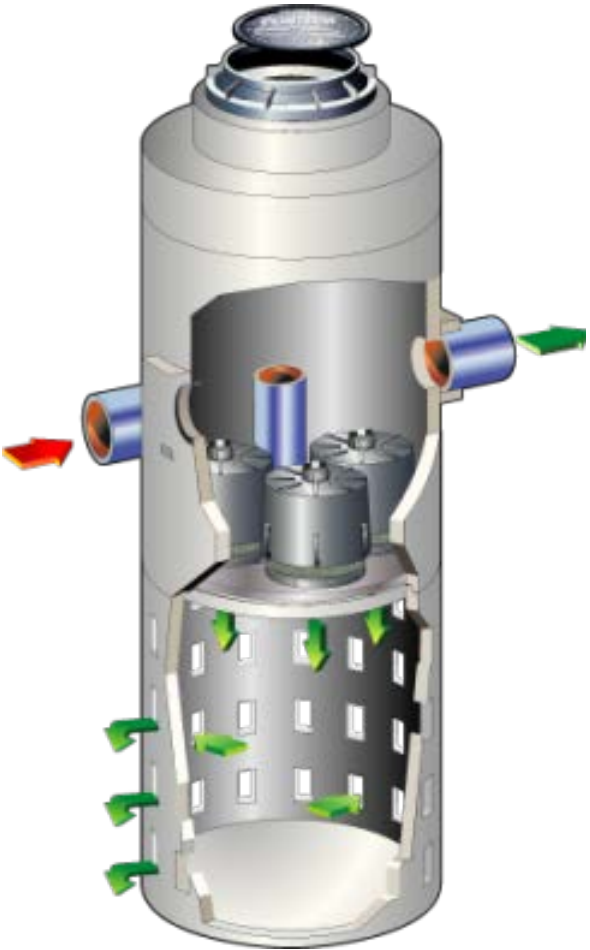
# Infiltration StormFilter



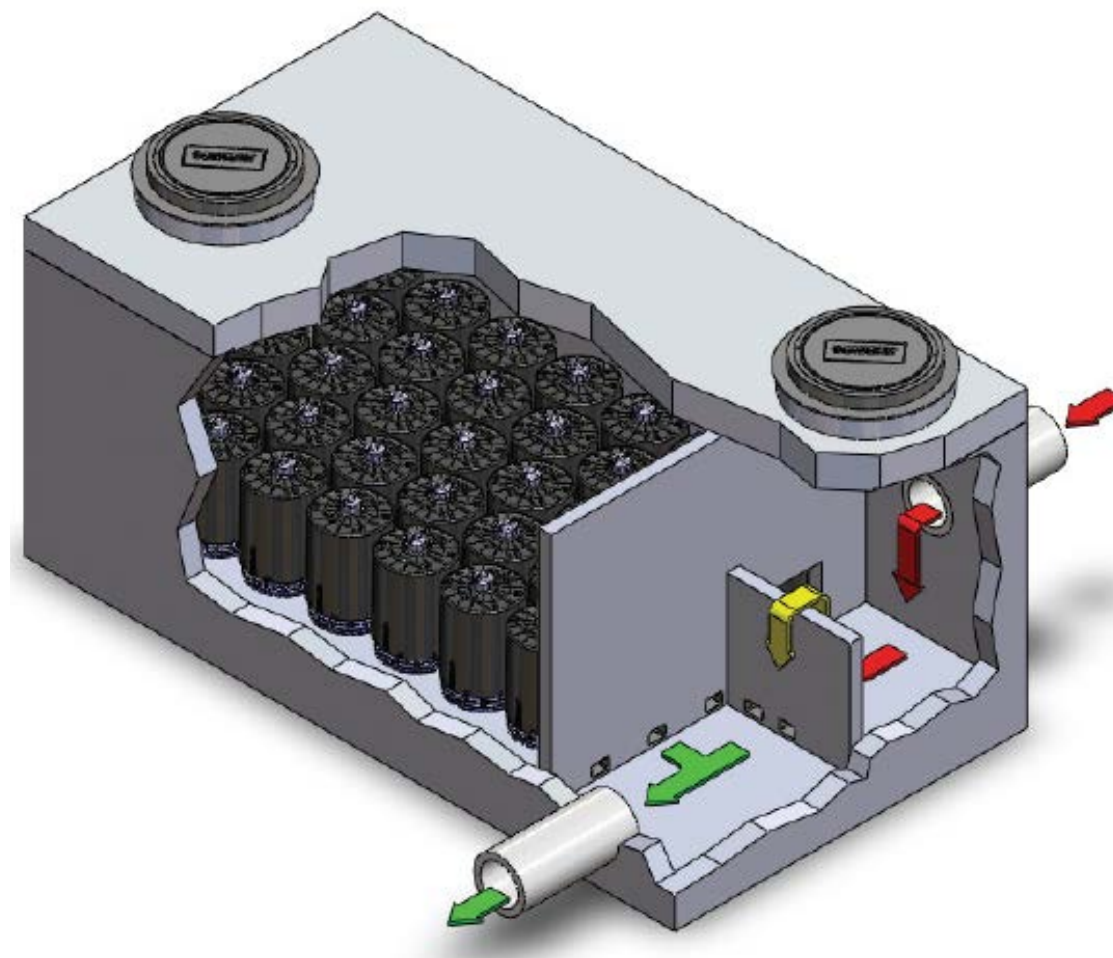
RetroFit: 0.1 cfs capacity

New Construction: 0.23 cfs capacity at 15 gpm / cartridge

(6.5 l/s at 0.95 L/s per cartridge)



# Peak Diversion StormFilter





# StormFilter Maintenance





# StormFilter in WinSLAMM

The screenshot shows the WinSLAMM software interface. The title bar reads "WinSLAMM - [Land Use Model]". The menu bar includes "File", "Current File Data", "Pollutants", "Tools", "Run", "Utilities", and "Help". The toolbar contains various icons, with the "SF" icon highlighted by a red arrow and a callout text "SF = StormFilter". The main workspace is mostly blank, with a small "Outfall" icon (a green square with "OUT" text) visible. The left sidebar contains a table for "Element Name:" and two other tables for "Land Use" and "Control Practice".

Land Use #	Land Use Type	Land Use Label	Land Use Area (acres)

CP #	Control Practice Type	Control Practice Name or Location

Check Current File Status | Total Area = | Upstream Drainage Area = | Icon Number | Index Number = | Icons Left = | Start Date: 01/01/81 | End Date: 12/31/81 | X = 1440 | Y = 7905 | Run Time =

# Modeling in WinSLAMM

The screenshot displays the WinSLAMM software interface. The top menu bar includes File, Current File Data, Pollutants, Tools, Run, Utilities, and Help. Below the menu is a toolbar with various icons for land use types (RES, INS, COM, IND, OU, FRE, GS, CB, WP, BF, PP, HD, OD, FS, SF, LF) and a circular icon. The main window is divided into two panes. The left pane shows a large purple area representing a land use model, with a table below it. The right pane shows a hydrologic flow diagram with a vertical line connecting several elements: Commercial 1 (COM), Junction 2, DS StormFilter # 1 (SF), Junction 1, and an Outfall (OUT).

Land Use #	Land Use Type	Land Use Label	Land Use Area (acres)
1	Commercial	Commercial 1	0.000

CP #	Control Practice Type	Control Practice Name or Location
1	StormFilter	DS StormFilter # 1

Check Current File Status | Total Area = 0.000 acres | Upstream Drainage Area = | Junc# = 2 | Index Number = 2 | Remaining Icons = 252 | Start Date: 01/01/81 | End Date: 12/31/81 | X = 1020 | Y = 9405 | Run Time =

# StormFilter Input – Online Configuration

Stormwater Management StormFilter(R) (by Contech)

Drainage System Control Practice

Media Type

Cartridge Height  
 12 inches  18 inches  27 inches

Cartridge Specific Flow Rate  
 1 gpm/sf  2 gpm/sf

Head Difference (ft) Between Inlet and Outlet Inverts (Minimum Difference = 3.05)

Bypass Structure Location  
 Online - Within cartridge chamber  
 Offline - Upstream of cartridge chamber

Activate Upstream Storage Gallery

Volume Based Chamber Size  
Runoff Depth (in)   
Storage Chamber Depth (ft)

Pipe Storage  
Storage Pipe Diameter (ft)   
Storage Pipe Length (ft)   
Chamber Sump Depth (ft)

Box Storage  
Chamber Footprint Area (sf)   
Chamber Depth (ft)   
Chamber Sump Depth (ft)

Solve for Given Conditions  
Number of Cartridges  Chamber Dimension = 5' dia

OR

Solve Iteratively for Desired Percent Reduction or Effluent Concentration

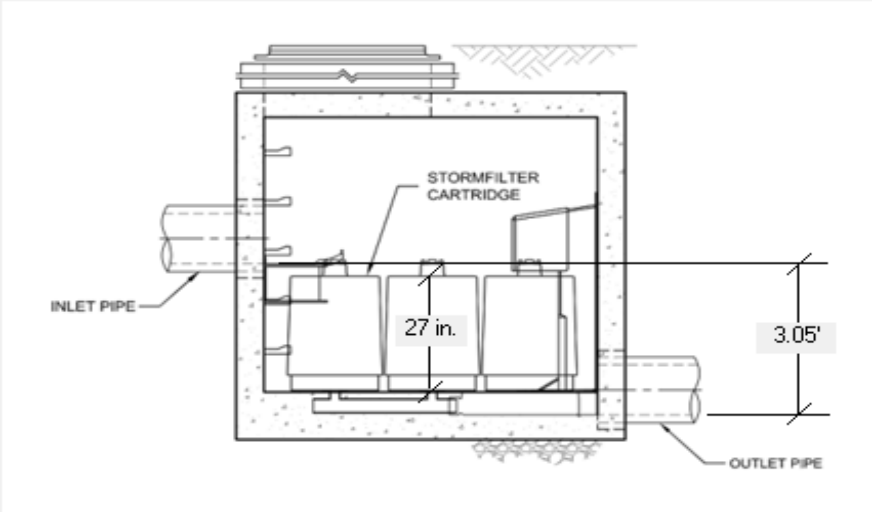
Treatment Goal - Percent TSS (0.45-75 um) Removed   
 Treatment Goal - Percent SSC (>0.45 um) Removed   
 Treatment Goal - Effluent TSS Concentration (mg/L)   
 Treatment Goal - Effluent SSC Concentration (mg/L)

Select Particle Size Distribution File

Have Model Determine Cleaning/Replacement Frequency

Copy Media Filter Data   
Paste Media Filter Data

Cartridge Flow Rate = 22.50 gpm      Internal Overflow Weir Height = 5.25 ft.      Tank Height = 5.5 ft.  
Max. Cartridge Flow Rate = 112.50



Not To Scale

Control Practice #: 1    CP Index #: 1    Upstream Drainage Area:

# StormFilter Input – Offline Configuration

Stormwater Management StormFilter(R) (by Contech)

**Drainage System Control Practice**

Media Type:

Cartridge Height:  12 inches  18 inches  27 inches

Cartridge Specific Flow Rate:  1 gpm/sf  2 gpm/sf

Head Difference (ft) Between Inlet and Outlet Inverts (Minimum Difference = 3.05):

Bypass Structure Location:  Online - Within cartridge chamber  Offline - Upstream of cartridge chamber

Activate Upstream Storage Gallery

Volume Based Chamber Size  
Runoff Depth (in):   
Storage Chamber Depth (ft):

Pipe Storage  
Storage Pipe Diameter (ft):   
Storage Pipe Length (ft):   
Chamber Sump Depth (ft):

Box Storage  
Chamber Footprint Area (sf):   
Chamber Depth (ft):   
Chamber Sump Depth (ft):

Solve for Given Conditions  
Number of Cartridges:  Chamber Dimension = 5' dia

OR

Solve Iteratively for Desired Percent Reduction or Effluent Concentration

Treatment Goal - Percent TSS (0.45-75 um) Removed

Treatment Goal - Percent SSC (>0.45 um) Removed

Treatment Goal - Effluent TSS Concentration (mg/L)

Treatment Goal - Effluent SSC Concentration (mg/L)

Select Particle Size Distribution File  
Not needed - calculated by program

Have Model Determine Cleaning/Replacement Frequency

Copy Media Filter Data

Paste Media Filter Data

Contact Contech Web Site

Cartridge Flow Rate = 22.50 gpm External Bypass Weir Height = 7.55 ft Tank Height = 5.5 ft  
Max. Cartridge Flow Rate = 112.50

Not To Scale

Control Practice #: 1 CP Index #: 1 Upstream Drainage Area:

# Case Study: TDS Telecom – Verona, WI (November, 2017)

Peak Diversion StormFilter – 8' x 6' with 7 Cartridges (27" tall with ZPG Media)

Drainage Area = 0.66 acres (Commercial)

69.20% TSS Reduction via WinSLAMM Modeling



# Case Study: West Place – Madison, WI (April, 2018)

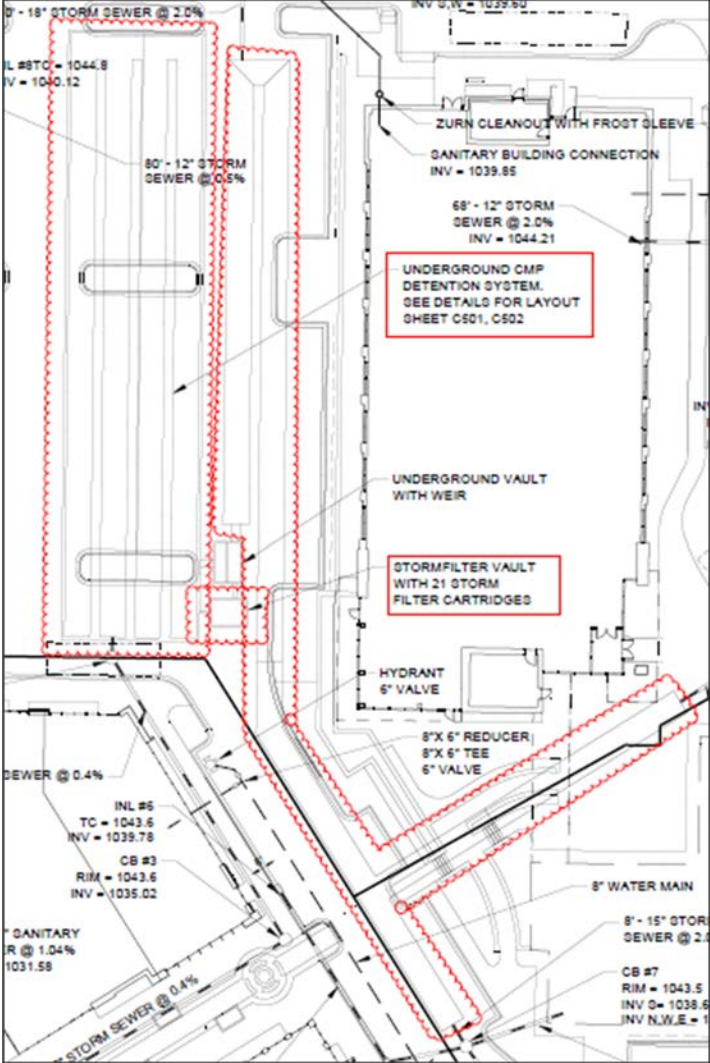
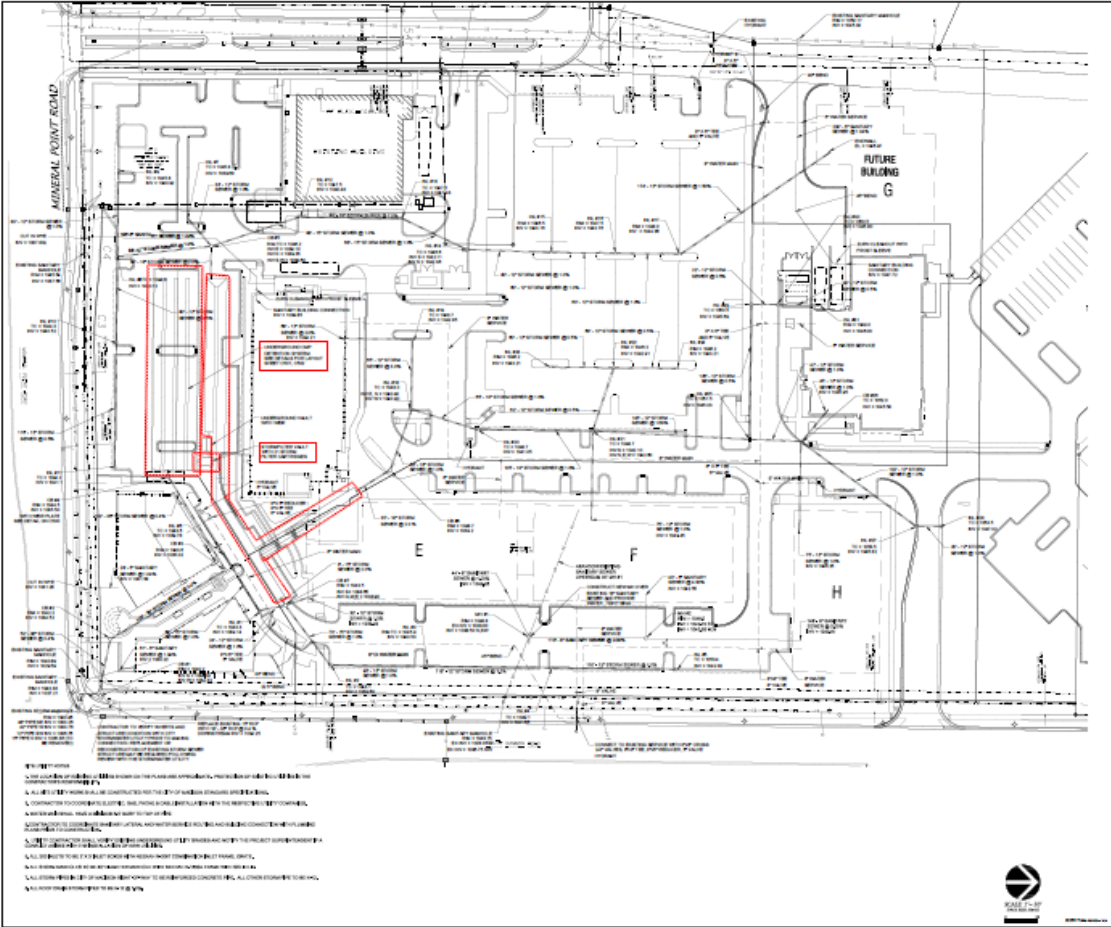
Project Site = 11.14 acre

Design Requirements:

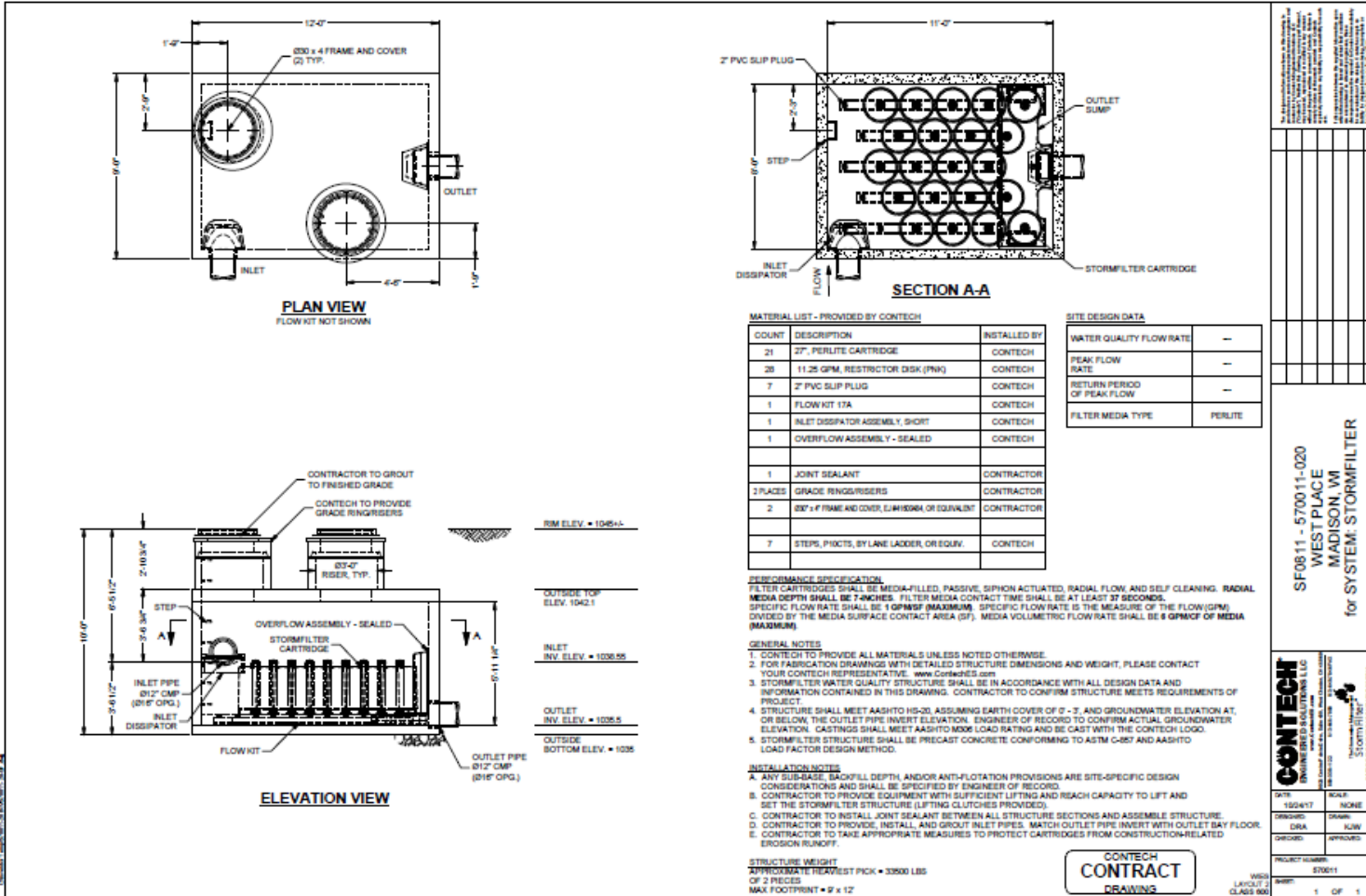
73.1% TSS Removal

Infiltration (90%)

Rate Control (1 yr, 2 yr, 10 yr and 100 yr)

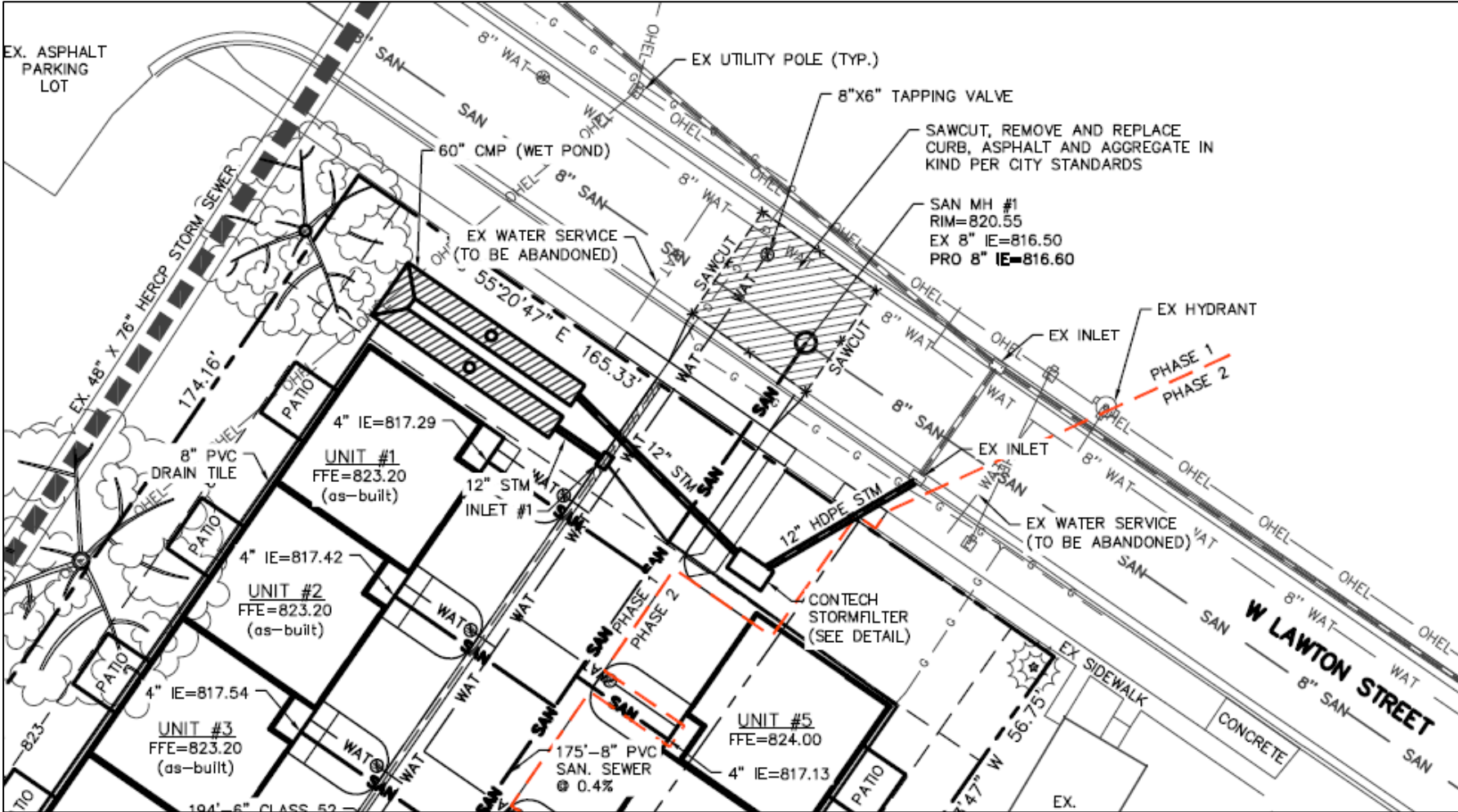


# Case Study: West Place – Madison, WI (April, 2018)



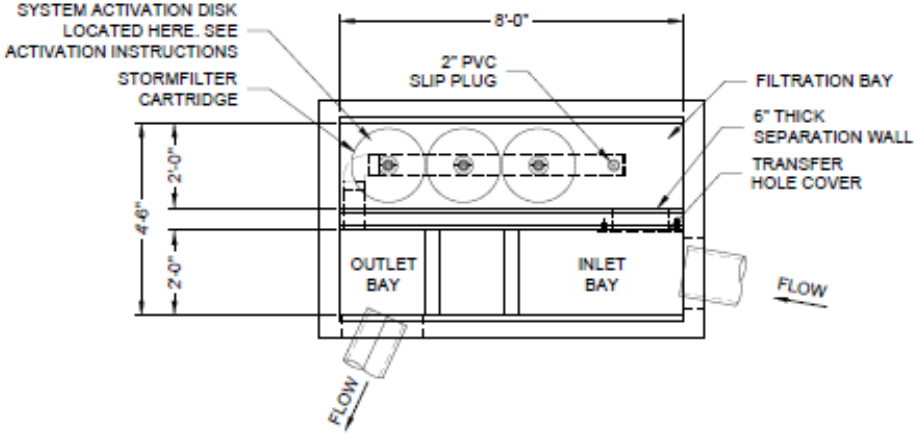
# Case Study: Lawton Street – Edgerton, WI (November, 2018)

Project Site = 0.67 acres  
Design Requirements:  
71.04% TSS Removal

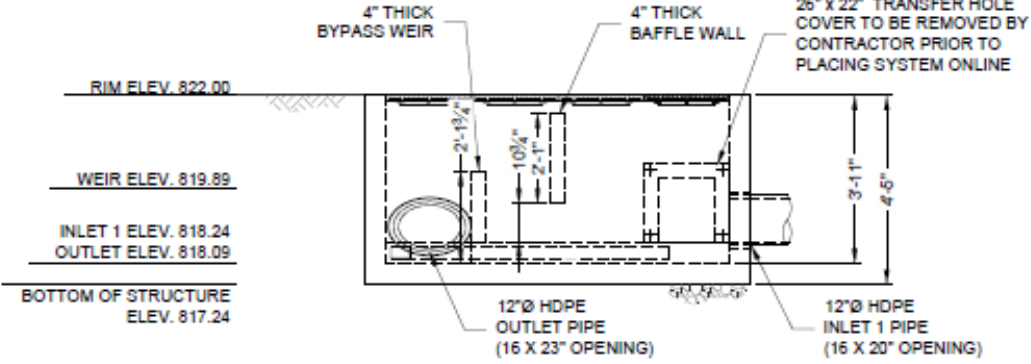




# Case Study: Lawton Street – Edgerton, WI (November, 2018)



**PLAN VIEW**



**ELEVATION VIEW**  
(CARTRIDGES NOT SHOWN FOR CLARITY)



Very shallow site required used of Linear Grate StormFilter

## What is Filterra? ... How does it work?

**Filterra is a Pre-engineered Stormwater Bioretention Treatment System consisting of:**

1. Concrete Landscape Container
2. Engineered Media
3. Underdrain System
4. Landscape Tree or Shrub
5. Protective Grate

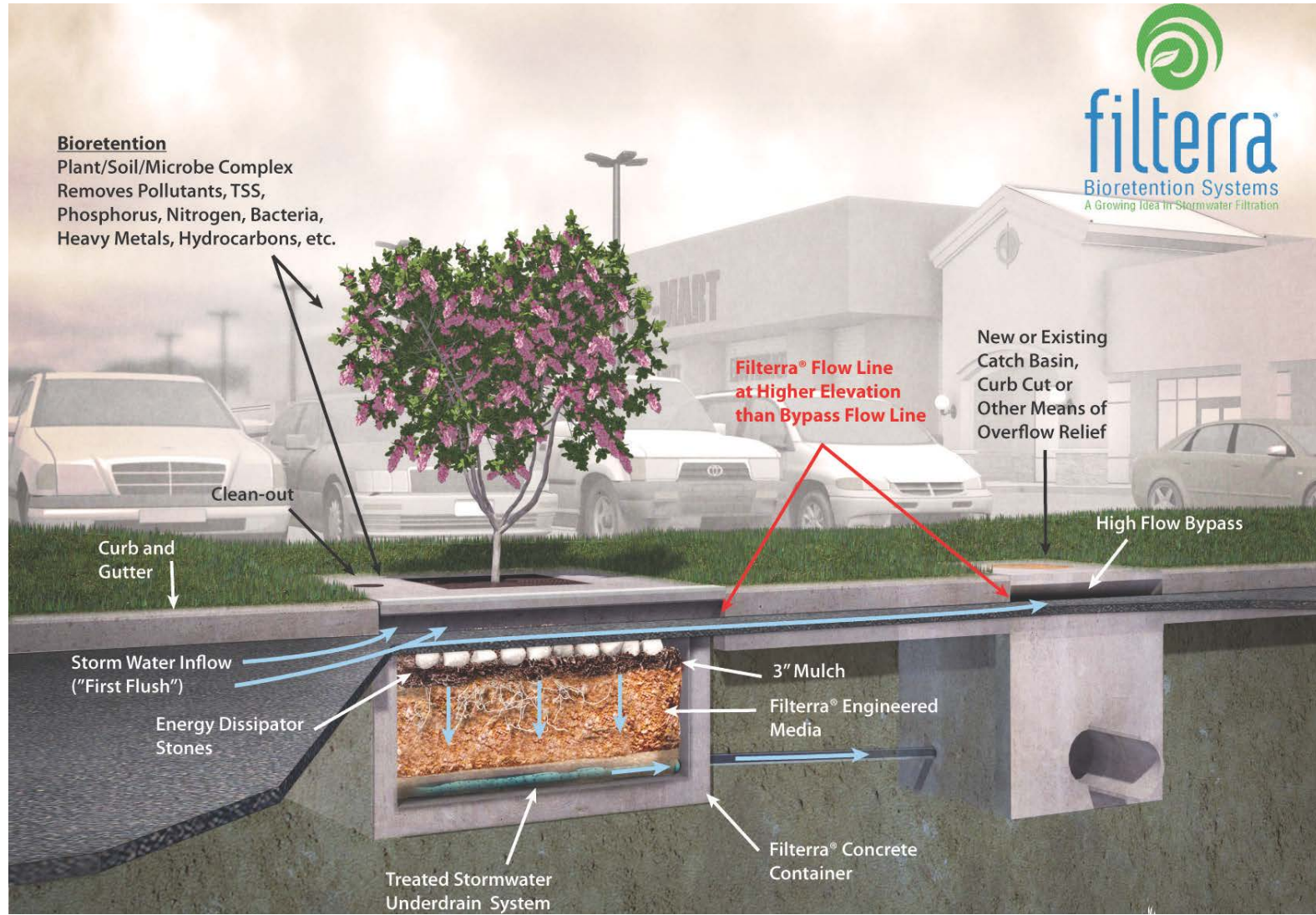




## Filterra Bioretention Bed



# Typical Layout



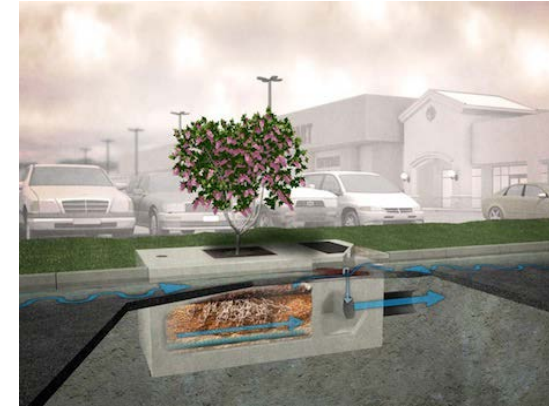
# Filterra Configurations



Filterra Internal Bypass-Pipe



Filterra with Infiltration



Filterra Internal Bypass-Curb

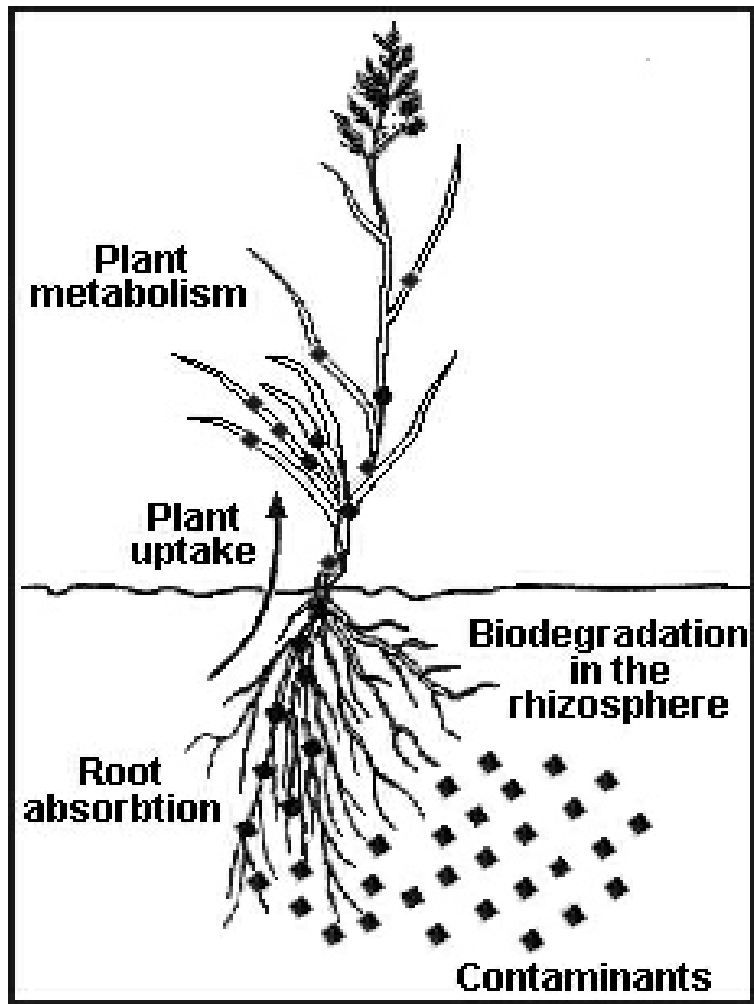


Filterra Sedimentation Chamber



Street Tree Filterra

# Pollutant Removal Mechanisms



- Physical/Chemical Processes
  - Filtration
  - Adsorption/Absorption
  - Cation/Anion exchange
  - Metals complexing
- Biological Processes
  - Degradation/Decomposition
  - Plant/Bacteria uptake



# Filterra vs. Standard Bioretention

<b>Components</b>	<b>Standard Bioretention</b>	<b>Filterra</b>
Mulch Layer	Yes	Yes
Media Depth	2.5' – 4'	1.75'
Underdrain	Frequently	Yes
Plants	Always	Always
Pollutant Removal	Physical, Chemical and Biological Processes	Physical, Chemical and Biological Processes
Media Tests	pH, Organics, Fertility, Soluble Salts, Particle Size Distribution	pH, Organics, Fertility, Soluble Salts, Particle Size Distribution
<b>Features/Attributes</b>	<b>Standard Bioretention</b>	<b>Filterra</b>
Media Flow Rate	5 – 10"/hour	Up to 140"/hour
QA/QC Media Tests	Generally none	25-30

# Where is Filterra?



Street Tree Filterra  
Richmond, VA

- Over 6,700 Filterra units shipped and installed
- Installations in over 25 states
- Accepted by over 500 jurisdictions nationwide, including key states with the highest stormwater quality requirements in the U.S.  
(via TARP, TAPE, NJCAT)
- Filterra manufactured locally



# Key Filterra Approvals



Southfield Redevelopment  
Weymouth, MA



Anderson Parkway LID  
Poulsbo, WA

**TAPE, TARP and NJDEP protocols**

District of Columbia

Georgia (Atlanta Regional Commission)

Maine

Maryland

New Jersey

TCEQ (San Antonio, TX region)

Virginia

Washington

**\*Wisconsin DNR Filter Protocol may refer to these approvals, specifically TAPE or NJDEP**

## Key Benefit #1: Small Footprint



Crossridge Subdivision  
Richmond, VA

- Filterra typically less than 1% of drainage area
- Contrasts to 5%-10% for standard bioretention cells
- Full use of land
- Ideal for urban retrofit



## Key Benefit #2: High Pollutant Removal Rates

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- Total Suspended Solids: 85%
- Total Phosphorus: 70%
- Total Nitrogen: 43%
- Total Copper: 58%
- Total Dissolved Copper: 46%
- Total Zinc: 66%
- Total Dissolved Zinc: 58%
- Predicted Oil & Grease: 93%

*\*All third party studies to date.*

## Key Benefit #3: Maintenance

- First year maintenance included
- Remove trash/mulch twice per year
- Easy access – no confined space
- No specialized equipment needed
- Maintenance contractors available
- Optional maintenance training
- Minimal cost



**Step 1:** Open grate & inspect

**Step 2:** Remove mulch & trash

**Step 3:** Add new mulch

**Step 4:** Sweep & replace grate



# Key Benefit #3: Maintenance

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**EPA Study 1999 (quoted in Dec 08 VaTech Economic Impact Study on Va New SW Regs)**

<b>BMP</b>	<b>Sum of Maintenance Costs over 20 years as % of Installed BMP Cost</b>
WET POND AND CONSTRUCTED WETLANDS	40 - 85%
ENGINEERED BIORETENTION AND SWALES	70-100%
SANDFILTERS	70-280%
<b>Filtterra Estimated Maintenance Cost</b>	<b>25%</b>

# Additional Filterra Benefits

- Pre-engineered design
- Media protected during construction
- QA/QC program in media manufacture
- LEED points
- Aesthetics
  - Plant selection
  - Recessed Top
  - Ornamental Grates
- Sustainable Design
- First year of maintenance included



Marina Del Ray, CA



Target – May, 2018  
Wauwatosa, WI

# Filterra Bioscape

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Aesthetically pleasing stormwater treatment solutions that is easily integrated into the site landscaping.

Includes all of the standard features and components of a standard precast Filterra:

- Qualified underdrain stone
- Filterra underdrain pipe
- High Performance Filterra Media
- Pretreatment Top Layer (Mulch)
- Vegetation
- Packaged System
  - Activation
  - 1<sup>st</sup> Year Maintenance



**Filterra Bioscape**  
(Emergency Communications Center– Raleigh, NC)

# Manchester Stormwater Park – Manchester, WA



**Summer 2015**



**Summer 2017**

## Project Features:

- Filterra Bioscape systems installed in large Cast-in-Place structures
- Trough inlets across system to distribute flow evenly
- Upstream hydrodynamic separator and base flow diversion to separate spiral rain garden

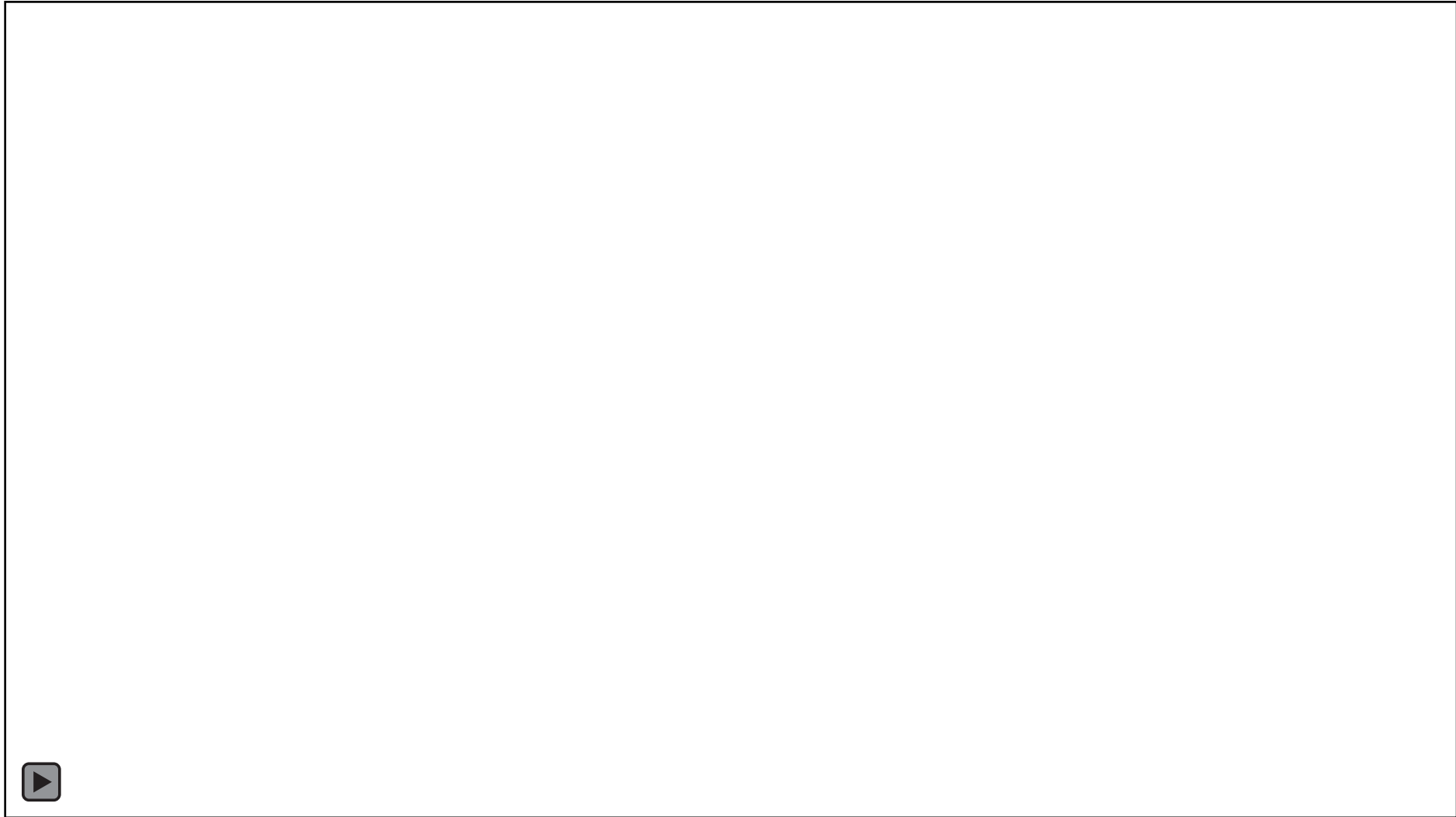


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Thank you!

# Jellyfish Filter

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# Jellyfish Filter

