Bio Clean
A Forterra Company

February 14, 2018

Mr. Leo Cosentini
California State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-100

Re: Amended Application for Trash Treatment Control Device - Bio Clean® Debris Separating Baffle Box (DSBB)

Dear Mr. Cosentini,

Bio Clean® is pleased to submit this amended application for the Debris Separating Baffle Box (DSBB) for Certification as a Full Capture System - Trash Treatment Control Device. Documentation for this application is being submitted in accordance with the California State Water Resources Control Board *Trash Treatment Control Device Application Requirements* document that includes the following minimum requisite sections:

1. Cover Letter
2. Table of Contents
3. Physical Description
4. Installation Information
5. Operation and Maintenance Information
6. Reliability Information
7. Field/Lab Testing Information and Analysis

Please note the portion of the application amended is Section 5.D. which starts at Page 26. While we believe the previous application contained sufficient detail to address Vector Control Accessibility we utilized the SWRCB delay to further detail the attributes of the DSBB that support Vector Control Accessibility. Please contact me with any questions or should additional information be required. Thank you for your consideration of this application.

Regards,

Zachariha J. Kent
Vice President of Product Development & Regulatory Compliance
Bio Clean®, A Forterra Company

1.0 COVER LETTER

1.A. A general description of the Device;

The Debris Separating Baffle Box (DSBB) is an inline, stormwater treatment system utilizing screening, hydrodynamic separation, sedimentation, and absorption to capture trash, floating and neutrally buoyant debris, suspended sediments and hydrocarbons. The non-blocking screening system is suspended above the sedimentation chambers allowing the captured trash and debris to be stored in a dry state that prevents further contamination of the stormwater and minimizes maintenance requirements. Design flows must pass through a non-blocking screen at the entrance of the device that has an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger. Captured trash and debris is stored offline in screened cages that prevent the resuspension and re-entrainment of this material.

1.B. The applicant's contact information and location;

California Contact:

William Harris
National Product Sales Director
Bio Clean®, A Forterra Company
398 Via El Centro
Oceanside, California
(760) 205-2185
William.Harris@forterrabp.com

Corporate Contact:

Zachariah J. Kent
Vice President of Product Development & Regulatory Compliance
Bio Clean®, A Forterra Company
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Irving, Texas 75062
(760) 433-7640
Zach.kent@forterrabp.com

1.C. The Devices' manufacturing location;

The stormwater division of Bio Clean® is supported through manufacturing by its parent company Forterra Building Products. Forterra Building Products currently has 88 manufacturing locations throughout the country. Three facilities currently provide support for the California market and are listed below:

Forterra Building Products
Drainage Pipe and Products Division
7020 Tokay Avenue
Sacramento, California 95828

Forterra Building Products
Drainage Pipe and Products Division
26380 Palomar Road
Menifee, California 92585

Forterra Building Products
BioClean Stormwater Management Systems
398 Via El Centro
Oceanside, California 92058

1.D. A brief summary of any field/lab testing results that demonstrates the Device functions as described within the application;

Bio Clean® conducted laboratory testing on the proprietary non-blocking screen material utilized in the DSBB. Bio Clean® conducted this testing to empirically determine the unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the DSBB to determine both the treatment and peak flow rates for the DSBB.

The test report has been included in this Application in Appendix F for review by the SWRCB and interested parties.

1.E. A brief summary of the Device limitations, and operational, sizing, and maintenance considerations;

The Bio Clean® Debris Separating Baffle Box (DSBB) is a pre-engineered hydrodynamic separation and screening system designed to meet site-specific water quality treatment requirements.

Conformance with the Engineer's Plans and Specifications is essential to ensure proper operation and function of the Device.

Bio Clean® manufactures the DSBB using a precast concrete housing and stainless steel internal components. The materials selected serve a wide variety of applications and are the most durable materials available for these type devices. Adherence to minimum and maximum installation depths and installation recommendations are required to ensure the design service life of the Device is maintained.

Bio Clean® DSBB systems should be sized to meet site and region specific water quality objectives and requirements. Systems that are not designed and installed in conformance within the maximum treatment flow rate and maximum bypass flow rate limits can cause adverse hydraulic conditions. Additionally, non-conformance with the Device design limits may cause non-compliance with the water quality objectives and requirements.

All structural, post-construction Best Management Practices require routine and scheduled inspection and maintenance. Inspection and maintenance is facilitated by large hatches for access to the treatment bays and perimeter mounted screens for access to the trash and sediment storage areas. System design should consider accessibility of the Device for inspection and maintenance. Design considerations for maintenance frequency should also be a consideration.

1.F. A description or list of locations, if any, where the Device has been installed. Include the name and contact information of as many as three municipality(s) purchasing the Device, and

Installations of the Trash Capture version of this device are pending SWRCB Certification.

1.G. The certification below:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Edward Sexe, P.E., Senior Vice President and General Manager

02/21/2018
Date

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2.0 TABLE OF CONTENTS

Contents

3.0 PHYSICAL DESCRIPTION

3.A. Design drawings for all standard Device sizes including dimensions, and alternative configurations;

Design drawings for all standard devices and configurations are included in Appendix A.

3.B. Description on how the Device works to trap all particles that are 5 mm or greater in size and how it is sized for varying flow volumes;

The Debris Separating Baffle Box (DSBB) is an inline, stormwater treatment system utilizing screening, hydrodynamic separation, sedimentation, and absorption to capture trash, floating and neutrally buoyant debris, suspended sediments and hydrocarbons. The non-blocking screening system is suspended above the sedimentation chambers allowing the captured trash and debris to be stored in a dry state that prevents further contamination of the stormwater and minimizes maintenance requirements. Design flows must pass through a non-blocking screen at the entrance of the device that has an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger. Captured trash and debris is stored offline in screened cages that prevent the resuspension and re-entrainment of this material.

In addition to suspended sediments and hydrocarbons, the DSBB removes trash and debris such as plastic bags, Styrofoam, food and beverage containers, paper, metal, cigarette butts, leaves, grass clippings, and branches. The patent pending screen system of the DSBB removes these gross pollutants and keeps them stored out of the water flow path as well as above the standing water line. Offline and dry storage of the gross pollutants provides the following benefits:

- Prevents nutrient leaching from leaves and grass clippings.
- Prevents septic conditions and odor issues associated with decomposition of organic solids in standing water.
- Minimizes bacteria growth associated with organic matter in standing water.
- Allows for easy cleaning of captured gross solids. No water has to be removed to clean the screening system. This minimizes maintenance costs.

The Full Capture DSBB incorporates the following features to achieve full capture of all particles 5mm in size or larger. These features additionally ensure no re-suspension of previously captured pollutants.

- The screen system is manufactured from a proprietary, non-blocking, louver-expanded stainless steel screen. The openings of the screen are made by a process that angles the opening in one direction so that when water and debris encounter the screen a wiping action occurs which pushes both water and debris across the opening rather than through the opening. This perpetual, deflective shielding action minimizes blockages and penetration of debris though the screen opening.
- The proprietary, non-blocking screens are made from 20 gauge, type 304 stainless steel with an aperture not greater than 4.7 mm. The open area is not less than 37%.

- All trash storage chambers are equipped with screened lids to prevent re-entrainment of floatables and neutrally buoyant material during flows in excess of the Full Capture design flow. An available alternative configuration utilizes taller screen heights for the trash storage chamber sidewalls. The screen heights are raised to a level that is greater than the maximum hydraulic grade line at peak flow. This configuration also ensures trash is retained under all conditions and eliminates the need for lids.

DSBB Features (Isometric View)

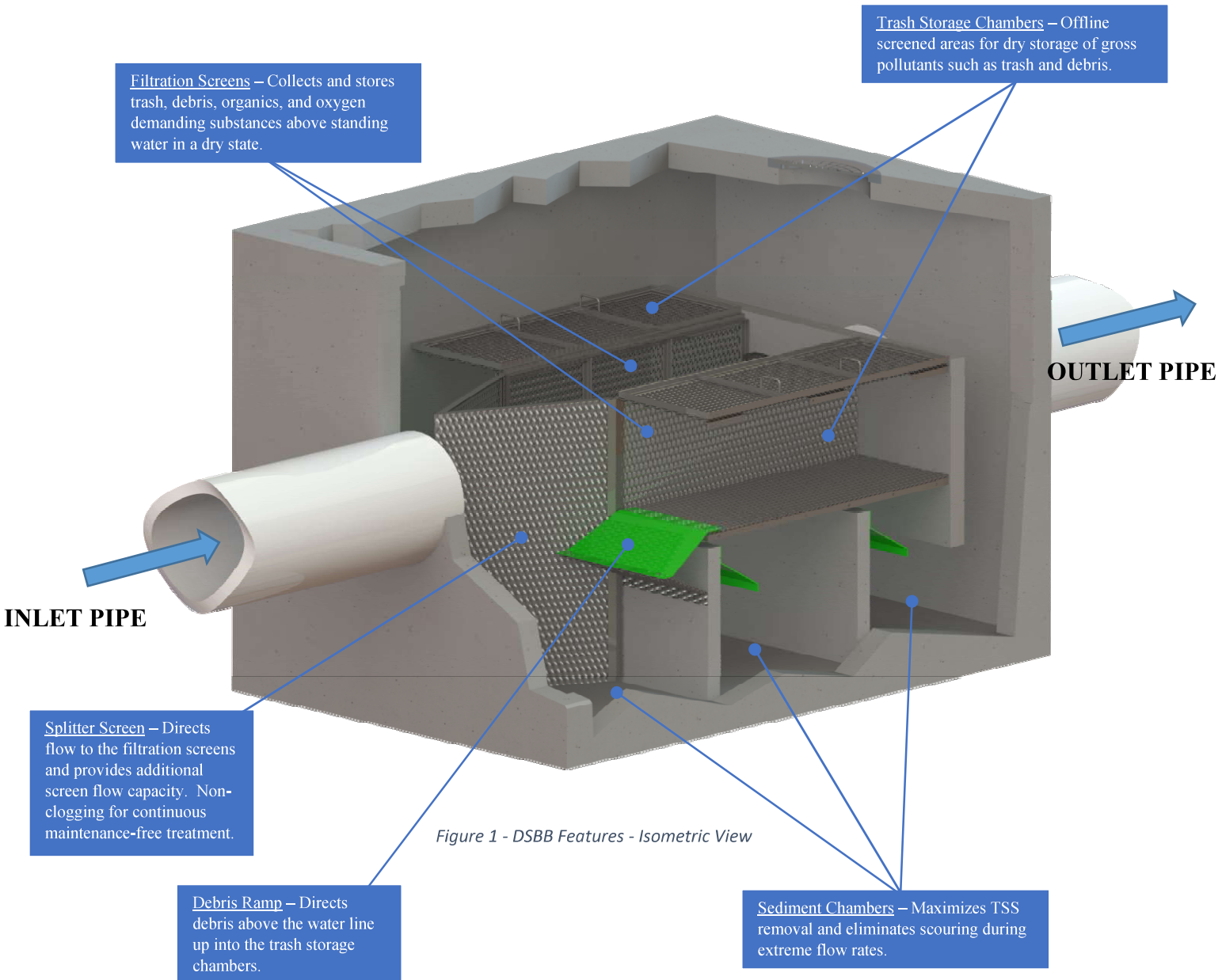


Figure 1 - DSBB Features - Isometric View

DSBB Features (Profile View)

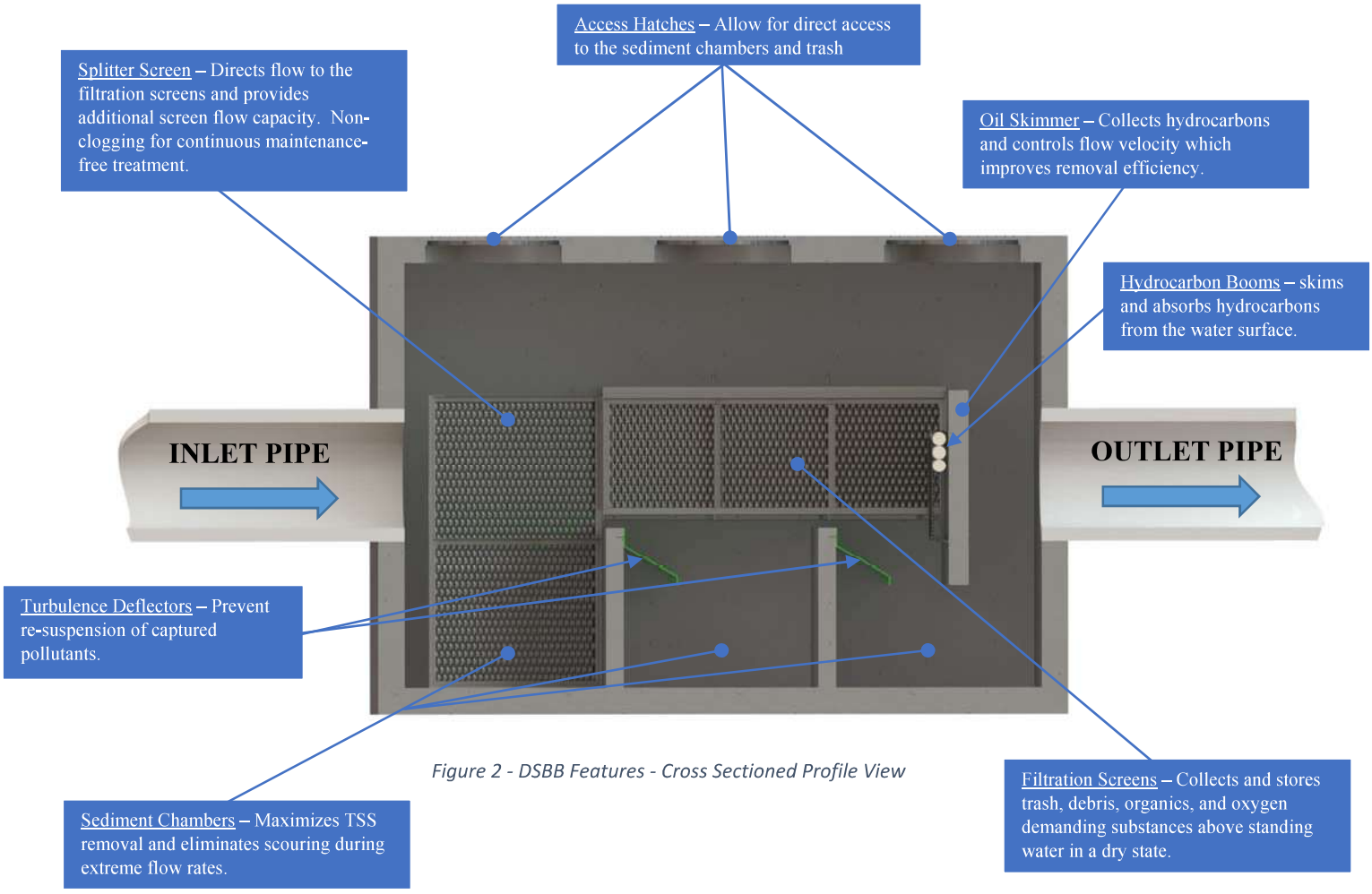


Figure 2 - DSBB Features - Cross Sectioned Profile View

DSBB Features (Plan View)

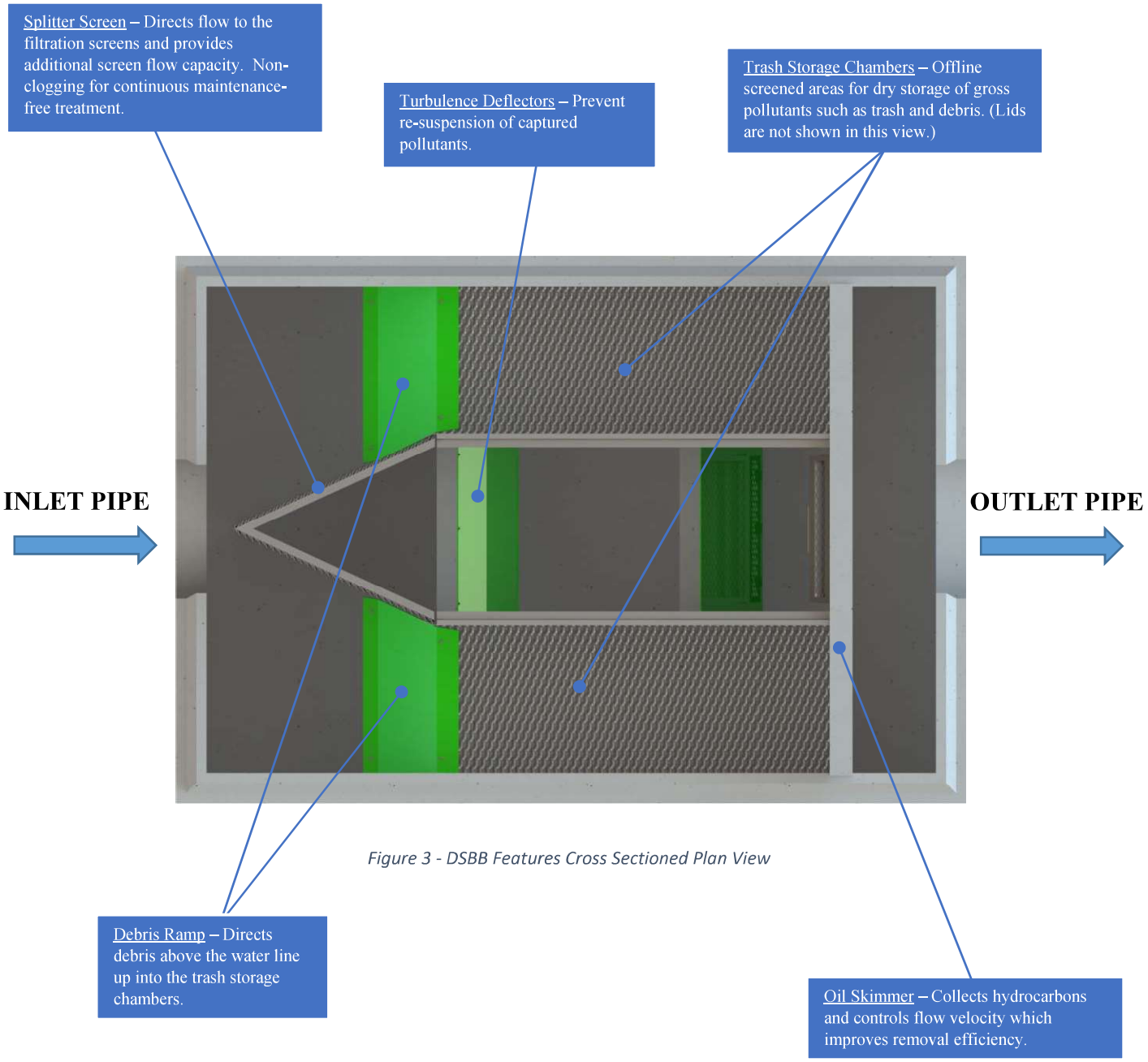


Figure 3 - DSBB Features Cross Sectioned Plan View

DSBB Operation – During Storm Events

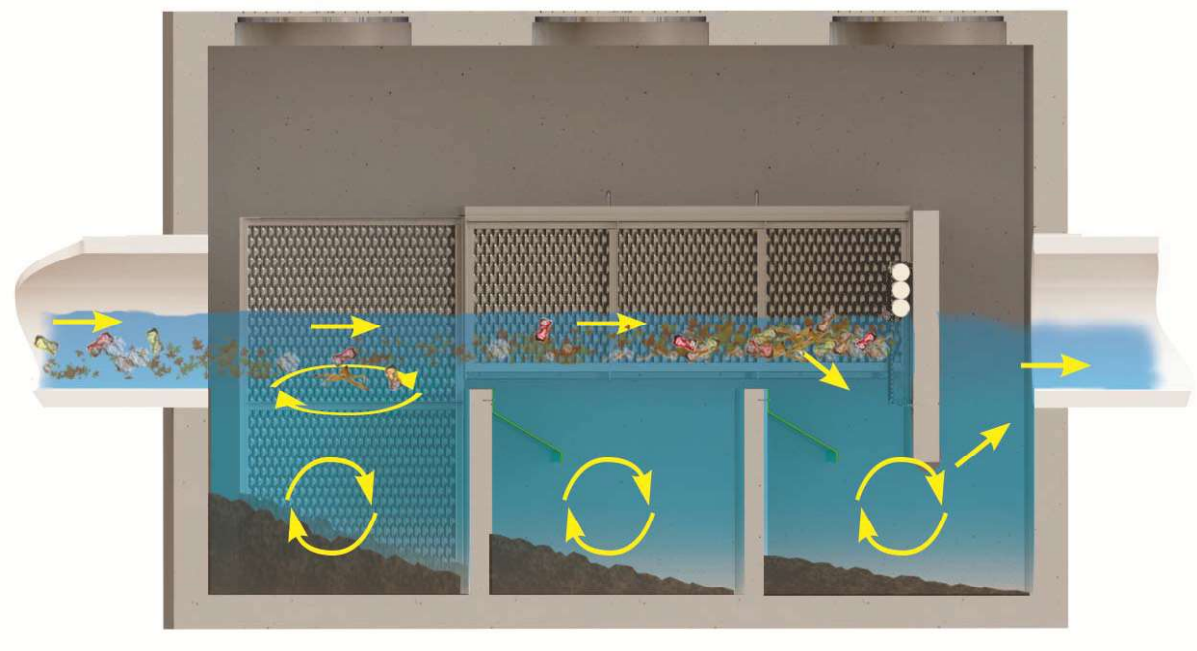


Figure 4 – DSBB Operation During Storm Events

DSBB Operation – Between Storm Events

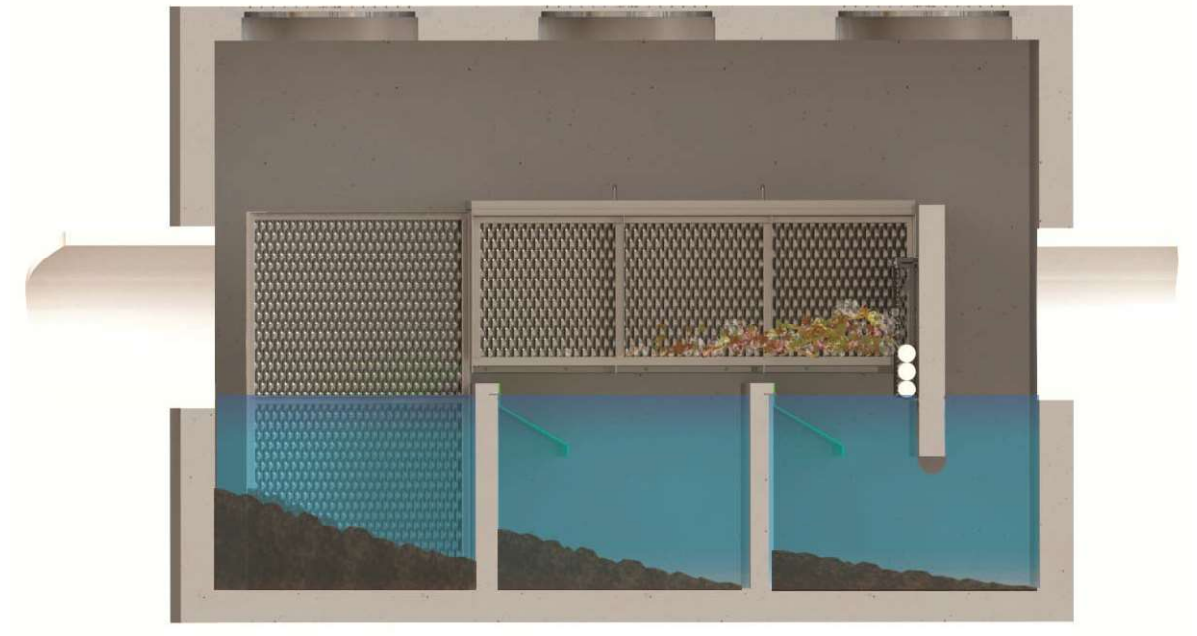


Figure 5 – DSBB Operation Between Storm Events

Section 3.B. (Continued)

Stormwater flow enters the treatment vault and the water immediately encounters an angled, expanded metal, mesh screen that both directs and screens the water. The gross pollutants such as the trash and debris are directed toward the left and right into the trash storage chambers located at the sides of the treatment vault. The trash storage chambers are constructed so that the end and one side is made as part of the concrete vault. The bottom and interior side of the containment compartments are made from an expanded metal screen with openings no larger than 4.7mm. The tops of the trash storage chambers are constructed with the same expanded metal screen but are hinged and have handles to allow for maintenance access.

Screened flows continue down the center of the vault where the suspended sediment is removed in one of three sedimentation chambers by way of gravitational sedimentation. Deflector shields in the sedimentation chambers direct water downward, which allows for increased residence time in the sedimentation chambers as well as reduced turbulence in the trash containment compartments and prevent scouring of sediments during higher flows. As a final treatment process, the stormwater flows must pass beneath an oil skimmer outfitted with hydrocarbon booms that screens and absorbs non-emulsified oil.

All water flow less than the maximum trash hydraulic capacity must pass through the inlet trash screen. The expanded metal, mesh screen is a proprietary non-blocking design that allows the trash and debris to be captured but the screen remains free and unblocked. The inlet angle of the screen additionally helps to keep the screen free from trash and debris by introducing water at the face of the screen at an angle that allows free flow of water through the screen while sweeping a portion of water across the face of the screen continuously wiping the screen clean.

A sizing chart for the Debris Separating Baffle Box is shown below in Table 1. The nomenclature for models denotes the inside Width(ft.) x Length(ft.) x Depth(in.) of the concrete structure that houses the internal components of the treatment Device. The capacities listed in the Table include pipe size, sediment storage capacity, trash storage capacity and the Maximum Treatment Flow Rate (MTFR) for Trash Full Capture removal.

- The pipe sizes listed in the Table include up to the maximum pipe sizes recommended for the models shown for standard installations (custom configurations available). Smaller pipe sizes have been omitted from the table for purposes of presentation only. Please contact Bio Clean® should a smaller pipe size need to be utilized for a specific model.
- The Maximum Treatment Flow Rate (MTFR) for Trash Full Capture listed in the table is the maximum flow rate the Device can operate at to remove all trash with a particle size of 5mm or greater. When designing for trash capture, the Model selected and applied should have a Trash MTFR greater than the peak flow rate resulting from a one-year, on-hour storm in the sub-drainage area or the MTFR should be at least the same as the flows carried in the corresponding storm drain.
- The Maximum Treatment Flow Rate (MTFR) for sediment removal is not listed in the Table. MTFR for sediment is particle size dependent. Please contact Bio Clean® for Sediment MTFR tables for specific regions. It should be noted that the Sediment MTFR is in almost all cases less than the Trash MTFR. If the Device is to be used for both

sediment and trash removal, the more conservative of the two flow rates should be utilized.

- The Sediment Storage Capacity and Trash Storage Capacity are considerate of both resuspension of removed pollutants and screen blockage.
- A plurality of units can be utilized in parallel to increase treatment flows or custom units can be manufactured to meet site-specific requirements.
- The sediment storage capacity is based on sediment levels in the storage chamber at half the height of the sediment baffles.

Debris Separating Baffle Box Characteristics and Capacity Table
California Full Capture Certified Capacities
Table 1

DSBB Model #	Pipe Size (in)	MTFR (Trash) (cfs)	Sediment Storage Capacity (ft^3)	Trash Storage Capacity (ft^3)
2.5 – 4 – 66	**10**	5.35	14.8	3.3
	12	5.56		
	15	6.01		
3 – 6 – 72	**12**	7.76	26.8	9.0
	15	12.02		
	18	14.39		
4 – 6 – 78	**15**	12.02	35.8	12.3
	18	14.74		
	24	14.90		
4 – 8 – 84	**15**	12.02	47.8	22.0
	18	17.16		
	24	27.40		
5 – 10 – 90	**18**	17.16	70.0	34.0
	24	24.54		
	30	30.25		
6 – 12 – 90	**24**	30.27	102.0	47.4
	30	33.11		
	36	35.08		
	42	36.49		
8 – 12 – 102	**36**	42.55	136.0	72.7
	42	46.64		
	48	46.82		
	54	48.64		
8 – 14 – 102	**36**	44.90	160.0	84.4
	42	47.42		
	48	49.77		
	54	51.76		
10 – 14 – 108	**42**	56.31	200.0	106.9
	48	59.15		
	54	61.67		
	60	63.80		
11 – 16 – 128	**54**	75.68	309.4	160.4
	60	78.53		
	66	80.96		
	72	85.54		
11 – 24 – 136	**54**	100.21	569.3	263.3
	60	104.75		
	66	108.40		
	72	112.85		
11 – 34 – 136	**54**	108.08	816.8	373.3
	60	113.52		
	66	118.79		
	72	123.74		

3.C. The Device maximum trash capture capacity;

Table 1 lists the trash capture volume (ft^3) retained by each DSBB model. The trash capture volumes listed are maximum volumes that can be removed without a reduction in treatment performance and considers full retention of trash with no re-entrainment under peak flow conditions.

3.D. The Device hydraulic capacity (flow in cfs) at its maximum trash capture capacity for all standard Device sizes;

The maximum hydraulic capacity at the maximum trash capacity is listed as the MTFR (Trash) in Table 1.

3.E. Conditions under which the Device re-introduces previously trapped trash;

The DSBB has been designed to remove and permanently retain all trash and debris that is 5mm in size or larger. Conditions under which the Device re-introduces previously trapped trash are listed below:

- If the device is not properly maintained and trash and debris are allowed to accumulate beyond the prescribed maximum allowable level in the trash containment compartments, conditions will be present that could cause a re-introduction of trash into the effluent of the Device.
- Broken or damaged screens at the inlet or in the trash containment compartments can cause an adverse condition that would allow re-introduction of trash and debris into the effluent.
- Missing or un-replaced trash compartment screened lids after a maintenance service can cause an adverse condition that could re-introduce trash and debris into the effluent of the Device.

3.F. Each material and material grade used to construct the Device (stainless steel, plastic, etc.);

The DSBB treatment system is constructed of high strength, durable materials and components that ensure a long design and service life for the Device. Appendix B of this submittal includes a detailed Specification for the DSBB Device which includes material specifications. Key materials and components are additionally listed below:

- Structure – The DSBB and all of its components are self-contained within a concrete structure constructed with a minimum 28 day compressive strength of 5,000psi or greater, with reinforcing steel per ASTM A 615, Grade 60, and is designed to support a minimum loading of H-20 per AASHTO.
- Screen Frame – The screen frame is constructed of aluminum channel, angle, and beam per Grade 6061-T6 and/or Stainless Steel Grade 304.

- Screens – The screens are manufactured from Type 304 Stainless Steel, louver-expanded metal with openings equal to or less than 4.7mm in size.
- Media Filtration Booms (Optional) – The media booms are made from granulated oil absorbing polymers tested in accordance with ASTM F 716.07.
- Turbulence Deflectors – The turbulence deflectors are manufactured from marine grade fiberglass and type 304 stainless steel.

3.G. Estimated design life of the Device;

The estimated design life for DSBB systems is 75 to 100 years. The design life is dependent on the materials utilized as well as the proper application of those materials.

3.H. Engineering plans/diagrams for a typical installation;

Typical installation details and typical configurations for a range of DSBB applications are included in Appendix C. Options for installation include multiple pipe inlets, angled pipe inlets, low flow outlets, angled outlets, and offline configurations. It should be noted that the DSBB can be configured and applied for offline installations but the design intent renders this configuration unnecessary.

3.I. Photographs, if any, of pre- and post-installation examples; and

Photographs of the DSBB in various stages of manufacture, installation and operation are included below:

Figure 6 - DSBB Base Slab Installation

Figure 7 - DSBB Base Slab Installation

Figure 8 - DSBB Baffle Wall Installation

Figure 10 - DSBB Treatment Section Installation

Figure 11 - DSBB Online Installation

Figure 9 - DSBB Treatment Section Installation

Figure 12 - View of DSBB Screen Storage Chambers

3.J. If the device is designed with an internal bypass, explain how the bypass only operates with flows greater than the design storm.

The DSBB is designed for online operation and is configured with an internal bypass that allows for operation in bypass without re-entrainment of previously captured trash and debris. Figure 13 and 14 illustrate the operation of the DSBB while in treatment and while in bypass.

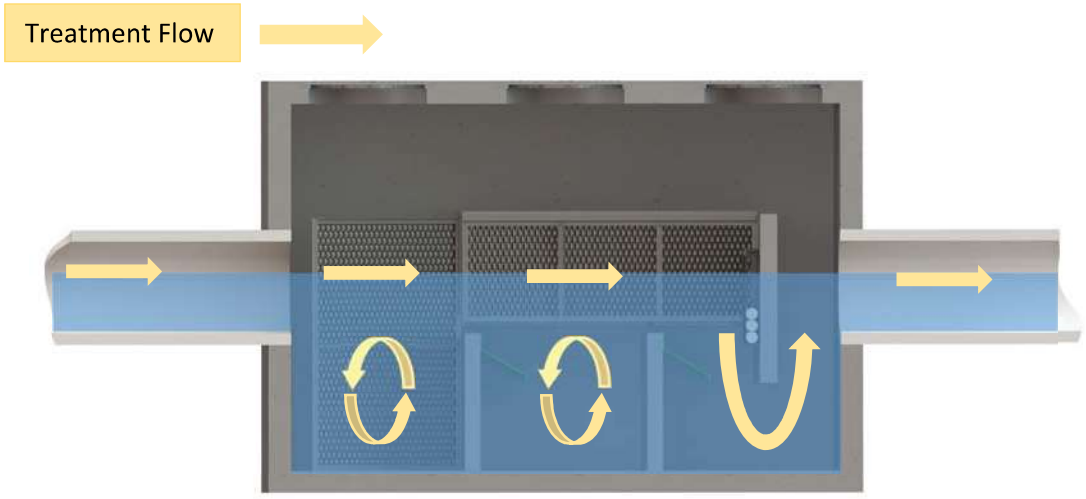


Figure 13 – Operation During Treatment

A unique feature of the DSBB is that the Device is designed to treat the Trash Capture Flow Rate as well as the peak flow rate generated by the drainage area without bypassing. While this exceeds the requirement for a Trash Treatment Control Device, this aspect of the Device design allows greater flexibility in the storm drain system design and/or more tolerance for error in sizing for retrofit applications of the Device. To protect against flooding or other adverse hydraulic conditions, the DSBB also allows for emergency bypass of the flows.

When a drainage system is hydraulically sized to the MTFR (Trash) listed in Table 1, the water elevation in the Device will not exceed the elevation of the splitter screen and filtration screens. All flows at or below the MTFR (Trash) must pass through the non-blocking splitter screen and filtration screens which have an aperture not greater than 4.7mm ensuring capture of all particles 5mm in size or larger for these flows. The retained trash and debris is hydraulically routed offline in screened cages that prevent the resuspension and re-entrainment of this material. These cages (See Figures 1, 2, and 3) are made from the same non-blocking screens with an aperture not greater than 4.7mm ensuring resuspension and re-entrainment of this captured material.

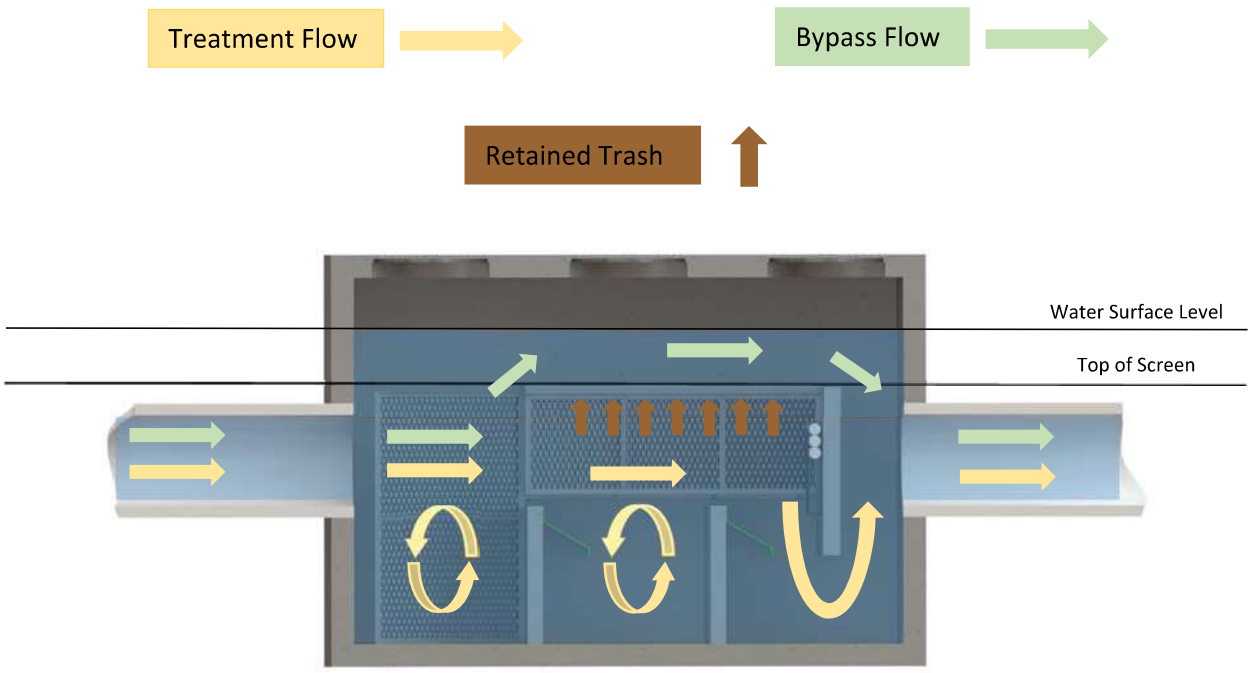


Figure 14 – Operation During Bypass

Should a storm event occur that would cause a flow in excess of the MTFR (Trash), the water surface level in the Device would rise above the top of the screen as shown in Figure 7. Under these conditions, new trash and debris entering the vault could bypass the splitter and filtration screens although treatment is still occurring. All previously removed trash is retained in the trash storage chambers and the screened lids of the trash storage chambers prevent the trash from being re-entrained into these bypass flows.

4.0 INSTALLATION INFORMATION

4.A. Device installation procedures and considerations; and

Installation requirements and procedures are detailed in the DSBB *Installation Guidelines for Vault Systems* which has been included in Appendix C of this submittal. The guidelines include requirements and procedures for:

- Delivery & Unloading/Lifting
- Inspection
- Site preparation
- Installation
- Installation Details
- Connection Details

In general terms, installation of the DSBB is similar to installation of precast utility and storm drain structures. The components unique to the DSBB that make it full capture capable and that provide other pollutant removal capabilities are housed internally in the DSBB vault. These internal components are pre-installed at the factory or are sometimes post-installed on site by the manufacturer. No Contractor or Owner installation of these components is required.

Post installation inspection of the DSBB is strongly advised. A representative from Bio Clean® is available for on-site inspection as support for the Owner. Inspection should determine if the DSBB was installed properly as well as provided in a clean condition with no defects as a result of the installation.

Installation for Trash Capture in association with Full Capture programs, Trash TMDLs, or the Statewide Trash Amendment are often retrofit type installations. Care should be taken to determine existing and as-built conditions to determine if the DSBB must be supplied in a unique configuration to meet the retrofit conditions. Consideration must be given to any unique configurations for flow, treatment, and installation.

4.B. Methods for diagnosing and correcting installation errors.

Bio Clean® has a process for design and manufacturer that includes checks and balances to minimize and eliminate errors in the design and manufacturing processes for the DSBB systems. This process involves a formal submittal and review of the design and fabrication details for each unit. The Owner has and should take this opportunity to review the proposed Device prior to installation. This process helps to reduce or eliminate errors during installation. In the event an installation error does occur, the error should be documented and reviewed with Bio Clean® and the Contractor immediately upon determination of the error.

Appendix C contains the DSBB *Installation Guidelines for Vault Systems* which contains an Installation checklist. This checklist includes key criteria for determination of proper installation. This checklist should be reviewed in its entirety at the completion of the installation and kept as documentation of proper installation. If during the checklist review an error is determined, the documented error should be reported to Bio Clean® as well as the Owner and Engineer. The checklist includes key criteria such as:

- Inlet/Outlet Pipe Size
- Inlet/Outlet Pipe Diameter
- Inlet/Outlet Pipe Material
- Inlet/Outlet Pipe Elevations
- RIM Elevation
- Bedding Elevation
- Screen Elevation
- Bedding and Backfill Type and Compaction
- Concrete Vault Sections Properly Sealed
- Concrete Condition
- Internal Component Condition
- Vault Protected from Construction Runoff

Additionally the DSBB can be inspected after commencement of operation to determine proper operation.

5.0 OPERATION AND MAINTENANCE INFORMATION

5.A. Device inspection procedures and inspection frequency considerations;

The DSBB *Operation and Maintenance Manual* is included with this submittal as Appendix D. This manual includes detailed requirements and recommendations for operation and maintenance of the DSBB when used as a Full Capture Trash Treatment Control Device. A summary of the requirements and recommendations are listed below:

Maintenance Summary

- Clean trash storage chambers. Typical service interval occurs once every 12 months (≈ 60 minute service time).
- Clean sedimentation chambers. Typical service interval occurs once every 12 months (≈ 60 minute service time).
- Replace hydrocarbon media booms. Typical replacement occurs once every 12 months (≈ 5 minute service time).

Notes:

- Maintenance cycles are dependent on site-specific pollutant loading.
- Maintenance operations should be planned to occur just prior to start of the rainy season and at the termination of the rainy season for the most effective system operation.

Inspection Procedures

- Following the installation of a Debris Separating Baffle Box, the unit will require periodic and scheduled maintenance. Bio Clean® or a Bio Clean® approved contractor can provide inspection and maintenance services.

- The Debris Separating Baffle Box is a multi-stage, self-contained treatment train. Each stage protects subsequent stages from clogging. These stages include: screening, sedimentation and absorption.

    - The splitter screen, filtration screens, and the trash storage chambers provide the screening mechanism for gross pollutants. The trash storage chambers provide a combined storage capacity from three cubic feet to almost 14 cubic yards of trash depending on the DSBB model utilized. The trash storage chambers capture gross pollutants such as trash and debris along with coarse sediment. Bio Clean® recommends inspection of the splitter screen and trash storage chambers every six months. Additionally, Bio Clean® recommends

cleaning of the splitter screen and trash storage chambers every 12 months or as site pollutant loading dictates. The trash and debris can be removed manually or by use of a standard vacuum truck.

- The three, inline, sedimentation chambers of the DSBB provide the sedimentation mechanism for pollutant removal. The chambers provide a combined storage capacity from one half cubic yard to over 30 cubic yards depending on the DSBB model utilized. The sedimentation removal process enables removal of coarse and fine sediment, particulate metals, and particulate bound nutrients. Bio Clean® recommends inspection of the sedimentation chambers every six months. Additionally, Bio Clean® recommends cleaning of sedimentation chambers every 12 months or as site pollutant loading dictates. The sediment and associated pollutants can be removed manually or by use of a standard vacuum truck.

- The oil skimmer and hydrocarbon booms remove hydrocarbons, oil and grease via absorption. The oil skimmer is a permanent structure and requires little to no maintenance. The hydrocarbon booms are a consumable treatment mechanism and require inspection and maintenance. Bio Clean® recommends inspection of the hydrocarbon booms every six months. Additionally, Bio Clean® recommends replacement of the hydrocarbon booms every 12 months or as pollutant loading dictates. Hydrocarbon booms can be visually inspected without entering the vault to determine if replacement is necessary.

5.B. Maintenance procedures, including a description of necessary equipment and materials;

A full description of the maintenance procedures can be located in the DSBB *Operation and Maintenance Manual* included with this submittal as Appendix D. A summary of the key components of the procedures is listed below:

Maintenance Procedures

Splitter Screen and Trash Storage Chamber Maintenance Procedures
Bio Clean® recommends inspection of the inlet screen and trash containment compartments every six months. Additionally, Bio Clean® recommends cleaning of the inlet trash screen and trash containment compartments every 12 months or as site pollutant loading dictates.

- Remove all manhole covers (or open hatches) to gain access to the splitter screen and trash storage chambers.
- Open the screened lids to the trash storage chambers. (On some models, the lids may be optional.)
- Remove all trash, debris, organics, and sediments captured by the screening basket. Removal of the trash and debris can be done manually or with the use of a vacuum truck.

The hose of the vacuum truck will not damage the screen of the filter. A pressure washer may be needed to remove debris stuck to the screening material.

- Remove vacuum hose, close the trash storage chamber lids and replace manhole covers or close hatch doors.
- Where possible the maintenance should be performed from the ground surface.
- Entry into an underground stormwater vault such as a DSBB treatment vault requires Confined Space Entry Training and Certification.
- Transport all debris, trash, organics and sediments to an approved facility for disposal in accordance with local and state requirements.

Sedimentation Chambers Maintenance Procedures

Bio Clean® recommends inspection of the sedimentation chambers every six months. Additionally, Bio Clean® recommends cleaning of sedimentation chambers every 12 months or as site pollutant loading dictates.

- Remove all manhole covers (or open hatches) to gain access to the sedimentation chambers.
- The splitter screen and trash storage chambers should be cleaned prior to cleaning the sedimentation chambers. Access to the sedimentation chambers is unimpeded in the middle of the vault.
- Use a vacuum truck hose and insert into the manhole or hatch opening. Lower the vacuum hose between the screens and into the first of the three sedimentation chambers, closest to the inlet pipe. Begin vacuuming out accumulated sediment and standing water until the chamber is empty. A pressure washer may be needed to assist with removing sediment that is compacted or stuck to the walls and floor of the sedimentation chamber.
- Repeat the above process in all three sedimentation chambers.
- Once all three sedimentation chambers are cleaned, remove the vacuum hose and lower hinged panels of the trash containment compartments back to a horizontal position.
- Remove vacuum hose and replace manhole covers or close hatch doors.
- Where possible the maintenance should be performed from the ground surface.
- Entry into an underground stormwater vault such as a DSBB treatment vault requires Confined Space Entry Training and Certification.
- Transport all debris, trash, organics and sediments to an approved facility for disposal in accordance with local and state requirements.

Hydrocarbon Boom Maintenance Procedures

Bio Clean® recommends inspection of the hydrocarbon booms every six months. Additionally, Bio Clean® recommends replacement of the hydrocarbon booms every 12 months or as pollutant loading dictates.

- Remove manhole cover (or open hatch) closest to the outflow end of the system to gain access to the hydrocarbon boom cage.
- Enter the manhole closest to the outlet pipe. Always use appropriate safety gear and procedures and follow local regulations.

- On the influent side of the weir is a small media cage containing hydrocarbon booms. Open the top of the cage. Remove the old hydrocarbon booms and replace with new hydrocarbon booms. Close the top (If the boom is filled with hydrocarbons and oils it should be replaced).
- Exit the vault.
- Entry into an underground stormwater vault such as a DSBB treatment vault requires Confined Space Entry Training and Certification.
- Transport all debris, trash, organics and sediments to an approved facility for disposal in accordance with local and state requirements.

Record Keeping Maintenance Procedures

- Following maintenance and/or inspection, the maintenance operator shall prepare a maintenance/inspection record. The record shall include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanism.
- The Owner shall retain the maintenance/inspection record for a minimum of five years from the date of maintenance. These records shall be made available to the governing municipality for inspection upon request at any time.

Maintenance Equipment and Materials

The following equipment is helpful when conducting DSBB inspections and maintenance:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)
- Confined space entry equipment (if necessary)
- Vacuum truck
- Pressure washer
- Replacement absorbent booms

5.C. Maintenance frequency considerations, including effects of delay; and

Standardized maintenance frequencies that are suitable for most sites are detailed in Section 5.A. and 5.B. Maintenance frequency however is very site specific depending on pollutant loading. Records from inspections and prior maintenances should be periodically reviewed to assess the appropriateness of the prescribed maintenance frequency.

Delayed or deferred maintenance can cause diminished pollutant removal, re-entrainment of pollutants, in vault and upstream hydraulic impacts, and impacts to water quality.

5.D. Device maintenance and vector control accessibility.

As with many storm water treatment Devices the DSBB requires a permanent pool of water to facilitate removal of pollutants. The DSBB has three unique sediment chambers that create a treatment train for advanced pollutant removal and these three chambers act as individual permanent pools of water. While this standing water has the potential to attract and facilitate Mosquito/Vector breeding, Bio Clean® designed the DSBB to minimize this potential. Additionally, in the event that Mosquito/Vector access occurs Bio Clean® designed the DSBB with access that facilitates access for inspection and treatment for Vector/Mosquito.

All DSBB Devices are designed to have one or more manhole covers or access hatches located directly above each individual sediment chamber so that direct access is provided to each sediment chamber. Figure 15 illustrates the direct relationship between access and sediment chambers. When the access cover or hatch is opened there is a direct line of sight provided to each sediment chambers and the standing water in the chamber. Liquid or solid material can be placed directly into the chambers for Mosquito/Vector control with no obstructions.

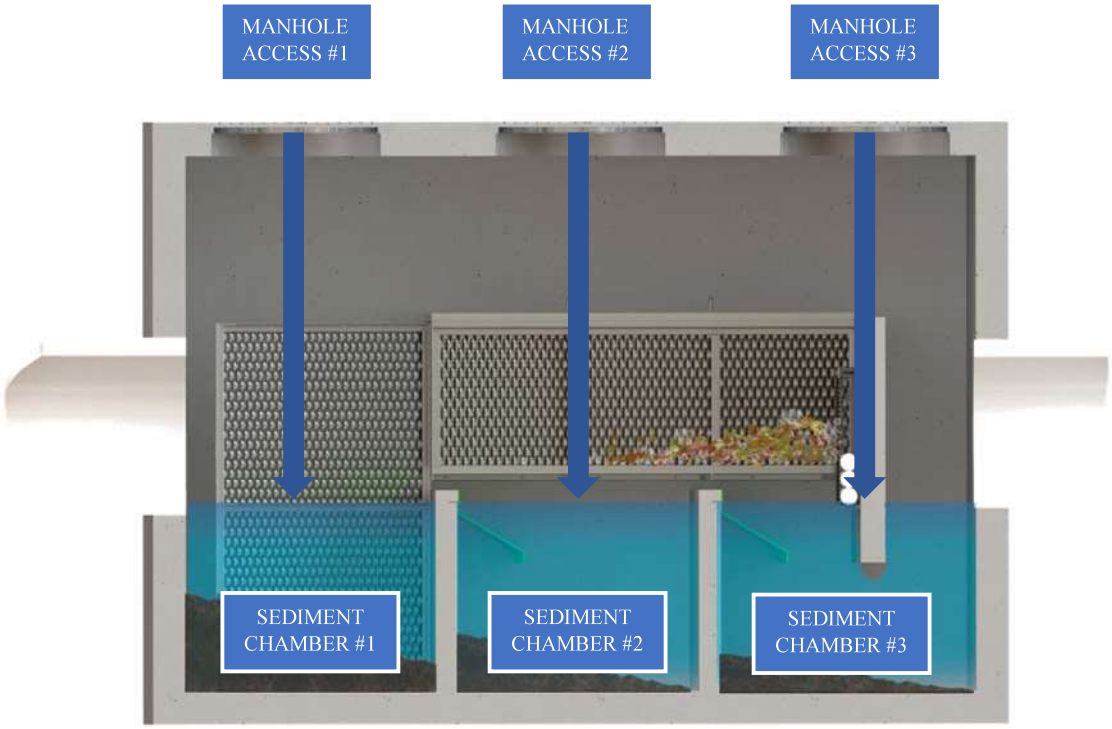


Figure 15 - Cross Section View of DSBB Showing Sediment Chambers in Relation to Access

Figure 16 further illustrates the accessibility of the sediment chambers. In this detail, the DSBB is shown with vacuum truck suction nozzles inserted into each sediment chamber. The vacuum truck suction nozzles have a minimum diameter of 8-inches. The DSBB is designed to allow the vacuum suction nozzle to be inserted unrestricted to the bottom of the sediment chamber for easy

removal of the accumulated sediment. With such access provided for the vacuum suction nozzle it is clear that access for Mosquito/Vector control is more than adequate.

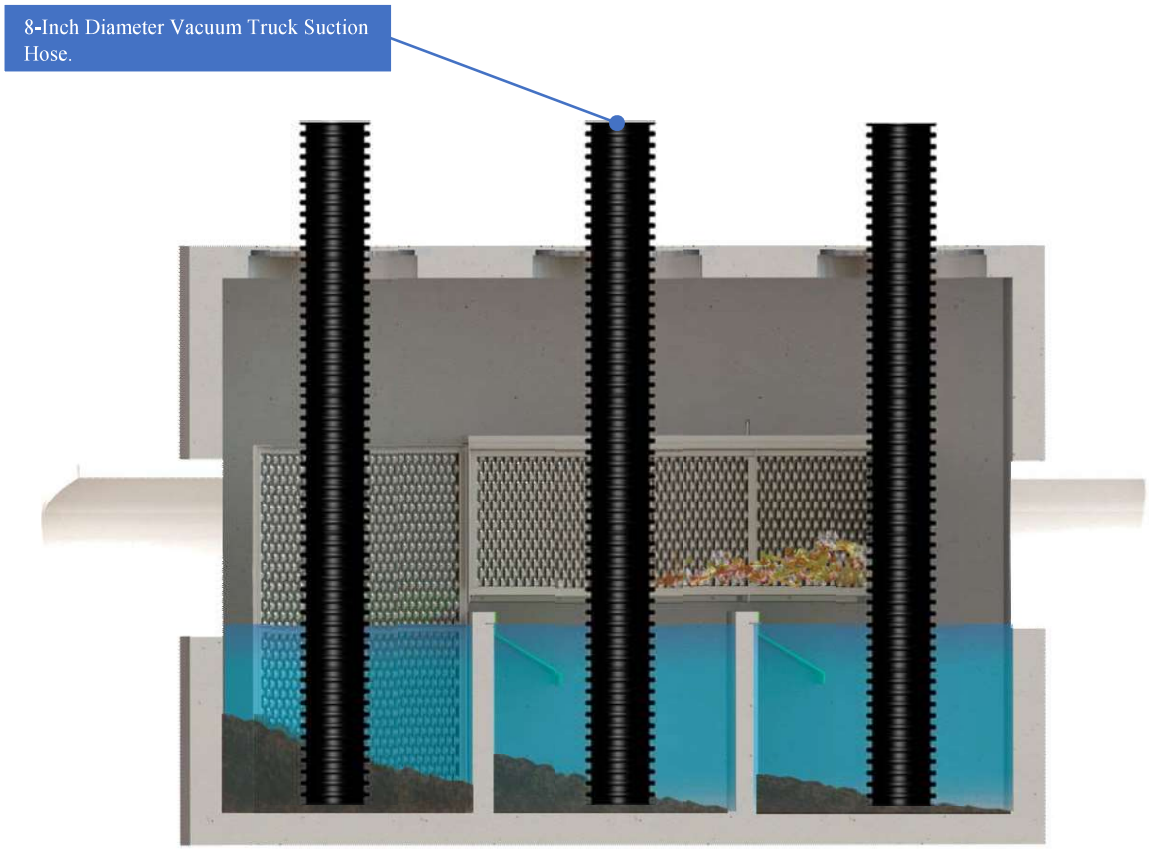


Figure 16 - Cross Section View of DSBB Showing Direct Access to Each Sump

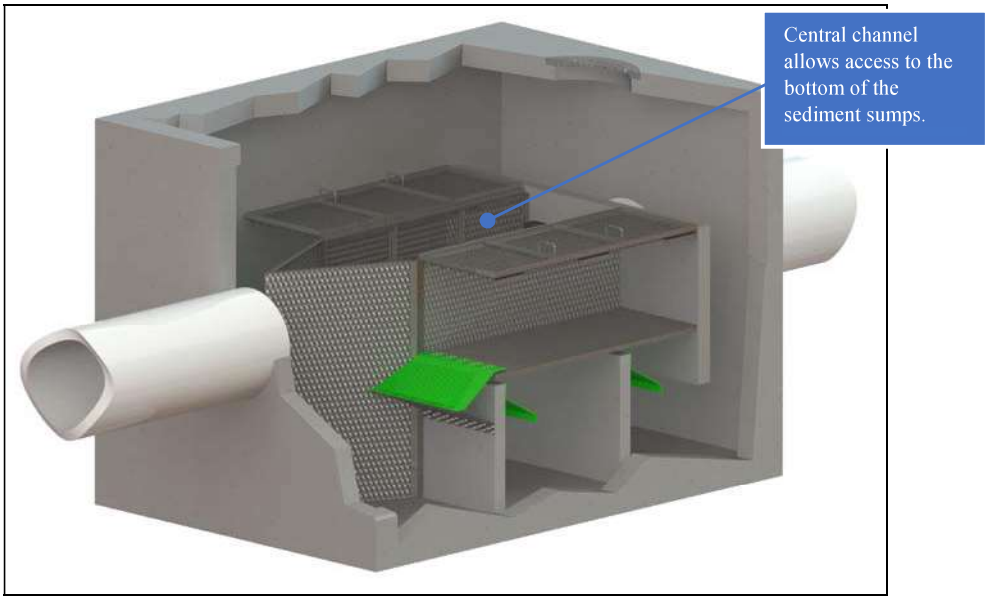


Figure 17 - Isometric View of DSBB Showing Central Access Maintenance Channel

Figure 18 - Installation of DSBB Showing Central Access Maintenance Channel

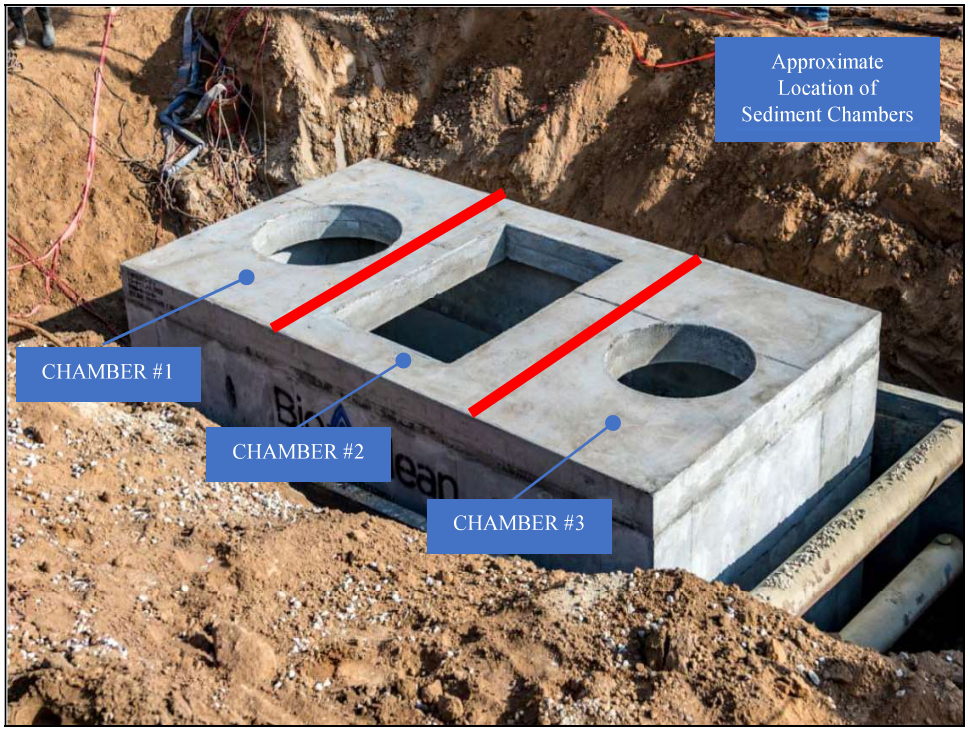


Figure 19 - Installation of DSBB Showing Access Points Relative to Sediment Chamber

The DSBB also contains design features that prevent mosquito and vector access. All manhole covers and access hatches are supplied with gasketed lids that seal the DSBB from mosquito and vector access. See Figure 20. Additionally, the manhole covers are designed with closed pick points. The pick point is a depression or hole in the cover for a tool to be inserted to help remove the cover. In many cases, the pick point is an open hole. For the DSBB the pick point is a depressed slot that serves the same function but does not allow an open hole and access into the vault. Mosquito and Vector are prevented from entering and escaping through the access points of the DSBB.

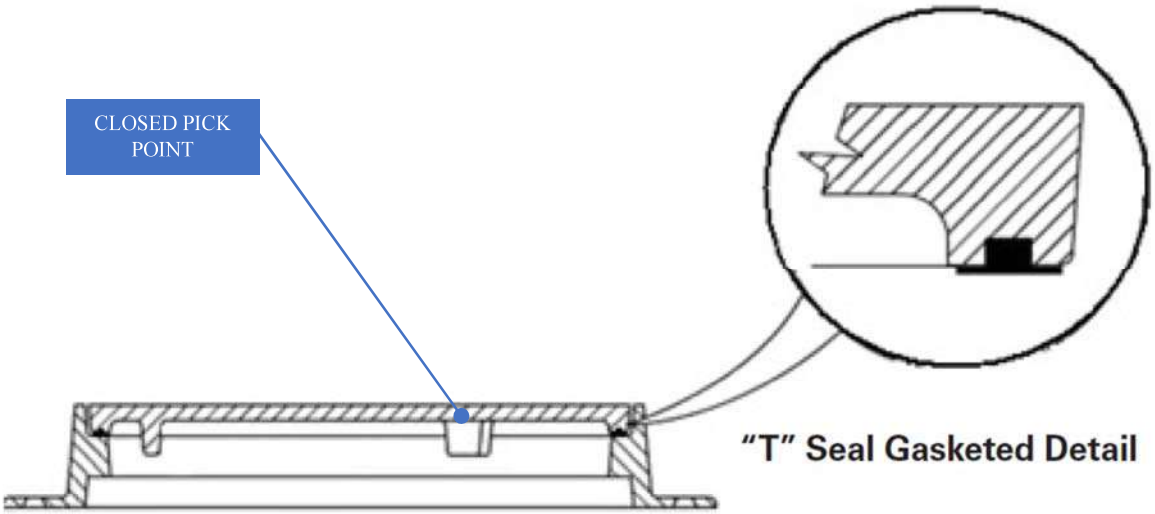


Figure 20 - Manhole Access Frame and Cover with Gasket and Sealed Pick Point

The influent and effluent pipes and connections, although below ground and often times long distances from daylight, can be access points for Mosquito and Vector. These influent and effluent pipes must remain open while the DSBB is in service. As such, these locations can be access points for Mosquito and Vector. Flap gates, pinch valves, and collapsible tubes have been used with some success in a variety of applications to prevent Mosquito and Vector access. The local Mosquito and Vector control agency should be contacted to determine which if any exclusion type device can be utilized in their District. In addition to exclusion devices, water agitators have been used with success to prevent Mosquito from breeding. The local Mosquito District should be contacted to determine if water agitators can be used in lieu of exclusion devices.

6.0 RELIABILITY INFORMATION

6.A. Device sensitivity to loadings other than trash (i.e., leaves, sediment);

The DSBB is designed to treat a variety of pollutants including sediment, heavy metals, nutrients, and trash and debris. The presence of other pollutant loadings than trash have no effect

on the trash capture performance of the Device. The DSBB operates as a treatment train and the removal mechanisms are independent of one another. In addition, the DSBB maintains the captured trash in separate containment compartments that remain elevated above the sedimentation chambers allowing continued operation of both treatment mechanisms with no impact to the other.

6.B. Warranty Information; and

Bio Clean provides a one year limited warranty for the DSBB Device per the conditions listed in the warrant document included in the submittal in Appendix E.

6.C. Applicant's customer support.

Bio Clean® is a California based company and has three facilities to provide Customer Support within the State.

Bio Clean® Corporate Office
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Office Fax: (760) 433-3176
info@BioCleanEnvironmental.com
Maintenance@BioCleanEnvironmental.com

7.0 FIELD/LAB TESTING INFORMATION AND ANALYSIS

Bio Clean® conducted laboratory testing on the proprietary non-blocking screen material utilized in the DSBB. Bio Clean® conducted this testing to empirically determine the unique properties of the screen including the Effective Open Area (EOA), the Coefficient of Discharge (C_d), and the flow capacity and characteristics. The results of the testing provided a clear relationship between discharge (Q) and head (h) acting on the screen. The results of the testing have been incorporated into the design of the DSBB to determine both the treatment and peak flow rates for the DSBB.

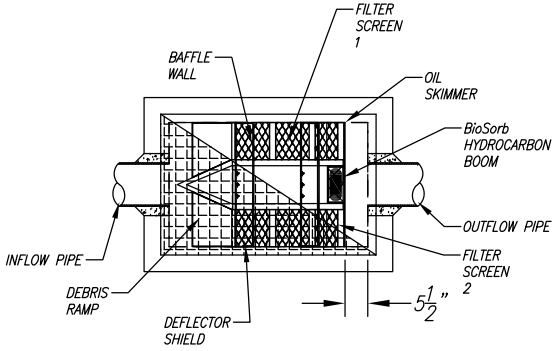
The test report has been included in this Application in Appendix F for review by the SWRCB and interested parties.

APPENDIX A

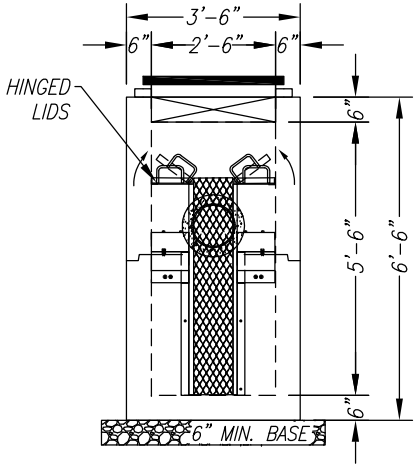
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			10"
OUTLET PIPE			10"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(1) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	10.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	3.28
SEDIMENT STORAGE CAPACITY (CF)	32.18
80% TSS REMOVAL @ --- MICRON	

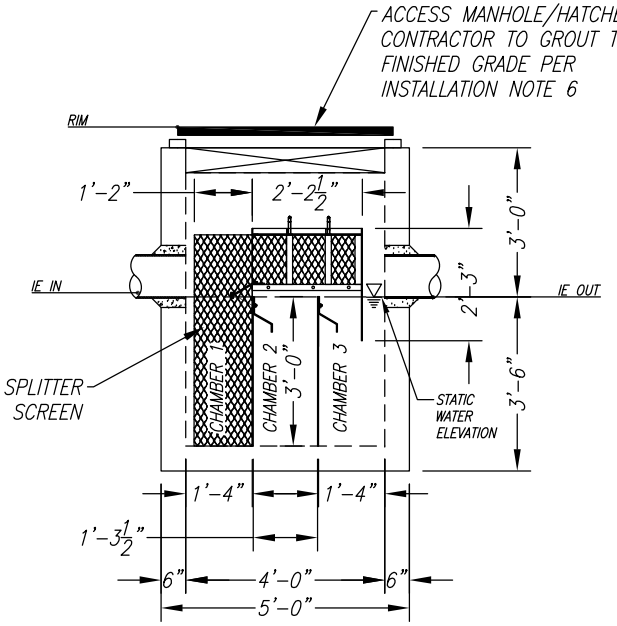
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	2.19	0.75	1.00	1.64
SCREEN 2	2.19	0.75	1.00	1.64
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	1.50	2.50	3.00	11.25
CHAMBER 2	1.29	2.50	3.00	9.68
CHAMBER 3	1.50	2.50	3.00	11.25



PLAN VIEW



END VIEW



ELEVATION VIEW

GENERAL NOTES

1. BIOCLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE NSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
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3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

Bio Clean
A Forterra Company

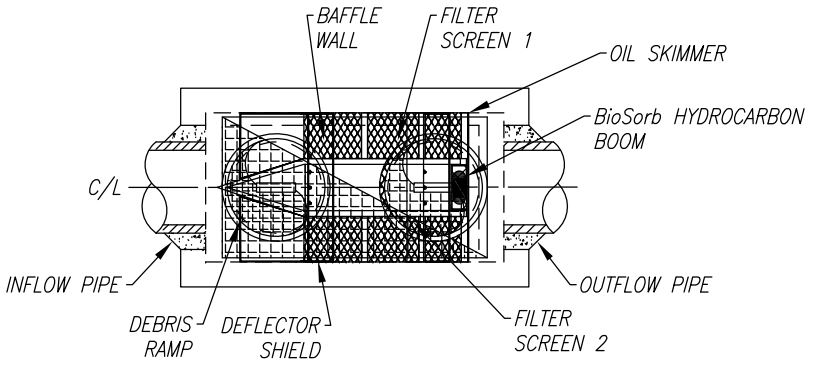
DSBB-2.5-4-66
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MPEARSON

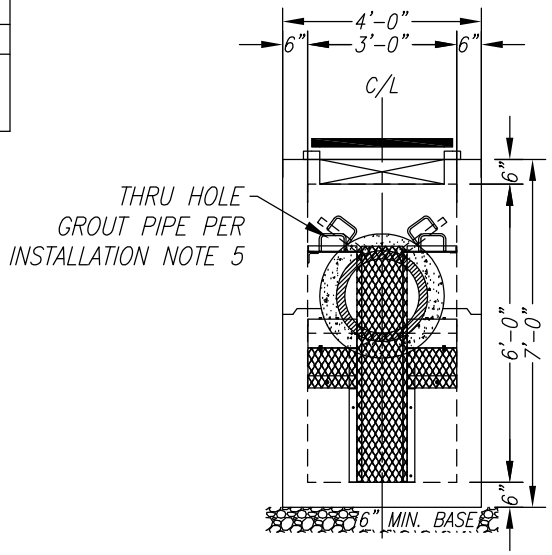
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			18"
OUTLET PIPE			18"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(2) ø22"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	18.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	9.03
SEDIMENT STORAGE CAPACITY (CF)	53.64
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	3.27	0.92	1.50	4.51
SCREEN 2	3.27	0.92	1.50	4.51
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	2.00	3.00	3.00	18.00
CHAMBER 2	1.92	3.00	3.00	17.28
CHAMBER 3	2.04	3.00	3.00	18.36



PLAN VIEW



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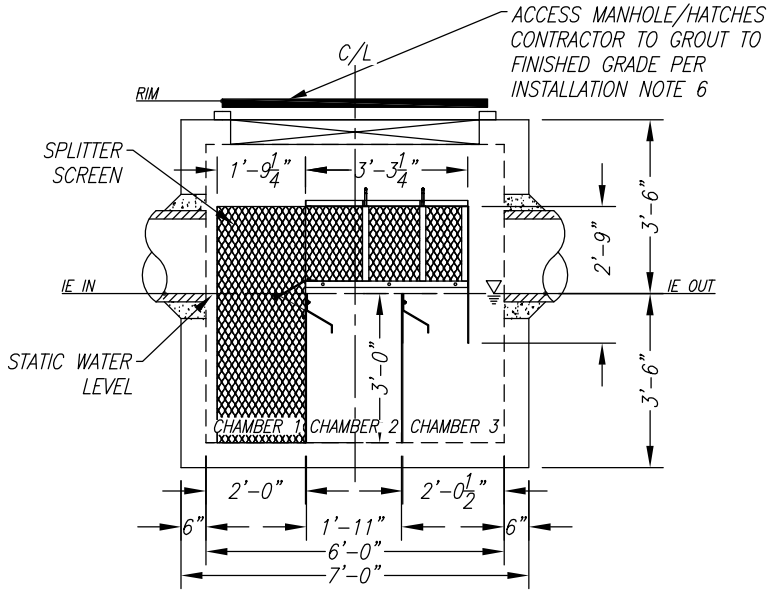

ELEVATION VIEW

GENERAL NOTES

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3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

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Bio Clean
A Forterra Company

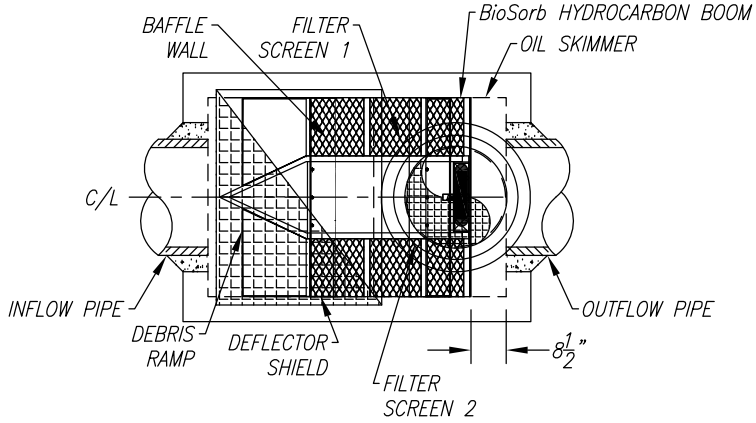
DSBB-3-6-72
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MPEARSON

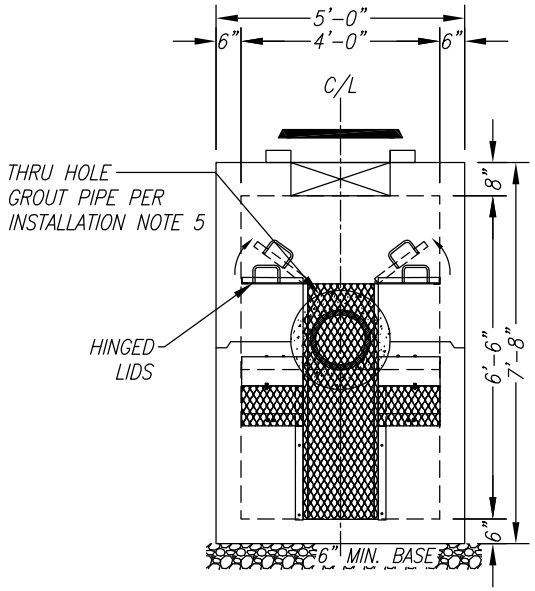
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			12"
OUTLET PIPE			12"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(2) ø24"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	24.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	12.26
SEDIMENT STORAGE CAPACITY (CF)	71.52
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	3.27	1.25	1.50	6.13
SCREEN 2	3.27	1.25	1.50	6.13
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	2.00	4.00	3.00	24.00
CHAMBER 2	1.92	4.00	3.00	23.04
CHAMBER 3	2.04	4.00	3.00	24.48



PLAN VIEW



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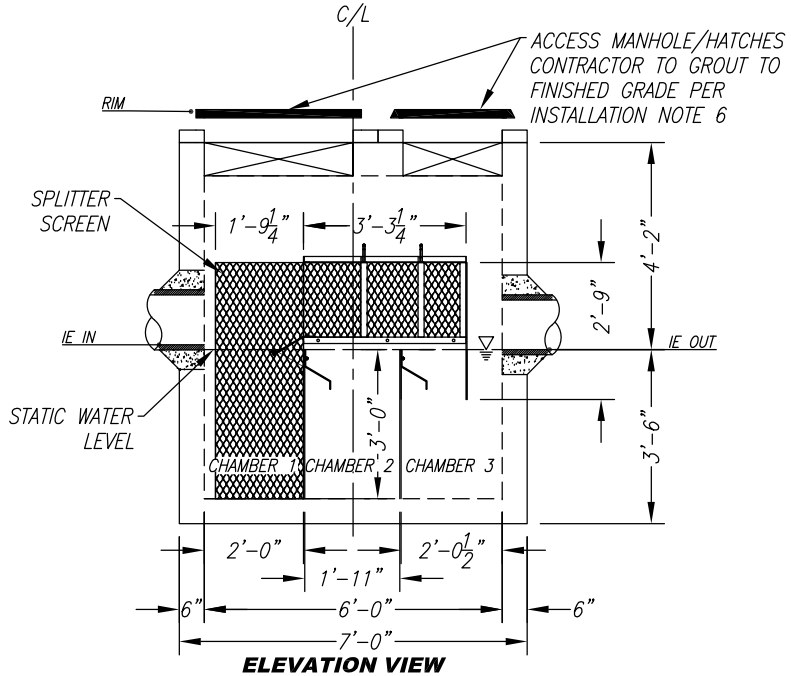

ELEVATION VIEW

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Bio Clean
A Forterra Company

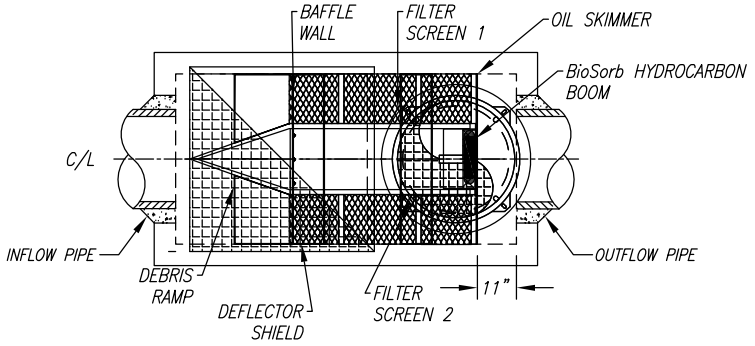
DSBB-4-6-78
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MPEARSON

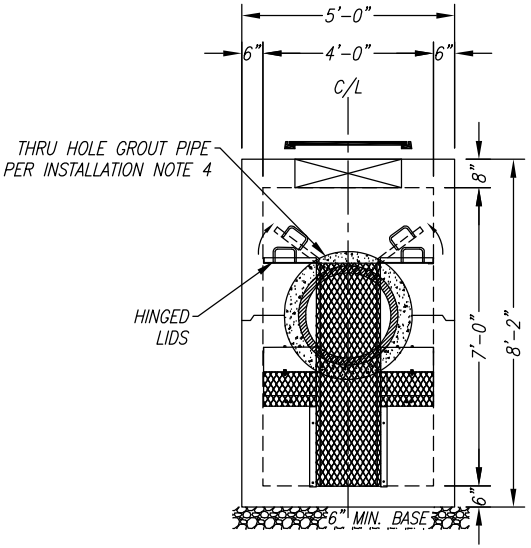
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(2) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	32.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	22.00
SEDIMENT STORAGE CAPACITY (CF)	96.60
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	4.40	1.25	2.00	11.00
SCREEN 2	4.40	1.25	2.00	11.00
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	2.67	4.00	3.00	32.04
CHAMBER 2	2.58	4.00	3.00	32.04
CHAMBER 3	2.71	4.00	3.00	32.52



PLAN VIEW



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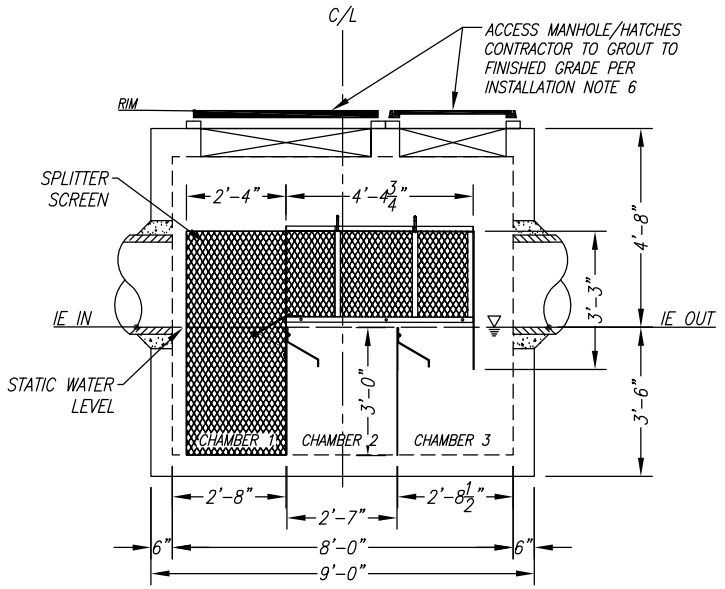

ELEVATION VIEW

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Bio Clean
A Forterra Company

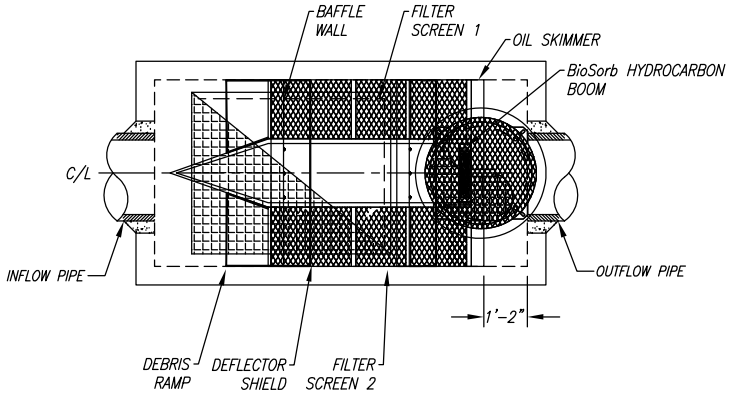
DSBB-4-8-84
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MPEARSON

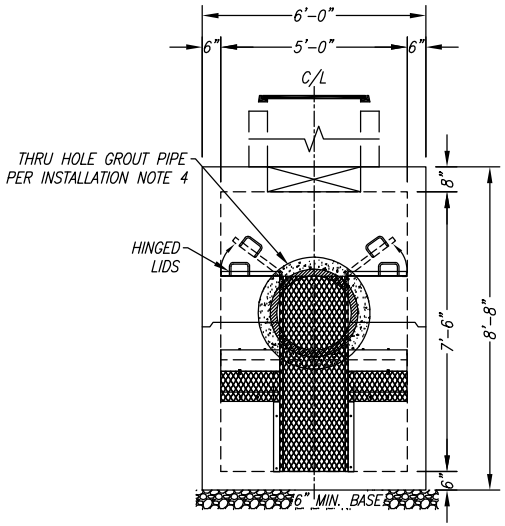
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(3) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	50.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	34.00
SEDIMENT STORAGE CAPACITY (CF)	140.10
80% TSS REMOVAL @ --- MICRON	

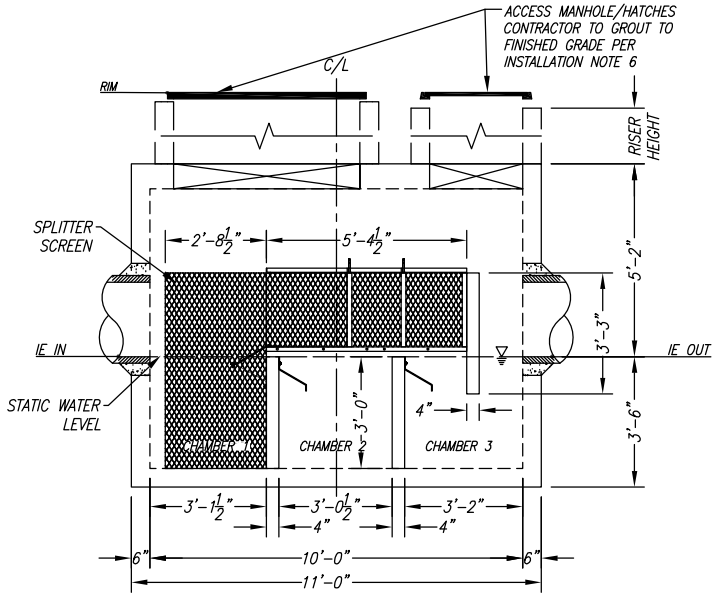
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	5.38	1.58	2.00	17.00
SCREEN 2	5.38	1.58	2.00	17.00
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	3.13	5.00	3.00	46.95
CHAMBER 2	3.04	5.00	3.00	45.60
CHAMBER 3	3.17	5.00	3.00	47.55



PLAN VIEW



END VIEW



ELEVATION VIEW

GENERAL NOTES

1. BIOCLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE NSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
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3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

10/24/17MEPARSON

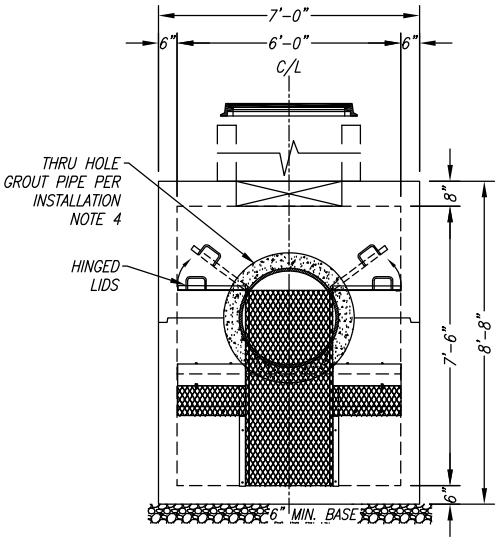
Bio Clean
A Forterra Company

DSBB-5-10-90
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

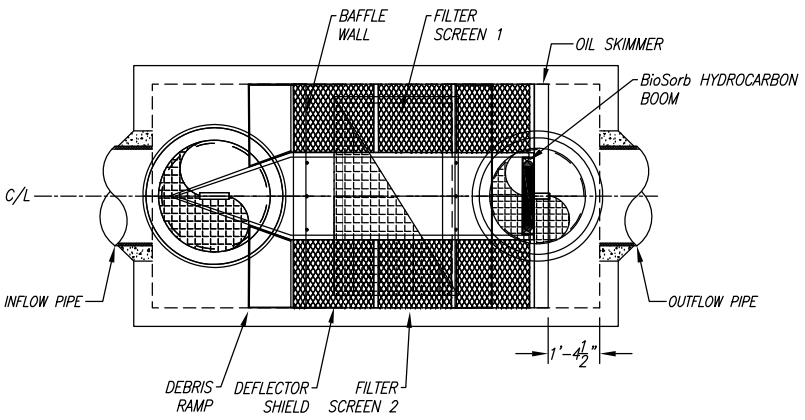
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			30"
OUTLET PIPE			30"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(3) ø36"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	72.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	47.29
SEDIMENT STORAGE CAPACITY (CF)	203.94
80% TSS REMOVAL @ --- MICRON	

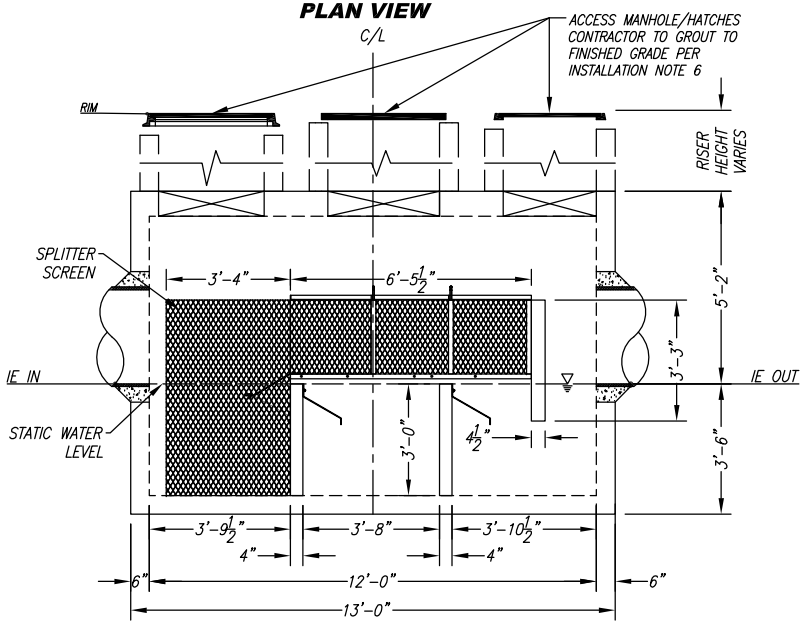
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	6.46	1.83	2.00	23.64
SCREEN 2	6.46	1.83	2.00	23.64
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	3.79	6.00	3.00	68.22
CHAMBER 2	3.67	6.00	3.00	66.06
CHAMBER 3	3.87	6.00	3.00	69.66



END VIEW



PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

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2. MANUFACTURER RECOMMENDS A 6"–12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
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5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

Bio Clean
A Forterra Company

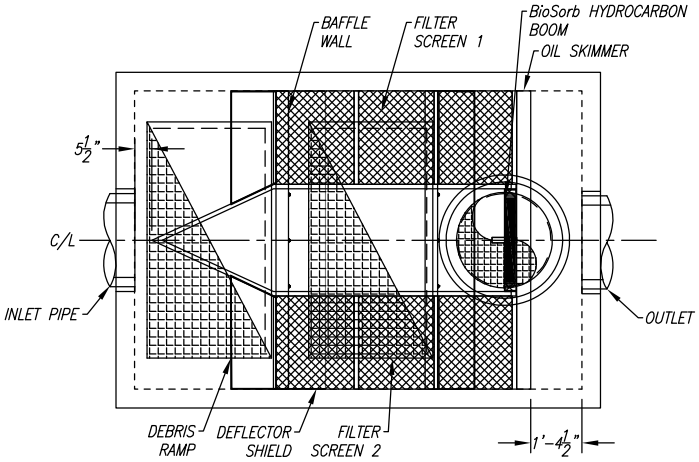
DSBB-6-12-90
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MEPARSON

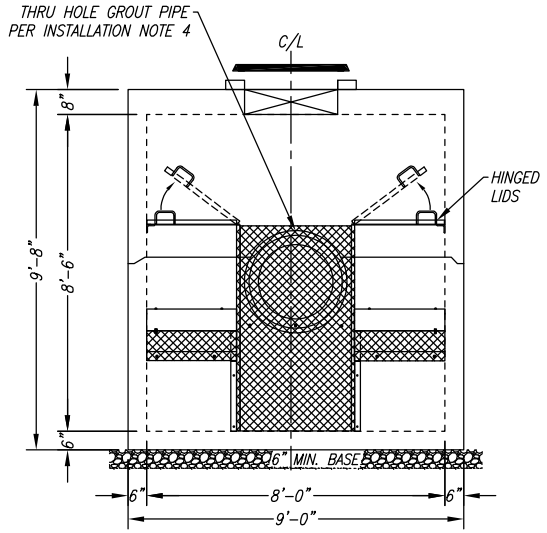
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(2) ø24" & (2) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	96.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	71.53
SEDIMENT STORAGE CAPACITY (CF)	274.80
80% TSS REMOVAL @ --- MICRON	

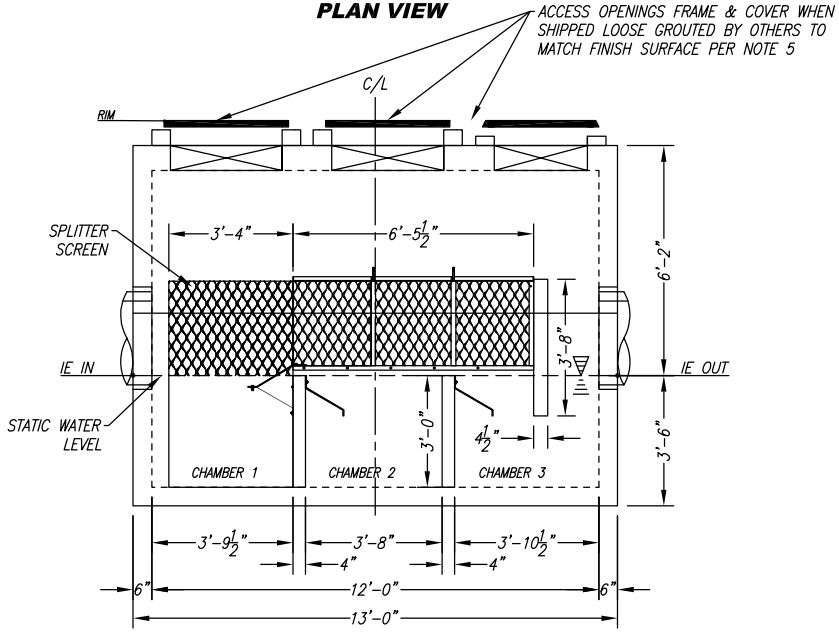
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	2.50	6.33	2.26	35.76
SCREEN 2	2.50	6.33	2.26	35.76
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	3.79	8.00	3.00	90.96
CHAMBER 2	3.67	8.00	3.00	90.96
CHAMBER 3	3.87	8.00	3.00	92.88



PLAN VIEW



END VIEW



ELEVATION VIEW

GENERAL NOTES

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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

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5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

10/24/17MPEARSON

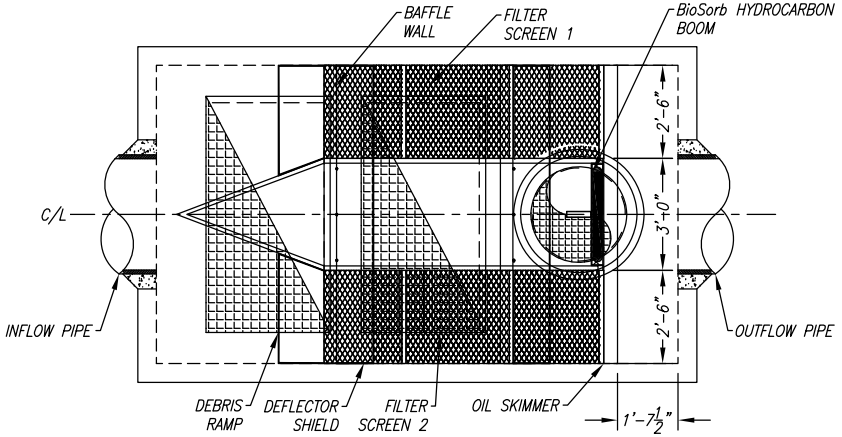
Bio Clean
A Forterra Company

DSBB-8-12-102
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

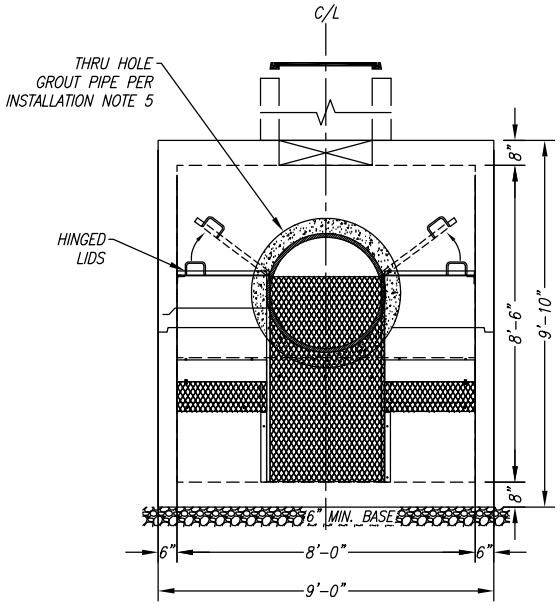
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(2) ø24" & (2) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	96.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	84.38
SEDIMENT STORAGE CAPACITY (CF)	324.00
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	7.50	2.50	2.25	42.19
SCREEN 2	7.50	2.50	2.25	42.19
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	4.50	8.00	3.00	108.00
CHAMBER 2	4.42	8.00	3.00	108.00
CHAMBER 3	4.50	8.00	3.00	108.00



PLAN VIEW



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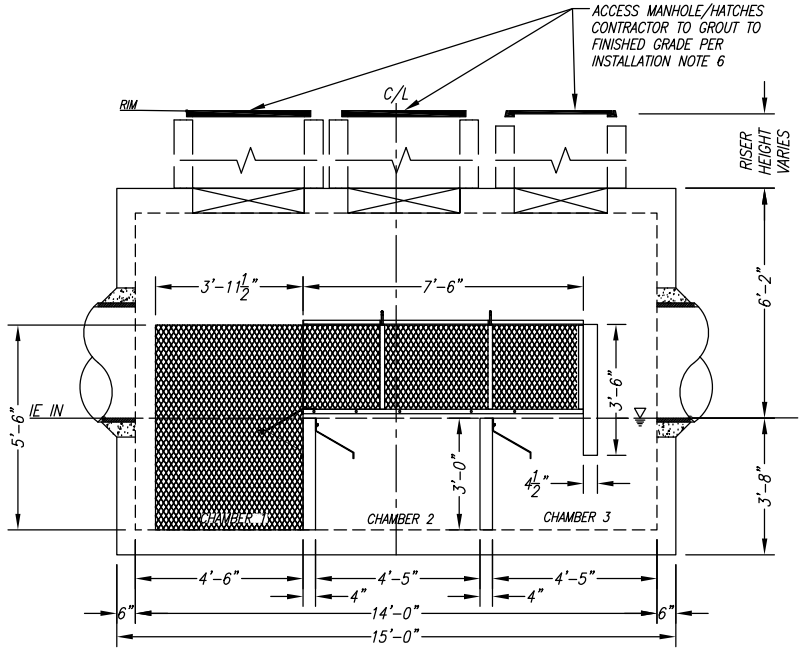

ELEVATION VIEW

GENERAL NOTES

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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
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Bio Clean
A Forterra Company

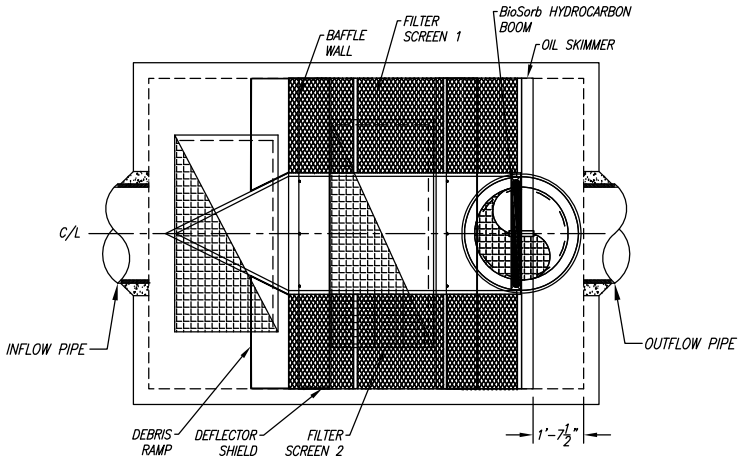
DSBB-8-14-102
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/24/17MPEARSON

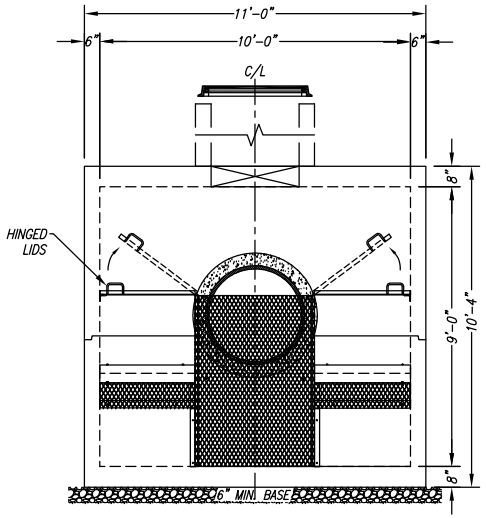
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			36"
OUTLET PIPE			36"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(3) ø36"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	140.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	106.99
SEDIMENT STORAGE CAPACITY (CF)	400.20
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	7.50	3.17	2.25	53.49
SCREEN 2	7.50	3.17	2.25	53.49
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	4.50	10.00	3.00	135.00
CHAMBER 2	4.42	10.00	3.00	132.60
CHAMBER 3	4.42	10.00	3.00	132.60



PLAN VIEW



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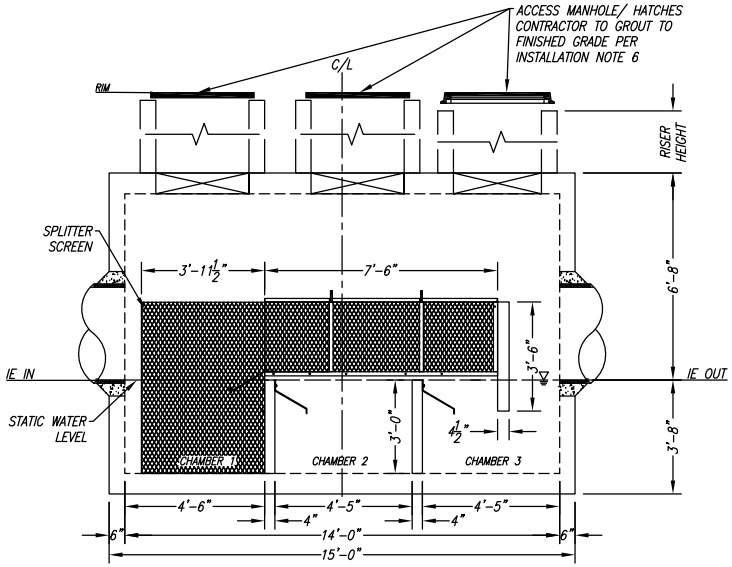

ELEVATION VIEW

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Bio Clean
A Forterra Company

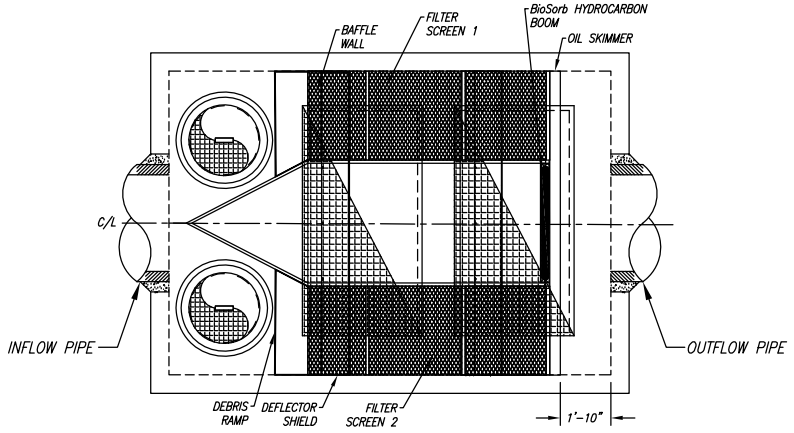
DSBB-10-14-108
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

10/12/17MPEARSON

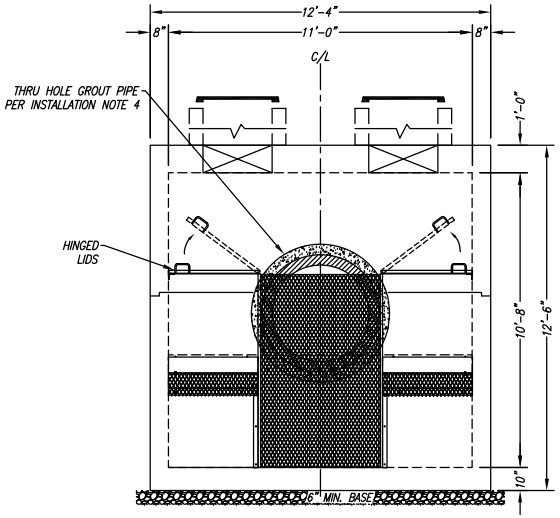
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			42"
OUTLET PIPE			42"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(3) ø36"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	176.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	160.26
SEDIMENT STORAGE CAPACITY (CF)	618.75
80% TSS REMOVAL @ --- MICRON	

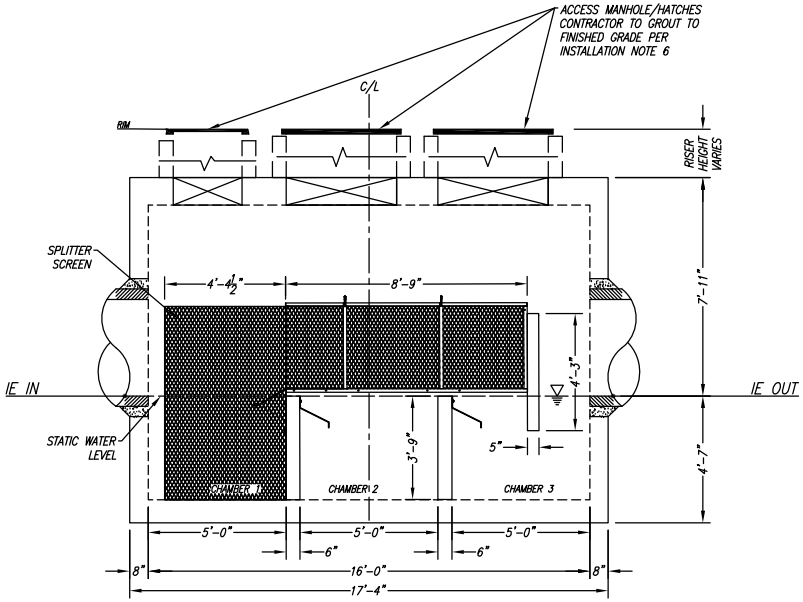
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	8.75	3.33	2.75	80.13
SCREEN 2	8.75	3.33	2.75	80.13
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	5.00	11.00	3.75	206.25
CHAMBER 2	5.00	11.00	3.75	206.25
CHAMBER 3	5.00	11.00	3.75	206.25



PLAN VIEW



END VIEW



ELEVATION VIEW

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3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE NSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"–12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.

10/24/17MEARSON

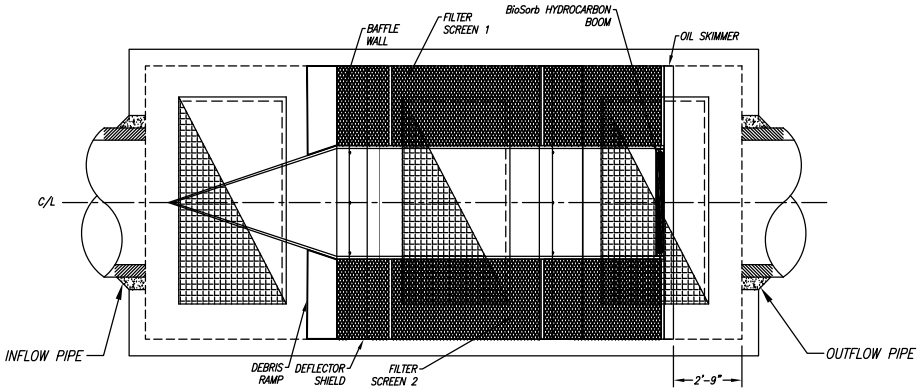
BioClean
A Forterra Company

DSBB-11-16-128
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

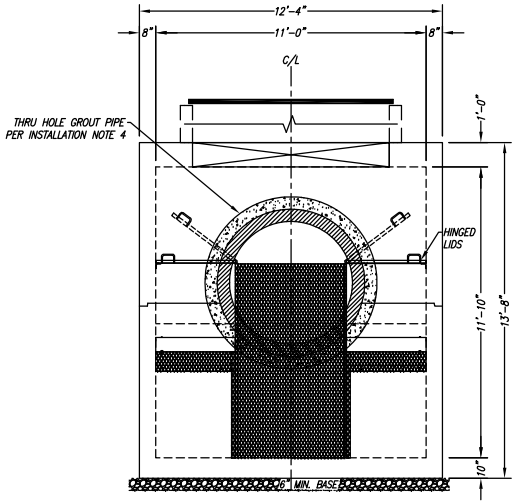
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			60"
OUTLET PIPE			60"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(3) ø36"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	264.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	263.14
SEDIMENT STORAGE CAPACITY (CF)	1139.00
80% TSS REMOVAL @ --- MICRON	

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	13.17	3.33	3.00	131.57
SCREEN 2	13.17	3.33	3.00	131.57
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	7.67	11.00	4.50	379.67
CHAMBER 2	7.67	11.00	4.50	379.67
CHAMBER 3	7.67	11.00	4.50	379.67



PLAN VIEW



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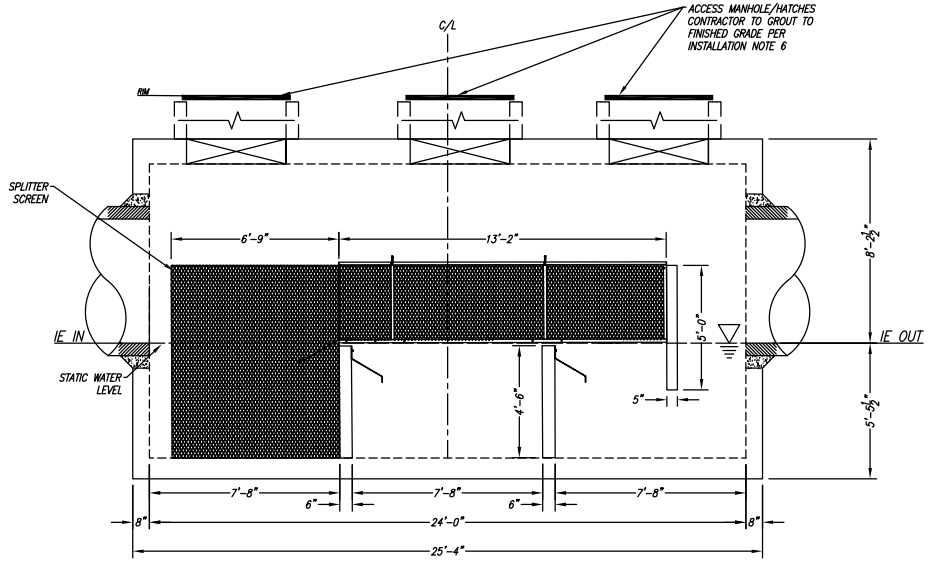

ELEVATION VIEW

GENERAL NOTES

1. BIOCLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

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10/24/17MEPARSON

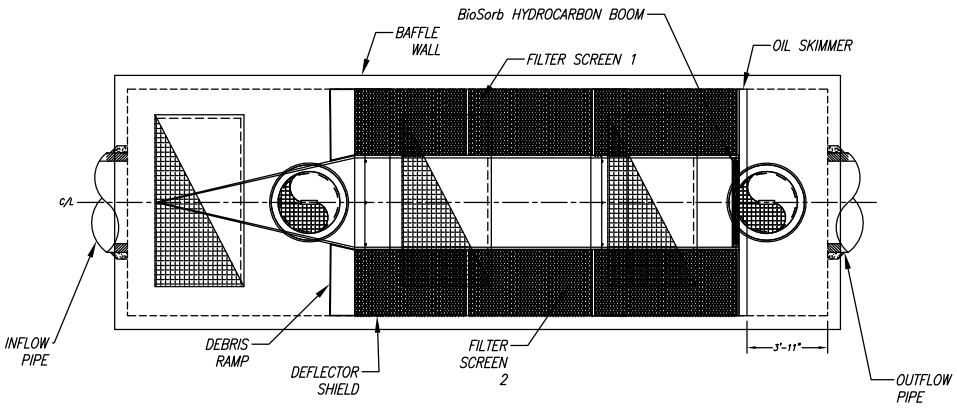
Bio Clean
A Forterra Company

DSBB-11-24-142
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

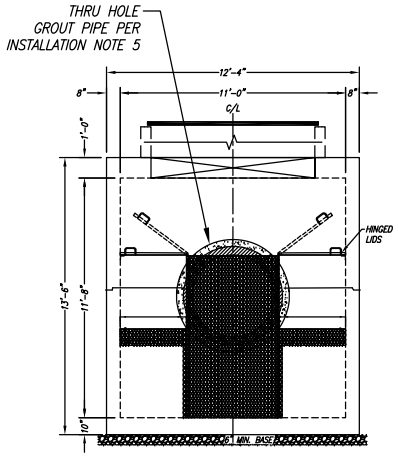
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			48"
OUTLET PIPE			48"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PARKWAY	
FRAME & COVER		(4) ø30"	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	
SETTLING AREA (SF)	374.0
LOADING RATE (GPM/SF)	####
SCREEN SYSTEM STORAGE CAPACITY (CF)	373.03
SEDIMENT STORAGE CAPACITY (CF)	1633.50
80% TSS REMOVAL @ --- MICRON	

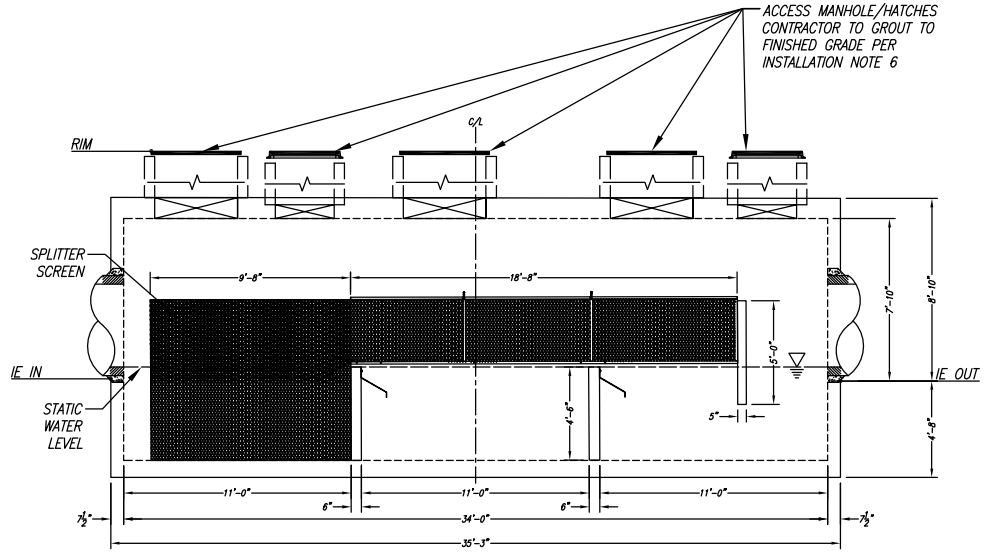
DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	18.67	3.33	3.00	186.51
SCREEN 2	18.67	3.33	3.00	186.51
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	11.00	11.00	4.50	544.50
CHAMBER 2	11.00	11.00	4.50	544.50
CHAMBER 3	11.00	11.00	4.50	544.50



PLAN VIEW



END VIEW



ELEVATION VIEW

GENERAL NOTES

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10/24/17MEPARSON

Bio Clean
A Forterra Company

DSBB-11-34-142
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

APPENDIX B

Section [_____]
Storm Water Treatment Device

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Storm Water Treatment Devices for treating storm water runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to promote understanding regarding materials, manufacture and installation; and to identify devices complying with this specification.

01.02.00 Description
Storm Water Treatment Devices (SWTD) are used for filtration of stormwater runoff including dry weather flows. The SWTD is an inline pre-engineered hydrodynamic separation system composed of multiple sediment chambers, a screening system designed to capture and store solid debris such as foliage and litter in a dry state, and a oil skimmer to remove free floating hydrocarbons.

01.03.00 Manufacturer
The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the SWTD(s) shall be a device manufactured by Bio Clean Environmental Services, Inc., or assigned distributors or licensees. Bio Clean Environmental Services, Inc. can be reached at:

Corporate Headquarters:
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.com

01.04.00 Submittals

01.04.01 Submittal drawings are to be provided with each order to the contractor and consulting engineer.

01.04.02 Submittal drawings are to detail the SWTD and all components required and the sequence for installation, including:
- System configuration with primary dimensions
- Interior components
- Any accessory equipment called out on submittal drawings

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of SWTD.

01.05.02 Manufacturer to supply components of the SWTD(s):
- Concrete structure
- Internal components

- Risers, hatches, and manholes optional

01.06.00 Reference Standards

ASTM A 615	Standard Specifications for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM F 716.07	Standard Test Methods for Sorbent Performance of Absorbents
ASTM D 3787	Standard Test Method for Bursting Strength of Textiles-Constant-Rate-of-Traverse (CRT) Ball Burst Test

PART 2 – COMPONENTS

The Storm Water Treatment Device (SWTD) and all of its components shall be self-contained within a concrete structure constructed with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60, and supports a minimum H-20 loading as indicated by AASHTO. All seams and connection points shall be sealed water tight with non-shrink grout in accordance with manufactures recommendations and project specifications.

02.01.00 Screening System

02.01.01 Screen Frame shall be constructed of 100% stainless steel. All joints and seams are to be welded or fastened together with stainless steel hardware. All sides of screen frame shall be fixed. The top section of the screen frame shall have one of the following, open top, hinged top section, or a track guided sliding top section per drawings. The bottom section of the basket frame shall be a minimum of 3" above static.

02.01.02 Screens shall be manufactured of 100% louver expanded stainless steel grade 304. The screen shall be capable of capturing and retaining 100 percent of pollutants greater than or equal to 4.7 mm regardless of specific gravity for flows up to the device's rated treatment capacity. Screens shall have openings that face opposite the flow of passing stormwater to provide continuous shielding and prevent clogging.

02.02.00 Oil Skimmer

The Oil Skimmer shall be mounted to the skimmer wall and located between the end of the screening system and the outlet pipe. Skimmer wall shall be constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60.

02.02.01 Oil Skimmer Cage shall be constructed of stainless steel frame with flattened expanded stainless steel. Housing shall have a hinged top section. Oil Skimmer Cage shall be secured to the skimmer wall with aluminum or stainless steel hardware.

02.02.02 Media Filtration Boom shall be made up of granulated oil absorbing polymers that have been tested in accordance with section 11.2 of ASTM F 716.07 and held within a netting.

- Oil absorbing polymers must be proven to absorb 180% of its weight within a 300 second contact time, and at this absorption percentage the physical increase in the size of the granules is not more that 50%.
- Netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.

- Filter netting shall be 100% polyester with a number 16 sieve size, and strength tested per ASTM D 3787.

02.03.00 Sediment Chambers

02.03.01 Baffle Walls shall be constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615, Grade 60.

02.03.02 Turbulence Deflectors shall be manufactured of 100% marine grade polyester resin and fiberglass strands or stainless steel and be mounted to the concrete baffles with stainless steel hardware. The turbulence deflectors should be sized to effectively eliminate scouring and re-suspension of previously captured sediments in the sediment removal chambers and creates a flow pattern that encourages suspended solids in influent flows to settle out and accumulate at the bottom of the SWTD.

- The all fiberglass deflectors must be coated with a polyester gel coating with ultra violet inhibitors incorporated into the coating for maximum ultra violet protection.
- Fiberglass must have a minimum thickness of 3/16".

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The SWTD is a pre-engineered inline hydrodynamic separation system composed of multiple sediment removal chambers, a screening system designed to capture and store solid debris such as foliage and litter in a dry state above the static water line, and an oil skimmer to capture oils, grease, and other hydrocarbons.

03.01.02 Removal Efficiencies - The SWTD must be capable of capturing and retaining 100% of all trash or debris equal to or greater than 4.7 mm. The SWTD shall not release material during flow events greater than the design flow rate. All removal efficiencies shall be tested in accordance with section 03.02.00.

03.01.03 Hydraulic Capacity - The SWTD shall provide a rated hydraulic capacity, which is consistent with governing water treatment regulations. The hydraulic capacity must be supported by independent third-party.

03.01.04 Storage Capacity - The SWTD must have multiple sediment removal chambers for storage of sediments and other non-floatable pollutants. The volume of each sediment removal chamber shall be called out on the submittal drawings. The SWTD must have an oil skimmer to capture hydrocarbons. The skimmer shall be equipped with storm booms per section 02.02.02. The storm boom must be capable of capturing up to 180% of its weight in oils & grease along with other emulsified and free floating hydrocarbons.

03.01.05 Pollution Separation - The SWTD must be equipped with a screening system capable of capturing and storing solid debris such as foliage and litter in a dry state above the static water line. The debris captured by the screening system must be stored a minimum of 3.5" above the static water line. The screening system must be located directly under the systems access hatch(s) to allow easy maintenance and removal of captured debris.

PART 4 - EXECUTION

04.01.00 General

The installation of the SWTD shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (SWTD) device(s) and appurtenances in accordance with the drawings and these specifications.

04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.

04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations and per governing agencies standards, prior to installation of SWTD.

04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations and per governing agencies standards, and with a minimum of 6" of gravel under all concrete structures.

04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – SWTD shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the SWTD and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The SWTD(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The SWTD shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the SWTD has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the SWTD and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the SWTD has been installed per the manufacturer's specifications and recommendations.

All components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal and replacement of the storm booms as needed. The maintenance shall be preformed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the SWTD. A Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the storm booms.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the SWTD shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURNACE

05.01.00 Warranty

The Manufacturer shall guarantee the SWTD against all manufacturing defects in materials and workmanship for a period of (1) year from the date of delivery to the _____. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The SWTD is limited to recommended application for which it was designed.

[End of This Section]

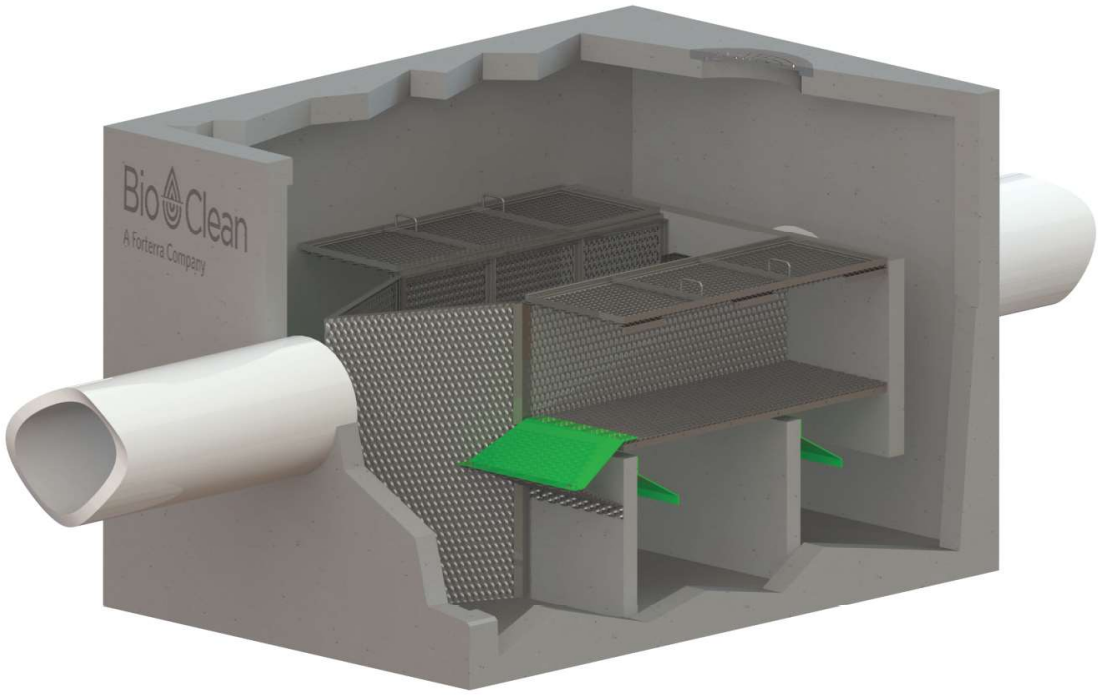
APPENDIX C

DUAL STAGE

Hydrodynamic Separator (DSBB)

Bio Clean
A Forterra Company

INSTALLATION MANUAL



Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

INSTALLATION PROCEDURES

The Debris Separating Baffle Box (DSBB), a stormwater dual-stage hydrodynamic separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. The innovative screening system directs floatable trash, debris, and organics into raised filtration screens for dry state storage which prevents septic conditions, odor, nutrient leaching and allows for easy removal. The raised filtration screens are assisted by a non-clogging inlet splitting screen which directs flows to the filtration screens while maintaining a high treatment flow rate. Its simple design allows for quick and easy installation. The system is housed in a standard precast structure and can be installed at various depths to meet site-specific conditions. Various size units are available from 2.5' x 4' up to 11' x 34'. Units are generally delivered with internals pre-installed (except for larger models) for quick installation.

Delivery & Unloading/Lifting

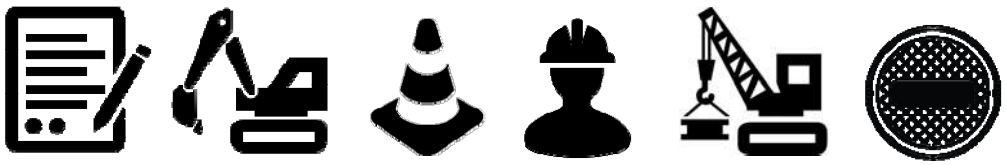
- Bio Clean Environmental Services, Inc. shall deliver the unit(s) to the site in coordination with the Contractor.
- The Contractor may be required to provide spreader bars and chains/cables to safely and securely lift the base section, risers, and top section along with suitable lifting hooks, knuckles, shackles and eyebolts.
- *Please see project specific drawings for weights and lifting details. Contact Bio Clean for additional lifting details. Internal components are pre-installed prior to delivery.*

Inspection

- Inspection of the DSBB and all parts contained in or shipped outside of the unit shall be inspected at time of delivery by the site Engineer/Inspector and the Contractor. Any non-conformance to approved drawings or damage to any part of the system shall be documented on the Bio Clean shipping ticket.
- Damage to the unit during and after unloading shall be corrected at the expense of the Contractor. Any necessary repairs to the DSBB unit shall be made to the acceptance of the Engineer/Inspector.

Site Preparation

- The Contractor is responsible for providing adequate and complete vault protection when the DSBB unit is installed prior to final site stabilization (full landscaping, grass cover, final paving, and street sweeping completed).



- The Contractor shall adhere to all jurisdictional and/or OSHA safety rules in providing temporary shoring of the excavation.
- The Contractor or Owner is responsible for appropriately barricading the DSBB unit from traffic (in accordance with local codes).

Installation

- Each DSBB unit shall be constructed based on the locations and elevations according to the sizes shown on the approved drawings. Any modifications to the elevation or location shall be at the direction of and approved by the Engineer.
- The DSBB unit shall be placed on level compacted sub-grade with a minimum 6-inch gravel base. Compact undisturbed sub-grade materials to be per Geotechnical/Soils report. Unsuitable material below sub-grade shall be replaced to site engineer's approval. Place granular sub-base and compact to State and local standards as per the Engineers requirements.
- Once the base piece is set, the riser(s) and/or top section should be sealed onto the base section before backfilling, using a non-shrink grout, butyl rubber or similar waterproof seal.
- Pipe connections shall be aligned and sealed to meet the approved drawings with modifications necessary to meet site conditions and local regulations. The correct connection (inlet/outlet) will be marked on the Bio Clean Vault unit. *NOTE: The inlet and outlet pipe cannot protrude past the structures I.D. wall as it will interfere with the internal components.*
- Once the DSBB unit is set, it should be protected from construction runoff entering it. Contractor will be responsible for cleaning if unit is contaminated by such construction runoff and associated pollutants and damaged (i.e. concrete wash water).
- Backfilling should be performed in a careful manner, bringing the appropriate fill material up in 6-inch lifts on all sides. Precast sections shall be set in a manner that will result in a watertight joint. In all instances, installation of the DSBB unit shall conform to ASTM specification C891 "Standard Practice for Installation of Underground Precast Utility Structures" unless specified otherwise in contract documents.

- If applicable, it is the responsibility of the Contractor to provide curb and gutter and transition to the DSBB unit for proper stormwater flow into the system through the throat, pipe or grate opening. Reference project specific plans, details and specifications for information relating to curb and gutter. Several variations of the standard design are available. Effective bypass for an offline DSBB unit is essential for correct operation (i.e. bypass to an overflow at lower elevation).

Pipe Connection Details

- Pipe material selection should be indicated on the Site Plan. Connect the pipe using a Kor-N-Seal, Press Seal, Fernco, or other approved watertight boot connection. In the case of concrete pipes, grout the connection watertight with non-shrink grout.

Example of appropriate pipe connection using a Kor-N-Seal. Note that the pipe connector does not protrude past the structures inside wall.

- Inlet pipe(s) shall be stubbed in and connected to the precast manhole according to the Engineer's requirement or specifications. The Contractor is to grout all inlet pipes flush with the interior wall of the structure per plans and specifications.
- Outlet pipe shall be stubbed in and connected to the precast manhole according to the Engineer's requirement or specifications. The Contractor is to grout all inlet pipes flush with the interior wall of the structure per plans and specifications.
- For illustration a BAD example of a pipe installation is included below. The pipe is off-center, the pipe invert is not in the appropriate position, it is protruding beyond the inside wall, the grout is not clean and properly finished. This site was corrected by re-excavating and re-connecting the pipe properly.

Example of a BAD pipe installation. Protruding past the internal wall of the structure, poor grouting, and wrong position.

Example of a GOOD pipe installation. Pipe flush with the internal wall of the structure, clean grouting, and proper position.

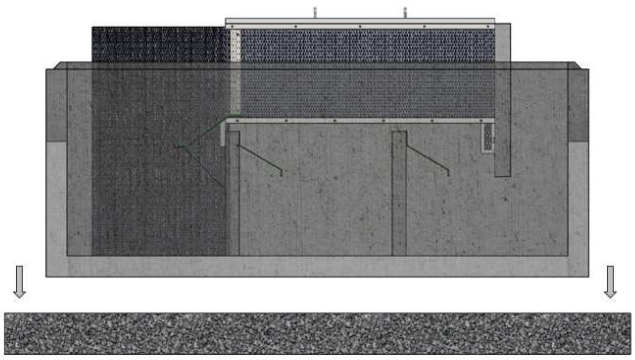
- Once the pipes are connected, carefully backfill around them, compacting in "lifts" that will not deflect, disturb or damage them.

Additional Information:

- The internal screening system of the DSBB is 100% stainless steel. Deflector shields and the debris ramp may be made of plastic, stainless steel or fiberglass depending on the size of the unit. Baffle and skimmer walls are generally made of concrete, yet smaller models use fiberglass to save space and reduce weight of the structure.
- The DSBB utilizes 4.7 mm screen openings and meets the Full Trash Capture requirements for various states such as California and Hawaii among others.
- Special attention must be paid to lifting the bottom portion of the structure when internals are pre-installed. Lifter cables/chain cannot rest or push against the internals which will cause bending and damage. Proper spreader bars shall be used to prevent damage.
- The DSBB is generally rectangular in shape and has a OD height from 6' to 20' feet. Please review approved project specific drawings which show the thickness of the bottom slab to ensure proper excavation depth. Pipe position/elevation into and out of the system is crucial to the system's proper function. Base material must be level in all four corners with maximum allowable tolerance of 3/4" from any one corner to another.
- Lifting points may be either on the inside wall, outside wall or floor of the structure.

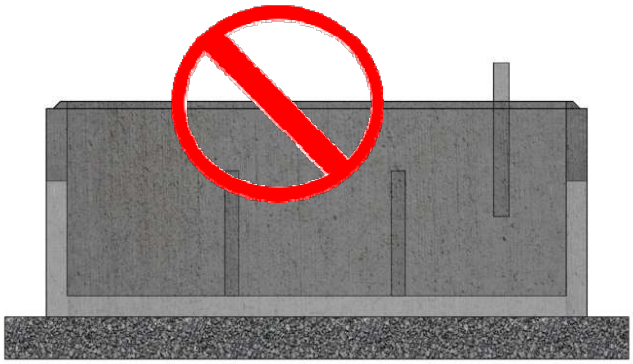
Illustrative Step-by-Step Installation Process

STEP 1



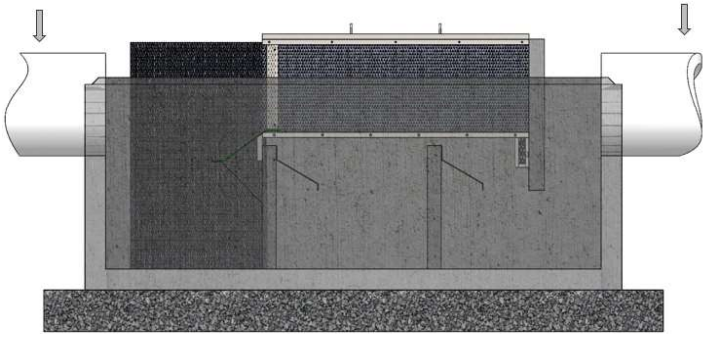
Set the base section of the DSBB on solid sub-grade using appropriate rigging and lifting method. Add watertight seal (either mastec rope or rubber gasket). Verify the level and elevation of the base section before adding any additional precast riser sections.

NO INTERNALS PRE-INSTALLED
ON LARGER UNITS



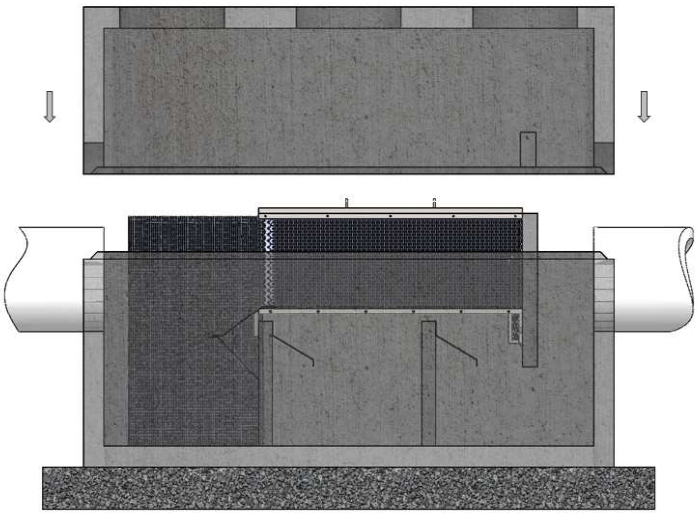
Most DSBB Models are delivered with internal components pre-installed (exception with the largest models). If you are receiving delivery of unit without internals pre-installed a manufacture's representative will contact you and provide on-site supervision and assistance with installation of these internals.

STEP 2



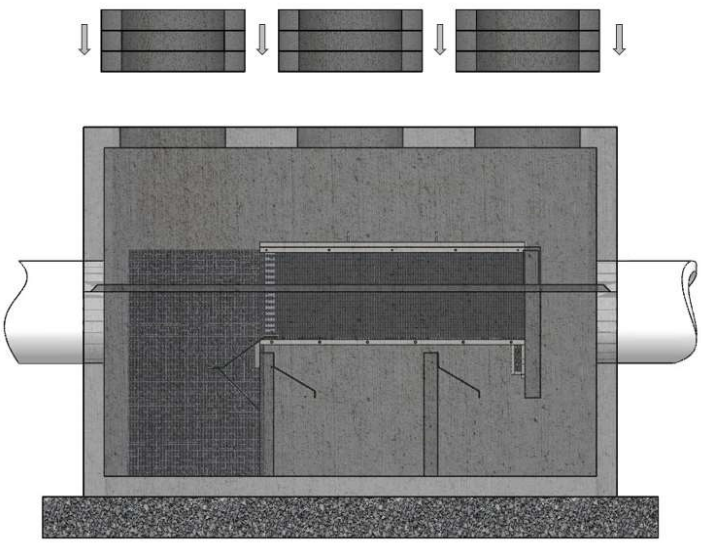
Once the base section is set, pipes can be positioned and set in place. This will simplify the installation of the pipes as opposed to positioning after the top section is set. Also, set any additional riser sections, if required, using the same method as previous section. Be sure to add watertight seal to each riser section.

STEP 3



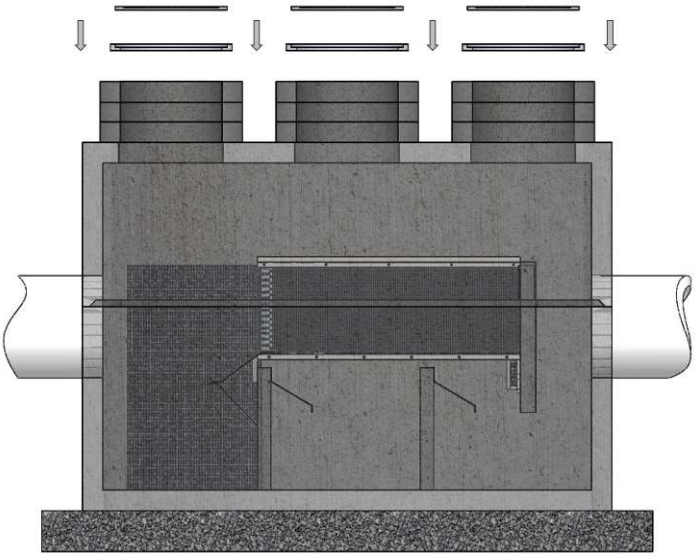
Set the top section. Note the top section's orientation. The manhole access opening(s) must be oriented per the drawings and details. Be sure to add watertight seal to each section.

STEP 4



Set the access risers (if applicable) to bring the manhole or hatch frame and covers up to finish surface elevation per the approved drawings and plans.

STEP 5



Set manhole covers or hatches over the top of the access risers. Use grout to adjust manhole frames to the proper elevations.

For Installation Support or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

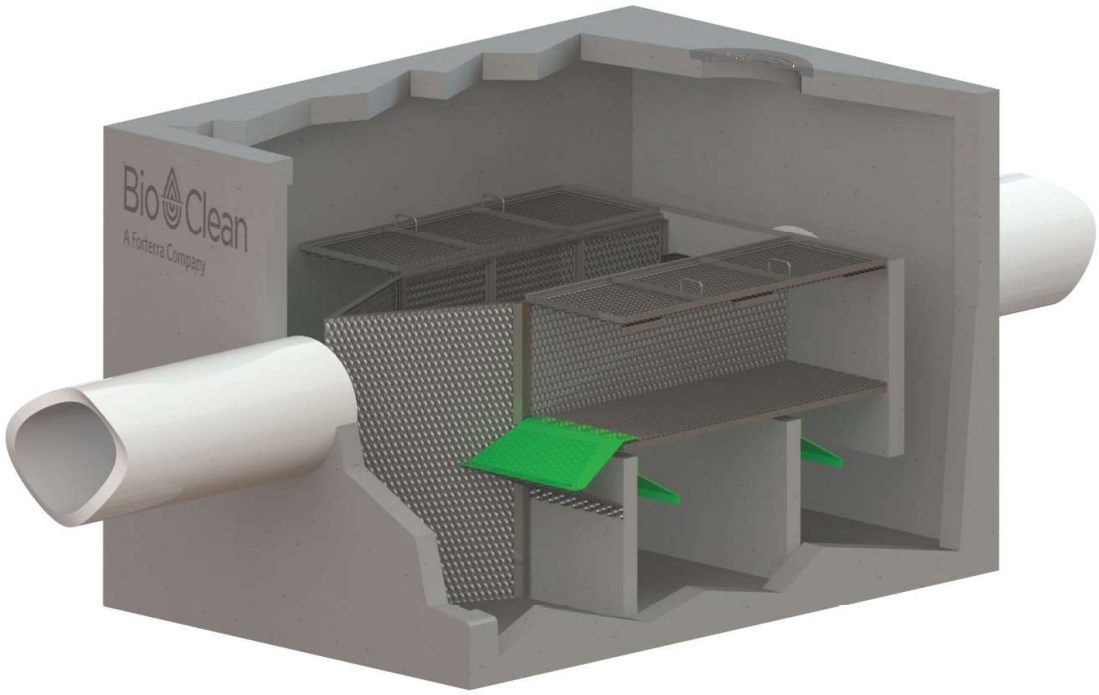
APPENDIX D

DUAL STAGE

Hydrodynamic Separator (DSBB)

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

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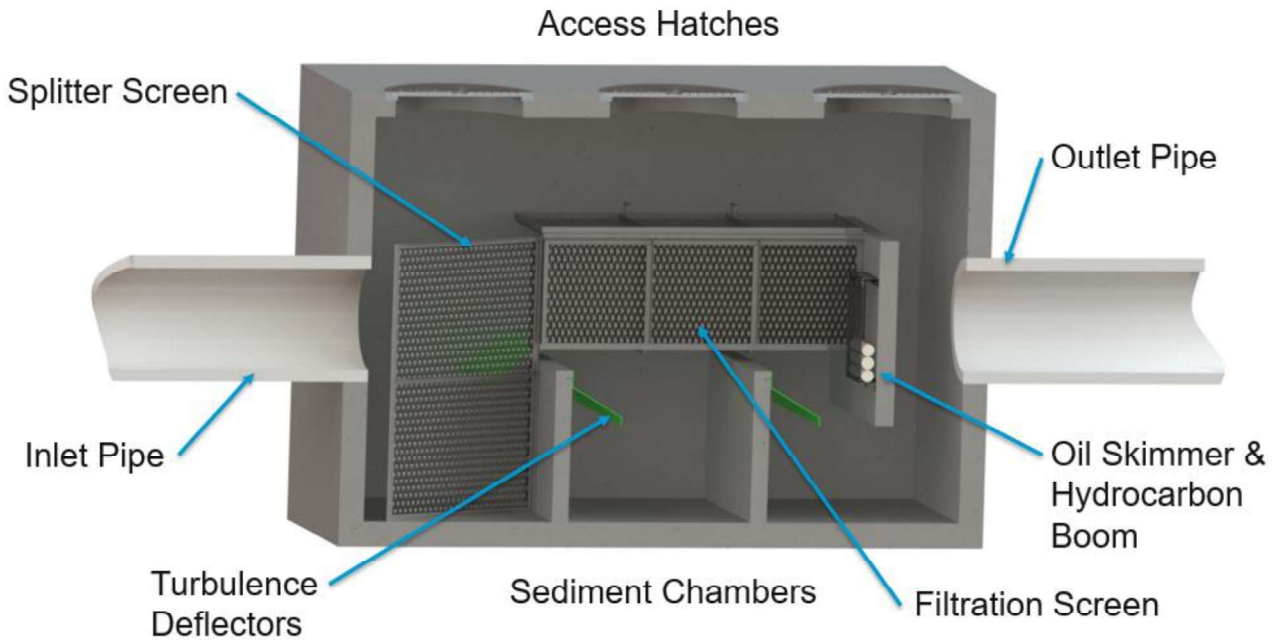
OPERATION & MAINTENANCE

The Debris Separating Baffle Box (DSBB), a stormwater dual-stage Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. The innovative screening system directs floatable trash, debris, and organics into raised filtration screens for dry state storage which prevents septic conditions, odor, nutrient leaching and allows for easy removal. The raised filtration screens are assisted by a non-clogging inlet splitting screen which directs flows to the filtration screens while maintaining high treatment flow rates. The DSBB is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs, inspection and maintenance on the DSBB Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the DSBB Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the DSBB are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The DSBB Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sediment chambers, filtration screens, splitter screen, or outflow pipe. Write down any observations on the inspection form.

- Through observation and/or digital photographs estimate the amount of floatable debris accumulated inside the filtration screens. Record this information on the inspection form. Check both the right and left filtration screens if applicable.
- Utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in each of the three sediment chambers. Record this depth on the inspection form.
- Observe the condition and color of the hydrocarbon booms and any floating oils in front of the boom cage. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable trash, debris and foliage in the filtration screens in which the length and width of the chambers screens is more than half full and/or flow into the screens is fully impeded by these debris. Large items blocking the entrance.
- Excessive accumulation of sediment in any of the three separation chambers is more than half-full (18" to 27" depending on the model size). See chart below:

Model	Sediment Chamber				Screen Basket Dimensions				Hydrocarbon Boom Cage		
	ID Length (in)	ID Width (in)	Sediment Chamber Depth (in)	Sediment Chamber Capacity at 50% Full (cu ft)	Screen Basket Quantity	Screen Basket Width (in)	Screen Basket Height (in)	Screen Basket Capacity (cu ft)	Cage Height (in)	Cage Width (in)	Booms
2.5-4	48	30	36	14.8	2	9	12	3.3	9	5	1
3-6	72	36	36	26.8	2	11	18	9.0	15	7	1
4-6	72	48	36	35.8	2	15	18	12.3	15	11	1
4-8	96	48	36	47.8	2	15	24	22.0	21	11	2
5-10	120	60	36	70.0	2	19	24	34.0	21	15	2
6-12	144	72	36	102.0	2	22	24	47.4	21	21	2
8-12	144	96	36	136.0	2	30	27	72.7	24	29	2
8-14	168	96	36	160.0	2	30	27	84.4	24	29	2
10-14	168	120	36	200.0	2	38	27	106.9	24	37	2
11-16	192	132	45	309.4	2	40	33	160.4	30	45	3
11-24	288	132	54	569.3	2	40	36	263.3	33	45	3
11-34	408	132	54	816.8	2	40	36	373.3	33	45	3

Maintenance Equipment

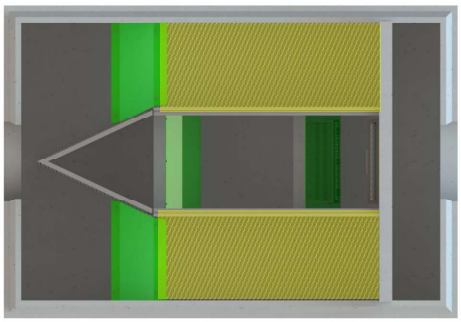
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the DSBB Separator:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Exception is deeper units entry may be required to open filtration screen lids and replace hydrocarbon booms.
- Vacuum truck (with pressure washer attachment preferred).

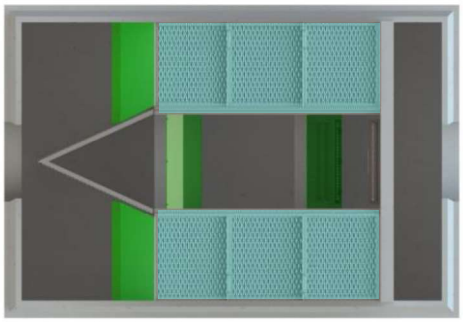
Maintenance Procedures

It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down from any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Debris captured in the filtration screens requires time to dry out which decreases time to remove and associated weight. Cleaning of the filtration screens and sediment chambers can be performed from finish surface without entry into the vault utilizing a vacuum truck on most installations. Depth and configuration of the installation may create conditions which would require entry for some or all of the maintenance procedures. Configuration and size of access hatches also effects the conditions in which entry may be required. Once all safety measures have been set up cleaning of the filtration screens, hydrocarbon boom(s) and/or sediment chambers can proceed as followed:

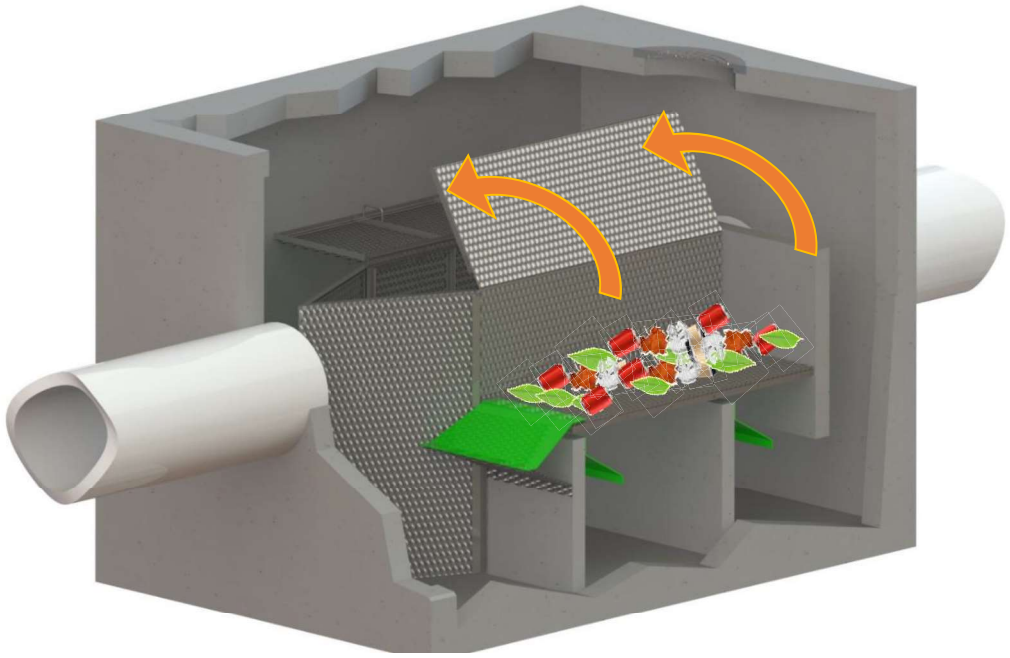
- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Locate the right and left filtration screens. Manhole or hatch access will be provided to each of these screens. As highlighted below. Depending on the configuration of the DSBB the filtration screens may or may not have hinged lids depending on factors such as online or offline bypass, water level at peak flow, back flow conditions amongst other site-specific variables. Units that have lids are designed with hinges and locking mechanisms along the sidewall of the structure that can be unlocked by finish surface with an extension rod. The length of this rod is limited and for deeper installs entry may be required to unlock and open the lids.



Top view into DSBB. Filtration screens highlighted in yellow without hinged lids.



Top view into DSBB. Filtration screens highlighted in turquoise with hinged lids.

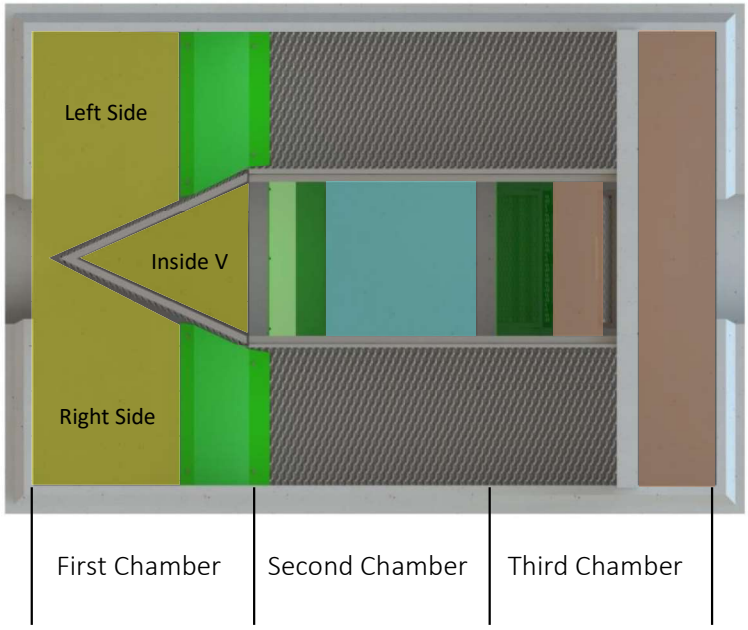


Isometric view into the DSBB illustrating the hinged lids of the filtration screens. Lids can hinge up and toward the center up to 180 degrees from closed & locked position for easy access for cleaning and removal of debris.

- Once filtration screens lids are opened (if applicable) the vacuum hose extension is inserted down into the screens for removal of debris. The width of the screen of the smallest model is 9” therefore allowing an standard 8” vacuum hose to be used for all models and sizes. All debris should be removed with the vacuum hose and the pressure washer should be used to

spray down and remove all debris on the bottom, side and top screens. Ensure all holes within in the screen are cleared of debris. This is critical to restoring the full hydraulic capacity of the filtration screens. Once completed close and lock lids (if applicable).

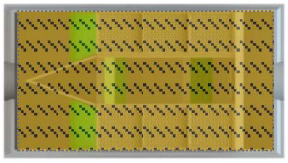
- Using an extension on a vacuum truck position the hose over the opened access hatch or hatches leading to the first sediment chamber adjacent to the pipe inlet and includes the splitter screen. Lower vacuum hose into the sediment chamber on the left and right side of the splitter screen. This is where a majority of the larger sediments and heavy debris will accumulate. Remove all floating debris, standing water and sediment from this sediment chamber. Vertical access to the bottom of the sediment chamber is unimpeded. The vac hose can be moved from side-to-side to fully remove sediments at the corners. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the floor of the chamber. The power washer should also be used to spray the splitter screen clean of any accumulated debris. The vacuum hose can also be inserted on the outlet side of the splitter screen (inside the V) to remove any remaining accumulated sediment.



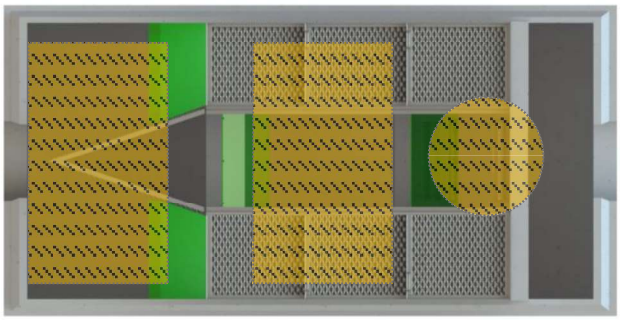
Top view into DSBB illustrating the three sediment chambers.

- The **yellow** highlighted areas show where the vacuum hose should be inserted for cleaning of the **first** sediment chamber.
- The **turquoise** highlighted area show where the vacuum hose should be inserted for cleaning of the **second** sediment chamber.
- The **orange** highlighted areas shows where the vacuum hose is inserted for cleaning of the **third** sediment chamber.

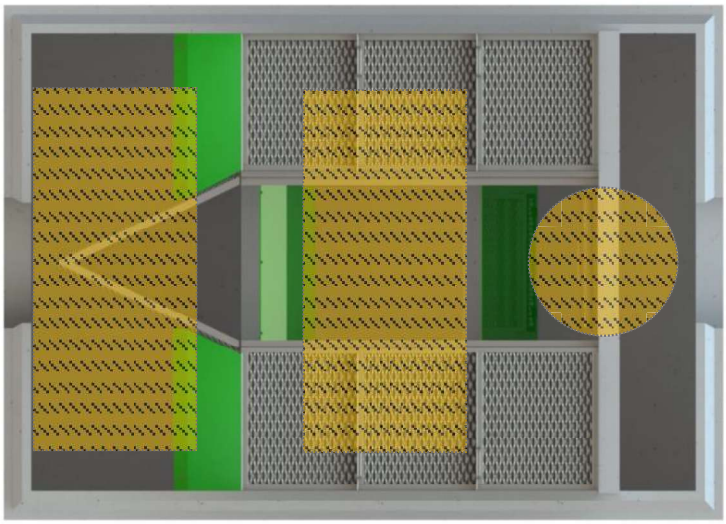
- Repeat the same procedure in the second and third sediment chambers in the locations shown in the above diagrams. Access to these two chambers is in the center of the system unlike the first sediment chamber. The filtration screens cover the sediment chamber along the sides, yet allow for unimpeded access in the middle without requirement to open filtration chamber tops or go through the filtration screens (hinged floor) as found with other baffle box systems. Hatch or manhole size, quantity and location vary based on model size and site specific project constraints. Various access hatch sizes and configurations are available to meet individual project requirements. Larger hatches, open assisted hatches and/or taller ID dimensions to increase headroom are available by request. Below are a few examples of various models and optimal hatch configurations.



A DSBB-2.5-4 is offered with a 2.5-4 access hatch in either parkway, direct or indirect traffic rating. This provides full access. Bolt and pull, hinged or hinged with lift-assisted options offered. *Figures not to scale.*

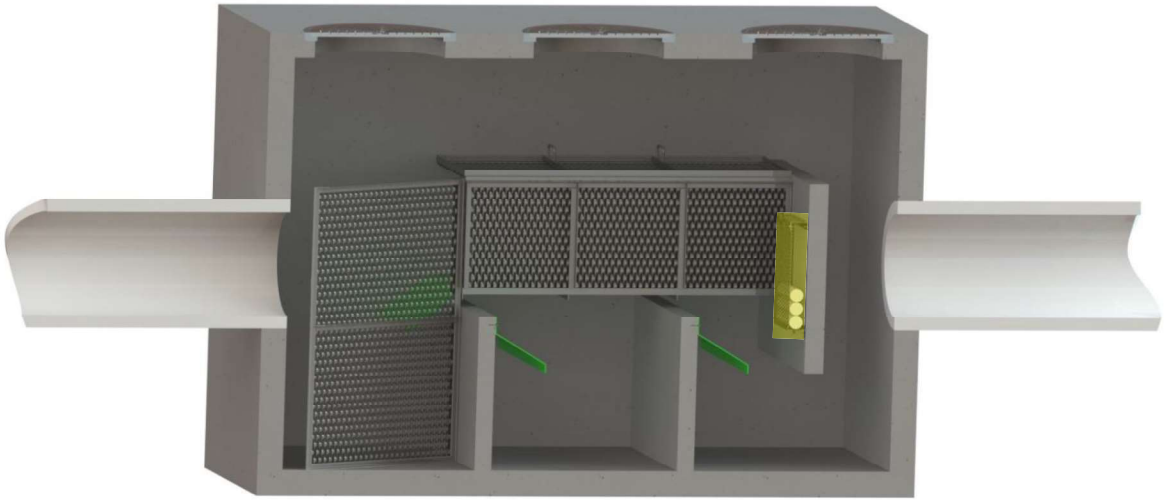


A DSBB-5-10 is offered with two 2.5-4 access hatches in either parkway, direct or indirect traffic rating along with a single 24" diameter manhole for access to the third sediment chamber and hydrocarbon booms. Bolt and pull, hinged or hinged with lift assisted options offered. *Figures not to scale.*

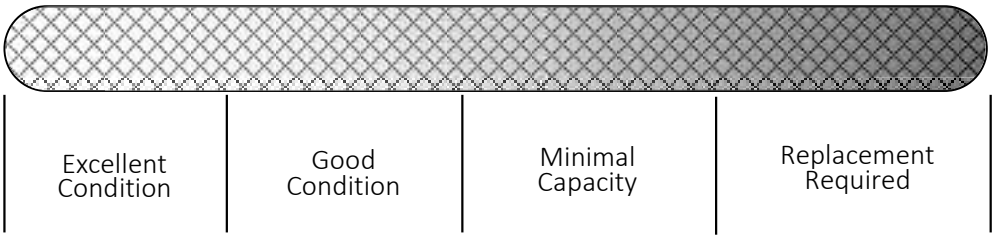


A DSBB-8-12 is offered with two 3-6 access hatches in either parkway, direct or indirect traffic rating along with a single 30" diameter manhole for access to the third sediment chamber and hydrocarbon booms. Bolt and pull, hinged or hinged with lift-assisted options offered. *Figures not to scale.*

- Based on the color of the hydrocarbon booms replacement may be necessary. The booms are housed inside the boom cage which is attached to the influent side of the oil skimmer wall. The cage has a hinged top which is opened allowing access to the hydrocarbon booms. Once old booms are removed new booms can be dropped in and the top closed. See below image.



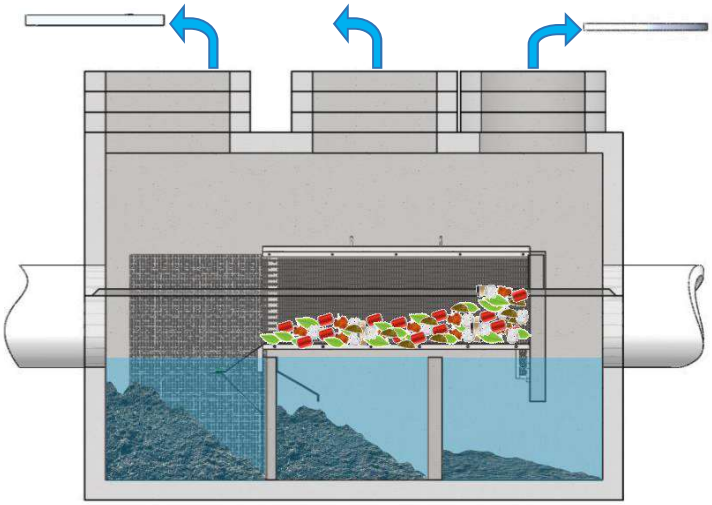
- Follow is a replacement indication color chart for the hydrocarbon booms:



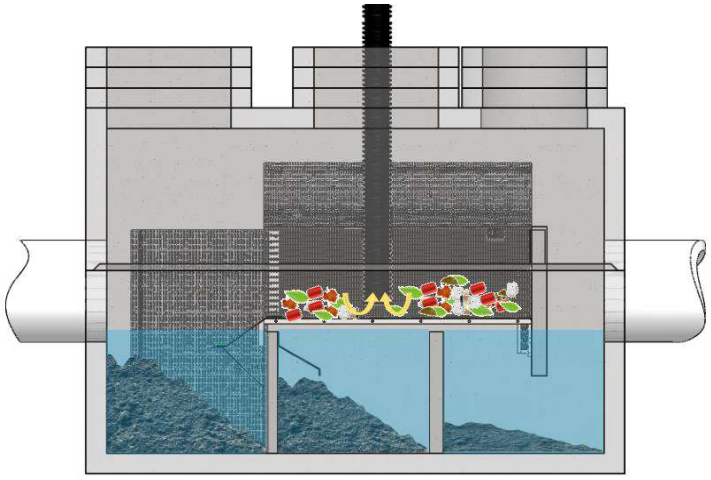
- NOTE: Filtration screens can be cleaned before or after cleaning and removal of sediment for the sediment chambers. Cleaning them before is preferred before removing sediment and standing water from the second and third chamber as debris and water will be deposited on the sediment chamber floors in the process of cleaning the filtration screens over the second and third chamber. Cleaning the first sediment chamber before the filtration screens allows the splitter screen to be fully exposed. Thus the pressure washing of all screens (splitter and filtration) can be done as the same time if needed.
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer.

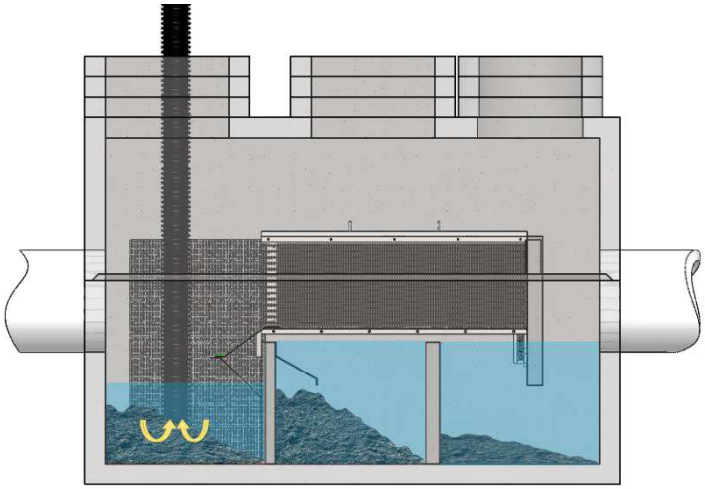
Maintenance Sequence



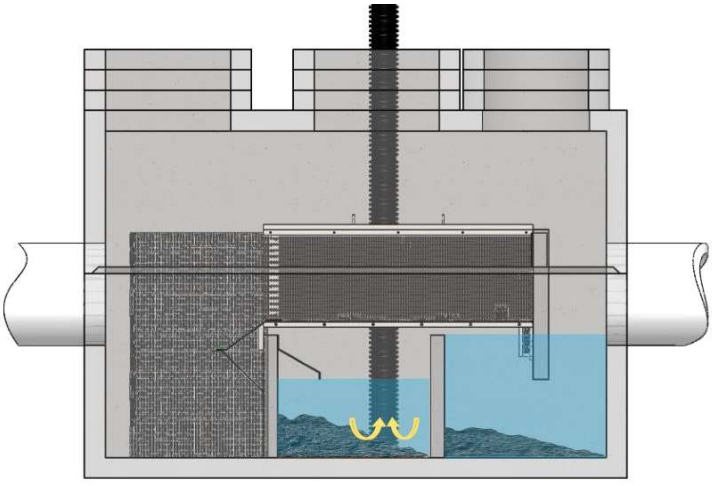
Remove access hatches set up vacuum truck to clean the filtration screens and sediment chamber. Locate positions of filtration screens and first, second and third sediment chambers plus the hydrocarbon boom cage.



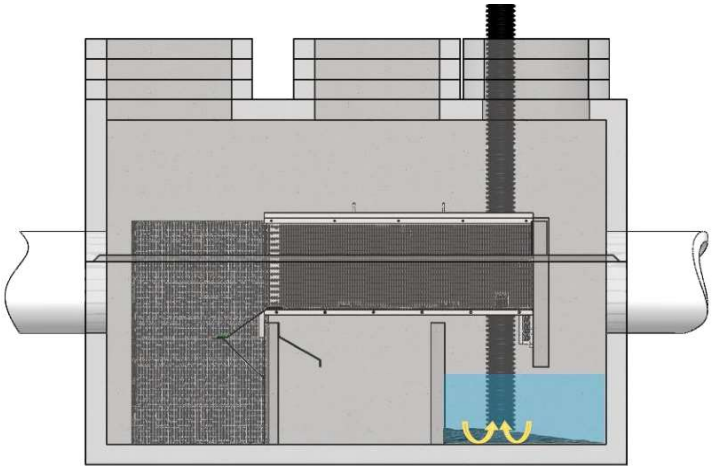
Unlock and open filtration screen lids (if applicable, some units will not have lids). Insert vacuum hose into the first filtration screen and clean out trash & debris. Use a pressure washer to remove any debris stuck on the screens.



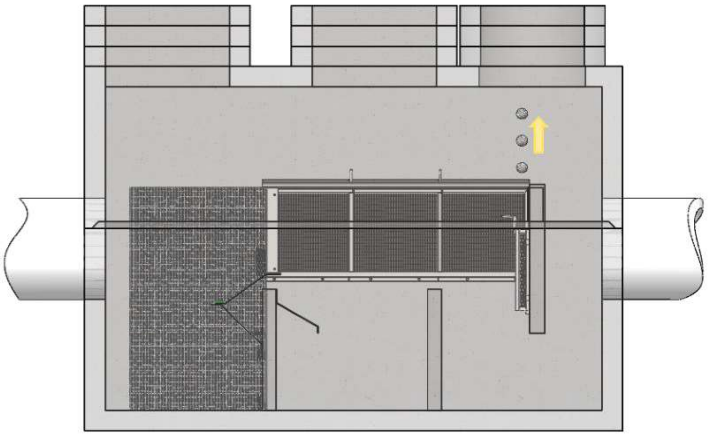
Insert vacuum hose in the first sediment chamber to remove sediment and debris. The vacuum hose will need to be inserted on the right and left side of the splitter screen to remove all sediment. Once completed use a pressure washer to clean off the splitter screen.



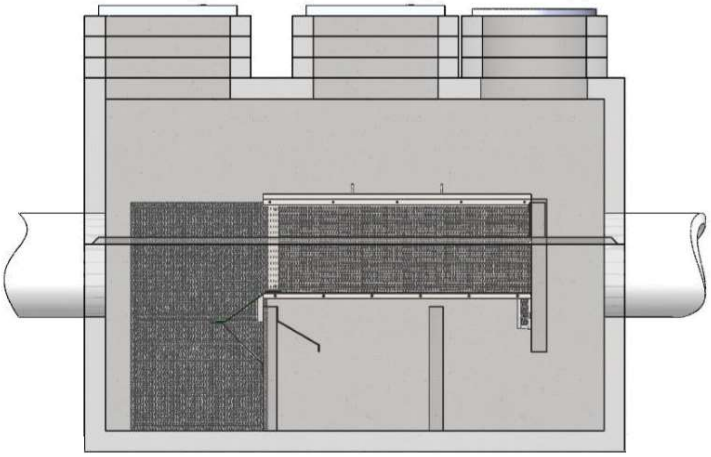
Repeat the above steps for cleaning the second sediment chamber. Compacted sediment can be loosened using a pressure washer.



Repeat the above steps for cleaning the third sediment chamber. Compacted sediment can be loosened using a pressure washer.



Once the unit is fully cleaned check the condition of the hydrocarbon booms in the boom cage hanging on the oil skimmer wall. Use color indicator in this manual to decide if replacement is required. If required open boom cage and replace booms.



Once cleaning and maintenance is complete ensure boom cage lid and filtration screen lids are closed and locked. Replace all manhole covers and or access hatches and remove traffic control.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Bio Clean Debris Separating Baffle Box

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Site Map #	GPS Coordinates of Vault	Model #	Debris, Trash and Foliage Accumilation Inside Filtration Screens (lbs)	Sediment Accumulation In Sediment Chambers (lbs) & Depth (inches)	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

398 Via El Centro, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

APPENDIX E

Product Warranty

DEBRIS SEPARATING BAFFLE BOX
HYDRODYNAMIC SEPARATOR

Bio Clean Environmental Services, Inc. products are engineered and manufactured with the intent to be considered as permanent infrastructure. Bio Clean Environmental Services, Inc. warranties its products to be free of manufacturer's defects for a period of 1 year from the date of purchase. If a warranty claim is made and determined to be valid, Bio Clean Environmental Services, Inc. will either repair or replace the product, at the discretion of Bio Clean Environmental Services, Inc. Warranty claims must be submitted, evaluated, and approved by Bio Clean Environmental Services, Inc. for the claim to be determined to be valid. All warranty work and/or corrective action must be authorized by Bio Clean Environmental Services, Inc. prior to beginning the work not covered by this warranty. There are no other warranties either expressed or implied other than what is specifically specified herein. Abusive treatment, neglect, or improper use of Bio Clean Environmental Services, Inc. products will not be covered by this warranty.

760-433-7640

Bio Clean
A Forterra Company

info@biocleanenvironmental.com

APPENDIX F

Good Harbour Laboratories

2596 Dunwin Drive
Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

Test Report

CUSTOMER:	Bio Clean Environmental Services & Modular Wetlands 398 Via El Centro Oceanside California 92058
Report Date: October 06, 2017	
Date(s) Analysis Performed: September 28 - 29	

Good Harbour Laboratories was asked to determine the head loss that occurs as water passes through a section of expanded metal grating that was supplied by Bio Clean Environmental Services. The screen had a diamond pattern that could be oriented either horizontally or vertically, as well as one side that had raised edges.

The section of screen (Figure 1) was mounted in a wooden frame that exposed a screen face 16-5/8 inches wide and 16-1/2 inches high when the diamonds were in the vertical position. The frame was mounted in a trough and water was passed through the screen. The difference in water height before and after the screen was used to determine head loss.

Figure 1: Expanded Metal Screen

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Mississauga ON L5L 1J5
Phone: 905.696.7276
Fax: 905.696.7279

TEST RESULTS:

Test 1: Diamond opening placed vertically; raised face on inlet side (against flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.4	1.9	3.5	1.4
100	8.2	2.7	5.5	2.2
200	12.7	3.5	9.2	3.6
300	16.0	4.4	11.6	4.6
400	19.3	5.2	14.1	5.6

Test 2: Diamond opening placed vertically; raised face on outlet side (with flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.2	1.8	3.4	1.3
100	7.7	2.6	5.1	2.0
200	12.7	3.6	9.1	3.6
300	15.8	4.5	11.3	4.4
400	19.5	5.3	14.2	5.6

Test 3: Diamond opening placed horizontally; raised face on outlet side (with flow).

Flow rate	Water Height[1]		Head Loss, ΔH	
(gpm)	Inlet (cm)	Outlet (cm)	cm	inch
50	5.2	1.6	3.6	1.4
100	7.2	2.5	4.7	1.9
200	11.4	3.9	7.5	3.0
300	14.7	4.3	10.4	4.1
400	18.5	5.0	13.5	5.3

[1] Water height has been corrected for the thickness of the wood frame.

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The above tests were repeated however for the second set of tests, the effluent side of the screen was allowed to free-fall into a receiving tank. The water height on the inlet side of the grating was recorded:

Test 4: Diamond opening placed vertically; raised face on inlet side (against flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	5.3	2.1
100	7.7	3.0
200	12.0	4.7
300	15.5	6.1
400	19.0	7.5

Test 5: Diamond opening placed vertically; raised face on outlet side (with flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	5.1	2.0
100	7.3	2.9
200	10.9	4.3
300	15.2	6.0
400	18.6	7.3

Test 6: Diamond opening placed horizontally; raised face on outlet side (with flow).

Flow rate (gpm)	Inlet Water Height[1]	
	cm	inch
50	4.9	1.9
100	7.4	2.9
200	11.0	4.3
300	14.4	5.7
400	17.3	6.8

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Results Summary:

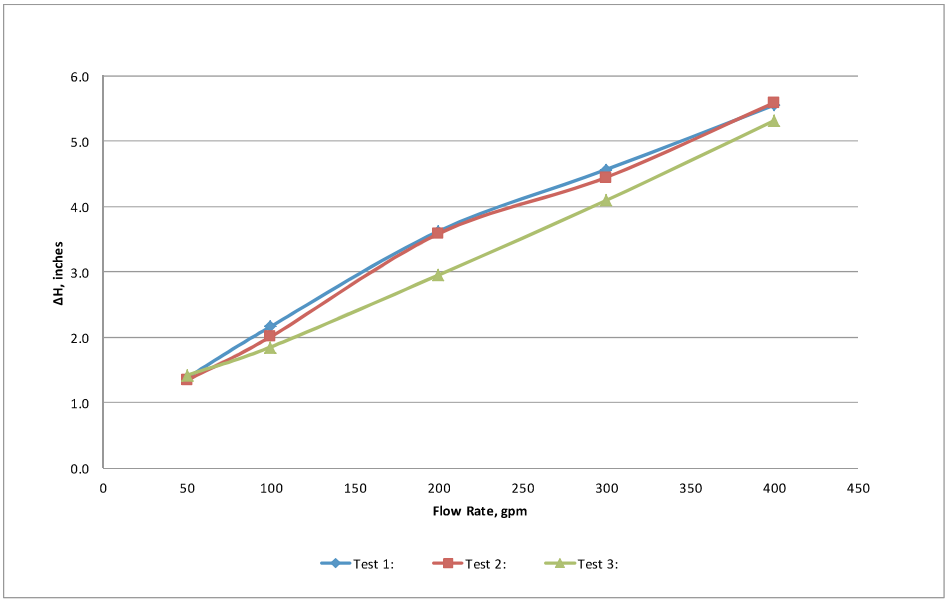

Figure 1: Head loss across expanded metal grating

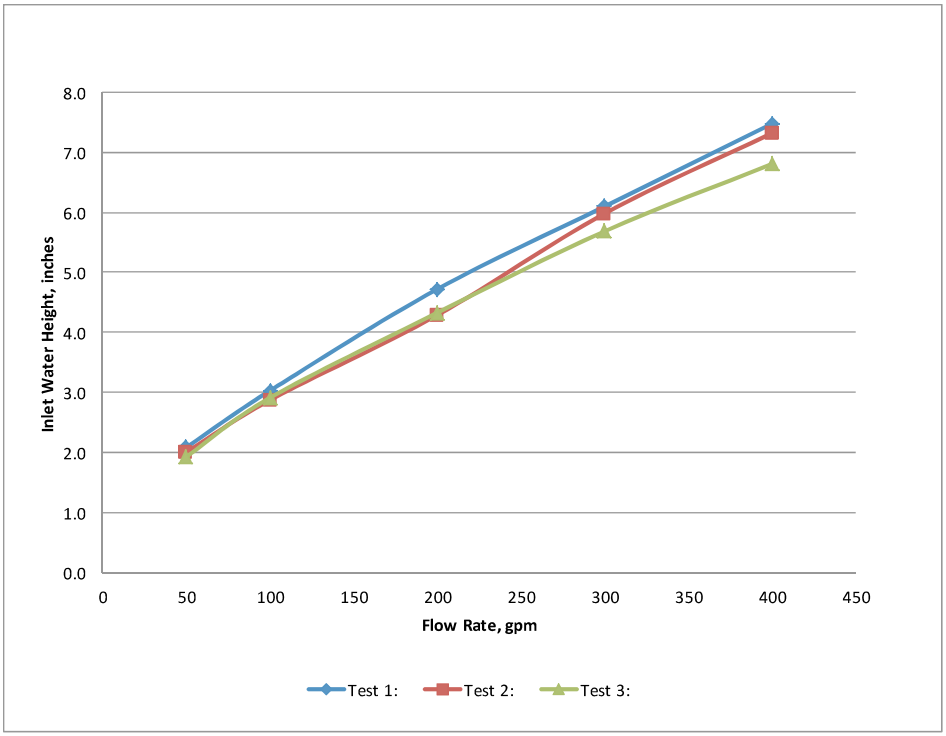

Figure 2: Inlet water height with effluent free-fall

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Test Report

Released By: Joe Costa (Name) | Signature | Oct. 06, 2017 (Date)

Senior Scientist (Title)