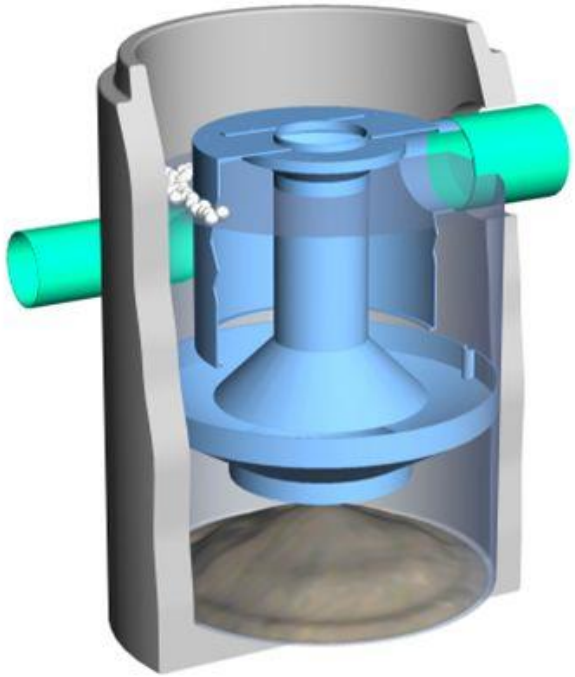
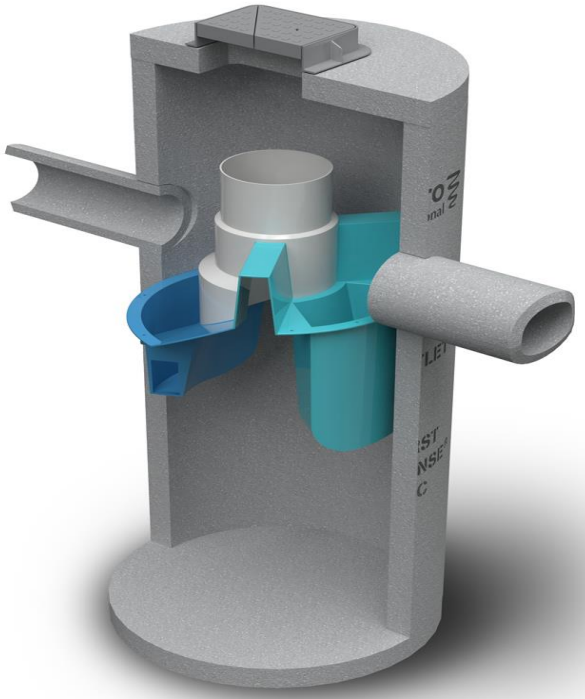
Downstream Defender & First Defense

Online Stormwater Separator Sizing Calculator
User Guide & Instructional Manual





Index

USER GUIDE:

ADDITIONAL INFORMATION:

Login / Create an Account

http://sizingcalculator.hydro-int.com/#!/login/

First Step:

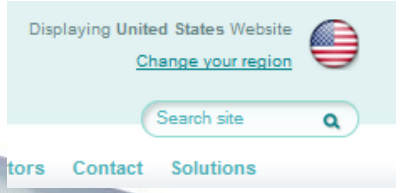
Go to the link above and create an account or if you have an existing account, use your existing login.

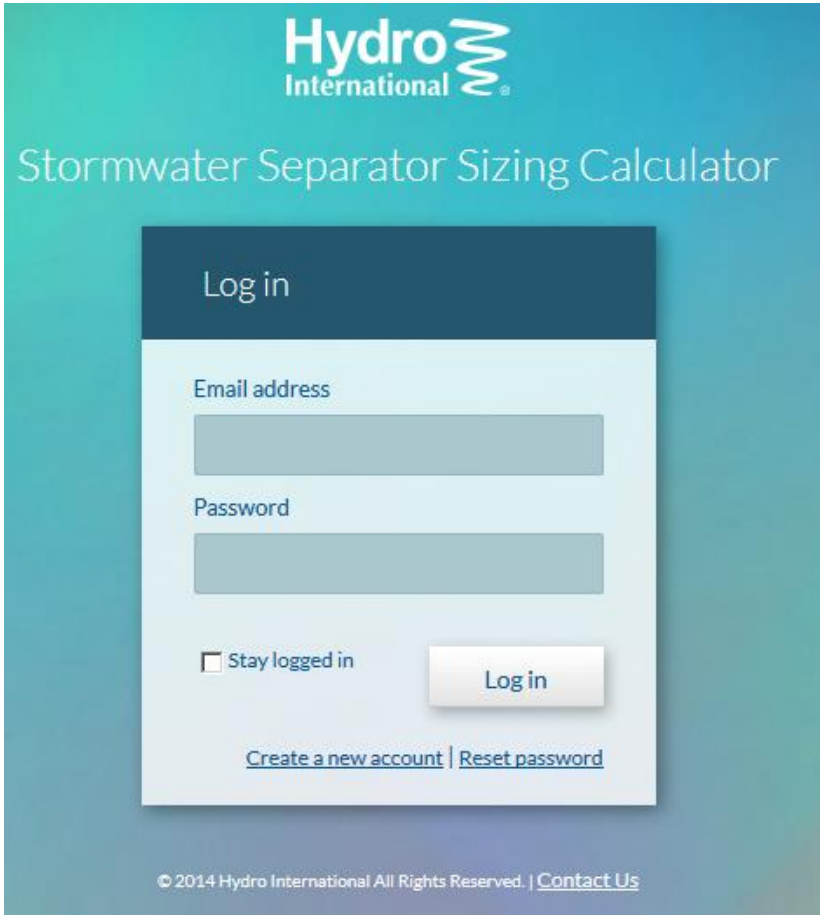
You will also find links to this screen from the Hydro International website and navigate to the First Defense or Downstream Defender page.

Home Page for US Website:

www.hydro-int.com/US

If you cannot find the links check that you are on the US not UK or International website.





Create a New Account

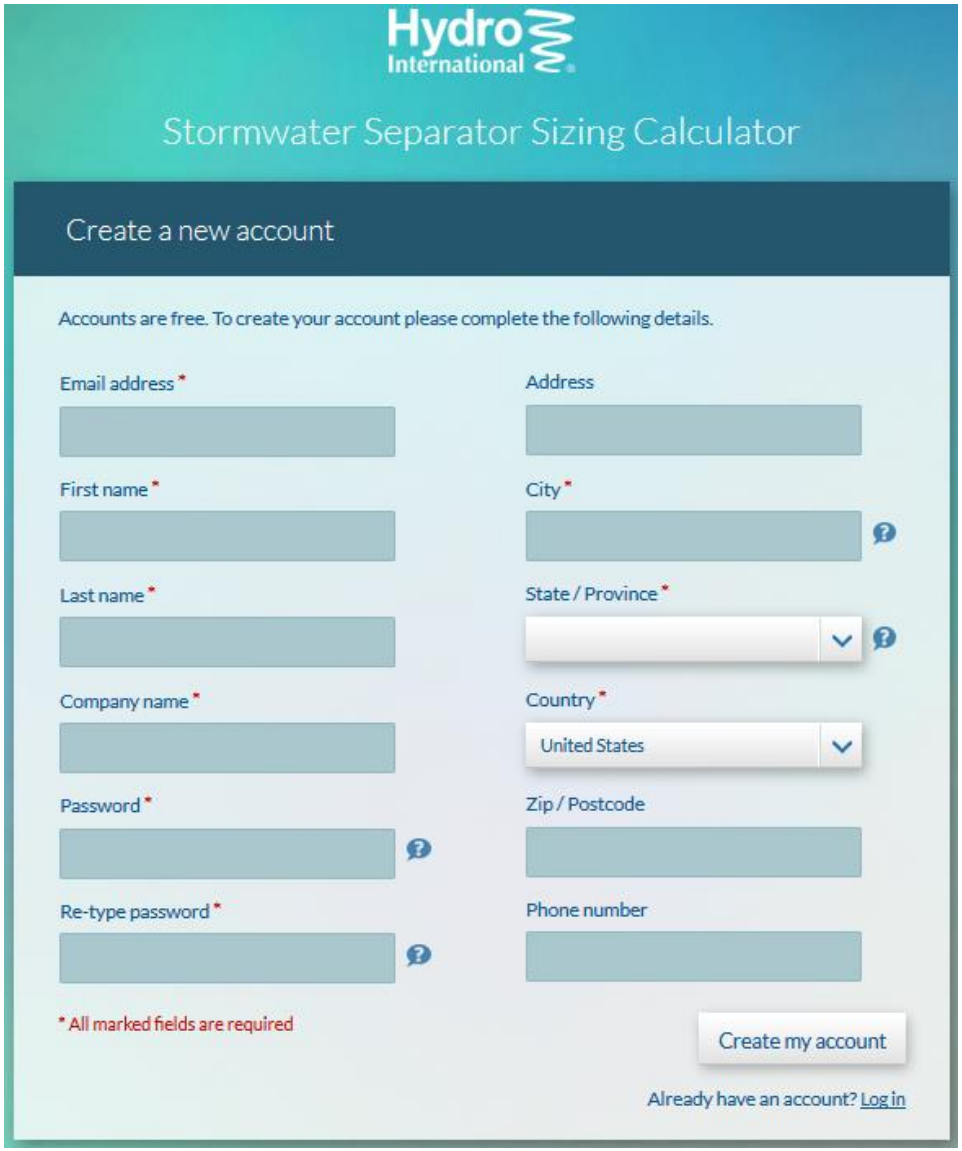
Create a new account:

Fill in the required fields.

Your account will be created and immediately available for use.

If the email address already is associated with an existing a notification that an account already exists will appear.

Click the Log in option in the lower right of the screen to use the existing account.



Basic Setup Screen (Home Screen)

My Projects:

This is where project files are stored with product files.

Size a Product:

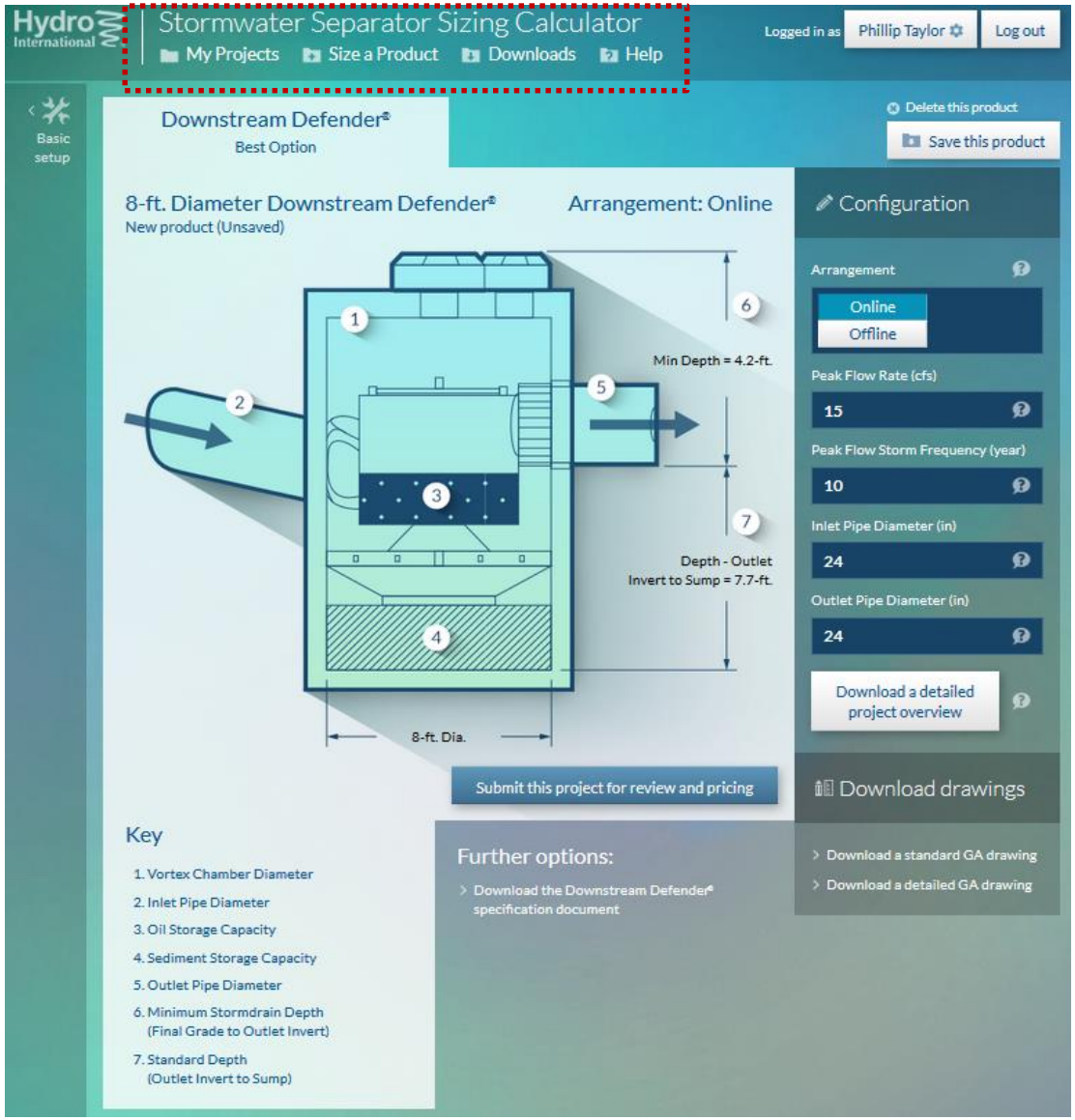
Returns to Basic setup screen for a new product design.

Downloads:

Provides a link to Hydro's website where more detailed product information can be obtained, including case studies, test reports etc.

Help:

Help files.



Basic Setup Screen

Size by regulatory agency:

This sets up the sizing criteria by the selected regulatory approval. Use this option if you must size by a regulatory approval agency.

Size by target particle size:

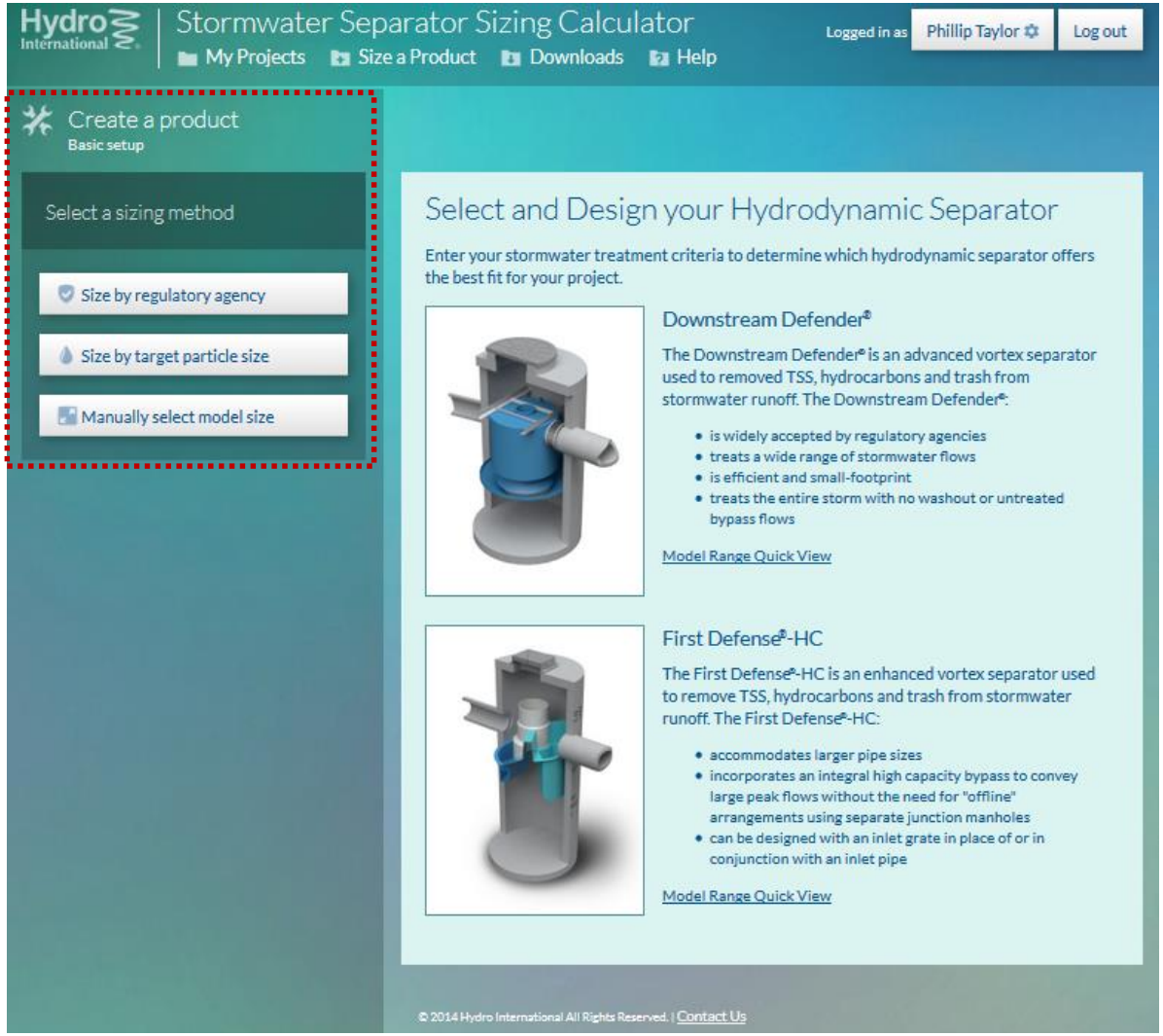
This sets up the sizing by a selected particle size.

For more information on particle size selection refer to the Additional Information section of this guide.

Manually select model size:

Use this option to quickly select a unit model and size without selecting any other criteria.

For more information on which model to use refer to the Additional Information section of this guide.



Basic Setup Screen

Product Information:

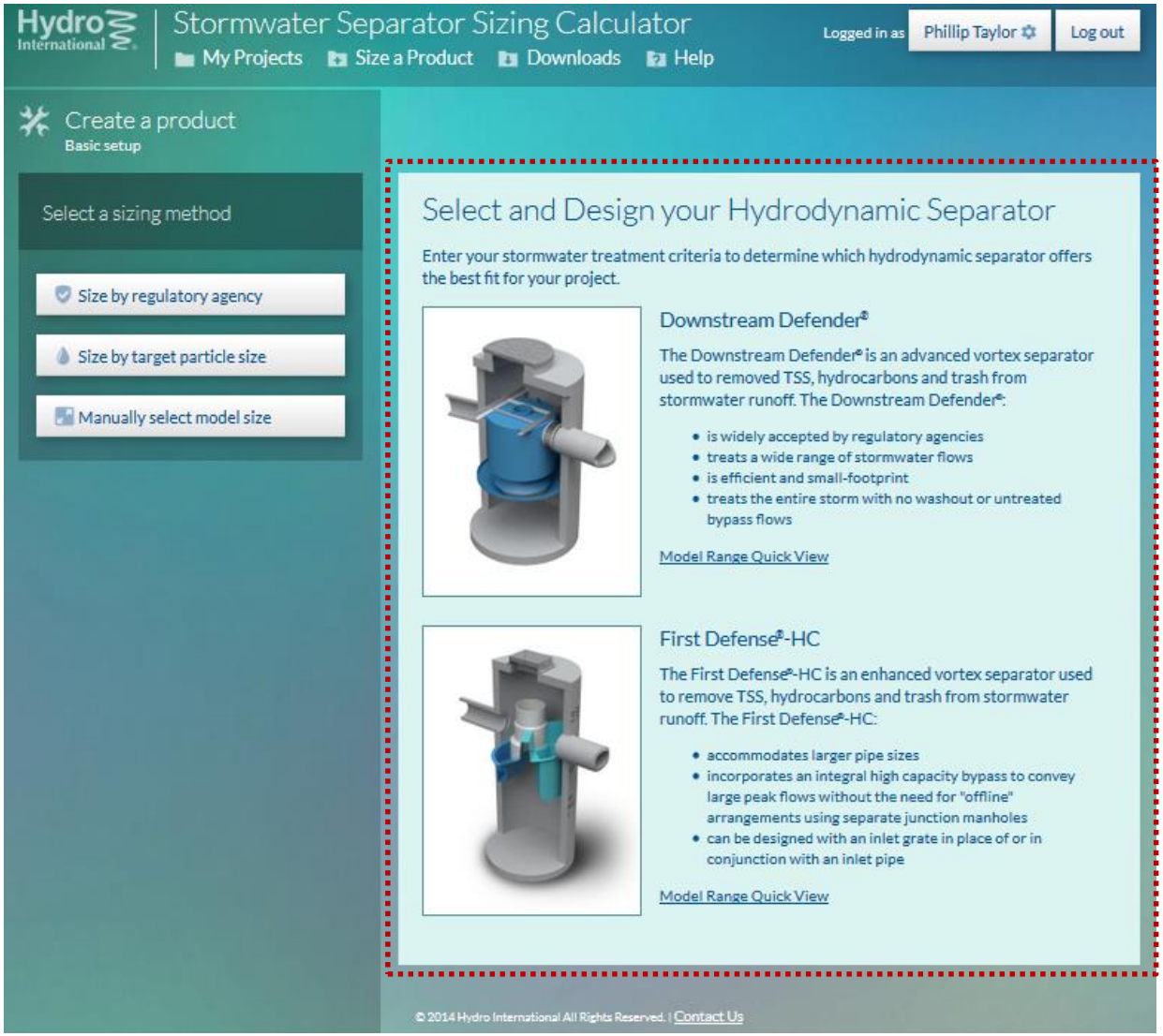
This area of the Basic setup screen provides product information.

Model Range Quick View:

This provides a table of properties for each model in the product range.

ADDITIONAL INFORMATION:

More information on each product is available in the product sections towards the back of this manual.



“My Projects” Screen

Create a new project:

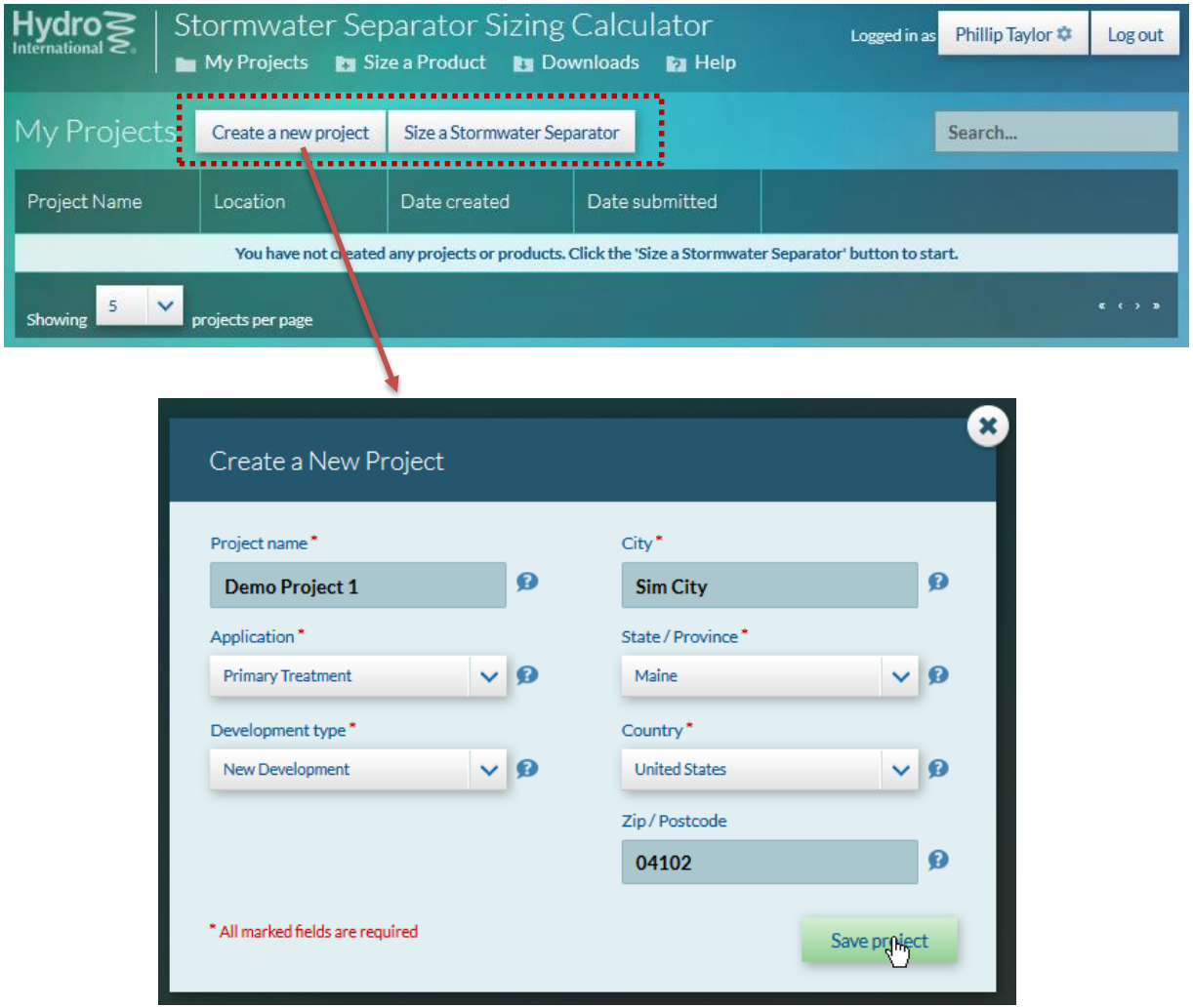
This button brings up a pop up box to create a new Project file. The Project file holds the various products designed.

You do not need to create a Project file in order to design a separator but you will need a Project file to save it for printing and future use.

A project file can be created once a separator has been designed. It is not required to create a Project first.

Size a Stormwater Separator:

This button returns to the Basic setup screen where a separator can be designed.



“My Projects” Screen

Projects:

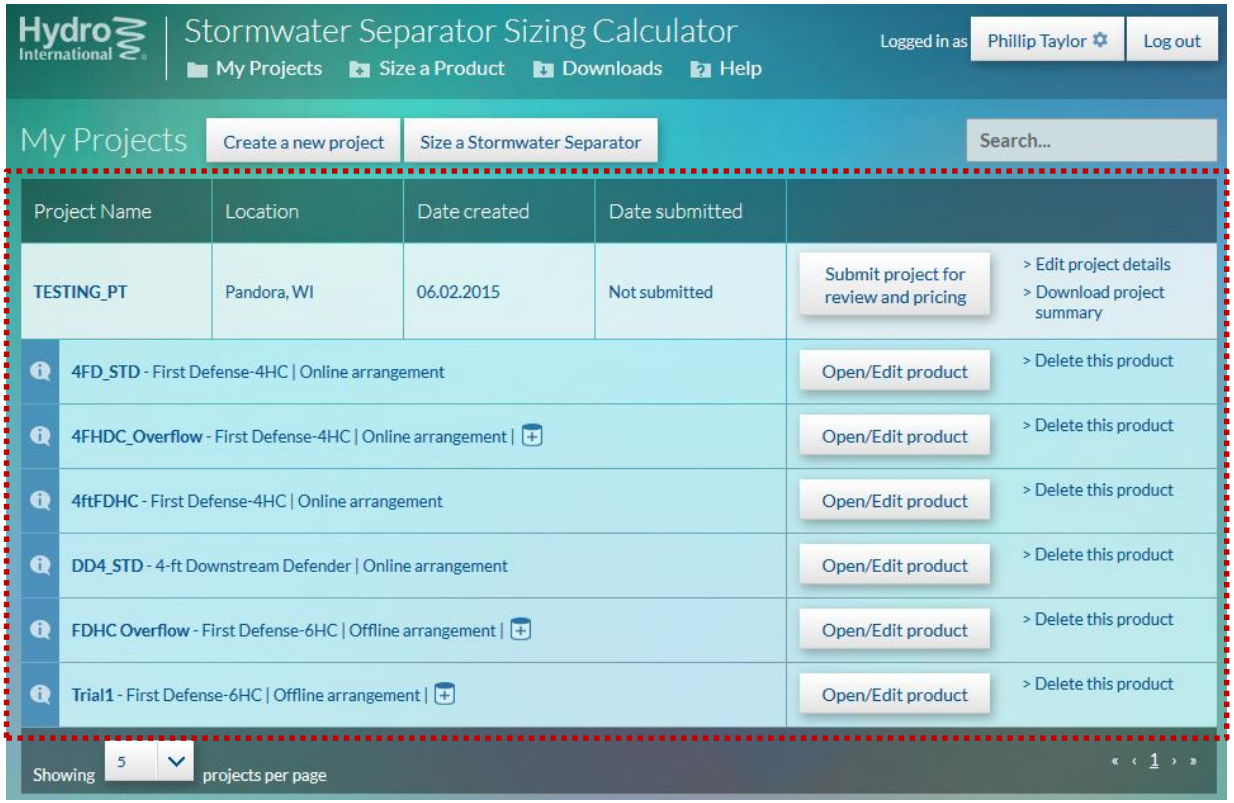
This area of the screen lists Projects and products listed under each Project.

Submit project for review and pricing:

This button generates a project file and sends it to Hydro for review.

Open/Edit product:

This button opens the specific product design for editing.



“My Projects” Screen

Projects:

This area of the screen lists Projects and products listed under each Project.

Submit project for review and pricing:

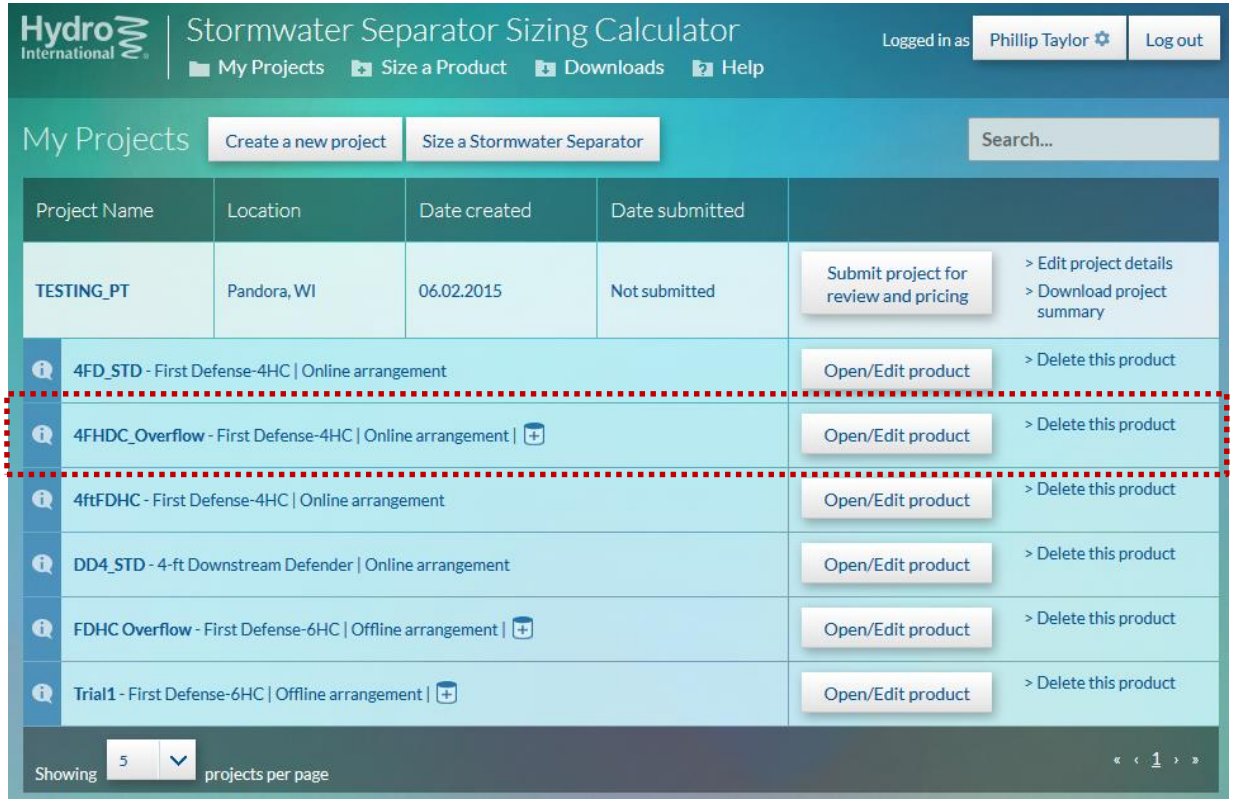
This button generates a project file and sends it to Hydro for review.

Open/Edit product:

This button opens the specific product design for editing.

Delete this product:

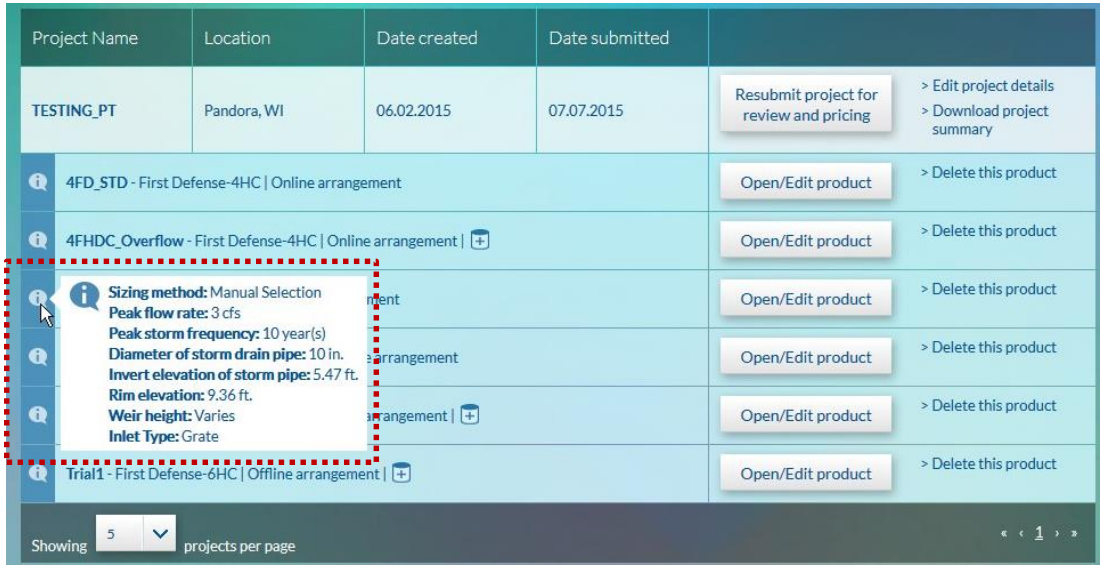
This button deletes the product line. A confirmation widow will open before deletion.



“My Projects” Screen

Information Button:

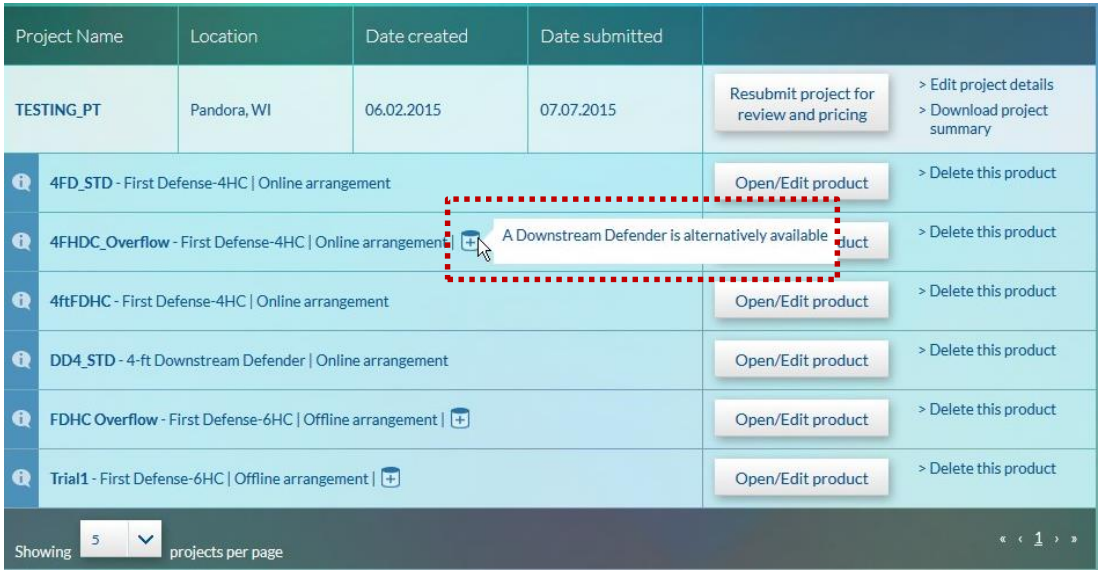
The information button gives a summary of the design parameters used to size the listed unit.



Alternate Button:

A “+” button after the product indicates an alternate is available. Click the button to see the alternate suggestion.

Edit the product to select the alternate.



“Size by regulatory agency”

Use this option when you have a specific regulator approval requirement.

Select “Size by regulatory agency”:

This will open the “Regulatory agency” drop down menu.

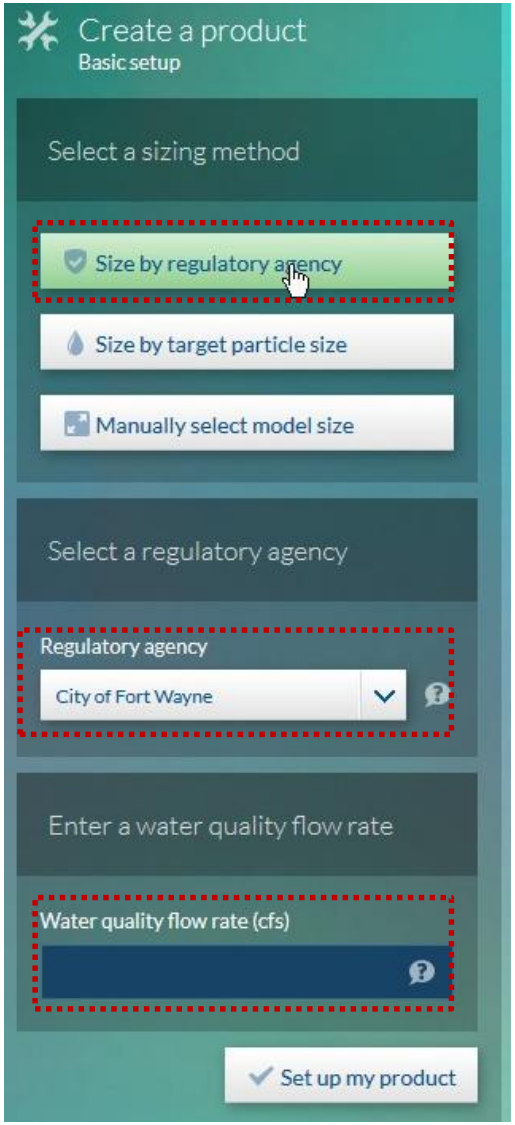
“Regulatory agency”:

From the dropdown list select the agency that applies. The tool knows the target objectives for the regulator and will select the device options available based on the water quality flow rate. If not listed contact Hydro for advice.

“Water quality flow rate (cfs)”:

Enter the flow rate that must be treated. This is usually defined in local stormwater manual and regulations.

Click “Set up my product”



“Size by target particle size”

Use this option when you have a specific particle size you need to remove.

Select “Size by target particle size”:

This will open the “Select a target particle size” drop down menu.

“Select a target particle size”:

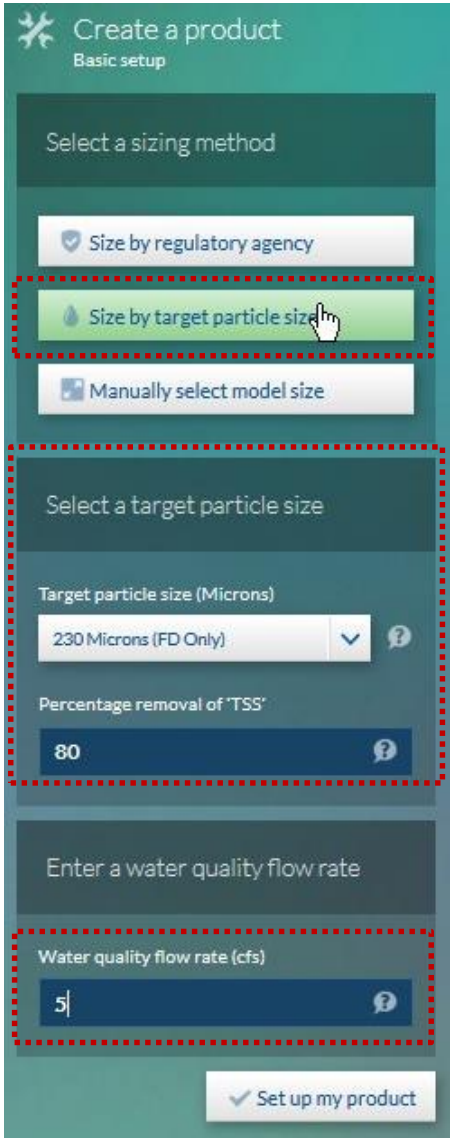
From the dropdown list select the desired target particle size. Currently there are 3 options, 50 µm, 106 µm, and 230 µm. Refer to Page 29 in the Additional Information section.

Enter the percent removal of Total Suspended Solids (TSS) required.

“Water quality flow rate (cfs)”:

Enter the flow rate that must be treated. This is usually defined in local stormwater manual and regulations.

Click “Set up my product”



“Manually select model size”

Use this option to manually choose a specific device.

Select “Manually select model size”:

This will open the “Select Stormwater Separator size” drop down menu.

Select Stormwater Separator size

From the dropdown list select the device you want to use.

Click “Set up my product”

“Set up my product”

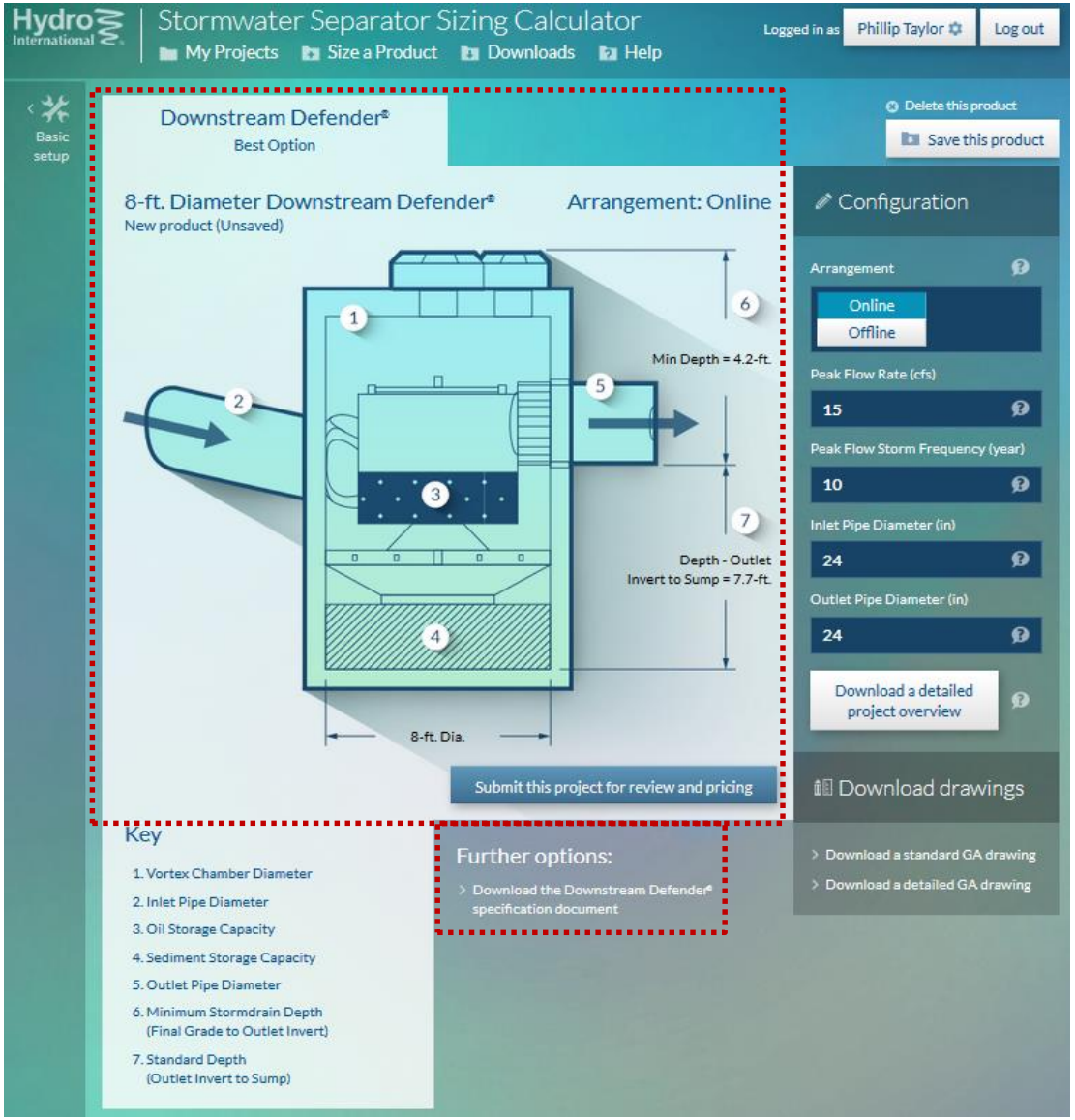
Best / Alternate Option Tabs:

Each product option tab provides minimum dimensional information.

If only one tab is showing then only one product option is available.

Further options:

This area shows additional download options.



“Set up my product”

Best Option / Alternate Option:

This area of the screen will show tabs for each treatment option available for the sizing method selected.

Configuration:

This area is used to detail the configuration of the installation, online or offline, peak flow and pipe sizes. Options in this area will change with device type.

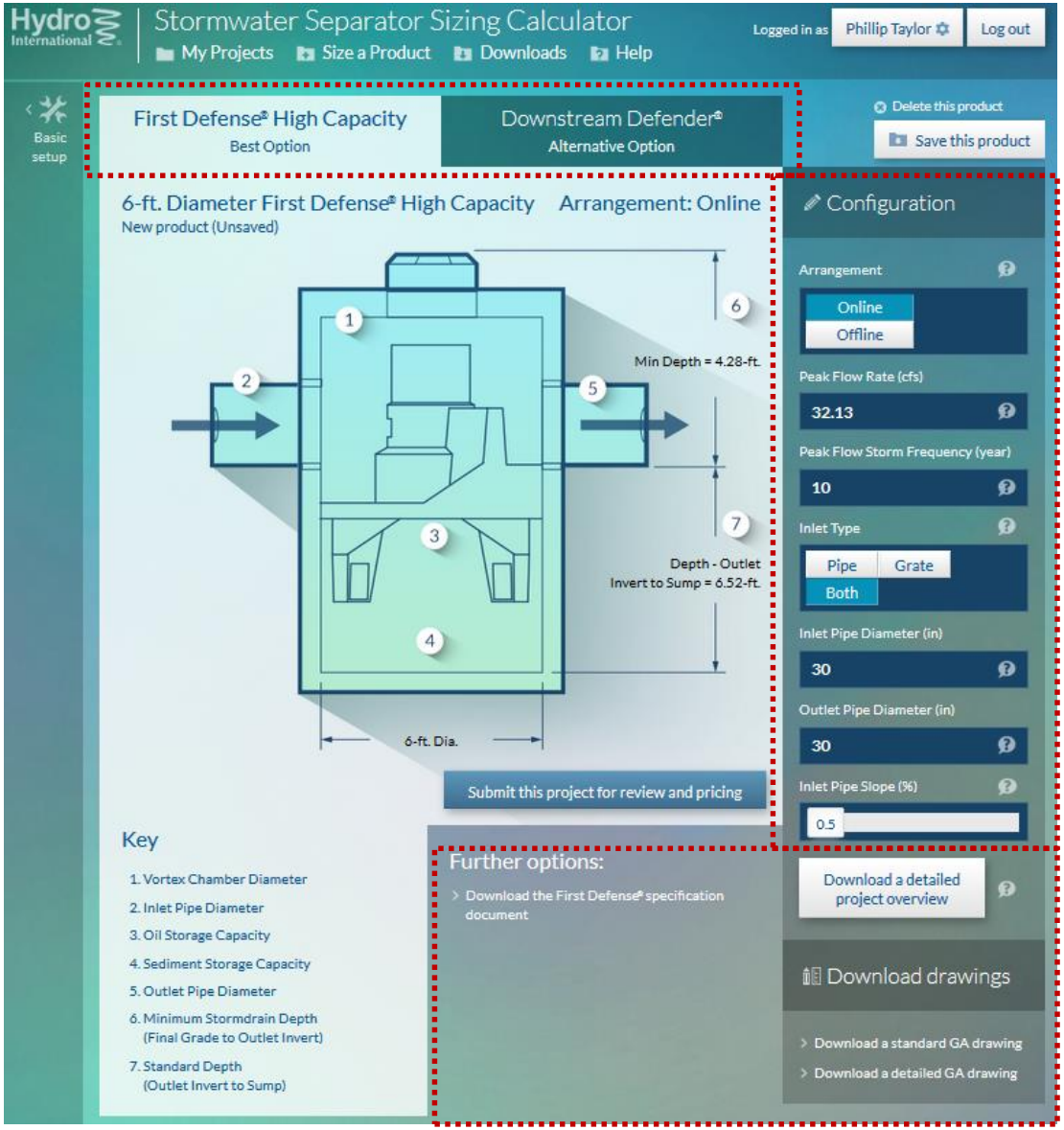
Download Area:

This is where all outputs are obtained including a project overview, and specific product drawings.

Product must be saved to a Project before a download can be obtained.

Further options:

This area shows additional download options.



“Save this product”

Save this product:

Click here to save the product.

You will be prompted for a reference name and project name to save the design to.

You can create a Project file or save to an existing Project file.

These details will be printed on the drawings and project summery documents.

FIRST DEFENSE®
MODEL 6-HC ONLINE

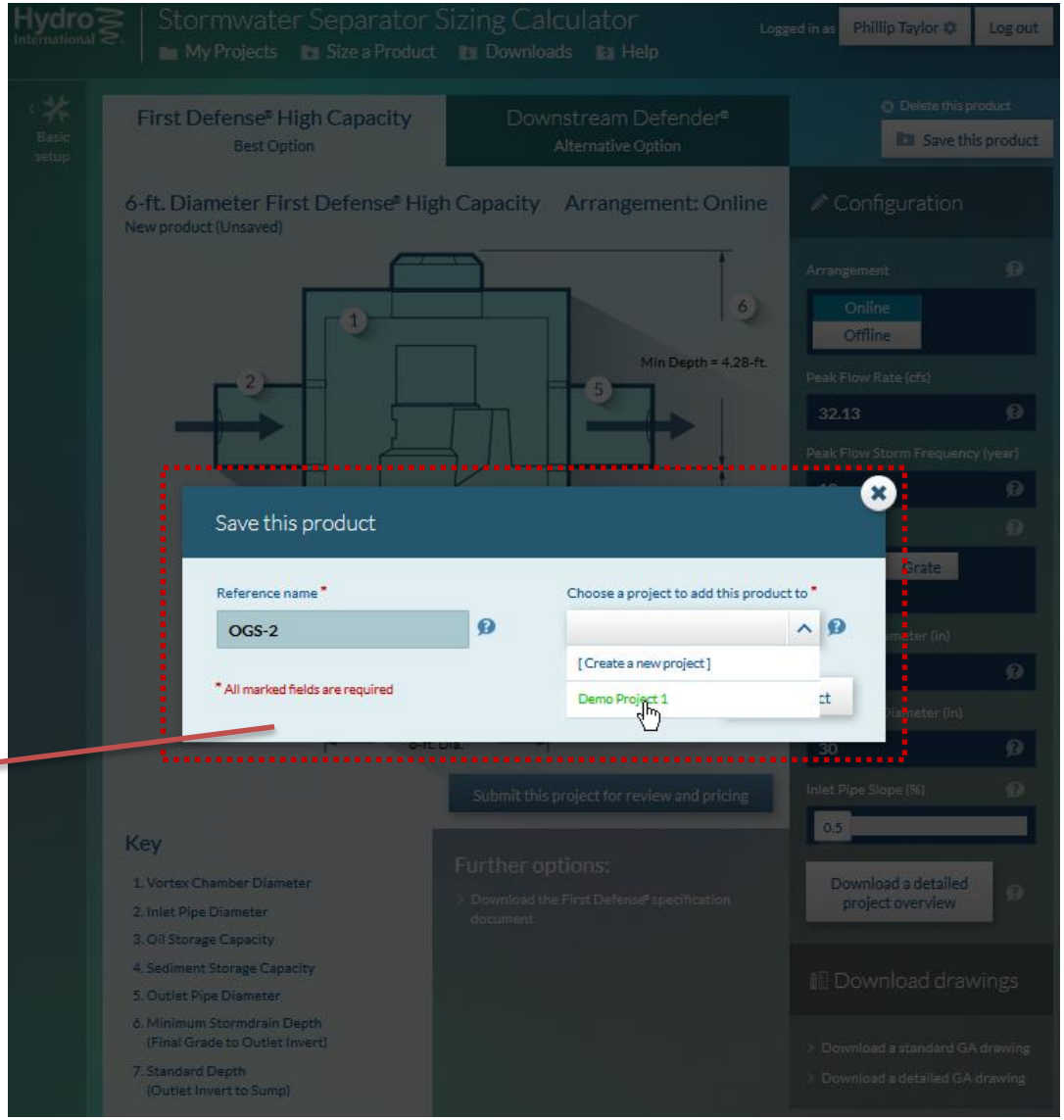
OGS-2

PROJECT NAME:

Demo Project 1

PROJECT LOCATION:

Sim City, ME



Common Product Configuration Settings

These setting are common to both products.

Arrangement:

Online / Offline -

The program will select the best option based on pipe size and peak flows. By default online is selected where possible but offline may be manually selected.

If a change to a larger pipe requires offline configuration the tool will prompt for a change to offline arrangement.

The selected arrangement is shaded with a blue background.

This function is common to all units.

Common Product Configuration Settings

These setting are common to both products.

Peak Flow Rate:

The peak flow rate is the maximum flow expected at the unit from all sources.

This includes the treatment flow and the bypass flow if installed offline.

Peak Flow Storm Frequency:

This is an optional field when using a First Defense unit. It does no influence the design.

First Defense Product Configuration

Inlet Type:

The First Defense can incorporate pipe and surface (grate) inlet.

Select the desired inlet configuration.

Inlet Pipe Diameter:

Input the inlet pipe size. The First Defense can have multiple inlet pipe sizes. This tool does not configure multiple pipes. The default setting is the largest pipe the selected unit can accommodate.

Outlet Pipe Size:

Input the outlet pipe size. This should not be less than the inlet pipe size normally. The default setting is the largest pipe the selected unit can accommodate.

Inlet Pipe Slope:

This provides a check on the inlet velocity of the peak flow. Altering the slope may result in a pipe size change.

NOTE!
If the pipe size or inlet velocity exceeds the capacity of the unit, it will be placed offline automatically. Keep an eye on the “Arrangement” indicator to see if the unit is online or offline.

Downstream Defender Product Configurations

Online / Offline:

Default settings will place the unit online (blue). Click offline to chance this setting.

Peak Flow Rate:

The default is the recommended peak flow rate for the unit selected. If the peak flow exceeds a certain value the tool will prompt to place the unit offline. A diversion structure will be required in this case.

Peak Flow Storm Frequency:

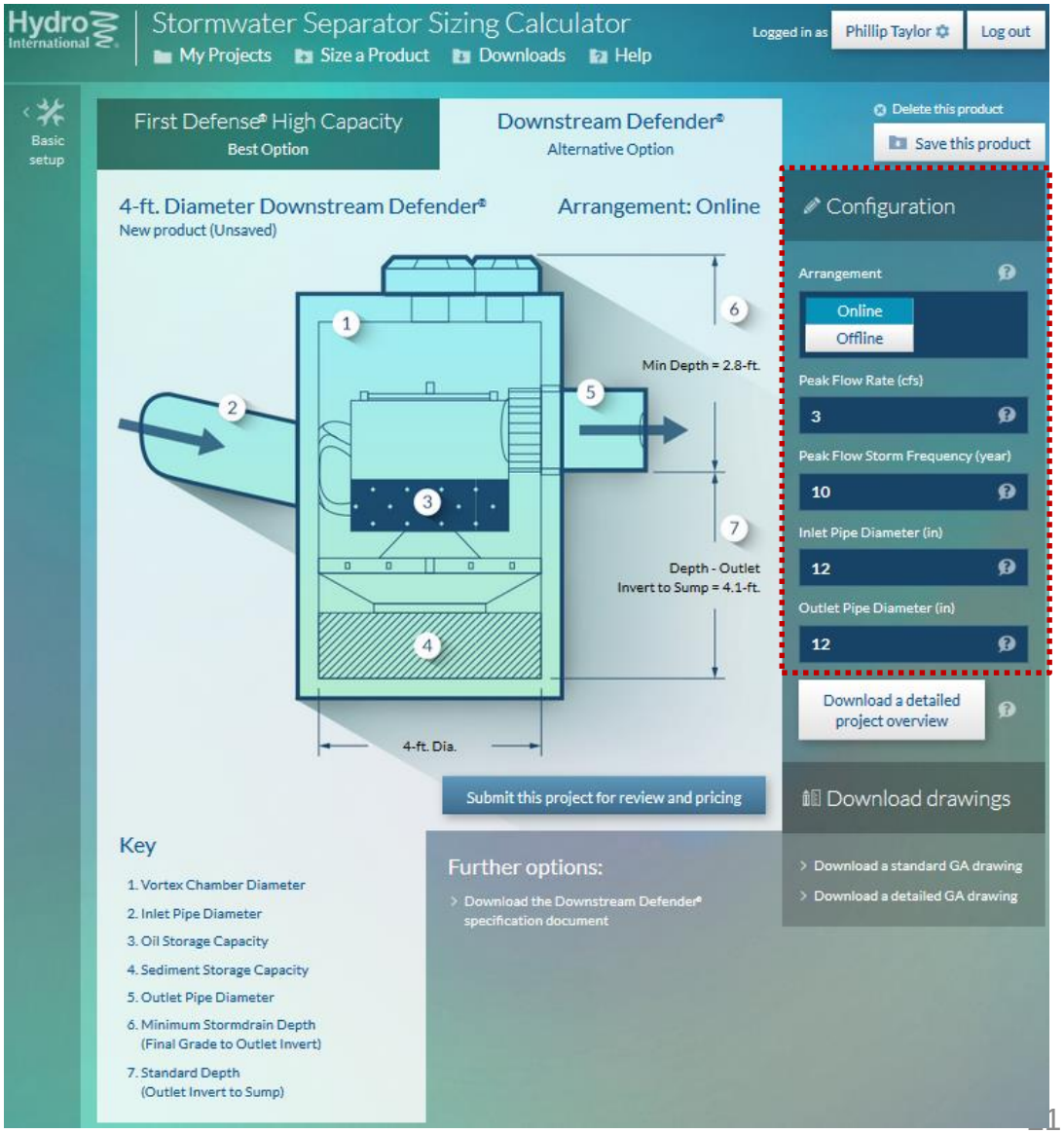
The storm return period is used to allow a tolerance to the peak flow. A 10 yr. or more storm period will allow a slightly larger peak flow than a storm return less than 10 yrs.

Inlet Pipe Diameter:

Input the inlet pipe size. The default is the maximum allowable.

Outlet Pipe Size:

Input the outlet pipe size. The default is the outlet stub size. An adaptor will be required if larger or smaller pipes are used downstream.



Adding more products

To add another product or start a new design:

Click the “Size a Product” or “Basic setup”

WARNING!
Clicking these options will exit the current product design and it will be lost unless saved before clicking one of these options. Save first!

Drawings – Standard GA Drawing

Download Drawings:

“Download a standard GA drawing”

This will produce a standard general arrangement drawing (pdf format) showing the standard unit dimensions.

No additional inputs will be asked for and standard dimensions will be used.

NOTE!
Drawing will automatically download to the browser’s download folder.

BUG!
In Firefox the downloaded file may not include the file extension “.pdf”. If the drawing file does not open, add a .pdf file extension to the file name to open it.

Drawings – Detailed GA Drawing

“Download a detailed GA drawing”

Invert Elevation of Storm Drain Pipe:

Input the invert of the outlet pipe. All units are set using the outlet pipe invert as the reference point.

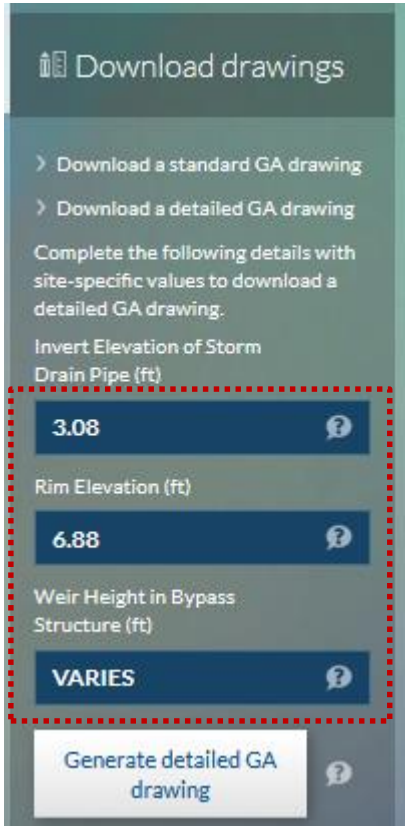
Rim Elevation:

Input the top of casting level (final grade).

Weir Heights in Bypass Structure:

If the unit is installed offline this field will be visible. If this is known input the weir height here

NOTE!:
If ether elevation results in insufficient cover to install the unit a warning message will appear.



Specification Download

Further Options:

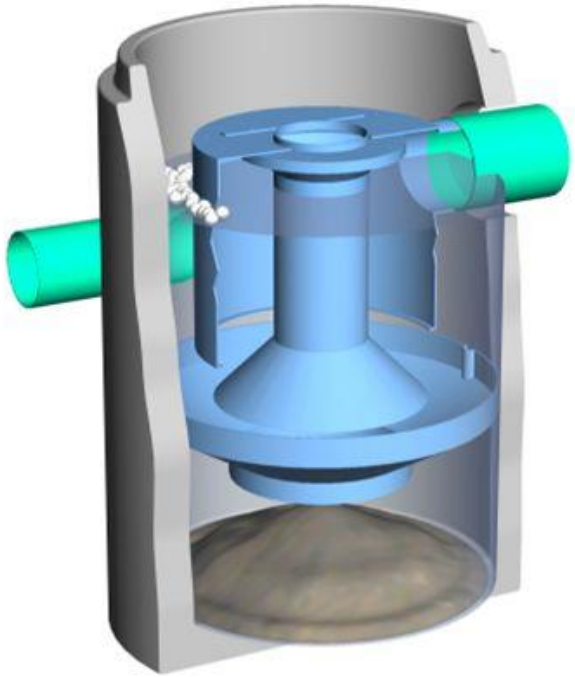
“Download specification”

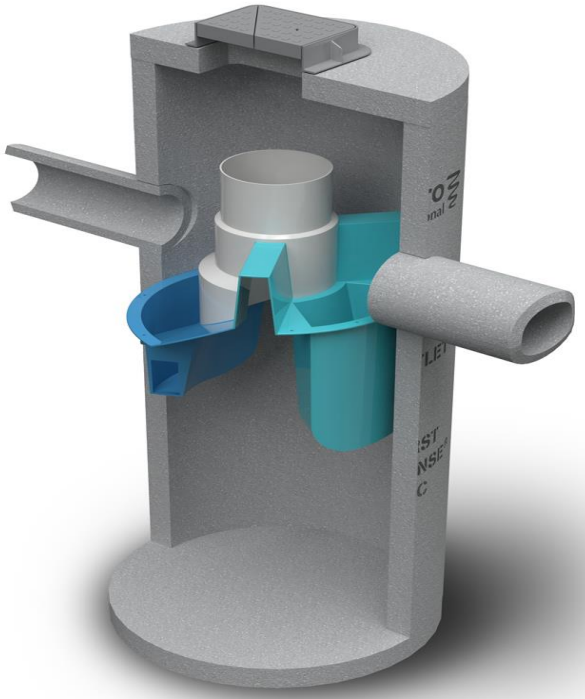
Click this link to download a standard product specification to the browser’s download folder standard general arrangement drawing (Word format).

NOTE!
The specification will automatically download to the browser’s download folder.

BUG!
In Firefox the downloaded file may not include the file extension “.doc”. If the specification file does not open, add a .doc file extension to the file name to open it.

Additional Information Section





DD & FD Comparison Table

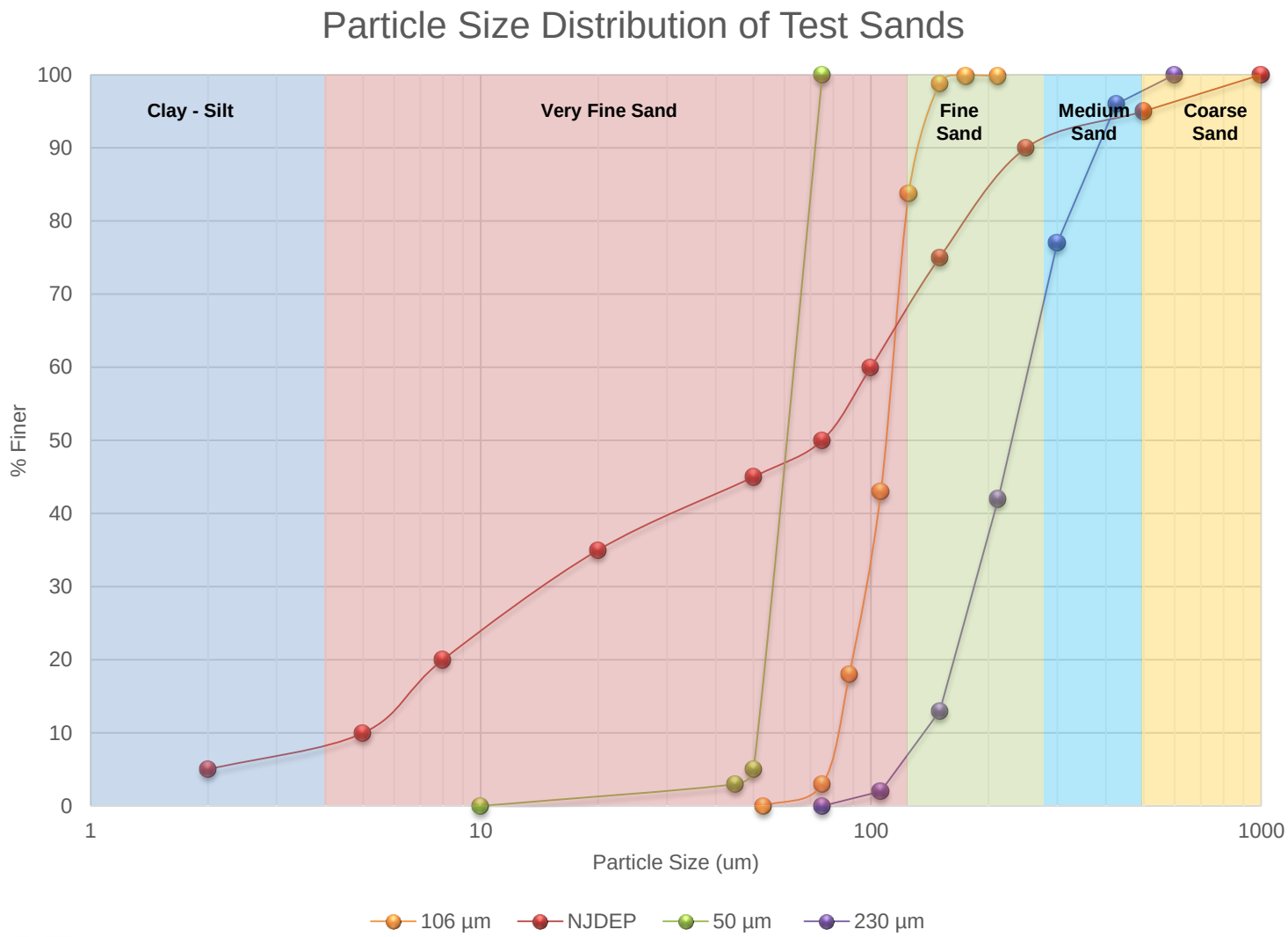
Table 1	Downstream Defender	First Defense HC
Treatment Manhole Sizes (mm) Nominal	1200, 1800, 2400, 3000, 3700 (4, 6, 8, 10, 12 ft)	1200, 1800, (2400 pending) (4, 6 ft, 8 ft pending)
Bypass Options	External bypass structure required	Internal bypass included, external optional
Surface inlet option (grate)	Possible – consult Hydro	Available
Inlet pipe options	Maximum 2, size and angle limits apply, consult Hydro.	Multiple inlet pipes allowed at variable angles.
Retrofit inline	Possible – consult Hydro	Best option
Retrofit offline	Best option	Optional
TSS Removal Data Available	50 µm, (Silts and up)	110 µm (Fine sands and up)
Hydrocarbon removal	Best option	Good option
Free floating trash	Best option	Good option
Maximum 80% TSS flow rate of largest unit	Up to 680L/s (24 cfs) (Fine sands)	Up to 108 L/s (3.8 cfs) (Coarse sands)
Peak Internal flow before requiring an external bypass	85 to 1076 L/s (3 to 38 cfs) depending on unit	57 to 906 L/s (2 to 32 cfs) limited by pipe capacity
Maximum Pipe Size	300 to 900 mm (12” to 36”) depending on unit	600 to 750 mm (24” to 30”) depending on unit
NJDEP pre 2015 certified	Yes	No
NJDEP Post 2015 certified	Yes	Pending
WADOE Pretreatment GULD	Yes	No
Other local approvals	Yes – consult Hydro	Yes – consult Hydro
Backwater Influence	Not affected	Can cause early bypass

Choosing Which Product To Use.

Choosing between a Downstream Defender and First Defense should be done according to the following rules:

1. Preapproval status – comply with local regulatory approvals and select the product approved. If both are approved or the option to use ether is presented go to 2.
2. If the treatment flow is less than 2.2 cfs, pipe under 36” and peak flow under 32 cfs, the option to use the First Defense should be looked at first.
3. If the treatment flow is up to 3.8cfs but a 230 µm particle size is acceptable and pipe sizes and peak flows meet item 2, then consider a First Defense.
4. If pipe size or peak flow exceed the capacity of the First Defense an offline Downstream Defender may be the best solution.
5. If the treatment flow exceed 2.2 cfs and a TSS of 106 µm or 50 µm is required use a Downstream Defender.

Particle Size Distributions



Particle Size Selection

If working in an unregulated area or where no predefined particle size is specified:

- 106 µm is recommended as this is a very common design size. It offers the most flexible design options as almost all hydrodynamic separators have data for this or similar particle size distributions. Generally removes the very fine sand and up.

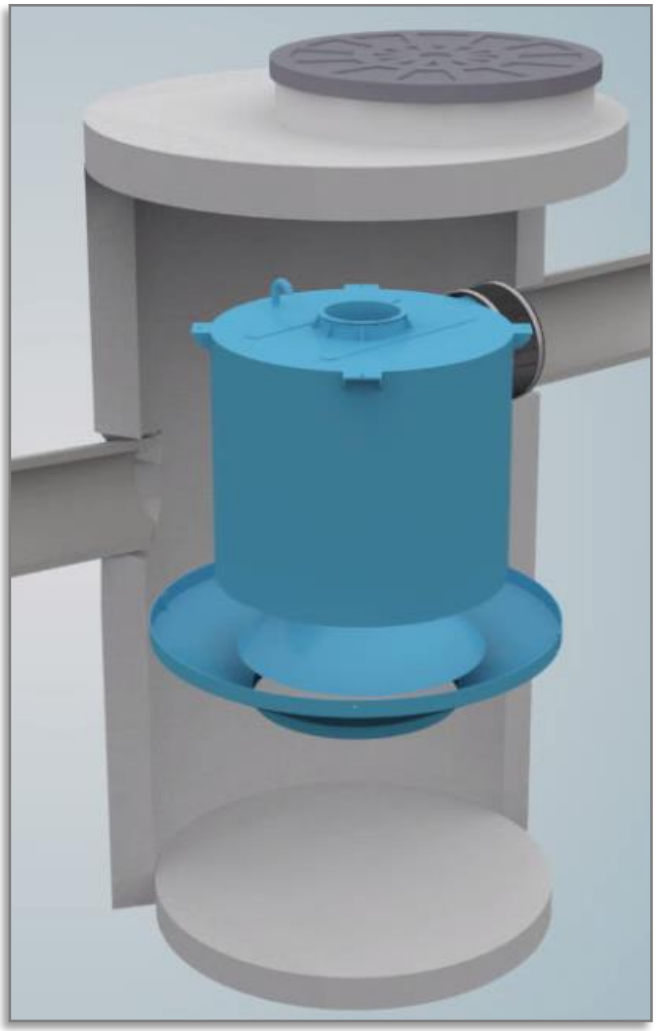
- 230 µm is mainly used for pretreatment to a lower standard and allows for increased flow. Suitable for removal of coarse sand and larger particles.

- 50 µm is used where a high standard of treatment is desired. Suitable for fine sand and coarse silt removal.

Downstream Defender Features & Benefits

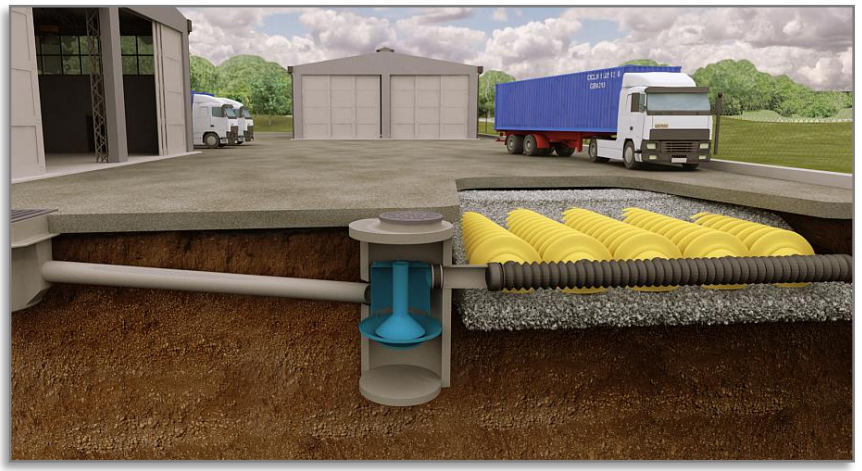
- Features
  - Compact footprint
  - Low head loss
  - No internal bypass
  - Isolated storage and treatment zones
  - High treatment flow rates

- Benefits
  - Low capital cost per treated cfs
  - Proven not to washout
  - Captures and holds free floating trash and oils
  - Easy to install
  - Manhole based – local supply
  - One credit on LEED®
  - Flexible design options



Downstream Defender Applications

- Pretreatment
  - Infiltration
  - Filtration
  - Detention
  - Retention
  - Reuse

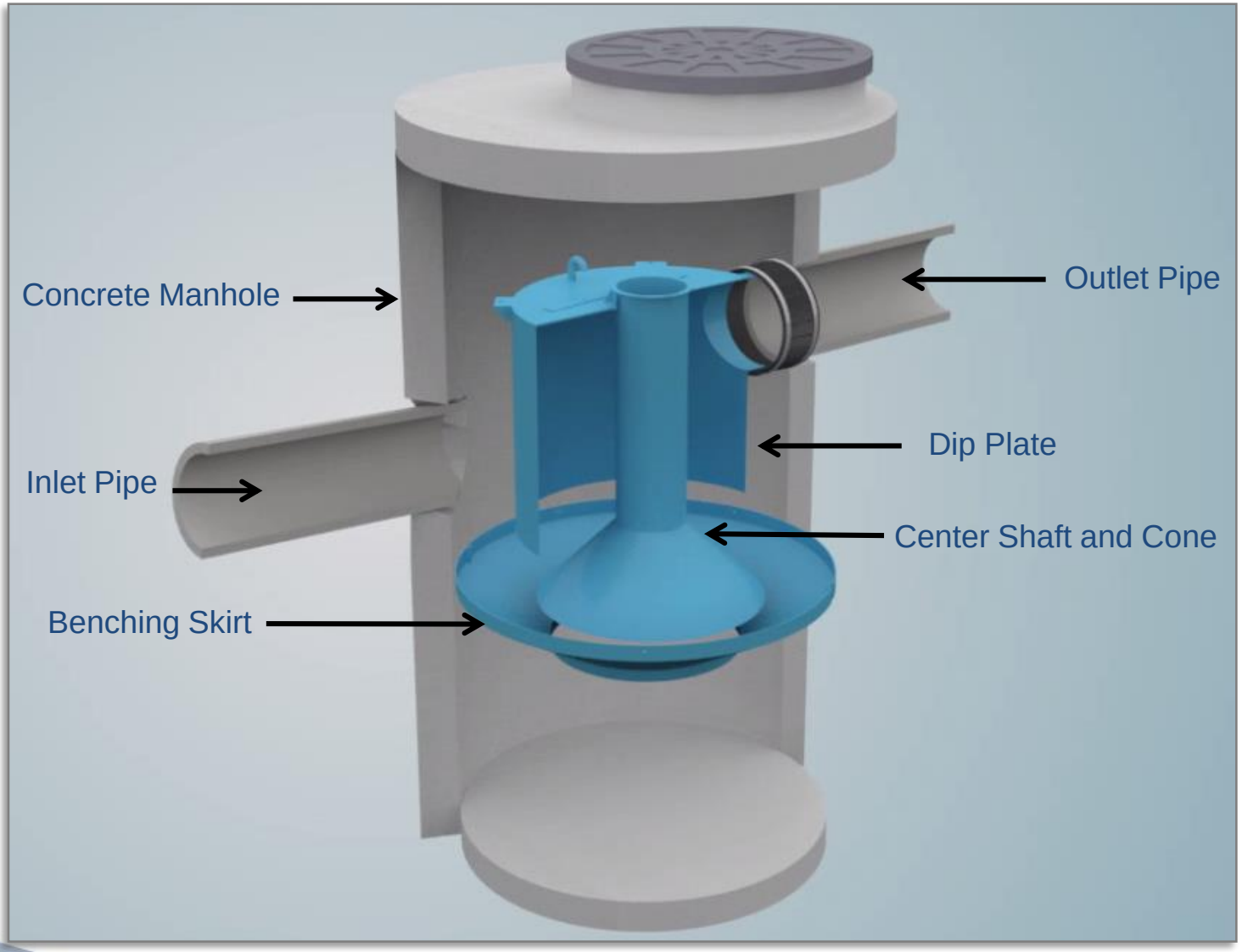


- Stand Alone
  - TSS Reduction
  - Hydrocarbons and Trash
  - Spill Containment
  - Treatment Trains

Treatment Ability

- Total Suspended Solids (TSS)
  - Good removal of coarse silt and larger
  - Limited removal of fine silts and clay size
- Free floating trash and hydrocarbons
  - Good removal of free floating material
- Metals and nutrients
  - Limited to particulate associated fraction
- Dissolved pollutants
  - Not generally removed by settling

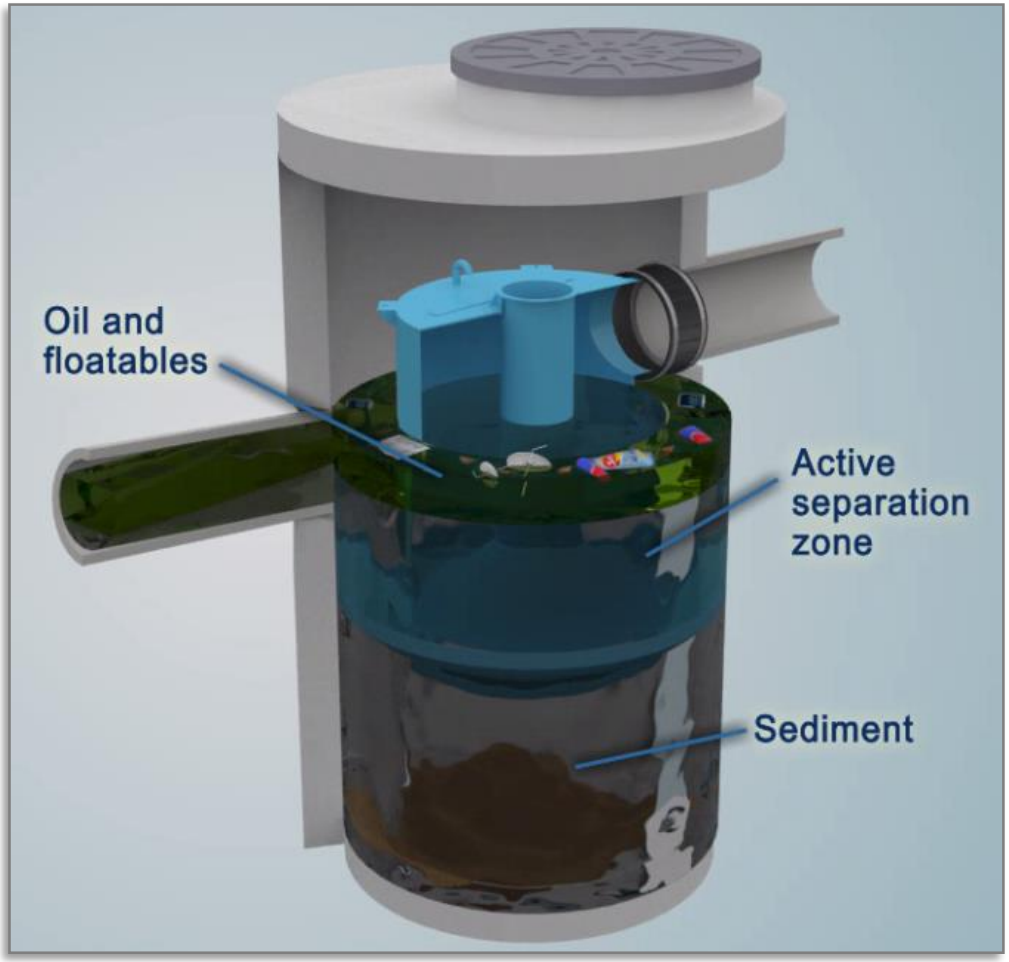
Downstream Defender Components



Isolated Storage

- Internal components optimize the flow regime
  - Increases efficiency
  - Eliminates short circuiting

- Settleable and Floatable pollutant are held in storage zones. Sediment is isolated from high flows preventing washout.

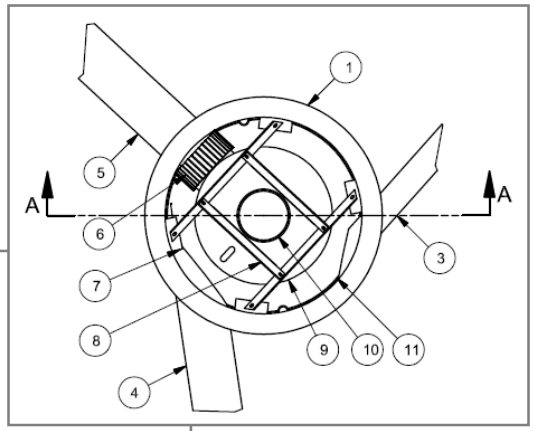


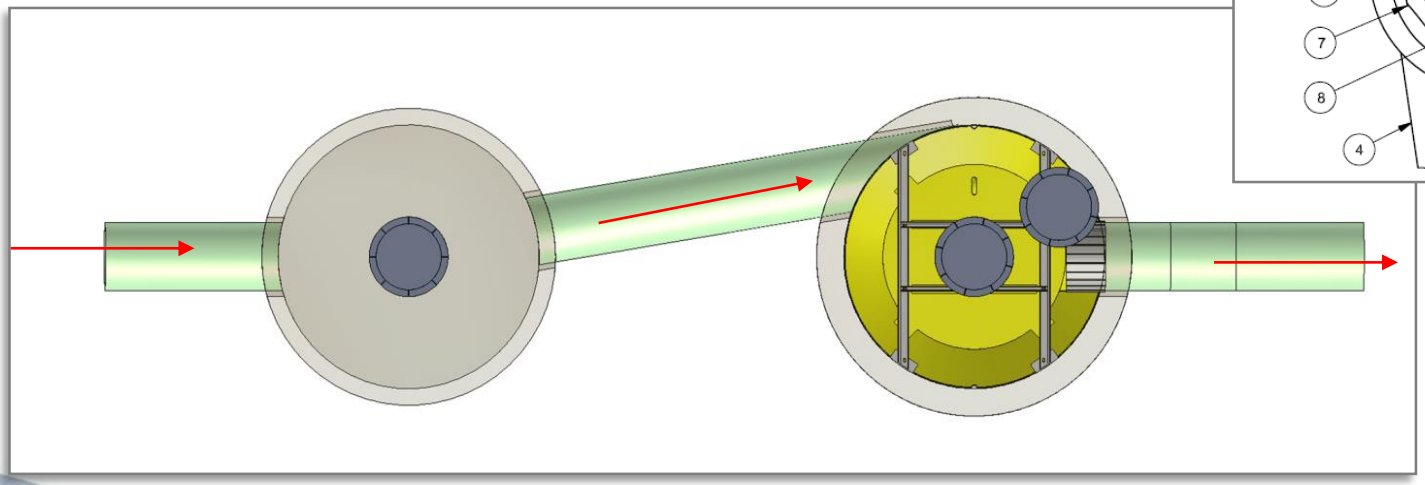
Free Floating Oil & Trash

- Removes significant levels of floating pollutants

Design – Inline Options

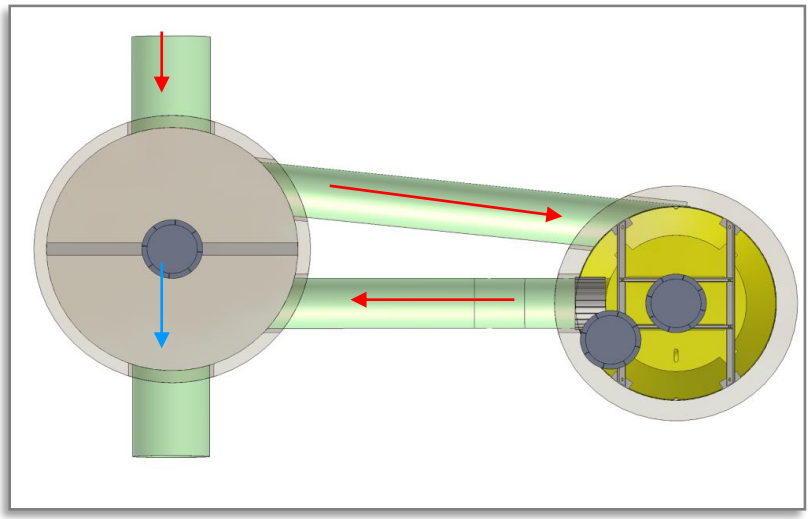
- There is no internal bypass so the peak flow and pipe size are primary considerations
- Inlet can be on ether side and two inlets can be accommodated with inlet pipe angles at 90º to each other and the outlet

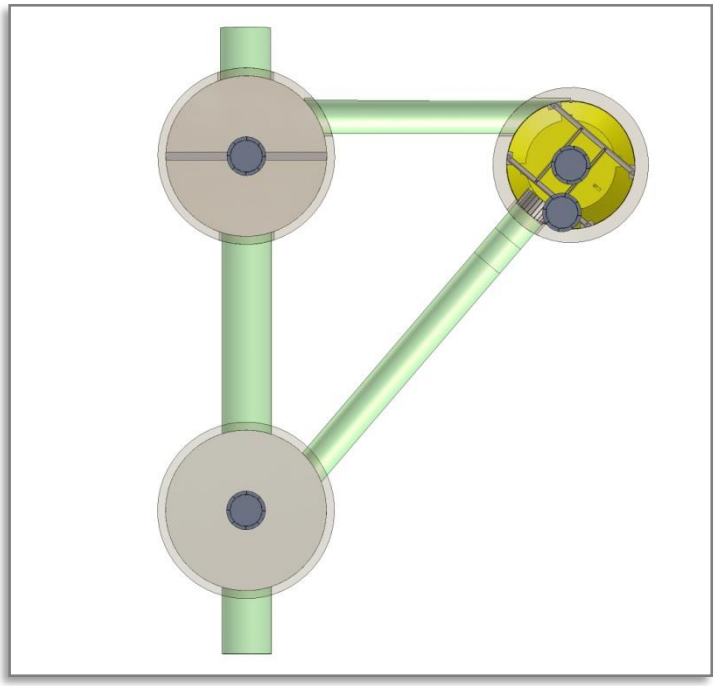




Design - Offline Options

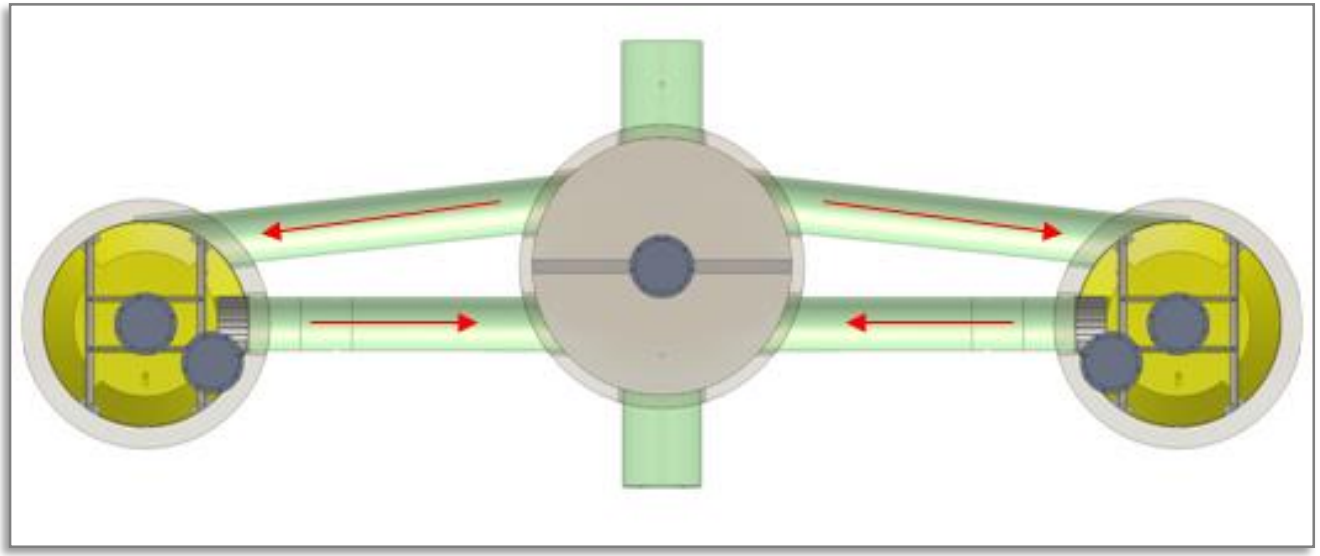
- External bypass structure is used to handle large peak flows and large pipes size, unit is optimized for treatment flow
- The treatment unit can be placed at a location where it is best accessed for maintenance





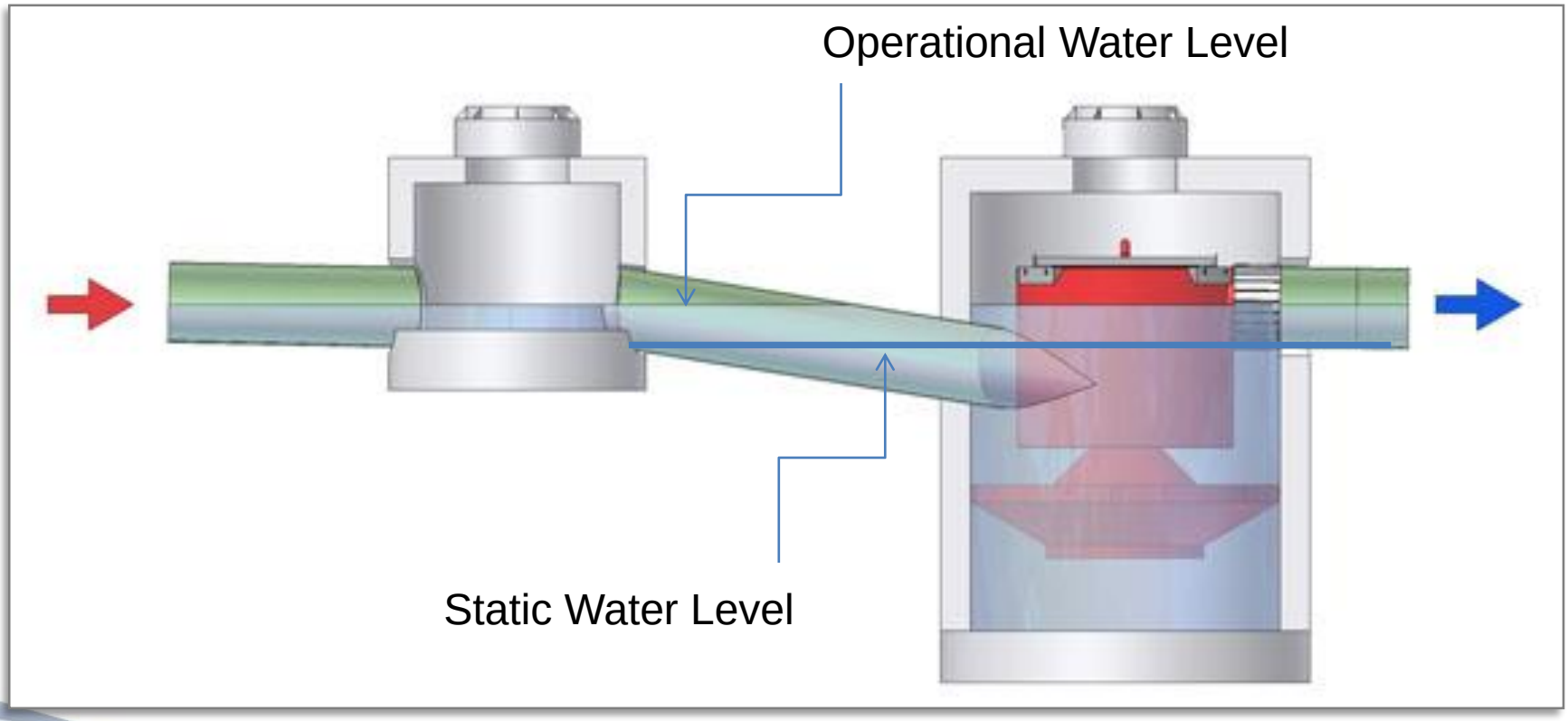
Large Flow Treatment

- Special consideration must be given to the hydraulic design of the system



Design - Hydraulic Profile

- The invert of the outlet is set on the pipe grade line
- Inlet is set lower by 1 pipe diameter
- Inlet pipe is set to a max 15^{o} down angle



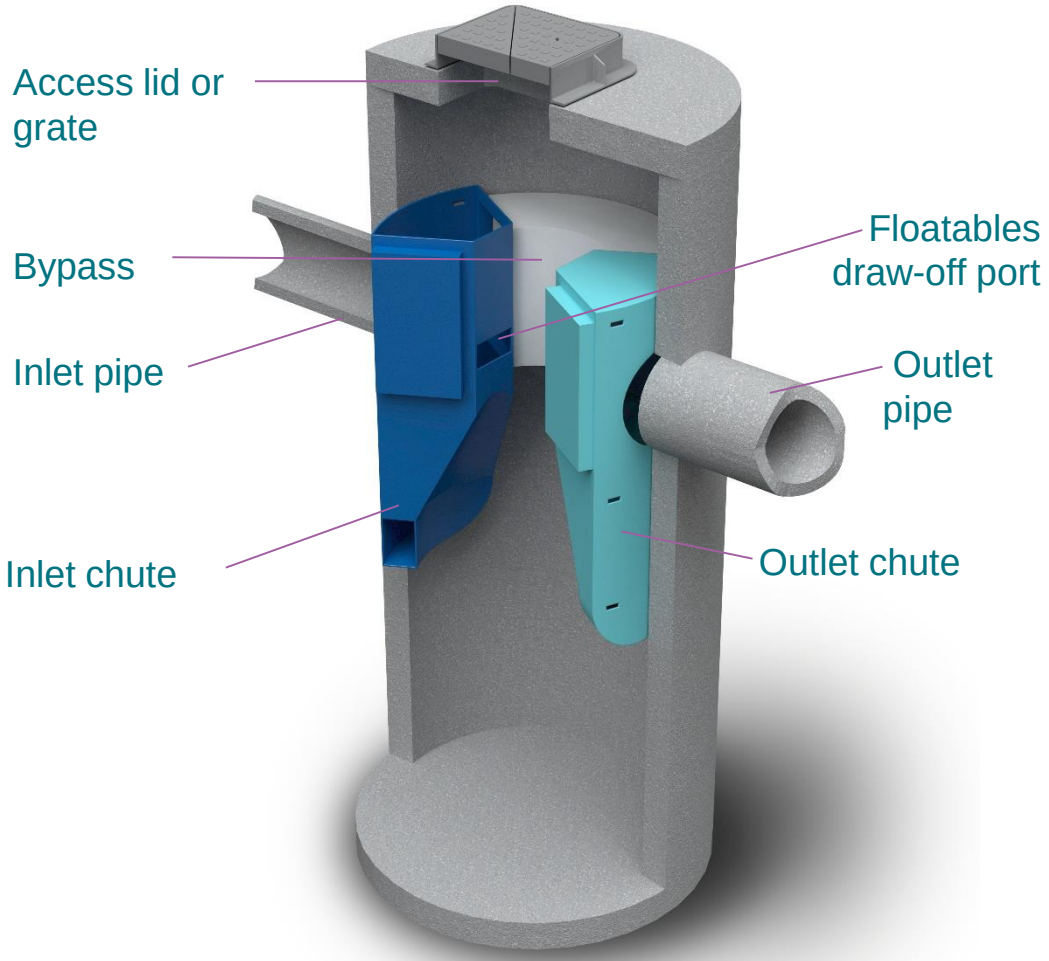
First Defense® High Capacity Uses and Applications

- Used to remove:
  - Sediment
  - Free floating hydrocarbons
  - Free floating trash

- Application:
  - Pretreatment
    - Infiltration
    - Filtration
    - Low impact design
  - Standalone treatment
  - Surface inlet treatment
  - Retrofits

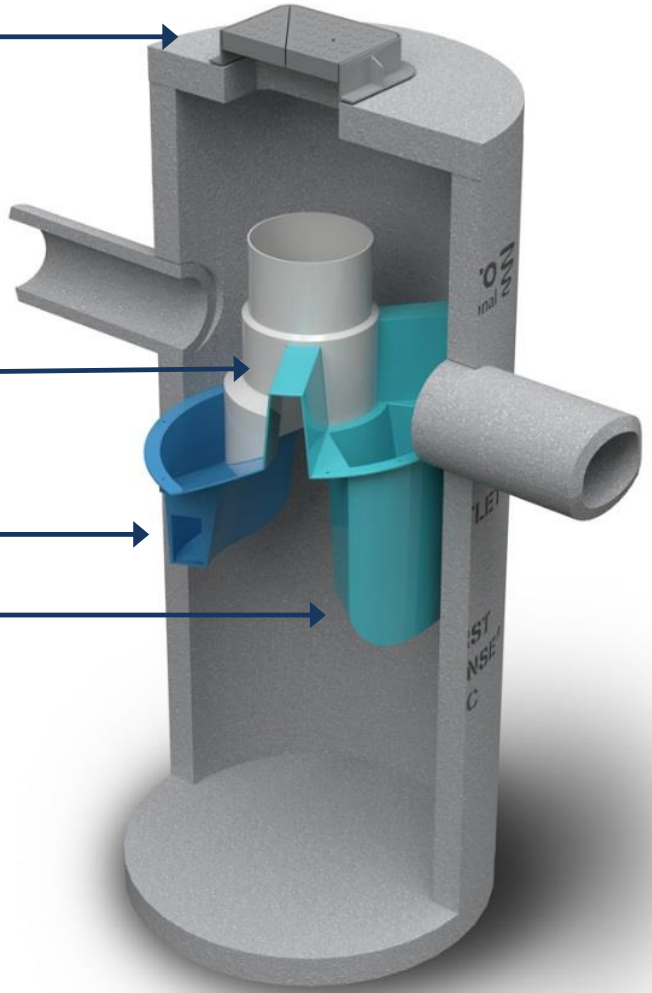
FDHC Features

- Optional grated inlet
- Integral isolated high-flow bypass
  - Conveys peak flows
  - Prevents washout of previously captured pollutants
- Outlet chute orientation prevents short-circuiting
  - Extends residence time for enhanced pollutant settling
- Arrives on site assembled



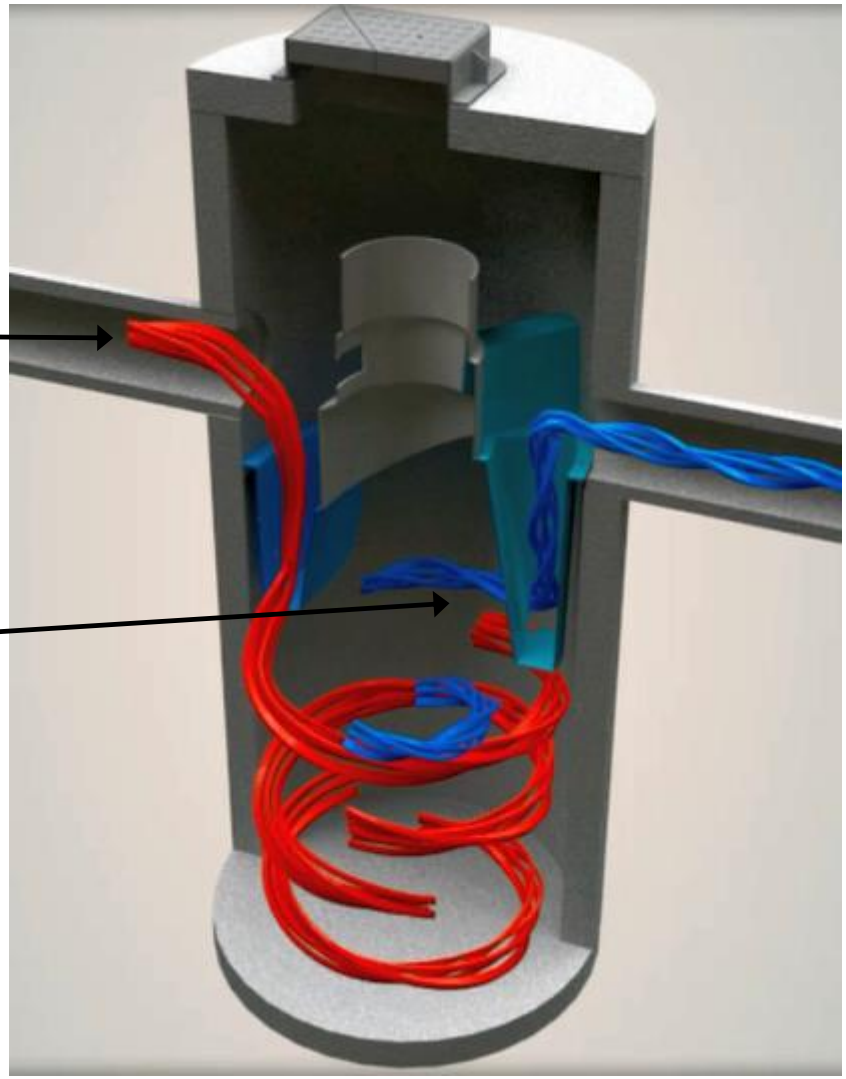
FDHC Parts

- Optional grated inlet
- High-flow bypass Weir (2)
- Inlet chute creates swirl
- Outlet chute



FDHC Treatment Flow Path

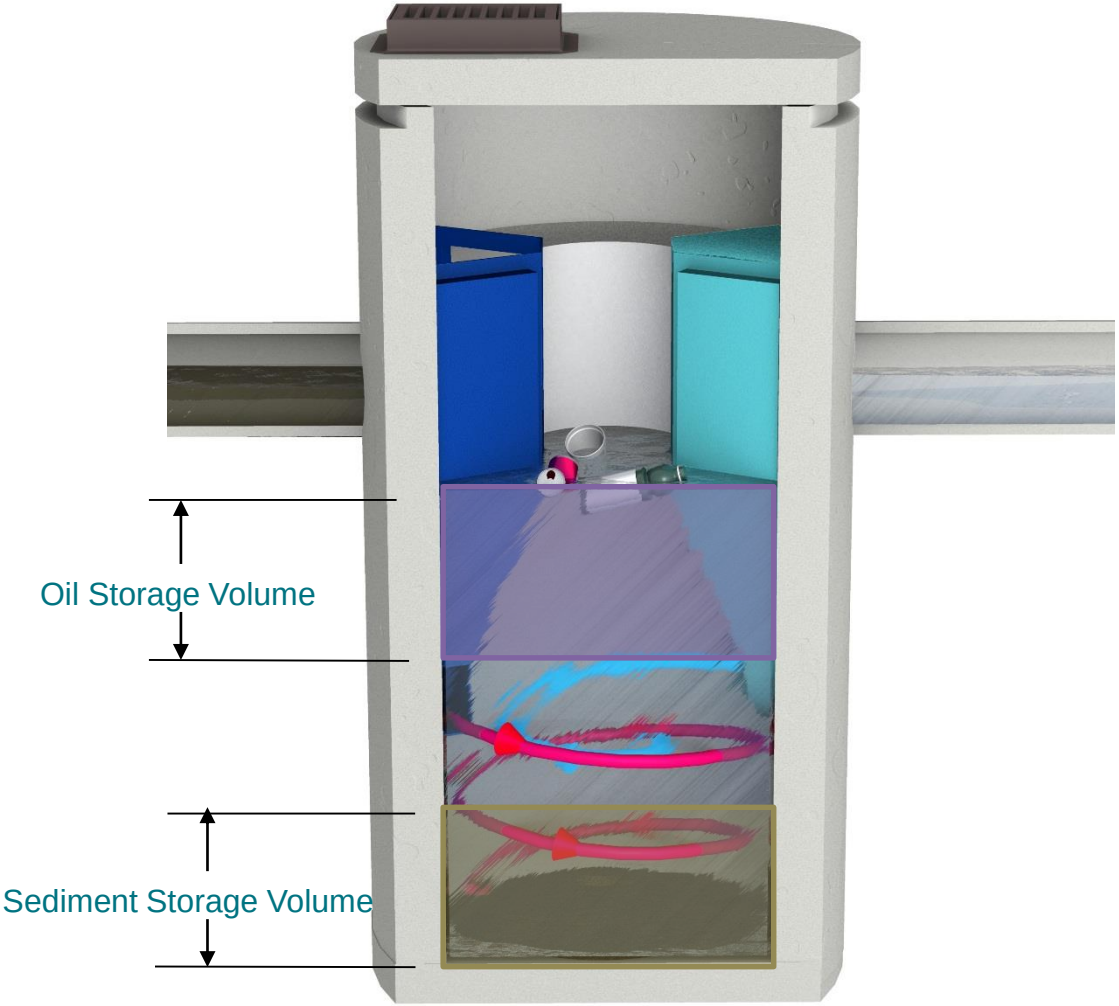
- Inflow
  - Directed down to treatment
  - Inlet generates a swirl action
- Outflow
  - Exit is against the flow
  - Flow must change direct to exit enhancing removal efficiency



FDHC Bypass Flow

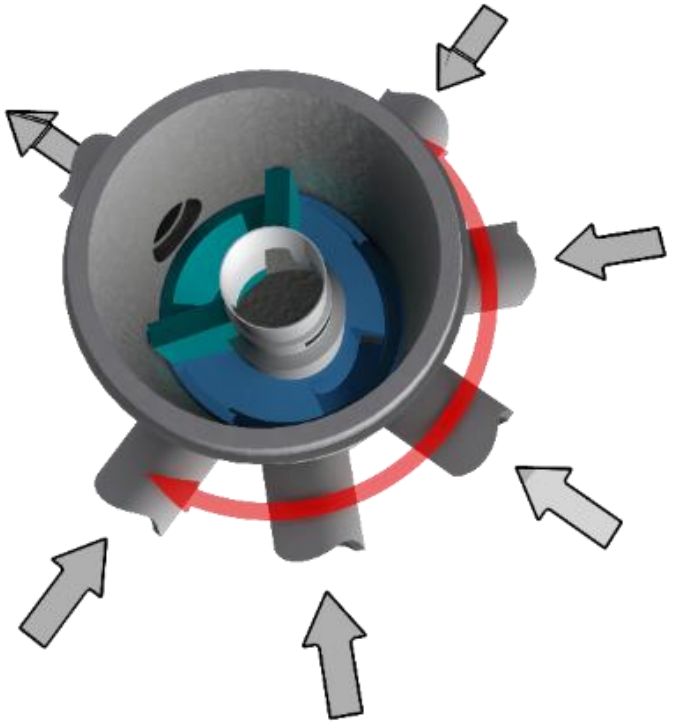
- Bypass Flow
  - Controlled by 2 weirs
  - High overflow weir

Pollutant Capture Zones



FDHC Pipe Configurations

- Flexible inlet angles
- Multiple Pipes
- Inverts do not need to match



Summary

- Efficient and economical stormwater treatment
- Very flexible design accommodates challenging sites
- Bypasses peak flows without washing out captured pollutants
- Straightforward installation and maintenance