### **DATA REPORT**

# Literature Review of Existing Treatment Technologies for Industrial Stormwater

Prepared for

Science Applications International Corporation

and

Washington State Department of Ecology

### **Note:**

Some pages in this document have been purposely skipped or blank pages inserted so that this document will copy correctly when duplexed.

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## Literature Review of Existing Treatment Technologies for Industrial Stormwater

Prepared for

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### 1.0 Introduction

The Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) are working to clean up contaminated sediments and control sources of recontamination in the Lower Duwamish Waterway (LDW) under an Administrative Order on Consent with the City of Seattle, King County, the Port of Seattle, and The Boeing Company. The LDW site is an approximately 5.5-mile portion of the Lower Duwamish River which flows into Elliott Bay. The sediments along the river contain a wide range of contaminants due to years of industrial activity and runoff from residential areas. These contaminants include polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), chlorinated dioxins and furans, metals, and phthalates.

Ecology is leading contaminant source control efforts in the LDW in cooperation with the City of Seattle, the Port of Seattle, King County, the City of Tukwila, and EPA. Source control is the process of finding and controlling releases of contaminants to the LDW. In order to support Ecology's source control efforts, Herrera Environmental Consultants (Herrera) conducted a literature review to identify technologies that could be used to treat industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. In addition, Herrera has also compiled information on technologies that could be used to treat contaminated groundwater for this same suite of contaminants.

This report summarizes information on the specific stormwater treatment technologies that were identified through this review. It includes a methods section that describes the procedures that were used to compile information about each treatment technology. The compiled information for each treatment technology is then summarized in a results section under the following general categories:

- Vendor information
- Treatment performance
- System design
- Installation and operation and maintenance (O&M) costs

Finally, a discussion section provides guidance on the appropriate application(s) for each general category of treatment technology and identifies logistical issues for monitoring their performance. The discussion section also identifies key data gaps in our understanding of treatment system performance and recommends future research to fill these data gaps.

It should be noted that this review is not intended to constitute a formal analysis of "all known, available, and reasonable methods of treatment", or AKART analysis as defined in Ecology (2010a). An AKART analysis consists of a review of all available technologies for a well-characterized waste stream (such as industrial process wastewaters or fully-characterized and quantified stormwater runoff), and an evaluation of the economic impact of such technologies for the specified site or business. This project, as currently conceived, would not be considered a complete AKART analysis, nor could it be approved by Ecology as such.

This report was prepared by Herrera under Ecology's "Hazardous Substances Site Investigation & Remediation for the Toxics Cleanup Program Contract No. C0700034" between Science Applications International Corporation (SAIC) and Ecology. Herrera is a subcontractor to SAIC under this contract.

### 2.0 Methods

As described above, Herrera conducted a literature review to identify technologies that could be used to treat industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. This review was intended to identify a broad range of possible technologies for different treatment applications within the LDW, including:

- Runoff treatment at end-of-pipe or point of compliance
- Treatment at the point of entry for runoff to stormwater conveyance system
- Above ground treatment of runoff prior to its point of entry to the conveyance system (e.g., roof-runoff interception)

Since the stormwater treatment technologies in the LDW will typically be used for retrofit applications, this review was not limited to technologies that have been approved through the Technology Assessment Protocol – Ecology (TAPE) process (Ecology 2008). This study primarily focused on proprietary stormwater treatment technologies that are not listed in Volume V of the Stormwater Management Manual for Western Washington (Ecology 2005). Most of the non-proprietary stormwater treatment technologies listed in Volume V of the Stormwater Management Manual for Western Washington (Ecology 2005) were removed from further research for this study due to aboveground footprint or infiltration requirements as summarized in the Step 3 (Screening Criteria) section below. If in the rare instance a large footprint best management practice (BMP) such as a wet pond or an infiltrating BMP such as bioretention or a media filter drain are deemed appropriate for a site, the reader should refer to Volume V of the Stormwater Management Manual for Western Washington (Ecology 2005); the Low Impact Development Technical Guidance Manual for Puget Sound (PSAT 2005); or the Washington State Department of Transportation Highway Runoff Manual (WSDOT 2010) for additional information on the BMP of interest. Only two non-proprietary stormwater treatment systems are included in this report: underground sand filters (e.g., Delaware Sand Filters and DC Sand Filters) since they may be applicable to retrofits in the LDW. Finally, source control BMPs such as street sweeping and catch basin cleaning discussed in Volume IV of the Stormwater Management Manual for Western Washington (Ecology 2005) are also not the focus of this study, but are critical for pollution prevention in the LDW.

The actual literature review and data compilation steps that were performed in conjunction with this effort are as follows:

- 1. Identify candidate treatment technologies
- 2. Categorize treatment technologies
- 3. Screen treatment technologies for potential application in the LDW
- 4. Compile detailed information on each treatment technology
- 5. Identify logistical issues for monitoring of each treatment technology

Each of these steps is described in more detail below.

### **Step 1. Identify Candidate Treatment Technologies**

A candidate list of stormwater treatment technologies was compiled using the following resources:

- Web search
- Technologies approved through TAPE (Ecology 2008) and/or New Jersey Corporation for Advanced Technology (NJCAT) using the Technology Acceptance and Reciprocity Partnership [TARP] protocol (TARP 2003).
- Caltrans Treatment BMP Technology Report (Caltrans 2008)
- Stormwater Management Manual for Western Washington (Ecology 2005)

### **Step 2. Categorize Treatment Technologies**

Stormwater treatment technologies were then classified as one of two main types:

- Active treatment systems: systems that require electricity to operate
- Passive treatment systems: systems that do not require electricity to operate and are generally lower cost alternatives when compared to active treatment systems

Within the active treatment system category, treatment systems were further classified into one of the following subcategories (see Figure 1):

- Chemical filtration
- Chemical treatment
- Electrocoagulation
- Filtration
- Ion exchange
- Reverse osmosis

Filtration was further categorized as one of the following types based on the technology description:

- Disc
- Media
- Pressure

Within the passive treatment system category, treatment systems were classified into one of the following subcategories (see Figure 1):

- Bioretention/filtration
- Drain inlet insert
- Hydrodynamic separation
- Media filtration
- Oil/water separator

Drain inlet inserts and media filtration systems were further categorized based on the technology description. Drain inlet inserts can generally be considered one of the following types (see Figure 1):

- Absorbent boom/fabric
- Media filtration
- Media filtration (cartridge)
- Combination system (screen and absorbent boom/fabric)
- Combination system (screen and media filtration)

Media filtration can generally be considered one of the following types (see Figure 1):

- Above ground (pump required)
- Cartridge
- Combination system (with hydrodynamic separation)
- Combination system (with oil/water separator)
- Up-flow

## Step 3. Screen Treatment Technologies for Potential Application in the LDW

Technologies were subsequently screened for potential application in the LDW based on a list of screening criteria. These screening criteria reflect the unique logistical issues for treating stormwater in the LDW given the presence of historical sediment contamination, flat site topography, high groundwater table, and a broad list of target contaminants in runoff.

The screening criteria for active treatment systems are as follows:

- Systems must be designed for long-term (i.e., permanent) installation.
- Systems must be designed to treat a relatively wide range of flows and concentrations that are associated with stormwater runoff

The screening criteria for passive treatment systems are as follows:

- Systems must have a minimal aboveground footprint due to the limited space available for retrofits (e.g., larger aboveground systems such as constructed wetlands, wet ponds, and Austin sand filters were removed).
- Systems must not rely on infiltration for treatment due to high water table and presence of historical soil and/or groundwater contamination (e.g., treatment technologies such as infiltration trenches, bioretention, and proprietary systems that provide storage for underground infiltration were removed).
- Systems must be able to effectively handle a large petroleum or chemical spill from industrial activities (e.g., porous pavement was removed).
- Systems should remove pollutants of concern; those systems with a focus on gross litter and debris removal were not considered (e.g., proprietary systems that have a trash basket catch basin insert design were removed).
- System design should be for a permanent installation; those systems with a construction site or temporary installation focus were not considered (e.g., catch basin filter sock designs were removed).
- Systems must be readily available; those systems with inactive vendor websites or discontinued product lines were not included.

# **Step 4. Compile Detailed Information on Each Treatment Technology**

Once the list of potential active and passive stormwater treatment technologies was narrowed down to those that could potentially be useful in the LDW, the following steps were taken to collect information on each of the systems:

- Review and compile publically available information from vendor websites
- Send questionnaire to vendors
- Conduct follow-up phone contacts with vendors

The vendor questionnaire requested the following specific information:

- Manufacturer name
- Technology name
- Contact information (name, e-mail, phone, website)
- Treatment type/application

- Number of installations in the state of Washington
- Estimated installation cost [range]
- Estimated annual O&M cost [range]
- Design flow rate [range]
- System footprint [range]
- Required head loss [range]
- Internal or external bypass
- Above or below grade
- Median influent concentration [see parameter list below]
- Median effluent concentration [see parameter list below]
- Median percent removal [see parameter list below]

Based on the contaminants of concern in the LDW and the required monitoring parameters in the National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit (Ecology 2010b), treatment performance data for the following parameters were requested from the each vendor:

- Total suspended solids (TSS) [required for Timber Product Industry (24xx), Paper and Allied Products (26xx), and discharges to 303(d)-listed waters; many pollutants can also be associated with sediment particles, thus TSS removal can also be an indicator of pollutant removal of other parameters]
- Total phosphorus [required for Chemical and Allied Products (28xx), Food and Kindred Products (20xx), and discharges to 303(d)-listed waters]
- Total petroleum hydrocarbons (TPH) [required for Primary Metals (33xx), Metals Mining (10xx), Automobile Salvage and Scrap Recycling (5015 and 5093), and Metals Fabricating (34xx)]
- Oil and grease [this parameter is measured instead of TPH in some portions of the country]
- Total and dissolved copper [total copper is required for all Industrial Stormwater permittees]
- Total and dissolved lead [total lead is required for Primary Metals (33xx), Metals Mining (10xx), Automobile Salvage and Scrap Recycling (5015 and 5093), Metals Fabricating (34xx), and discharges to 303(d)-listed waters]
- Total and dissolved zinc [total zinc is required for all Industrial Stormwater permittees]
- Semivolatile organic compounds (SVOCs) [contaminant of concern in the LDW]

- Polycholrinated biphenyls (PCBs) [contaminant of concern in the LDW]
- Dioxins [contaminant of concern in the LDW]
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) [contaminant of concern in the LDW]

Additional monitoring parameters (turbidity, pH, and oil sheen) are required by the NPDES Industrial Stormwater General Permit for all industries; however, these parameters were not listed as contaminants of concern in the LDW or are not commonly used for determining pollutant removal performance; thus, data for these parameters were not requested from the vendors. Specific industrial groups are also required to collect additional monitoring parameters (ammonia total as nitrogen, biochemical oxygen demand [BOD<sub>5</sub>], chemical oxygen demand [COD], nitrate/nitrite as nitrogen, and additional metals); however, since these parameters are not required for multiple industries and were not listed as contaminants of concern in the LDW, they were not included as part of this literature review.

Information compiled for each technology was summarized on a two-page Technology Summary Sheets that provides a picture or diagram of each system, and a consistent framework for presenting data on system design, treatment performance, installation costs, O&M costs, and the number of installations in Washington. In addition, more detailed product brochures, drawings, specifications, and O&M information that were obtained from the vendors for each technology were compiled for reference within this document.

### 3.0 Results

Using the methods identified in the previous section, a total of 91 passive and 18 active systems were identified for possible use in treating industrial or municipal stormwater for the contaminants of concern in sediments within the LDW. Tables 1 and 2 identify these passive and active systems, respectively, with their associated treatment subcategories and vendor contact information. The Technology Summary Sheets that were prepared for each system are provided in Appendix A. The appendix includes a divider to separate information for passive and active systems; the Technology Summary sheets for individual systems are then organized alphabetically by system name.

Information presented in the Technology Summary Sheets was derived in part from questionnaire responses from the vendors for each system (see description of questionnaires in *Methods* section). Questionnaire responses were received from vendors for 58 percent of the passive systems and 67 percent of the active systems; these questionnaire responses are documented in Appendix B. The appendix includes a divider to separate information for passive and active systems; questionnaire responses for individual systems are then organized alphabetically by system name.

When no questionnaire response was obtained from a vendor for a specific treatment system, efforts were made to obtain the required information for this report based on a review of publically available information on that system from the vendor. Limited information was obtained through these reviews for 15 percent of the passive systems and 11 percent of the active system. Publically available product information (e.g., brochures, drawings, specifications, and O&M information) for all the treatment systems identified in Tables 1 and 2 has been compiled in Appendix C (provided electronically on CD). The appendix includes a divider to separate information for passive and active systems; product information for individual systems is then organized alphabetically by system name.

In addition to the appendices described above, the following summary tables are provided in the main body of this report to facilitate rapid comparisons of different treatment system attributes:

- Table 3. Treatment system removal performance for total metals.
- Table 4. Treatment system removal performance for dissolved metals.
- Table 5. Treatment system removal performance for TSS.
- Table 6. Treatment system removal performance for total petroleum hydrocarbons and oil and grease.
- Table 7. Treatment system removal performance for total phosphorus.
- Table 8. Treatment system removal performance for SVOCs, PCBs, dioxins, and cPAHs.

- Table 9. Design information for passive systems.
- Table 10. Design information for active systems.
- Table 11. Installation and annual operation and maintenance costs for passive treatment systems.
- Table 12. Installation and annual operation and maintenance costs for active treatment systems.

The information contained in Tables 3 through 12 has also been compiled in a separate Microsoft Excel® file to allow rapid sorting and review of the system treatment attributes; this file is designated Appendix D to this document and is provided electronically on CD.

In reviewing the aforementioned tables and appendices, it is important to note that most of the associated data were supplied by the treatment system vendors and have not been verified by an independent third-party. In a few select cases, independent verification of some treatment system attributes has occurred through TAPE and/or NJCAT. System attributes that are verified through TAPE may include removal performance for basic (TSS), enhanced (dissolved metals), phosphorus, and oil treatment. Typical system maintenance schedules are also verified through TAPE. NJCAT only verifies removal performance for TSS. Neither program verifies installation and annual operation and maintenance costs. The specific treatment systems that have been verified through TAPE and/or NJCAT are identified in Table 13. More detailed information on the systems that have been verified through TAPE is available through Ecology's website for emerging stormwater treatment technologies:

http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html. Detailed information on treatment systems that have been verified through NJCAT may also be obtained through the following website for the State of New Jersey Department of Environmental Protection: http://www.njstormwater.org/treatment.html.

### 4.0 Discussion

This section provides guidance on the appropriate application(s) for each general category of treatment technology, identifies logistical issues for monitoring performance, identifies key data gaps in our understanding of treatment system performance, and recommends future research to fill these data gaps.

### 4.1 Treatment Technology Applications

In general, land use in drainage basins to the LDW is predominantly industrial, although there are some limited areas of mixed residential/commercial land use in adjacent neighborhoods (e.g., South Park and Georgetown). Because industrial areas in the LDW are largely built-out (i.e., all the available space is either paved or occupied by buildings), many of the non-proprietary stormwater treatment technologies identified in the *Stormwater Management Manual for Western Washington* (Ecology 2005) are impractical due to their large aboveground footprint. Instead, proprietary treatment technologies that have been specifically designed for retrofit applications will generally be more useful for treating the contaminants of concern in the LDW. To overcome the numerous design restraints in built-out environments, these systems are typically designed to have a small footprint, have low head-loss requirements, and are easily scalable. Because of these attributes, these technologies can be more easily installed in a variety of sites and applications.

The most common treatment applications in industrial areas are the treatment of roof runoff (e.g., for treatment of zinc from galvanized metal roofs) or the treatment of stormwater from pollution generating impervious surfaces at the inlet to the storm drain system or at end-of-pipe. Pumping and treating groundwater, though not technically stormwater, is also a common application in industrial areas. A large variety of treatment technologies is generally available for these applications, including both passive and active systems. In general, passive treatment systems are less expensive to install, operate, and maintain than active systems; however, they typically do not provide as high a level of treatment in comparison to active systems. For the same level of treatment, a passive system usually occupies more space than an active system. The higher level of treatment achieved by active systems typically involves a multi-step process to optimize performance; due to this increased complexity, active systems often require a higher level of operator knowledge and have increased O&M costs.

Description of the most common treatment applications for the general treatment technology categories defined in this report are provided below. Table 14 also identifies common treatment applications for the specific treatment systems that are identified in Tables 1 and 2.

#### 4.1.1 Passive Treatment

1. *Biofiltration/Filtration* – Bioretention systems (e.g., rain gardens) have been shown to achieve a high level of pollutant removal (Davis et al. 2009; Hsieh and

Davis 2005). Manufacturers have taken this technology and adapted it to the ultraurban environment. These systems have a relatively small footprint and in general are not easily scalable. The majority of bioretention systems are easy to maintain. Bioretention systems are most commonly used to treat stormwater from pollution generating impervious surfaces either at the inlet to the storm drain system or at the end-of-pipe.

- 2. Drain Inlet Insert These systems are small devices that occupy a catch basin or are inserted into the inlet of a storm drain. Because they are not scalable and occupy existing inlets, it is difficult to correctly size these technologies. They are relatively inexpensive, require minimal head loss, and need to be distributed throughout the site to treat large areas. Drain inserts are most commonly used to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system; however, some of these systems are also configured to treat roof runoff.
- 3. *Hydrodynamic Separation* These devices can treat high flows in a very small footprint. Maintenance is similar to standard catch basin cleaning. Because these systems are not filters, they do not target dissolved pollutants and, in general, cannot remove fine silt and clay sized particles (Kim and Sansalone 2008). Hydrodynamic separators require minimal head loss. Hydrodynamic separation systems are most commonly used to treat stormwater from pollution generating impervious surfaces at end-of-pipe.
- 4. *Media Filtration* Media filters are scalable systems that require head loss (varies from system to system) to drive the water through the filter media. They achieve a relatively high level of treatment for dissolved and particulate pollutants (Geosyntec and Wright Water 2008) but are generally more expensive to maintain than other passive treatment types. Media filtration systems are most commonly used to treat stormwater from pollution generating impervious surfaces either at the inlet to the storm drain system or at the end-of-pipe.
- 5. Oil/Water Separators These systems target hydrocarbons with simple baffle technologies. They do not target other pollutants but are effective at reducing high concentrations of hydrocarbons and can provide some limited TSS and metals removal via sedimentation. These systems are most commonly used to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system.

#### 4.1.2 Active Treatment

1. *Chemical Filtration* – Media filtration is more effective if the average particle size in the stormwater is large. Chemical filtration entails the addition of a flocculent to the stormwater prior to filtration in order to enhance the filtration process. Because the large particles cannot penetrate the media, surface occlusion is an

issue. Many systems use a backflush device to prevent surface occlusion. As with most active treatment devices, water is pumped into these systems and thus head loss restrictions are not an issue. In addition, most active treatment systems are above ground installations and consequently require a large footprint on the site (though less than conventional stormwater ponds). Chemical filtration systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.

- 2. Chemical Treatment To target specific analytes, these technologies are simple devices that add a chemical to the influent stormwater. Chemical treatment systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.
- 3. Electrocoagulation This technology applies a charge to the influent stream to generate flocculation. The device then settles or filters the floc to generate a clean waste stream. Removal of settled floc is a required and frequent maintenance procedure. This is an effective treatment method that can target dissolved and particulate pollutants, though operation and maintenance can be onerous. Electrocoagulation systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.
- 4. Filtration Pressurized filtration enhances the filtration process by increasing the pressure of the water as it moves through the filter. The filtration process is usually followed by a backflushing process to clean the media. As with all system with a backflush, the collected solids must be removed on a regular basis. Filtration systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.
- 5. *Ion Exchange* Ion exchange is a polishing step that specifically targets polar dissolved constituents. Pretreatment is required prior to ion exchange as suspended solids will clog the exchange columns. Ion exchange systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe using a pump system; they are also commonly used to treat contaminated groundwater.
- 6. Reverse Osmosis These systems are highly effective at removing dissolved contaminants. Using a pump, these systems can be used to treat stormwater from pollution generating impervious surfaces at end-of-pipe and contaminated groundwater. These systems also require pre-treatment as particulate matter can foul the ion selective membrane and reduce performance.

# **4.2** Logistical Issues for Monitoring Treatment System Performance

In order to ensure that source control efforts in the LDW are effective, some monitoring of stormwater treatment system performance may be required pursuant to future permit requirements or other regulatory drivers. At a minimum, this monitoring would likely involve sampling to characterize contaminant concentrations in treatment system effluent to ensure they are below levels that could contribute to sediment recontamination in the LDW. Influent samples might also be required to determine the actual pollutant removal efficiency of the treatment system.

In general, the following logistical issues are frequently encountered when collecting samples to characterize influent and effluent contaminant concentrations for propriety treatment systems that are designed for retrofit applications:

- The conveyance system for stormwater entering and leaving the treatment system is below grade and not directly accessible; therefore, there is no convenient collection point for influent and/or effluent samples. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at end-of-pipe (e.g., biofiltration/filtration, hydrodynamic separation, and media filtration systems).
- Effluent from the stormwater treatment system is discharged directly into a conveyance pipe containing water from another up-gradient source; therefore, it is difficult to obtain a representative effluent sample that is uncontaminated by this other source. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts).
- The stormwater treatment system is configured in a manner that allows bypass water to mix directly with treated effluent; therefore, it is difficult to obtain a representative effluent sample that is not contaminated by the bypass water. This situation is frequently encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts) and at end-of-pipe (e.g., biofiltration/filtration, hydrodynamic separation, and media filtration systems).
- Influent enters the stormwater system as diffuse sheet flow; therefore, the flow is not sufficiently concentrated to facilitate collection of an influent sample. This situation is most often encountered with systems that are designed to treat stormwater from pollution generating impervious surfaces at the inlet to the storm drain system (e.g., drain inlet inserts).

It is often possible to identify sampling procedures to overcome these logistical issues. For example, in situations where there is no convenient collection point for effluent samples at the direct outlet for a treatment system, it is often possible to collect samples at a downgradient access point in the stormwater conveyance system if no additional stormwater inputs have occurred from sources other than the treatment system. However, these sampling strategies typically need to be worked out on a case-by-case basis given the wide variety of treatment system configurations that exist and unique attributes of the stormwater conveyance system at any given monitoring site. Given this consideration, it is not practical to offer generalized sampling strategies to overcome the logistical issues for monitoring that are identified above.

### 4.3 Data Gaps

Although there are many stormwater treatment technology options, not all of them have been rigorously field tested. This is primarily due to the fact that field testing is expensive and many government agencies do not require field data to approve systems for use in their jurisdictions. Table 13 presents those systems which have gone through the TAPE or TARP field testing process, but even for these rigorously tested systems, there exists a lack of data related to the removal of toxic pollutants. Specifically, few have been tested for any metals besides copper and zinc, SVOCs, PCBs, dioxins, and cPAHs removal. This data gap exists for a number of reasons:

- 1. Removal of these toxics from stormwater is not the primary concern for the majority of the market.
- 2. Collection and analysis of these parameters is expensive.
- 3. Influent concentrations are highly variable, and thus achieving target reduction goals consistently is difficult.

The lack of rigorous field or laboratory testing by independent third parties is another major data gap that needs to be addressed before informed decisions can be made regarding selection of proprietary stormwater treatment systems. There is an obvious conflict of interest when companies test their own products and report the results as fact. In order to address this issue, many more jurisdictions have begun to require third-party verified data to support the performance claims of treatment technology vendors. Still others have been establishing their own verification protocols because the existing protocols (e.g., TAPE and TARP), do not address issues which can be locally important. For instance, TAPE and TARP do not require long-term monitoring to assess system performance over time, or maintenance past the 1- to 2-year time scale. Stormwater managers in Oregon have identified this as a data gap and have begun the process of establishing a monitoring protocol for long-term maintenance and system lifecycle assessments. However, until this monitoring protocol begins to produce results, the long-term performance of these systems and lifecycle expectations will remain a data gap.

#### 4.4 Recommended Future Research

Though there any many treatment technologies on the market, few have been rigorously tested under variable field conditions. Even fewer have been subjected to long-term testing to quantify system lifecycles and long-term O&M requirements. It is recommended that more of these studies be conducted by third party entities so that objective results are available for a wide variety of systems. This is a difficult prospect for treatment technology manufacturers because of their rapid research and development timelines and the large investment required for long-term studies. Due to this consideration, local jurisdictions and/or Industrial Stormwater permittees may need to take on this monitoring themselves in order to reach more informed decisions on which treatment technologies are appropriate and effective for various stormwater treatment applications. As mentioned above, stormwater managers in Oregon have already initiated this process. In Washington, the Port of Seattle also has a long history of monitoring stormwater treatment system performance, including various downspout media filter configurations and oyster shell augmented filtration swales.

Though rigorous field studies exist for a select few treatment technologies, these studies have primarily addressed metals, nutrients, and solids removal. Very little data exist for the removal of toxic pollutants. It is recommended that future studies analyze other metals in addition to copper and zinc (e.g., mercury, cadmium, and chromium), SVOCs, PCBs, dioxins, and cPAHs. Such studies would need to occur in industrial areas because treatment cannot be verified unless influent concentrations are elevated. Alternatively, because of the expense and difficulty of conducting studies of toxics in stormwater, research on toxic pollutant affinity for various particle sizes could be conducted. Such a study would segregate and analyze various particle size fractions for concentrations of SVOCs, PCBs, dioxins, and cPAHs. This approach has been used by researchers to relate metals to particle size classes (Ran et al. 2000; Ranville et al. 1999); a similar approach could be used here for toxic organic chemicals. Once a relationship between particle size and pollutant concentration is developed, removal of various particle size categories by treatment technologies can be used as a proxy for removal of difficult-to-measure toxics.

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### FIGURES AND TABLES

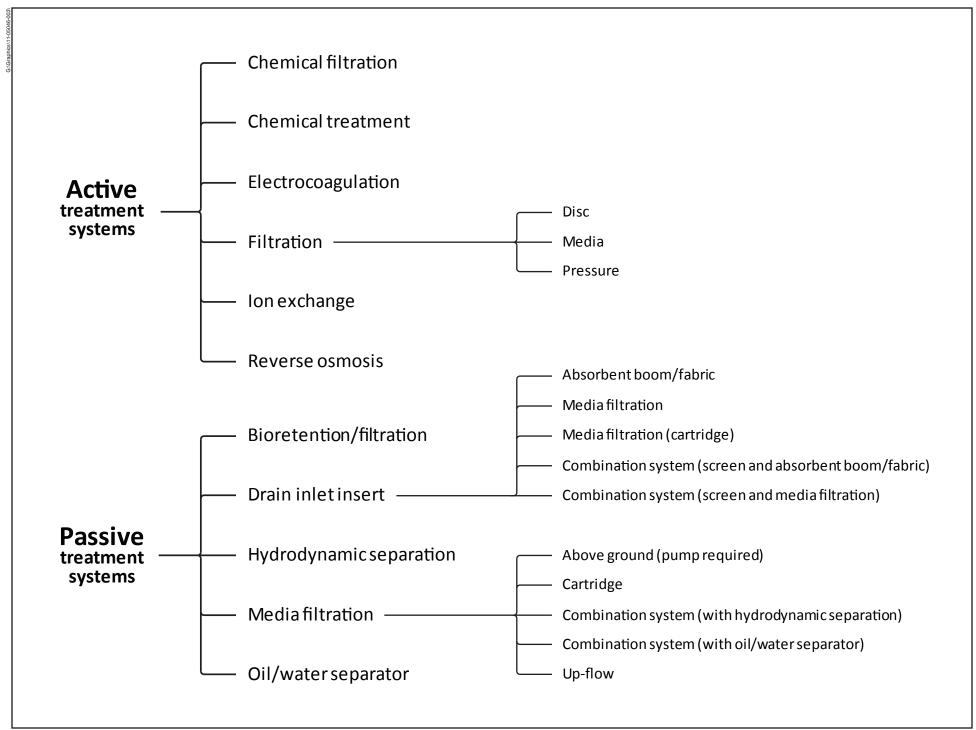


Figure 1. Treatment type categories for active and passive treatment systems.

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Bioretention/Filtration				
	Filterra® Curb Inlet System	Filterra, DBAAmericast, Inc.	www.filterra.com	877-345-1450
	Filterra® Roof Drain System	Filterra, DBAAmericast, Inc.	www.filterra.com	877-345-1450
	Modular Wetland System - Linear	Modular Wetland Systems, Inc./BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Silva Cell	DeepRoot Partners	www.deeproot.com	800 458 7668
	TREEPOD® Biofilter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	UrbanGreen BioFilter	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
Drain Inlet Insert				
Absorbent Boom/Fabric	ADsorb-It	Eco-Tec, Inc.	www.adsorb-it.com	888-668-8982
	Enviro-Drain®	Enviro-Drain, Inc.	www.enviro-drain.com	206-363-0316
	EnviroSafe <sup>TM</sup> Storm Safe HF10	Transpo Industries, Inc.	www.transpo.com	503-674-9180
	Ultra-Urban Filter™	Abtech Industries	abtechindustries.com	480-874-4000
Media Filtration	EcoVault <sup>TM</sup> Baffle Box	EcoSense International	www.ecosenseint.com	321-449-0324
	EnviroSafe <sup>TM</sup>	Transpo Industries, Inc.	www.transpo.com	503-674-9180
	HUBER Hydro Filt	Huber Technology, Inc.	www.huber-technology.com	425-392-0491
	Hydro-Kleen <sup>TM</sup>	ACF Environmental, Inc.	www.acfenvironmental.com	800-448-3636
	Raynfiltr <sup>TM</sup>	Environmental Filtration, Inc.	www.raynfiltr.org	800-333-5234
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
(1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	StormPod <sup>TM</sup>	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
	Triton Drop Inlet Insert	Revel Environmental Manufacturing, Inc./CONTECH Stormwater Solutions Inc.		800-548-4667
Combination System (Screen and Absorbent	Bio Clean Curb Inlet Basket	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
Boom/Fabric)	Bio Clean Downspout Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Flume Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Grate Inlet Skimmer Box	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Bio Clean Trench Drain Filter	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Clean Way Downspout Filtration Unit	Clean Way	www.cleanwayusa.com	800-723-1373
	DrainPac <sup>TM</sup>	United Storm Water, Inc.	www.unitedstormwater.com	877-71-STORM
	EnviroTrap Catch Basin Insert	Environment 21	www.ENV21.com	800-809-2801
	FloGard® Downspout Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® LoPro Matrix Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® LoPro Trench Drain Filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard+PLUS®	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	FloGard® Trash & Debris Guard	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	Inceptor®	Stormdrain Solutions	www.stormdrains.com	877-OUR-PIPE
	StormClean Catch Basin Insert	Clean Way	www.cleanwayusa.com	800-723-1373
	StormClean Curb Inlet Insert	Clean Way	www.cleanwayusa.com	800-723-1373
	StormClean Wall Mount Filtration Unit	Clean Way	www.cleanwayusa.com	800-723-1373
	Storm PURE <sup>TM</sup>	Nyloplast/Hancor, Inc.	www.hancor.com	253-255-6302
	SwaleGard® Pre-filter	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
Combination System (Screen and Media	Aqua-Guardian™ Catch Basin Insert	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
Filtration)	ClearWater BMP	ClearWater Solutions, Inc.	www.clearwaterbmp.com	800-758-8817
•	Coanda Curb Inlet Filter	Coanda, Inc.	www.coanda.com	714-389-2113
	Coanda Downspout Filter	Coanda, Inc.	www.coanda.com	714-389-2113

11-05046-003 Tables 1 & 2 - Passive and Active systems list.xls

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Drain Inlet Inserts (cont.)				
	RSF (Rapid Stormwater Filtration) 100	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
	RSF (Rapid Stormwater Filtration) 1000	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
	RSF (Rapid Stormwater Filtration) 4000	EcoSol Wastewater Filtration Systems	www.ecosol.com.au	+61 8 8262 2528 (Australia)
Hydrodynamic Separation	A 0 110	A 01' 11m 4 1	1 . 11.	000 244 0044
	Aqua-Swirl Concentrator	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
	BaySeparator®	BaySaver Technologies, Inc.	www.BaySaver.com	301-829-6470
	CDS™ Stormwater Treatment System	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
	Downstream Defender	Hydro International, Inc.	www.hydro-international.biz	207-756-6200
	FloGard® Dual-Vortex Hydrodynamic Separator	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	HydroGuard	Hydroworks	www.hydroworks.com	888-290-7900
	Nutrient Separating Baffle Box	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Stormceptor®	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	StormTrooper®	Park USA	www.park-usa.com	888-611-PARK
	StormTrooper® EX Extra-Duty	Park USA	www.park-usa.com	888-611-PARK
	Terre Kleen <sup>TM</sup>	Terre Hill Concrete Products	www.terrehill.com	800-242-1509
	UniScreen	Environment 21	www.ENV21.com	800-809-2801
	UniStorm	Environment 21	www.ENV21.com	800-809-2801
	V2B1 Treatment System	Environment 21	www.ENV21.com	800-809-2801
	Vortechs System	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
Media Filtration				
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	StormwateRx	www.stormwaterx.com	503-233-4660
Cartridge	BayFilter®	BaySaver Technologies, Inc.	www.BaySaver.com	301-829-6470
	EcoSense™ Stormwater Filtration Systems	EcoSense International	www.ecosenseint.com	321-449-0324
	Perk Filter™	Kristar Enterprises, Inc.	www.kristar.com	800-579-8819
	PuriStorm	Environment 21	www.ENV21.com	800-809-2801
	Sorbtive™ FILTER	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	Stormfilter using ZPG Media	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667
	StormSafe™ Helix	Fabco Industries, Inc.	www.fabco-industries.com	631-393-6024
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	Rotondo Environmental Solutions, LLC	www.rotondo-es.com	703-212-4830
	Underground Sandfilter (DC Sandfilter)	Rotondo Environmental Solutions, LLC	www.rotondo-es.com	703-212-4830
Combination System	Aqua-Filter System	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
(with Hydrodynamic Separation)	Go-Filter	AquaShieldTM, Inc.	www.aquashieldinc.com	888-344-9044
Combination System	CrystolCombo Hybrid P-U-1	CarretalStroom Technologies	http://ow.otolotus-us-	900 749 6045
Combination System	CrystalCombo Hybrid Polisher	CrystalStream Technologies	http://crystalstream.com	800-748-6945
(with Oil/Water Separator)	HydroFilter	Hydroworks	www.hydroworks.com	888-290-7900
Up-Flow	Bio Clean Water Polisher	BioClean Environmental Services, Inc.	www.biocleanenvironmental.com	760-433-7640
	Jellyfish™ Filter	Imbrium Systems Corp	www.imbriumsystems.com	503-706-6193
	Up-Flo™ Filter	Hydro International, Inc.	www.hydro-international.biz	207-756-6200

11-05046-003 Tables 1 & 2 - Passive and Active systems list.xls

Table 1. Passive treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Oil/Water Separator				
	ADS® Water Quality Unit	Advanced Drainage Systems, Inc	www.adspipe.com	800-821-6710
	BioSTORM	Bio-Microbics, Inc.	www.biomicrobics.com	800-753-3278
	Clara® Gravity Stormwater Separator Vault	StormwateRx	www.stormwaterx.com	503-233-4660
	CrystalClean Separator	CrystalStream Technologies	http://crystalstream.com	800-748-6945
	ecoLine A®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoLine B®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoSep®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	ecoTop®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	www.watertectonics.com	866-402-2298
	First Flush 1640FF	ABT, Inc.	www.abtdrains.com	800-438-6057
	Hancor Storm Water Quality Unit	Hancor, Inc.	www.hancor.com	253-255-6302
	Kleerwater <sup>TM</sup>	Brown-Minneapolis Tank Co./Kleerwater Technologies, LLC	www.kleerwater.net	800-999-TANK (8265)
	PSI Separator	PSI International, Inc.	www.psinternational.com	605-332-1885
	SNOUT®	Nyloplast/Hancor, Inc.	www.hancor.com	253-255-6302
	VortClarex	CONTECH Stormwater Solutions Inc.	www.contech-cpi.com	800-548-4667

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Table 2. Active treatment systems that could be used to treat industrial stormwater in the Lower Duwamish basin.

Treatment Type	Treatment System Name	Manufacturer/Vendor Name	Website	Contact Phone No.
Chemical Filtration				
	Baker Tank with Sand Filter	BakerCorp	www.bakercorp.com	425-347-8811
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	Clear Creek Systems	www.clearcreeksystems.com	661-979-2525
	Purus® Stormwater Polishing System	StormwateRx	www.stormwaterx.com	503-233-4660
Chemical Treatment				
	ACISTBox® pHATBox® Wetsep	Water Tectonics, Inc. Water Tectonics, Inc. Waste & Environmental Technologies Ltd.	www.watertectonics.com www.watertectonics.com http://wetsep.com	866-402-2298 866-402-2298 (65) 64560040
Electrocoagulation				
	High-Flo Electrocoagulation OilTrap ElectroPulse Water Treatment System	Kaselco OilTrap Environmental	www.kaselco.com www.oiltrap.com	361-594-3327 360-943-6495
	Redbox WaveIonics <sup>TM</sup>	Morselt Borne BV Water Tectonics, Inc.	www.morselt.com www.watertectonics.com	317-449-0324 866-402-2298
Filtration				
Disc	Arkal Filter (Spin Klin System)	Arkal Filtration Systems/PEP (U.S. Distributor)	www.arkal-filters.com	(972)-4-6775140 (Israel)
Media	Fuzzy Filter	Schreiber		
ivicuia	WaterTrak Pressurized Media Filter WaterTrak Ultrafiltration	Aquatech Aquatech	www.aquatech.com www.aquatech.com	724-746-5300 724-746-5300
Pressure	Arkal Media Filter	Arkal Filtration Systems/PEP (U.S. Distributor)	www.arkal-filters.com	(972)-4-6775140 (Israel)
Ion Exchange				
6	Wastewater Ion Exchange System (WWIX)	Siemens Water Technologies Inc.	www.siemens.com	860-593-2063
	WaterTrak Ion Exchange	Aquatech	www.aquatech.com	724-746-5300
Reverse Osmosis				
	WaterTrak Reverse Osmosis	Aquatech	www.aquatech.com	724-746-5300

Table 3. Treatment removal performance for total metals.

			Total Coppe	er		Total Lead			Total Zinc		
		Median	Median		Median	Median		Median	Median		1
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	<b>Effluent</b>	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Passive Treatment Technologies		•		•							
Bioretention/Filtration											
	Filterra® Curb Inlet System	0.0081	0.0034	54%	NA	NA	NA	0.384	0.102	56%	
	Filterra® Roof Drain System	0.0081	0.0034	54%	NA	NA	NA	0.384	0.102	56%	
	Modular Wetland System - Linear	0.04	NA	>50%	NA	NA	NA	0.24	NA	>79%	
	Silva Cell	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert											
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration	EcoVault <sup>TM</sup> Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	NA	NA	NA	0.018	0.0049	73%	0.335	0.175	48%	
ritedia i madion (Cartinage)	StormPod <sup>TM</sup>	NA	NA	NA	0.018	0.0049	73%	0.335	0.175	48%	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System (Source and Absorbant	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	24.3	10.4	79%	Units reported by vendor appear to be anomalous
Combination System (Screen and Absorbent Boom/Fabric)	Bio Clean Downspout Filter	NA NA	NA	76%	NA NA	NA NA	96%	NA	NA	69%	Chits reported by vehicor appear to be anomalous
Boolivi dolle)	Bio Clean Flume Filter	NA NA	NA	NA	NA	NA	17%	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	1.9	0.1	95%	1.5	0.2	87%	13.7	0.73	95%	Units reported by vendor appear to be anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	Cints reported by vendor appear to be unormatous
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	DrainPac <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	0.08	0.07	9%	0.79	0.68	14%	0.3	0.24	20%	Testing is not complete for metals; therefore, these values are estimated.
	FloGard® Downspout Filter	NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard® LoPro Matrix Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	10	6	60%	Units reported by vendor appear to be anomalous  Units reported by vendor appear to be anomalous
	FloGard® LoPro Trench Drain Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard+PLUS®	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	10	6	60%	Units reported by vendor appear to be anomalous
	FloGard® Trash & Debris Guard	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA	NA	NA	Topoted of vendor appear to be anomalous
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURE <sup>TM</sup>	ND ND	ND	ND	ND ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	NA NA	NA	NA	NA	NA	NA	10	6	60%	Units reported by vendor appear to be anomalous
			•			•		-	-		

			Total Coppe	r		Total Lead	l		Total Zinc		
		Median	Median		Median	Median		Median	Median		
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Drain Inlet Insert (continued)											
Combination System (Screen and Media	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Filtration)	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	48	15	69%	Units reported by vendor appear to be anomalous
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	48	15	69%	Units reported by vendor appear to be anomalous
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
II. 1 1											
Hydrodynamic Separation	A 01:11 A 0 :10 4 4	NT A	NT A	NIA	NIA	NIA	NT A	NT A	NT A	NT A	
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	CDS™ Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Downstream Defender	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA NA	NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	HydroGuard	NA 0.017	NA	NA	NA	NA	NA	NA	NA	NA	
	Nutrient Separating Baffle Box	0.017	0.01	41%	0.014	0.0065	54%	0.088	0.038	57%	
	Stormceptor®	NA	NA	NA	NA ND	NA	NA	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	Tasting is not complete for metals, therefore, these values or
	UniScreen	0.08	0.06	20%	0.79	0.56	27%	0.3	0.18	40%	Testing is not complete for metals; therefore, these values are estimated.
		0.00	0.00	20%	0.75	0.50	2170	0.5	0.10	40 //	Testing is not complete for metals; therefore, these values are
	UniStorm	0.08	0.06	20%	0.79	0.56	27%	0.3	0.18	40%	estimated.
											Testing is not complete for metals; therefore, these values are
	V2B1 Treatment System	0.08	0.05	40%	0.79	0.35	55%	0.5	0.09		estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration											
	Aguin@ Enhanged Stammyutan Filtration System	0.152	0.008	94%	0.02	0.006	79%	0.425	0.061	85%	
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	0.152	0.008	94%	0.03	0.006	19%	0.425	0.061	83%	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
-	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Perk Filter <sup>TM</sup>	0.052	0.02	62%	0.15	0.05	68%	0.25	0.1	61%	
	D; C4										Testing is not complete for metals; therefore, these values are
	PuriStorm	0.08	0.04	50%	0.79	0.28	65%	0.5	0.06	80%	estimated.
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	0.04	0.03	47%	0.12	0.04	24%	0.23	0.13	62%	
	StormSafe <sup>TM</sup> Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	
C 151	D ' ( C ICI (D I C ICI )	NID	NID	NID	NID	NID	NID	NID	NID	NID	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	0.019	0.009	53%	0.005	0.002	60%	0.17	0.073	57%	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	NA	NA	NA	NA	NA	NA	NA	NA	NA	
•	Jellyfish <sup>TM</sup> Filter	78	0.3	99%	35	5	86%	1.45	0.6		Zinc concentrations are in mg/L.
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	,

		Total Copper			Total Lead			Total Zinc			
		Median	Median	, <u> </u>	Median	Median	•	Median	Median		
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Oil/Water Separator	·		_								
	ADS® Water Quality Unit	ND	ND	74%	ND	ND	74%	ND	ND	74%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	0.516	0.078	29.5	0.088	0.072	25.8	2.82	1.21	32	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Kleerwater <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	VOICIAICA	IVA.	IVA	IVA	NA	IVA	NA	IVA.	IVA	MA	
Active Treatment Technologies											
Chemical Filtration											
	Baker Tank with Sand Filter	150	75	50%	500	200	40%	2500	1000	50%	Units reported by vendor appear to be anomalous
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	0.28	0.083	86%	
					2.22						
Chemical Treatment											
	ACISTBox®	0.341	0.0179	95	0.25	0.05	80	2.12	1.04	51	
	pHATBox®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Wetsep	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Electrocoagulation											
	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	12.1	0.072	99.4%	14.1	0.039	99.7%	151	0.34	99.9%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaveIonics <sup>TM</sup>	4.8	0.0074	100%	0.253	0.003	99%	0.516	0.0315	94%	
Filtration											
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	99.9%	Information obtained from product literature
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	99.9%	Information obtained from product literature
i ressure	AMRAI MICHIA I INCI	עעו	ND	ND	עא	שא	ND	עאו	עאו	99.970	information obtained from product interactive
Ion Exchange											
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	ND	ND	ND	
				1,2		1,2			1,2		
Reverse Osmosis											
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

Table 4. Treatment removal performance for dissolved metals.

		]	Dissolved Cop	per		Dissolved Le	ad		Dissolved Zi	nc	
		Median	Median	•	Median	Median		Median	Median		
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	<b>Effluent</b>	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Passive Treatment Technologies				_							
Bioretention/Filtration											
	Filterra® Curb Inlet System	0.0056	0.0033	44%	NA	NA	NA	0.194	0.082	54%	
	Filterra® Roof Drain System	0.0056	0.0033	44%	NA	NA	NA	0.194	0.082	54%	
	Modular Wetland System - Linear	0.757	0.0552	93%	0.543	0.1	81%	0.95	0.185	80%	
	Silva Cell	NA	NA	90%	NA	NA	NA	NA	NA	90%	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert											
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	
1	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr™	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Wiedia i initation (Cartildge)	StormPod <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Die Class Cook Inlet Deslet	NIA	NIA	NIA	NIA	NIA	NIA	NTA	NIA	NI A	
Combination System (Screen and Absorbent	Bio Clean Curb Inlet Basket	NA NA	NA	NA	NA	NA	NA NA	NA NA	NA	NA	
Boom/Fabric)	Bio Clean Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Flume Filter	NA NA	NA	NA	NA	NA	NA NA	NA NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box Bio Clean Trench Drain Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	Clean Way Downspout Filtration Unit	ND ND	NA ND	NA ND	ND	NA ND	NA ND	NA ND	NA ND	ND	
	DrainPac <sup>TM</sup>	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	
	EnviroTrap Catch Basin Insert	NA NA	NA NA	NA NA	NA NA	NA NA	ND NA	NA NA	NA NA	NA NA	
	FloGard® Downspout Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	FloGard® LoPro Matrix Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	FloGard® LoPro Trench Drain Filter	NA NA	NA NA	NA NA	NA NA	NA	NA NA	NA NA	NA	NA NA	
	FloGard+PLUS®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Trash & Debris Guard	NA NA	NA NA	NA NA	NA NA	NA	NA NA	NA NA	NA	NA NA	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURE <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SwaleGard® Pre-filter	NA NA	NA	NA	NA	NA	NA	NA	NA	NA	
		1771	- 111 1	2123			7 17 7		- 11.1	2,72	

			Dissolved Cop	ner		Dissolved Lea	ad		Dissolved Zin	nc	
		Median	Median	PC-	Median	Median		Median	Median		1
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Drain Inlet Insert (cont)	·	, j	<u> </u>	` '	<u> </u>	<u> </u>	<u>`</u>	, 0,		`	
Combination System (Screen and Media	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Filtration)	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation											
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
l l	BaySeparator®	ND	ND	42%	ND	ND	ND	ND	ND	38%	Information obtained from product literature
l l	CDS <sup>TM</sup> Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	_
l l	Downstream Defender	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Stormceptor®	NA	NA	28%	NA	NA	42%	NA	NA	35%	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	UniScreen	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UniStorm	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	V2B1 Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
								- 1			
Media Filtration Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	0.084	0.006	93%	0.008	0.007	51%	0.196	0.06	73%	
risove ground (pump required)	Aquipo Eminica storminator i munto o System	0.001		7570		0.007	3170	0.170			
Cartridge	BayFilter®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Perk Filter <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PuriStorm	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	0.0046	0.0042	11%	NA	NA	NA	0.060	0.053	15%	
	StormSafe™ Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA	NA	NA	NA	NA	NA	0.066	0.042	36%	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	0.57	0.12	79%	0.38	0.01	98%	0.75	0.16	78%	
	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	

		Γ	Dissolved Cop	per		Dissolved Lea	ad		Dissolved Zin	1C	
		Median	Median		Median	Median		Median	Median		1
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Oil/Water Separator											
	ADS® Water Quality Unit	ND	ND	74%	ND	ND	74%	ND	ND	74%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Kleerwater <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies		<u> </u>									<u> </u>
Chemical Filtration											
	Baker Tank with Sand Filter	20	10	50%	40	20	50%	400	40	90%	Units reported by vendor appear to be anomalous
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	0.06	0.0074	88%	
Chemical Treatment											
	ACISTBox®	NA	NA	NA	NA	NA	NA	0.817	0.744	9%	
	pHATBox®	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Wetsep	0.007	0.001	86%	0.018	< 0.001	94%	NA	NA	NA	Zinc concentrations are in mg/L.
Electrocoagulation											
8	High-Flo Electrocoagulation	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	8.2	0.072	99%	10.9	0.039	100%	78.6	0.34	99.9%	
	Redbox	NA	NA	99%	NA	NA	99%	NA	NA	99%	
	WaveIonics <sup>TM</sup>	0.0235	0.005	79%	0.0157	0.0031	80%	0.12	0.02	83%	
Filtration											
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	( <b>-</b> F)		- 12-	- 1,2	2	- 12	_ ,	- 1.2	- 12	- 1.25	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Ion Exchange											
- Lacining	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND ND	ND	ND ND	ND ND	ND	ND	ND ND	ND ND	ND ND	
D											
Reverse Osmosis	W. T. I. D. O.	NE	M	175	ME	MD	1775	) T	) In	177	
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

Table 5. Treatment removal performance for total suspended solids.

		Total S	uspended Sol	ida (TCC)	
		Median	Median	ius (133)	
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Passive Treatment Technologies	11040110110 5750011141110	(111g/12)	(1118/12)	1101110 ( 111 ( 110 )	110005
Bioretention/Filtration					
	Filterra® Curb Inlet System	27.5	4.2	85%	
	Filterra® Roof Drain System	27.5	4.2	85%	
	Modular Wetland System – Linear	270	3	98%	
	Silva Cell	NA	NA	80%	
	TREEPOD® Biofilter	NA NA	NA	NA	
	UrbanGreen BioFilter	NA NA	NA NA	NA NA	
	OroanGreen Bioriner	NA	INA	NA	
Drain Inlet Insert					
Absorbent Boom/Fabric	ADsorb-It	V	V	80-99%	
A COSOTOCIIL BOOTINT ADTIC	Enviro-Drain®	ND	ND	ND	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND ND	ND	ND	
	Ultra-Urban Filter <sup>TM</sup>	NA	NA	80%	mm range.
Media Filtration	EcoVault <sup>TM</sup> Baffle Box	NA	NA	NA	
	EnviroSafe <sup>TM</sup>	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	
	Raynfiltr <sup>TM</sup>	NA	NA	NA	
	Rayiiiiii	INA	INA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	112	3	98%	
	$StormPod^{TM}$	112	3	98%	
	Triton Drop Inlet Insert	NA	NA	NA	
Combination System (Screen and Absorben	t Die Clean Cook Inlet Darket	NIA	NIA	020/*	*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90
Boom/Fabric)	Bio Clean Curb Inlet Basket	NA	NA	93%*	Sand gradation was used for the testing.
					*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90
	Bio Clean Downspout Filter	NA	NA	93%*	Sand gradation was used for the testing.
	Bio Clean Flume Filter	73	51.6	29%	
	Bio Clean Grate Inlet Skimmer Box	978	329	66%	Units reported by vendor appear to be anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	This reported by vendor appear to be anomalous
	Clean Way Downspout Filtration Unit	ND	ND	ND	
	DrainPac <sup>TM</sup>	ND ND	ND ND	ND ND	
	Drainf ac ····	ND	ND	ND	
	EnviroTrap Catch Basin Insert	250	175	30%	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with
	Zarrae Trup Curent Zusan Insert		1,0	2070	a d50 of 180 microns was used.
	FloGard® Downspout Filter	100	20	80%	
	FloGard® LoPro Matrix Filter	100	20	80%	
	FloGard® LoPro Trench Drain Filter	100	20	80%	
	FloGard+PLUS®	100	20	80%	
	FloGard® Trash & Debris Guard	NA	NA	NA	
	Inceptor®	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	
	StormClean Curb Inlet Insert	ND ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND ND	ND ND	ND ND	
	Storm PURE <sup>TM</sup>	ND ND	ND ND	ND ND	
		100	ND 20	ND 80%	
	SwaleGard® Pre-filter	100	20	ðU%	
Combination System (Screen and Media	Aqua-Guardian <sup>TM</sup> Catch Basin Insert	43	5	80%	
Filtration)	ClearWater BMP	ND	ND	ND	

		Total S	Suspended Sol	ids (TSS)	
		Median	Median		
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Drain Inlet Insert (cont.)		4.700		0~	
Combination System (Screen and Media	Coanda Curb Inlet Filter	1,500	1,376	8%	Units reported by vendor appear to be anomalous
Filtration)	Coanda Downspout Filter	1,500	1,376	8%	Units reported by vendor appear to be anomalous
	RSF (Rapid Stormwater Filtration) 100	ND	ND	65%	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	49%	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	91%	Information obtained from product literature
Hydrodynamic Separation					
-	Aqua Shield Aqua-Swirl Concentrator	137	12	86%	
	BaySeparator®	ND	ND	80%	Information obtained from product literature
	CDS <sup>TM</sup> Stormwater Treatment System	154	26	95%	
	Downstream Defender	ND	ND	50%	Information obtained from product literature
	FloGard® Dual-Vortex Hydrodynamic Separator	202	80	60%	
	HydroGuard	ND	ND	70%	Information obtained from product literature
	Nutrient Separating Baffle Box	366	48	87%	Information obtained from product merature
	Stormceptor®	159	59	53%	
	StormTrooper®	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND ND	ND ND	ND ND	
	Terre Kleen <sup>TM</sup>	ND ND	ND ND	78%	Information obtained from product literature
	Terre Riceri	ND	ND	7670	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with
	UniScreen	250	175	80%	a d50 of 110 microns was used.
		200	1,0	0070	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with
	UniStorm	250	175	80%	a d50 of 110 microns was used.
	V2B1 Treatment System	ND	ND	63.8%	Information obtained from product literature
	Vortechs System	108	28	93%	
3.5 11 TO 11					
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	30	3.39	83%	
Cartridge	BayFilter®	ND	ND	80%	Information obtained from product literature
Cartridge	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	information obtained from product incrature
	Perk Filter <sup>TM</sup>	70	11	82%	
		, ,	11	0276	The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with
	PuriStorm	250	175	80%	a d50 of 60 microns was used.
	Sorbtive™ FILTER	ND	ND	84%	Information obtained from product literature
	Stormfilter using ZPG Media	83	23	82%	
	StormSafe™ Helix	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	43	5	80%	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	200	26	87%	
	Go-Filter	NA	NA	NA	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	
(with Oil/Water Separator)	CrystalCombo Hybrid Polisher HydroFilter	ND ND	ND ND	ND ND	
(with Oil Water Separator)	TrydioFile	שא	ND	ND	
Up-Flow	Bio Clean Water Polisher	84.6	12.4	85%	
	Jellyfish <sup>TM</sup> Filter	74	8	89%	
	Up-Flo™ Filter	ND	ND	91%	Information obtained from product literature
	1			2 - 70	

		Total S	uspended Soli	ide (TSS)	
		Median	Median	ius (133)	
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Oil/Water Separator	·	, g	<u>, , , , , , , , , , , , , , , , , , , </u>	· · ·	
	ADS® Water Quality Unit	ND	ND	80%	Information obtained from product literature
	BioSTORM	227	7.9	95.3%	
	Clara® Gravity Stormwater Separator Vault	284.5	173.5	47%	
	CrystalClean Separator	ND	ND	ND	
	ecoLine A®	NA	NA	NA	
	ecoLine B®	NA	NA	NA	
	ecoSep®	ND	ND	ND	
	ecoTop®	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	
	Kleerwater <sup>TM</sup>	NA	NA	NA	
	PSI Separator	ND	ND	ND	
	SNOUT®	ND	ND	ND	
	VortClarex	NA	NA	NA	
Active Treatment Technologies		•			
Chemical Filtration					
	Baker Tank with Sand Filter	200	10	95%	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	
Chemical Treatment					
Chemical Treatment	ACISTBox®	NA	NA	NA	
	pHATBox®	NA NA	NA NA	NA NA	
	Wetsep	112	<2	98%	
	weisep	112	<b>\</b> 2	90 %	
Electrocoagulation					
	High-Flo Electrocoagulation	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	600	10	98%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	99%	**
	WaveIonics <sup>TM</sup>	200	5	98%	
Filtration					
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	
Media	Fuzzy Filter	10	2	70-95%	
	WaterTrak Pressurized Media Filter	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	
Reverse Osmosis					
increise Osinosis	WaterTrak Reverse Osmosis	ND	ND	ND	
	11 arci itak ikevetse Oshiosis	ND	עוו	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

V = varies

Table 6. Treatment removal performance for total petroleum hydrocarbons and oil and grease.

			TPH Oil and Grease				ase			
		Median	Median		Median	Median		†		
		Influent	Effluent	Median	Influent	Effluent	Median			
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes		
Passive Treatment Technologies										
Bioretention/Filtration										
	Filterra® Curb Inlet System	43.4	1.2	97%	6.2	5.0 U	>18%			
	Filterra® Roof Drain System	43.4	1.2	97%	6.2	5.0 U	>18%			
	Modular Wetland System – Linear	19	0	>99%	4	U	>99%			
	Silva Cell	NA	NA	NA	NA	NA	NA			
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA			
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA			
Drain Inlet Insert										
Absorbent Boom/Fabric	ADsorb-It	V	V	99-100%	V	V	99-100%			
ı	Enviro-Drain®	ND	ND	ND	ND	ND	ND			
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND	ND	ND	ND	ND	ND			
	Ultra-Urban Filter <sup>TM</sup>	>100	<10	90%	>100	<10	85%			
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	NA	NA	NA			
	EnviroSafe <sup>TM</sup>	ND	ND	ND	ND	ND	ND			
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND			
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND			
	Raynfiltr <sup>TM</sup>	NA	NA	NA	NA	NA	NA			
	Nayiiitu	1471	1471	1471	1471	1471	1171			
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	NA	NA	NA	59.5	<5	>90%			
	StormPod <sup>TM</sup>	NA	NA	NA	59.5	<5	>90%			
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA			
Combination System (Screen and Absorbent	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA			
Boom/Fabric)	Bio Clean Downspout Filter	NA	NA	NA	223.5	29.5	87%	Units reported by vendor appear to be anomalous		
	Bio Clean Flume Filter	223	29.5	87%	360	62	83%	Units reported by vendor appear to be anomalous		
	Bio Clean Grate Inlet Skimmer Box	NA	NA	NA	189	10.43	95%	Units reported by vendor appear to be anomalous		
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA			
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND			
	DrainPac <sup>TM</sup>	ND	ND	ND	ND	ND	ND			
	EnviroTrap Catch Basin Insert	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product,		
								accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of		
	FloGard® Downspout Filter	35	7	80%	35	7	80%	0.89 are used. The removal efficiencies are estimated.		
	FloGard® LoPro Matrix Filter	35	7	80%	35	7	80%			
	FloGard® LoPro Trench Drain Filter	35	7	80%	35	7	80%			
	FloGard+PLUS®	35	7	80%	35	7	80%			
	FloGard® Trash & Debris Guard	NA	NA	NA	NA	NA	NA			
	Inceptor®	ND	ND	ND	ND	ND	ND			
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND			
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND			
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND			
	Storm PURE <sup>TM</sup>	ND	ND	ND	ND	ND	ND			
	SwaleGard® Pre-filter	35	7	80%	35	7	80%			
			,	2070		,	3070			

			ТРН			Oil and Grea	ase	
		Median	Median		Median	Median		1
		Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Drain Inlet Insert (cont)								
Combination System (Screen and Media	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	NA	NA	NA	
Filtration)	ClearWater BMP	NA	NA	NA	NA	NA	NA	
	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	
	Coanda Downspout Filter	NA	NA	NA	NA	NA	NA	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	
	Total (Taple Stormwater Financia) 1000	1,12		11,12	112		112	
Hydrodynamic Separation								
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	CDS <sup>TM</sup> Stormwater Treatment System	NA	NA	NA	22	5	64%	
	Downstream Defender	NA	NA	NA	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	4	ND	>99%	
	Stormceptor®	29	4	73%	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	
	UniScreen	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product
	Olligereen	400	130	03 70	400	130	03 70	accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	UniStorm	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of
								0.89 are used. The removal efficiencies are estimated.
	V2B1 Treatment System	400	150	63%	400	150	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product
	V2B1 Heatment System	400	130	0370	400	130	03%	accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of
								0.89 are used. The removal efficiencies are estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	0.69 are used. The removal efficiencies are estimated.
	Volteens bystem	1111	1471	1121	1171	1171	1171	
Media Filtration						_		
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	9.9	3	70%	
Cartridge	BayFilter®	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	The common common nom product morning
	Perk Filter <sup>TM</sup>	20	5	75%	20	5	75%	
	PuriStorm	400	80	80%	400	80	80%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product
	Turistoriii	400	00	00 70	400	00	30 %	accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	0.09 are used. The removal efficiencies are estimated.
	Stormfilter using ZPG Media	NA NA	NA	NA	NA	NA	NA	
	StormSafe <sup>TM</sup> Helix	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA NA	NA	NA NA	NA NA	NA	NA NA	
C	Go-Filter	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	GO I IIIOI	IVA.	11/1	11/1	14/1	11/1	11/1	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	1.4	0	>99%	69.8	6.5	91%	
	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	
	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	

		1	ТРН			Oil and Grea	950	
		Median	Median		Median	Median	isc	
		Influent	Effluent	Median	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	Notes
Oil/Water Separator			<u> </u>		· • /	<u> </u>		
•	ADS® Water Quality Unit	ND	ND	ND	ND	ND	80%	Information obtained from product literature
	BioSTORM	NA	NA	NA	NA	NA	NA	·
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	
	ecoLine A®	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	
	ecoSep®	ND	ND	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	ND	ND	
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	
	Kleerwater <sup>TM</sup>	NA NA	NA	NA NA	NA	NA	NA	
	PSI Separator	ND	NA ND	NA ND	NA ND	NA ND	NA ND	
	SNOUT®	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	
	VortClarex	NA NA					ND NA	
	Voriciarex	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies								
Chemical Filtration								
	Baker Tank with Sand Filter	NA	NA	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear™	NA	NA	NA	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	
		·		·	·			
Chemical Treatment								
	ACISTBox®	3.12	0.38	88%	NA	NA	NA	
	pHATBox®	NA	NA	NA	NA	NA	NA	
	Wetsep	NA	NA	NA	NA	NA	NA	
Electrocoagulation		3.7.		27.	3.7.1	27.		
	High-Flo Electrocoagulation	NA 50	NA	NA	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	78	0.27	100%	136	<5.0	>96.3%	Units reported by vendor appear to be anomalous
	Redbox	NA	NA	NA	NA	NA	NA	
	WaveIonics <sup>TM</sup>	45.6	0.25	99%	197	4.76	98%	Units reported by vendor appear to be anomalous
Filtration								
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	
	That I not (opin thin obscin)	110	110	110	110	1110	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	
Ion Exchange								
TOH Exchange	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	
		NA ND	NA ND		NA ND	NA ND	NA ND	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	
Reverse Osmosis								
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	
				- :=		= :=		

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

TPH = Total Petroleum Hydrocarbons

U = at or below detection limit

V = varies

 $\label{thm:continuous} \textbf{Table 7. Treatment removal performance for total phosphorus.}$ 

		Tot	al Phosphorus	s (TP)	
		Median	Median		
m m	T	Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Passive Treatment Technologies					
Bioretention/Filtration		0.15	0.14	50	T. T. D
	Filterra® Curb Inlet System	0.15	0.14	7%	during TAPE study. 69.5% efficiency ratio
	Filterra® Roof Drain System	0.15	0.14	7%	during TAPE study. 69.5% efficiency ratio
	Modular Wetland System – Linear	NA	NA	NA	
	Silva Cell	NA	NA	68%	
	TREEPOD® Biofilter	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	
Drain Inlet Insert					
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	
	Enviro-Drain®	NA	NA	NA	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	NA	NA	NA	
	Ultra-Urban Filter™	NA	NA	NA	
Media Filtration	EcoVault™ Baffle Box	NA	NA	NA	
	EnviroSafe <sup>TM</sup>	NA	NA	NA	
	HUBER Hydro Filt	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	
	Raynfiltr <sup>TM</sup>	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	0.57	0.3	47%	
	StormPod <sup>TM</sup>	0.57	0.3	47%	
	Triton Drop Inlet Insert	NA	NA	NA	
Combination System (Screen and	Bio Clean Curb Inlet Basket	85.8	73.4	71-96%	anomalous
Absorbent Boom/Fabric)	Bio Clean Downspout Filter	NA	NA	NA	
	Bio Clean Flume Filter	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	18.6	0.452	98%	anomalous
	Bio Clean Trench Drain Filter	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	
	DrainPac <sup>TM</sup>	ND	ND	ND	
	EnviroTrap Catch Basin Insert	ND	ND	ND	

		Total	al Phosphorus	s (TP)	
		Median	Median		
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Drain Inlet Insert (cont.)					
	FloGard® Downspout Filter	NA	NA	NA	
	FloGard® LoPro Matrix Filter	NA	NA	NA	
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	
	FloGard+PLUS®	NA	NA	NA	
	FloGard® Trash & Debris Guard	NA	NA	NA	
	Inceptor®	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	
	Storm PURE <sup>TM</sup>	ND	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	
Combination System (Screen and Media	Aqua-Guardian™ Catch Basin Insert	NA	NA	NA	
Filtration)	ClearWater BMP	ND	ND	ND	
	Coanda Curb Inlet Filter	NA	NA	NA	
Combination System (Screen and Media	Coanda Downspout Filter	NA	NA	NA	
Filtration)	RSF (Rapid Stormwater Filtration) 100	NA	NA	40%	
	RSF (Rapid Stormwater Filtration) 1000	NA	NA	30%	
	RSF (Rapid Stormwater Filtration) 4000	NA	NA	30%	
Hydrodynamic Separation					
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	80%	
	BaySeparator®	NA	NA	19.4%	
	CDS <sup>TM</sup> Stormwater Treatment System	NA	NA	NA	
	Downstream Defender	NA	NA	NA	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	
	HydroGuard	NA	NA	NA	
	Nutrient Separating Baffle Box	1.49	0.44	70%	
	Stormceptor®	0.275	0.175	21.8%	
	StormTrooper®	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	NA	NA	NA	
	UniScreen	ND	ND	ND	
	UniStorm	ND	ND	40%	Information obtained from product literature

		Tot	al Phosphorus	s (TP)	
		Median	Median		
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Hydrodynamic Separation (cont)					
	V2B1 Treatment System	ND	ND	40%	Information obtained from product literature
	Vortechs System	NA	NA	NA	
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	
Cartridge	BayFilter®	NA	NA	>50%	
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	
	Perk Filter <sup>TM</sup>	NA	NA	NA	
	PuriStorm	ND	ND	ND	
	Sorbtive™ FILTER	ND	ND	>77%	Information obtained from product literature
	Stormfilter using ZPG Media	NA	NA	NA	
	StormSafe™ Helix	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA	NA	NA	
	Go-Filter	NA	NA	NA	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	2.07	0.63	70%	
	Jellyfish™ Filter	NA	NA	50%	
	Up-Flo™ Filter	NA	NA	NA	
Oil/Water Separator					
	ADS® Water Quality Unit	NA	NA	>43%	
	BioSTORM	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	
	CrystalClean Separator	ND	ND	ND	
	ecoLine A®	NA	NA	NA	
	ecoLine B®	NA	NA	NA	

		Tota	al Phosphorus	s (TP)	
		Median	Median		
T 4 T	T	Influent	Effluent	Median	N
Treatment Type Oil/Water Separator (cont.)	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
On water Separator (cont.)	222 5220	ND	ND	ND	
	ecoSep® ecoTop®	ND ND	ND ND	ND ND	
	First Flush 1640FF	ND NA	NA	ND NA	
		NA ND	NA ND	NA ND	
	Hancor Storm Water Quality Unit				
	Kleerwater <sup>TM</sup>	NA	NA	NA	
	PSI Separator	ND	ND	ND	
	SNOUT®	ND	ND	ND	
	VortClarex	NA	NA	NA	
Active Treatment Technologies					
Chemical Filtration					
	Baker Tank with Sand Filter	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	NA	NA	NA	
	Purus® Stormwater Polishing System	NA	NA	NA	
	ranase storm and resisting system	1,12	1,11	1,11	
Chemical Treatment					
	ACISTBox®	NA	NA	NA	
	pHATBox®	NA	NA	NA	
	Wetsep	13.4	1.9	86%	
Electrocoagulation					
Electrocougulation	High-Flo Electrocoagulation	NA	NA	NA	
	OilTrap ElectroPulse Water Treatment System	NA	NA	NA	
	Redbox	NA	NA	NA	
	WaveIonics <sup>TM</sup>	NA	NA	NA	
Filtration					
Disc	Arkal Filter (Spin Klin System)	NA	NA	NA	
Media	Fuzzy Filter	NA	NA	NA	
uvicuia	WaterTrak Pressurized Media Filter	NA ND	NA ND	NA ND	
	Water Trak Pressurized Media Filter WaterTrak Ultrafiltration	ND ND	ND ND	ND ND	
	watei Hak Oluaniuation	עאו	ND	מא	
Pressure	Arkal Media Filter	NA	NA	NA	

		Tota	al Phosphorus	s (TP)	
		Median	Median		
		Influent	Effluent	Median	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	Notes
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	
Reverse Osmosis					
	WaterTrak Reverse Osmosis	ND	ND	ND	

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

Table 8. Treatment removal performance for SVOCs, PCBs, dioxins, and CPAHs.

			SVOCs			PCBs			Dioxins				
		Median	Median		Median	Median		Median	Median		Median	Median	
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	Influent	Remova	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	l (%)	Notes
Passive Treatment Technologies		•									-		
Bioretention/Filtration													
	Filterra® Curb Inlet System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Filterra® Roof Drain System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Modular Wetland System - Linear	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Silva Cell	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	TREEPOD® Biofilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	UrbanGreen BioFilter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Drain Inlet Insert													
Absorbent Boom/Fabric	ADsorb-It	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
resorbent Boons rubite	Enviro-Drain®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Ultra-Urban Filter™	180	>4.4	40%	NA	NA	NA	NA	NA	NA	>100	605	Units reported by vendor appear to
								·				000	be anomalous
Media Filtration	EcoVault <sup>TM</sup> Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	EnviroSafe <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Raynfiltr <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
riodia i initation (Caranage)	StormPod <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Triton Drop Inlet Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	-												
Combination System (Screen and	Bio Clean Curb Inlet Basket	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Absorbent Boom/Fabric)	Bio Clean Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Flume Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Grate Inlet Skimmer Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Bio Clean Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	DrainPac <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	400	150	0.625	400	150	0.625	400	150	0.625	400	63%	Any oil based removal depends on
													the droplet size and specific gravity
													of the oil. For this product,
													accurate, analyzed data is
													unavailable; therefore a mean oil
													droplet size of 100 micron and a
													spgr of 0.89 are used. The removal
		. · ·	***	37.	***	***	***	***	***	**.	2.5		efficiencies are estimated.
	FloGard® Downspout Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	1
	FloGard® LoPro Matrix Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard® LoPro Trench Drain Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard+PLUS®	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
	FloGard® Trash & Debris Guard	NA	NA	NA ND	NA	NA	NA	NA	NA	NA	NA	NA	
	Inceptor®	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormClean Catch Basin Insert	ND	ND	ND ND	ND	ND	ND	ND ND	ND	ND ND	ND ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND ND	ND	ND	ND	ND	ND	ND ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Storm PURETM	ND NA	ND	ND NA	ND	ND	ND NA	ND NA	ND	ND NA	ND	ND	
	SwaleGard® Pre-filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	35	7%	
Combination System (Screen and Media	Aqua-Guardian <sup>TM</sup> Catch Basin Insert	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Filtration)	ClearWater BMP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
•	Coanda Curb Inlet Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	

			SVOCs			PCBs			Dioxins		CPA		
		Median	Median		Median	Median		Median	Median		Median	Median	
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	Influent	Remova	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	l (%)	Notes
Drain Inlet Insert (cont)	County Design out Filter	NIA	NTA	NT A	NIA	NIA	NT A	NIA	NT A	NIA	NT A	NT A	
	Coanda Downspout Filter RSF (Rapid Stormwater Filtration) 100	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	NA ND	
		ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND	
	RSF (Rapid Stormwater Filtration) 1000 RSF (Rapid Stormwater Filtration) 4000			ND ND	ND ND	ND ND	ND ND		ND ND	ND ND	ND ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hydrodynamic Separation													
	Aqua Shield Aqua-Swirl Concentrator	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	BaySeparator®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	CDS <sup>TM</sup> Stormwater Treatment System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Downstream Defender	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	FloGard® Dual-Vortex Hydrodynamic Separator	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	HydroGuard	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Stormceptor®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	UniScreen	400	150	63%	400	150	63%	400	150	63%	400	63%	Any oil based removal depends on
				0376			03.70			os n		03 76	the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	UniStorm	400	150	63%	400	150	63%	400	150	63%	400	63%	Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal
	V2B1 Treatment System	400	150	63%	400	150	63%	400	150	63%	400	63%	efficiencies are estimated. Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
	Vortechs System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Modio Filtuotia-													
Media Filtration	Aguin@ Enhanced Stammyraton Eilterti Senten	NT A	NT A	NI A	NT A	NI A	NI A	NT A	NT A	NIA	NT A	NT A	
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cartridge	BayFilter®	ND NA	ND	ND NA	ND NA	ND	ND NA	ND NA	ND	ND NA	ND NA	ND	
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA 20	NA	
	Perk Filter™	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	75%	Units reported by vendor appear to
													be anomalous
	PuriStorm	400	80	80%	400	80	80%	400	80	80%	400		Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

			SVOCs			PCBs			Dioxins		CPA		
		Median	Median		Median	Median		Median	Median		Median	Median	
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	Influent	Remova	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	l (%)	Notes
Cartridge (cont'd)	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	Stormfilter using ZPG Media	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.12	42%	
	StormSafe <sup>™</sup> Helix	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Sand Piner	Underground Sandfilter (DC Sandfilter)	ND ND	ND	ND	ND ND	ND	ND ND	ND	ND	ND ND	ND	ND ND	
	Chacigiouna Sunainer (De Sunainer)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Combination System	Aqua Shield Aqua-Filter System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Go-Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	C . IC I WITTEN	ND	ND	ND	NID	NID	ND	ND	ND	ND	ND	NID	
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher HydroFilter	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	ND ND	
(with Oil/ water Separator)	nydiorinei	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
.l -	Jellyfish™ Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
.	Up-Flo™ Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Oil/Water Separator													
	ADS® Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
	BioSTORM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Clara® Gravity Stormwater Separator Vault	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	CrystalClean Separator	37.4	27.4	27.4	NYA	27.4	27.4	27.4	37.4	27.4	27.4	37.4	
	ecoLine A®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoLine B®	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	ecoSep® ecoTop®												
	First Flush 1640FF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Hancor Storm Water Quality Unit	1421	1171	1471	1471	1421	1421	142 \$	147.	1471	1421	INA	
	Kleerwater <sup>TM</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	PSI Separator												
	SNOUT®												
	VortClarex	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Active Treatment Technologies Chemical Filtration													
Chemical Filtration	Baker Tank with Sand Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	NA NA	NA	NA	NA	NA	NA NA	NA	NA	NA	NA	NA NA	
	Purus® Stormwater Polishing System	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chemical Treatment	ACISTBox®	0.0199	0.00002	99.9%	NA	NA	NA	NA	NA	NA	0.00028	93%	
	pHATBox®	0.0199 NA	0.00002 NA	99.9% NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	0.00028 NA	93% NA	
	Wetsep	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	NA NA	
	5.55	1111	11/1	1 12 1		1121	1121	1111	1111	1121	1111	11/1	
Electrocoagulation													
	High-Flo Electrocoagulation	NA 20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	** **
	OilTrap ElectroPulse Water Treatment System	28	0.43	98.4%	NA	NA	NA	NA	NA	NA	NA		Units reported by vendor appear to
	Redbox WaveIonics™	NA 2.24	NA 0.00002	NA 100%	NA 0.0024	NA 0.00011	NA 05.5%	NA NA	NA NA	NA NA	NA 0.001	NA	
	wavelonics	2.34	0.00002	100%	0.0024	0.00011	95.5%	INA	INA	NA	0.091	99.98%	
Filtration													
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND ND	ND	ND	ND	ND	ND	ND	NA ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
70													
Pressure	Arkal Media Filter	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

			SVOCs			PCBs			Dioxins		CPA	Hs	
		Median	Median		Median	Median		Median	Median		Median	Median	
		Influent	Effluent	Median	Influent	Effluent	Median	Influent	Effluent	Median	Influent	Remova	
Treatment Type	Treatment System Name	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	(mg/L)	Removal (%)	(mg/L)	l (%)	Notes
Ion Exchange													
	Wastewater Ion Exchange System (WWIX)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	WaterTrak Ion Exchange	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Reverse Osmosis													
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

mg/L = milligrams per liter

NA = not available; vendor filled out treatment system questionnaire, but did not provide all data

ND = no data; vendor did not fill out treatment system questionnaire

PCBs = polychlorinated biphenyls

SVOCs = semivolatile organic compounds

Table 9. System design information for passive treatment systems.

		Design Flov	Rate (gpm)	System Fo	otprint (sf)	Required Hea	ad Loss (feet)	Internal or External	<b>Above or Below</b>	
Treatment Type	Treatment System Name	Low	High	Low	High	Low	High	Bypass	Grade	Bypass Notes
Bioretention/Filtration										
	Filterra® Roofdrain System	8.5	>50	16	72	2.5	2.5	Internal/External	Both	System footprint obtained from Western Washington
	Therras Rootaram System	0.5	250	10	72	2.3	2.3	mena/Lxena	Dom	Engineering Design Assistance Kit
	Filterra® System	8.5	>50	16	72	2.5	2.5	Internal/External	Both	System footprint obtained from Western Washington
	•									Engineering Design Assistance Kit
	Modular Wetland System – Linear	22.4	120	16	84	2	4	Internal	Both	External bypass in some situations
	Silva Cell	20 in/hr	3 in/hr	NA	NA	NA	NA	Internal/External	Below	
	TREEPOD® Biofilter UrbanGreen BioFilter	16	72	24	84 0	0 3	0.5	Internal	Both	
	UrbanGreen BioFiller	4	60	0	U	3	6	Internal/External	Below	
Drain Inlet Insert										
Absorbent Boom/Fabric	Adsorb-It	80/SF	100/SF	V	V	NA	NA	NA	Below	Per individual application
Absorbent Boom/1 abric	Enviro-Drain®	2	71	0	0	NA NA	NA NA	NA NA	Below	Information obtained from product literature
	Enviro-Braines Enviro-Braines Enviro-Braines Enviro-Braines	900	9000	0	0	NA	NA	External	Below	Information obtained from product literature
	Ultra-Urban Filter <sup>TM</sup>	190	500	0	0	0.5	1.5	Internal	Below	information obtained from product iterature
	Cita Cibali Filor	170	300	Ü	Ü	0.5	1.5	memai	Below	
Media Filtration	EcoVault™ Baffle Box	1,346	48,000	NA	NA	V	V	Internal/External	Below	
1120111 1 1111111011	EnviroSafe <sup>TM</sup>	115	230	0	0	NA	NA	External	Below	Information obtained from product literature
	HUBER Hydro Filt	ND	ND	0	0	ND	ND	ND	Below	product normal
	Hydro-Kleen™	ND	ND	ND	ND	ND	ND	ND	Below	
	Raynfiltr <sup>TM</sup>	0	900	0	0	NA	NA	NA	Below	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	50	2,500	4	200	1.25	2.5	Internal/External	Below	
( 2 )	StormPod <sup>TM</sup>	50	2,500	4	200	1.25	2.5	Internal/External	Below	
	Triton Drop Inlet Insert	100	5,404	0	0	NA	NA	Internal/External	Below	
Combination System (Screen and	Bio Clean Curb Inlet Basket	381	898	0	0	0.5	2	External	Below	Installed in catch basin - does not affect basin hydraulics
Absorbent Boom/Fabric)	Bio Clean Downspout Filter	249	1,145	0.31 CF	1.57 CF	1	2	Internal	Above	High flow unimpeded - UPC approved and tested
,	•	117		1		0.002		T ( 1/17 ( 1		Internal bypass up to specific flow - configured to allow for
	Bio Clean Flume Filter	116	583	1	6	0.083	0.5	Internal/External	Above	high flow external bypass
	Bio Clean Grate Inlet Skimmer Box	224	8,980	0	0	0.5	2	Internal	Below	High flow rate
	Bio Clean Trench Drain Filter	28	86	0	0	4	12	Internal/External	Below	Internal bypass up to specific flow - configured to allow for high flow external bypass
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	ND	ND	ND	Above	ingii now external oypass
	DrainPac <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	Below	
	EnviroTrap Catch Basin Insert	0	2700	NA	NA	0	0.5	NA	Below	
	FloGard® Downspout Filter	30	325	0.5	1.0	0	0.5	Internal	Above	
	FloGard® LoPro Matrix Filter	45	800	0.75	16	0	0.5	Internal	Above	
	FloGard® LoPro Trench Drain Filter	200	500	1.0	20	0	0.25	Internal	Above	
	FloGard+PLUS®	100	2,000	1.0	10	0	0.25	Internal	Above	
	FloGard® Trash & Debris Guard	50	500	0.5	4	0	0.25	Internal	Above	
	Inceptor®	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Catch Basin Insert	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	ND	ND	ND	Below	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	ND	ND	ND	Above	
	Storm PURE <sup>TM</sup>	ND	ND	ND	ND	ND	ND	ND	Below	
	SwaleGard® Pre-filter	100	800	4	16	0	0.5	Internal	Above	

		Design Flow	v Rate (gpm)	System Fo	otprint (sf)	Required He	ad Loss (feet)	Internal or External	Above or Below	
Treatment Type	Treatment System Name	Low	High	Low	High	Low	High	Bypass	Grade	Bypass Notes
Drain Inlet Insert (cont)	·		_		_			· •		
Combination System (Screen and	Aqua-Guardian™ Catch Basin Insert	5/400*	100/940*	NA	NA	0	0	Internal/External	Below	* $x/x = flow thru perlite/flow thru perlite + filter cloth$
Media Filtration)	ClearWater BMP	200	200	5	6	NA	NA	External	Above	Information obtained from product literature
	Coanda Curb Inlet Filter	50	360,000	2	2000	1.5	3	Internal	Above	Optional internal bypass is provided.
	Coanda Downspout Filter	50	360,000	2	2000	1.5	3	Internal	Above	Optional internal bypass is provided.
	RSF (Rapid Stormwater Filtration) 100	1,784	7,000	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 1000	12,000	18,162	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
	RSF (Rapid Stormwater Filtration) 4000	837	68,270	0	0	0.5	0.5	Internal	Below	Information obtained from product literature
Hydrodynamic Separation										
	Aqua Shield Aqua-Swirl Concentrator	100	2,600	NA	NA	0.25	0.25	Internal/External	Below	
	BaySeparator®	450	1,350	0	0	NA	NA	NA	Below	Information obtained from product literature
	CDS™ Stormwater Treatment System	20	44,900	NA	NA	0.1	0.1	Internal/External	Below	
	Downstream Defender	500	7,800	0	0	0.5	0.9	NA	Below	Information obtained from product literature
	FloGard® Dual-Vortex Hydrodynamic Separator	150	6,500	7	113	0	3	Internal	Below	
	HydroGuard	360	3,232	0	0	0	2	NA	Below	Information obtained from product literature
	Nutrient Separating Baffle Box	148	8,858	0	0	0	0	Internal	Below	External bypass in some situations
	Stormceptor®	0	11,000	NA	NA	0.22	0.22	Internal	Below	
	StormTrooper®	ND	ND	ND	ND	ND	ND	ND	Below	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	ND	ND	ND	Below	
	Terre Kleen <sup>TM</sup>	1.5	100	0	0	NA	NA	Internal	Below	Information obtained from product literature
	UniScreen	0	15700	20	135	0	0.5	Both	Above	
	UniStorm	0	15700	20	135	0	0.5	Both	Above	
	V2B1 Treatment System	0	63000	20	800	0	0.5	Both	Above	
	Vortechs System	50	22,450	NA	NA	0.1	0.1	Internal/External	Below	
Media Filtration										
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	10	350	14	320	4	7	External	Above	
Cartridge	BayFilter®	15	30	0	0	ND	ND	ND	Below	Information obtained from product literature
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	25	1,662	NA	NA	V	V	Internal		Hooded
	Perk Filter <sup>TM</sup>	12	1,000	10	150	1.7	3.5	Internal	Below	
	PuriStorm	0	2000	9	600	0	0.5	Both	Above	
	Sorbtive™ FILTER	ND	ND	ND	ND	ND	ND	ND	Below	
	Stormfilter using ZPG Media	2	44,900	8	6,050	1.8	12	Internal/External	Below	
	StormSafe™ Helix	3	9	160	250	0	3	Internal/External	Below	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	ND	ND	ND	Below	
	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	ND	ND	ND	Below	

		Design Flor	w Rate (gpm)	System Fo	otprint (sf)	Required Hea	d Loss (feet)	Internal or External	Above or Below	
Treatment Type	Treatment System Name	Low	High	Low	High	Low	High	Bypass	Grade	Bypass Notes
Media Filtration (cont)										
Combination System	Aqua Shield Aqua-Filter System	25	>960	NA	NA	0.8	0.8	Internal/External	Below	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	NA	180	NA	NA	0.41 (a)	NA	Internal/External	Below	Head loss based on: - Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units 360 gpm through the system, 180 gpm per filter Site specific model calibrated onsite at known flow rates Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units) Filters assumed to be at the point of required maintenance
										(twice the head loss measured for new filters).
	Go-Filter	50	675	NA	NA	0.5	0.5	Internal/External	Below	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	ND	ND	ND	Below	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	ND	ND	ND	Below	1
Up-Flow	Bio Clean Water Polisher	191	528	0	0	1	2	Internal	Below	High Flow Unimpeded
	Jellyfish™ Filter	60	2,300	12	113	1	2	Internal/External	Below	
	Up-Flo™ Filter	147	448	0	0	1.7	2.5	Internal	Below	Information obtained from product literature
Oil/Water Separator										
	ADS® Water Quality Unit	1,800	126,000	0	0	NA	NA	External	Below	
	BioSTORM	225	4,800	45	162	0.5	0.17	External	Below	
	Clara® Gravity Stormwater Separator Vault	5	1,120	0	150	0.5	1.5	Internal	Below	
	CrystalClean Separator	ND	ND	ND	ND	ND	ND	ND	Below	
	ecoLine A®	25	626	12	70	6	6	V	Below	
	ecoLine B®	50	1,110	NA	NA	6	6	V	Below	
	ecoSep®	ND	ND	ND	ND	ND	ND	ND	Below	
	ecoTop®	ND	ND	ND	ND	ND	ND	ND	Below	
	First Flush 1640FF	449	538	0	0	0	0	NA	Below	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	ND	ND	ND	Below	
	Kleerwater <sup>TM</sup>	25	10,000	NA	NA	0	0	External	Below	
	PSI Separator	ND	ND	ND	ND	ND	ND	ND	Below	
	SNOUT®	ND	ND	ND	ND	ND	ND	ND	Below	
	VortClarex	100	2,000	0	0	0.1	0.1	Internal/External	Below	

CF = cubic feet

gpm = gallons per minute

in/hr = inches per hour

NA = not available; vendor filled out Treatment System Summary form, but did not provide all data

ND = no data; vendor did not fill out Treatment System Summary form

SF = square foot

V = varies

Table 10. System design information for active treatment systems.

		Design Flo	w Rate (gpm)	System Fo	ootprint (sf)	(feet	:)	Internal or External	Above or Below	
Treatment Type	Treatment System Name	Low	High	Low	High	Low	High	Bypass	Grade	Notes
Chemical Filtration										
	Baker Tank with Sand Filter	15	>1000	1000	2500	NA	NA	NA	Above	
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	< 25	> 2,000	< 25	> 2,000	NA	NA	External	Above	Offline facility
	Purus® Stormwater Polishing System	5	210	10	90	70	120	External	Above	
Chemical Treatment										
Chemical Treatment	ACISTBox®	100	> 1,000	200	> 2,000	NA	NA	NA	Above	
	ACISTBONE	100	21,000	200	> 2,000	11/21	11/1	1471	Above	(a) Packaged in 4' -6' (w) x 2.5' (d) x 4' (t) industrial steel box w/hinged top opening lid. Additional storage space for
	pHATBox®	250	350	10	24	NA (a)	NA (a)	NA	Above	additive will depend on volume of additive storage (up to 35 gal drums in box, larger must go external) - plus secondary containment).
	Wetsep	20	260	NA	NA	40	40	External	NA	
Electrocoagulation										
_	High-Flo Electrocoagulation	2.5	> 1,200	40	4,000	2	20	External	Above	
	OilTrap ElectroPulse Water Treatment System	5	500	40	1,500	5	15	Internal/External	Above	
	Redbox	0.5	150	NA	NA	NA	NA	NA	Above	
	WaveIonics <sup>TM</sup>	50	> 1,000	200	> 4,000	NA	NA	NA	Above	
Filtration										
Disc	Arkal Filter (Spin Klin System)	100	4400	16	16	0.1	14	NA	Above	Information obtained from product literature
Media	Fuzzy Filter	70	Unlimited	NA	NA	35	35	External	Above	
	WaterTrak Pressurized Media Filter	27	905	43	119	ND	ND	ND	Above	Information obtained from product literature
	WaterTrak Ultrafiltration	38	377	31	62	ND	ND	ND	Above	Information obtained from product literature
Pressure	Arkal Media Filter	44	150	16	16	3	28	NA	Above	Information obtained from product literature
Ion Exchange										
	Wastewater Ion Exchange System (WWIX)	1	5000	NA	NA	20	20	NA	Above	
	WaterTrak Ion Exchange	23	866	65	113	ND	ND	ND	Above	Information obtained from product literature
Reverse Osmosis										
	WaterTrak Reverse Osmosis	65	275	143	243	350	350	ND	Above	Information obtained from product literature

gpm = gallons per minute

NA = not available; vendor filled out Treatment System Summary form, but did not provide all data

ND = no data; vendor did not fill out Treatment System Summary form

SF = square foot

Table 11. Installation and annual operation and maintenance costs for passive treatment systems.

		Installa	tion Cost	Annual C	0&M Cost	
Treatment Type	<b>Treatment System Name</b>	Low	High	Low	High	Notes
Bioretention/Filtration						
	Filterra® Curb Inlet System	\$1,200	\$7,500	\$300	\$3,000	
	Filterra® Roof Drain System	\$1,200	\$7,500	\$300	\$3,000	
	Modular Wetland System - Linear	\$12,000	\$25,000	\$8.26/gal	\$10.50/gal	
	Silva Cell	\$4,000-5,600	\$10,000-14,000	\$100-200	100-200	Depends on selected tree species (small or large)
	TREEPOD® Biofilter	\$10,000	\$50,000	\$400	\$750	
	UrbanGreen BioFilter	\$10,000	\$250,000	\$0.0001/gal	\$0.0003/gal	
Drain Inlet Insert						
Absorbent Boom/Fabric	ADsorb-It	\$0.91/SF	\$0.91/SF	\$0.91/SF	\$0.91/SF	
	Enviro-Drain®	ND	ND	ND	ND	
	EnviroSafe <sup>TM</sup> Storm Safe HF10	ND	ND	ND	ND	
	Ultra-Urban Filter™	\$400	\$1,700	NA	NA	
Media Filtration	EcoVault™ Baffle Box	\$25,000	\$125,000	\$200	\$1,800	
	EnviroSafe <sup>TM</sup>	ND	ND	ND	ND	
	HUBER Hydro Filt	ND	ND	ND	ND	
	Hydro-Kleen <sup>TM</sup>	ND	ND	ND	ND	
	Raynfiltr <sup>TM</sup>	\$531	\$554	NA	NA	
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>	\$750	\$2,000	\$200	\$800	
	StormPod <sup>TM</sup>	\$750	\$2,000	\$200	\$800	
	Triton Drop Inlet Insert	\$300	\$2,500	\$0.000002/gal	\$0.00008/gal	
Combination System (Screen and	Bio Clean Curb Inlet Basket	\$445	\$1,600	\$0.20/gal	\$0.40/gal	
Absorbent Boom/Fabric)	Bio Clean Downspout Filter	\$1,035	\$1,200	\$0.16/gal	\$0.22/gal	
	Bio Clean Flume Filter	\$660	\$1,302	\$0.23/gal	\$0.74/gal	
	Bio Clean Grate Inlet Skimmer Box	\$635	\$1,800	\$0.15/gal	\$0.40/gal	
	Bio Clean Trench Drain Filter	\$660	\$1,302	\$0.23/gal	\$0.74/gal	
	Clean Way Downspout Filtration Unit	ND	ND	ND	ND	
	DrainPac™	ND	ND	ND	ND	
	EnviroTrap Catch Basin Insert	\$200	\$1000	\$0	\$1000	
	FloGard® Downspout Filter	\$1,500	\$3,500	\$75	\$250	
	FloGard® LoPro Matrix Filter	\$400	\$1,000	\$75	\$300	
	FloGard® LoPro Trench Drain Filter	\$600	\$3,000	\$75	\$350	
	FloGard+PLUS®	\$250	\$1,800	\$75	\$350	
	FloGard® Trash & Debris Guard	\$450	\$1,500	\$50	\$200	
	Inceptor®	ND	ND	ND	ND	

	ı	Installa	ation Cost	Annual C	)&M Cost	
Treatment Type	Treatment System Name	Low	High	Low	High	Notes
Drain Inlet Insert (cont)						
	StormClean Catch Basin Insert	ND	ND	ND	ND	
	StormClean Curb Inlet Insert	ND	ND	ND	ND	
	StormClean Wall Mount Filtration Unit	ND	ND	ND	ND	
	Storm PURE <sup>TM</sup>	ND	ND	ND	ND	
	SwaleGard® Pre-filter	\$4,500	\$4,500	\$75	\$300	
Combination System (Screen and	Aqua-Guardian™ Catch Basin Insert	V	V	V	V	
Media Filtration)	ClearWater BMP	ND	ND	ND	ND	
	Coanda Curb Inlet Filter	\$2,000	\$3,500	\$0	\$0	
	Coanda Downspout Filter	\$2,000	\$3,500	\$0	\$0	
	RSF (Rapid Stormwater Filtration) 100	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 1000	ND	ND	ND	ND	
	RSF (Rapid Stormwater Filtration) 4000	ND	ND	ND	ND	
Hydrodynamic Separation						
	Aqua Shield Aqua-Swirl Concentrator	V	V	V	V	
	BaySeparator®	ND	ND	ND	ND	
	CDS <sup>TM</sup> Stormwater Treatment System	\$10,000	\$2,500,000	\$0.00001/gal	\$0.00001/gal	
	Downstream Defender	ND	ND	ND	ND	
	FloGard® Dual-Vortex Hydrodynamic Separator	\$10,000	\$100,000	\$300	\$3,500	
	HydroGuard	ND	ND	ND	ND	
	Nutrient Separating Baffle Box	\$10,000	\$200,000	\$0.33/gal	\$0.84/gal	
	Stormceptor®	\$3,000	\$15,000	\$500	\$5,000	
	StormTrooper®	ND	ND	ND	ND	
	StormTrooper® EX Extra-Duty	ND	ND	ND	ND	
	Terre Kleen <sup>TM</sup>	ND	ND	ND	ND	
	UniScreen	\$2000	\$15000	0	\$2000	
	UniStorm	\$2000	\$15000	0	\$2000	
	V2B1 Treatment System	\$2000	\$15000	0	\$2000	
	Vortechs System	\$20,000	\$500,000	\$0.00001/gal	\$0.00004/gal	
Media Filtration						
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System	\$5,000	\$150,000	\$0.0003/gal	\$0.003/gal	
Cartridge	BayFilter®	ND	ND	ND	ND	
	EcoSense <sup>TM</sup> Stormwater Filtration Systems	\$400	\$2,000	\$100	\$500	
	Perk Filter <sup>TM</sup>	\$10,000	\$200,000	\$1,200	\$10,000	
	PuriStorm	\$3000	\$25000	\$0	\$10000	
	Sorbtive <sup>TM</sup> FILTER	ND	ND	ND	ND	
	Stormfilter using ZPG Media	\$10,000	\$2,500,000	\$0.00008/gal	\$0.00024/gal	

	Installation Cost		tion Cost	Annual O	&M Cost	
Treatment Type	<b>Treatment System Name</b>	Low	High	Low	High	Notes
Media Filtration (cont)						
	StormSafe <sup>TM</sup> Helix	\$20,000	\$60,000	\$2,000	\$6,000	
Sand Filter	Perimeter Sandfilter (Delaware Sandfilter)	ND	ND	ND	ND	
Sund I liter	Underground Sandfilter (DC Sandfilter)	ND	ND	ND	ND	
	Chaciground Sunamer (20 Sunamer)	1,12	112	112	ND	
Combination System	Aqua Shield Aqua-Filter System	V	V	V	V	
(with Hydrodynamic Separation)	ecoStorm + ecoStorm Plus®	\$8,900 (a)	\$37,500 (a)	NA (b)	NA (b)	<ul> <li>(a) Cost varies based on combination of units, number of units, and final design requirements.</li> <li>(b) \$500 - \$1000 per cleaning/backflush event;</li> <li>Minimum of 1X per year to monthly for stormwater.</li> </ul>
	Go-Filter	V	V	V	V	
Combination System	CrystalCombo Hybrid Polisher	ND	ND	ND	ND	
(with Oil/Water Separator)	HydroFilter	ND	ND	ND	ND	
Up-Flow	Bio Clean Water Polisher Jellyfish™ Filter Up-Flo™ Filter	\$25,000 NA ND	\$125,000 NA ND	\$5.24/gal NA ND	\$7.85/gal NA ND	
Oil/Water Separator						
	ADS® Water Quality Unit BioSTORM Clara® Gravity Stormwater Separator Vault	\$500 \$20,000	\$2,000 \$52,000	\$400 \$0.0005/gal	\$4,000 \$0.01/gal	

		Installation Cost		Annual O	&M Cost	
Treatment Type	Treatment System Name	Low	High	Low	High	Notes
Oil/Water Separator (cont.)						
	CrystalClean Separator	ND	ND	ND	ND	
	ecoLine A®	\$6,700	\$44,250	NA	NA	Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.
	ecoLine B®	\$8,200	\$81,900	NA	NA	Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and replaced. In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.
	ecoSep®	ND	ND	ND	ND	
	ecoTop®	ND	ND	ND	ND	
	First Flush 1640FF	\$5,000	\$10,000	\$500	\$3,000	
	Hancor Storm Water Quality Unit	ND	ND	ND	ND	
	Kleerwater <sup>TM</sup>	V	V	V	V	
	PSI Separator	ND	ND	ND	ND	
	SNOUT®	ND	ND	ND	ND	
	VortClarex	\$10,000	\$300,000	\$0.00008/gal	\$0.001/gal	

gal = gallon

NA = not available; vendor filled out treatment system questionaire, but did not provide all data

ND = no data; vendor did not complete treatment system questionaire

SF = square foot

V = varies

Table 12. Installation and annual operation and maintenance costs for active treatment systems.

		Install	ation Cost	Annual O	&M Cost	
Treatment Type	Treatment System Name	Low	High	Low	High	Notes
Chemical Filtration						
	Baker Tank with Sand Filter	NA	NA	NA	NA	
	Chitosan-Enhanced Sand Filtration Using FlocClear <sup>TM</sup>	\$15,000	>\$250,000	<\$0.001/gal	>0.003/gal	
	Purus® Stormwater Polishing System	\$10,000	\$140,000	\$0.0024/gal	\$0.0047/gal	
Chemical Treatment						
	ACISTBox®	\$25,000	\$400,000	NA	NA	Demands on hyffering
	pHATBox®	\$19,500	\$28,500	NA	NA	Depends on buffering capacity of waterstream, flow rate, total volume processed, specific pH adjustment additive selected, and final pH point required.
	Wetsep	\$1,000	\$2,500	\$100/day	\$250/day	
Electrocoagulation						
	High-Flo Electrocoagulation	\$2,500	\$2,200,000	\$0.0005/gal	\$0.01/gal	
	OilTrap ElectroPulse Water Treatment System	\$25,000	\$500,000	\$0.002/gal	\$0.005/gal	
	Redbox WaveIonics <sup>TM</sup>	\$42,000 \$60,000	\$1,000,000 \$850,000	\$1,000 \$0.0008/gal	\$20,000 \$0.008/gal	
Filtration						
Disc	Arkal Filter (Spin Klin System)	ND	ND	ND	ND	
Media	Fuzzy Filter	NA	NA	NA	NA	
	WaterTrak Pressurized Media Filter	ND	ND	ND	ND	
	WaterTrak Ultrafiltration	ND	ND	ND	ND	
Pressure	Arkal Media Filter	ND	ND	ND	ND	
Ion Exchange						
	Wastewater Ion Exchange System (WWIX)	\$3,000	\$250,000	\$3,000	\$500,000	
	WaterTrak Ion Exchange	ND	ND	ND	ND	
Reverse Osmosis						
	WaterTrak Reverse Osmosis	ND	ND	ND	ND	
gal = gallon						•

gal = gallon

NA = not available; vendor filled out treatment system questionaire, but did not provide all data

ND = no data; vendor did not complete treatment system questionaire

Table 13. TAPE and NJCAT approvals for passive stormwater treatment technologies.

Freatment Type	Treatment System Name		Technology Assessment Protocol - Ecology (TAPE)					Advanced Technology (NJCAT)
		Pretreatment	Basic	Enhanced	Phosphorus	Oil	50% TSS Removal	80% TSS Removal
Sioretention/Filtration								
	Filterra® Curb Inlet System		GULD	GULD		GULD		
	Silva Cell		GULD	GULD				
Hydrodynamic Separation								
	Aqua Shield Aqua-Swirl Concentrator	GULD					X	
	BaySeparator®	CULD					X	
	CDS <sup>TM</sup> Stormwater Treatment System	GULD	GULD			PULD	X	
	Downstream Defender	GULD					X	
	FloGard® Dual-Vortex Hydrodynamic Separator						X	
	HydroGuard						X	
	Nutrient Separating Baffle Box						X	
	Stormceptor®						X	
	Terre Kleen™						X	
	V2B1 Treatment System	PULD					X	
	Vortechs System	GULD					X	
Media Filtration								
Cartridge	BayFilter®		CULD	CULD	CULD			X
	Perk Filter <sup>TM</sup>		GULD		GULD			
	Stormfilter using ZPG Media		GULD					X
Combination System	Aqua Shield Aqua-Filter System		PULD	PULD	PULD	PULD		X
(with Hydrodyanamic Separation)	ecoStorm + ecoStorm Plus®		CULD					
	Jellyfish™ Filter		PULD					X
	Up-Flo™ Filter		PULD					X
Dil/Water Separator								
	ecoSep®					PULD		

CULD = Conditional Use Level Designation

GULD = General Use Level Designation

PULD = Pilot Use Level Designation

TSS = Total Suspended Solids

**Table 14. Treatment system applications.** 

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Bioretention/Filtration					
	Filterra® Roofdrain System	•			
	Filterra® System		•		
	Modular Wetland System – Linear		•	•	
	Silva Cell		•		
	TREEPOD® Biofilter		•	•	
	UrbanGreen BioFilter		•	•	
Drain Inlet Insert					
Absorbent Boom/Fabric	Adsorb-It		•		
	Enviro-Drain®		•		
	EnviroSafe™ Storm Safe HF10		•		
	Ultra-Urban Filter™		•		
Media Filtration	EcoVault™ Baffle Box		•		
	EnviroSafe <sup>TM</sup>		•		
	HUBER Hydro Filt		•		
	Hydro-Kleen™		•		
	Raynfiltr <sup>TM</sup>		•		
Media Filtration (Cartridge)	StormBasin <sup>TM</sup>		•		
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	StormPod <sup>TM</sup>		•		
	Triton Drop Inlet Insert		•		
Combination System (Screen and	Bio Clean Curb Inlet Basket		•		
Absorbent Boom/Fabric)	Bio Clean Downspout Filter	•			
	Bio Clean Flume Filter		•		

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Drain Inlet Insert (cont)					
	Bio Clean Grate Inlet Skimmer Box		•		
	Bio Clean Trench Drain Filter		•		
	Clean Way Downspout Filtration Unit	•			
	DrainPac <sup>TM</sup>		•		
	EnviroTrap Catch Basin Insert		•		
	FloGard® Downspout Filter	•			
	FloGard® LoPro Matrix Filter		•		
	FloGard® LoPro Trench Drain Filter		•		
	FloGard+PLUS®		•		
	FloGard® Trash & Debris Guard		•		
	Inceptor®		•		
	StormClean Catch Basin Insert		•		
	StormClean Curb Inlet Insert		•		
	StormClean Wall Mount Filtration Unit		•		
	Storm PURE <sup>TM</sup>		•		
	SwaleGard® Pre-filter		•		
Combination System (Screen and	Aqua-Guardian™ Catch Basin Insert		•		
Media Filtration)	ClearWater BMP		•		
	Coanda Curb Inlet Filter		•		
	Coanda Downspout Filter	•			
	RSF (Rapid Stormwater Filtration) 100		•		
	RSF (Rapid Stormwater Filtration) 1000		•		
	RSF (Rapid Stormwater Filtration) 4000		•		
Hydrodynamic Separation					
	Aqua Shield Aqua-Swirl Concentrator			•	
	BaySeparator®			•	
	CDS™ Stormwater Treatment System			•	
	Downstream Defender			•	

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Hydrodynamic Separation (cont)					
	FloGard® Dual-Vortex Hydrodynamic Separator			•	
	HydroGuard			•	
	Nutrient Separating Baffle Box			•	
	Stormceptor®			•	
	StormTrooper®			•	
	StormTrooper® EX Extra-Duty			•	
	Terre Kleen™			•	
	UniScreen			•	
	UniStorm			•	
	V2B1 Treatment System Vortechs System			•	
	voiteens system			•	
Media Filtration					
Above ground (pump required)	Aquip® Enhanced Stormwater Filtration System			•	
Cartridge	BayFilter®			•	
	EcoSense™ Stormwater Filtration Systems		•		
	Perk Filter™		•	•	
	PuriStorm		•	•	
	Sorbtive™ FILTER			•	
	Stormfilter using ZPG Media		•	•	
	StormSafe™ Helix			•	
Combination System	Aqua Shield Aqua-Filter System			•	
(with Hydrodyanamic Separation)	ecoStorm + ecoStorm Plus®			•	
	Go-Filter			•	

		Treatment of Roof	Treatment at Inlet to	Treatment at	Treatment of Pumped
Treatment Type	Treatment System Name	Runoff	Storm Drain System	End-of-pipe	Groundwater
Media Filtration (cont)					
Combination System (with Oil/Water Separator)	CrystalCombo Hybrid Polisher HydroFilter			•	
Up-Flow	Bio Clean Water Polisher Jellyfish™ Filter Up-Flo™ Filter			•	
Oil/Water Separator					
	ADS® Water Quality Unit BioSTORM Clara® Gravity Stormwater Separator Vault CrystalClean Separator ecoLine A® ecoLine B® ecoSep® ecoTop® First Flush 1640FF Hancor Storm Water Quality Unit Kleerwater™ PSI Separator SNOUT® VortClarex		•	•	•
Chemical Filtration					
	Baker Tank with Sand Filter Chitosan-Enhanced Sand Filtration Using FlocClear™ Purus® Stormwater Polishing System			•	•
Chemical Treatment					
	ACISTBox® pHATBox® Wetsep			•	•

Treatment Type	Treatment System Name	Treatment of Roof Runoff	Treatment at Inlet to Storm Drain System	Treatment at End-of-pipe	Treatment of Pumped Groundwater
Electrocoagulation					
	High-Flo Electrocoagulation			•	•
	OilTrap ElectroPulse Water Treatment System			•	•
	WaveIonics™			•	•
	Redbox			•	•
Filtration					
Disc	Arkal Filter (Spin Klin System)			•	•
Media	Fuzzy Filter			•	•
Filtration (cont)					
	WaterTrak Pressurized Media Filter			•	•
	WaterTrak Ultrafiltration			•	•
Pressure	Arkal Media Filter			•	•
Ion Exchange					
	Wastewater Ion Exchange System (WWIX)			•	•
	WaterTrak Ion Exchange			•	•
Reverse Osmosis					
	WaterTrak Reverse Osmosis			•	•

## **APPENDIX A**

# **Technology Summary Sheets**

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# Active



#### Treatment Technology Summary Report

	ERKEKA				g, <b>cu</b>	, ,			
	rer/Vendor:	WaterTect	onics						
Name of Te		ACIST							
Technology Type: Che			Treatment						
Schemati	<u> </u>					Sustam D	osian In	formatio	
Scrieman						System D	esign in	jormatio	rı .
						Design Flo	w Rate (g	pm):	
		)		RoadSide AC	IST™	low:	100	-	
				System Layou	t Design	high:	>1000	_	
	RoadSide ACIST								
		-		Genset		System Foo		q. ft.):	
		-		П	_		200-2000		=
_		00			_	Required F		(ft):	
				П			NA		-
Ť						Internal or			
1 1							auto reciro	culation	-
						Application			
						Stormwater			
			Treat	ment Perforr	nance *	Wastewater	/Ground v	vater	
			meat	ment renjon	nunce				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHS
Number of	samples:				on a grease	31003	. 055	- Dioxiiis	0.7
	luent (mg/L):			3.12		0.0199			0.00028
Median Eff	luent (mg/L):			0.38		0.00002			0.00002
Median Re	moval (%):			88		99.9			93
								7	
			Total Met			olved Metal	1		
		Cu	Pb	Zn	Cu	Pb	Zn	4	
Number of	•							4	
	luent (mg/L):	0.341	0.25	2.12			0.817	4	
	luent (mg/L):	0.0179	0.05	1.04			0.744	4	
Median Re	moval (%): ls indicate no info	95	80	51			9	╛	
* Blank cell	is indicate no info	rmation w	as received t						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	7	Other A	nnrovals:	
TAPE	Tretreatment	Dasie	Limaneca	1 nospiiorus	O.I.	1	Other A	opi o vais.	
.,	<u> </u>			<u> </u>		_1	-		
	50% TSS Re	moval	80% TS	S Removal			-		
NJCAT							•		
	•				•				
			Lo	ocal Installat	ions				
# of Installa	ations in Washing	ton:		5					
					•				

#### **Estimated Costs**

 Estimated Installation Cost:
 low:
 \$25,000
 high:
 \$400,000

 Estimated Annual O&M Cost:
 low:
 high:



#### **Treatment Technology Summary Report**

Manufacturer/Vendor:	WaterTectonics	
Name of Technology:	ACIST	
Technology Type:	Chemical Treatment	

#### **Treatment Notes**

Field by operator; in-line real-time with sensors/data loggers for turbidity and pH; in-house and independent party grab/composite
sampling; in-house and 3rd party independent analytical laboratory testing.

#### **Additional Notes**

Provided under DOE issued GULD as Chitosan-Enhanced Sandfiltration (CESF), a stand alone system. Water Tectonics expands CESF application for removal of LNAPL, NWTPH, cPAH/PAH's, and metals by system modification to include oil/water separation, enhanced pre-treatment, post SF micron filtration, and granular activated carbon and/or other media adsorption. As a stand-alone technology it is designated for turbidity and pH. If raw water turbidity is >600 NTU, pretreatment is required. CESF has limited to no ability to remove turbidity consisting of rock dust, rock flour, or other rock source fines that have not been geochemically weathered over time. Chitosan performance is typically compromised by acidic or alkaline pH conditions out side the neutral range. Performance data presented is from from full-scale use at temporary projects where RSA CESF technology was used in accordance with GULD specifications with modifications for enhanced removal components (e.g., granular activated carbon). Untreated construction water ranging from >25 NTU to > 5000 NTU (with pretreatment if over 600 NTU) have all been reduced to <10 NTU, but typically to <5 NTU. Flow ranges for various conventional system sizes range from 100 to over 1000 gpm for 24/7 continuous operations.



# of Installations in Washington:

Estimated Installation Cost: Estimated Annual O&M Cost:

#### **Treatment Technology Summary Report**

Arkal Filtration Systems/PEP (U.S. Distributor) Manufacturer/Vendor: Name of Technology: Arkal Filter (Spin Klin System) Technology Type: Filtration(Disc) Schematic **System Design Information** Design Flow Rate (gpm): low: 100 high: 4400 System Footprint (sq. ft.): 16 Required Head Loss (ft): 0.1,14 Internal or External Bypass: **Application** Treatment Performance \* TSS TPH Oil & grease **SVOCs PCBs** Dioxins CPAHs TP Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): **Total Metals Dissolved Metals** Cu Pb Zn Pb Number of samples: Median Influent (mg/L): ND Median Effluent (mg/L): ND Median Removal (%): 99.9 \* Blank cells indicate no information was received from vendor **Approvals** Pretreatment Basic Enhanced **Phosphorus** Oil Other Approvals: TAPE 50% TSS Removal 80% TSS Removal NJCAT **Local Installations** 

**Estimated Costs** 

high:

low:



## Treatment Technology Summary Report

Manufacturer/Vendor: Name of Technology: Technology Type:

**Treatment Notes** 

Arkal Filtration Systems/PEP (U.S. Distributor)

: Arkal Filter (Spin Klin System)
Filtration(Disc)

Additional Notes

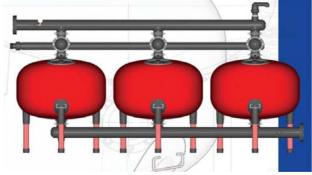


Manufacturer/Vendor: Name of Technology: Technology Type: Arkal Filtration Systems/PEP (U.S. Distributor)

Arkal Media Filter

Filtration(Pressure)





#### **System Design Information**

Design Flow Rate (gpm):

low: 44 high: 150

System Footprint (sq. ft.):

16

Required Head Loss (ft):

3,28

Internal or External Bypass:

Other Approvals:

**Application** 

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			ND				
Median Effluent (mg/L):			ND				
Median Removal (%):			99.9				

<sup>\*</sup> Blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

#### **Approvals**

ГАРЕ				
	50% TSS Removal	80% TS	S Removal	
NJCAT				

#### **Local Installations**

# of Installations in Washington:

#### **Estimated Costs**

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Name of Technology:

Arkal Filtration Systems/PEP (U.S. Distributor) Manufacturer/Vendor: Arkal Media Filter Technology Type: Filtration(Pressure) **Treatment Notes Additional Notes** 



Estimated Installation Cost: Estimated Annual O&M Cost:

# **Treatment Technology Summary Report**

					<b>3</b> ,	, ,			
Manufactu	rer/Vendor:	BakerCorp	)						
Name of Te	chnology:	Baker Tan	k with Sand Fil	ter					
Technology	Туре:	Filtration(	Media)						
Schematic	<u> </u>					System I	Design I	nformati	on
						Design Flo	ow Rate (	gpm):	
						low:	15	51	
						high:	1,000+	_	
		OBAR						<b>6.</b> )	
		-				System Fo	otprint (: 1000-2500		
						Required			-
	PRO .					Nequireu	NA	3 (11).	
						Internal o		l Bypass:	-
							NA	, p	
						Application	n		•
						Stormwate	r/Process	Water/	
						Wastewate	er/Ground	water	
			Treatr	nent Perforn	nance *				
		TSS	ТР	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:	133			On & grease	34003	i CD3	DIOXIIIS	CIAIIS
	luent (mg/L):	200							
	luent (mg/L):	10							
Median Re		95							
					1			7	
			Total Met	1		lved Meta		_	
Niahan af		Cu	Pb	Zn	Cu	Pb	Zn	4	
Number of	samples: luent (mg/L):	150	500	3500	20	40	400	1	
	luent (mg/L):	150 75	500 200	2500 1000	20 10	40 20	400 40	+	
Median Re		50	40	50	50	50	90	†	
	s indicate no info				30	30	30	4	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other Ap	provals:	
TAPE							•	•	
				•	-	<del>-</del>			
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	itions in Washing	ton:		1					
					<u> </u>				
			Ε	stimated Cos	sts				

low:

high: \_\_\_\_\_



Manufacturer/Vendor:	BakerCorp Baker Tank with Sand Filter						
Name of Technology:							
Technology Type:	Filtration(Media)						
Treatment Notes							
	ed metals removal will depend upon the degree that they will absorb to particulate matter. The values						
	rs are based upon a study done by Dungeness Environmental during 2009-2010. Dungeness						
	e relevant data for the organics listed in this table. For any questions, please contact Chris Palczewski at						
Dungeness Environmental: 4	125-481-0600 or cpalczewski@dungenessenviro.com. Thank you.						
Additional Notes							
Additional Notes							
<u> </u>							



Manufacturer/Vendor: Name of Technology: Technology Type: Clear Creek Systems, Inc.

Chitosan-Enhanced Sand Filtration Using FlocClear

**Chemical Filtration** 

#### **Schematic**



#### System Design Information

Design Flow Rate (gpm):

low: < 25 high: > 2,000

System Footprint (sq. ft.):

< 25 -> 2,000

Required Head Loss (ft):

NA

**Internal or External Bypass:** 

External - Offline Facility

Other Approvals:

**Application** 

Stormwater/Process water/ Groundwater/Wastewater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> Blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

#### **Approvals**

**Phosphorus** 

Oil

TAPE				
	50% TSS Removal	80% TSS Removal	]	
NJCAT				

#### **Local Installations**

# of Installations in Washington: > 15 on the West Coast

#### **Estimated Costs**

 Estimated Installation Cost:
 low: \$15,000
 high: >\$250,000

 Estimated Annual O&M Cost:
 low: <\$0.001/gal</th>
 high: >\$0.003/gal

**Enhanced** 



Manufacturer/Vendor:

Clear Creek Systems, Inc.

Chitosan-Enhanced Sand Filtration Using FlocCle

Name of Technology:	Chitosan-Enhanced Sand Filtration Using FlocClear						
Technology Type:	Chemical Filtration						
Treatment Notes							
	from grab samples that were analyzed by an accredited laboratory.						
	<b>6</b> , , , , ,						
Additional Notes							
Additional Notes							



Estimated Installation Cost: Estimated Annual O&M Cost:

# Treatment Technology Summary Report

Manufactur Name of Te Technology		Schreiber LLC Fuzzy Filter Filtration(Media)							
Schematic		A SHOW AND	Vie			System	Design I	nformati	on
Schemado						Design Flo low: high:  System Fo  Required  Internal of  Application Stormwater Wastewater	ow Rate ( 70 unlimited potprint ( Head Los 3.5 or External External on	gpm): sq. ft.): s (ft): ll Bypass:	Un
			Treatr	nent Perforn	nance *				
		TSS	ТР	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:	133			On a grease	37003	1 003	DIOXIIIS	CI AIIS
	uent (mg/L):	10							
	uent (mg/L):	2							
Median Rer		70-95							
			Total Met	als	Disso	lved Meta	lc	7	
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of	samples:					1.2		†	
	uent (mg/L):							1	
	uent (mg/L):							1	
Median Rer								1	
* Blank cell	s indicate no info	rmation w	as received f	rom vendor				-	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Ī	Other Ar	provals:	
TAPE	rretreatment	Dasic	Limancea	riiospiiorus	O.I.	1	Other A	provais.	
		Į	1	ļ		4			
	50% TSS Rer	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	tions in Washingt	ton:		0					
			E.	stimated Cos	sts				

low:\_\_\_\_

high: \_\_\_\_



Manufacturer/Vendor:	Schreiber LLC Fuzzy Filter Filtration(Media)							
Name of Technology:								
Technology Type:								
Treatment Notes								
	de solids 4 microns and above. The media is compressible so that pore size can be adjusted thru changes							
	a via the integral actuator connected to a perforated compression plate. Influent solids should be less							
than 100 mg/l with many typ	oical applications processing water streams containing 20 mg/l and less.							
Additional Notes								



 Manufacturer/Vendor:
 KASELCO, LLC

 Name of Technology:
 High-Flo Electrocoagulation

 Technology Type:
 Electrocoagulation

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm): low: 2.5 high: 1,200+

System Footprint (sq. ft.):

40 - 4000

Required Head Loss (ft):

2,20

**Internal or External Bypass:** 

External

Other Approvals:

**Application** 

Stormwater/Process Water/ Groundwater/Wastewater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> Blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

#### **Approvals**

Oil

					•
TAPE					
	•		•	•	•
	50% TSS Ren	noval	80% TS	S Removal	
NJCAT					1

#### **Local Installations**

# of Installations in Washington: 0 in WA, 2 in Vancouver

#### **Estimated Costs**

Estimated Installation Cost:low: \$25,000high: \$2,200,000Estimated Annual O&M Cost:low: \$0.0005/galhigh: \$0.01/gal



Manufacturer/Vendor:	KASELCO, LLC
Name of Technology:	High-Flo Electrocoagulation
Technology Type:	Electrocoagulation

#### **Treatment Notes**

System Performance has been evaluated in lab as well as in field research applications and existing installations. Grab samples are	
analyzed both internally as well as by a third party lab.	

Additional Notes
Have attached actual test result parameters. We are currently in the process of having detailed third party test evaluations and will
supply those results as available.



Manufacturer/Vendor: Name of Technology: Technology Type: OilTrap Environmental Prod

OilTrap ElectroPulse Water Treatment System

Electrocoagulation

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm):

low: 5 high: 500

System Footprint (sq. ft.):

40-1500

Required Head Loss (ft):

5,15

**Internal or External Bypass:** 

Either

**Application** 

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	600		78	136	28	NA	NA	NA
Median Effluent (mg/L):	10		0.27	<5.0	0.43	NA	NA	NA
Median Removal (%):	98.3		99.6	>96.3	98.4	NA	NA	NA

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	12.1	14.1	151	8.2	10.9	78.6	
Median Effluent (mg/L):	0.072	0.039	0.34	0.072	0.039	0.34	
Median Removal (%):	99.4	99.7	99.9	99.1	99.6	99.9	

<sup>\*</sup> Blank cells indicate no information was received from vendor

#### **Approvals**

1	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE					
	•		•		
	50% TSS Ren	noval	80% TSS	S Removal	
NJCAT					

	llations

# of Installations in Washington: 33

#### **Estimated Costs**

Estimated Installation Cost:low: \$25,000high: \$500,000Estimated Annual O&M Cost:low: \$0.002/galhigh: \$0.005/gal



Manufacturer/Vendor: Name of Technology:

OilTrap Environmental Prod

OilTrap ElectroPulse Water Treatment System

Technology Type:	Electrocoagulation
Treatment Notes	
Samples were collected as	routine grab samples and tested by an EPA certified laboratory.
1	
1	
Additional Notes	
We have not worked with	wastewater with PCB or dioxins. We generally see 90%+ in reduction of pesticides also.



Manufacturer/Vendor:	WaterTectonics
Name of Technology:	рНАТВох
Technology Type:	Chemical Treatment

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm): low: 250

high: 250

System Footprint (sq. ft.):

10-24 (b)

Required Head Loss (ft):

N/A

**Internal or External Bypass:** 

N/A

Other Approvals:

**Application** Stormwater

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(c)		(c)	(c)	(c)	(c)	(c)	(c)
Median Effluent (mg/L):	(c)		(c)	(c)	(c)	(c)	(c)	(c)
Median Removal (%):	(c)		(c)	(c)	(c)	(c)	(c)	(c)

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)	
Median Effluent (mg/L):	(c)	(c)	(c)	(c)	(c)	(c)	
Median Removal (%):	(c)	(c)	(c)	(c)	(c)	(c)	

<sup>\*</sup> Blank cells indicate no information was received from vendor

**Basic** 

Pretreatment

#### **Approvals**

**Phosphorus** 

Oil

TAPE				
			<b>-</b>	
	50% TSS Removal	80% TSS Removal		
NJCAT				

Local	Install	lations
LUCUI	IIIStail	ations

# of Installations in Washington: 20+

#### **Estimated Costs**

**Enhanced** 



 Manufacturer/Vendor:
 WaterTectonics

 Name of Technology:
 pHATBox

 Technology Type:
 Chemical Treatment

Tro	atm	ont	Nic	۱tac

IICat	ment Notes
Field.	Real-time with in-line probes. 2-point buffer calibration.

#### **Additional Notes**

- (a) Depends on buffering capacity of waterstream, flow rate, total volume processed, specific pH adjustment additive selected, and final pH point required.
- (b) Packaged in 4'-6' (w) x 2.5' (d) x 4' (t) industrial steel box w/hinged top opening lid. Additional storage space for additive will depend on volume of additive storage (up to 35-gal drums in box, larger must go external) plus secondary containment). Unit has inline pH probe for real time monitoring and data logger expandable for dual pH adjustment (multi injection/mixing loops), and flow recording. pH set-point(s) programmable into controller.
- (c) Adjusts pH. System performance data not applicable.

#### Additional Notes:

- -Effective for controlling alkaline waters from cement/concrete operations using carbon dioxide.
- -Suitable for inclusion as pH adustment component in variety of water treatment systems.
- -pH set-points (high/low) variable for application.



 Manufacturer/Vendor:
 StormwateRx LLC

 Name of Technology:
 Purus Stormwater Polishing System

 Technology Type:
 Chemical Filtration

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm): low: 5

high: 210

System Footprint (sq. ft.):

10,90

Required Head Loss (ft):

70 - 120

**Internal or External Bypass:** 

External

Application

Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):			YES		YES	YES		YES

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			0.28			0.06	
Median Effluent (mg/L):			0.083			0.0074	
Median Removal (%):			86			88	

<sup>\*</sup> Blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Ennanced	Pnospnorus	OII	Otner Approvais:
TAPE						
						<u></u>
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
	•					<del></del>

#### **Local Installations**

# of Installations in Washington: YES

#### **Estimated Costs**

 Estimated Installation Cost:
 low: \$10,000
 high: \$140,000

 Estimated Annual O&M Cost:
 low: \$0.0024/gal
 high: \$0.0047/gal



Manufacturer/Vendor:	StormwateRx LLC							
Name of Technology:	Purus Stormwater Polishing System Chemical Filtration							
Technology Type:								
Treatment Notes								
	d as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All							
limit.	party certified analytical lab. Non-detects were assumed to have the value of one half the detection							
iimit.								
Additional Notes								
Additional pollutant removal	includes bacteria (>99%), PCBs, PAHs and toxic organics.							



Manufacturer/Vendor:	Morselt Borne BV
Name of Technology:	Redbox
Technology Type:	Electrocoagulation

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm): low: 0.5 high: 150

System Footprint (sq. ft.):

Required Head Loss (ft):

**Internal or External Bypass:** 

NA

**Application** 

Wastewater/Process Water

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):	99							

		Total Metals			Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn		
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):				99	99	99		

<sup>\*</sup> Blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•		•			
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						

# of Installations in Washington:

#### **Estimated Costs**

**Estimated Installation Cost:** high: \$1,000,000 low: \$42,000 **Estimated Annual O&M Cost: low:** \$1,000 high: \$20,000



Manufacturer/Vendor: Name of Technology: Redbox Electrocoagulation

Treatment Notes

Third part analysis has been performed in many cases. Results show very high removal rates, especially for heavy metals.

Additional Notes



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

# **Treatment Technology Summary Report**

Manufactu	rer/Vendor:	Aquatech							
Name of Te	chnology:	WaterTrak	Ion Exchange						
Technology	Туре:	Ion Exchar	nge						
Schematic				Pifmine A		System	Design I	nformati	on
						Design Fl	ow Rate (	gnm):	
						low:	23	Ph\.	
						high:	866	-	
						6		-	
						System F	ootprint ( 65,113	sq. ft.):	
						Required	Head Los	s (ft):	-
		THE STATE OF				Internal o	or Externa	l Bypass:	-
	A STATE					Applicati	on		-
			Treatn	nent Perforn	nance *				
			T	1	T	ı	_	T	
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAH
Number of									
	uent (mg/L):								
	uent (mg/L):								
Median Rei	moval (%):								
			T	-1-				7	
		C	Total Meta			ved Meta	1	4	
<b>N</b>		Cu	Pb	Zn	Cu	Pb	Zn	4	
Number of								4	
	uent (mg/L):							4	
	uent (mg/L):							4	
Median Rei								_	
* Blank cell	s indicate no info	rmation w	as received						
				Approvals					
	1			1		T			
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	oprovals:	
TAPE									
	500/ TCC D		200/ 70	. n	1				
	50% TSS Rei	moval	80% 153	S Removal					
NJCAT					]				
			Lo	cal Installati	ons				
# of Installa	tions in Washing	ton:			-				
			E:	stimated Cos	sts				

low:

high: \_\_\_\_\_





**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

# **Treatment Technology Summary Report**

Manufactui	rer/Vendor:	Aquatech							
Name of Te	•		Pressurized N	/ledia Filter					
Technology		Filtration(I	Media)						
Schematio	:			<b>h</b>	System Design Information  Design Flow Rate (gpm):				
			- h			low: high:	905	<b>-</b> -	
	V		System Fo	43,119					
	EI .	-				Required			·
						Internal o		I Bypass:	
			-			Application	on 		
			Treatr	nent Perforn	nance *				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAH
Number of	samples:								
Median Infl	uent (mg/L):								
Median Effl	uent (mg/L):								
Median Rer	moval (%):								
		<u> </u>	Tatal Nast	-1-	D:		1-	ד	
		C	Total Met			ved Meta		4	
Niahau af		Cu	Pb	Zn	Cu	Pb	Zn	4	
Number of	uent (mg/L):							4	
	uent (mg/L):							+	
Median Rer			+					+	
	s indicate no info	rmation w	as received	from vendor		<u> </u>	<u> </u>	1	
Diank cen	3 maicate no mio	THICKIOH W	- Tab received	Approvals					
				,,,					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Ī	Other A	pprovals:	
TAPE						İ			
	•			•		•			
	50% TSS Rei	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	tions in Washing	ton:			-				
			E.	stimated Cos	sts				

low:

high:

high:



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Additional Notes

Aquatech
WaterTrak Pressurized Media Filter
Filtration(Media)

Additional Notes



Manufactu	rer/Vendor:	Aquatech	nquatech									
Name of Te	echnology:	WaterTrak	Reverse Osm	osis								
Technology	/ Type:	Reverse Os	smosis									
Schemati						Design Floring	ow Rate ( 65 275 cotprint ( 143,243 Head Los 350 or Externa	- - sq. ft.): s (ft):	on			
			Treatr	nent Perforn	nance *							
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAH			
Number of	samples:											
	luent (mg/L):											
	luent (mg/L):											
Median Re	moval (%):											
					T			7				
			Total Met			ved Meta	1	<u> </u>				
		Cu	Pb	Zn	Cu	Pb	Zn	<u> </u>				
Number of								<u> </u>				
	luent (mg/L):							1				
	luent (mg/L):							<u> </u>				
Median Re								1				
* Blank cel	ls indicate no info	rmation w	as received									
				Approvals								
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:				
TAPE												
						=						
	50% TSS Rer	noval	80% TS	S Removal								
NJCAT												
			Lo	cal Installati	ons							
# of Installa	ations in Washingt	ton:			-							
			E.	stimated Cos	sts							
	Installation Cost:		low:		high:		_					
Estimated Annual O&M Cost:			low:		high:							



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Aquatech
WaterTrak Reverse Osmosis
Reverse Osmosis

Additional Notes



Estimated Installation Cost: Estimated Annual O&M Cost:

# **Treatment Technology Summary Report**

Manufactui	rer/Vendor:	Aquatech							
Name of Te	chnology:	WaterTrak	Ultrafiltration	1					
Technology	Туре:	Filtration(I	Media)						
Schematic	;					System	Design I	nformatio	on
Shr.	tirring.					Design Flo	ow Rate (	gpm):	
4	"Water Bullion					low:	38	5 -···/·	
P) II		NA CONTRACT	PRINCIPLE PRINCIPLE	The Park	Park.	high:	377	=	
					( may 1	•		=	
	Page 1	10 10				System Fo	ootprint (	sq. ft.):	
				4 . 4			31,62		
	2(C)					Required	Head Los	s (ft):	
		15 18				Internal c	r Externa	l Bypass:	•
CIN MINE		100							
				AN INCH		Application	on		
			Treatn	nent Perforn	nance *				
		TSS	ТР	TPH	Oil & grease	SVOCs	PCBs	Dioxins	СРАН
Number of	samples:				on an groupe	01000			<b>U.</b> 7.11.
	uent (mg/L):								
Median Effl	uent (mg/L):								
Median Rer	moval (%):								
		<b>-</b>			Ι			7	
		_	Total Meta			lved Meta		1	
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of	•							1	
	uent (mg/L): uent (mg/L):							+	
Median Rer								1	
	s indicate no info	rmation w	as received t	from vendor			ļ	1	
				Approvals					
	Bustus stans and	Dania .	Fulranand	Dhaashassa	0:1	ī	O4h 4		
TADE	Pretreatment	Basic	Enhanced	Phosphorus	Oil	•	Other Ap	provais:	
TAPE						<u> </u>			
	50% TSS Rer	moval	80% TS	S Removal					
NJCAT	3070 133 NCI	novai	5070 133	, Kemovai					
			Lo	cal Installati	ons				
# of Installa	tions in Washing	ton:			<del>-</del>				

**Estimated Costs** 

low:

high: \_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Additional Notes



Manufacturer/Vendor:	WaterTectonics
Name of Technology:	Wavelonics
Technology Type:	Electrocoagulation

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: >1000

System Footprint (sq. ft.):

200-4000

Required Head Loss (ft):

NA

**Internal or External Bypass:** 

NONE-auto recirculation

**Application** 

Stormwater/Process

Water/Wastewater/Ground water

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):		200	45.6	197	2.34	0.0024		
Median Effluent (mg/L):		5	0.25	4.76	0.00002	0.00011		
Median Removal (%):		98	99	98	100	95		

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	4.8	0.253	0.516	0.0235	0.0157	0.12	
Median Effluent (mg/L):	0.0074	0.003	0.0315	0.005	0.0031	0.02	
Median Removal (%):	100	99	94	79	80	83	

<sup>\*</sup> Blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	· · · · · · · · · · · · · · · · · · ·	•			•	
	50% TSS Removal		80% TSS Removal			
NJCAT						

Local	l Insta	llations

# of Installations in Washington: 35+

#### **Estimated Costs**

Estimated Installation Cost: low: \$60000 high: \$850000 Estimated Annual O&M Cost: low: \$0.0008/gal high: \$0.008/gal



Manufacturer/Vendor:	WaterTectonics
Name of Technology:	Wavelonics
Technology Type:	Electrocoagulation

#### **Treatment Notes**

Field via hand-held instruments, Technology's in-line and real-time water quality monitoring system, Oversight Engineers/Project Owners, 3rd party analytical testing laboratories using both instantaneous grab and composting methods (manual and automated). System performance "Median" data presented below does not accommodate analytical data results for parameters report as ND (<MDL's, or <MCL's). All ND data was utilized in the calculations as the value of the MDL or MCL. Influent data is limited in that our Clients typically do not incur cost expenditure to evaluate raw water characteristics once the system has been designed, installed, and made operational. They focus on monitoring effluent quality. Further, effluent data generated by our Clients/System Owners do not typically provide us with DMR's they submit to Ecology or other regulatory agencies. Effluent data points do not reflect technology ability to achieve lower than reported results. Permit discharge limitations have historically varied from site to site, permit to permit, and therefore data reflect treatment efforts and not technology limitations.

#### **Additional Notes**

Wavelonics electrocoagulation (EC) reactions will depend on the nature of constituents present, their reaction chemistry, pH sensitivity, and water conductivity. Bacteria disinfection has been demonstrated at laboratory and full-scale applications. Technology viability and optimization is recommended for non-conventional constituents of concern, or for complex matrices where interferences and competing conditions are problematic to conventional advanced treatment processes. System Performance data fields (above) call for "Median" data points that do not allow for presentation of worst-case conditions, nor do they adequately reflect "mean" conditions, both of which are more elevated than the "Median" data presented for influent characteristics. Effluent "median" data do not reflect <MDL or <MCL data as reported by laboratories. However, ND results utilized in the calculation were the numeric value of the actual MDL or MCL. SVOC and cPAH data reflect a summation of all individual constituents in SVOC or cPAH parameter suites as totals. PCB's are totals of all Arochlor congeners. Oil and Grease data reflect both Freon and Hexane extraction analytical methods. Technology has not been used to specifically remove Dioxins and when technology was utilized, Dioxins were not targeted for analytical testing. Other data available upon request for: bacteria; other heavy metals; color from humics, etc.



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

### **Treatment Technology Summary Report**

Manufacturer/Vendor: Waste & Environmental Technologies Ltd. Name of Technology: Technology Type: **Chemical Treatment Schematic System Design Information** Flow Diagram Design Flow Rate (gpm): low: 20 260 high: System Footprint (sq. ft.): Required Head Loss (ft): 40 feet **Internal or External Bypass: External Bypass Application** Stormwater/Wastewater Treatment Performance \* TPH **TSS** TP Oil & grease **SVOCs PCBs** Dioxins **CPAHs** Number of samples: Median Influent (mg/L): 112 13.4 Median Effluent (mg/L): <2 1.9 Median Removal (%): 98 86 Dissolved Metals **Total Metals** Pb Zn Cu Cu Pb Zn Number of samples: Median Influent (mg/L): 7 μg/L 18 μg/L Median Effluent (mg/L):  $1 \mu g/L$  $<1 \mu g/L$ Median Removal (%): 86 94 Blank cells indicate no information was received from vendor **Approvals Pretreatment** Basic **Enhanced Phosphorus** Oil Other Approvals: **TAPE** 50% TSS Removal 80% TSS Removal NJCAT **Local Installations** # of Installations in Washington: **Estimated Costs** 

\$1000

low: \_\_ \$100/day

low:

high: \$2500

**high:** \$250/day



Manufacturer/Vendor:	Waste & Environmental Technologies Ltd.
Name of Technology:	Wetsep
Technology Type:	Chemical Treatment

#### **Treatment Notes**

The data can be stored and downloaded from data logger for flowrate, pH and Turbidity. Grab samples can also be taken at various
points in the system to be varified by a third party (i.e. laboratory).
Please aslo find the Field Study for the WetSep filtration System

Additional Notes
The WetSep system was used in the State of Washington at the Canada/US border crossing. The main Contractor for this job was JE
Dunn Construction. The main use of the unit was for treatment of construction waste runoff.



# of Installations in Washington:

# **Treatment Technology Summary Report**

						•			
Manufactu	rer/Vendor:	Siemens							
Name of Te	chnology:	Waste Wa	ter Ion Exchan	ge System (WW	IX)				
Technology	Type:	Ion Exchar	nge	· · · · · · · · · · · · · · · · · · ·	•				
Schematic	С					System D	esign Inf	formation	า
	NCOMING NSEWATERS					Design Flov	v Rate (gp	m):	
10	(ARTRIDGE	ION EXCHANGE				low:	1gpm	•	
	PILTERS	CANISTERS		/ WATER		high:	5000gpm	<u> </u>	
1				RE-USE		Ū		_	
				CLEAN		System Foo	otprint (sq	. ft.):	
		CATION	NON	EFFLUENT TO DISCHARGE		Required H		(ft):	-
RECEP	gvo	5 5	pH ADJUST  (F NECESSARY)			Internal or	20psi	D	=
TAN-			# NECESSARY)			Internal or	None	оуразз:	
						Application			=
						Stormwater/		ater/	
						Wastewater			
			Treat	ment Perfor	mance *	· · · · · · · · · · · · · · · · · · ·	Croanaw	100	
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAH
Number of	samples:								
Median Infl	luent (mg/L):								
<b>Median Effl</b>	luent (mg/L):								
<b>Median Rer</b>	moval (%):								
								_	
			Total Met		Diss	olved Metals	5		
-		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	· ·								
	luent (mg/L):								
	luent (mg/L):							4	
Median Rei								_	
* Blank cell	s indicate no inf	ormation w	as received f						
				Approvals	3				
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other A	provals:	
TAPE									
				•	_	-			
	50% TSS R	emoval	80% TS	S Removal					
NJCAT									
					_		_		

#### **Estimated Costs**

>500

Local Installations

Estimated Installation Cost:low: \$3,000high: \$250,000Estimated Annual O&M Cost:low: \$3,000high: \$500,000



# Passive



Manufacturer/Vendor:	Advanced Drainage Systems, Inc
Name of Technology:	ADS® Water Quality Unit
Technology Type:	Oil/Water Separator

Sc			

### **System Design Information**

Design Flow Rate (gpm):

BYPASS PIPE LOCATED ON THE SITE OF THE	high: 1800 126000
ADE VATER GUALITY UNIT ACCESS RISERS	System Footprint (sq. ft.):
	Required Head Loss (ft):
SEIDMENT D-WIGER	Internal or External Bypass:
	Application

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA		ND				
Median Effluent (mg/L):	ND	NA		ND				
Median Removal (%):	80	>43		80				

		Total Meta	als	Dissol	ved Meta	s
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	ND	ND	ND	ND	ND	ND
Median Effluent (mg/L):	ND	ND	ND	ND	ND	ND
Median Removal (%):	74	74	74	74	74	74

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
			1		·	
	50% TSS Ren	noval	80% TSS	S Removal		
NJCAT						
			1 -			
# of Instal	lations in Washingt	on:	LO	cal Installation	3	
# of Instal	lations in Washingt	on:				
# of Instal	lations in Washingt	on:		stimated Costs		
	lations in Washingto	on:		stimated Costs		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Additional Notes

Advanced Drainage Systems, Inc

ADS\* Water Quality Unit

Oil/Water Separator

Additional Notes



 Manufacturer/Vendor:
 Eco-Tec, Inc

 Name of Technology:
 ADsorb-it

 Technology Type:
 Drain Inlet Inset (Absorbent Boom/Fabric)

## **Schematic**



## **System Design Information**

Design Flow Rate (gpm):

low: 80/SF high: 100/SF

System Footprint (sq. ft.):

Varies

Required Head Loss (ft):

NA

**Internal or External Bypass:** 

Per individual application

**Application** 

Stormwater, Groundwater, Wastewater, Process Water

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	Varies		Varies	Varies				
Median Effluent (mg/L):	Varies		Varies	Varies				
Median Removal (%):	80-99		99-100	99-100				

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):	Varies	Varies	Varies	Varies	Varies	Varies	

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•	•	•		<u></u>
	50% TSS Removal		80% TSS Removal			
NJCAT						·

Local	l Instal	lations
-------	----------	---------

# of Installations in Washington: 61

#### **Estimated Costs**

Estimated Installation Cost: low: \$0.91/SF high: \$0.91/SF
Estimated Annual O&M Cost: low: \$0.91/SF high: \$0.91/SF



Manufacturer/Vendor: Eco-Tec, Inc
Name of Technology: ADsorb-it

Technology Type: Drain Inlet Inset (Absorbent Boom/Fabric)

#### **Treatment Notes**

A variety of sampling methods have been implemented over the years based on specific installations of the ADsorb-it Filtration Fabric and associated application specific product configurations manufactured from the ADsorb-it Fabric. ADsorb-it is designed to be versatile in its installation for diverse filtration applications, thus it can be configured for Downspout, Drain Inlet Inset, Below Ground Vault, Above Ground Vault, Shoreline, Oil Water Separator, and General Stormwater applications. ADsorb-it is approved by the Department of Ecology (Ecology) for use as a Catch Basin Insert and is used by Ecology for spill response and general oil/water related issues.

#### **Additional Notes**

As can be seen on our web site at www.eco-tec-inc.com, miles of ADsorb-it Fabric were deployed along the Gulf Coast Shoreline as an Oil Fence to provide effective removal of advancing oils from the BP Deepwater Horizon Release. Additional testing data can be accessed on our web site simply by clicking on "Test Data" in the left hand column. As a note, ADsorb-it is highly effective at removing hydrocarbons, including fats, oils and greases (FOG) from water, thus any other contaminants that would be attached to the hydrocarbon such as PCBs would be removed in conjuncton with hydrocarbon / FOG removal. ADsorb-it is an environmentally compatible product in that it is: Made from waste fibers from the textile manufacturing industry, it effectively removes hydrocarbons and associated / attached contaminants from the environment, it can be cleaned and reused indefinitely, it can be disposed of as a fuel source with a higher BTU per pound value than coal and less than 1% residual ash.



Manufacturer/Vendor: Name of Technology:

AquaShield, Inc.

Aqua-Filter **Technology Type:** 

Media Filtration(Combination System (with Hydrodyanamic Separation))

## **Schematic**



## System Design Information

Design Flow Rate (gpm):

low: 25 high: 960+

System Footprint (sq. ft.):

NA

Required Head Loss (ft):

8.0

**Internal or External Bypass:** 

Both

Other Approvals:

**Application** 

Stormwater/ Process Water

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	160							
Median Influent (mg/L):	43							
Median Effluent (mg/L):	5							
Median Removal (%):	80							

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

## **Approvals**

**Phosphorus** 

Oil

## **Local Installations**

# of Installations in Washington:

#### **Estimated Costs**

**Estimated Installation Cost:** low: Site-specific high: Site-specific **Estimated Annual O&M Cost:** low: Site-specific high: Site-specific

**Enhanced** 



Manufacturer/Vendor:	AquaShield, Inc. Aqua-Filter							
Name of Technology:								
Technology Type:	Media Filtration(Combination System (with Hydrodyanamic Separation))							
Treatment Notes								
Independent lab by grab sam	ples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.							
. , , ,								
Additional Notes								
Aqua-Filter filtration cartridge	e has been verified by NJCAT. AF5.3 model is currently undergoing independent TARP Tier II field							
	g 96% TSS removal. Anticipate completion in 2012. AF-4.2 model field tested at Univeristy of New							
Hampshire Stormwater Cent	er, 80% TSS removal efficiency (see above parameters).							



Manufacturer/Vendor: Name of Technology: AquaShield, Inc.
Aqua-Guardian

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Media Filtration))

## **Schematic**



## System Design Information

Design Flow Rate (gpm):

low: 5/400\* high: 100/940\*

System Footprint (sq. ft.):

NA

Required Head Loss (ft):

0

**Internal or External Bypass:** 

Both

Other Approvals:

Application

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	160							
Median Influent (mg/L):	43							
Median Effluent (mg/L):	5							
Median Removal (%):	80							

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

## **Approvals**

**Phosphorus** 

Oil

## **Local Installations**

# of Installations in Washington: 15

## **Estimated Costs**

Estimated Installation Cost:low:Site-specifichigh:Site-specificEstimated Annual O&M Cost:low:Site-specifichigh:Site-specific

**Enhanced** 



Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Aqua-Guardian
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

т	r۵	at	m	۵	nt	Ν	In	t۵	
		aι			IIL	- 11	w	LC	

* x/x = flow thru perlite/flow thru perlite + filter cloth. See Aqua-Filter, since this device uses same media. Independent lab by grab
samples. Field by auto-composite sampling, 6 sample pairs per TARP qualifying storm.

## **Additional Notes**

See Aqua-Filter since this device uses same filter media. Aqua-Filter filtration cartridge has been verified by NJCAT. AF-5.3 model is
currently undergoing independent TARP Tier II field testing in Maryland averaging 96% TSS removal. Anticipate completion in 2012.
AF-4.2 model field tested at Univeristy of New Hampshire Stormwater Center, 80% TSS removal efficiency (see above parameters).



Manufacturer/Vendor:	AquaShield, Inc.	
Name of Technology:	Aqua-Swirl	
Technology Type:	Hydrodynamic Separation	
Schematic		System Design Information
		Design Flow Rate (gpm):
		lour 100



low:

System Footprint (sq. ft.):

Required Head Loss (ft):

0.25

2,600

**Internal or External Bypass:** 

Both

**Application** 

high:

Stormwater/Process Water

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	192							
Median Influent (mg/L):	137							
Median Effluent (mg/L):	12							
Median Removal (%):	86							

		Total Met	als	Disso	ved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil
TAPE	GULD				
	50% TSS Rer	noval	80% TSS	S Removal	
NJCAT	Y				

Local	Instal	lations

# of Installations in Washington:

## **Estimated Costs**

**Estimated Installation Cost:** low: Site-specific high: Site-specific **high:** Site-specific low: Site-specific **Estimated Annual O&M Cost:** 



Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Aqua-Swirl
Technology Type:	Hydrodynamic Separation
Treatment Notes	
Lab tested by Tennessee Tech	h University using autosamplers. Field by auto-composite sampling, 6 sample pairs per TARP.
Additional Notes	
	derway per TARP Tier II in Maryland, anticipate completion in 2011. 16 storms and 14 inches of rain
	ameters above are for field test. Lab testing verified by NJCAT.
	6 · · · · · · · · · · · · · · · · · · ·



Manufacturer/Vendor: Name of Technology: Technology Type: StormwateRx LLC

Aquip Enhanced Filtration System

Media Filtration(Above ground (pump required))

## **Schematic**



## System Design Information

Design Flow Rate (gpm):

low: 10 high: 350

System Footprint (sq. ft.):

14 - 320

Required Head Loss (ft):

4 - 7

Other Approvals:

**Internal or External Bypass:** 

External

**Application** 

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	30			9.9				
Median Effluent (mg/L):	3.39			3				
Median Removal (%):	83		YES	70	YES	YES		YES

		Total Met	als	Disso	olved Metals	
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.152	0.03	0.425	0.084	0.008	0.196
Median Effluent (mg/L):	0.008	0.006	0.061	0.006	0.007	0.06
Median Removal (%):	94	79	85	93	51	73

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

## **Approvals**

**Phosphorus** 

Oil

TAPE		
	50% TSS Removal	80% TSS Removal
NJCAT		

## **Local Installations**

# of Installations in Washington: 30

## **Estimated Costs**

Estimated Installation Cost:low: \$5,000high: \$150,000Estimated Annual O&M Cost:low: \$0.0003/galhigh: \$0.003/gal

**Enhanced** 



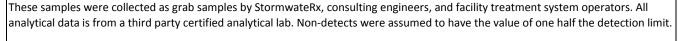
Manufacturer/Vendor: Name of Technology: Technology Type:

StormwateRx LLC

Aquip Enhanced Filtration System

Media Filtration(Above ground (pump required))

#### **Treatment Notes**



#### **Additional Notes**

Non-detects were assumed to have the value of one half the detection limit.

Aquip removes PCBs, PAHs and other toxic organics through particle filtration and absorption to one of the filtration media in the bed. VOC and SVOC removal is through absorption and biological degradation.

The Aquip is a secondary defense against oil and grease and removes TPH and soluble oils through biodegredataion, absorption and bio-mechanical means.



Manufactu	rer/Vendor:	BaySaver 7	Гесhnologies, I	nc.					
Name of Te	echnology:	BayFilter®							
Technology	у Туре:	Media Filt	ration(Cartridg	ge)					
Schemati	c .					System	Design I	nformati	on
	INLET PLATE MEDIA SPIRAL #1		04.004			Design Flo	ow Rate (	gpm):	
	MEDIA SPIRAL #2	-	26.00″	-		low:	15	OF,-	
	INLET DRAINAGE MATERIAL  DUTLET DRAINAGE MATERIAL					high:	30	_	
	POLYMER SEAL		2.00″	ORE P				_	
	DUTLET PIPE					System F		sq. ft.):	
	AIR RELEASE VALVE						0	(6.)	-
	FLOW CONTROL DRIFT	ICE		28.75"		Required	Head Los	ss (ft):	
	FILTER LEG	is_				Internal o	or Externa	ıl Bypass:	
	8			DUTLET COLLECTION MANIFOLD		Application	on		•
									•
			Treatr	nent Perforn	nance *				
		<del></del>	T	1	1	T	T	T	
Niahan af		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•	ND	NΙΔ		ND				
	luent (mg/L): luent (mg/L):	ND ND	NA NA		ND ND				
Median Re		80	>50		80				
iviculari ite	1110vai (70).	80	/30		80				<u> </u>
			Total Met	als	Disso	lved Meta	ls	7	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	samples:							7	
Median Inf	luent (mg/L):								
Median Eff	luent (mg/L):								
Median Re	moval (%):								
* blank cell	s indicate no info	rmation wa	as received fro	om vendor					
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other A	provals:	
TAPE		CULD	CULD	CULD					
	•			•	-	<del>.</del>	-		
	50% TSS Re	moval	80% TS	S Removal	-				
NJCAT				X					
			10	cal Installati	ons				
			20	cai mscanaci	0113				
# of Installa	ations in Washing	ton:			-				
			E	stimated Co	sts				
	Installation Cost:	<b>.</b> .	low:		high:		=		
Estimated A	Annual O&M Cos	τ:	low:		high:		_		



Manufacturer/Vendor:	BaySaver Technologies, Inc.
Name of Technology:	BayFilter®
Technology Type:	Media Filtration(Cartridge)
,	
Treatment Notes	
Additional Notes	
Additional Notes	



	ırer/Vendor:		Technologies, I	lnc.					
Name of To	• .	BaySepara							
Technology	y Type:	Hydrodyna	amic Separatio	n					
Schemati	ic					System	Design I	nformati	on
	В	AYSEPARATOR UNIT				Design Flo	ow Rate (	gpm):	
						low:	450	· ,	
	INLET PIPE	, I	PLANUE			high:	1350	_	
			FERNOD CI	OUPLER				_	
		CONNECTING				System F		sq. ft.):	
			and the second	8			0	(6.)	=
	20111101		RUBBER BOOT-			Required	Head Los	s (π):	
	PRIMARY	MANHOLE				Internal o	or Externa	l Bypass:	-
				STORAGE MANHOLE		Application	on		-
									-
			Treatr	nent Perforn	nance *				
			ı	•	T	1		1	•
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•	ND.	NI A		ND				
	fluent (mg/L):	ND	NA NA		ND ND				
	fluent (mg/L): emoval (%):	ND 80	NA 19		ND 80				
iviculali ite	illovai (70).		13		80				]
			Total Met	als	Disso	lved Meta	ls	7	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	f samples:							1	
Median Inf	fluent (mg/L):				ND		ND	1	
Median Eff	fluent (mg/L):				ND		ND		
Median Re	· '				42		38		
* blank cell	ls indicate no info	mation wa	is received fr						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE	CULD	<u> </u>							
	50% TSS Re	moval	80% TS	S Removal	1				
NJCAT	X	IIIOVAI	3070 13.	3 Kemovai	-		-		
IUCAI	Α				J				
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
			_						
	Installation Cost:		low:	-	_		_		
Estimated .	Annual O&M Cos	t:	low:		high:		_		



Manufacturer/Vendor:	BaySaver Technologies, Inc.
Name of Technology:	BaySeparator®
Technology Type:	Hydrodynamic Separation
Treatment Notes	
Additional Notes	



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental
Bio Clean Curb Inlet Basket

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

## Schematic



## **System Design Information**

Design Flow Rate (gpm):

low: 381 high: 898

System Footprint (sq. ft.):

0

Required Head Loss (ft):

0.5-2

**Internal or External Bypass:** 

Other Approvals:

External

**Application** 

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	85.8	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	73.4	NA	NA	NA	NA	NA	NA
Median Removal (%):	93*	14	NA	NA	NA	NA	NA	NA

		Total Met	als	Disso	ved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	24.3	NA	NA	NA
Median Effluent (mg/L):	NA	NA	10.4	NA	NA	NA
Median Removal (%):	NA	NA	79	NA	NA	NA

<sup>\*</sup> blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

## Approvals

Oil

	FOO/ TCC Domesial	900/ TO	CC Domessal	7	
NJCAT	50% TSS Removal	80% 13	SS Removal		

Local	Instal	lations
-------	--------	---------

# of Installations in Washington: 0 WA

## **Estimated Costs**

Estimated Installation Cost: low: \$445 high: \$1,600
Estimated Annual O&M Cost: low: \$0.20/gal high: \$0.40/gal



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental
Bio Clean Curb Inlet Basket

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### **Treatment Notes**

The Curb Inlet Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.

- --Univerisity of Southern California Independent Field Testing (Turbidity in NTUs)
- --Suspended Solids Retention Testing Full Scale Lab Testing

Additional Notes
*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK
90 Sand gradation was used for the testing.



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Bio Clean Downspout Filter

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

# Schematic LOW PATH IERS HIGH FLOW BYPASS POWDER COATED FILTER HOUSING FILTER HOUSING STAINLESS STEEL FILTER CARTRIDGE BIOSORB HYDROCARBON BOOM (wrapped around cartridge) (additional filter media available)

## **System Design Information**

Design Flow Rate (gpm):

low: 249 high: 1,145

System Footprint (sq. ft.):

0.31-1.57 (cu ft)

Required Head Loss (ft):

1,2

Other Approvals:

**Internal or External Bypass:** 

Internal Bypass - High Flow

Unimpeded

**Application** 

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	NA		223.5	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA		29.5	NA	NA	NA	NA
Median Removal (%):	93*	NA		87	NA	NA	NA	NA

		Total Met	als	Disso	lved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	76	96	69	NA	NA	NA

Basic Enhanced Phosphorus

Pretreatment

## **Approvals**

Oil

TAPE						
		,			7	
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT				ļ		

#### **Local Installations**

# of Installations in Washington: 17 (Port of Olympia)

## **Estimated Costs**

Estimated Installation Cost: low: \$1,035 high: \$1,200
Estimated Annual O&M Cost: low: \$0.16/gal high: \$0.22/gal

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:BicName of Technology:BicTechnology Type:Drawn

Bio Clean Environmental
Bio Clean Downspout Filter

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### **Treatment Notes**

The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by IAMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.

--Full Scale Laboratory Testing D-Tek Analytical

--X-Tex-Z-200 Testing for Metals - From Xextex Corporation, USA

Additional Notes
*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This
filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to downspousizes 4" to 12".
51265 1 100 12 1



Manufacturer/Vendor: Name of Technology:

Bio Clean Environmental

Bio Clean Flume Filter

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

## Schematic



## **System Design Information**

Design Flow Rate (gpm):

low: 116 high: 583

System Footprint (sq. ft.):

1,6

Required Head Loss (ft):

0.083,0.5

**Internal or External Bypass:** 

Internal Bypass

**Application** 

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	73	NA	223	360	NA	NA	NA	NA
Median Effluent (mg/L):	51.6	NA	29.5	62	NA	NA	NA	NA
Median Removal (%):	29	NA	87	83	NA	NA	NA	NA

		Total Met	als	Disso	ved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	17	NA	NA	NA	NA

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Ennanced	Pnospnorus	Oll	Otner Approvais:
TAPE						
•	·	•			•	<u> </u>
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
					•'	

Local	Insta	llations
	111360	

# of Installations in Washington: 0 WA

## **Estimated Costs**

Estimated Installation Cost:low:\$660high:\$1,302Estimated Annual O&M Cost:low:\$0.23/galhigh:\$0.74/gal





Manufacturer/Vendor: Name of Technology:

Bio Clean Environmental

Bio Clean Grate Inlet Skimmer Box

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

## Schematic



## **System Design Information**

Design Flow Rate (gpm):

low: 224 high: 8,980

System Footprint (sq. ft.):

0

Required Head Loss (ft):

0.5,2

**Internal or External Bypass:** 

Internal - High Flow Rate

Application

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	18.6	NA	189	NA	NA	NA	NA
Median Effluent (mg/L):	NA	0.452	NA	10.43	NA	NA	NA	NA
Median Removal (%):	86*	98	NA	95	NA	NA	NA	NA

		Total Met	als	Disso	ved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	1.9	1.5	13.7	NA	NA	NA
Median Effluent (mg/L):	0.1	0.2	0.73	NA	NA	NA
Median Removal (%):	95	87	95	NA	NA	NA

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
		•	•	•	•	<u> </u>
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						

## **Local Installations**

# of Installations in Washington: 0 WA, 123 OR

## **Estimated Costs**

Estimated Installation Cost: low: \$635 high: \$1,800
Estimated Annual O&M Cost: low: \$0.15/gal high: \$0.40/gal



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Bio Clean Grate Inlet Skimmer Box

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### **Treatment Notes**

The Grate Inlet Skimmer Basket has been in use since the mid 90's. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below.

- --Longo Toyota Independent Field Testing
- --Suspended Solids Retention Testing Full Scale Lab Testing
- --Reedy Creek Improvement District Independent Field Testing
- --UC Irvine Independent Testing
- --Whitman's Pond
- --Creech Engineering

Additional Notes
*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-
90 Sand gradation was used for the testing.



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Bio Clean Trench Drain Filter

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

## Schematic



## **System Design Information**

Design Flow Rate (gpm):

low: 28 high: 86

System Footprint (sq. ft.):

0

Required Head Loss (ft):

4,12

**Internal or External Bypass:** 

Internal Bypass

**Application** Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	NA	NA	NA	NA	NA	NA	NA

		Total Meta	als	Dissol	ved Meta	s
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	NA	NA	NA	NA	NA

<sup>\*</sup> blank cells indicate no information was received from vendor

## **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
ГАРЕ						
	•	•	•	•		
	50% TSS Rer	noval	80% TS	S Removal		

	Local		Inst	all	at	ic	n.	5
--	-------	--	------	-----	----	----	----	---

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$660high:\$1,302Estimated Annual O&M Cost:low:\$0.23/galhigh:\$0.74/gal



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Bio Clean Trench Drain Filter

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Technology Type.	milet insert (Combination System (Serven and Absorbert Boom) rabitely
Treatment Notes	
No testing has been done on the trencl	h drain filter.
Additional Notes	
The Bio Clean Trench Drain Filter come	es standard with BioSorb Hydrocarbon booms or can use BioMediaGREEN. The filter is
designed to utilize varoius media based	d upon pollutants of concern. The Trench Drain Filter can be used in various size trench drains
S .	

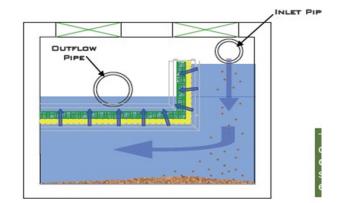


Manufacturer/Vendor: Name of Technology: Technology Type: **Bio Clean Environmental** 

Bio Clean Water Polisher - Up Flow Filter

Hydrodynamic Separation(Up-Flow)

#### **Schematic**



## **System Design Information**

Design Flow Rate (gpm):

low: 191 high: 528

System Footprint (sq. ft.):

0

Required Head Loss (ft):

1,2

**Internal or External Bypass:** 

Internal Bypass - High Flow

Unimpeded

**Application** 

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	84.6	2.07	1.4	69.8	NA	NA	NA	NA
Median Effluent (mg/L):	12.4	0.63	0	6.5	NA	NA	NA	NA
Median Removal (%):	85	70	>99	91	NA	NA	NA	NA

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	NA	NA	NA	0.57	0.38	0.75	
Median Effluent (mg/L):	NA	NA	NA	0.12	0.01	0.16	
Median Removal (%):	NA	NA	NA	79	98	78	

<sup>\*</sup> blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals
APE						
	•				•	
	50% TSS Rer	noval	80% TSS	S Removal		

## **Local Installations**

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$25,000high:\$125,000Estimated Annual O&M Cost:low:\$5.24/galhigh:\$7.85/gal



Manufacturer/Vendor: Name of Technology: Technology Type:

Bio Clean Environmental

Bio Clean Water Polisher - Up Flow Filter

Hydrodynamic Separation(Up-Flow)

#### **Treatment Notes**

The Bio Clean Water Polisher is a unique upflow media filter designed as a stand alone treatment unit or incorporated with the Nutrient Separating Baffle Box to form a complete treatment train. The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. The BioMediaGREEN has been independently tested in full scale labaratory testing. Media surface loading rate during the testing averaged 2-5 gpm with minimal head. A series of 8 composite influent and effluent grab samples we collected over a perioud of two days.

BioMediaGREEN Performance Testing by Waves Environmental - Independent Full Scale Lab Testing

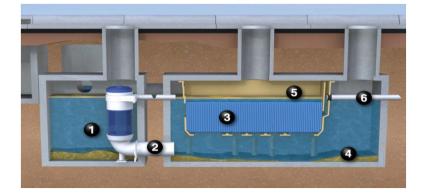
#### **Additional Notes**

The Bio Clean Water Polisher utilizes the revolutionary filter media, BioMediaGREEN. This material is made of billions of small fibers formed into solid blocks. The media composition consists of various oxides to allow for ion exchange and precipitation of dissolved pollutants. The physical structure of the media provides high peformance for the entrapment of particulate pollutants. The media has 80% void space which allows for double the hydraulic retention time when compared to granular media which leads to better overall performance. Another result of the void space is a high hydraulic conductivity. The media surface area loading rate for the media is approximately 7 gpm/sq ft surface area at a head pressure of 18".



Manufacturer/Vendor:	Bio-Microbics, Inc.
Name of Technology:	BioStorm®
Technology Type:	Oil/Water Separator

## **Schematic**



## **System Design Information**

Design Flow Rate (gpm):

low: 225 high: 4,800

System Footprint (sq. ft.):

45 - 162

Required Head Loss (ft):

0.5 - 0.17

**Internal or External Bypass:** 

External

**Application** 

Stormwater/Groundwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	227							
Median Effluent (mg/L):	7.9							
Median Removal (%):	95.3							

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Ennanced	Phosphorus	Oli	Other Approvais:
TAPE						
	50% TSS Ren	noval	80% TS	S Removal		
NJCAT						
					•	

	lations

# of Installations in Washington: 0

## **Estimated Costs**

Estimated Installation Cost:low: \$500high: \$2,000Estimated Annual O&M Cost:low: \$400high: \$4,000



Manufacturer/Vendor:	Bio-Microbics, Inc.						
Name of Technology:	BioStorm®						
Technology Type:	Oil/Water Separator						
Treatment Notes							
TSS results are from grab san	nples done in a lab setting. Unit was tested from 50% of design flow up to 125%. Numbers reported						
below are at 100% of design	flow.						
Additional Notes							
	osts are estimates for the Washington area and do not include equipment or tank costs. Drawings and						
further information on the pr	roduct can be obtained on our website at the following url: http://biomicrobics.com/?p=77						

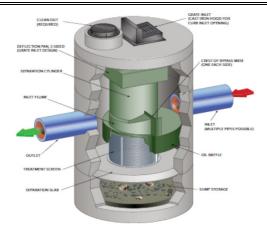


Manufacturer/Vendor: Name of Technology: CONTECH Stormwater Solutions, Inc.

CDS

**Technology Type:** Hydrodynamic Separation

## **Schematic**



## **System Design Information**

Design Flow Rate (gpm):

low: 20 high: 44,900

System Footprint (sq. ft.):

NA

Required Head Loss (ft):

0.1

**Internal or External Bypass:** 

**Both Available** 

Other Approvals:

Application

Stormwater

## Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	154			22				
Median Effluent (mg/L):	26			5				
Median Removal (%):	95			64				

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

**Enhanced** 

**Basic** 

**Pretreatment** 

## **Approvals**

**Phosphorus** 

Oil

NPE .	GULD	GULD			PULD
	50% TSS Ren	noval	80% TSS	Removal	]
UCAT.	V				

## **Local Installations**

# of Installations in Washington: > 250

#### **Estimated Costs**

Estimated Installation Cost:low: \$10,000high: \$2.5MEstimated Annual O&M Cost:low: \$0.00001/galhigh: \$0.00001/gal

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:

CONTECH Stormwater Solutions, Inc.

Name of Technology:	CDS						
Technology Type:	Hydrodynamic Separation						
Treatment Notes							
The Manasquan Savings Bar	nk Stormwater Treatment System Field Evalutaion: CDS Unit (2010). Field, Peer-Reviewed, Composite.						
Additional Notes							
Oil & Grease laboratory dat	ta using sorbents at flow rates of 25, 50, and 75% of design.						



Manufacturer/Vendor: Name of Technology: Technology Type: StormwateRx LLC
Clara Plug Flow Separator

Hydrodynamic Separation

## **Schematic**



## **System Design Information**

Design Flow Rate (gpm):

low: 5 high: 1120

System Footprint (sq. ft.):

0 - 150

Required Head Loss (ft):

0.5 - 1.5

**Internal or External Bypass:** 

Internal

Application

Stormwater

## Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	284.5							
Median Effluent (mg/L):	173.5							
Median Removal (%):	47		YES	YES				

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	0.516	0.088	2.82				
Median Effluent (mg/L):	0.078	0.072	1.21				
Median Removal (%):	30	26	32				

<sup>\*</sup> blank cells indicate no information was received from vendor

## **Approvals**

•	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	50% TSS Removal		80% TSS Removal			
NJCAT						<u> </u>

## **Local Installations**

# of Installations in Washington: 2

#### **Estimated Costs**

Estimated Installation Cost:low: \$20,000high: \$52,000Estimated Annual O&M Cost:low: \$0.0005/galhigh: \$0.001/gal



 Manufacturer/Vendor:
 StormwateRx LLC

 Name of Technology:
 Clara Plug Flow Separator

 Technology Type:
 Hydrodynamic Separation

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These samples were collected as grab samples by StormwateRx, consulting engineers, and facility treatment system operators. All
analytical data is from a third party certified analytical lab. Non-detects were assumed to have the value of one half the detection
limit.

Additional Notes
The Clara uses four pre-engineered chambers with an internal high-flow bypass to trap pollutants such as heavy solids and oil and
grease.



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

## **Treatment Technology Summary Report**

Clean Way Manufacturer/Vendor: Name of Technology: Clean Way Downspout Filtration Unit **Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric)) Schematic **System Design Information** Design Flow Rate (gpm): low: high: System Footprint (sq. ft.): Required Head Loss (ft): **Internal or External Bypass: Application** Treatment Performance TPH Oil & grease **TSS** TP **SVOCs PCBs** Dioxins | CPAHs Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): **Total Metals Dissolved Metals** Zn Cu Pb Cu Pb Zn Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): blank cells indicate no information was received from vendor **Approvals Pretreatment Basic Enhanced Phosphorus** Oil Other Approvals: TAPE 50% TSS Removal 80% TSS Removal **NJCAT Local Installations** # of Installations in Washington: **Estimated Costs** 

low: \_\_\_\_

low:\_\_\_\_

high: \_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Clean Way
Clean Way
Clean Way Downspout Filtration Unit
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Additional Notes



Manufacturer/Vendor: ClearWater Solutions, Inc. \* Name of Technology: ClearWater BMP **Technology Type:** Drain Inlet Insert(Combination System (Screen and Media Filtration))

_			_	
Sc	hο	m	at	ir



## System Design Information

Design Flow Rate (gpm): low: 200 high: 200 System Footprint (sq. ft.): 5,6

Required Head Loss (ft): **Internal or External Bypass:** 

Application

## Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

## Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	50% TSS Rer	noval	80% TSS Removal			
NJCAT						
			1-	and Installatio		

	Local	l Instal	llations
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# of Installations in Washington:		
	Fstimated Costs	

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

ClearWater Solutions, Inc. \*

ClearWater BMP
Drain Inlet Insert(Combination System (Screen and Media Filtration))

Additional Notes



Manufacturer/Vendor: Name of Technology:

Coanda, Inc.
Curb Inlet

Technology Type:

Drain Inlet Insert(Combination System (Screen and Media Filtration))

#### Schematic



### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 360,000

System Footprint (sq. ft.):

2-2000

Required Head Loss (ft):

1.5-3

**Internal or External Bypass:** 

Internal

**Application** 

Stormwater/Wastewater/

**Process Water** 

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	1500							
Median Effluent (mg/L):	1376							
Median Removal (%):	8							

	Total Metals			Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			48				
Median Effluent (mg/L):			15				
Median Removal (%):			69				

<sup>\*</sup> blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•		•	-		· · · · · · · · · · · · · · · · · · ·
	50% TSS Ren	noval	80% TSS	S Removal		

#### **Local Installations**

# of Installations in Washington:

A handful of private downspouts and area drains.

#### **Estimated Costs**

Estimated Installation Cost:low:\$2,000high:\$3,500Estimated Annual O&M Cost:low:\$-0-high:\$-0-



Manufacturer/Vendor:	Coanda, Inc.
Name of Technology:	Curb Inlet
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

#### **Treatment Notes**

USC (University of Southern California) obtained trash from Los Angeles Sanitation Services and United Stormwater. The Coanda BMP was filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the street. The water then entered the BMP at approximately 635 gallons per minute (gpm). The BMP was evaluated for pollutant removal potential by collecting water quality samples before it reached the BMP and then from under the BMP at different time intervals. The samples were evaluated by USC using chemical analysis to determine the water quality.

#### **Additional Notes**

A summary of the USC report can be found at: http://www.coanda.com/products/documents/usc\_research\_project.pdf.

Other case studies have been performed, demonstrating removal of trash, nutrients, metals, pesticides, and bacteria: http://www.coanda.com/products/documents/Rowlett\_Case\_Study\_I.pdf



Manufacturer/Vendor: Coanda, Inc. Name of Technology: Downspouts

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Media Filtration))

#### Schematic





### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 360,000

System Footprint (sq. ft.):

2-2000

Required Head Loss (ft):

1.5-3

**Internal or External Bypass:** 

Internal

Other Approvals:

**Application** 

Stormwater/Wastewater/

Process water

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	1500							
Median Effluent (mg/L):	1376							
Median Removal (%):	8							

	Total Metals			Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			48				
Median Effluent (mg/L):			15				
Median Removal (%):			69				

<sup>\*</sup> blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

#### **Approvals**

Oil

					•	
TAPE						
	•			•	•	
	50% TSS Ren	noval	80% TSS	S Removal		
NJCAT						

#### **Local Installations**

# of Installations in Washington: A handful of private downspouts and area drains.

### **Estimated Costs**

**Estimated Installation Cost:** \$2,000 **high:** \$3,500 low: **Estimated Annual O&M Cost:** high: \$-0**low:** \$-0-



Manufacturer/Vendor:	Coanda, Inc.
Name of Technology:	Downspouts
Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))

#### **Treatment Notes**

USC (University of Southern California) obtained trash from Los Angeles Sanitation Services and United Stormwater. The Coanda BMP was filled with trash to evaluate the hydraulic performance. The test was conducted by running water from water trucks onto the street. The water then entered the BMP at approximately 635 gallons per minute (gpm). The BMP was evaluated for pollutant removal potential by collecting water quality samples before it reached the BMP and then from under the BMP at different time intervals. The samples were evaluated by USC using chemical analysis to determine the water quality.

#### **Additional Notes**

A summary of the USC report can be found at: http://www.coanda.com/products/documents/usc\_research\_project.pdf.

Other case studies have been performed, demonstrating removal of trash, nutrients, metals, pesticides, and bacteria: http://www.coanda.com/products/documents/Rowlett\_Case\_Study\_I.pdf



	rer/Vendor:		eam Technolog	gies						
Name of Te		CrystalClean Separator								
Technology	у Туре:	Oil/Water	Separator							
Schemati	C					System	Design I	nformati	on	
						Design Fl	ow Rate (	gpm):		
						low:				
						high:		_		
						System F	ootprint (	sq. ft.):		
		an Contraction				Required	Head Los	s (ft):		
						Internal o	or Externa	l Bypass:		
						Applicati	on			
									-	
			Treatr	nent Perforn	nance *					
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Number of	•									
	luent (mg/L):									
	luent (mg/L):									
Median Re	moval (%):									
			T-+-1 84-4	-1-	D:		1-	٦		
		<b>C</b>	Total Met			lved Meta		_		
Number of	annulas.	Cu	Pb	Zn	Cu	Pb	Zn	4		
Number of								4		
	luent (mg/L):	+						4		
	luent (mg/L):							4		
Median Re	movai (%): s indicate no infor	emation we	s received fr	om vondor		L				
* blank cell	s indicate no infor	mation wa	is received in	Approvals						
				Approvais						
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other A	provals:		
TAPE										
					-					
	50% TSS Re	moval	80% TS	S Removal						
NJCAT										
			Lo	cal Installati	ons					
# of Installa	ations in Washing	ton:			-					
			E	stimated Cos	sts					
			_							
	Installation Cost:		low:				_			
Estimated A	Annual O&M Cost	<b>::</b>	low:		high:		_			



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

CrystalStream Technologies

CrystalClean Separator

Oil/Water Separator

Additional Notes

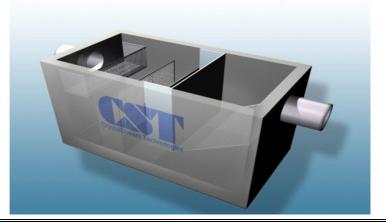


 Manufacturer/Vendor:
 CrystalStream Technologies

 Name of Technology:
 CrystalCombo Hybrid Polisher

 Technology Type:
 Media Filtration(Combination System (with Oil/Water Separator))

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System Design Information
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Design Flow Rate (gpm): low: high:
System Footprint (sq. ft.):
Required Head Loss (ft):
Internal or External Bypass:
Application

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

Estimated Installation Cost: Estimated Annual O&M Cost:

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:								
TAPE														
	ı													
	50% TSS Removal		80% TS	S Removal										
NJCAT														
	•		•	•										
			Lo	cal Installatio	ns									
# of Install	# of Installations in Washington:													
		Estimated Costs												

low:\_\_\_\_\_

high: \_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

CrystalStream Technologies

CrystalCombo Hybrid Polisher

Media Filtration(Combination System (with Oil/Water Separator))

Additional Notes



Manufactu	ırer/Vendor:	Hydro Inte	ernational, Inc.						
		-	am Defender						
Technology	у Туре:	Hydrodyna	amic Separatio	n					
Schemati	ic	Oil & flo	patables			System	Design I	nformati	on
		storage				Design Fl	ow Rate (	gnm):	
				lle .		low:	500	6F/.	
						high:	7800	_	
								_	
	-					System F	ootprint (	sq. ft.):	
						Required		s (ft):	<u>-</u> ,
							0.5-0.9		=,
						Internal	or Externa	ıl Bypass:	
				sediment		Applicati	on		-
Number of s Median Influ Median Rem  Number of s Median Rem  Number of s Median Rem  * blank cells  TAPE  NJCAT  # of Installat			stor	rage zone					-
			Treatr	nent Perforn	nance *				
				-					
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
	fluent (mg/L):	ND							
		ND							
Median Re	moval (%):	50							
			Total Met	ala .	Disco	lund Mata	la .	7	
		Cu	Pb	Zn	Cu	lved Meta Pb	Zn		
Number of	samples:	Cu	FD	211	Cu	FU	211	+	
		+						†	
								†	
								+	
	ls indicate no info	rmation wa	as received from	om vendor	ļ	ļ.	ļ	→	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other A	provals:	
TAPE	GULD								
			•	•	-	-			
	50% TSS Re	moval	80% TS	S Removal					
NJCAT	X				]				
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
	Installation Cost:						_		
Estimated .	Annual O&M Cos	t:	low:		high:		_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Hydro International, Inc.
Downstream Defender
Hydrodynamic Separation

Treatment Notes



Manufactu	rer/Vendor:	United Sto	orm Water, Inc.						
Name of Te		DrainPac™	ı						
Technology		Drain Inlet	Insert(Combir	nation System (S	creen and Absor	bent Boom	/Fabric))		
Schematic	С					System	Design II	nformatio	on
	Į.		u bar			Design Flo low: high: System Fo	ootprint (s	- - sq. ft.):	
	A					Required Internal of			
						Application	on		
			<del></del>	15.6					
			Treatn	nent Perforn	nance *				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
Median Eff	luent (mg/L):								
Median Rei	moval (%):								
								٦	
			Total Metals			ved Meta		_	
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of								1	
	luent (mg/L):							1	
	luent (mg/L):								
Median Rei		<u> </u>						<u> </u>	
* blank cell:	s indicate no infor	mation wa	is received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other Ap	provals:	
TAPE				-			-	•	
		•				1			
	50% TSS Rei	moval	80% TSS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
	nstallation Cost:		low:		high:		=		
Estimated A	Annual O&M Cost	:	low:		high:		_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

United Storm Water, Inc.
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Additional Notes



Manufacturer/Vendor: Name of Technology: Technology Type: **Royal Environmental Systems** 

ecoLine a

Type: Oil/Water Separator

#### Schematic



### **System Design Information**

Design Flow Rate (gpm):

low: 25 high: 626

System Footprint (sq. ft.):

12-70

Required Head Loss (ft):

6.00" with clean coalescer

**Internal or External Bypass:** 

Site specific design required

**Application** 

Stormwater/Process Water/ Wastewater/Groundwater

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)		(b)	(b)	(b)	(b)	(b)	(b)

		Total Met	als	Dissolved Metals			
	Cu	Cu Pb Zn			Pb	Zn	
Number of samples:							
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)	

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•	•	•	•	
	50% TSS Removal		80% TSS Removal			
NJCAT						

Local I	nstali	lations
---------	--------	---------

# of Installations in Washington: 6

#### **Estimated Costs**

Estimated Installation Cost:low:\$ 6,700high:\$ 44,250Estimated Annual O&M Cost:low:(a)high:(a)



Manufacturer/Vendor: Name of Technology: Technology Type:

Royal Environmental Systems

ecoLine a

Oil/Water Separator

#### **Treatment Notes**

CEN EN 858-1 Test Method for Class I Coalescing Separator

Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3\* (Solubility of light liquid nil, unsaponifiable)

Water: Potable or purified surface water

Water turn over: Minimum four volumes of test units

Liquid flux: 25-40 m<sup>3</sup>/m<sup>2</sup>-h (10-15 gpm/ft<sup>2</sup>)

Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

#### **Additional Notes**

(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and rep	laced.
In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.	

(b)	Report Form's System	performance data	fields are not applic	able. Product re	moves free-phase	fluids such a	s floating o	oil and
oth	er petroleum hydrocar	rbon products (LNA	APL - Light Non-Aque	ous Phase Liquid	ls).			

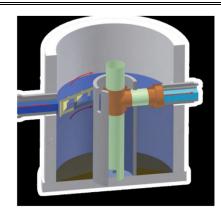


Manufacturer/Vendor: Name of Technology: **Royal Environmental Systems** 

ecoLine b

Technology Type: Oil/Water Separator

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 1110

System Footprint (sq. ft.):

N/A

Required Head Loss (ft):

6.00" with clean coalescer

**Internal or External Bypass:** 

Site specific design required

**Application** 

Stormwater/Process

Water/Wastewater/Ground Water

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Effluent (mg/L):	(b)		(b)	(b)	(b)	(b)	(b)	(b)
Median Removal (%):	(b)		(b)	(b)	(b)	(b)	(b)	(b)

		Total Met	als	Dissolved Metals			
	Cu	Pb Zn Cu Pb					
Number of samples:							
Median Influent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	
Median Effluent (mg/L):	(b)	(b)	(b)	(b)	(b)	(b)	
Median Removal (%):	(b)	(b)	(b)	(b)	(b)	(b)	

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•			•	
[	50% TSS Removal		80% TS	S Removal		
NJCAT						

	Local		Inst	all	at	ic	n.	5
--	-------	--	------	-----	----	----	----	---

# of Installations in Washington: 7

#### **Estimated Costs**

Estimated Installation Cost: low: \$ 8,200 high: \$ 81,900 Estimated Annual O&M Cost: low: (a) high: (a)



Manufacturer/Vendor: Name of Technology: Technology Type:

**Royal Environmental Systems** 

ecoLine b

Oil/Water Separator

#### **Treatment Notes**

CEN EN 858-1 Test Method for Class I Coalescing Separator

Light liquid: Fuel oil, per ISO 8217, designation ISO-F-DMA with density of 0.85 g/cm3\* (Solubility of light liquid nil, unsaponifiable)

Water: Potable or purified surface water

Water turn over: Minimum four volumes of test units

Liquid flux: 25-40 m<sup>3</sup>/m<sup>2</sup>-h (10-15 gpm/ft<sup>2</sup>)

Max. residual light liquid: 5 mg/L (Hydrocarbon content analysis by prescribed infrared spectroscopy procedure)

#### **Additional Notes**

(a) Gravity flow system has no moving parts or power requirement. Oil coalescing media pack can be removed, rinsed, and repla	aced.
In the event of damage to the coalescing media, new coalescing panels can be purchased for a low cost.	

(b) Repo	rt Form's System	n performance data	a fields are not ap	plicable. Pro	oduct removes	free-phase flu	uids such as	floating of	oil and
other pet	roleum hydroca	rbon products (LN	APL - Light Non-Ad	queous Phas	e Liquids).				

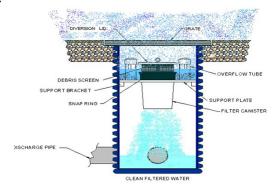


Manufacturer/Vendor: Name of Technology: Technology Type: EcoSense International Inc.

EcoSense Stormwater Filtertration systems, Catch basin inserts

Media Filtration(Cartridge)

#### Schematic



### System Design Information

Design Flow Rate (gpm):

low: 25 high: 1,662\*

System Footprint (sq. ft.):

Required Head Loss (ft):

Varies\*

Internal or External Bypass:

Internal, Hooded

Other Approvals:

**Application** 

Stormwater/Process Water/ Wastewater/Groundwater

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

### **Approvals**

**Phosphorus** 

Oil

TAPE		
	50% TSS Removal	80% TSS Removal
NJCAT		

	lations

# of Installations in Washington: 0

### **Estimated Costs**

Estimated Installation Cost:low: \$400high: \$2,000Estimated Annual O&M Cost:low: \$100high: \$500

**Enhanced** 



Manufacturer/Vendor: Name of Technology: Technology Type: EcoSense International Inc.

EcoSense Stormwater Filtertration systems, Catch basin inserts

Media Filtration(Cartridge)

_												
т	^	-	•	m	e	м		N	$\sim$		^	•
	c	а	ш				ıL	13	u	w	c	3

Third party lab and simulated field studies have been done in US, Italy, New Zealand and Canada on filters loaded with Melt Blown Polypropylene only. One study performed Grab samples on canisters loaded with surfactant modified zeolite and impregnated polyester pads. Results will be included with this submittal.

#### **Additional Notes**

EcoSense offers two media types for canister filters, but other media may be easily loaded. The system incorporates media filter canisters for low flows and "clean pass" hooded over-flows pipes. Multiple filters and over-flows may be installed depending on space available. Hooded over-flow effectively prevent floatables from bypassing canister filters. Debris, sediment, oils and grease (and contaminant associated) are effectively captured by the system. Debris collection baskets are also available especially designed to remove organic debris and trash. These systems are modular so that depending on catch basin sizes multiple baskets or filters or both may be installed.



Manufactu	rer/Vendor:	Royal Envi	ronmental Sys	tems, Inc./Wate	r Tectonics, Inc.				
Name of Te	echnology:	ecoSep®							
Technology	туре:	Oil/Water	Separator						
Schemati	С					System	Design II	nformatio	on
			A Park			Design Flow:	ow Rate (	gpm): -	
		0 0	1	1		high:		_	
		1	6			System Fo	ootprint (	sq. ft.):	
				At for		Required	Head Los	s (ft):	
						Internal o	r Externa	l Bypass:	
						Application	on		
			Treat	ment Perfori	mance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):								
<b>Median Eff</b>	luent (mg/L):								
Median Re	moval (%):								
			Total Meta	ale	Disco	lved Meta	lc .	1	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	samples:	Cu	F 5	211	Cu	FD	211	1	
	luent (mg/L):							1	
	luent (mg/L):								
Median Re									
	s indicate no infor	mation wa	s received from	om vendor		<u> </u>	<u> </u>	4	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other Ap	nrovals:	
TAPE	ricticatilient	Dasic	Limanceu	riiospiiorus	PULD		Other Ap	provais.	
IAFL		<u> </u>			FOLD	]	-		
	50% TSS Rer	noval	80% TSS	S Removal					
NJCAT			0070						
	I		I		I				
			Lo	cal Installati	ons				
# of Installa	ations in Washingt	on:							
			E	stimated Cos	its				
Fatim - 4 1 -	matallatics Coo		1		1.1.1				
	Installation Cost:	_	low:		nigh:		_		
estimated /	Annual O&M Cost	:	low:		nigh:		_		



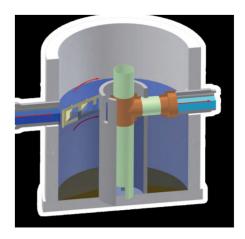


Manufacturer/Vendor: Name of Technology: Technology Type: Royal Environmental Systems

ecoStorm & ecoStorm Plus

Media Filtration(Combination System (with Hydrodyanamic Separation))

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):

 low:
 No Min

 high:
 180

System Footprint (sq. ft.):

N/A

Required Head Loss (ft):

0.41' (c)

**Internal or External Bypass:** 

Internal &/or External

**Application** 

Stormwater/Process Water/ Wastewater/Ground Water

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	200							
Median Effluent (mg/L):	26							
Median Removal (%):	87							

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	0.019	0.005	0.17			0.066	
Median Effluent (mg/L):	0.009	0.002	0.073			0.042	
Median Removal (%):	53	60	57			36	

<sup>\*</sup> blank cells indicate no information was received from vendor

### **Approvals**

	Pretreatment	Basic   Enhanced   Phosphorus   Oil			Oil	norus Oil	Other Approvals:
TAPE		CULD					
	•		•			<u> </u>	
	50% TSS Removal		80% TSS	S Removal			
NJCAT							

Local		Inst	all	a	ti	0	n	S
-------	--	------	-----	---	----	---	---	---

# of Installations in Washington: 9

### **Estimated Costs**

 Estimated Installation Cost:
 low: \$8,900 (a)
 high: \$37,500 (a)

 Estimated Annual O&M Cost:
 low: (b)
 high: \$0



Manufacturer/Vendor: Name of Technology: Technology Type:

Royal Environmental Systems ecoStorm & ecoStorm Plus

Media Filtration(Combination System (with Hydrodyanamic Separation))

#### **Treatment Notes**

Field monitoring at the McRedmond Park site located in Redmond, WA. Auto sampler for flow-portional composite and time-based discrete collections. Independent analytical laboratory, and 3rd party data validation/statistical analysis of data points and sets.

#### **Additional Notes**

ecoStorm and ecoStorm plus can be utilized as separate stand-alone technologies or combined in serial component installation. Combined technologies are currently under TAPE evaluation through WADOE for stormwater. Performance data reflects both stormwater and non-stormwater installations.

- (a) Cost varies based on combination of units, number of units, and final design requirements.
- (b) \$500 \$1000 per cleaning/backflush event; Minimum of 1x per yr. to monthly for stormwater.
- (c) Headloss based on:
- Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units.
- 360 gpm through the system, 180 gpm per filter.
- Site specific model calibrated onsite at known flow rates.
- Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units).
- Filters assumed to be at the point of required maintenance (twice the headloss measured for new filters).

System Performance Data results shown are for qualifying events only, per Washington State TAPE requirements:

- Per TAPE requirements, removal requirements for influent concentration less than 100 mg/l are that effluent must be less than or equal to 20 mg/l.
- For parameters with no results presented above, they are not being monitored or were present at concentrations are below measurable thresholds.



**Estimated Annual O&M Cost:** 

# Treatment Technology Summary Report

Manufactui	rer/Vendor:	Royal Envi	ronmental Sys	tems, Inc./Wate	r Tectonics, Inc.				
Name of Te	chnology:	ecoTop®							
Technology	Туре:	Oil/Water	Separator						
Schematio	;				<u> </u>	System	Design II	nformatio	on
			D	100 × 5 km		Design Flo	ow Rate (	gpm):	
		7				high:		_	
			ecol	OP AND SEPARATOR		System Fo	ootprint (	sq. ft.):	
	9	BO'	VE GRADE OIL-W	AIER-JEI/40		Required	Head Los	s (ft):	
						Internal o		l Bypass:	
						Application	on		
			Treat	ment Perfori	mance				
			Heut	ment Perjon	nance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
	uent (mg/L):								
Median Effl	uent (mg/L):								
Median Rer	moval (%):								
					T			7	
		_	Total Met			ved Meta	1		
<u> </u>	•	Cu	Pb	Zn	Cu	Pb	Zn	_	
Number of								_	
	uent (mg/L):							1	
	uent (mg/L):								
Median Ren	· /						<u> </u>	]	
* blank cells	s indicate no infor	mation wa	is received tro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other Ap	provals:	
TAPE		200.0		посрыстис	<u> </u>		- u	, p. 0 . u	
	ļ	!	·	ļ		ı			
	50% TSS Rei	noval	80% TS	S Removal					
NJCAT									
					•				
			Lo	cal Installati	ons				
# of Installa	tions in Washingt	ton:							
			E	stimated Cos	its				
Estimated I	nstallation Cost:		low:		high:				

high:





П	ERRERA	,,,	eutmem	. recilion	gy Sullill	ury nep	OI C		
Manufactu	rer/Vendor:	EcoSense l	International II	nc.					
Name of Te		EcoVault							
Technology	у Туре:	Drain Inlet	: Insert(Media	Filtration)					
Schemati	C					System D	esign In	formatio	n
						Design Flor		pm):	
			The second of	1		low: high:	1,346	_	
			A VEST			mgn.	48,000	_	
	4	Armin				System Fo	otprint (so	q. ft.):	
				3		Required H		(ft):	-
						Internal or	Varies*	Rynass	-
							ther or Bot		
						Application	า		-
						Stormwater			-
			Treat	ment Perfori	mance *				
			ii cut	inche i cijon	nance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
Median Re	luent (mg/L):								
IVICUIUII IXC	1110441 (70).						1	-1	
			Total Met	als	Disse	olved Metal	S		
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of								_	
	luent (mg/L): luent (mg/L):							_	
Median Re								_	
	s indicate no infor	mation wa	is received fro	ı om vendor	<u> </u>		1		
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other A	pprovals:	
TAPE		<u> </u>				1	· -		
				•	-	=			
	50% TSS Re	moval	80% TS	S Removal	_				
NJCAT							-		
			Lo	ocal Installat	ions				
# of Installa	ations in Washing	ton:		0	_				

### **Estimated Costs**

Estimated Installation Cost:low: \$25,000high: \$125,000Estimated Annual O&M Cost:low: \$200high: \$1,800



Manufacturer/Vendor:	EcoSense International Inc.
Name of Technology:	EcoVault
Technology Type:	Drain Inlet Insert(Media Filtration)

#### **Treatment Notes**

A study has not been completed on this specific system. Studies have been performed on other manufactures version of the Type II Baffle Box. Minimum Performance claims are based on model studies performed at the Florida Institute of Technology: Pandit and Gopatakrishnan, 1996. The study mentioned was performed with a scale model Type 1 Baffle Box. Improvements such as media filtration and horizontal debris collection system were subsequently added.

#### **Additional Notes**

The EcoVault is unique among Type II baffle boxes. The standard model incorporates a high performance media filter into the	e last
internal weir which treats low flows and remove a wide variety of contaminants including bacteria, mobile phosphate, ammo	nia,
dissolved heavy metals and orgainics. TSS removal is expect to be 80% at the flows mentioned above. Course organic materi captured and stored above the static WL greatly increasing overall nutrient removal. * Head Loss varies depending on the me filter's top elevation and is directly proportional. Debris loading also effects head loss.	



Manufactu	rer/Vendor:	Enviro-Dra	in, Inc.						
Name of Te	echnology:	Enviro-Dra	nin®						
Technology	/ Туре:	Drain Inlet	Insert(Absorb	ent Boom/Fabri	c)				
Schemati	C					System	Design I	nformati	on
	APPROXICE.		-			Design Flo	ow Rate (	gpm):	
		=	10			low:	2	5k).	
	<b>指基理</b>					high:	71	_	
	<b>有数</b>					Ū		=	
	1					System F	ootprint (	sq. ft.):	
			MIII.			Required	Head Los	s (ft):	-
						Internal o	or Externa	l Bypass:	<del>.</del>
						Application	on		-
									-
			Treat	ment Perfor	mance				
				-					
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
	luent (mg/L):								
Median Re	moval (%):								
					1			7	
			Total Met		•	lved Meta			
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of		<u> </u>						_	
	luent (mg/L):	<u> </u>						1	
	luent (mg/L):	<u> </u>						1	
Median Re	<b>movai (%):</b> s indicate no infor					<u> </u>		]	
* blank cell	s indicate no infor	mation wa	is received tro						
				Approvals		_			
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
			1		1		-		
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
	Installation Cost:		low:		high:		_		
Estimated A	Annual O&M Cost	:•	low:		high:				



Manufacturer/Vendor:	Enviro-Drain, Inc.							
Name of Technology:	Enviro-Drain®							
Technology Type:	Drain Inlet Insert(Absorbent Boom/Fabric)							
Treatment Notes								
Additional Notes								
Additional Notes								



iviaiiuiactu	iei/veiluul.	Transpo III	idustries, inc.						
Name of Te	echnology:	EnviroSafe	o <sub>™</sub>						
TAPE 50% TSS		Drain Inlet	Insert(Media	Filtration)					
Schemati	c					System	Design I	nformati	on
						Design Fl	ow Data (	~~	
							ow Rate (	gpm):	
						low:	115	-	
						high:	230	_	
						System F	ootprint (	sq. ft.):	
						Required	Head Los	s (ft):	-
- 1						Internal	or Externa	l Bypass:	-
- 1						Applicati	on		-
									<b>≘</b> ∘
			Treat	ment Perfor	mance				
		TSS	ТР	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):								
Median Re	moval (%):								
vieulan Kemovai (%).			Total Met	als	Disso	lved Meta	ls	7	
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of	samples:				Cu			1	
								1	
								1	
								†	
		mation wa	as received fro	om vendor	ļ		ļ	-1	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other Ap	provals:	
TAPE		1					•	•	
		4				4	-		
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
	•		•		•				
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
	Installation Cost:		low:		high:		_		
Estimated A	Annual O&M Cost	<b>::</b>	low:		high:		_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Treatment Notes

Additional Notes

Transpo Industries, Inc.
EnviroSafe™
Drain Inlet Insert(Media Filtration)

Treatment Notes



Estimated Installation Cost: Estimated Annual O&M Cost:

# Treatment Technology Summary Report

Manufactu	rer/Vendor:	Transpo In	dustries, Inc.						
Name of Te			™ Storm Safe	HF10					
Technology				ent Boom/Fabri	c)				
Schematic						Suctom	Docian I	nformati	<b>0</b> n
Scriemati	<b>.</b>					System	Design i	njormati	On
						Design Flo	ow Rate (	gpm):	
				SIIIII		low:	900	_	
						high:	9000	<del>_</del>	
		Act				System F	ootprint (	sq. ft.):	
		CCARCO				Required	Head Los	s (ft):	•
						Internal o	r Externa	l Bypass:	
	Filter tube cut-a showing helical					Application	on		-
									<u>-</u>
			Treat	ment Perfor	mance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
	luent (mg/L):								
Median Re	movai (%):								
			Total Met	Disso	lved Meta	ls	7		
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of	samples:							1	
Median Inf	luent (mg/L):							1	
Median Eff	luent (mg/L):							7	
Median Re	moval (%):							]	
* blank cell	s indicate no infor	mation wa	s received fro	om vendor	•	•		<del>-</del>	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other A	provals:	
TAPE									
	50% TSS Re	moval	80% TS	S Removal	]				
NJCAT			3076 16.						
			10	cal Installati	ons				
			LO	cai iiistuiiuli	UIIS				
# of Installa	ntions in Washing	ton:			-				
			E.	stimated Cos	sts				

low:\_\_\_\_

high: \_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Transpo Industries, Inc.

EnviroSafe™ Storm Safe HF10

Drain Inlet Insert(Absorbent Boom/Fabric)

Treatment Notes

Additional Notes



Manufacturer/Vendor: Name of Technology:

**Environment 21** 

EnviroTrap Catch Basin Insert

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):

low: 0 high: 2700

System Footprint (sq. ft.):

NA

Required Head Loss (ft):

0-0.5

**Internal or External Bypass:** 

NΑ

Application

Stormwater

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**150	**150	**150	**150	**150	**150
Median Removal (%):	*30		**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA	
Median Effluent (mg/L):	***0.07	***0.68	***0.24	NA	NA	NA	
Median Removal (%):	***9	***13.6	***20	NA	NA	NA	

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
ГАРЕ						
	•		•	•	-	
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						

I acal	Incta	llations

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$200high:\$1,000Estimated Annual O&M Cost:low:0high:\$1,000



Manufacturer/Vendor: Name of Technology: Technology Type: **Environment 21** 

EnviroTrap Catch Basin Insert

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### **Treatment Notes**

\*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 180 microns was used.

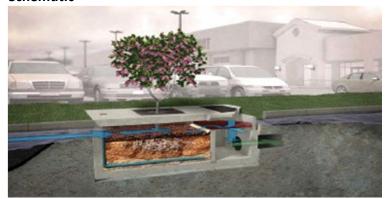
\*\*Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
\*\*\*Testing is not complete for metals; therefore, these values are estimated.

Additional Notes		



Manufacturer/Vendor: Name of Technology: Technology Type: Filterra, DBA Americast, Inc. Filterra Curb Inlet System Bioretention/Filtration

_	-					_
SI	- 6	_	-	~	•	-
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### **System Design Information**

Design Flow Rate (gpm):

low: 8.5 high: 50+

System Footprint (sq. ft.):

Required Head Loss (ft):

2.5

**Internal or External Bypass:** 

Can be either

Other Approvals:

**Application** Stormwater

Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	10	12	12					
Median Influent (mg/L):	27.5	0.15	43.4					
Median Effluent (mg/L):	4.2	0.14	1.2					
Median Removal (%):	84.7	6.7	97.2					

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:				29		29	
Median Influent (mg/L):				0.0056		0.194	
Median Effluent (mg/L):				0.0033		0.082	
Median Removal (%):				44		54	

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

### Approvals

**Phosphorus** 

Oil

TAPE		GULD	GULD		GULD	
					_	
	50% TSS Ren	noval	80% TSS	Removal		
NJCAT						

_	_	
Incal	Inctall	lations

# of Installations in Washington: 186

### **Estimated Costs**

Estimated Installation Cost:low: \$1,200high: \$7,500Estimated Annual O&M Cost:low: \$300high: \$3,000

Enhanced



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Filterra, DBA Americast, Inc.
Filterra Curb Inlet System
Bioretention/Filtration

#### **Treatment Notes**

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

#### **Additional Notes**

Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.002 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).



Manufacturer/Vendor: Name of Technology: Technology Type: Filterra, DBA Americast, Inc. Filterra Roof Drain System

Bioretention/Filtration

### **Schematic**



# **System Design Information**

Design Flow Rate (gpm):

low: 8.5 high: 50+

System Footprint (sq. ft.):

Required Head Loss (ft):

2.5

**Internal or External Bypass:** 

Internal

Other Approvals:

Application

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	10	12	12					
Median Influent (mg/L):	27.5	0.15	43.4					
Median Effluent (mg/L):	4.2	0.14	1.2					
Median Removal (%):	84.7	6.7	97.2					

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:				29		29	
Median Influent (mg/L):				0.0056		0.194	
Median Effluent (mg/L):				0.0033		0.082	
Median Removal (%):				44		54	

Enhanced

**Basic** 

Pretreatment

# Approvals

**Phosphorus** 

Oil

|--|--|

#### **Local Installations**

# of Installations in Washington:

#### **Estimated Costs**

Estimated Installation Cost:low: \$1,200high: \$7,500Estimated Annual O&M Cost:low: \$300high: \$3,000

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor: Name of Technology: Technology Type: Filterra, DBA Americast, Inc.
Filterra Roof Drain System
Bioretention/Filtration

#### **Treatment Notes**

For third party field monitoring at the Port of Tacoma Industrial site in WA, samples were collected via automatic flow-weighted composite samplers. Trapezoidal flumes and V-notch weirs with associated bubbler systems were installed to intercept influent and effluent stormwater, respectively, for flow measurements. Water levels within flumes were recorded using 5-minute intervals. A rain guage was installed in association with the units locations to continuously monitor precipitation totals in the drainage areas, and was interfaced with the autosampler and bubbler equipment.

#### **Additional Notes**

Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.002 to 0.02 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).



Manufactu	rer/Vendor:	ABT, Inc.							
Name of Te	echnology:	First Flush							
Technology	у Туре:	Oil/water S	Separator						
Schemati	С					System I	Design Ir	nformatio	on
						Design Flo	ow Rate (s	gpm):	
						low:	449	,,,,,	
						high:	538	-	
								_	
						System Fo	otprint (s	sq. ft.):	
						•	NA	. ,	
						Required		(ft):	•
							NA		-
						Internal o	r Externa	Bypass:	
						Application	n		•
						Stormwate	r		_
			Treatr	ment Perforn	nance *				
		TCC	TD	TDU	Oil 9 arrange	CVOC-	DCD-	Diavisa	CDALL
Number of	camples	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
	luent (mg/L):								
	luent (mg/L):								
Median Re								+	
Wicalali itc							I	_1	
			Total Met	als	Disso	lved Meta	ls	7	
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of	samples:							1	
Median Inf	luent (mg/L):							1	
Median Eff	luent (mg/L):							1	
Median Re									
* blank cell	s indicate no infor	mation wa	as received fro	om vendor					
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other Ar	provals:	
TAPE	Tretreatment		2	· · · · · · · · · · · · · · · · · · ·	0		• · · · · · · ·	, p. 0 ta.s.	
.,				1		J			
	50% TSS Re	moval	80% TS	S Removal	]				
NJCAT							-		
			1				-		
			Lo	cal Installati	ions				
# of Installs	ations in Washing	ton:		0					
# OI IIIStalia	ations in washing	ton.		0	-				
			E	stimated Co	sts				
Estimated	Installation Cost:		low	\$5,000	high	\$10,000			
	Annual O&M Cost	r:		\$5,000		\$3,000	_		
		·-		7000	,	70,000			



Manufacturer/Vendor: Name of Technology: First Flush
Technology Type: Oil/water Separator

Treatment Notes

Lab test results are provided on the filter media performance and system hydraulic performace based on design capabilites. The installation cost if factoring material and cost of installation together...or an installed cost.

Additional Notes



Manufacturer/Vendor: Kri

Kristar Enterprises, Inc.

Name of Technology: Technology Type:

FloGard Plus

Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

### Schematic



# **System Design Information**

Design Flow Rate (gpm):

low: 100 high: 2000

System Footprint (sq. ft.):

1,10

Required Head Loss (ft):

0,0.25

**Internal or External Bypass:** 

Internal

Application

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			10				
Median Effluent (mg/L):			6				
Median Removal (%):			60				

<sup>\*</sup> blank cells indicate no information was received from vendor

# Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	50% TSS Ren	noval	80% TSS	S Removal		·
NJCAT						

### **Local Installations**

# of Installations in Washington: 100

#### **Estimated Costs**

Estimated Installation Cost:low: \$250high: \$1800Estimated Annual O&M Cost:low: \$75high: \$350



Manufacturer/Vendor:	Kristar Enterprises, Inc.  FloGard Plus  Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))							
Name of Technology:								
Technology Type:								
Treatment Notes								
ab - UCLA, Univeristy of Haw	vaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland							
Additional Notes								



Manufacturer/Vendor: Kristar Enterprises, Inc. Name of Technology:

FloGard Downspout Filter

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

### Schematic



# **System Design Information**

Design Flow Rate (gpm):

low: 30 high: 325

System Footprint (sq. ft.):

0.5,1

Required Head Loss (ft):

0,1.5

**Internal or External Bypass:** 

Internal

Other Approvals:

**Application** 

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			10				
Median Effluent (mg/L):			6				
Median Removal (%):			60				

<sup>\*</sup> blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

### **Approvals**

Oil

					J	
TAPE						
	•	•	•	•		<u> </u>
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
					•	

Local	Ins	tall	lati	ons

# of Installations in Washington:

#### **Estimated Costs**

**Estimated Installation Cost: low:** \$1500 high: \$3500 **Estimated Annual O&M Cost: low:** \$75 high: \$250



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Additional Notes



Manufacturer/Vendor: Name of Technology: Technology Type: Kristar Enterprises, Inc.
FloGard Dual Vortex Seperator
Hydrodynamic Separation

Sc	ha	m	~1	+i,
	ne	m	m	. I C



# **System Design Information**

Design Flow Rate (gpm):

low: 150 high: 6,500

System Footprint (sq. ft.):

7 - 113

Required Head Loss (ft):

0 - 3

**Internal or External Bypass:** 

Internal

Other Approvals:

Application

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	202							
Median Effluent (mg/L):	80							
Median Removal (%):	60							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

Enhanced Phosphorus

Basic

Pretreatment

# **Approvals**

Oil

APE			
	FOO/ TCC Domonal	COO/ TCC Domousi	٦
	50% TSS Removal	80% TSS Removal	
NJCAT	X		

Local	1	nstal	ı	a	ti	ัก	n	ς
LUCUI	•	Hotui	u	u	u	v	•	J

# of Installations in Washington: 10

# **Estimated Costs**

Estimated Installation Cost:low: \$10,000high: \$100,000Estimated Annual O&M Cost:low: \$300high: \$3,500

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Kristar Enterprises, Inc. FloGard Dual Vortex Seperator

Technology Type:	Hydrodynamic Separation

# **Treatment Notes** Internal lab testing performed by Kristar. Third party lab testing was performed by Alden Research laboratories based in Holden Massachussets. No field studies have been completed at this date.

Additional Notes	
No field studies have been completed at this time. C	Correlation of TSS removal with other POCs would indicate similar removal of Total
metals.	



Manufacturer/Vendor: Kristar Enterprises, Inc. Name of Technology:

FloGard LoPro Matrix Filter

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

### **Schematic**



# **System Design Information**

Design Flow Rate (gpm):

low: 45 high: 800

System Footprint (sq. ft.):

0.75,16

Required Head Loss (ft):

0,0.5

**Internal or External Bypass:** 

Internal

**Application** 

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•		•	-		· · · · · · · · · · · · · · · · · · ·
	50% TSS Ren	noval	80% TSS	S Removal		

Local	Ins	tall	lati	ons

# of Installations in Washington:

#### **Estimated Costs**

**Estimated Installation Cost:** low: \$400 high: \$1000 **Estimated Annual O&M Cost: low:** \$75 high: \$300



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Additional Notes



Manufacturer/Vendor: Name of Technology:

Kristar Enterprises, Inc.

FloGard LoPro Trench Drain Filter

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

### Schematic



# **System Design Information**

Design Flow Rate (gpm):

low: 200 high: 500

System Footprint (sq. ft.):

1,20

Required Head Loss (ft):

0,0.25

**Internal or External Bypass:** 

Internal

Application

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

		Total Me	tals	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):			10				
Median Effluent (mg/L):			6				
Median Removal (%):			60				

<sup>\*</sup> blank cells indicate no information was received from vendor

# Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
			<u>-</u>		•	<u></u>
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						

### **Local Installations**

# of Installations in Washington: 0

# **Estimated Costs**

Estimated Installation Cost:low: \$600high: \$3000Estimated Annual O&M Cost:low: \$75high: \$350



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Additional Notes



Manufacturer/Vendor: Name of Technology:

Kristar Enterprises, Inc.

FloGard Trash & Debris Guard

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

### Schematic



# **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 500

System Footprint (sq. ft.):

0.5 - 4

Required Head Loss (ft):

0 - 0.25

**Internal or External Bypass:** 

Internal

Other Approvals:

Application

Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

### **Approvals**

Oil

					J	
TAPE						
	•	•	•	•		<u> </u>
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
					•	

Local	Ins	tall	lati	ons

# of Installations in Washington: 0

# **Estimated Costs**

Estimated Installation Cost:low: \$450high: \$1,500Estimated Annual O&M Cost:low: \$50high: \$200



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

No Data Available

Additional Notes

Kristar Enterprises, Inc.
FloGard Trash & Debris Guard
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Additional Notes

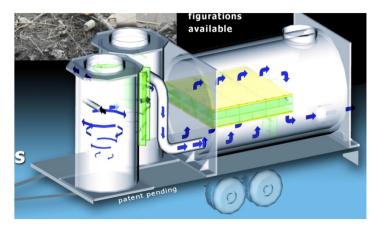


 Manufacturer/Vendor:
 AquaShield, Inc.

 Name of Technology:
 Go-Filter

 Technology Type:
 Media Filtration(Combination System (with Hydrodyanamic Separation))

### **Schematic**



# **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 675

System Footprint (sq. ft.):

Required Head Loss (ft):

0.5

**Internal or External Bypass:** 

Both

**Application** 

Stormwater/Process water

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

# **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
			•	•	•	
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						
					•	

1000	Incta	llations

# of Installations in Washington: 0

# **Estimated Costs**

Estimated Installation Cost:low:Site-specifichigh:Site-specificEstimated Annual O&M Cost:low:Site-specifichigh:Site-specific



Manufacturer/Vendor:	AquaShield, Inc.
Name of Technology:	Go-Filter
Technology Type:	Media Filtration(Combination System (with Hydrodyanamic Separation))
Treatment Notes	
See Aqua-Filter for lab and fie	eld testing.
Additional Notes	
	e principle as Aqua-Filter. Useful on construction sites for turbidity reduction in addition to sediment
	s have been verified by NJCAT.
l l l l l l l l l l l l l l l l l l l	That's seen vermed by the ti.



Manufactu	urer/Vendor:	Hancor, In	ıc.						
Name of T	echnology:	Hancor Sto	orm Water Qu	ality Unit					
Technolog	у Туре:	Oil/Water	Separator						
Schemati	ic					System	Design II	nformati	on
						Design Flo	ow Rate (g	gpm):	
		ASS PIPE LOCATED ON				low:	-	_	
	/ ur	THE STORM WATER QUA	CCESS RISERS			high:		=	
FLOW						System F	ootprint (	sq. ft.):	
,					<b>→</b>	Required	Head Los	s (ft):	-
	SEDIMENT CH	WBER .	OIL CHAN	ADER		Internal o	r Externa	l Bypass:	-
						Application	on		-
			Treat	ment Perfor	mance				-
			T		T	T	T		Γ
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	fluent (mg/L):								
	fluent (mg/L): emoval (%):								
IVICUIAII IXC	inovai (70).							<u> </u>	
			Total Met	als	Disso	ved Meta	ls	1	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	f samples:							Ī	
Median In	fluent (mg/L):								
Median Ef	fluent (mg/L):							Ī	
Median Re	emoval (%):								
* blank cel	ls indicate no infor	mation wa	as received fro					•	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE						]			
	50% TSS Re	moval	80% TS	S Removal	]				
NJCAT									
			Lo	cal Installati	ons				
# of Install	ations in Washing	ton:			-				
			E	stimated Cos	sts				
Estimated	Installation Cost:		low:		high:				
	Annual O&M Cost	t:	low:		high:		_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Hancor, inc.
Hancor Storm Water Quality Unit
Oil/Water Separator



Manufactu	rer/Vendor:	Huber Tec	hnology, Inc.						
Name of To	echnology:	HUBER Hydro Filt							
Technology	у Туре:	Drain Inlet Insert(Media Filtration)							
Schemati	ic					Design Flow: high:	Design II  ow Rate (	-	on
				,		Required	0 Head Los	s (ft):	-
		-				Internal o	or Externa	ı Bypass:	
						Application	on		-
		A FOR ELECTION							-
			Treat	ment Perfor	mance				
		TSS	ТР	TDU	Oil 9 arease	SVOCa	DCDe	Dioxins	CDALIS
Number of	f camples:	133	IP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
	fluent (mg/L):	+							
	fluent (mg/L):	+							
	emoval (%):	+							
.v.cu.u.r.vc			1		1			1	
			Total Met	als	Disso	ved Meta	ls	1	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	f samples:							İ	
	fluent (mg/L):							1	
	fluent (mg/L):							1	
	moval (%):							İ	
	ls indicate no infor	mation wa	s received fro	om vendor		ļ	Į.	-1	
				Approvals					
						1			
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE		<u> </u>							
					7		-		
	50% TSS Re	moval	80% TS	S Removal	-		-		
NJCAT					]				
					<u> </u>				
			LO	cal Installati	ons				
# of Install	ations in Washing	ton:			-				
			E	stimated Cos	sts				
	Installation Cost:		low:				_		
Estimated	Annual O&M Cost	t:	low:				_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Huber Technology, Inc.
HUBER Hydro Filt
Drain Inlet Insert(Media Filtration)

Treatment Notes



	ırer/Vendor:	Hydrowor							
	echnology:	HydroFilter							
Technolog	у Туре:	Media Filt	ration(Combin	ation System (w	th Oil/Water Sep	parator))			
Schemati	ic	-				System	Design II	nformati	on
	V	-	7			Design Flow:	ow Rate (	gpm):	
	1	111				high:		_	
		1 C						=	
			:			System F	ootprint (	sq. ft.):	
						Required	Head Los	s (ft):	-
	-					Internal o	or Externa	l Bypass:	-
						Application	on		-
									<u>-</u>
			Treat	ment Perfor	mance				
		TSS	ТР	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	f samples:	133			On & grease	34003	1 CD3	DIOXIIIS	CIAIIS
	fluent (mg/L):								
	fluent (mg/L):								
	emoval (%):								
					T			7	
			Total Met		Disso	lved Meta			
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of									
	fluent (mg/L):							_	
	fluent (mg/L):								
	emoval (%):		1					<u> </u>	
* blank cel	ls indicate no infor	mation wa	as received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE							•	•	
ļ.	-	4	+	!	-	4			
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Install	ations in Washing	ton:							
			E	stimated Cos	sts				
	Installation Cost:		low:	-	high:	-	_		
Estimated	<b>Annual O&amp;M Cost</b>	::	low:		high:				



Manufacturer/Vendor:	Hydroworks								
Name of Technology:	HydroFilter								
Technology Type:	Media Filtration(Combination System (with Oil/Water Separator))								
Treatment Notes									
Additional Notes									



Manufactu	rer/Vendor:	Hydrowor	ks						
Name of Te	echnology:	HydroGua	rd						
Technology	/ Туре:	Hydrodyna	amic Separatio	n					
Schemati	c					System	Design II	nformati	on
				Low Flow Path High Flow Path Flow in Innet Ch Flow in Middle C		Design Flow: low: high:	360 3232	gpm): - -	
	Inlet Pipe			Outet Pipe		System Fe	ootprint (s	sq. ft.):	
	Innér Chamber Out			Middle Chamber Outlet  Outlet Chamber		Required		s (ft):	•
						Internal o		l Bypass:	
		1 P. C.				Application	on		
			Treat	ment Perfor	mance				
			neut.	ment renjon	nance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):	ND							
	luent (mg/L):	ND							
Median Re	moval (%):	70							
								•	
			Total Meta	als	Disso	ved Meta	ls		
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	samples:								
Median Inf	luent (mg/L):								
Median Eff	luent (mg/L):								
Median Re	moval (%):								
* blank cell	s indicate no info	rmation wa	s received fro	om vendor			•	<b>-</b>	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other Ap	provals:	
TAPE									
	•	•				•			
	50% TSS Re	moval	80% TSS	S Removal					
NJCAT	X								
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:							
			E:	stimated Cos	sts				
Estimated I	Installation Cost:		low:		high:		=		
Estimated A	Annual O&M Cost	t:	low:		high:		_		



Manufacturer/Vendor:	Hydroworks								
Name of Technology:	HydroGuard								
Technology Type:	Hydrodynamic Separation								
Treatment Notes									
Additional Notes									



Manufactu	rer/Vendor:	ACF Enviro	nmental, Inc.						
Name of Te	chnology:	Hydro-Kleen™							
Technology	Туре:	Drain Inlet Insert(Media Filtration)							
Schematio						Design Flo low: high: System Fo	ootprint (s	- - sq. ft.): s (ft):	on
			Treat	ment Perfor	mance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
	luent (mg/L):								
	luent (mg/L):								
Median Rei	moval (%):								
								7	
			Total Met			ved Meta			
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of									
	luent (mg/L):							<u> </u>	
	luent (mg/L):							<u> </u>	
Median Rei								]	
* blank cells	s indicate no infor	mation wa	is received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
	<u> </u>						-		
	50% TSS Rei	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	itions in Washingt	ton:							
			E	stimated Cos	sts				
Estimated !	nstallation Cost:		la		. طاء اط				
			low:		high:		_		
Estimated A	nated Annual O&M Cost: low: high:			_					



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

ACF Environmental, Inc.
Hydro-Kleen™
Drain Inlet Insert(Media Filtration)

Treatment Notes



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

# **Treatment Technology Summary Report**

Manufacturer/Vendor: Stormdrain Solutions Name of Technology: Inceptor® **Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric)) **Schematic System Design Information** Design Flow Rate (gpm): low: high: System Footprint (sq. ft.): Required Head Loss (ft): **Internal or External Bypass: Application** Treatment Performance TPH Oil & grease **TSS** TP **SVOCs PCBs** Dioxins | CPAHs Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): Dissolved Metals **Total Metals** Pb Zn Cu Cu Pb Zn Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): blank cells indicate no information was received from vendor **Approvals Pretreatment Basic Enhanced Phosphorus** Oil Other Approvals: TAPE 50% TSS Removal 80% TSS Removal **NJCAT Local Installations** # of Installations in Washington:

**Estimated Costs** 

high: \_\_\_\_

low:\_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Stormdrain Solutions
Inceptor\*
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Additional Notes



# HERRERA Treatment Technology Summary Report

Manufactu	rer/Vendor:	Imbrium S	vstems						
Name of Te		Jellyfish Fil							
Technology			ration(Up-Flow	<i>ı</i> )					
Schematic	ε					System	Design II	nformati	on
		Contract Contract		,					
							ow Rate (	gpm):	
						low:	60	_	
	4		de			high:	2300	_	
		1	200					<b>6.</b> \	
		1				System F	ootprint (	sq. ft.):	
						Poguirod	12 - 113 <b>Head Los</b>	c /f+\.	•
		3 III war	THE STREET			Requireu	1,2	s (IL).	
						Internal o	or Externa	l Bynass:	
		1997					or Externa		
						Application		/	
						Stormwate			
									•
			Treatn	nent Perforn	nance *				
		1							
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•								
	luent (mg/L):	74							
	luent (mg/L):	8							
Median Rei	movai (%):	89							
			Total Meta	als	Disso	ved Meta	ls	]	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	samples:							1	
	luent (mg/L):	78	35	1.45				1	
Median Eff	luent (mg/L):	0.3	5	0.6					
Median Rei	moval (%):	99	86	59					
* blank cells	s indicate no infor	mation wa	s received fro	om vendor		•		<u> </u>	
				Approvals					
	Duatuaatusaut	Posis	Enhanced	Dhaanhaus	Oil	1	Othou Au		
TADE	Pretreatment	Basic	Ennanceu	Phosphorus	Oii		Other Ap	pprovais.	
TAPE	1	PULD	ļ						
	50% TSS Rei	moval	80% TS	S Removal					
NJCAT	3070 133 110.		3070 130	X			-		
					I				
			Lo	cal Installati	ons				
# of Installa	ntions in Washingt	ton:		1					
					•				
			E	stimated Cos	its				
	nstallation Cost:		low:		high:		_		
Estimated A	Annual O&M Cost	:	low:		high:		_		



Manufacturer/Vendor:	Imbrium Systems							
Name of Technology:	Jellyfish Filter							
Technology Type:	Media Filtration(Up-Flow)							
Treatment Notes								
	rd-party field study at University of Florida conducted according to the TARP protocol. Samples							
collected were grab samples	of the entire crossection of flow. Twenty-one storm events have been monitored to date.							
Additional Notes								
* *	micrograms per liter. Zinc concentrations are in milligrams per liter. Lead concentraions are in							
micrograms per liter. The O&	kM cost ranges from \$0.001/gal to \$0.003/gal. Installation costs range from \$8000 to \$125,000.							



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

# **Treatment Technology Summary Report**

Manufactu	rer/Vendor:	Brown Mir	nneapolis Tank								
Name of Te	-	Kleerwater									
Technology		Oil/Water									
Schematic	<u> </u>					System	Design II	nformatio	on		
	aced		Suction.	D CAM		Design Flo low: high: System Fo	25 10,000 potprint (s	gpm): - - sq. ft.):			
			Crossover	Coologuer with basis		Internal o	External	l Bypass:			
						Application Stormwater		ater			
			Treatn	nent Perform	nance *						
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs		
Number of											
	luent (mg/L):										
	luent (mg/L):										
Median Rei	moval (%):										
			Total Met	als	Disso	ved Meta	lc	1			
		Cu	Pb	Zn	Cu	Pb	Zn	1			
Number of	samples:							<del>-</del>			
	luent (mg/L):							†			
	luent (mg/L):							†			
Median Rei								<del>-</del>			
	s indicate no infor	mation wa	is received fro	om vendor	<u> </u>		ļ	4			
				Approvals							
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other Ap	provals:			
TAPE				-		1	•				
		+	*	-		1					
	50% TSS Re	moval	80% TS	Removal							
NJCAT											
			Lo	cal Installatio	ons						
# of Installa	ations in Washing	ton:									
			E	stimated Cos	sts						

low: Varies

low: Varies

high: Varies

high: Varies



Manufacturer/Vendor: Name of Technology: Technology Type:

Brown Minneapolis Tank	
Kleerwater	
Oil/Water Separator	

#### **Treatment Notes**

All data collected and verified by third party inspectors and Underwriters Laboratories (UL).

#### **Additional Notes**

- Underwriters Laboratories tested and listed per UL-2215
- Designed for no internal or confined space entry when performing routine maintenance.
- Kleerwater™ can handle larger influent flows, allowing for smaller separator tanks. With smaller separation tanks, less installation costs.
- Kleerwater™ separators utilizes Stokes Law for defining rates of rise of oil spheres in a liquid medium
- Unique patented oil separation process enhances oil from water separation efficiencies
- Separation efficiencies down to 5 ppm & lower.

Note:

Kleerwater™will not remove oils with a specific gravity of less than 0.95, dissolved hydrocarbons, or volatile organic compounds. For additional information, please visit www.kleerwater.net

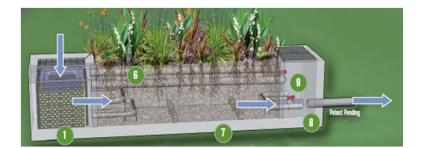


Manufacturer/Vendor: Name of Technology: Technology Type: Modular Wetland Systems, Inc.

Modular Wetland Systems - Linear

Bioretention/Filtration

#### Schematic



# System Design Information

Design Flow Rate (gpm):

low: 22 high: 120

System Footprint (sq. ft.):

16-84

Required Head Loss (ft):

2,4

Internal or External Bypass:

Internal (External in Some

Situations)

**Application** Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	270		19	4	NA	NA	NA	NA
Median Effluent (mg/L):	3		0	ND	NA	NA	NA	NA
Median Removal (%):	98		>99	>99	NA	NA	NA	NA

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	0.04	ND	0.24	0.757	0.543	0.95	
Median Effluent (mg/L):	ND	ND	ND	0.0552	0.1	0.185	
Median Removal (%):	>50		>79	93	81	80	

<sup>\*</sup> blank cells indicate no information was received from vendor

### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•	•	•		<u> </u>
	50% TSS Removal		80% TSS Removal			
NJCAT						

Incal Inc	tallat	tions

# of Installations in Washington: 0

### **Estimated Costs**

Estimated Installation Cost:low:\$12,000high:\$25,000Estimated Annual O&M Cost:low:\$8.26/galhigh:\$10.50/gal





Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Nutrient Separating Baffle Box

Hydrodynamic Separation

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):

low: 148 high: 8,858

System Footprint (sq. ft.):

0

Required Head Loss (ft):

0

Internal or External Bypass:

Other Approvals:

Internal (External in Some

Situations)
Application

Stormwater

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:	2	4	NA	2	NA			NA
Median Influent (mg/L):	366	1.49	NA	4	NA			NA
Median Effluent (mg/L):	48	0.44	NA	n/d	NA			NA
Median Removal (%):	86.8	70	NA	>99	NA			NA

		Total Met	als	Dissolved Metals			
	Cu Pb Zn			Cu	Pb	Zn	
Number of samples:	2	NA	0	NA	NA	NA	
Median Influent (mg/L):	0.07	NA	0.318	NA	NA	NA	
Median Effluent (mg/L):	0.042	NA	0.222	NA	NA	NA	
Median Removal (%):	40	NA	30.25	NA	NA	NA	

Enhanced

Basic

Pretreatment

#### **Approvals**

Phosphorus

Oil

TAPE			
	50% TSS Removal	80% TSS Removal	
NJCAT	Х		

#### **Local Installations**

# of Installations in Washington: 0 WA, 4 UT, 3 OR

#### **Estimated Costs**

Estimated Installation Cost: low: \$10,000 high: \$200,000
Estimated Annual O&M Cost: low: \$0.33/gal high: \$0.84/gal

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor: Name of Technology: Technology Type: Bio Clean Environmental

Nutrient Separating Baffle Box
Hydrodynamic Separation

#### **Treatment Notes**

The Nutrient Separating Baffle Box has been in use since for over 10 years. Several field and laboratory studies have been performed on the system. For this reason several reports are being listed below. N/A stands for information not available - pollutant not tested in the report

- --City of Santa Monica field data is independent and was performed over the course of 1 year.
- --Brevard County field testing is independent and was peformed over 4 storm events Micco & Indiatlantic
- -- NJ CAT Full Scale Labratory Testing Tier 1

Additional Notes
The Nutrient Separating Baffle Box employees screening, three chambered hydrodynamic spearation and absoptive polymer media
for the removal of gorss solids, TSS, particulate pollutants and hydrocarbons.



Manufacturer/Vendor: Name of Technology: **Technology Type:** 

Rotondo Environmental Solutions, LLC

Perimeter Sandfilter (Delaware Sandfilter)

Media Filtration (Sand Filter)

<b>Schematic</b>	



### **System Design Information**

Design Flow Rate (gpm): low: high:	
System Footprint (sq. ft.):	
Required Head Loss (ft):	
Internal or External Bypass:	
Application	

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

	Total Metals			Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
						·
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
	•					
			Lo	cal Installatio	ons	

Local	Ins	tall	lati	ons

# of Installations in Washington:	
	Estimated Costs

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Manufacturer/Vendor:Rotondo EnvironmName of Technology:Perimeter SandfiltTechnology Type:Media Filtration (S

Rotondo Environmental Solutions, LLC
Perimeter Sandfilter (Delaware Sandfilter)
Media Filtration (Sand Filter)

Treatment Notes		
Additional Notes		



Manufacturer/Vendor:	Kristar Enterprises, Inc.	
Name of Technology:	Perk Filter	
Technology Type:	Media Filtration(Cartridge)	
Schematic		System Design Information
		Design Flow Rate (gpm):



POD SYSTEM CONFIGURATION

Design	Flow	Rate	(gpm):
		12	

low: 12 high: 1000

System Footprint (sq. ft.):

10,150

Required Head Loss (ft):

1.7,3.5

**Internal or External Bypass:** 

Internal

**Application** Stormwater

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	70		20	20				20
Median Effluent (mg/L):	11		5	5				5
Median Removal (%):	82		75	75				75

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	0.052	0.15	0.25				
Median Effluent (mg/L):	0.02	0.05	0.1				
Median Removal (%):	62	68	61				

<sup>\*</sup> blank cells indicate no information was received from vendor

### **Approvals**

	Pretreatment	Basic	Ennanced	Pnospnorus	5	Other Approvais:
TAPE		GULD		GULD		
	•	•				<u> </u>
	50% TSS Rer	50% TSS Removal 80% TSS		S Removal		
NJCAT		•				

Local	Ins	tall	lati	ons

# of Installations in Washington:

### **Estimated Costs**

**Estimated Installation Cost: low:** \$10000 high: \$200000 low: \$1200 high: \$10000 **Estimated Annual O&M Cost:** 



Manufacturer/Vendor:	Kristar Enterprises, Inc.							
Name of Technology:	Perk Filter							
Technology Type:	Media Filtration(Cartridge)							
Treatment Notes								
	d by Kristar. Third party lab testing was performed by CSUS - OWP for TSS and subsequent "street							
Sweeipings" testing for metal	ls and nutrients. Third Party field testing for GULD by Herrera.							
Additional Notes								



Manufactu	rer/Vendor:	PSI Interna	itional, Inc.						
Name of Te	chnology:	PSI Separa	tor						
Technology	Туре:	Oil/Water	Separator						
Schematic	C					System	Design II	nformati	on
	Control Alarm m	ranera	eak Monitor Tubes Co	Rectangular alescer Manway					
C	oncrete Pad**		il Pump-Qut Pi	/	Pip in g**	Design Fl	ow Rate (	gpm):	
	Carry Comment		7		0	low:		_	
	Round Acce Manw			Lifting Lo		high:		_	
	Inlet Lifting Lug	Oil Level		Out		System F	ootprint (	sq. ft.):	
Ir	nlet Nozzle	3.) Sintercond	el Sensor						_
	Corrugated			(5) (C)	d D own	Required	Head Los	s (ft):	
	Plate Separator				Straps*	<del></del>			-
	Corrugated Paralle		Polyn	ropylene	st Pad**	Internal	or Externa	i Bypass:	
	Plate Separator	Sludge	Baffle Coa	alescer		Application			-
		* Optio		vailable from PS Int Installer supplied e		Application	UII		
									-
			Treat	ment Perfor	mance				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:				3				
	luent (mg/L):								
	luent (mg/L):								
Median Rei									
						•	•		
			Total Met	als	Disso	lved Meta	ls		
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of									
	luent (mg/L):								
	luent (mg/L):								
Median Rei									
* blank cells	s indicate no infor	mation wa	s received fro						
				Approvals					
			_	1	1	_			
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
	T				1				
	50% TSS Rei	moval	80% TS	S Removal					
NJCAT					]				
			Lo	cal Installati	ons				
# of Installa	itions in Washingt	ton:			_				
			E.	stimated Cos	sts				
Estimated I	nstallation Cost:		low:		high		_		
Estimated A	Annual O&M Cost	:	low:		high	:	_		





Manufacturer/Vendor:
Name of Technology:

**Environment 21** 

PuriStorm

**Technology Type:** Media Filtration(Cartridge)

#### **Schematic**



### System Design Information

Design Flow Rate (gpm):

low: 0 high: 2000

System Footprint (sq. ft.):

9-600

Required Head Loss (ft):

0-0.5

**Internal or External Bypass:** 

Both

Other Approvals:

**Application** 

Stormwater

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**80	**80	**80	**80	**80	**80
Median Removal (%):	*80		**80	**80	**80	**80	**80	**80

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA	
Median Effluent (mg/L):	***0.04	***0.28	***0.06	NA	NA	NA	
Median Removal (%):	***50	***65	***80	NA	NA	NA	

<sup>\*</sup> blank cells indicate no information was received from vendor

Pretreatment Basic Enhanced Phosphorus

### Approvals

Oil

ГАРЕ					
	50% TSS Rem	noval	80% TSS	S Removal	
NJCAT					7

Local	Ins	tall	lati	ons

# of Installations in Washington:

### **Estimated Costs**

Estimated Installation Cost:low:\$3,000high:\$25,000Estimated Annual O&M Cost:low:0high:\$10,000



Manufacturer/Vendor:
Name of Technology:
Technology Type:

| Media Filtration(Cartridge)

| Media Filtration(Cartridge)

| Treatment Notes
| Treatment Notes
| Treatment Stremoval efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a dSO of 60 microns was used.
| \*\*Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.
| \*\*\*Testing is not complete for metals; therefore, these values are estimated.
| Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additional Notes | Additi



Manufactu	rer/Vendor:	Environme	ental Filtration	Inc.					
Name of Te		Raynfiltr							
Technology			Insert(Media	Filtration					
Schemati	С	▼				System	Design I	nformati	on
		Raynf		Keep top of canister within 12" from the bottom of the grate. Use risers when needed		Design Flow: high:	0 900 pootprint (	_ _ sq. ft.):	-
			Costab	~ Riser		Internal of Application Stormwater	or Externa		
						Stormwate	<b>51</b>		-
			Treatr	nent Perforn	nance *				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):								
<b>Median Eff</b>	luent (mg/L):								
Median Re	moval (%):								
								=	
			Total Met	als	Disso	lved Meta	ls		
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of									
	luent (mg/L):								
	luent (mg/L):								
Median Re								⅃	
* blank cell	s indicate no infor	mation wa	is received fro						
				Approvals					
	T	Τ		1		7			
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE			<u> </u>			_	-		
	FO9/ TCC Do		909/ TC	C Domessal	1				
NUCAT	50% TSS Re	movai	80% 153	S Removal			-		
NJCAT					l				
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:	1 (a	irport)					
			E	stimated Cos	sts				
				4=04		4			
	Installation Cost:			\$531	-	\$554	_		
Estimated A	Annual O&M Cost	: <b>:</b>	low:		high:		_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Costs per catch basin



Manufacturer/Vendor: Name of Technology: **EcoSol Wastewater Filtration Systems** 

RSF (Rapid Stormwater Filtration) 100

Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))

#### **Schematic**



Syster	n Dec	ian Ir	form	ation
SVSLEI	II DES	iuri ir	HUTTI	auoi

Design Flow Rate (gpm):

low: 1784 high: 7000

System Footprint (sq. ft.):

Required Head Loss (ft):

0.5

**Internal or External Bypass:** 

Application

## Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	65	40						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•	•	•		·
	50% TSS Rer	50% TSS Removal 80% T		S Removal		
NJCAT						

Local	Ins	tall	lati	ons

# of Installations in Washington:		

#### **Estimated Costs**

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Manufacturer/Vendor: Name of Technology: Technology Type: **EcoSol Wastewater Filtration Systems** 

RSF (Rapid Stormwater Filtration) 100

Drain Inlet Insert(Combination System (Screen and Media Filtration))

Treatment Notes		
Additional Notes		



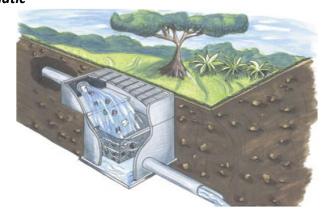
Manufacturer/Vendor: Name of Technology: **Technology Type:** 

**EcoSol Wastewater Filtration Systems** 

RSF (Rapid Stormwater Filtration) 1000

Drain Inlet Insert(Combination System (Screen and Media Filtration))

### **Schematic**



C	D!	1 £	
<b>System</b>	vesian	ıntorm	ation

Design Flow Rate (gpm):

low: 12000 high: 18162

System Footprint (sq. ft.):

Required Head Loss (ft):

0.5

**Internal or External Bypass:** 

Application

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	49	30						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•	•	•	•		<u> </u>
	50% TSS Rer	moval	80% TSS	S Removal		

Local	Ins	tall	lati	ons

# of Installations in Washington:		
	Estimated Costs	

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Manufacturer/Vendor: Name of Technology: Technology Type: **EcoSol Wastewater Filtration Systems** 

RSF (Rapid Stormwater Filtration) 1000

Drain Inlet Insert(Combination System (Screen and Media Filtration))

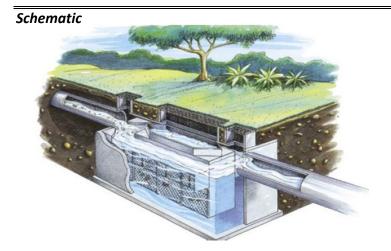
	2.4	 201 0 0 111 0 111 0 0 10 10 10 10 10 10 1	
<b>Treatment Notes</b>			
Additional Notes			



Manufacturer/Vendor: Name of Technology: **EcoSol Wastewater Filtration Systems** 

RSF (Rapid Stormwater Filtration) 4000

Technology Type: Drain Inlet Insert(Combination System (Screen and Media Filtration))



## System Design Information

Design Flow Rate (gpm):

low: 837 high: 68270

System Footprint (sq. ft.):

0

Required Head Loss (ft):

0.5

**Internal or External Bypass:** 

Application

## Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	NA						
Median Effluent (mg/L):	ND	NA						
Median Removal (%):	91	30						

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

I	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
		•				<u> </u>
1	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT		•				

Local	Insta	llations
	111360	

# of Installations in Washington:		
	Estimated Costs	

Estimated Installation Cost:	low:	high:
Estimated Annual O&M Cost:	low:	high:



Manufacturer/Vendor: Name of Technology:

**EcoSol Wastewater Filtration Systems** 

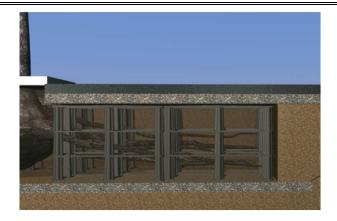
RSF (Rapid Stormwater Filtration) 4000

Technology Type:	Drain Inlet Insert(Combination System (Screen and Media Filtration))
Treatment Notes	
Treatment Notes	
Additional Notes	



Manufacturer/Vendor:	Deep Root Partners, L.P.
Name of Technology:	Silva Cell
Technology Type:	Bioretention/Filtration

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):
low: 20"/hour
high: 3"/hour

System Footprint (sq. ft.):

Required Head Loss (ft):

n/a

**Internal or External Bypass:** 

Optional

**Application** Stormwater

# Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):	80	68						

	Total Metals			Dissolved Metals			
	Cu Pb Zn			Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):				90+		90+	

<sup>\*</sup> blank cells indicate no information was received from vendor

### Approvals

	Pretreatment	Basic	Ennanced	Phosphorus	Oil	Otner Approvals:
TAPE		GULD	GULD			
	•		•	•		·
	50% TSS Ren	noval	80% TSS	S Removal		
NJCAT	50% TSS Rer	noval	80% TSS	S Removal		

Lace	ıl In	ctall	atio	nc

# of Installations in Washington: 7

#### **Estimated Costs**

 Estimated Installation Cost:
 low: \$4,000-\$5,600
 high: \$10,000-\$14,000

 Estimated Annual O&M Cost:
 low: \$100-\$200
 high: \$100-\$200



Manufacturer/Vendor:	Deep Root Partners, L.P.
Name of Technology:	Silva Cell
Technology Type:	Bioretention/Filtration
Treatment Notes	
	search. The water quality filtering values are based on research by Davis at University of Maryland and
Hunt at the University of Nor	th Carolina.
Additional Notes	
Prince Georges County Storm	nwater Manual, British Columbia Stormwater Manual, State of Washington Department of Ecology



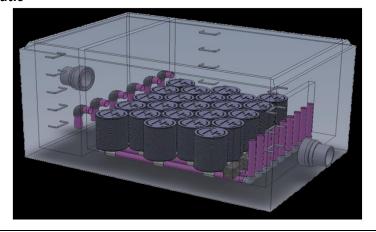
Manufactu	rer/Vendor:	Nyloplast/l	Hancor, Inc.						
Name of Te		SNOUT®							
Technology		Oil/Water	Separator						
Schematic	C					-		nformati	on
		-		THE P		Design Flow:	ow Rate (	gpm): _	
		1				high:		_ _	
		/-	SNOUT	Stormwater and treat-enter structure through grate or pipe		System F	ootprint (s	sq. ft.):	
		*	<b>5</b> _			Required	Head Los	s (ft):	•
		Cinaner water exits from under SNOUT	TT,	Chi and fixatable Dobris on surface cannot serb plas		Internal o	or Externa	l Bypass:	•
		Gross particles and some suspended solds sink	100			Application	on		•
			Treat	ment Perfor	mance				•
				<b>,</b> -					
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):								
<b>Median Eff</b>	luent (mg/L):								
Median Rei	moval (%):								
								=	
			Total Met		Disso	ved Meta	ls		
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of								<u> </u>	
	luent (mg/L):							<u> </u>	
	luent (mg/L):							<u> </u>	
Median Re								]	
* blank cell:	s indicate no infor	mation wa	s received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
	_				1				
	50% TSS Rer	noval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	tions in Washingt	ton:			-				
			E	stimated Cos	sts				
Ectimated !	netallation Cost		la		hiah.				
	nstallation Cost:		low:				_		
esumated A	Annual O&M Cost	•	low:		high:		_		



Manufacturer/Vendor:	Nyloplast/Hancor, Inc.					
Name of Technology:	SNOUT®					
Technology Type:	Oil/Water Separator					
Treatment Notes						
Additional Notes						



Manufacturer/Vendor:Imbrium Systems CorpName of Technology:Sorbtive™ FILTERTechnology Type:Media Filtration(Cartridge)



# System Design Information

Design Flow Rate (gpm): low: high:
System Footprint (sq. ft.):
Required Head Loss (ft):
Internal or External Bypass:
Application

## Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	ND	ND						
Median Effluent (mg/L):	ND	ND						
Median Removal (%):	84	>77						

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

**Estimated Annual O&M Cost:** 

### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	·	•				
	50% TSS Rer	noval	80% TS	S Removal		
NJCAT						
				<u>.</u>		
			Lo	cal Installatio	ons	
# of Install	ations in Washingt	on.				
" OI IIIStaii	actions in washing	.011.				
			E	stimated Cos	ts	
Estimated	Installation Cost:		low:		high:	

low:\_\_\_\_\_

high:



Manufacturer/Vendor:
Name of Technology:
Technology Type:

| Media Filtration(Cartridge)

| Treatment Notes

| Additional Notes | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtration | Media Filtratio



**Estimated Annual O&M Cost:** 

# Treatment Technology Summary Report

Manufactur	er/Vendor:	Nyloplast/Hancor, Inc.							
Name of Te	chnology:	Storm PURE™  Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))							
Technology	Туре:	Drain Inlet	Insert(Combin	nation System (S	creen and Absor	bent Boom	/Fabric))		
Schematic		Drain Inlet	Insert(Combin	nation System (S	creen and Absor	System	Design II  Dow Rate (g  Dootprint (s  Head Loss  Or Externa	sq. ft.): s (ft):	on
			Treat	ment Perfori	nance				•
			1	_		0.45.5		1	
Number of	complex	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	sampies: uent (mg/L):								
	uent (mg/L):								
Median Rer									
	• •								
			Total Met			ved Meta			
		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of								1	
	uent (mg/L):						-	1	
	uent (mg/L):						-	1	
Median Ren		matica	s received for				L	l	
" piank cells	indicate no infor	rnation wa	is received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
	·								
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installatio	ons				
# of Installa	tions in Washing	ton:							
			E	stimated Cos	its				
Estimated I	nstallation Cost:		low:		high:				

high:





Manufacturer/Vendor: Name of Technology: Technology Type: FABCO industries

Stormbasin/Stormpod

Drain Inlet Insert(Media Filtration (Cartridge))

#### Schematic



### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: >2500

System Footprint (sq. ft.):

4 - 200

Required Head Loss (ft):

1.25 - 2.5

**Internal or External Bypass:** 

Both

Other Approvals:

Application

Stormwater

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	111.9	0.57		59.5				
Median Effluent (mg/L):	2.7	0.3		<5				
Median Removal (%):	97.8	47		>90				

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):		0.018	0.335				
Median Effluent (mg/L):		0.0049	0.175				
Median Removal (%):		73	48				

Basic Enhanced Phosphorus

Pretreatment

### Approvals

Oil

APE					
	·	·			-
	50% TSS Remova	al	80% TSS	Removal	
NJCAT					

#### **Local Installations**

# of Installations in Washington: <20

### **Estimated Costs**

Estimated Installation Cost:low: \$750high: \$2,000Estimated Annual O&M Cost:low: \$200high: \$800

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:	FABCO industries
Name of Technology:	Stormbasin/Stormpod
Technology Type:	Drain Inlet Insert(Media Filtration (Cartridge))

### **Treatment Notes**

FABCO stormbasin/stormpod has been tested in the lab and the field by 1st+3rd party's data was collected according to established
protocols and consisted of barious methods including grab, auto, semi-auto and single event or composite samples

#### Additional Notes

Additional Notes
FABCO was awarded a competition bid-soil source spec for large scale municupal deployment in the urban/ms4 stormdrain system
of nassau county, long island, ny. Since 2009 FABCO was installed over 2000 stormbasins. Our performance approval as part of this
spec-sediment TSS removal> 50% d50: 110 um. Hydrocarbons/oil&grease: >80%Phosphorus: >50%. Nitrogen >40%. Bacteria.
>70%. Stormbasin is a great retrofit device for industrial facilities and is considered a structural BMP for pretreatment, source
control or in spcc + swpp plans.



					<b>9</b> ,	y			
Manufactu	rer/Vendor:	Imbrium S	ystems						
Name of Te	chnology:	Stormcept	tor						
Technology	Туре:	Hydrodyna	amic Separatio	n					
Schematic						Custom	Dasiera I	f.o. u.u.o. at.i	
Schematic						System Design Information  Design Flow Rate (gpm): low: 0			
						high: System Fo	11000	- - sa ft ):	
						Required			-
	d					-	0.22		<del>-</del>
						Internal o	Internal	п вураss:	-
			The second			Application Stormwater			=
			Treatr	nent Perforn	nance *				
		TSS	TP	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of		57	38	15					
	uent (mg/L):	159	0.275	29					
	uent (mg/L):	59	0.175	4					
Median Rei	moval (%):	53	21.8	73					
			Total Met	als	Disso	lved Meta	ls	7	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	samples:							7	
Median Infl	uent (mg/L):								
Median Effl	uent (mg/L):								
Median Rei					27.5	41.8	35.3	]	
* blank cells	s indicate no infor	mation wa	as received fro						
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	1	Other A	provals:	
TAPE									
	50% TSS Rei	moval	80% TS	S Removal	]				
NJCAT X					]				
			Lo	cal Installati	ons				
# of Installa	tions in Washing	ton:	5	10+	-				

### **Estimated Costs**

Estimated Installation Cost:low: \$3,000high: \$15,000Estimated Annual O&M Cost:low: \$500high: \$5,000



Manufacturer/Vendor:	Imbrium Systems					
Name of Technology:	Stormceptor					
Technology Type:	Hydrodynamic Separation					

#### **Treatment Notes**

The data detailed below is aggregate of many field studies (8) as well as lab studies (2) including the NJCAT TARP program. Most
studies were conducted 3rd party with both automatic and grab samplers. Individual test reports are available upon request.

#### **Additional Notes**

Despite the above averages, the Stormceptor system, when sized with PCSWMM for Stormceptor has a 0.94 correlation (r-squared regression value) with field performance when an accurate PSD is used to size the unit. Therefore the Stormceptor can be confidently and accurately sized for TSS removal goals on the order of 80% TSS, if the proper consideration like a true PSD are taken into account. Furthermore, the laboratory evaluation indicates that the Stormceptor unit can achieve DOE level performance at flow rates larger than the indicated treatment flow rate on the DOE GULD. The flow rates listed in the DOE GULD are merely a hydraulic marker within the system that indicates when the unit begins to inhibit scour from the unit.



**Estimated Installation Cost:** 

**Estimated Annual O&M Cost:** 

## **Treatment Technology Summary Report**

Clean Way Manufacturer/Vendor: Name of Technology: StormClean Catch Basin Insert **Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric)) **System Design Information Schematic** Design Flow Rate (gpm): low: high: System Footprint (sq. ft.): Required Head Loss (ft): **Internal or External Bypass: Application** Treatment Performance TPH Oil & grease **TSS** TP **SVOCs PCBs** Dioxins | CPAHs Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): **Total Metals Dissolved Metals** Pb Zn Cu Cu Pb Zn Number of samples: Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%): blank cells indicate no information was received from vendor **Approvals Pretreatment Basic Enhanced Phosphorus** Oil Other Approvals: TAPE 50% TSS Removal 80% TSS Removal **NJCAT Local Installations** # of Installations in Washington: **Estimated Costs** 

low:\_\_\_\_

low:

high: \_\_\_\_



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Treatment Notes

Additional Notes



Manufactu	rer/Vendor:	Clean Way	,									
Name of To	echnology:	StormClea	mClean Curb Inlet Insert									
Technology	у Туре:	Drain Inlet	Insert(Combin	nation System (S	creen and Absor	bent Boom	/Fabric))					
Schemati	ic .		System Design Information									
	1		Design Flow Rate (gpm): low: high:  System Footprint (sq. ft.):									
	1	I Keennad	717	Site of the second		Required						
					1	Internal o	or Externa	l Bypass:				
	PHED.	PAGE T PECT T	PALEGRA	5		Application	on		•			
			Treat	ment Perfor	mance							
		TSS	ТР	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs			
Number of	samples:				on on ground	0.000	1 020	21040	0.7			
	fluent (mg/L):											
	fluent (mg/L):											
	moval (%):											
Wicalan No			I	I	l		1	1				
			Total Metals			Dissolved Metals						
		Cu	Pb	Zn	Cu	Pb	Zn	_				
Number of	samples:							†				
	fluent (mg/L):							†				
Median Effluent (mg/L):												
Median Re												
	ls indicate no infor	mation wa	s received fro	om vendor	!	ļ.	1	<b>-</b>				
				Approvals								
	Pretreatment	Basic	Enhanced	Phosphorus	Oil	]	Other Ap	provals:				
TAPE				-			•	-				
	<del>-!</del>			!	!	4						
	50% TSS Rer	% TSS Removal		80% TSS Removal								
NJCAT												
			Lo	cal Installati	ons							
# of Installa	ations in Washingt	on:			-							
			E.	stimated Cos	sts							
			=									
Estimated Installation Cost:			low:				=					
Estimated Annual O&M Cost:			low:		high:		_					



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Clean Way
StormClean Curb Inlet Insert
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

Additional Notes



Manufacturer/Vendor:

Clean Way

Name of Technology: StormClean Wall Mount Filtration Unit											
Technology Type: Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))											
Schematic	С			Syster				n Design Information			
		Clean W		re, Inc.			System Design Information  Design Flow Rate (gpm): low: high: System Footprint (sq. ft.): Required Head Loss (ft): Internal or External Bypass: Application				
	M.C.	ALC: YES									
			Treat	ment Perfori	mance						
				,							
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs		
Number of	samples:										
	luent (mg/L):										
	luent (mg/L):										
Median Rei											
	` ,		•	I.		I	· L				
			Total Met	als	Dissolved Metals						
		Cu			Cu	Pb Zn					
Number of samples:								-			
Median Influent (mg/L):								-			
Median Effluent (mg/L):								-			
Median Removal (%):								†			
	s indicate no infor	mation wa	s received fro	om vendor			1	4			
				Approvals							
	Pretreatment	Basic	Enhanced Phosphorus		Oil	Other A		approvals:			
TAPE											
	•		•	•	•	•					
50% TSS Removal		80% TS	S Removal								
NJCAT											
			Lo	cal Installati	ons						
# of Installa	ations in Washingt	on:									
			E	stimated Cos	its						
eut. · ·	la sa a lla co										
Estimated Installation Cost:			low:		high:		_				
Estimated Annual O&M Cost:			low:		high:		_				



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Clean Way
StormClean Wall Mount Filtration Unit
Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

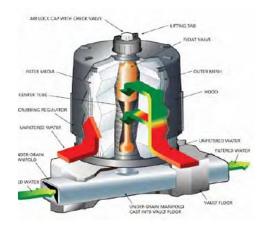
Additional Notes



Manufacturer/Vendor:CONTECH Construction Products Inc.Name of Technology:StormFilter - ZPG

**Technology Type:** Media Filtration(Cartridge)

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm):

low: 2 high: 44900

System Footprint (sq. ft.):

8 - 6,050

Required Head Loss (ft):

1.8 - 12

**Internal or External Bypass:** 

Both available

Other Approvals:

**Application** Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	83							0.12
Median Effluent (mg/L):	23							0.062
Median Removal (%):	82							42

		Total Met	als	Dissol	ved Meta	s
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):	0.0425	0.12	0.225	0.00464		0.0599
Median Effluent (mg/L):	0.0335	0.0435	0.12767	0.00423		0.0532
Median Removal (%):	47	24	62	11		15

**Enhanced** 

**Basic** 

**Pretreatment** 

#### Approvals

**Phosphorus** 

Oil

#### **Local Installations**

# of Installations in Washington: > 500

#### **Estimated Costs**

 Estimated Installation Cost:
 low: \$10K
 high: \$2.5 M

 Estimated Annual O&M Cost:
 low: \$0.00008/gal
 high: \$0.00024/gal

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:	CONTECH Construction Products Inc.
Name of Technology:	StormFilter - ZPG
Technology Type:	Media Filtration(Cartridge)

#### **Treatment Notes**

a) Stormwater Management StormFilter Basic Treatment Application for General Use Level Designation (2005): field, flow-weighted, peer reviewed, composite samples; b) Milwaukee Riverwalk ETV; Third Party, Field, Flow weighted. c) Heritage Marketplace Field Evalution (2004): field, flow-weighted, peer reviewed, composite samples; d) EvTec Lake Union Ultra-Urban Stormwater Technology Evaluation Stormwater Management StormFilter (2008): field, third party, composite.

Additional Notes
TSS reference a; Metals references b & c; cPAHs reference d. cPAHs used Chrysene as the parameter as it was the median
performance for the suite of requested analytes. Ranges were 33% to 47% for the entire suite. cPAH data contained 10% more GAC
(by volume) than standard ZPG.



Manufactu	rer/Vendor:	Fabco Indu	ustries						
Name of Te	echnology:	Stormsafe	-helix						
Technology	у Туре:	Media Filt	ration(Cartridg	ge)					
Schemati	С					System	Design II	nformati	on
		6				Design Flo	ow Rate (	gpm):	
						low:	3	JI ,	
			Manage			high:	9	<del>-</del> -	
		A						_"	
		1999				System Fo	ootprint (: 160 - 250	sq. ft.):	
		THE SERVICE		all -		Required		s (ft):	-
	Filter tube	cut-away				- 4	0 - 3	- ( -/	
		elical filters				Internal o	or Externa both	l Bypass:	-
						Application			-
						Stormwate			_
			Tu a autu	and Danfann	<b>*</b>				
			reatr	nent Perforn	iance *				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	samples:								
Median Inf	luent (mg/L):								
Median Eff	luent (mg/L):								
Median Re	moval (%):								
								7	
			Total Met			ved Meta		4	
Normalia a seria d		Cu	Pb	Zn	Cu	Pb	Zn	1	
Number of		<del>                                     </del>						1	
	luent (mg/L):	<del>                                     </del>						1	
Median Re	luent (mg/L):	<del>                                     </del>						+	
	s indicate no infor	mation ws	s received fr	l om vendor				<u> </u>	
DIGITIK CEII.	3 maicate no mio	THATIOH WA	is received in	Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
			000/ 000		1				
*****	50% TSS Re	moval	80% TS	S Removal			-		
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:	n	ione	-				
			E	stimated Cos	sts				
	Installation Cost:		low:	\$20,000	high:	\$60,000	_		
Estimated A	Annual O&M Cost	t:	low:	\$2,000	high:	\$6,000	_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

We have conducted lab and field studies as descried in our online reports, we are currently undergoing 3rd party field testing at a wastewater treatment plant, treating 10 acres of stormwater runoff.

Additional Notes

Additional Notes



Manufactu	rer/Vendor:	Park USA							
Name of To	echnology:	StormTroc	pper®						
Technology	у Туре:	Hydrodyna	amic Separatio	n					
Schemati	ic					System	Design II	nformati	on
		Giornimator II	delian System	CONTROL		Design El	ow Rate (g	mm).	
		200	0	STORMWATER		low:	ow Kate (§ 0	gpin).	
				RUNOFF		high:	11000	=	
				SCREEN BYPASS		ılığıı.	11000	=	
			8 38	WEIR		System Fo	ootprint (s	sa. ft.):	
	TORMWATER					o you can i	ooepi iiie (	, q. 14.7.	
		-				Required	Head Los	s (ft):	-
			COALESCING	TO STORM SEWER		•	0.22	` '	
	- 1		MEDIA PACK			Internal o	r Externa	l Bypass:	-
			<b></b>						_
			,			Application	on		
									_
			Treat	ment Perfori	mance				
			1	ı	T	Г			1
		TSS	TP	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•								
	fluent (mg/L):								
	fluent (mg/L):								
Median Re	emovai (%):								
			Total Met	alc	Dissol	ved Meta	le	1	
		Cu	Pb	Zn	Cu	Pb	Zn		
Number of	f samples:			211	- Cu			1	
	fluent (mg/L):							_	
	fluent (mg/L):								
Median Re								1	
	ls indicate no infor	mation wa	s received fro	om vendor	!		1	4	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
			•			•			
	50% TSS Re	moval	80% TS	S Removal					
NJCAT							-		
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:							
	J				-				
			E.	stimated Cos	sts				
					•				
Estimated	Installation Cost:		low:		high:				
Estimated .	Annual O&M Cost	:	low:		high:		_		



Manufacturer/Vendor:	Park USA
Name of Technology:	StormTrooper®
Technology Type:	Hydrodynamic Separation
Treatment Notes	
Additional Notes	



Manufactu	rer/Vendor:	Park USA							
Name of Te	echnology:	StormTroo	per® EX Extra-	-Duty					
Technology	у Туре:	Hydrodyna	amic Separatio	n					
Schemati	C					System	Design II	nformati	on
				DETROL NEROLE			ow Rate (	gpm):	
	66	1		ORDINATER MOSS		low:		_	
	- 2		1	IDRES		high:		_	
				THE SIS		System F	ootprint (	sq. ft.):	
	ENGF.	W.		a store		Required	Head Los	s (ft):	•
	- 11		COALESCING MEDIAPACK IN TERCEPTOR	MIN.		Internal o	or Externa	l Bypass:	•
	10					Application	on		•
	-								
			Treat	ment Perfor	mance				
			•	1	1	1	1	1	
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
	luent (mg/L):								
Median Re	movai (%):								
			Total Met	als	Disso	ved Meta	lc	7	
		Cu	Pb	Zn	Cu	Pb	Zn	-	
Number of	samnles:	Cu	10	211	Cu	1.5	211	1	
	luent (mg/L):							†	
	luent (mg/L):							1	
Median Re								†	
	s indicate no infor	mation wa	s received fro	om vendor	ļ	ļ	ļ	-1	
				Approvals					
				••					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
	•		-	•	_	•			
	50% TSS Rei	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:			-				
			E	stimated Cos	sts				
Estimated I	Installation Cost:		low:		high:				
	Annual O&M Cost	:	low:		high:		_		
		•	.0				_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

Park USA
StormTrooper® EX Extra-Duty
Hydrodynamic Separation

Treatment Notes



Manufacturer/Vendor: Name of Technology:

Kristar Enterprises, Inc.

Name of Technology:

SwaleGard

**Technology Type:** Drain Inlet Insert(Combination System (Screen and Absorbent Boom/Fabric))

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm):

low: 100 high: 800

System Footprint (sq. ft.):

4 - 16

Required Head Loss (ft):

0 - 0.5

**Internal or External Bypass:** 

Internal

**Application** 

Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	100		35	35				35
Median Effluent (mg/L):	20		7	7				
Median Removal (%):	80		80	80				7

		Total Met	als	Disso	ved Meta	ls
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):			10			
Median Effluent (mg/L):			6			
Median Removal (%):			60			

<sup>\*</sup> blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•		•			
	50% TSS Ren	noval	80% TSS	S Removal		

Local	Insta	llations
	111360	

# of Installations in Washington: 2

#### **Estimated Costs**

Estimated Installation Cost:low: \$4,500high: \$4,500Estimated Annual O&M Cost:low: \$75high: \$300



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Lab - UCLA, Univeristy of Hawaii, City of Auckland, NZ, CSUS - OWP. Field Study - University of Hawaii and City of Auckland

Additional Notes

Additional Notes



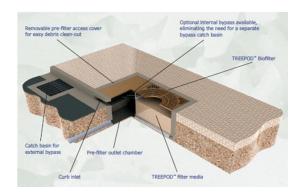
Manufactui	rer/Vendor:	Terre Hill (	Concrete Produ	ucts						
Name of Te	chnology:	Terre Klee	n™							
Technology	Type:	Hydrodyna	amic Separatio	n						
Schematio						Design Flo low: high: System Fo Required Internal of	pow Rate (g 1.5 100 potprint (s 0 Head Loss	- - sq. ft.): s (ft):	on	
			Treat	ment Perfori	mance					
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Number of	samples:									
Median Infl	luent (mg/L):	ND								
Median Effl	luent (mg/L):	ND								
Median Rer	moval (%):	78								
								=		
			Total Meta	als	Dissol	ved Meta	ls			
		Cu	Pb	Zn	Cu	Pb	Zn			
Number of										
	luent (mg/L):									
Median Effl	luent (mg/L):									
Median Rer								<u> </u>		
* blank cells	s indicate no infor	mation wa	is received fro							
				Approvals						
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:		
TAPE						1	-			
			•	•		•				
	50% TSS Rei	moval	80% TS	S Removal						
NJCAT	Х									
			Lo	cal Installati	ons					
# of Installa	ntions in Washing	ton:								
			E	stimated Cos	its					
Estimated !	netallation Cast		la		. طه اها					
	nstallation Cost:		low:		-		_			
Estimated Annual O&M Cost:			low:		high:		_			





Manufacturer/Vendor:	Kristar Enterprises, Inc.
Name of Technology:	TreePod Biofilter
Technology Type:	Bioretention/Filtration

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm): low: 16

high: 72

System Footprint (sq. ft.):

24 - 84

Required Head Loss (ft):

0 - 0.5

Internal or External Bypass:

Internal

Application

Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	TBD		TBD	TBD				TBD
Median Effluent (mg/L):	TBD		TBD	TBD				TBD
Median Removal (%):	TBD		TBD	TBD				TBD

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD	
Median Effluent (mg/L):	TBD	TBD	TBD	TBD	TBD	TBD	
Median Removal (%):	TBD	TBD	TBD	TBD	TBD	TBD	

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
		•	•	•	•	<u> </u>
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						

### Local Installations

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low: \$10,000high: \$50,000Estimated Annual O&M Cost:low: \$400high: \$750





 Manufacturer/Vendor:
 CONTECH Stormwater Solutions, Inc.

 Name of Technology:
 Triton Drop Inserts

 Technology Type:
 Drain Inlet Insert(Media Filtration (Cartridge))

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm):

low: 100
high: 5404

System Footprint (sq. ft.):

Required Head Loss (ft):

Internal or External Bypass: Both available

Other Approvals:

**Application** Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

Basic Enhanced Phosphorus

Pretreatment

#### Approvals

Oil

TAPE					
	•		,		-
	50% TSS Rem	oval	80% TSS	Removal	
NJCAT					

#### **Local Installations**

# of Installations in Washington: > 100

#### **Estimated Costs**

 Estimated Installation Cost:
 low:
 \$300
 high:
 \$2,500

 Estimated Annual O&M Cost:
 low:
 \$0.000002/gal
 high:
 \$0.00008/gal

<sup>\*</sup> blank cells indicate no information was received from vendor



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

CONTECH Stormwater Solutions, Inc.

Triton Drop Inserts
Drain Inlet Insert(Media Filtration (Cartridge))

Additional Notes



Manufacturer/Vendor: Name of Technology: Technology Type:

AbTech Industries
Ultra Urban Filter

Drain Inlet Inset (Absorbent Boom/Fabric)

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm):

low: 190 high: 500

System Footprint (sq. ft.):

0

Required Head Loss (ft):

0.5 - 1.5

**Internal or External Bypass:** 

Internal Bypass

**Application** 

Stormwater/Process Water

Other Approvals:

### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):			>100	>100	180			>100
Median Effluent (mg/L):			<10	<10	>4.4			>10
Median Removal (%):	*80		90	85	**40			**60

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

**Basic** 

**Pretreatment** 

#### Approvals

**Phosphorus** 

Oil

TAPE				
	1			
	50% TSS Removal	80% TSS Removal		
NJCAT				

	Local	Instal	lations
--	-------	--------	---------

# of Installations in Washington:	

#### **Estimated Costs**

Estimated Installation Cost:low: \$400high: \$1,700Estimated Annual O&M Cost:low: NAhigh: NA

**Enhanced** 



Manufacturer/Vendor: Name of Technology: Technology Type: AbTech Industries
Ultra Urban Filter

Drain Inlet Inset (Absorbent Boom/Fabric)

#### **Treatment Notes**

Primary analysis of AbTech Industries Ultra Urban Filter (UUF) was conducted in laboratory studies conducted by third parties using grab samples from established test protocols developed by federal and state regulatory entities. Field data was collected during studies conducted by municipalities to evaluate the effectiviness of the UUFs for deployment in the localized watershed. The testing methods used by the municipalities were governed by the state regulatory body, in which that municipality was located.

#### **Additional Notes**

- \* Data based on Particle Size Distribution (PSD) and not on mg/L. Samples tested were evaluated using a medium sand in the 0.355-0.300 mm range.
- \*\*Reduction of soluble dissolved hydrocarbons occurs when they become partitioned in the dispersed hydrocarbons and are removed simultaneously. Filtration of dissolved phase hydrocarbons through AbTech's UUFs will not occur, in substantial percent volumes, without the presence of dispersed hydrocarbons. Bench scale testing can be conducted on field samples to establish viability in a specific environment or to meet a specific discharge standard.

Total Metals Removal: Based on TSS testing the UUF has the ability to physically separate Total Metals from the water column, but AbTech products have no Chemical or Biological exchange during the filtration of Total Metals.



Manufacturer/Vendor: Name of Technology: Technology Type: Rotondo Environmental Solutions, LLC

Underground Sandfilter (DC Sandfilter)
Media Filtration (Sand Filter)

#### Schematic



System Design Information	SVSTPM LIPSIAN INTARMATIAN
---------------------------	----------------------------

Design Flow Rate (gpm): low:	
high:	
System Footprint (sq. ft.):	
Required Head Loss (ft):	_
Internal or External Bypass:	
Application	

### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):							

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
•	•	•				
	50% TSS Rer	S Removal 80% TSS Removal				
NJCAT						·
	•					

Local	Ins	tall	lati	ons

# of Installations in Washington:		
	Estimated Costs	

Estimated Installation Cost: low: high: high: high: \_\_\_\_\_



Manufacturer/Vendor: Name of Technology: Technology Type: Rotondo Environmental Solutions, LLC
Underground Sandfilter (DC Sandfilter)

Media Filtration (Sand Filter)

Technology Type:	Media Filtration (Sand Filter)							
Treatment Notes								
Additional Notes								
Additional Notes								



Manufacturer/Vendor: Name of Technology:

Environment 21

UniScreen

Technology Type: Hydrodynamic Separation

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm):

low: 0 high: 15,700

System Footprint (sq. ft.):

20-135

Required Head Loss (ft):

0-0.5

**Internal or External Bypass:** 

Both

Application

Stormwater

#### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250		**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175		**150	**150	**150	**150	**150	**150
Median Removal (%):	*80		**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA	
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA	
Median Removal (%):	***20	***27	***40	NA	NA	NA	

<sup>\*</sup> blank cells indicate no information was received from vendor

#### **Approvals**

	Pretreatment	Basic	Ennanced	Phosphorus	Oil	Otner Approvals:
TAPE						
•		•	•	•	•	
	50% TSS Rer	noval	80% TSS	S Removal		
NJCAT						

Lace	ıl In	ctall	atio	nc

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$2,000high:\$15,000Estimated Annual O&M Cost:low:0high:\$2,000



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

\*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 150 microns was used.

\*\*Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

\*\*\*Testing is not complete for metals; therefore, these values are estimated.

Additional Notes



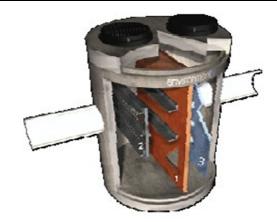
Manufacturer/Vendor: Name of Technology:

**Environment 21** 

UniStorm

**Technology Type:** Hydrodynamic Separation

#### Schematic



#### **System Design Information**

Design Flow Rate (gpm):

low: 0 high: 15,700

System Footprint (sq. ft.):

20-135

Required Head Loss (ft):

0-0.5

**Internal or External Bypass:** 

Α

Application

Stormwater

#### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250	ND	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	ND	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA	
Median Effluent (mg/L):	***0.06	***0.56	***0.18	NA	NA	NA	
Median Removal (%):	***20	***27	***40	NA	NA	NA	

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

	Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
TAPE						
	•		•			
	50% TSS Ren	noval	80% TSS	S Removal		

	Local		Inst	all	at	ic	n.	5
--	-------	--	------	-----	----	----	----	---

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$2,000high:\$15,000Estimated Annual O&M Cost:low:0high:\$2,000



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

\*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 150 microns was used.

\*\*Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

\*\*\*Testing is not complete for metals; therefore, these values are estimated.

Additional Notes



Manufactu	rer/Vendor:	Hydro Inte	ernational, Inc.						
Name of Te	echnology:	Up-Flo™ F	ilter						
Technology	у Туре:	Media Filt	ration(up flow)	)					
Schemati						System	Desian I	nformati	on
	Inlet grate					-,	_ co.g	,	
			ETHINA.			Design Fl	ow Rate (	gpm):	
						low:	147		
				Bypass siphon		high:	448	_	
		(TA)		_with floatables baffle		_		_	
				Outlet module		System F	ootprint (	sq. ft.):	
	Filter module			Oddet moddle			0		_
	Media pack			Drain down port		Required	Head Los	s (ft):	
	Angled screen	1		Outlet pipe			1.7-2.5		_
						Internal o	or Externa	l Bypass:	
	Sump								<u>-</u>
						Applicati	on		
									-
			<del></del>						
			ireat	ment Perfor	mance				
			T	T	T = =		T	T =	
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•	<u> </u>							
	luent (mg/L):	ND							
	fluent (mg/L):	ND							
Median Re	moval (%):	91							
			Tatal Nast	-1-	Diago	l	la .	7	
		<u> </u>	Total Met		t	Ived Meta	1		
Number of	i aamanlaa	Cu	Pb	Zn	Cu	Pb	Zn	_	
Number of		<del> </del>						_	
	fluent (mg/L):							+	
	fluent (mg/L):	<del> </del>						_	
Median Re	ls indicate no info	rmation	s received fr	l om vondor			ļ		
· Dialik Celi	is maicate no mio	I III ation wa	as received in						
				Approvals					
	Ductucctuccut	Pasia	Enhanced	Dhaanhausa	0:1	7	Othor A		
TADE	Pretreatment	Basic	Ennanced	Phosphorus	Oil		Other A	oprovals:	
TAPE		PULD		<u> </u>					
	50% TSS Re	moval	90% TS	S Removal	1				
NJCAT	30% 133 Re	illovai	80/8 13.	X	-				
NJCAT				Λ	J				
			LO	cal Installati	ons				
# of Installa	ations in Washing	ton:			_				
			E	stimated Cos	sts				
Estimated	Installation Cost:		low:		high:		_		
Estimated A	Annual O&M Cos	t:	low:		high:				





Manufactu	rer/Vendor:	CONTECH	Stormwater So	olutions, Inc.					
Name of Te	echnology:	UrbanGree	en BioFilter						
Technology	/ Type:	Bioretentio	on/Filtration						
Schemati	С	le -spin				System	Design II	nformatio	on
						Design Flo low: high: System Fo	600	-	
		Y				Required Internal o	3,6	l Bypass:	
						Application Stormwater	on		
			Treatn	nent Perforn	nance *				
					1				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of									
	luent (mg/L):								
	luent (mg/L):	<del>                                     </del>							
Median Re	moval (%):	1							
			Total Met	als	Disso	ved Meta	lc .	1	
		Cu	Pb	Zn	Cu	Pb	Zn	_	
Number of	camples:	Cu	FU	211	Cu	FD	211	1	
	luent (mg/L):	+						1	
	luent (mg/L):	+							
Median Re		+							
	s indicate no info	rmation wa	is received fro	ı om vendor	<u> </u>	<u> </u>	ļ	4	
				Approvals					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
1	_				1				
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:	>	> 25					
			F	stimated Cos	sts				
			_		· <del></del>				
	Installation Cost:		low:	\$10k	-	\$250K	_		
Estimated A	Annual O&M Cost	t:	low:	\$0.0001/gal	high:	\$0.0003/gal			





Manufacturer/Vendor: Name of Technology: Technology Type: **Environment 21** 

V2B1 Treatment System
Hydrodynamic Separation

#### **Schematic**



#### **System Design Information**

Design Flow Rate (gpm):

low: 0 high: 63000

System Footprint (sq. ft.):

20-800

Required Head Loss (ft):

0-0.5

**Internal or External Bypass:** 

Both

Application

Stormwater

#### Treatment Performance

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	*250	ND	**400	**400	**400	**400	**400	**400
Median Effluent (mg/L):	*175	ND	**150	**150	**150	**150	**150	**150
Median Removal (%):	*80	40	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5

		Total Meta	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Number of samples:							
Median Influent (mg/L):	***0.08	***0.79	***0.3	NA	NA	NA	
Median Effluent (mg/L):	***0.05	***0.35	***0.09	NA	NA	NA	
Median Removal (%):	***40	***55	***70	NA	NA	NA	

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

Pretreatment	Basic	Enhanced	Phosphorus	Oil	Other Approvals:
PULD					
•		•	•		•
50% TSS Ren	noval	80% TSS	S Removal		
Х					
		PULD  50% TSS Removal  X			

Local	Insta	llations
	111360	

# of Installations in Washington: 0

#### **Estimated Costs**

Estimated Installation Cost:low:\$2,000high:\$15,000Estimated Annual O&M Cost:low:0high:\$2,000



 Manufacturer/Vendor:
 Environment 21

 Name of Technology:
 V2B1 Treatment System

 Technology Type:
 Hydrodynamic Separation

#### **Treatment Notes**

\*The TSS removal efficiency is also dependent upon the Particle Size Distribution (PSD). For this product, the assumption of a PSD with a d50 of 110 microns was used.

\*\*Any oil based removal depends on the droplet size and specific gravity of the oil. For this product, accurate, analyzed data is unavailable; therefore a mean oil droplet size of 100 micron and a spgr of 0.89 are used. The removal efficiencies are estimated.

\*\*\*Testing is not complete for metals; therefore, these values are estimated.

Additional Notes			



	rer/Vendor:	CONTECH	Stormwater So	olutions, Inc.					
Name of Te	chnology:	VortClarex	(						
Technology	туре:	Oil/Water	Separator						
Schematio	С					System	Design II	nformatio	on
	нат	CH -				Design Flo	ow Rate (	gpm):	
	MANHOLE					low:	100	_	
				OUTLET		high:	2000	_	
			Espera III	-					
			4	OUTLET T-PIPE		System Fo	ootprint (	sq. ft.):	
						Required	Head Los	s (ft):	
		100	COALESCING			Internal c	r Externa		•
		SOLIDS	BAFFLE WALL	MEDIA			oth availab	le	
						Application			
						Stormwate	er		
			Troats	nent Perforn	anco *				
			Heath	nent Perjoin	iurice				
		TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of	•								
	luent (mg/L):								
	luent (mg/L):								
Median Rei	moval (%):								
			Tatal Mat	-1-	Diago	80.4.	1-	7	
		C	Total Met			lved Meta	1		
Number of	complex	Cu	Pb	Zn	Cu	Pb	Zn	1	
	luent (mg/L):								
	luent (mg/L):								
Median Rei								1	
	s indicate no infor	mation wa	s received fro	l om vendor		ļ	<u> </u>	1	
Didilik CCII.	3 malcate no mior	THUCHOTT WA	13 TCCCIVCU III	Approvals					
				7-7-					
	Pretreatment	Basic	Enhanced	Phosphorus	Oil		Other Ap	provals:	
TAPE									
			1						
	50% TSS Re	moval	80% TS	S Removal					
NJCAT									
			Lo	cal Installati	ons				
# of Installa	ations in Washing	ton:	;	>25	-				
			E	stimated Cos	sts				
Estimated I	nstallation Cost:		low:	\$10K	high:	\$300K	=		
Estimated A	Annual O&M Cost	; <b>:</b>	low:	\$0.00008/gal	high:	\$0.001/gal	_		



Manufacturer/Vendor:
Name of Technology:
Technology Type:

Treatment Notes

Additional Notes

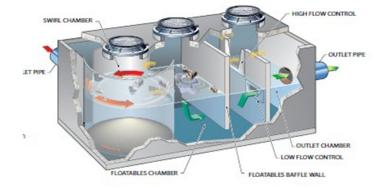
CONTECH Stormwater Solutions, Inc.

VortClarex
Oil/Water Separator



Manufacturer/Vendor:	CONTECH Stormwater Solutions, Inc.
Name of Technology:	Vortechs
Technology Type:	Hydrodynamic Separation

#### **Schematic**



### **System Design Information**

Design Flow Rate (gpm):

low: 50 high: 22450

System Footprint (sq. ft.):

NA

Required Head Loss (ft):

0.1

**Internal or External Bypass:** 

**Both Available** 

**Application** Stormwater

#### Treatment Performance \*

	TSS	TP	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Number of samples:								
Median Influent (mg/L):	108							
Median Effluent (mg/L):	28							
Median Removal (%):	93							

	Total Metals			Dissolved Metals		
	Cu	Pb	Zn	Cu	Pb	Zn
Number of samples:						
Median Influent (mg/L):						
Median Effluent (mg/L):						
Median Removal (%):						

<sup>\*</sup> blank cells indicate no information was received from vendor

#### Approvals

GULD						
-	•					
50% TSS Rem	noval	80% TSS	S Removal			
Х						
ļ	50% TSS Rem X	50% TSS Removal X	50% TSS Removal 80% TSS	50% TSS Removal 80% TSS Removal	50% TSS Removal 80% TSS Removal X	50% TSS Removal X

#### **Local Installations**

# of Installations in Washington: > 100

#### **Estimated Costs**

 Estimated Installation Cost:
 low: \$20K
 high: \$500K

 Estimated Annual O&M Cost:
 low: \$0.00001/gal
 high: \$0.00004/gal



## **APPENDIX B**

# **Technology Questionnaire Responses**

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# Active



Manufacturer: Name of Technology: # of Installations in Washington:  Downspout Drain Inlet Insert			ent Type/App ill Filtration (med	ia)	mail: hone: /ebsite:	jim@wat 866 www.wat	•	<u>om</u>	✓ Stormwater ✓ Groundwater
Below Ground Vault		ic Separation	Filtration (biofi	,		Electrocoa			✓ Wastewater
✓ Above Ground Vault	Floatables Ba	attle	✓ Filtration (chen	nically enhance	ed)	✓ Chemical T	reatment		✓ Process water
	Estimated Costs  Estimated Installation Cost (unit cost and construction cost): low: \$ 25,000   high: \$ 400,000   Estimated Annual O&M Cost (\$/gallon treated): low:   high:								
			System Hy	draulics/	'Design				
Design Flow Rate (gpm System aboveground fo Required head loss (ft): Internal or External Byp	otprint (sq ft	•	low: low: low: recirculation	100 200 N/A	high: high: high:	>2000	- - -		
Briefly describe how da	ta were colle	cted (field, l	,	Performo		composite, (	etc.)		
Field by operator; in-line rea party independent analytica			ers for turbidity and	d pH; in-hous	e and indep	endent party	grab/composit	te sampl	ing; in-house and 3rd
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAH	,	
Median Influent (mg/L)		3.12	e. g. ease	0.0199		2.0	0.00028		
Median Effluent (mg/L)	:	0.38		0.00002			0.00002	2	

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):		3.12		0.0199			0.00028
Median Effluent (mg/L):		0.38		0.00002			0.00002
Median Removal (%):		88%		99.9%			93%

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Median Influent (mg/L):	0.341	0.25	2.12			0.817	
Median Effluent (mg/L):	0.0179	0.05	1.04			0.744	
Median Removal (%):	95%	80%	51%			9%	

#### Notes, Comments, Additional References

Provided under DOE issued GULD as Chitosan-Enhanced Sandfiltration (CESF), a stand alone system. Water Tectonics expands CESF application for removal of LNAPL, NWTPH, cPAH/PAH's, and metals by system modification to include oil/water separation, enhanced pre-treatment, post SF micron filtration, and granular activated carbon and/or other media adsorption. As a stand-alone technology it is designated for turbidity and pH. If raw water turbidity is >600 NTU, pretreatment is required. CESF has limited to no ability to remove turbidity consisting of rock dust, rock flour, or other rock source fines that have not been geochemically weathered over time. Chitosan performance is typically compromised by acidic or alkaline pH conditions out side the neutral range. Performance data presented is from from full-scale use at temporary projects where RSA CESF technology was used in accordance with GULD specifications with modifications for enhanced removal components (e.g., granular activated carbon). Untreated construction water ranging from >25 NTU to > 5000 NTU (with pretreatment if over 600 NTU) have all been reduced to <10 NTU, but typically to <5 NTU. Flow ranges for various conventional system sizes range from 100 to over 1000 gpm for 24/7 continuous operations.



Manufacturer:		Bak	erCorp	_	Contact N	ame:	Tim	Ferris			
Name of Technology:			with Chitosan		Contact E	maile	Afania Obalianaana aana				
# of Installations in	_	Ennanced S	and Filtration	_	Contact P		tferris@bakero	93-6136			
Washington:			1		Contact W			orp.com			
	_	T			200 / 1 /						
Downspout	<b>V</b>	Dil/Water Sep		ype/Applicati		all that a	_	ongo ookumn	<b>7</b>	Stormwater	
Drain Inlet Insert		•	urution	✓ Filtration (med				ange column	_		
		Settling Hydrodynami	Congration	Filtration (fabri				osmosis		Groundwater	
Below Ground Vault		Hydrodynami		Filtration (biofi	ltration)			oagulation	$ \checkmark $	Wastewater	
Above Ground Vault	☐ <sup>1</sup>	Floatables Bat	fle	✓ Filtration (chen	nically enhance	ed)	✓ Chemica	Il Treatment	✓	Process water	ſ
				Estimated	Costs						
Estimated Installation	Cost (ι	unit cost a	nd constru	iction cost):		low	:	high:			
Estimated Annual O&N	/I Cost	(\$/gallon	treated):			low		high:			
			-		l' /D '						
Docian Flour Bata Janm	۸.		3)	ystem Hydrau			4 000				
Design Flow Rate (gpm System aboveground for		nt (sa ft):		_	15gpm 1,000sq ft	•	1,000gpm+ 2,500sq ft				
Required head loss (ft)	•	iic (3 <b>4</b> ic).		low:		high					
Internal or External By							·				
					•						
				System Perfo	ormance						
Briefly describe how da	-t	vo colloct	ad (field la	ah third narty a	rah samul		mnosito o	+o \			
briefly describe flow da	ata we	ie conect	eu (Heiu, ia	ab, tilliu party, g	iau saiiipii	e, auto-co	iliposite, e	ι.,			
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs			
Median Influent (mg/L	):	200	1711	Oil & grease	34003	r CD3	DIOXIIIS	CFAIIS			
Median Effluent (mg/L		10									
Median Removal (%):		95									
							,				
	-	_	Total Me			olved Me					
Median Influent (mg/L)	١.	Cu	Pb	Zn 2500	Cu	Pb	Zn 400				
Median Effluent (mg/L)		150 75	200	2500 1000	20 10	40 20	400				
Median Removal (%):	١٠.	50	40	50	50	50	90				
median nemoval (70).		30	10	30	30	30	30				
			Notes. Co	omments, Add	litional R	eference	S				
TSS, total metals, and dissol	ved me	tals remova				-		tter. The valu	ues pr	ovided for th	ese
parameters are based upon											
the organics listed in this tal			-	ontact Chris Palczev	vski at Dunge	eness Enviro	nmental: 42	5-481-0600 d	r		
cpalczewski@dungenessenv	viro.con	n. Thank yo	ou.								



Manufacturer: Name of Technology: # of Installations in Washington:	Name of Technology: Multiple Technologies  t of Installations in			Contact Name: Contact Email: Contact Phone: Contact Website:				om_
	Tre	atment T	ype/Applicati	on (check	all that a	(ylqq		
✓ Downspout	✓ Oil/Water Sep		✓ Filtration (med	•			ange column	✓ Stormwater
Drain Inlet Insert	✓ Settling		Filtration (fabri	ic)		Reverse	osmosis	✓ Groundwater
Below Ground Vault	Hydrodynami	c Separation	Filtration (biofi	•			oagulation	✓ Wastewater
Above Ground Vault	Floatables Bar	ffle	✓ Filtration (chen	-	ed)	✓ Chemica	Il Treatment	✓ Process water
			Estimated	Costs				
Estimated Installation C Estimated Annual O&M	•				low low			>250,000 > 0.003
		Sy	stem Hydrau	lics/Desig	gn			
Design Flow Rate (gpm)			low:	< 25	high	> 2,000		
System aboveground for	otprint (sq ft):		low:	< 25	high			
Required head loss (ft):		5 ()	low:	NA	high	: NA		
Internal or External Byp	ass: _	External -	Offline Facility	-				
Briefly describe how data Attached data was collected		_		rab sample		omposite, e	tc.)	
	TCC	TDU	Oil 8 aveces	SVOC	DCDa	Diavina	CDALL	
Median Influent (mg/L):	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Effluent (mg/L):								
Median Removal (%):								
			1		<u> </u>	-		
		Total Me	tals	Diss	solved Me	etals		
	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):								
Median Effluent (mg/L):							•	
Median Removal (%):						<u> </u>		
		Notes Co	mments, Add	litional D	oforonce			
Clear Creek Systems, Inc. (CCI exchange, oil/water seperato requirements using the West either laboratory or field trea We have attached some data about CCS can be found at wishare the data that has been	rs, UV, RO, chem ern Washington I tability and pilot and a Power Poi ww.clearcreeksys	e variety of wa ical treatment Hydrology Mo testing. For th nt presentatio tems.com. W	ater treatment equited and chemically ended 3. We select the lis reason we have in that further expl	ipment include hanced sand e appropriate included a brains our appreasants.	ding particu filtration. C e treatment road range o roach and c	llate filtration Our treatmen technology f of flow rates, apabilities. In	t systems are or a specific costs and foo addition, mu	sized for specific site site by conducting otprint requirements. uch more information



Manufacturer: Name of Technology:	Schreiber Fuzzy Filt			Contact Na		William Ku			
Technology Category:	- ruzzy riic			Contact Ph		205-655			
Technology Process:				Contact W		www.schreiber			
# of Installations in Wasl	nington:	0							
			A I' .						
		ent Type/		-	eck all tha	_			
Downspout	Oil/Water Separa	artion	Filtration	(media)		Ion exchai	nge column	✓ Stormw	ater
Drain Inlet Insert	Settling		Filtration	(fabric)		Reverse of	smosis	✓ Ground	lwater
Below Ground Vault	Hydrodynamic S	Separation	Filtration	(biofiltration)		Electrocoa	gulation	✓ Wastew	vater .
Above Ground Vault	Floatables Baffle		Filtration	(chemically en	hanced)	Chemical :	Treatment	✓ Process	water
		E	stimat	ed Costs					
Estimated Installation Co	ost:	low:		high:					
Estimated Annual O&M	Cost:	low:		high:		•			
		C							
D : 51 D : / \		-		ydraulics					
Design Flow Rate (gpm):		low:	70	nign: _	unlimited	i			
Required head loss (ft): Internal or External Bypa		3.5 external							
internal of External Dypa		external							
		Syst	em Pe	rformand	e				
Breifly describe how dat									
Fuzzy Filter removes susper changes in compressioon of should be less than 100 mg, particle distribution analysi filtration of contaminated s process 85 MGD for the city	f the media via th /I with many typi s for removal of s torm water colle	ne integral ac ical application suspended so	tuator cons proceolids from	onnected to essing water n river wate	a perforate r streams c er. Two rec	ted compres containing 20 ent projects	sion plate. I mg/I and Io under conti	Influent soli ess. Attache ruction incl	ids ed is a ude
Parameter:	TSS	TP D	is. Cu	Dis. Zn	Dis. Cd	Dis. Pb	ТРН	cPAHs	PCBs
# of sample:									
Median Influent (mg/L):	10								
Median Effluent (mg/L):	2								
% Removal:	70-95%								
		es, Comm							
Fuzzy Filter removes susper changes in compressioon of should be less than 100 mg, particle distribution analysi	f the media via th /I with many typi	ne integral ac ical application	tuator cons proce	onnected to essing water	a perforat r streams o	ted compres containing 20	sion plate. I mg/I and I	Influent soli ess. Attache	ids ed is a
filtration of contaminated s		ected within o	hemical	plants. We	also have s	several CSO i	nstallations	s, one of wh	nich can
process 85 MGD for the city	of Atlanta.								



Manufacturer:	Manufacturer: KASELCO, LLC			Contact N	lame:	Dou	glas Herber	
Name of Technology:	High-Flo Ele	ectocoagulation	_	Contact E	mail:	dherber@kaselco.com		
# of Installations in				Contact P	hone:	361	-594-3327	
Washington:	0 in WA, 2	! in Vancouver	_	Contact V	Vebsite:	www.l	kaselco.com	
		Treatm	ent Type/App	lication	chock all	that annly		
Downspout	✓ Oil/Water Sep		Filtration (med		check un	_	inge column	√ Stormwater
Drain Inlet Insert							_	
_	Settling		Filtration (fabri			Reverse		✓ Groundwater
Below Ground Vault	Hydrodynami	c Separation	Filtration (biofi	Itration)		✓ Electroco	agulation	✓ Wastewater
Above Ground Vault Floatables Baffle Filtration (chemically enhanced) Chemical Treatment								✓ Process water
			Estim	ated Cos	ts			
Estimated Installation (	Cost (unit cost	and consti	ruction cost):		low	\$25,000	high:	\$2,200,000
Estimated Annual O&N						\$0.0005	high:	\$0.01
				.d!:	/D :			
Docian Flour Pata Jann	١.		System Hy			1 200 . /	Can link systems i	n narallal for
Design Flow Rate (gpm		١.	low:		high:		Can link systems i	n parallel for
System aboveground for Required head loss (ft):		):	low:	40	high:		arger capacity	
Internal or External By			xternal	2	high:	20		
internal of External by	Jass.		xterriai	-				
			System	Perform	ance			
			•	-				
Briefly describe how da	ita were collec	ted (field,	lab, third party,	grab samp	ole, auto-c	composite,	etc.)	
System Performance has be	en evaluated in la	ab as well as i	n field research app	lications and	d existing in:	stallations. G	rab samples are an	alyzed both internally as wel
as by a third party lab.								
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L)		IFN	Oii & grease	30003	PCDS	DIUXIIIS	CFARIS	
Median Effluent (mg/L)								
Median Removal (%):	·							
iviculari Kemovai (70).								
		Total Me	tals	Diss	solved Me	tals		
	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L)								
Median Effluent (mg/L)								
Median Removal (%):								
						<u> </u>		
		Not	es, Comments	, Additio	nal Refe	rences		
Have attached actual test re	sult parameters.						aluations and will s	upply those results as
available.								



Manufacturer: Name of Technology:		Environmental Pr			Contact N			Davis	
# of Installations in		DilTrap ElectroPul	se		Contact P			13.6495	
Washington:		33			Contact V			trap.com	
	-		nt Tuno	/Annliant	ion /-bd				
Downspout	Oil/Wa	iter Separation	т туре, П	/Applicati Filtration (med		t all that a	_	nange column	Stormwater
Drain Inlet Insert	Settlin	q		Filtration (fabr	•		☐ Reverse	osmosis	Groundwater
Below Ground Vault	Hydro	dynamic Separat	tion $\square$	Filtration (biofi	•			oagulation	Wastewater
Above Ground Vault	Floata	bles Baffle		Filtration (cher	,	ed)		al Treatment	Process water
				Estimated					
		_			COSIS				
Estimated Installation C	•			n cost):		low:			500000
Estimated Annual O&M	COST (\$/{	gallon treate	ea):			low:	\$0.002	high:	0.005
			Syste	m Hydrau	lics/Desi	gn			
Design Flow Rate (gpm)	:			low:	5	high:	500		
System aboveground for		q ft):		low:	40	high:	1500		
Required head loss (ft):				low:	5	high:	15	•	
Internal or External Byp	ass:		eithe	r	-				
			Sy	stem Perf	ormance				
			,	•					
Briefly describe how da						e, auto-coi	mposite, e	tc.)	
Samples were collected as ro	outine grab	samples and t	ested by ar	n EPA certified	laboratory.				
	TS	SS TP	н о	il & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L)		00 78	8	136	28	Unknown	Unknown	Unknown	
Median Effluent (mg/L)	: 1	0 0.2	27	<5.0	0.43	Unknown	Unknown	Unknown	
Median Removal (%):	98	.3 99	.6	>96.3	98.4	Unknown	Unknown	Unknown	
		<b>-</b>	l na . i . i .		D:-			ī	
			l Metals	7n	•	solved Me		y.	
Median Influent (mg/L)	: 12			<b>Zn</b> 151	<b>Cu</b> 8.2	<b>Pb</b> 10.9	<b>Zn</b> 78.6	,	
Median Effluent (mg/L)				0.34	0.072	0.039	0.34		
Median Removal (%):	99			99.9	99.1	99.6	99.9	,	
Wiedlan Hemoval (70)	33	.1 33	.,	33.3	33.1	33.0	33.3	Į.	
		Note	s, Comn	nents, Add	litional R	eference.	s		
I have not worked with wast	ewater with	PCB or dioxir	ns. We gen	erally see 90%	+ in reduction	n of pesticid	es also.		



Manufacturer:	Wate	erTectonics		Contact Na	ıme:	lim Mo	othersbaugh		
Name of Technology:	-	HATBox	_	Contact En			ertectonics.com	_	
# of Installations in			_	Contact Ph			402-2298	_	
Washington:		40 +	<u>_</u> .	Contact Wo	ebsite:		ertectonics.com		
		Treatme	nt Type/Appli	ication (ch	neck all th	at apply)			
Downspout	Oil/Water S		Filtration (medi			or approvi	je column	J	Stormwater
Drain Inlet Insert	Settling		Filtration (fabric	c)		Reverse osr	nosis	4	Groundwater
Below Ground Vault	Hydrodyna	mic Separation	Filtration (biofil	-		☐ Electrocoag			Wastewater
✓ Above Ground Vault	Floatables	Baffle		nically enhanced	i)	✓ Chemical Tr	eatment	<b>✓</b>	Process water
			Estima	ited Costs	;				
Estimated Installation C	Cost (unit cos	t and constru	ction cost):		low:	\$ 19,500	hig	<b>h:</b> \$	28,500
Estimated Annual O&M	Cost (\$/gall	on treated):	,		low:	(a)	hig		(a)
			System Hyd	lraulics/D	esian				
Design Flow Rate (gpm)	):		low:	250	high:	350			
System aboveground for		t):	low:	10 (b)	high:	24 (b)			
Required head loss (ft):			low:	N/A	high:	N/A			
Internal or External Byp	ass:		N/A		•				
			System P	Performan	се				
			7	,					
Briefly describe how da	ta were colle	cted (field, la	b, third party, g	rab sample	, auto-co	mposite, etc	.)		
Field. Real-time with in-line	probes. 2-poin	: buffer calibrati	on.						
	1		T = 0 = 1						
Madian Influent (ma/l)	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs		
	: (c)	(c)	(c)	(c)	(c)	(c)	(c)		
Median Effluent (mg/L)	: (c)	(c)	(c)	(c)	(c)	(c)	(c)		
Median Effluent (mg/L)	: (c)	(c)	(c)	(c)	(c)	(c)	(c)		
Median Effluent (mg/L)	: (c)	(c)	(c) (c) (c)	(c) (c) (c)	(c)	(c) (c)	(c)		
Median Effluent (mg/L)	: (c)	(c) (c)	(c) (c) (c)	(c) (c) (c)	(c) (c)	(c) (c)	(c)		
Median Effluent (mg/L) Median Removal (%):	: (c) : (c) (c)	(c) (c) (c) Total Me	(c) (c) (c)	(c) (c) (c)	(c) (c) (c)	(c) (c) (c)	(c)		
Median Effluent (mg/L) Median Removal (%): Median Influent (mg/L)	: (c) : (c) (c)  Cu : (c)	(c) (c) (c) Total Me	(c) (c) (c)	(c) (c) (c) Diss	(c) (c) (c) solved Me	(c) (c) (c) tals	(c)		
Median Effluent (mg/L) Median Removal (%): Median Influent (mg/L) Median Effluent (mg/L)	: (c) : (c) (c) Cu : (c)	(c) (c) (c) Total Me Pb (c)	(c) (c) (c) tals Zn (c)	(c) (c) (c) Diss Cu (c)	(c) (c) (c) Solved Me Pb (c)	(c) (c) (c) tals Zn (c)	(c)		
Median Effluent (mg/L) Median Removal (%):  Median Influent (mg/L) Median Effluent (mg/L)	: (c) : (c) Cu : (c) : (c)	(c) (c) (c) Total Me Pb (c) (c) (c)	(c) (c) (c) tals (c) (c) (c) (c)	(c) (c) (c) Diss Cu (c) (c) (c)	(c) (c) (c) Solved Me Pb (c) (c) (c)	(c) (c) (c) tals Zn (c) (c) (c)	(c)		
Median Effluent (mg/L) Median Removal (%):  Median Influent (mg/L) Median Effluent (mg/L) Median Removal (%):	: (c) : (c) Cu : (c) : (c)	(c) (c) (c) (c) (c) (c) (c) (c) (c) (d)	(c) (c) (c) tals Zn (c) (c) (c) (c) (c) (c) (c) (c)	(c) (c) (c) Diss Cu (c) (c) (c)	(c) (c) (c) Solved Me Pb (c) (c) (c)	(c) (c) (c) tals Zn (c) (c) (c)	(c) (c)		
Median Removal (%):  Median Influent (mg/L)	: (c) : (c) Cu : (c) : (c) : (c)	(c) (c) (c)  Total Me Pb (c) (c) (c) (c) (c) tream, flow rate	(c) (c) (c) tals Zn (c) (c) (c) (c) (c) (c) (c) (c) (c) (c)	(c) (c) (c) Diss Cu (c) (c) (c) (c) (d) Additional essed, specific	(c) (c) (c)  Solved Me Pb (c) (c) (c) (c) (d) Refere C pH adjustr	(c) (c) (c) tals Zn (c) (c) (c) (c) (c)	(c) (c) (c)		

expandable for dual pH adjustment (multi injection/mixing loops), and flow recording. pH set-point(s) programmable into controller. (c) Adjusts pH. System performance data - not applicable.

#### Additional Notes:

-Effective for controlling alkaline waters from cement/concrete operations using carbon dioxide.

-Suitable for inclusion as pH adustment component in variety of water treatment systems.

-pH set-points (high/low) variable for application.



Manufacturer: Name of Technology: # of Installations in	_	Contact Phone:					ayng@storr 800.68	nwaterx.com 30.3543	
Washington:				<del></del>		nwaterx.com			
Downspout		<b>Tre</b> Oil/Water Sepa		Type/Applicati  ✓ Filtration (medi		all that a	_	nange column	✓ Stormwater
Drain Inlet Insert	_	Settling		✓ Filtration (fabri	c)		Reverse	osmosis	Groundwater
Below Ground Vault	_	lydrodynamic		Filtration (biofil	tration)			oagulation	Wastewater
✓ Above Ground Vault	□ ⊦	loatables Baff	fle	Filtration (chen	nically enhance	d)	Chemica	al Treatment	Process water
				Estimated	Costs				
Estimated Installation ( Estimated Annual O&N				uction cost):		low:		high: high:	140000 0.0047
			S	ystem Hydrau	ics/Desig	ın			
Design Flow Rate (gpm		_		low:	5	high:			
System aboveground for	-	nt (sq ft):		low:	10	high:			
Required head loss (ft) Internal or External By			,	low:	70	high:	120		
Internal of External by	pass.	_	· ·	External					
				System Perfo	rmance				
5.0.1.11.1	_		1.60 1.1.1			_			
These samples were collected			•			-		•	Il analytical data is
from a third party certified a	analytica	al lab. Non-d	detects were	e assumed to have th	ne value of or	ne half the o	detection lim	it.	
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L									
Median Effluent (mg/L	):								
Median Removal (%):			YES		YES	YES		YES	
			Total Me	otals	Diss	olved Me	tals	Ī	
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L	):			0.28	-		.060		
Median Effluent (mg/L	):			0.083			0.0074		
Median Removal (%):				86			88		
			N-4: C		!!!! F	- <b>f</b>			
Additional national nations	al includ			omments, Add		ejerence	S		
Additional pollutant remova	ai iiiClud	es pacteria	(/9970), PCB	s, rans and toxic org	garrics.				
i .									



Manufacturer:	Morselt Bo	orne BV	C	ontact Na	ame:	Harry A	Assink		
Name of Technology:	Redb		С	ontact Er	nail:	info@mo		-	
Technology Category:			C	ontact Ph	none:	317426	61166	_	
<b>Technology Process:</b>			C	ontact W	ebsite:	www.moi	selt.com	_	
# of Installations in Wa	shington:							_	
	Trea	tment Type	e/Applic	ation (c	heck all th	at apply)			
Downspout	Oil/Water Sep		Filtration (	-		☐ Ion exchange	column	Storm	nwater
☐ Drain Inlet Insert	Settling		Filtration (1	abric)		Reverse osm	osis	Groun	ıdwater
Below Ground Vault	Hydrodynamic	Separation	_	oiofiltration)		✓ Electrocoagu			ewater
Above Ground Vault	Floatables Bat	fle		chemically er	nhanced)	Chemical Tre		_	ss water
			Estimat	ed Cost	<u> </u>				
						_			
Estimated Installation ( Estimated Annual O&M		low: \$			\$1,000,00	0			
Estimated Aimadi Odiv									
			System F	-					
Design Flow Rate (gpm		low:	0.5	high:	150				
Required head loss (ft): Internal or External By		n.a.							
internal or External Бур		n.a.							
		Sy	stem Pe	rformaı	nce				
Duaifly dagariba bayy da		ad <i>(t</i> : ald lab	مصامدتاه						
Third part analysis has been								w motals	
Tillia part allalysis lias bed	en periorinea in	ilially cases.	inesuits sile	vv very me	sirreinovar	rates, especial	iy ioi iiea	vy metais.	
Parameter:	TSS	TP [	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:	99		99	99	99	99			
	N	otes, Comi	ments, A	ddition	al Refere	nces			
The RedBox purifies indus	trial wastewater	for many ind	ustries suc	h as platin	g, paper, p	rinting, paint n	nanufactu	ring.	
1									



Manufacturer:	Sie	mens		Contact N	ame:	Adam Sz	czesniak		
Name of Technology:		/WIX	<del>-</del> _	Contact E	mail:	adam.szczesnia		<u>m</u>	
Technology Category:			_	Contact P	hone:	860-59	3-2063		
Technology Process:	Regulated N	∕letals Removal	_	Contact V	/ebsite:	siemens.com/v	<u>rater</u>	•	
# of Installations in Was	hington:	>50	00	_					
	Tred	atment Ty	pe/Applic	cation (ch	eck all th	at apply)			
✓ Downspout	Oil/Water	Separartion	✓ Filtratio	n (media)		✓ Ion excha	ange column	✓ Storr	nwater
✓ Drain Inlet Insert	Settling		Filtratio	n (fabric)		✓ Reverse	osmosis	✓ Grou	ndwater
✓ Below Ground Vault	Hydrodyna	amic Separation	Filtratio	n (biofiltration)		Electroco	agulation	✓ Wast	ewater
✓ Above Ground Vault	Floatables	Baffle	✓ Filtratio	n (chemically e	nhanced)	✓ Chemical	Treatment	✓ Proce	ess water
			Estima	ted Costs					
Estimated Installation Co	nst·	low:	3,000	high:	250,000				
Estimated Annual O&M		low:		_	500,000	-			
				_		-			
D ' El D ' ( )			•	Hydraulic					
Design Flow Rate (gpm):		low:		nign:	5000gpm	-			
Required head loss (ft): Internal or External Bypa	acc.	20p No		-					
	333.	INO	iie	-					
			System P	erforman	ce				
Proifly describe how dat	a wara sala	acted (field	lab third	narty grah	cample	uto comp	ocito oto l		
Breifly describe how dat Siemens manufactures an e									ane
technologies and ion excah			-	-			-		
low discharge levels as low	-				-				
on site test kits or samples	shipped to lo	ocal certified	laboratorie	s for evalua	tion.				
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:		Votes Com		۸ ما ما:4: م	I Defere				
		Notes, Con	nments, /	Additiona	і кејеге	nces			
i .									



Manufacturer:	WaterTed	tonics	(	Contact Name:	Jim Mothersbaugh	
Name of Technology:	Wavelo	nics	(	Contact Email:	jim@watertectonics.com	
# of Installations in			(	Contact Phone:	866-402-2298	
Washington:	35+		(	Contact Website:	www.watertectonics.com	
	Trea	tment Tvn	e/Annlicatio	on (check all that	annly)	
Downspout	✓ Oil/Water Separa		✓ Filtration (media	•	Ion exchange column	✓ Stormwater
Drain Inlet Insert	✓ Settling	[	Filtration (fabric)	)	Reverse osmosis	✓ Groundwater
Below Ground Vault	Hydrodynamic S	eparation [	Filtration (biofilt	ration)	✓ Electrocoagulation	✓ Wastewater
Above Ground Vault	✓ Floatables Baffle		Filtration (chemi	cally enhanced)	Chemical Treatment	✓ Process water
			Estimated (	Costs		
Estimated Installation (	Cost:	low:	60000	high: 850000	_	
Estimated Annual O&N	l Cost:	low:	0.0008	high: 0.008	_ _	
		Syst	em Hydrauli	ics/Design		
Design Flow Rate (gpm)	):	low:	50	<b>high:</b> >1000		
System footprint (sq ft)	:	low:	200	<b>high:</b> >4000		
Required head loss (ft):		low:	NA	high: NA	_	
Internal or External Byp	oass:	NONE-auto	recirculation for I	retreat	_	

#### System Performance

#### Breifly describe how data were colected (field, lab, third party, grab sample, auto-composite, etc.)

Field via hand-held instruments, Technology's in-line and real-time water quality monitoring system, Oversight Engineers/Project Owners, 3rd party analytical testing laboratories using both instantaneous grab and composting methods (manual and automated). System performance "Median" data presented below does not accommodate analytical data results for parameters report as ND (<MDL's, or <MCL's). All ND data was utilized in the calculations as the value of the MDL or MCL. Influent data is limited in that our Clients typically do not incur cost expenditure to evaluate raw water characteristics once the system has been designed, installed, and made operational. They focus on monitoring effluent quality. Further, effluent data generated by our Clients/System Owners do not typically provide us with DMR's they submit to Ecology or other regulatory agencies. Effluent data points do not reflect technology ability to achieve lower than reported results. Permit discharge limitations have historically varied from site to site, permit to permit, and therefore data reflect treatment efforts and not technology limitations.

	NTU's	TSS	TPH0	O&G	SVOCs	PCBs	Dioxins
Median Influent (mg/L):	830	200	45.6	197	2.34	0.0024	
Median Effluent (mg/L):	0.4	5	0.25	4.76	0.00002	0.00011	
Median Removal (%):	100	98	99	98	100	9505	

		Total Met	als	Diss			
_	Cu	Pb	Zn	Cu	Pb	Zn	CPAHs
Median Influent (mg/L):	4.8	0.253	0.516	0.0235	0.0157	0.12	0.081
Median Effluent (mg/L):	0.0074	0.003	0.0315	0.005	0.0031	0.02	0.00002
Median Removal (%):	100	99	94	79	80	83	99.98

#### Notes, Comments, Additional References

Wavelonics electrocoagulation (EC) technology can be stand-alone, or part of a treatment train with supplemental components (see Treatment Type/Application, above) utilized for pre-treatment and/or polishing. EC facilitates the coagulation of suspended solids fines and/or dissolved species that are suitable for removal by conventional precipitation settling and/or filtration process steps. EC reactions will depend on the nature of constituents present, their reaction chemistry, pH sensitivity, and water conductivity. Bacteria disinfection has been demonstrated at laboratory and full-scale applications. Technology viability and optimization is recommended for non-conventional constituents of concern, or for complex matrices where interferences and competing conditions are problematic to conventional advanced treatment processes. Although a technology for application to a broad-spectrum of constituents, EC does not rely on treatment chemicals (e.g. polymers), it generates low solids volumes, is full-automated to reduce O&M labor, and cost-effectively converts AC power to DC. Power consumption is driven primarily by demand and loads of pumps, common to any mechanical water conveyance system plus optional control area HVAC. System Performance data fields (above) call for "Median" data points that do not allow for presentation of worst-case conditions, nor do they adequately reflect "mean" conditions, both of which are more elevated than the "Median" data presented for influent characteristics. Effluent "median" data do not reflect <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mbody or <mb



		Waste & Environ	mental							
Manufacturer:		Technologies	Ltd.		Contact N	lame:	Dr. A	vin Ip		
Name of Technology:		WetSep		<u>-</u> _	Contact E	mail:	alvin@was	tech.com.hk		
<b>Technology Category:</b>		Above Ground	Vault	-	<b>Contact P</b>	hone:	(852) 26	02-0308	<del></del>	
<b>Technology Process:</b>		Water Treatn	nent	_	Contact V	Vebsite:	www.wast	ech.com.hk		
# of Installations in Wa	shing	ton:	1							
		Treatme	nt Typ	oe/Applic	ation (ch	eck all the	at apply)			
Downspout	<b>✓</b>	Oil/Water Separartion		Filtration	(media)		☐ Ion exchar	nge column	✓ Storm	nwater
☐ Drain Inlet Insert	1	Settling		Filtration	(fabric)		Reverse of	smosis	Grou	ndwater
Below Ground Vault	1	Hydrodynamic Separa	ition	Filtration	(biofiltration)		Electrocoa	gulation	✓ Waste	ewater
✓ Above Ground Vault		Floatables Baffle		✓ Filtration	(chemically e	nhanced)	✓ Chemical	Γreatment	Proce	ss water
				Estimat	ed Costs					
Estimated Installation	Cost:		low:	\$1000	high:	\$2500				
Estimated Annual O&N	1 Cos	t:	low:	\$100/day	high:	\$250/day				
				System H	lydraulic	rs				
Design Flow Rate (gpm	):		low:	-	high:	260				
Required head loss (ft)			40 fe	eet			-			
Internal or External By	pass:	E	xternal	Bypass						
			5	System Pe	rforman	CP				
				,	.,					
Breifly describe how da										
The data can be stored ar					te, pH and	Turbidity. G	irab samples	can also be	taken at var	ious
points in the system to be										
Please also find the Field	Study	for the WetSep fi	ltration	System						
Parameter:		SS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	ТРН	cPAHs	PCBs
# of sample:		33	••	D13. Cu	D13. 211	D13. Cu	D13.1 D		CI AIIS	. 653
Median Influent (mg/L):		112 1	3.4	7 μg/L		0,3 μg/L	18 μ <b>g/L</b>			
Median Effluent (mg/L):			1.9	1 μg/L		<0.2 μg/L	<1 μg/L			
% Removal:		98% 8	6%	86%		50%	94%			
		Note	s. Con	nments, A	dditiona	l Referer	nces			
The WetSep system was u	ısed ir		•					Contractor f	for this iob w	as JE
Dunn Construction. The r			_							

# Passive



Manufacturer:	Eco-Tec, Inc	Contact Name:	Herb Pearse	
Name of Technology:	ADsorb-it	Contact Email:	herb@eco-tec-inc.com	
# of Installations in		Contact Phone:	253-884-6804	
Washington:	61	_ Contact Website:	www.eco-tec-inc.com	
	Treatment 1	ype/Application (check all that	annly)	
✓ Downspout ✓	Oil/Water Separation	Filtration (media)	Ion exchange column	√ Stormwater
☐ Drain Inlet Insert ☐	Settling		Reverse osmosis	☐ Groundwater
Below Ground Vault	Hydrodynamic Separation	Filtration (fabric)	Electrocoagulation	
		Filtration (biofiltration)		Wastewater
✓ Above Ground Vault	Floatables Baffle	Filtration (chemically enhanced)	Chemical Treatment	✓ Process water
		Estimated Costs		
Estimated Installation Cost Estimated Annual O&M Co	•	•		\$0.91/SF \$0.91/SF
	S	ystem Hydraulics/Design		
Design Flow Rate (gpm):		low: 80/SF hig	<b>sh:</b> 100/SF	
System aboveground footp	rint (sq ft):	low: Varies hig	<b>sh:</b> Varies	
Required head loss (ft):		low: NA hig	<b>sh:</b> NA	
Internal or External Bypass	Per indivi	dual application		
		System Performance		
		eyetem i eiyeimanee		
Briefly describe how data v	vere collected (field, la	ab, third party, grab sample, auto-	composite, etc.)	
A variety of sampling methods ha	ave been implemented ove	er the years based on specific installations	of the ADsorb-it Filtration F	abric and associated
	=	rom the ADsorb-it Fabric. ADsorb-it is des	=	
		oout, Drain Inlet Inset, Below Ground Vau	lt, Above Ground Vault, Shor	eline, Oil Water
Separator, and General Stormwa	Annual Continue AP 1 1	the annual control by the Demantage of the Control	/F1 \ f \ \ .	de Distriction for a substantial Co.

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	Varies	Varies	Varies				
Median Effluent (mg/L):	Varies	Varies	Varies				
Median Removal (%):	80-99	99-100	99-100				

		Total Met	als	Dissolved Metals			
	Cu	Pb	Zn	Cu	Pb	Zn	
Median Influent (mg/L):							
Median Effluent (mg/L):							
Median Removal (%):	Varies	Varies	Varies	Varies	Varies	Varies	

#### Notes, Comments, Additional References

Please see the attached report from the City of Tacoma as well as the VMS Full Scale and Field Tests for TSS removal. The 'filter blanket" referred to in the City of Tacoma Report is the ADsorb-it Fabric Product #EDB24-5, Contour Ditch Boom. Attached to this email is additional testing / application data and photographs to present a general spectrum of possible applications. As can be seen on our web site at www.eco-tec-inc.com, miles of ADsorb-it Fabric were deployed along the Gulf Coast Shoreline as an Oil Fence to provide effective removal of advancing oils from the BP Deepwater Horizon Release. Additional testing data can be accessed on our web site simply by clicking on "Test Data" in the left hand column. As a note, ADsorb-it is highly effective at removing hydrocarbons, including fats, oils and greases (FOG) from water, thus any other contaminants that would be attached to the hydrocarbon such as PCBs would be removed in conjuncton with hydrocarbon / FOG removal. ADsorb-it is an environmentally compatible product in that it is: Made from waste fibers from the textile manufacturing industry, it effectively removes hydrocarbons and associated / attached contaminants from the environment, it can be cleaned and reused indefinitely, it can be disposed of as a fuel source with a higher BTU per pound value than coal and less than 1% residual ash.



# HERRERA Manufacturer Technology Report

Manufacturer:	AquaShield,	Inc.		Contact Na	me:	Mark Miller			
Name of Technology:	Aqua-Filte			Contact En			uashieldinc.com		
Technology Category:	Below Ground			Contact Ph		888-344-904			
Technology Process:	Vortex + Filtra			Contact We		www.aquash			
# of Installations in Was	-		3					<del></del>	
				- !: .:					
			nent Type/A		n (check all				
Downspout	✓ Oil/Water Separ	artion [	Filtration (med	lia)		☐ Ion exchange	column	✓ Storn	nwater
Drain Inlet Insert	Settling	[	Filtration (fabr	ic)		Reverse osmo	osis	Grour	ndwater
Below Ground Vault	✓ Hydrodynamic S	eparation [	Filtration (biofi	Itration)		Electrocoagul	ation	☐ Waste	ewater
Above Ground Vault	▼ Floatables Baffle	• [	Filtration (cher	mically enhanced	)	Chemical Trea	atment	✓ Proce	ess water
			Es	stimated C	osts				
Estimated Installation C	net:	low:	Site-specific	high:	Site-specific	•			
Estimated Annual O&M		low:	Site-specific	high:	Site-specific				
			Site specific		Site speeme				
			Sys	tem Hydr	aulics				
Design Flow Rate (gpm)		low:	25	high:	960+	<u></u>			
Required head loss (ft):		0.	.8	_					
Internal or External Byp	ass:	Во	oth	_					
			Syst	em Perfor	mance				
			,	, .					
Breifly describe how dat	a were colected	(field, la	b, third party	, grab samp	le, auto-coi	mposite, etc.)			
Parameter:		TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
# of sample:	160								
Median Influent (mg/L): Median Effluent (mg/L):	43								
% Removal:	5 80								
76 Kelliovai.	80				· I D . C				
			tes, Comme						
Aqua-Filter filtration cart									_
Maryland averaging 96%				2012. AF-4.	2 model fle	eid tested at Ur	liveristy of New H	ampsnire Stor	mwater
Center, 80% TSS remova	efficiency (see a	ibove pai	rameters).						



# HERRERA Manufacturer Technology Report

Name of Technology:	Aquasiii	eld, Inc.		Contact N	ame:	Ma	ırk Miller		
ivanie or recimology.	Aqua-Gı	uardian		Contact Er	mail:	mmiller@a	nguashielding	.com	
<b>Technology Category:</b>	Drain Inle	et Insert		Contact Pl	none:	888	-344-9044		
Technology Process:	Filtra	tion		Contact W	ebsite:	www.aq	uashieldinc.c	<u>om</u>	
# of Installations in Was	nington:	1	15	_					
	Treat	tment Typ	e/Applicati	ion (check	all that apply	)			
Downspout	Oil/Water S	Separartion	✓ Filtration (me	edia)	]	on exchan	ge column	✓ Stor	mwater
✓ Drain Inlet Insert	Settling		Filtration (fab	oric)		Reverse os	smosis [	7 Grou	ındwater
Below Ground Vault	Hydrodyna	mic Separation	Filtration (bio	•		Electrocoa		_	tewater
☐ Above Ground Vault	Floatables	Baffle		emically enhance	vq)	Chemical 1		_	cess wate
			Estimated						ocss wate
Estimated Installation Co		low:_	Site-specific	_ high:	Site-specific	_			
Estimated Annual O&M	Cost:	low:_	Site-specific	_ high:	Site-specific	_			
			System Hyd	draulics					
Design Flow Rate (gpm):		low:	5/400*	high:	100/940*	* x/x = flo	w thru		
Required head loss (ft):	_		0	_		•	w thru per	ite +	
Internal or External Bypa	ass:	Во	oth	_		filter cloth			
		S	ystem Perf	ormance					
See Aqua-Filter, since this c	levice uses sar				_	-	-	g, 6 sa	mple
	levice uses sar				_	-	-	g, 6 sa	mple
See Aqua-Filter, since this c pairs per TARP qualifying st	levice uses sar orm.	me media. Ind	dependent lab	by grab samp	bles. Field by au	uto-composi	te samplin		
See Aqua-Filter, since this c pairs per TARP qualifying st Parameter:	levice uses sar orm. TSS				_	-	te samplin	g, 6 sa	mple PCBs
See Aqua-Filter, since this contains per TARP qualifying st Parameter: # of sample:	evice uses sar orm.  TSS 160	me media. Ind	dependent lab	by grab samp	bles. Field by au	uto-composi	te samplin		
See Aqua-Filter, since this contains per TARP qualifying storm of the pairs per TARP qualifying	rss 160 43	me media. Ind	dependent lab	by grab samp	bles. Field by au	uto-composi	te samplin		
See Aqua-Filter, since this contains per TARP qualifying st Parameter: # of sample:	evice uses sar orm.  TSS 160	me media. Ind	dependent lab	by grab samp	bles. Field by au	uto-composi	te samplin		
See Aqua-Filter, since this compairs per TARP qualifying st Parameter:  # of sample:  Median Influent (mg/L):  Median Effluent (mg/L):	TSS 160 43 5 80	me media. Ind	dependent lab	by grab samı	Dis. Cd	uto-composi	te samplin		



Manufacturer:	AquaShie	ld. Inc.		Contact Na	ame:		Mark	Miller		
Name of Technology:	Aqua-S		-	Contact Er				ashieldinc.com	_	
Technology Category:	Below Grou		=	Contact Ph				4-9044	_	
Technology Process:	Hydrodyna		-	Contact W				hieldinc.com	_	
		ппс эср.		Contact W	CDSITE.		www.aqaas	meranic.com	_	
# of Installations in Was	nington:		82	=						
		Trea	tment Type/	Applicatio	n (check al	I that ap	ply)			
Downspout	✓ Oil/Water Se	eparartion	Filtration (med	dia)		☐ Ion e	xchange colum	in	✓ Stor	mwater
☐ Drain Inlet Insert	Settling		Filtration (fabr	ric)		Reve	rse osmosis		Grou	ndwater
Below Ground Vault	✓ Hydrodynan	nic Separation	Filtration (biof	iltration)		☐ Elect	rocoagulation		☐ Wast	ewater
Above Ground Vault	✓ Floatables B	affle	_	mically enhance	d)		nical Treatmen	t		ess water
				stimated (						
			E.	sumatea (	LOSIS					
Estimated Installation C		low:		high:	Site-specifi					
Estimated Annual O&M	Cost:	low:	Site-specific	high:	Site-specifi	<u>c</u>				
			Sy:	stem Hydr	aulics					
Design Flow Rate (gpm)	:	low:	-	high:	2600					
Required head loss (ft):		(	0.25	_		_				
Internal or External Byp	ass:	[	Both	_						
			Syct	tem Perfoi	rmance					
			3,31	iciii i cijoi	manec					
Breifly describe how da	ta were colect	ed (field,	lab, third party	, grab samı	ole, auto-co	mposite,	etc.)			
Lab tested by Tennessee T						_		TARP.		
,	,	Ü	. ,	•		, ,				
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis.	Ph	TPH	cPAHs	PCBs
# of sample:	192	••	2.5. Cu	D131 Z11	2131 Cu	2.51			0171115	. 000
Median Influent (mg/L):	137									
Median Effluent (mg/L):	12									
% Removal:	86									
		N	otes, Comm	ents. Addi	tional Refe	erences				
Independent field testin	g underway ne							s and 14 inches	of rain sam	pled to
date. Sample parameter						2011	10 3(0)	o una 1 menes	or rain san	ipica to
aute. Jumple parameter	s above are to	i iicia test	Lab testing ve	inica by 143	C/ (1.					



Manufacturer:		Stormw	vateRx LLC		Contact N	ame:	Ayn G	eneres	
Name of Technology:	-	Aquip Enhance	ed Filtration Sys.	_ _	Contact E	mail:	ayng@storn	nwaterx.com	
# of Installations in					Contact P		800.68	30.3543	
Washington:			30		Contact W	/ebsite:	www.storm	nwaterx.com	
				ype/Applicati	on (check	all that a	pply)		
Downspout	_	Oil/Water Sep	aration	✓ Filtration (med	ia)		☐ Ion exch	ange column	✓ Stormwater
Drain Inlet Insert		Settling		Filtration (fabri	c)		Reverse	osmosis	Groundwater
✓ Below Ground Vault		Hydrodynamic	Separation	✓ Filtration (biofil	Itration)		Electroc	oagulation	Wastewater
✓ Above Ground Vault	<b>✓</b>	Floatables Baf	fle	Filtration (chen	nically enhance	ed)	Chemica	Il Treatment	Process water
				Estimated	Costs				
Estimated Installation Co Estimated Annual O&M	•	•		ction cost):		low:		high: high:	150000 0.003
			Sj	ystem Hydrau	lics/Desig	gn			
Design Flow Rate (gpm):				low:	10	high			
System aboveground for	otpr	int (sq ft):		low:	14	high			
Required head loss (ft):	2001		_	low:	4	high	7		
Internal or External Bypa	ass:	-	t	external					
Briefly describe how dat These samples were collected from a third party certified ar	d as g	grab samples	by Stormwat	teRx, consulting eng	ineers, and f	acility treat	ment system	operators. A	ll analytical data is
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):		30		9.9					
Median Effluent (mg/L):		3.39		3					
Median Removal (%):	$\Box$	83	YES	70	YES	YES		YES	
	1		Total Me	tale	Dice	solved Me	+alc		
	-	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):		0.152	0.03	0.425	0.084	0.008	0.196		
Median Effluent (mg/L):	_	0.008	0.006	0.061	0.006	0.007	0.06	•	
Median Removal (%):		94	79	85	93	51	73		
[				omments, Add	litional R	eference	5		
Non-detects were assumed to	o hav	re the value o	of one half the	e detection limit.					
Aquip removes PCBs, PAHs ar removal is through absorptio		_	_	າ particle filtration a	and absorption	on to one of	the filtration	media in the	e bed. VOC and SVOC
The Aquip is a secondary defemeans.	ense	against oil ar	nd grease and	I removes TPH and s	soluble oils t	hrough biod	legredataion,	, absorption a	ınd bio-mechanical



Manufacturer: Name of Technology: # of Installations in Washington:	Bio Clean Environmental Bio Clean Curb Inlet Basket 0 WA	Contact Name: Contact Email: Contact Phone: Contact Website:	Greg Kent  gkent@biocleanenvironmental.ne  760-433-7640  www.biocleanenvironmental.ne	<del>-</del>
	Treatn	nent Type/Application (check all th	hat apply)	
Downspout	Oil/Water Separation	Filtration (media)	☐ Ion exchange column	Stormwater
✓ Drain Inlet Insert	Settling	Filtration (fabric)	Reverse osmosis	Groundwater
■ Below Ground Vault	Hydrodynamic Separation	Filtration (biofiltration)	Electrocoagulation	Wastewater
Above Ground Vault	Floatables Baffle	Filtration (chemically enhanced)	Chemical Treatment	Process water
		Estimated Costs		
	Cost (unit cost and construction cost): // Cost (\$/gallon treated - based on pea	ak treatment flow rate):		high: 1,600 high: \$ 0.40
		System Hydraulics/Design		
Design Flow Rate (gpm	•	low: 381	high: 898	
System aboveground for Required head loss (ft):	,	low: 0	high: 0	
		low: 0.5	high: 2	
Internal or External By	pass:	External - Installed in Catch Basin -	Does Not Affect Basin Hydraulics	
		System Performance		
Briefly describe how da	ata were collected (field, lab, third par	tv. grab sample, auto-composite, etc.)		
The Curb Inlet Basket has belowUniverisity of Southern	been in use since the mid 90's. Several fiel California Independent Field Testing (Turbi tion Testing Full Scale Lab Testing	d and laboratory studies have been perfor		eral reports are being listed
University of Southern Ca	lifornia			

University of Southern Californ	aia.						
offiversity of southern camon	Turbidity	ТРН	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	42	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	12.75	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	70	not tested	not tested	not tested	not tested	not tested	not tested
		Total Metals			issolved Met	·alc	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	24.3	not tested	not tested	not tested	85.8
Median Effluent (mg/L):	not tested	not tested	10.4	not tested	not tested	not tested	73.4
Median Removal (%):	not tested	not tested	79	not tested	not tested	not tested	14
Suspended Solids Retention To	est						
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	93*	not tested	not tested	not tested	not tested	not tested	not tested
		Total Metals			issolved Met	als	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested

#### Notes, Comments, Additional References

\*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing. The Bio Clean Curb Inlet Basket is available with the patented Easy Maintenance Shelf System which reduces maintenance time and slows down water velocity for added settling and pollutant removal. To see this system in action visit: http://www.biocleanenvironmental.com/product/video/?path=content/product/curb\_inlet\_baskets/Curb\_Inlet\_Basket-Product\_Video.flv&w=768&h=576



## of Installations in 17 Port of Olympia (Upcoming 2011)	Manufacturer:		ean Environmental	_	Contact Name		Greg		
Washington: 17 Port of Olympia (Upcoming 2011)   Treatment Type/Application (check all that applies the property of the product of the prod	Name of Technology: # of Installations in	Bio Cle	an Downspout Filter	_					
Design Flow Rate (gam):   System Prigranulacy Annual CBM Cost (Syglian treated - based on peak treatment flow rate):   Nov. 240   Night   1,145   Night   Ni	Washington:	17 Port of O	lympia (Upcoming 2011)	_					
Date in let let set   Date of Statistics   Date o			Treatment	Type/Application	on (check all t	hat apply)			
Stelland Boundary	✓ Downspout	Oil/Water Separation		Filtration (media)			Ion exchange column		✓ Stormwater
Estimated Installation Cost (unit cost and construction cost):  Estimated Costs  Estimated Installation Cost (unit cost and construction cost):  Estimated Annual O&M Cost (5/galion treated - based on peak treatment flow rate):    System Hydraulics/Design   low: 3.015   low: 9.016   low: 9.015   low: 9.0	☐ Drain Inlet Insert	Settling		Filtration (fabric)			Reverse osmosis		Groundwater
Estimated installation Cost (unit cost and construction cost):  Estimated Annual O&M Cost (Sygalion treated-based on peak treatment flow rate):    System Hydraulics/Design   System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound footprint (sq ft): System Bovergound	☐ Below Ground Vault	Hydrodynamic Separat	tion	Filtration (biofiltra	ation)		Electrocoagulation		Wastewater
Estimated Installation Cost (unit cost and construction cost):  Estimated Annual O&M Cost (S/gallon treated - based on peak treatment flow rate):    System Hydraulics/Design	Above Ground Vault	Floatables Baffle		Filtration (chemic	ally enhanced)		Chemical Treatment		Process water
System Boveground Footprint (sq ft):   System Hydraulics/Design   System Boveground footprint (sq ft):   System Boveground footprint				Estimated	Costs				
Design Flow Rate (spm): System aboveground footprint (sq ft): Internal Bypass: High Flow Unimpeded - UPC Approved and Tested    Note			•	ent flow rate):				-	
System aboveground footprint (sq ft):   low:       light			9	System Hydrau	lics/Design				
Internal or External Bypass:   Internal Bypass: High Flow Unimpeded - UPC Approved and Tested				low:	249	high:	1,145		
System Performance	-	otprint (sq ft):							
System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by IAMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.				low:	1	high:	2		
Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by LMMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the korrage capacity of the product. The filter has also been tested in full scale labratory testing.  —X-Tex-Z-200 Testing for Metals - X-Tex-Z-200 Testing for Metals - Total Scale Laboratory Testing.  Full Scale Laboratory Testing.  TSS Turbidity paccasi axis of 18 grease SVOCs PCBs Dioxins CPAHs not tested	Internal or External Byp	ass:		Internal Bypass -	High Flow Unim	peded - UPC Ap	proved and Tested	d .	
The Bio Clean Downspout Filter has been used since 2003. It has been tested and approved by IAMPO. The downspout filter has UPC certification. The filter has been tested under the IAMPO to verify treatment and bypass flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.  -Full Scale Laboratory Testing D-Tek Analytical X-Tex-Z-200 Testing for Metals -  Full Scale Laboratory Testing TSS Turbidity paid-salaso) Oil & grease SVOCs PCBs Dioxins CPAHs  Median Influent (mg/L): n/a 429 223.5 not tested not				System Perfo	rmance				
to verify treatment and byposs flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labaratory testing.  —Full Scale Laboratory Testing D-Tek Analytical  —X-Tex-Z-200 Testing for Metals-  Full Scale Laboratory Testing D-Tek Analytical  —X-Tex-Z-200 Testing for Metals-  Full Scale Laboratory Testing TSS  —Turbidity (sacc-sat 260)  Median Influent (mg/L):  n/a  429  223.5  not tested  not tested  not tested  not tested  not tested  not tested on tested on tested  not tested on tested on tested on tested  Median Removal (%):  7 Total Metals  —Total Metals  —Dissolved Metals  Nutrients  Wedian Influent (mg/L):  not tested on test	Briefly describe how da	ta were collected (fi	eld, lab, third party, grab sa	ample, auto-comp	osite, etc.)				
to verify treatment and byposs flow rates. The filter also meets the protocol's minimum pollutant removal specification of at least 60% TSS at a concentration of 150 mg/L over a several hour period up to the storage capacity of the product. The filter has also been tested in full scale labaratory testing.  —Full Scale Laboratory Testing D-Tek Analytical  —X-Tex-Z-200 Testing for Metals-  Full Scale Laboratory Testing D-Tek Analytical  —X-Tex-Z-200 Testing for Metals-  Full Scale Laboratory Testing TSS  —Turbidity (sacc-sat 260)  Median Influent (mg/L):  n/a  429  223.5  not tested  not tested  not tested  not tested  not tested  not tested on tested on tested  not tested on tested on tested on tested  Median Removal (%):  7 Total Metals  —Total Metals  —Dissolved Metals  Nutrients  Wedian Influent (mg/L):  not tested on test	The Die Clear Dawner +	Filtor has been used -	2002 It has been test - 1	ad approved by Jan	IDO The dames	aout filtar ha - 1	IDC cortification T	ha filtar bas bassa	tosted under the IANADO
period up to the storage capacity of the product. The filter has also been tested in full scale labratory testing.  "Full Scale Laboratory Testing  TSS Turbidity (silc_sill_sill_sill_sill_sill_sill_sill_	· '			,					
Full Scale Laboratory Testing D-Tek Analytical From Xextex Corporation, USA  Full Scale Laboratory Testing TSS Turbidity (sis-co-sis-sis) Oil & grease SVOCs PCBs Dioxins CPAHs Median Influent (mg/L): n/a 429 223.5 not tested not tested not tested not tested Median Effluent (mg/L): n/a 251 29.5 not tested not tested not tested not tested Median Effluent (mg/L): n/a 41 87 not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested not tested not tested Needian Effluent (mg/L): not tested not tested not tested not tested not tested not tested not tested Needian Effluent (mg/L): not known not known not known not known not tested not tested not tested not tested not tested Needian Effluent (mg/L): not known not known not known not known not tested not test						ation of at leas	1 00% 133 at a cont	entration of 130 i	iig/Lovei a severai iloui
Full Scale Laboratory Testing  TSS Turbidity (sik-co-sil alog)  Median Influent (mg/L): n/a 429 223.5 not tested not tested not tested not tested Median Removal (%): 93* 41 87 not tested not tested not tested not tested Nedian Removal (%): 93* 41 87 not tested not tested not tested not tested Nedian Removal (%): 95* 41 87 not tested not tested not tested not tested Nedian Removal (%): 95* 41 87 not tested not tested not tested not tested Nedian Removal (%): 95* 41 87 not tested not tested not tested not tested Nedian Removal (%): 95* 41 87 not tested Nedian Removal (%): 95* 41 87 not tested Nedian Removal (%): 100 tested Nedian Removal (%): 10			The meet has also been tested	· · · · · · · · · · · · · · · · · · ·	ny testing.			X-Tex-Z-20	00 Testing for Metals -
Median Influent (mg/L):									· ·
TSS   Turbidity psacosusos   Oil & grease   SVOCs   PCBs   Dioxins   CPAHs									
TSS   Turbidity (SPLO-SIS 106)   Oil & grease   SVOCS   PCBS   Dioxins   CPAHS	Full Cools Laboratory Tosti								1
Median Influent (mg/L):	ruii Scale Laboratory Testii		Turbidity (sil-co-sil 106)	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Removal (%): 93* 41 87 not tested not tested not tested not tested   Nutrients	Median Influent (mg/L)								
Total Metals  Cu  Pb  Zn  Cu  Pb  Zn  TP  Median Influent (mg/L):  not tested	Median Effluent (mg/L)	n/a	251	29.5	not tested	not tested	not tested	not tested	
Cu Pb Zn TP  Median Influent (mg/L): not tested not tes	Median Removal (%):	93*	41	87	not tested	not tested	not tested	not tested	
Cu Pb Zn Cu Pb Zn TP  Median Influent (mg/L): not tested not teste					_				
Median Influent (mg/L):   not tested   not		C.	1	7.0					
Median Removal (%):   not tested   not tes	Median Influent (mg/L)								
Notested   Not tested   Not t			†			1			
X-TEX FABRIC TESTING - For Metals Removal  TSS Turbidity (sil-co-sil 106)  Median Influent (mg/L): not tested	Median Removal (%):			1		1			
Median Influent (mg/L): not tested not teste									
Median Influent (mg/L): not tested not tested not tested not tested not tested not tested not tested not tested Nedian Effluent (mg/L): not tested not tested not tested not tested not tested not tested not tested Nedian Removal (%): not tested not tested not tested not tested not tested not tested not tested Nedian Removal (%): not tested not tested not tested not tested not tested Nedian Removal (%): not keyon Not keyon Not keyon Not keyon Not keyon Not tested Not tested Not tested Nedian Effluent (mg/L): not kwonw Not kwonw Not kwonw Not tested Not tested Nedian Removal (%): 76 96 69 Not tested N	X-TEX FABRIC TESTING - Fo	or Metals Removal							
Median Effluent (mg/L): not tested not teste			Turbidity (Sil-Co-Sil 106)	Oil & grease	SVOCs		Dioxins		
Median Removal (%):  not tested  Total Metals  Dissolved Metals  Nutrients  Cu  Pb  Zn  Cu  Pb  Zn  TP  Median Influent (mg/L):  not kwonw  not kwonw  not kwonw  not kwonw  not kwonw  not tested  no				+					
Total Metals  Cu  Pb  Zn  Cu  Pb  Zn  TP  Median Influent (mg/L):  not kwonw  not kwonw  not kwonw  not kwonw  not kwonw  not kwonw  not kwonw  not kwonw  not tested  not tes				+					
Cu Pb Zn TP  Median Influent (mg/L): not kwonw not kwonw not kwonw not kwonw not tested not tested not tested not tested Nedian Effluent (mg/L): not kwonw not kwonw not kwonw not kwonw not tested not tested not tested Nedian Removal (%): 76 96 69 not tested not tested not tested not tested not tested Notes, Comments, Additional References  *Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to	iviedian Kemoval (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested	
Cu Pb Zn TP  Median Influent (mg/L): not kwonw not kwonw not kwonw not kwonw not tested not tested not tested not tested Nedian Effluent (mg/L): not kwonw not kwonw not kwonw not kwonw not tested not tested not tested Nedian Removal (%): 76 96 69 not tested not tested not tested not tested not tested Notes, Comments, Additional References  *Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to			Total Metals			issolved Met	als	Nutrients	
Median Influent (mg/L): not kwonw not kwonw not kwonw not tested not tested not tested not tested Nedian Effluent (mg/L): not kwonw not kwonw not kwonw not tested not tested not tested not tested Nedian Removal (%): 76 96 69 not tested not tested not tested not tested not tested Notes, Comments, Additional References  *Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to		Cu		Zn					
Median Removal (%): 76 96 69 not tested not tested not tested not tested not tested  Notes, Comments, Additional References  *Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to	Median Influent (mg/L)	not kwonw	not kwonw						
*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to		not kwonw	not kwonw	not kwonw	not tested	not tested	not tested	not tested	
*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to	Median Removal (%):	76	96	69	not tested	not tested	not tested	not tested	
*Mass Balance was used for the TSS Tesing and therefore mg/L and number of samples does not apply. Turbidity in NTUs. This filter is made of all stainless steel and is istalled inline with new or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to			Notes. C	Comments. Add	itional Refer	ences			
or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to									
or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to									
or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to									
or existing downspouts. The Bio Clean Downspout Filter is also available with added for ion exchange embedded filter fabric for enhanced removal of metals. The filter is adaptable to									
domispote sizes 4 to 12 .			it riiter is also avallable with a	uueu ioi ion exchar	ige ennoedded fi	iter rapric for 6	manceu removal	or metals. The filte	er is adaptable to
	downspout sizes 4 to 12								



Manufacturer:	Bio Clean Environmental	Contact Name:	Greg Kent
Name of Technology:	Bio Clean Flume Filter	Contact Email:	gkent@biocleanenvironmental.net
# of Installations in		Contact Phone:	760-433-7640
Washington:	0 WA	Contact Website:	www.biocleanenvironmental.net
	<del>-</del>		
	Treatment 1	Type/Application (check all that app	nly)
Downspout	Oil/Water Separation	✓ Filtration (media)	☐ Ion exchange column ✓ Stormwater
Drain Inlet Insert	Settling	Filtration (fabric)	Reverse osmosis Groundwater
Below Ground Vault	✓ Hydrodynamic Separation	Filtration (biofiltration)	☐ Electrocoagulation ☐ Wastewater
Above Ground Vault	Floatables Baffle	Filtration (chemically enhanced)	Chemical Treatment Process water
		Estimated Costs	
		d on peak treatment flow rate low	high:     1,302       high:     0.23
	S	ystem Hydraulics/Design	
Design Flow Rate (gpm)	:	low: 116 high	n: 583
System aboveground for		low: 1 high	<del></del>
Required head loss (ft):		low: 0.083 high	0.5
Internal or External Byp	pass: Internal E	Bypass Up to Specific Flow - Configured to A	Illow for High Flow External Bypass
		System Performance	
The Bio Clean Flume Filter	has been tested indepedently in wo days. The Flume Filter Tested	hird party, grab sample, auto-composite a full scale laboratory setting A series of 5 utilized a series of three BioSorb Hydrocark	composite influent and effluent samples were

Full Scale Laboratory Testing							
	TSS						
	(Sil-Co-Sil 106)	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	73	223	360	NA	NA	NA	NA
Median Effluent (mg/L):	51.6	29.5	62	NA	NA	NA	NA
Median Removal (%):	29	87	83	NA	NA	NA	NA
	•	•		-	•	•	•
	To	tal Metals		Diss	olved Met	als	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	NA	NA	NA	NA	NA	NA	NA
Median Effluent (mg/L):	NA	NA	NA	NA	NA	NA	NA
Median Removal (%):	NA	17	NA	NA	NA	NA	NA

#### Notes, Comments, Additional References

The Bio Clean Flume Filter comes standard with BioSorb Hydrocarbon booms. The filter is designed to utilize varoius media based upon pollutants of concern. The Flume Filter is designed to be used in unique conditions in which sheet flow needs to be treated and no fall is available for other types of technologies.



Manufacturer:	Bio Clean Environmental	Contact Name:	Greg Kent	
Name of Technology:	Bio Clean Grate Inlet Skimmer B	ox Contact Email:	gkent@biocleanenvironn	nental.net
# of Installations in		Contact Phone:	760-433-764	0
Washington:	0 WA, 123 OR	Contact Website:	www.biocleanenvironm	<u>ental.net</u>
	Trea	tment Type/Application (check all th	nat apply)	
Downspout	Oil/Water Separation	Filtration (media)	☐ Ion exchange column	Stormwater
✓ Drain Inlet Insert	Settling	Filtration (fabric)	Reverse osmosis	Groundwater
Below Ground Vault	Hydrodynamic Separation	Filtration (biofiltration)	Electrocoagulation	Wastewater
Above Ground Vault	Floatables Baffle	Filtration (chemically enhanced)	Chemical Treatment	Process water
		Estimated Costs		
Estimated Installation	Cost (unit cost and construction cost	):	low: 635	high: 1,800
Estimated Annual O&N	/I Cost (\$/gallon treated - based on p	eak treatment flow rate):	low: \$ 0.15	high: \$ 0.40
		System Hydraulics/Design		
Design Flow Rate (gpm	):	low: 224	high: 8,980	
System aboveground f	•	low: 0	high: 0	
Required head loss (ft)	:	low: 0.5	high: 2	
Internal or External By	pass:	Internal - High	n Flow Rate	
		System Performance		
		<i>-</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Briefly describe how d	ata were collected (field, lab, third pa	erty, grab sample, auto-composite, etc.)		
The Grate Inlet Skimmer listed below.	Basket has been in use since the mid 90's	s. Several field and laboratory studies have be		this reason several reports are being dependent Field Testing
	tion Testing Full Scale Lab Testing		Longo Toyota - In	Reedy Creek
Improvement District Ind	-			Needy Creek
UC Irvine Independent				
Whitman's Pond	·····g			
Creech Engineering				

Longo Toyota - Independent F	ield Testing						
· · · · · · · · · · · · · · · · · · ·	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not tested	not tested	189	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	10.43	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	95	not tested	not tested	not tested	not tested
		Total Metals			issolved Met	als	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	1.9	1.5	13.7	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	0.1	0.2	0.73	not tested	not tested	not tested	not tested
Median Removal (%):	95	87	95	not tested	not tested	not tested	not tested
Suspended Solids Retention T	est						
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	n/a	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	86*	not tested	not tested	not tested	not tested	not tested	not tested
		Total Metals		D	issolved Met	als	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested
Reedy Creek Improvement Dis	strict						
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Effluent (mg/L):	not known	not tested	not known	not tested	not tested	not tested	not tested
Median Removal (%):	74	not tested	54	not tested	not tested	not tested	not tested
		Total Metals			issolved Met	als	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
	not tested	not tested	not tested	not tested	not tested	not tested	not known
Median Influent (mg/L):	Hot tested						
Median Influent (mg/L): Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not known

TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
not known	not tested	not known	not tested	not tested	not tested	not tested
not known	not tested	not known	not tested	not tested	not tested	not tested
53	not tested	90	not tested	not tested	not tested	not tested
	Total Matala		-		-l-	NI. utui a uata
						Nutrients
						TP
not known	not known	not known	not tested	not tested	not tested	not tested
not known	not known	not known	not tested	not tested	not tested	not tested
7	98	11	not tested	not tested	not tested	not tested
TCC	TOU	0.1.0	SVOC-	DCD-	Dii	CDALL
		<del>                                       </del>				CPAHs
978	not tested	not tested	not tested	not tested	not tested	not tested
329	not tested	not tested	not tested	not tested	not tested	not tested
329 66	not tested not tested	not tested not tested	not tested not tested	not tested not tested	not tested not tested	not tested not tested
	not tested		not tested	not tested	not tested	not tested
66	not tested  Total Metals	not tested	not tested	not tested	not tested	not tested  Nutrients
66 <b>Cu</b>	not tested  Total Metals  Pb	not tested	not tested D Cu	not tested  issolved Met  Pb	not tested	not tested  Nutrients TP
Cu not tested	not tested  Total Metals Pb not tested	not tested  Zn  not tested	not tested  Cu  not tested	not tested  issolved Met  Pb  not tested	not tested  cals  Zn  not tested	Nutrients TP 18.6
Cu not tested	not tested  Total Metals  Pb  not tested  not tested	not tested  Zn  not tested  not tested	not tested  Cu  not tested  not tested	not tested  issolved Met  Pb  not tested  not tested	not tested  als  Zn  not tested  not tested	Nutrients TP 18.6 0.452
Cu not tested	not tested  Total Metals Pb not tested	not tested  Zn  not tested	not tested  Cu  not tested	not tested  issolved Met  Pb  not tested	not tested  cals  Zn  not tested	Nutrients TP 18.6
Cu not tested	not tested  Total Metals  Pb  not tested  not tested	not tested  Zn  not tested  not tested	not tested  Cu  not tested  not tested	not tested  issolved Met  Pb  not tested  not tested	not tested  als  Zn  not tested  not tested	Nutrients TP 18.6 0.452
Cu not tested	not tested  Total Metals  Pb  not tested  not tested	not tested  Zn  not tested  not tested	not tested  Cu  not tested  not tested	not tested  issolved Met  Pb  not tested  not tested	not tested  als  Zn  not tested  not tested	Nutrients TP 18.6 0.452
Cu not tested not tested not tested	not tested  Total Metals Pb not tested not tested not tested	Zn not tested not tested not tested not tested	not tested  Cu not tested not tested not tested	not tested  issolved Met  Pb  not tested  not tested  not tested	not tested  Zn  not tested  not tested  not tested	Nutrients
Cu not tested not tested not tested	not tested  Total Metals Pb not tested not tested not tested	Zn not tested not tested not tested not tested Oil & grease	not tested  Cu not tested not tested not tested SVOCs	not tested  issolved Met  Pb  not tested  not tested  not tested  PCBs	not tested  Zn  not tested  not tested  not tested  not tested  Dioxins	Nutrients
Cu not tested not tested not tested	not tested  Total Metals Pb not tested not tested not tested TPH not tested	Zn not tested not tested not tested not tested  Oil & grease not tested	not tested  Cu not tested not tested not tested  SVOCs not tested	not tested  pb not tested not tested not tested not tested PCBs not tested	not tested  Zn not tested not tested not tested not tested  Dioxins not tested	Nutrients TP 18.6 0.452 98  CPAHs not tested
Cu not tested not tested not tested TSS not known not known	not tested  Total Metals Pb not tested not tested not tested  TPH not tested not tested not tested	not tested  Zn  not tested  not tested  not tested  Oil & grease  not tested  not tested	not tested  Cu not tested not tested not tested svocs not tested not tested not tested	not tested  Pb not tested not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Zn not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Nutrients TP 18.6 0.452 98  CPAHs not tested not tested not tested
Cu not tested not tested not tested TSS not known 73	not tested  Total Metals Pb not tested not tested not tested  TPH not tested not tested not tested  TOTAL Metals	not tested  Zn  not tested  not tested  not tested  Oil & grease  not tested  not tested  not tested	not tested  Cu not tested not tested not tested  SVOCs not tested not tested not tested	not tested  pb not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not Metales not tested	not tested  Zn not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Nutrients TP 18.6 0.452 98  CPAHs not tested not tested not tested Nutrients
Cu not tested not tested not tested TSS not known not known	not tested  Total Metals Pb not tested not tested not tested  TPH not tested not tested not tested	not tested  Zn  not tested  not tested  not tested  Oil & grease  not tested  not tested	not tested  Cu not tested not tested not tested svocs not tested not tested not tested	not tested  Pb not tested not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Zn not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Nutrients TP 18.6 0.452 98  CPAHs not tested not tested not tested
Cu not tested not tested not tested TSS not known 73	not tested  Total Metals Pb not tested not tested not tested  TPH not tested not tested not tested  TOTAL Metals	not tested  Zn  not tested  not tested  not tested  Oil & grease  not tested  not tested  not tested	not tested  Cu not tested not tested not tested  SVOCs not tested not tested not tested	not tested  pb not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not Metales not tested	not tested  Zn not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested	not tested  Nutrients TP 18.6 0.452 98  CPAHs not tested not tested not tested Nutrients
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1	ot known 53  Cu ott known 7  TSS	ot known not tested not known not tested 53 not tested    Total Metals Pb not known not known not known not known 7 98    TSS TPH		tot known not tested not known not tested so not tested not known not tested not known not known not known not known not known not known not known not known not known not known not known not known not tested not known not	tot known not tested not known not tested not tested not known not tested not known not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not known not known not known not known not known not tested not teste	tot known not tested not known not tested not tested not tested not tested not known not tested not known not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not tested not known not known not known not known not known not known not known not known not known not known not known not tested not

#### Notes, Comments, Additional References

\*Mass Balance was used for the Suspended Solids Retention Test and therefore mg/L and number of samples does not apply. An OK-90 Sand gradation was used for the testing. The Bio Clean Grate Inlet Skimmer Basket is backed by a 5 year unlimited warranty. It's the only catch basin filter to utilize multiple levels of screens to maxmize performance and treatment flow rate. The product is manufactured from marine grade fiberglass and stainless steel. It contains no cheap net, plastics or fabrics which can rip, tare and break under field conditions. For more information visit: http://www.biocleanenvironmental.com/product/grate\_inlet\_skimmer\_box



Name of Technology:   Bio Clean Trench Drain Filter   Contact Phone: Total Asynchronic   Golden Trench Drain Filter   Contact Phone: Total Asynchronic   Total Asynchronic   Total Meals   Total Median Removal (%):	Name of Technology:   Bio Clean Trench Drain Filter   Contact Phone:	Name of Technology: Bio Clean Trench Drain Filter Contact Phone: Total Institution in Contact Phone: Quality of Institution (in Institution in Contact Website: Washington: 0 WA Treatment Type/Application (check all that apply)    Deampool	Manufacturer:	Bio Clean Enviro	onmental		Contact Name	e:	Gre	g Kent	
Contact Phone:   766-433-7640   Nashington:   O WA   Contact Website:   Workshipped   Nashington:   O WA   Contact Website:   Workshipped   Nashington:   O WA   Contact Website:   Workshipped   Nashington:   O WA   O	Contact Phone:   Treatment Type/Application (check all that apply)   Stormus   Storm	Contact Website:   To Q-333 7-60						-			
Treatment Type/Application (check all that apply)   Downspout   OliWater Separation   Filtration (media)   Filtration (media)   Ion exchange column   Io	Treatment Type/Application (check all that apply)    Downspout	Treatment Type/Application (check all that apply)    Downspoot	f of Installations in			_	760-4	=			
Downspout   OlivWater Separation   Filtration (media)   Internal profession   One exchange column   Olivater Separation   Settling   Filtration (media)   Filtration (media)   Internal profession   Olivater Separation   Filtration (media)   Filtration (media)   Electrocagulation   Electrocagulation   Electrocagulation   Oceanical Treatment   Oceanic	Downspout     Olivater Separation     Filtration (media)     Ion exchange column   Stormwere   Stelling     Filtration (fabric)     Reverse cosmools   Cround's   Reverse cosmools   Cround's   Reverse cosmools   Reverse c	Design Flow Rate (gpm) Per Linear Foot:	Washington:	0 WA			Contact Webs	site:	www.biocleane	environmental.net	- -
Prilarition (flabrics)   Reverse composits   Reverse composition   Reverse composi	Potan Intel Internt   Settling   Filtration (Florinc)   Reverse comosis   Ground's Ground Vault   Hydrodynamic Separation   Hydrodynamic Separation   Filtration (florincation)   Glectroccapidation   Wastewn   Above Ground Vault   Hydrodynamic Separation   Filtration (florincation)   Glectroccapidation   Wastewn   Above Ground Vault   Hydrodynamic Separation   Filtration (florincation)   Glectroccapidation   Wastewn   Above Ground Vault   Prostables Buffle   Filtration (florincation)   Glectroccapidation   Wastewn   Process   Filtration (florincation)   Glectroccapidation   Wastewn   Process   Filtration (florincation)   Glectroccapidation   Wastewn   Process   Filtration (florincation)   Glectroccapidation   Glectroccapidation   Wastewn   Process   Glectroccapidation   Glectroccapidation   Wastewn   Process   Glectroccapidation   Glectroccapidation   Glectroccapidation   Glectroccapidation   Wastewn   Process   Glectroccapidation   Glectroccapidation   Glectroccapidation   Glectroccapidation   Wastewn   Process   Glectroccapidation   Glectroccapidation   Glectroccapidation   Glectroccapidation   Glectroccapidation   Wastewn   Process   Glectroccapidation   Glectroc	Setting   Filtration (fabric)   Reverse conocids   Groundward (Groundward Vault   Hydrodynamic Separation   Filtration (fabric)   Below Ground Vault   Hydrodynamic Separation   Filtration (cotemically enhanced)   Chemical Treatment   Process w			Treatmer	nt Type/Applicat	ion (check al	l that apply)			
Below Ground Vault	Below Cround Vault   Hydrodynamic Separation   Filtration (biofiltration)   Belcrocognisation   Wastew   Piltration (chemically enhanced)   However   Piltration (chemically enhanced)   However   Process   P	Below Ground Vault   Hydrodynamic Separation   Filaration (Boilfliration)   Chemical Treatment   Westewart   Process w   Pro	☐ Downspout ☐	Oil/Water Separation		· · · · · ·	•		Ion exchange colum	nn	Stormwater
Below Ground Vault   Hydrodynamic Separation   Filtration (bioritiration)   Electrocosegulation   Above Ground Vault   Ploatables Baffle   Filtration (chemically enhanced)   Chemical Treatment   Che	Below Ground Vault   Hydrodynamic Separation   Filtration (blofiltration)   Electrocoagulation   Wastew   Wastew   Above Ground Vault   Floatables Baffile   Filtration (chemically enhanced)   Chemical Treatment   Process   Process   Process   Estimated Costs   Process   Pro	Below Ground Voult   Hydrodynamic Separation   Filtration (beloftration)   Electrocoagulation   Wastenett   Above Ground Voult   Hydrodynamic Separation   Filtration (beloftration)   Electrocoagulation   Process w   Prostables Baffie   Filtration (chemically enhanced)   Chemical Treatment   Process w   Process w	✓ Drain Inlet Insert	Settling		Filtration (fabric)			Reverse osmosis		☐ Groundwate
Above Ground Vault   Floatables Baiffle   Filtration (chemically enhanced)   Chemical Treatment	Above Ground Vault   Floatables Baffle   Filtration (chemically enhanced)   Chemical Treatment   Process	Above Ground Vauit	☐ Below Ground Vault	Hydrodynamic Separation			ation)				
Estimated Costs  Estimated Installation Cost (unit cost and construction cost):  Estimated Annual O&M Cost (\$/gallon treated - based on peak treatment flow rate):    System Hydraulics/Design	Estimated Costs  Estimated Installation Cost (unit cost and construction cost):    Iow:   660	Estimated Installation Cost (unit cost and construction cost):    Sestimated Annual Q&M Cost (\$/gallon treated - based on peak treatment flow rate):   System Hydraulics/Design	_	Floatables Baffle						t	Process wa
System Hydraulics/Design   System Hydraulics/Design   System Hydraulics/Design	Estimated Installation Cost (unit cost and construction cost):    Iow:   660	Estimated Installation Cost (unit cost and construction cost):    System Hydraulics/Design   Dow:									
System Hydraulics/Design Design Flow Rate (gpm) Per Linear Foot: System Hydraulics/Design Design Flow Rate (gpm) Per Linear Foot: System Boveground footprint (sq ft): Sequired head loss (ft): Some started head loss (ft): Some started head loss (ft): Some started head loss (ft): System Bypass: System Performance  System Perfo	System Hydraulics/Design   System Hydraulics/Design   System Hydraulics/Design   System Hydraulics/Design   System Hydraulics/Design   System Boveground footprint (sq ft):	System Hydraulics/Design Design Flow Rate (gpm) Per Linear Foot: System Hydraulics/Design Design Flow Rate (gpm) Per Linear Foot: System Boveground footprint (sq ft): Dow: 10				LStimate	2 00313				
Design Flow Rate (gpm) Per Linear Foot:    System Hydraulics/Design   Design Flow Rate (gpm) Per Linear Foot:   System aboveground footprint (sq ft):   Iow:   0	System Hydraulics/Design   Design Flow Rate (gpm) Per Linear Foot:   low: 28   high: 86   System aboveground footprint (sq ft):   low: 0   high: 0   high: 12   Internal Bypass   Internal Bypass   Up to Specific Flow - Configured to Allow for High Flow External Bypass	System Hydraulics/Design   Design Flow Rate (gpm) Per Linear Foot:   low: 28   high: 36   System aboveground footprint (sq ft):   low: 4   high: 12   Internal or External Bypass:   Internal Bypass:   Internal Bypass:   Internal Bypass:   Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass      System Performance   System Performance		•				-		_ ~	
Seeging Flow Rate (gpm) Per Linear Foot:   low: 28   high: 86   high: 0   low: 0   high: 12   low: 12   high: 12   low: 14   high: 12   low: 15   high: 16   high: 16   high: 16   high: 17   high: 18   high:	Design Flow Rate (gpm) Per Linear Foot:	Design Flow Rate (gpm) Per Linear Foot:	stimated Annual O&M C	ost (\$/gallon treated - b	ased on peak tr	eatment flow rate	):	low:	\$ 0.23	_ nigh:	\$ 0.74
Required head loss (ft): Internal Bypass: Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass  System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCs  PCBs  Dioxins  CPAHs  Median Influent (mg/L): Not tested Not tes	Acquired head loss (ft):  Internal Bypass:  Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass  System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCs  PCBs  Dioxins  CPAHs  Median Influent (mg/L):  not tested  no	Internal of External Bypass:  Internal Bypass Up to Specific Flow - Configured to Allow for High Flow External Bypass  System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCs  PCBs  Dioxins  CPAHs  Median Influent (mg/L):  not tested  not				System Hydrau	ılics/Design				
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System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  TSS (Sil-Co-Sil 106) TPH Oil & grease SVOCS PCB Dioxins CPAHS Median Influent (mg/L): not tested n	System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCS  PCBS  Dioxins  CPAHs  Median Influent (mg/L):  not tested  not	System Performance  Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH Oil & grease  SVOCS  PCBS Dioxins  CPAHS  Median Influent (mg/L): not tested not test		print (sq ft):				high:	0	_	
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Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Total Metals  Total Metals  Total Metals  Cu  Pb  Zn  Cu  Pb  Zn  Cu  Pb  Zn  Cu  Pb  Zn  Median Influent (mg/L):  not tested	Briefly describe how data were collected (field, lab, third party, grab sample, auto-composite, etc.)  No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCs  PCBs  Dioxins  CPAHs  Median Influent (mg/L):  not tested	Professional Profe				System Deri	formance				
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No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106)  TPH  Oil & grease  SVOCS  PCBS  Dioxins  CPAHS  Median Influent (mg/L):  not tested  not te	No testing has been done on the trench drain filter.  Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106) TPH Oil & grease SVOCS PCBS Dioxins CPAHS Median Influent (mg/L): not tested not	Full Scale Laboratory Testing  TSS (Sil-Co-Sil 106) TPH Oil & grease SVOCs PCBs Dioxins CPAHs Median Influent (mg/L): not tested not	Briefly describe how data	were collected (field, la	b. third party. g	rab sample, auto-	omposite, etc	:.)			
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Total Metals   Dissolved Metals   Nutrients	Total Metals   Dissolved Metals   Nutrients	Notes, Comments, Additional References   Not tested   n	, ,			1		1			1
Total Metals Dissolved Metals Nutrients  Cu Pb Zn Cu Pb Zn TP  Median Influent (mg/L): not tested not tested not tested not tested not tested not tested Median Effluent (mg/L): not tested not tested not tested not tested not tested not tested Not tested not tested not tested not tested not tested not tested Not tested	Total Metals Dissolved Metals Nutrients  Cu Pb Zn Cu Pb Zn TP  Median Influent (mg/L): not tested not tested not tested not tested not tested not tested Median Effluent (mg/L): not tested	Total Metals Dissolved Metals Nutrients  Cu Pb Zn Cu Pb Zn TP  Median Influent (mg/L): not tested not tested not tested not tested not tested not tested Nedian Effluent (mg/L): not tested not tested not tested not tested not tested not tested Nedian Removal (%): not tested not tested not tested not tested not tested not tested N						1		+	1
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Median Effluent (mg/L):     not tested       Median Removal (%):     not tested	Median Effluent (mg/L):     not tested       Median Removal (%):     not tested     not tested     not tested     not tested     not tested     not tested	Median Effluent (mg/L): not tested not teste		+				<del>                                     </del>		<u> </u>	1
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	Notes, Comments, Additional References		vledian Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested	
	Notes, Comments, Additional References				A/		-lisil C - C				
Notes, Comments, Additional Rejerences		The Bio Clean Trench Drain Filter comes standard with BioSorb Hydrocarbon booms or can use BioMediaGREEN. The filter is designed to utilize varoius media based upon po			Notes	, comments, Ad	aitionai Refe	erences			
		Fig. 21. Class Tough David Filters and advantable DioCode Understand to the DioCode Understand t									



Manufacturer:	Bio Clean Env	vironmental		Contact Name	i.	Gree	Kent	
Name of Technology:	Bio Clean Water Polis		_	Contact Email	_	gkent@bioclean	_	
of Installations in		·	-	Contact Phon	e: _	760-43	33-7640	_
Washington:	0		_	Contact Webs	ite:	www.biocleane	nvironmental.net	_ _
	_	Treatment	Type/Application	on (check all	that apply)			
□ Downspout	✓ Oil/Water Separation		Filtration (media)			Ion exchange colum	ı	Stormwater
Drain Inlet Insert	✓ Settling		Filtration (fabric)			Reverse osmosis		Groundwater
✓ Below Ground Vault	✓ Hydrodynamic Separation		Filtration (biofiltra	tion)		Electrocoagulation		☐ Wastewater
Above Ground Vault	Floatables Baffle		Filtration (chemica	ally enhanced)		Chemical Treatment		Process water
			Estimated	Costs				
	ost (unit cost and construc	•			low:	25,000	high	
Estimated Annual O&M	Cost (\$/gallon treated - ba				low:	\$ 5.24	high	: \$ 7.85
		9	System Hydraul					
Design Flow Rate (gpm):			low:	191	high:	528		
System aboveground for Required head loss (ft):	otprint (sq ft):		low: low:	0	high: _ high:	2		
			-	1 	-		•	
Internal or External Bypa	ass:		Ir	nternal Bypass -	High Flow Unin	предед		
			System Perfo	rmance				
The Bio Clean Water Polish	er is a unique upflow media f	filter designed as a star	nd alone treatment	unit or incorpor				
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test		filter designed as a star nary filter media, BioN ninimal head. A series o	nd alone treatment of MediaGREEN. The Bi	unit or incorpor oMediaGREEN l ent and effluen	nas been indepe	endently tested in	full scale labarat	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro	filter designed as a star nary filter media, BioM ninimal head. A series o nmental - Independer	nd alone treatment i MediaGREEN. The Bi of 8 composite influ nt Full Scale Lab Test	unit or incorpor oMediaGREEN I ent and effluen	nas been indepe	endently tested in we collected over	n full scale labarat a perioud of two	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform Full Scale Laboratory Testin	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro	filter designed as a star nary filter media, BioM ninimal head. A series o nmental - Independer TPH	nd alone treatment in dediaGREEN. The Bio of 8 composite influint Full Scale Lab Test	unit or incorpor oMediaGREEN l ent and effluen ting SVOCs	nas been indepe grab samples v	endently tested in we collected over	full scale labarat a perioud of two CPAHs	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform Full Scale Laboratory Testin Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ g TSS (Sil-Co-Sil 106)	filter designed as a star nary filter media, BioM ninimal head. A series o nmental - Independer TPH 1.4	nd alone treatment in dediaGREEN. The Bio of 8 composite influint Full Scale Lab Test  Oil & grease  69.8	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested	PCBs not tested	endently tested in we collected over Dioxins not tested	full scale labarat a perioud of two CPAHS not tested	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform Full Scale Laboratory Testin Median Influent (mg/L): Median Effluent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro	filter designed as a star nary filter media, BioM ninimal head. A series o nmental - Independer TPH	nd alone treatment in dediaGREEN. The Bio of 8 composite influint Full Scale Lab Test	unit or incorpor oMediaGREEN l ent and effluen ting SVOCs	nas been indepe grab samples v	endently tested in we collected over	full scale labarat a perioud of two CPAHs	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform Full Scale Laboratory Testin Median Influent (mg/L): Median Effluent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro  g  TSS (Sil-Co-Sil 106)  84.6  12.4	rilter designed as a star nary filter media, BioM ninimal head. A series o nomental - Independer TPH 1.4 0 >99	nd alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5	unit or incorpor oMediaGREEN l ent and effluen ting  SVOCs not tested not tested	PCBs not tested not tested not tested	Dioxins not tested not tested not tested	cpaHs not tested	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the test BioMediaGREEN Perform Full Scale Laboratory Testin Median Influent (mg/L): Median Effluent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro  g  TSS (Sil-Co-Sil 106)  84.6  12.4  85	rilter designed as a star nary filter media, BioM ninimal head. A series on nomental - Independer TPH 1.4 0 >99	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91	unit or incorpor oMediaGREEN l ent and effluen ting  SVOCs not tested not tested not tested	PCBs not tested not tested not tested sissolved Meta	Dioxins not tested not tested not tested	CPAHS not tested not tested Nutrients	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Removal (%):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro  g  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu	rilter designed as a star nary filter media, BioM ninimal head. A series of commental - Independer TPH 1.4 0 >99	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn	unit or incorpor oMediaGREEN   ent and effluent ting  SVOCs not tested not tested not tested Cu	PCBs not tested not tested not tested sissolved Meta	Dioxins not tested not tested not tested sals Zn	CPAHs not tested not tested Nutrients TP	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Removal (%):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro  g  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested	rilter designed as a star nary filter media, BioN ninimal head. A series o nmental - Independer  TPH  1.4  0  >99  Total Metals Pb  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested	unit or incorpor oMediaGREEN I ent and effluent ting  SVOCs not tested not tested not tested Cu 0.57	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested sals Zn 0.75	CPAHs not tested not tested not tested TP Nutrients TP 2.07	ory testing. Media surf
train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Removal (%):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4 0 >99  Total Metals Pb not tested not tested not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested not tested not tested Cu 0.57 0.12	PCBs not tested not tested not tested sissolved Meta	Dioxins not tested not tested not tested not tested 2 2 0.75 0.16	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Enviro  g  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested	rilter designed as a star nary filter media, BioN ninimal head. A series o nmental - Independer  TPH  1.4  0  >99  Total Metals Pb  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested	unit or incorpor oMediaGREEN I ent and effluent ting  SVOCs not tested not tested not tested Cu 0.57	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested sals Zn 0.75	CPAHs not tested not tested not tested TP Nutrients TP 2.07	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Removal (%):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4  0  >99  Total Metals  Pb  not tested  not tested  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested not tested not tested Cu 0.57 0.12 79	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested not tested 2 2 0.75 0.16	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4  0  >99  Total Metals  Pb  not tested  not tested  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested  not tested	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested not tested not tested Cu 0.57 0.12 79	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested not tested 2 2 0.75 0.16	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4  0  >99  Total Metals  Pb  not tested  not tested  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested  not tested	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested not tested not tested Cu 0.57 0.12 79	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested not tested 2 2 0.75 0.16	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4  0  >99  Total Metals  Pb  not tested  not tested  not tested	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested  not tested	unit or incorpor oMediaGREEN I ent and effluen ting  SVOCs not tested not tested not tested Cu 0.57 0.12 79	PCBs not tested not tested not tested vissolved Meta	Dioxins not tested not tested not tested not tested 2 2 0.75 0.16	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63	ory testing. Media surf
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):  Median Influent (mg/L):  Median Influent (mg/L):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested  not tested  not tested  not tested	TPH  1.4 0 >99  Total Metals Pb not tested not tested Notes, C	Oil & grease  69.8 6.5 91  Zn not tested not tested not tested Total Rester  Comments, Add	svocs not tested not tested not tested 1.57 0.12 79	PCBs not tested not tested not tested not tested vissolved Meta Pb 0.38 0.01 98	Dioxins not tested not tested not tested not tested not 78	CPAHs not tested not tested not tested Nutrients TP 2.07 0.63 70	ory testing. Media suri
The Bio Clean Water Polish train. The Bio Clean Water loading rate during the testBioMediaGREEN Perform.  Full Scale Laboratory Testin  Median Influent (mg/L):  Median Effluent (mg/L):  Median Influent (mg/L):  Median Influent (mg/L):  Median Effluent (mg/L):  Median Removal (%):	er is a unique upflow media f Polisher utilizes the revolutio ing averaged 2-5 gpm with m ance Testing by Waves Environ  TSS (Sil-Co-Sil 106)  84.6  12.4  85  Cu  not tested not tested	TPH  1.4 0 >99  Total Metals Pb not tested not tested Notes, C	ond alone treatment of MediaGREEN. The Bio of 8 composite influent Full Scale Lab Test  Oil & grease  69.8  6.5  91  Zn  not tested  not tested  not tested  rot tested  not tested  The state of the st	unit or incorpor oMediaGREEN lent and effluenting  SVOCs not tested not tested not tested 10.57 10.12 179  itional Referential list made of bill	PCBs not tested not tested not tested not tested solves of samples with tested not teste	Dioxins not tested not tested not tested not tested not 78  Dioxins not ested not tested not tested not rested not tested	CPAHS not tested not tested not tested not tested Nutrients TP 2.07 0.63 70	ory testing. Media sur days.



# HERRERA Manufacturer Technology Report

Manufacturer:		Bio-Mic	robics, Inc.			Contact N	ame:	Lucas	s Staus			
Name of Technology:			STORM	_		Contact E	mail:	sales@biomicrobics.com				
# of Installations in	•			_		Contact P	hone:	800-753-3278				
Washington:			0	_		Contact W	/ebsi <u>te//w</u>	.biomicrobi	cs.com	,		
		Tre	eatment T	уре	/Applicati	on (check	all that a	ipply)				
Downspout	1	Oil/Water Sep	parartion	1	Filtration (med	ia)		On exch	ange column	4	Stormwater	
Drain Inlet Insert	1	Settling			Filtration (fabri	c)		Reverse	osmosis	4	Groundwater	
✓ Below Ground Vault		Hydrodynami	c Separation		Filtration (biofil	Itration)		Electroc	oagulation		Wastewater	
Above Ground Vault		Floatables Ba	ffle		Filtration (chen	nically enhance	ed)	Chemica	l Treatment		Process water	
					Estimated	Costs						
Estimated Installation Co	st:		low	:	500	high:	2000					
Estimated Annual O&M	Cos	t:	low	=	400	high:	4000	<del>-</del> -				
			Sy	ste	m Hydrau	lics/Desig	<u></u>					
Design Flow Rate (gpm):			low	:	225	high:	4800	_				
System footprint (sq ft):			low	:	45	high:	162	_				
Required head loss (ft):			low	:	0.5	high:	0.17	_				
Internal or External Bypa	iss:		e	xtern	al	-						
				Sys	stem Perfo	ormance						
Breifly describe how dat	2 14/	ero coloct	ed (field la	h th	ird party or	rah samplo	auto-coi	mnosita a	to 1			
TSS results are from grab sam										d helo	w are at 100% of	
design flow.	•		· ·			· ·			·			
	1	TSS	TPH	0	il & grease	SVOCs	PCBs	Dioxins	CPAHs	1		
Median Influent (mg/L):	$\neg$	227								1		
Median Effluent (mg/L):		7.9								ĺ		
Median Removal (%):		95.3								ĺ		
	Г					T			Ī			
	-		Total Me	tals			solved Me	1				
Madian Influent (ma/l)	_	Cu	Pb	+	Zn	Cu	Pb	Zn				
Median Influent (mg/L): Median Effluent (mg/L):	_			+								
Median Removal (%):												
iviedian Kemovai (70).								1	l			
			Notes, Co	mn	nents, Add	litional R	eference	?S				
Installation costs and O&M co	sts	are estimate	s for the Wasl	hingt	on area and do	o not include	equipment	or tank cost	s. Drawings	and fu	rther	
information on the product ca	an b	e obtained o	on our website	at th	ne following ur	l: http://bio	microbics.c	om/?p=77				



Manufacturer: Name of Technology: # of Installations in Washington:		CONTECH Construction Products,  CDS  > 250				Contact N Contact E Contact P Contact W	mail: hone:	Sean darcys@cod 503-25 contech-	8-3105	- <u>-</u> -	
		7.	reatment '	Tune	Annlica	tion /cho	ماد مالا خام	t amalul		-	
✓ Downspout	<b>✓</b>	Oil/Water Sep			Filtration (medi		ck all tha	_	ange column	✓ Stormwate	er
Drain Inlet Insert	$\overline{}$	Settling			Filtration (fabri	c)		Reverse	osmosis	Groundwat	ter
✓ Below Ground Vault	$\checkmark$	Hydrodynamic	c Separation		Filtration (biofil	tration)		Electroco	agulation	Wastewate	er
Above Ground Vault	✓	Floatables Bat	ffle		Filtration (chem	nically enhance	ed)	Chemical	Treatment	Process wa	ater
					Estimate	d Costs					
Estimated Installation ( Estimated Annual O&N				ıctioı	n cost):		low:	\$10K \$0.00001	high: high:		
			5	yste	em Hydra	ulics/Des	sign				
Design Flow Rate (gpm System aboveground for Required head loss (ft): Internal or External By	ootp :			Availa	low: low: low:	20 NA 0.1	high: high: high:	NA NA			
				Sv	stem Per	formance	<u> </u>				
Briefly describe how da The Manasquan Savings Ban			•			-			•	е.	
		TSS	TPH	Oil	& grease	SVOCs	PCBs	Dioxins	CPAHs	SSC<50 um	
Median Influent (mg/L)		154			22					35	
Median Effluent (mg/L) Median Removal (%):	):	26			5					9	
ivieulali Kelliovai (76).		95			64					65	
			Total Met	als		Dis	solved M	etals			
		Cu	Pb		Zn	Cu	Pb	Zn			
Median Influent (mg/L)											
Median Effluent (mg/L)	):										
Median Removal (%):									l		
			Notes C	`om	ments, Ad	Iditional	Referen	CPS			
Oil & Grease laboratory data	a usir	ng sorbents a					nejeren				



Manufacturer: Name of Technology: # of Installations in Washington:		StormwateRx LLC  Clara Gravity Stormwater Separator  2				Contact Na Contact Er Contact Ph Contact W	nail: none:	ayng@storn 800.68	mwaterx.com 80.3543	
		Tre	atment T	ype/	Applicati	on (check	all that a	ррју)		
Downspout	<b>✓</b>	Oil/Water Sep	aration		Filtration (medi	a)		☐ Ion exch	nange column	✓ Stormwater
☐ Drain Inlet Insert	<b>√</b>	Settling			Filtration (fabri	c)		Reverse	osmosis	Groundwater
✓ Below Ground Vault	<b>✓</b>	Hydrodynamic	Separation		Filtration (biofil	tration)		☐ Electroc	oagulation	Wastewater
✓ Above Ground Vault	<b>√</b>	Floatables Baf	fle		Filtration (chen	nically enhance	d)	Chemica	al Treatment	Process water
				E	stimated	Costs				
Estimated Installation C Estimated Annual O&M		•		ction	cost):		low:		high: high:	52000 0.001
Design Flow Rate (gpm) System aboveground for Required head loss (ft): Internal or External Byp	otpı		•	<b>/sten</b>	low: low: low: low:	5 0 0.5	n high: high: high:	150		
Briefly describe how date These samples were collected from a third party certified an	d as	grab samples	by Stormwat	eRx, co	onsulting eng	ineers, and fa	acility treat	ment system	operators. A	ll analytical data is
		TSS	TPH	Oil	& grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):		284.5	IFII	Oii	ox grease	30003	PCD3	DIOXIIIS	CFAIIS	
Median Effluent (mg/L):		173.5								
Median Removal (%):		47.0	YES		YES					
		<u> </u>						1		
			Total Me	tals		Diss	olved Me	tals		
		Cu	Pb		Zn	Cu	Pb	Zn		
Median Influent (mg/L):		0.516	0.088	1	2.82					
Median Effluent (mg/L):	:	0.078	0.072	-	1.21			ļ		
Median Removal (%):		29.5	25.8		32.0				l	
			Notes, Co	mme	ents, Add	itional Re	eference	rs		
The Clara uses four pre-enging	ieere	ed chambers	with an interr	nal high	n-flow bypass	to trap pollu	itants such	as heavy soli	ds and oil and	d grease.



Manufacturer:		Coanda, Inc.	_		Contact N	ame:	Steve Esmond		_
Name of Technology:		Coanda Effect	_		Contact E		sesmond@coar	ida.com	
# of Installations in		A handful of private downspouts			Contact P	none:	(714) 272-1997		-
Washington:		and area drains.	_		Contact W	ebsite:	http://www.coa	anda.com/	-
		Treatment	Ту	pe/Applico	ation (che	ck all tha	t apply)		
✓ Downspout	Ш	Oil/Water Separartion	✓	Filtration (med	lia)		Ion excha	nge column	✓ Stormwater
✓ Drain Inlet Insert		Settling		Filtration (fabr	ic)		Reverse of	osmosis	Groundwater
✓ Below Ground Vault		Hydrodynamic Separation		Filtration (biofi	iltration)		Electroco	agulation	✓ Wastewater
Above Ground Vault		Floatables Baffle		Filtration (cher	mically enhance	d)	Chemical	Treatment	✓ Process water
				Estimate	ed Costs				
Estimated Installation C	ost:	low	:	\$2,000	high:	\$3,500			
Estimated Annual O&M	Cos	t: low	:	\$-0-	high:	\$-0-	No installat	ion has require	ed maintenance to da
			Sys	tem Hydro	aulics/Des	ign			
Design Flow Rate (gpm)	:	low	:	50	high:	360,000	_		
System footprint (sq ft):	:	low	:	2	high:	2,000	_		
Required head loss (ft):		low	:	1.5	_ high:	3	_		
Internal or External Byp	ass:	Optional inter	nal b	ypass is provid	ded.				
			5	System Pe	rformance	?			
	_								
Breifly describe how da									
USC (University of Southern C evaluate the hydraulic perfor									
approximately 635 gallons pe BMP and then from under the						-	_		
		TC		<b>TO</b> 2	61/06	0.00	I st. t. I	CDAIL	1
Madian Influent (mg/L)		TS COD	╁	TOC	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L): Median Effluent (mg/L):		1500 1262 1276 1091	+	1137					
Median Removal (%):	•	1376 1081 8% 14%	╁	996 12%					
					1				ı
		Total Me Cu Pb	tals	Zn	Cu	olved M	etals Zn		
Median Influent (mg/L):	:	Cu FD	+	48	Cu	FD	211		
Median Effluent (mg/L):				15					
Median Removal (%):			T	69%					
		l l			· ·				
		Notes,	Con	nments, A	dditional	Referen	ces		
A summary of the USC report	can	be found at: http://www.o	coanc	la.com/produc	cts/document	s/usc_resea	arch_project.po	df.	
Other case studies have been		iarmad damanatrating ram	امررما	of two ch mutui	ante matale	n osticidos	and bactoria.		
http://www.coanda.com/pro	•			•	ents, metais,	pesticides,	and bacteria:		
intep.//www.counda.com/pro	uuct.	s, aocaments, nowiett_cast	_5.0	uy_i.pui					



Manutacturer:	Hydro Inter	national	<u></u>	Contact N	ame:	Fred Kraekel			
Name of Technology:	Downstream	n Defender®	)	Contact E	mail:	fkraekel@hil-te	ch.com		
<b>Technology Category:</b>	Below Grou	nd Vault	_	Contact P	hone:	207-321-373	3		
<b>Technology Process:</b>	Filter		_	<b>Contact W</b>	/ebsite:	www.hydro-int	ernational.biz		
# of Installations in Wa	shington:			_					
	7,	oatment	Tune/Ani	nlication	(check al	l that apply)			
Downspout	✓ Oil/Water S		<u></u>	n (media)	(CHECK UII	I triat appry)  Ion exchan	ao column	✓ Storn	nwater
Drain Inlet Insert		cpararaon		, ,			•		
	✓ Settling		_	n (fabric)		Reverse os		☐ Groui	ndwater
Below Ground Vault	Hydrodyna	mic Separation	Filtration	n (biofiltration)		Electrocoa	gulation	Wast	ewater
Above Ground Vault	✓ Floatables	Baffle	Filtration	n (chemically e	nhanced)	Chemical 1	reatment	Proce	ess water
			Estin	nated Co	sts				
Estimated Installation	Cost:	low	:	high:					
Estimated Annual O&N	/I Cost:	low				<del>-</del> -			
			Syster	m Hydrau	ilics				
Design Flow Rate (gpm	ı):	low	, :	-					
Required head loss (ft)	:					_			
Internal or External By	pass:			-					
			System	Perform	ance				
			7	,					
Breifly describe how da	ata were cole	cted (field,	lab, third p	oarty, grab	sample, a	auto-compos	site, etc.)		
		Cor	ntact Hydro	Internation	al for detai	ls.			
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									
			Comment						
The Downstream Defer	nder® is an ad	vanced Hyd	drodynamic	Vortex Se	parator th	nat is specific	ally designed	d to provide	high
removal efficiencies of	urban runoff	pollutants of	over a wide	range of f	low rates.	. It is commo	only used in s	stormwater	
applications as either p	retreatment (	or as a stan	d-alone tre	atment sys	tem. The	unique flow	-modifying i	nternal com	ponents
distinguish the Downst	ream Defende	er from sim	ple swirl-ty	pe devices	and conv	entional oil/	grit separato	rs by minim	izing
turbulence and head lo				-				-	-
removal efficiencies an							•		
		w head loss	es of the D	ownstream	n Defende	r allow for a	small footpr	int, making i	t a
	d inherent lo								
compact and economic	d inherent loval	r non-point	source pol	lution. Co					
	d inherent loval	r non-point	source pol	lution. Co					
compact and economic	d inherent loval	r non-point	source pol	lution. Co					



	Royal Environmenta	al Systems	Contact Na	ame:	Jim Mo	thersbaugh		
Name of Technology:	ecoLine .	A	Contact Er			rtectonics.co	<u>m</u>	
# of Installations in			Contact Ph		-	402-2298		
Washington:	6		Contact W	ebsite:	www.wate	rtectonics.co	<u>m</u>	
		reatment Type//	Application (che	ck all that	apply)			
Downspout	✓ Oil/Water Separation	✓ Filtra	ation (media)		☐ Ion exchange	column	<b>✓</b>	Stormwater
Drain Inlet Insert	Settling	Filtra	ation (fabric)		Reverse osmo	osis	<b>√</b>	Groundwater
Below Ground Vault	Hydrodynamic Separa	ation Filtra	ation (biofiltration)		☐ Electrocoagul	ation	<b>V</b>	Wastewater
Above Ground Vault	Floatables Baffle	Filtra	ation (chemically enhance	d)	Chemical Tre	atment		Process water
		Es	stimated Costs					
stimated Installation Cost (u	nit cost and constructio	on cost):		low	: \$ 6,700	h	igh: \$	44,250
Estimated Annual O&M Cost (		,		low			igh:	(a)
		System	n Hydraulics/De	cian				
esign Flow Rate (gpm):		3,5.6	low: 25	<i>sigii</i> high	: 626			
System aboveground footprin	t (sa ft):		low: 12	high				
Required head loss (ft):	• (- 1)			ith clean co.				
nternal or External Bypass:	Sit	te specific design requ						
			em Performanc					
EN EN 858-1 Test Method for Class ight liquid: Fuel oil, per ISO 8217, de Vater: Potable or purified surface wa Vater turn over: Minimum four volu	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units				nifiable)			
EN EN 858-1 Test Method for Class ight liquid: Fuel oil, per ISO 8217, de Vater: Potable or purified surface wa Vater turn over: Minimum four volu iquid flux: 25-40 m³/m²-h (10-15 gpi	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft <sup>2</sup> )	ensity of 0.85 g/cm3* (	Solubility of light liquic	d nil, unsapor	nifiable)			
EN EN 858-1 Test Method for Class ight liquid: Fuel oil, per ISO 8217, de Vater: Potable or purified surface wa Vater turn over: Minimum four volu iquid flux: 25-40 m³/m²-h (10-15 gpi	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b	ensity of 0.85 g/cm3* (: by prescribed infrared sp	Solubility of light liquid	d nil, unsapor				
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface wa Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp Max. residual light liquid: 5 mg/L (Hyu	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b	ensity of 0.85 g/cm3* (:  by prescribed infrared sp  TPH Oil & §	Solubility of light liquid pectroscopy procedure	d nil, unsapor	Dioxins	CPAHs		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface wa Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp) Max. residual light liquid: 5 mg/L (Hyu	esignation ISO-F-DMA with deater mes of test units m/ft²) drocarbon content analysis b	ensity of 0.85 g/cm3* (:  by prescribed infrared sp  TPH Oil & g  (b) (ti	Solubility of light liquid spectroscopy procedure  grease SVOCs b) (b)	PCBs	Dioxins (b)	(b)		
EN EN 858-1 Test Method for Class ight liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w. Water turn over: Minimum four volu iquid flux: 25-40 m³/m²-h (10-15 gp. wax. residual light liquid: 5 mg/L (Hyuman Influent (mg/L): Median Influent (mg/L):	esignation ISO-F-DMA with deater mes of test units m/ft²) drocarbon content analysis b	ensity of 0.85 g/cm3* (constitution)  py prescribed infrared sp  TPH Oil & g  (b) (i)  (b) (i)	Solubility of light liquic spectroscopy procedure  grease SVOCs b) (b) b) (b)	PCBs (b) (b)	Dioxins (b) (b)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface we Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp; Wax. residual light liquid: 5 mg/L (Hyu  Median Influent (mg/L):  Median Effluent (mg/L):	esignation ISO-F-DMA with deater mes of test units m/ft²) drocarbon content analysis b	ensity of 0.85 g/cm3* (constitution)  py prescribed infrared sp  TPH Oil & g  (b) (i)  (b) (i)	Solubility of light liquid spectroscopy procedure  grease SVOCs b) (b)	PCBs	Dioxins (b)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface we Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gn) Max. residual light liquid: 5 mg/L (Hyu	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)	ensity of 0.85 g/cm3* (constitution)  py prescribed infrared sp  TPH Oil & g  (b) (i)  (b) (i)	pectroscopy procedure  grease SVOCs b) (b) b) (b) b) (b)	PCBs (b) (b)	Dioxins   (b)   (b)   (b)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface we Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp Max. residual light liquid: 5 mg/L (Hydedian Influent (mg/L):  Median Influent (mg/L):  Median Removal (%):	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)	TPH Oil & g (b) (t) (b) (t) Otal Metals	pectroscopy procedure  grease SVOCs b) (b) b) (b) b) (b)	PCBs (b) (b) (b)	Dioxins   (b)   (b)   (b)	(b)		
Briefly describe how data wer CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface wa Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp; Max. residual light liquid: 5 mg/L (Hy)  Median Influent (mg/L): Median Removal (%):  Median Influent (mg/L):	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Cu (b)	TPH	pectroscopy procedure  grease SVOCs b) (b) b) (b) b) (b) c) Dis- cin Cu b) (b)	PCBs (b) (b) (b) solved Me Pb (b)	Dioxins   (b) (b) (b) (c)   (b)   (c)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water turn over: Minimum four volu liquid flux: 25-40 m³/m²-h (10-15 gpi Max. residual light liquid: 5 mg/L (Hyd  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Influent (mg/L): Median Effluent (mg/L):	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Cu (b) (b) (b)	TPH	grease SVOCs b) (b) b) (b) c) Dis- cin Cu b) (b) b) (b)	PCBs (b) (b) (b) solved Me Pb (b) (b)	Dioxins   (b) (b) (b)   (b)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water: Potable or purified surface w Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp; Max. residual light liquid: 5 mg/L (Hyr  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Influent (mg/L): Median Influent (mg/L):	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Cu (b)	TPH	pectroscopy procedure  grease SVOCs b) (b) b) (b) b) (b) c) Dis- cin Cu b) (b)	PCBs (b) (b) (b) solved Me Pb (b)	Dioxins   (b) (b) (b) (c)   (b)   (c)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface we Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gp Max. residual light liquid: 5 mg/L (Hydedian Influent (mg/L):  Median Influent (mg/L):  Median Removal (%):	I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Cu (b) (b) (b)	TPH	pectroscopy procedure  grease SVOCs b) (b) b) (b) c) Dis- cin Cu b) (b) b) (b) b) (b) c) (b) b) (b)	PCBs (b) (b) (b) solved Me Pb (b) (b) (b)	Dioxins   (b) (b) (b)	(b)		
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gpi Max. residual light liquid: 5 mg/L (Hyd  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):	r I Coalescing Separator esignation ISO-F-DMA with de ater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Cu (b) (b) (b) (b) (b) (b) (b) (b) (b) (b)	TPH	grease SVOCs b) (b) b) (b) c) Distance Cu b) (b) b) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b)	PCBs (b) (b) (b) solved Me Pb (b) (b) (b)	Dioxins   (b) (b) (b)   (b)   (c)   (c)   (d)   (d)   (d)   (d)   (d)   (e)   (b) (b) (b)			
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water turn over: Minimum four volu liquid flux: 25-40 m³/m²-h (10-15 gpi Max. residual light liquid: 5 mg/L (Hyd  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Removal (%):  Median Removal (%):	I Coalescing Separator esignation ISO-F-DMA with deater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Tc Cu (b) (b) (b) (b) (b) (c) (d) (d) (e) (e) (e) (f) (f) (f) (f) (f) (f) (f) (f) (f) (f	TPH	grease SVOCs b) (b) b) (b) c) Distance Cu b) (b) b) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b)	PCBs (b) (b) (b) solved Me Pb (b) (b) (b)	Dioxins   (b) (b) (b)   (b)   (c)   (c)   (d)   (d)   (d)   (d)   (d)   (d)   (e)   (b) (b) (b)	ge to the co	alescing media, new	
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water turn over: Minimum four volu Liquid flux: 25-40 m³/m²-h (10-15 gpi Max. residual light liquid: 5 mg/L (Hyd  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):	I Coalescing Separator esignation ISO-F-DMA with deater mes of test units m/ft²) drocarbon content analysis b  TSS (b) (b) (b) (b)  Tc Cu (b) (b) (b) (b) (b) (c) (d) (d) (e) (e) (e) (f) (f) (f) (f) (f) (f) (f) (f) (f) (f	TPH	grease SVOCs b) (b) b) (b) c) Distance Cu b) (b) b) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b) c) (b)	PCBs (b) (b) (b) solved Me Pb (b) (b) (b)	Dioxins   (b) (b) (b)   (b)   (c)   (c)   (d)   (d)   (d)   (d)   (d)   (d)   (e)   (b) (b) (b)	ge to the co	alescing media, new	
CEN EN 858-1 Test Method for Class Light liquid: Fuel oil, per ISO 8217, de Water: Potable or purified surface w Water turn over: Minimum four volu liquid flux: 25-40 m³/m²-h (10-15 gpi Max. residual light liquid: 5 mg/L (Hyd  Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):  Median Influent (mg/L): Median Removal (%):  Median Removal (%):	TSS  (b)  (b)  (b)  (b)  (b)  (b)  (b)  (	TPH Oil & g  (b) (t)  (b) (t)  Otal Metals  Pb Z  (b) (t)  Otal Metals  Pb (b) (t)  Otal Metals  Pb (b) (t)  Otal Metals  Ph (t)  Otal Metals  Ph (t)  Otal Metals  Ph (t)  Otal Metals  Ph (t)  Otal Metals  Otal Me	pectroscopy procedure  grease SVOCs b) (b) b) (b) b) (b) c) Disc cn Cu b) (b) b) (b) b) (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (b) ch (c) c	PCBs (b) (b) (b) Solved Me Pb (b) (b) (b)	Dioxins (b) (b) (b)  tals  Zn (b) (b) (b) (b)  Ces  replaced. In the	(b) (b) (b)		- '

-				
(A)	ΗF	RR	F	RA
		1/1/	-	

Manufacturer: Name of Technology:	ame of Technology: ecoLine B of Installations in			Con	tact Name:		Jim Mothe	ctonics.com	
# of Installations in Washington:			7		tact Phone: tact Website:		866-402 www.watertee		-
			Trea	tment Type/Appli	cation (check all the	at apply)			
Downspout	✓ Oil/Water	r Separation		Filtration (media)			Ion exchange column		Stormwater
Drain Inlet Insert	Settling			Filtration (fabric)			Reverse osmosis		Groundwater
✓ Below Ground Vault	Hydrodyn	namic Separation		Filtration (biofiltration	n)		Electrocoagulation		✓ Wastewater
Above Ground Vault	Floatable	s Baffle		Filtration (chemically	enhanced)		Chemical Treatment		✓ Process water
				Estima	ted Costs				
Estimated Installation Estimated Annual O&			•			low:		high: high:	\$ 81,900 (a)
				System Hyd	raulics/Design				
Design Flow Rate (gpr				low:	50	high:			
System aboveground		q ft):		low: low: 6	N/A	high:			
Required head loss (ft Internal or External By	•		Site specific des		i.00" with clean coalesco	er high:	N/A		
				System D	erformance				
				System F	erjormunce				
Briefly describe how o				grab sample, auto-co	omposite, etc.)				
CEN EN 858-1 Test Method Light liquid: Fuel oil, per ISO				R5 g/cm3* (Solubility of lig	ht liquid nil unsanonifiah	ile)			
Water: Potable or purified			with defisity or 0.0	is granis (solubility of lig	int iiqala iii, ansapoiiinab	nc)			
Water turn over: Minimum									
Liquid flux: 25-40 m <sup>3</sup> /m <sup>2</sup> -h Max. residual light liquid: 5			nalysis by prescribed	d infrared spectroscopy pr	rocedure)				
	- O/ ( / · · ·		,,,,,,	, , , , , , , , , , , , , , , , , , , ,					
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/		(b)	(b)	(b)	(b)	(b)	(b)	(b)	
Median Effluent (mg/	•	(b)	(b)	(b)	(b)	(b)	(b)	(b)	
Median Removal (%):		(b)	(b)	(b)	(b)	(b)	(b)	(b)	J
			Total Metals	s	Disso	olved Metals			
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/	L):	(b)	(b)	(b)	(b)	(b)	(b)		
Median Effluent (mg/	•	(b)	(b)	(b)	(b)	(b)	(b)		
Median Removal (%):		(b)	(b)	(b)	(b)	(b)	(b)		
				lotes, Comments,	Additional Peferer	1000			
(a) Gravity flow system has	s no moving pa	arts or power rea					damage to the coales	cing media. new co	palescing panels can
be purchased for a low cos	0.							. 0	0,1
(b) Report Form's System	nerformance d	data fields are no	it applicable Produc	rt removes free-phase flui	ids such as floating oil and	tother netroleum hv	drocarbon products (	INAPI - Light Non-	-Agueous Phase
Liquids).	periorinance a	rata ricius are no	с аррисавіс. Тточас	eremoves nee phase nar	as such as nouting on and	other petroleum ny	arocarbon products (	LIVALE LIGHT IVOIL	Aqueous i nuse



Manufacturer:	EcoSense Interna	tional Inc.	Contact Name:	Randy Burden	
Name of Technology:	EcoSense Stormwater	r Filtration systems, Cato	Contact Email:	randy.burden@ecosenseint.com	<u>m</u>
<b>Technology Category:</b>			Contact Phone:	321-449-0324 / 321-5	
<b>Technology Process:</b>	Oil/ Grease / sediment /	debris removal	Contact Website:	www.ecosenseint.com	<u>L</u>
# of Installations in Was	hington:	0			
	Treatme	nt Type/Applic	ation (check all th	nat apply)	
✓ Downspout	✓ Oil/Water Separart		-	☐ Ion exchange column	✓ Stormwater
✓ Drain Inlet Insert	Settling	✓ Filtration	(fabric)	Reverse osmosis	Groundwater
Below Ground Vault	Hydrodynamic Sep		(biofiltration)	☐ Electrocoagulation	✓ Wastewater
✓ Above Ground Vault	✓ Floatables Baffle		(chemically enhanced)	Chemical Treatment	Process water
			ed Costs		
Estimated Installation C		low: \$400.00	high: \$2,000	_	
Estimated Annual O&M	Cost:	low: \$100.00	high: \$500.00	_	
		System H	lydraulics		
Design Flow Rate (gpm)	:	low: 25	high: 1662*	<u>_</u>	
Required head loss (ft):		Varies*	•		
Internal or External Byp	ass: In	ternal, Hooded			
		System Pe	rformance		
Breifly describe how da					
Third party Lab and simula			•		
Polypropylene only. One s polyester pads. Results wi		•	iters loaded with surf	actant modified zeolite a	nd impregnated
polyester paus. Results wi	ii be iiicidded witii t	.iiis subiiiittai.			
Parameter:	TSS T	TP Dis. Cu	Dis. Zn Dis. Cd	Dis. Pb TPH	cPAHs PCBs
# of sample:	133 1	P Dis. Cu	DIS. ZII DIS. Cu	DIS. PD IPH	CPARS PCDS
Median Influent (mg/L):					
Median Effluent (mg/L):					
% Removal:					
	Notes	s, Comments, A	dditional Refere	ences	
EcoSense offers two media			·		
canisters for low flows and	•		•	•	
space available. Hooded o					_
(and contaminant associat					
designed to remove organ or filters or both may be in		rnese systems are	modular so that depe	ending on catch basin size	es multiple baskets
of filters of both may be if	istalieu.				



Manufacturer: Name of Technology:	Royal Environmental S ecoStorm & ecoStorm	<u>-</u>	t Name: t Email:	Jim Mothersbaugh jim@watertectonics.c	<u>om</u>		
# of Installations in Washington:	9		t Phone: t Website:	866-402-2298 www.watertectonics.c	<u>com</u>		
	Tred	tment Type/Applica	ition (chec	k all that apply)			
Downspout	✓ Oil/Water Separation	✓ Filtration (media)		☐ Ion exchange column	✓ Stormwater		
Drain Inlet Insert	✓ Settling	Filtration (fabric)		Reverse osmosis	✓ Groundwater		
✓ Below Ground Vault	✓ Hydrodynamic Separation	Filtration (biofiltration)		Electrocoagulation	✓ Wastewater		
Above Ground Vault	Floatables Baffle	Filtration (chemically enl	nanced)	Chemical Treatment	✓ Process water		
		Estimate	ed Costs				
	Estimated Installation Cost (unit cost and construction cost):    Iow: 8900 (a)   high: 37500 (a)						
		System Hydro		_			
Design Flow Rate (gpm)		low: No M					
System aboveground for Required head loss (ft):	otprint (sq ft):	low: N/A	high				
Internal or External Byp	ass: Internal	low: 0.41' ( &/or External	c) high	··			
	-	<u> </u>	,				
		System Pe	rformance				
Briefly describe how da							
Field monitoring at the McRe analytical laboratory, and 3rd				onal composite and time-b	ased discrete collections. Independent		

	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs
Median Influent (mg/L):	200						
Median Effluent (mg/L):	26						
Median Removal (%):	87%						

		Total Met	Dissolved Metals				
	Cu	Pb	Zn	Cu	Pb	Zn	
Median Influent (mg/L):	0.019	0.005	0.17			0.066	
Median Effluent (mg/L):	0.009	0.002	0.073			0.042	
Median Removal (%):	53%	60%	57%			36%	

#### Notes, Comments, Additional References

ecoStorm and ecoStorm plus can be utilized as separate stand-alone technologies or combined in serial component installation. Combined technologies are currently under TAPE evaluation through WADOE for stormwater. Performance data reflects both stormwater and non-stormwater installations.

- (a) Cost varies based on combination of units, number of units, and final design requirements.
- (b) \$500 \$1000 per cleaning/backflush event; Minimum of 1x per yr. to monthly for stormwater.
- (c) Headloss based on:
- Current monitoring configuration: 1 ecoStorm upstream of 2 ecoStorm plus units.
- 360 gpm through the system, 180 gpm per filter.
- Site specific model calibrated onsite at known flow rates.
- Headloss negating effects of drop structure were neglected (located between the ecoStorm and ecoStorm plus units).
- Filters assumed to be at the point of required maintenance (twice the headloss measured for new filters).

System Performance Data results shown are for qualifying events only, per Washington State TAPE requirements:

- Per TAPE requirements, removal requirements for influent concentration less than 100 mg/l are that effluent must be less than or equal to 20 mg/l.
- For parameters with no results presented above, they are not being monitored or were present at concentrations are below measurable thresholds.



Manufacturer:	EcoSense Internation	al Iı	Contact Na	me:	Randy B	urden		
Name of Technology:	EcoVault Baffle Bo	<del>.</del>	Contact Em	nail:	ı.burden@e			
Technology Category:	Below Ground Vau	t	<b>Contact Ph</b>	one:	-449-0324 /	<b>321-544-</b> 9		
Technology Process:	Type II Baffle Box		Contact We	ebsite:	www.ecoser	nseint.com		
# of Installations in Was	shington:	0	_					
	Treatment	Type/Applic	ation (che	ck all the	at apply)			
Downspout	✓ Oil/Water Separartion	✓ Filtration	(media)		✓ Ion excha	nge column	✓ Storm	nwater
Drain Inlet Insert	✓ Settling	✓ Filtration	(fabric)		Reverse o	smosis	Grour	ndwater
✓ Below Ground Vault	Hydrodynamic Separat	_	(biofiltration)		Electrocoa	agulation	─ Waste	ewater
Above Ground Vault	✓ Floatables Baffle	Filtration	(chemically enh	anced)	Chemical	Treatment	Proce	ess water
		Estima	ed Costs					
Estimated Installation C	Cost: lo	<b>w:</b> \$25,000.00	high:	\$125,000				
Estimated Annual O&M	Cost: lo	<b>w:</b> \$200.00		\$1,800.00	- -			
		System I	- Hydraulics					
Design Flow Rate (gpm)	: lo	<b>w:</b> 1346	high:	48,000	_			
Required head loss (ft):		aries*	_					
Internal or External Byp	pass: Eith	er or Both	_					
A study has not been com II Baffle Box. Minimum Pe and Gopatakrishnan, 1996 media filtration and horizo	pleted on this specific sortions are before and the study mentioned	ystem. Studies ased on model was performed	have been pe studies perfo I with a scale	erformed rmed at t model Ty	on other mar he Florida Ins	nufactures stitute of T	echnology	: Pandit
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	ТРН	сРАНѕ	PCBs
		omments, A						
The EcoVault is unique am internal weir which treats dissolved heavy metals an are captured and stored al three filter components in impregnated with Granula depending on the media fi	low flows and remove a d orgainics. TSS remove bove the static WL grea cluding surfactant mod ted Ferric Hydroxide, N	a wide variety on al is expect to b tly increasing o ified zeolite, hy atural Zeolite a	f contaminante 80% at the second transfer of	its includi flows mei t remova eltblown i de acid wa	ng bacteria, intioned abov I. The casset polypropylen ashed Activat	mobile pho e. Course te style me e and poly ed Carbon	osphate, ar organic ma edia filter c ester fiber . * Head Lo	nmonia, aterials ontains pads



Manufacturer:		Environm	ent 21, LLC			Contact	Na	me:	Dino Pezzimen	ti		
Name of Technology:		Envi	roTrap			Contact	En	nail:	dino@env	21.com		
# of Installations in						Contact	Ph	one:	585-815-4714			
Washington:			0	_		Contact	W	ebsite:	www.env2	1.com		
		Tre	atment T	уре	/Applicati	on (che	ck	all that a	pply)			
Downspout	$\checkmark$	Oil/Water Sep	-	<b>.</b> ✓	Filtration (med					ange column	<b>✓</b>	Stormwater
☐ Drain Inlet Insert	<b>✓</b>	Settling			Filtration (fabri	ic)			Reverse	osmosis		Groundwater
Below Ground Vault		Hydrodynamic	Separation		Filtration (biofi	Itration)			☐ Electroc	oagulation		Wastewater
Above Ground Vault	<b>~</b>	Floatables Baf	fle		Filtration (cher	nically enha	nced	d)	Chemica	al Treatment		Process water
					Estimated	Costs						
Estimated Installation C		+•	low: low:		\$200 0	nig hig	-	\$1,000 \$1,000	_			
	CUS		iow.	·	0	. "6	···-	\$1,000	_			
			Sy	ste	m Hydrau	lics/Des	sig	n				
Design Flow Rate (gpm)			low:		0	hig	-	2,700	_			
System footprint (sq ft):			low:		NA	hig	_	NA	=			
Required head loss (ft):			low:		0	hig	n: _	0.5	-			
Internal or External Byp	ass:	-		NA		-						
Breifly describe how dat Field studies are incomplete a						•	,			,		
		TSS	ТРН	Oi	il & grease	SVOCs	; T	PCBs	Dioxins	CPAHs		
Median Influent (mg/L):	:	*250	**400		**400	**400		**400	**400	**400		
Median Effluent (mg/L):	:	*175	**150		**150	**150		**150	**150	**150		
Median Removal (%):		*30	**62.5		**62.5	**62.5		**62.5	**62.5	**62.5		
			Total Met	als		D	iss	olved Me	tals			
		Cu	Pb		Zn	Cu	Ī	Pb	Zn			
Median Influent (mg/L):	:	***0.08	***0.79		***0.3	NA		NA	NA			
Median Effluent (mg/L):	:	***0.07	***0.68		***0.24	NA		NA	NA			
Median Removal (%):		***9	***13.6		***20	NA		NA	NA			
			Notes Co			liti a .a a.l	<b>D</b> -	favoros	_			
*The TSS removal efficiency i microns was used. **Any oil based removal dep mean oil droplet size of 100 r ***Testing is not complete fo	ends nicro	o dependent on the dropl on and a spgr	upon the Part et size and sp of 0.89 are us	ecific ed.	gravity of the The removal e	on (PSD). F	For t	this produc	t, the assum curate, analy			



Manufacturer: Name of Technology: Technology Category: Technology Process: # of Installations in Was	nology: Filterra Curb Inlet System ategory: Below Ground Vault rocess: biofiltration ons in Washington: 186			Contact Na Contact Er Contact Ph Contact W	nail: none:	<u>wharris@</u> 909-79	Harris filterra.com 90-5239 terra.com	- - -		
	•	Treatment Type/A	Applicatio	n (check a	II that ap	ply)				
Downspout	Oil/Water Se		-	n (media)		_	nange column	✓ Storm	nwater	
Drain Inlet Insert	Settling		Filtration (fabric)				osmosis	Grour	ndwater	
✓ Below Ground Vault	Hydrodynar	nic Separation		n (biofiltration)		☐ Electrod	coagulation	☐ Waste	ewater	
Above Ground Vault	Floatables E	affle	_	n (chemically er	nhanced)	Chemica	al Treatment		ss water	
Estimated Costs										
Estimated Installation ( Estimated Annual O&N		low	·'	high:	\$7,500 \$3,000	_ _				
System Hydraulics										
Design Flow Rate (gpm) Required head loss (ft): Internal or External Byp	_	2.5 Can be eithe	•	high:	50+	_				
		Syst	em Perfor	mance						
Breifly describe how da For third party field monit samplers. Trapezoidal flun respectively, for flow mea association with the units and bubbler equipment.	oring at the Ponnes and V-notcl surements. Wa	rt of Tacoma Industrial n weirs with associated ter levels within flume	site in WA, s I bubbler sys s were recor	amples were ir tems were ir ded using 5-	e collected nstalled to minute in	l via automa intercept ir tervals. A ra	nfluent and in guage wa	effluent sto s installed i	rmwater, in	
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs	
# of sample:	10	12	29	29			12		-	
Median Influent (mg/L):	27.5	0.15	0.0056	0.194			43.4			
Median Effluent (mg/L):	4.2	0.14	0.0033	0.082			1.2			
% Removal:	84.7	6.7	44	54			97			

#### Notes, Comments, Additional References

Please refer to the attached Filterra Curb Inlet Model Overview Sheet for further information. Please note that the Filterra Curb Inlet Model can be designed and built with or without an internal high flow bypass compartment. Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.02 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).



Manufacturer: Name of Technology: Technology Category: Technology Process:	me of Technology: Filterra Roof Drain Sy hnology Category: Downspout hnology Process: Biofiltration f Installations in Washington:			Contact Name: Contact Email: Contact Phone: Contact Website:			Vill Harris is@filterra.com 0-790-5239	- - -			
# of installations in was		1									
_		Treatment Type/	Application	1 (check a	ll that ap	ply)		_			
✓ Downspout	Oil/Water S	eparartion	Filtration	n (media)		Ion	exchange column	✓ Storr	nwater		
Drain Inlet Insert	Settling		Filtration	(fabric)		Rev	erse osmosis	Groui	ndwater		
✓ Below Ground Vault	Hydrodynai	mic Separation	(biofiltration)		☐ Elec	ctrocoagulation	☐ Wast	ewater			
✓ Above Ground Vault	Floatables I	Baffle	Filtration (chemically enhanced)				mical Treatment	Proce	ess water		
Estimated Costs											
Estimated Installation C Estimated Annual O&M		lov lov			\$7,500 \$3,000	- -					
System Hydraulics											
Design Flow Rate (gpm):  Required head loss (ft):  Internal or External Bypass:			v: 8.5	high:	50+	_					
		Syst	tem Perfor	mance							
Breifly describe how da For third party field monit samplers. Trapezoidal flun respectively, for flow mea association with the units and bubbler equipment.	I site in WA, sa d bubbler syst es were record	amples were in led using 5-	e collected estalled to minute int	via auto intercep ervals. A	matic flow-we t influent and e rain guage wa	effluent sto s installed i	rmwater, n				
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. F		cPAHs	PCBs		
# of sample: Median Influent (mg/L):	10 27.5	12 0.15	29 0.0056	29 0.194			12 43.4				
Median Effluent (mg/L):	4.2	0.13	0.0030	0.194			1.2				
% Removal:	84.7	6.7	44	54		97.2					
					_						

#### **Notes, Comments, Additional References**

Please refer to the attached Filterra Roof Drain System Model Overview Sheet for further information. Please note that the Filterra Roof Drain System can be designed and built with or without an internal high flow bypass compartment. System can be also designed and built for either above ground or below ground applications. Data from Technical Evaluation Report (2009) produced by Herrera Environmental Consultants for Washington Department of Ecology. TSS data in the influent range accepted by Ecology(20 mg/L and greater). TP data in the influent range accepted by Ecology (0.1 to 0.5 mg/L). Low TP removal due to anomalous phosphorus data collected at the Port of Tacoma included very low TP influent concentrations and a high fraction of soluble reactive phosphorus. Dissolved copper data in the influent range accepted by Ecology (0.0029 to 0.02 mg/L). Dissolved zinc data in the influent range accepted by Ecology (0.002 to 0.6 mg/L). TPH data in the influent range accepted by Ecology (10 mg/L or greater).



Manufacturer:	ABT,	Inc.		Contact N	ame:	Brad 9	Short		
Name of Technology:	First Flush	1640FF		Contact Er	nail:	bshort@abtdra	ns.com		
Technology Category:	Below Gro	und Vault		Contact Pl	none:	949-633	3-6111		
Technology Process:	Gravity-Flov	w through		Contact W	ebsite:	www.abtdr	ains.com		
# of Installations in Was		0							
			/ A 1:						
	_	ment Typ	_	-	eck all th	_			
Downspout	Oil/Water Se	Darar (IOH	Filtration	n (media)		Ion excha	nge column	✓ Storm	water
✓ Drain Inlet Insert	Settling		✓ Filtration	n (fabric)		Reverse of	osmosis	Groun	dwater
✓ Below Ground Vault	Hydrodynam	ic Separation	Filtration	n (biofiltration)		Electroco	agulation	☐ Waste	water
Above Ground Vault	Floatables Ba	iffle	Filtration	n (chemically er	nhanced)	Chemical	Treatment	Proce	ss water
			Estima	ted Costs					
Estimated Installation Co	nst.	low:	\$5,000	high:	10,000				
Estimated Annual O&M		low:	\$500		\$3,000	-			
			7300		73,000	-			
			System I	Hydraulic	s				
Design Flow Rate (gpm):		low:	449	high:	538	_			
Required head loss (ft):				•					
Internal or External Bypa	ass: Se	e detail for	bypass.	<u>.</u>					
		Sı	vstem Pe	erforman	ce				
		- /	,	,					
Breifly describe how dat	a were colec	ted (field, la	ab, third p	oarty, grab	sample, a	uto-compo	site, etc.)		
Lab test results are provide	on the filter m	nedia perfori	mance and	system hyd	raulic perf	ormace base	d on design	n capabilite	s. The
installation cost if factoring	material and	cost of insta	llation toge	etheror an	installed o	ost. See atta	ached detai	il of the lar	ger unit
available from ABT. Installa	ation in severa	l states inclu	iding CA.						
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	<b>PCBs</b>
# of sample:									
Median Influent (mg/L):									
Median Effluent (mg/L):									
% Removal:									
	No	ites, Com	ments, A	Additiona	l Refere	nces			
			•						
			•						
			•						



Manufacturer:		Kristar Enterpr	ises, Inc.	_	Contact	Name:	Michael Kimb			
Name of Technology:		FloGard Down	spout Filter	_	Contact	Email:	mkimberl	ain@kristar.com		
# of Installations in					Contact		(800) 579-88	19		
Washington:		0		_	Contact	Website:	www.kris	tar.com	_	
				nent Type	Application	n (check a	ll that apply	)		
✓ Downspout	<b>✓</b>	Oil/Water Sep	parartion	Filtratio	n (media)		☐ Ion exchar	nge column	$\checkmark$	Stormwater
☐ Drain Inlet Insert		Settling		✓ Filtratio	n (fabric)		Reverse os	smosis		Groundwater
Below Ground Vault		Hydrodynam	ic Separation	Filtratio	n (biofiltration)		Electrocoa	gulation		Wastewater
Above Ground Vault		Floatables Ba	iffle	Filtratio	n (chemically enhan	ced)	Chemical 1	Freatment		Process water
					Estimated C	osts				
Estimated Installation C	ost	:	low:	\$1,500	) high	<b>3,500</b>				
Estimated Annual O&M	Cos	st:	low		high					
				Syste	em Hydraulio	s/Design	1			
Design Flow Rate (gpm)	):		low:	30	high	325				
System footprint (sq ft)	:		low:	0.5	high					
Required head loss (ft):			low:	0	high	0.5				
Internal or External Byp	ass	:	Ir	iternal						
				Sy	stem Perfor	mance				
Breifly describe how da										
Lab - UCLA, Univeristy of Hav	vaii,	City of Auck	and, NZ, CSUS	- OWP. Field	d Study - Universi	ty of Hawaii a	and City of Auc	kland		
		TSS	TPH	Oil & gre	ease SVOCs	PCBs	Dioxins	CPAHs	$\neg$	
Median Influent (mg/L)	:	100	35	35				35		
Median Effluent (mg/L)	:	20	7	7						
Median Removal (%):		80	80	80				7		
			Total Met	tals		issolved N	letals	1		
		Cu	Pb	Zn	Cu	Pb	Zn			
Median Influent (mg/L)	:			10						
Median Effluent (mg/L)	:			6						
Median Removal (%):				60				]		
			Not	es. Comr	ments, Addit	ional Ref	erences			
				,		,				



Manufacturer:		Kristar Enter	prises, Inc.	_	Contact Na	ıme:	M	ichael Kimberlain	_
Name of Technology:	Flo G	ard Dual Vor	tex Separator	_ _			mkimbe	erlain@kristar.com	- -
# of Installations in									_
Washington:		10		_	Contact W	ebsite:	WW	w.kristar.com	-
_	✓ Oil/	Water Separ	artion	Filtration (med	lia)		Ion exchange col	lumn	✓ Stormwater
Drain Inlet Insert	✓ Set	tling		Filtration (fabri	ic)		Reverse osmosis		Groundwater
✓ Below Ground Vault	✓ Hyd	Irodynamic S	Separation	✓ Filtration (biofi	iltration)		Electrocoagulation	on	Wastewater
Above Ground Vault	✓ Floa	atables Baffle	<b>)</b>	Filtration (cher	mically enhanced	i) $\square$	Chemical Treatm	ent	Process water
				Est	imated Co	sts			
Estimated Installation (	Cost:		low	\$10,000	high:	\$100,000	<u></u>		
Estimated Annual O&N	/I Cost:		low	\$300	high:	\$3,500	<u> </u>		
				System I	Hydraulics	/Design			
			low			6,500	<u> </u>		
					<del>-</del>		_		
					high:_	3	_		
internal or External By	pass:	_	Ir	iternal	=				
				Syste	m Perforn	nance			
Draifly describe how de			مالاتماما	بينسمم لمناطة عام					
								Holden Massachussets	No field studies have
• ,	,		p =	8 p	,				
	-	TCC	TDU	Oil 9 grands	SVOC-	DCDa	Diavina	CDALLS	Т
Median Influent (mg/L)			IPH	Oii & grease	SVOCS	PCBS	Dioxins	CPARS	+
				+					1
	,.			1					†
()					1				1
			Total Me	tals	Dis	ssolved Met	als		
		Cu	Pb	Zn	Cu	Pb	Zn		
,	):								
iviedian Removai (%):									
			No	otes, Commen	nts, Additi	onal Refer	ences		
No field studies have been c	omplete	d at this tir	ne. Correla	ition of TSS remova	al with other P	OCs would inc	licate similar rei	moval of Total metals.	



Manufacturer:		Kristar Enterpr	ises, Inc.	_	Contact Na	ame:	Michael Kimbe	erlain	
Name of Technology:		FloGard LoPro	Matrix Filter	_	Contact Er	nail:	mkimberla	in@kristar.com	
# of Installations in					Contact Ph	one:	(800) 579-881	9	
Washington:		10		_	Contact W	ebsite:	www.krista	ar.com	<u>—</u>
			Treatm	nent Type/	'Application	(check al	I that apply)		
Downspout	$\checkmark$	Oil/Water Se		Filtration		•	on exchang	ge column	✓ Stormwater
✓ Drain Inlet Insert		Settling		✓ Filtration	(fabric)		Reverse osr	nosis	Groundwater
Below Ground Vault		Hydrodynam	ic Separation		(biofiltration)		Electrocoag		Wastewater
Above Ground Vault		Floatables Ba	affle		(chemically enhance	4)	☐ Chemical Tr		Process water
					stimated Cos				Trocess water
Fatimental Installation C	٠		lavv						
Estimated Installation C Estimated Annual O&M			low: low:		high: _ high:	\$1,000	_		
			10 W.	· · · · · · · · · · · · · · · · · · ·		•			
Design Flow Bate (game)	١.		la	=	n Hydraulics,	_			
Design Flow Rate (gpm) System footprint (sq ft)			low: low:		high: _	800			
Required head loss (ft):			low:		high: high:	0.5	_		
Internal or External Byp		}		ternal		0.5	_		
		•			tem Perform				
		TSS	ТРН	Oil & grea	se SVOCs	PCBs	Dioxins	CPAHs	$\neg$
Median Influent (mg/L)	:	100	35	35				35	
Median Effluent (mg/L)		20	7	7					
Median Removal (%):		80	80	80				7	
			Total Met	alc	Die	solved M	letals		
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L)	:			10					
Median Effluent (mg/L)				6					
Median Removal (%):				60					
			Not	os Comm	onts Additio	nal Bof	oroncoc		
			NOL	es, comm	ents, Additio	пит кеј	erences		



## HERRERA Manufacturer Technology Report

Manufacturer:		Kristar Enterpri	ises, Inc.	_	Contact Na	ame:	Michael Kimb	erlain	
Name of Technology:		FloGard LoPro T	rench Drain Filter	_	Contact Er		mkimberla	ain@kristar.com	_
# of Installations in					Contact Ph		(800) 579-881	.9	<u> </u>
Washington:		0		_	Contact W	ebsite:	www.krist	ar.com	
			Treatn	nent Type/Ap	plication	(check a	ll that apply)		
Downspout	$\checkmark$	Oil/Water Sep		Filtration (med	-		☐ Ion exchan		✓ Stormwater
✓ Drain Inlet Insert		Settling		✓ Filtration (fabr	ic)		Reverse os	mosis	Groundwater
Below Ground Vault		Hydrodynami	c Separation	Filtration (biofi			☐ Electrocoag	gulation	☐ Wastewater
Above Ground Vault		Floatables Ba	iffle		mically enhance	4)	☐ Chemical T	reatment	Process water
	_				mated Co.				
Estimated Installation C	nst.		low		high:	\$3,000			
Estimated Annual O&M			low		high:	\$350			
				-	lydraulics,	_			
Design Flow Rate (gpm)			low		high:	500			
System footprint (sq ft):			low		high:	20			
Required head loss (ft): Internal or External Byp			low	ternal	high:	0.25			
internal of External byp	ass.	'	<u>ii</u>	iternai	-				
				Systen	n Perform	ance			
Breifly describe how da									
Lab - UCLA, Univeristy of Hav	vaii, (	City of Auckl	and, NZ, CSUS	- OWP. Field Stud	y - University	of Hawaii a	ind City of Auck	aland	
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L)	:	100	35	35	34003	1 003	DIOXIIIS	35	
Median Effluent (mg/L)		20	7	7				33	
Median Removal (%):		80	80	80				7	
. ,				1				Į.	
			Total Me	tals	Dis	solved M	letals		
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L)				10					
Median Effluent (mg/L)	:			6					
Median Removal (%):	!			60				l	
			Not	tes, Comment	ts Additio	nal Dof	oroncos		
			NO	les, Comment	is, Additio	iiui keji	erences		



Manufacturer:	Kristar Er	nterprises, Inc.		Contact Na	ame:	Michael Kimbe	erlain	
Name of Technology:	FloG	Gard+Plus	_	Contact En	nail:	mkimberla	in@kristar.com	<del>_</del>
# of Installations in			<u> </u>	Contact Ph	one:	(800) 579-881	9	<del>_</del>
Washington:		100	_	Contact W	ebsite:	www.krist	ar.com	<u></u>
		Troats	nent Type/Ap	nlication	lchock a	II that annly)		
Downspout	Oil/Water Se			-	(спеск а	I that apply)  I lon exchang	ro column	Stormwater
✓ Drain Inlet Insert	_	parartion	Filtration (med				,	_
_	Settling	io Compression	Filtration (fabri			Reverse osr		Groundwater
Below Ground Vault	_	ic Separation	Filtration (biofil	Itration)		Electrocoag		Wastewater
Above Ground Vault	✓ Floatables Ba	affle		mically enhance		Chemical Tr	reatment	Process water
			Estii	mated Co	sts			
Estimated Installation Co	ost:	low	\$250	high:	\$1,800			
Estimated Annual O&M	Cost:	low	<b>:</b> \$75	high:	\$350	<u> </u>		
			System H	ydraulics,	/Design			
Design Flow Rate (gpm):		low	100	high:	2,000			
System footprint (sq ft):		low	:1	high:	10			
Required head loss (ft):		low	:0	high:	0.25			
Internal or External Bypa	ass:		nternal	-				
			Systen	n Perform	ance			
			7,000	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
Breifly describe how dat	a were colec	ted (field, la	ab, third party, g	grab sample	, auto-co	omposite, etc	.)	
Lab - UCLA, Univeristy of Haw	aii, City of Auck	land, NZ, CSUS	- OWP. Field Study	y - University	of Hawaii a	ind City of Auck	and	
	TSS	TPH	Oil & grosso	SVOCs	PCBs	Dioxins	CPAHs	$\neg$
Median Influent (mg/L):	_	35	Oil & grease	3000	PCDS	DIOXIIIS	35	
Median Effluent (mg/L):		7	7				33	
Median Removal (%):	80	80	80				7	
(, , ,							<u>-</u>	
		Total Me	tals	Dis	solved M	letals		
	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):			10					
Median Effluent (mg/L):			6					
Median Removal (%):			60					
		No	tas Cammant	to Additio	nal Dof	0409606		
		INO	tes, Comment	s, Additio	пат кеј	erences		Т



Manufacturer:		Kristar En	terprises, Inc.	_	Contact Na	ame:	Michael Kimberla	in	<u></u>
Name of Technology:		FloGard Trash	h & Debris Guard	_	Contact Er	nail:	mkimberlain	<u></u>	
# of Installations in					Contact Ph	none:	(800) 579-8819		
Washington:			0	_	Contact W	ebsite:	www.kristar.	<u>com</u>	
			Treatn	nent Type/Ap	plication	(check a	ll that apply)		
Downspout	$\checkmark$	Oil/Water Sep	parartion	Filtration (med	lia)		☐ Ion exchange	column	✓ Stormwater
✓ Drain Inlet Insert		Settling		✓ Filtration (fabr	ic)		Reverse osmo:	sis	Groundwater
Below Ground Vault		Hydrodynami	c Separation	Filtration (biof	iltration)		☐ Electrocoagula	tion	Wastewater
Above Ground Vault	<b>/</b>	Floatables Ba	iffle	Filtration (cher	mically enhance	d)	Chemical Trea	tment	Process water
				Esti	mated Co	sts			
Estimated Installation C	ost:		low	\$450	high:	\$1,500			
Estimated Annual O&M	Cos	st:	low	\$50	high:	\$200			
				System H	lydraulics,	/Design	1		
Design Flow Rate (gpm)	:		low	50	high:	500			
System footprint (sq ft):			low:	0.5	high:	4	<u> </u>		
Required head loss (ft):			low	0	high:	0.25			
Internal or External Byp	ass	:	Ir	nternal	_				
				Systen	n Perform	ance			
postficial continue to the			1 / (* . 1 . 1 . 1 .	le alicente de la contraction					
Breifly describe how da	ta w	ere colect	геа (пета, та	b, third party, §	grab sampie	e, auto-co	omposite, etc.)		
No Data Available									
<b>-</b>		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):									
Median Effluent (mg/L):									
Median Removal (%):			<u> </u>						
			Total Met	tals	Dis	solved N	letals		
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):	:								
Median Effluent (mg/L):	:								
Median Removal (%):									
			Not	tes, Comment	ts, Additio	nal Ref	erences		
				-	<del>-</del>				



## HERRERA Manufacturer Technology Report

Manufacturer:	AquaShield, Inc.	Co	ontact Nan	ne:	Mark Miller			
Name of Technology:	Go-Filter	_	ontact Ema		mmiller@aquas	hieldinc.com	_	
Technology Category:	Above Ground Vault	_ Cc	ontact Pho	ne:	888-344-9044		_	
Technology Process:	Vortex + Filtration	Co	ontact Wel	osite:	www.aguashield	dinc.com	_	
# of Installations in Was		0					_	
		tment Type/Ap	nlication	(shock all	that apply)			
Downspout	✓ Oil/Water Separartion	Filtration (media)	piicution	(cneck un	In exchange colu	mn	✓ Storm	nwater
Drain Inlet Insert	Ξ	_			_	11111		
	Settling	Filtration (fabric)			Reverse osmosis		Groun	ndwater
Below Ground Vault	✓ Hydrodynamic Separation	Filtration (biofiltrat	tion)		Electrocoagulation	1	☐ Waste	ewater
Above Ground Vault	✓ Floatables Baffle	Filtration (chemica	illy enhanced)		Chemical Treatme	ent	✓ Proce	ess water
		Estir	mated Co	sts				
Estimated Installation Co	ost: low:	Site-specific	high:	Site-specific				
Estimated Annual O&M			_	Site-specific				
					<del></del>			
· · · ·			m Hydra					
Design Flow Rate (gpm):	low		high:	675	_			
Required head loss (ft):		0.5						
Internal or External Bypa	ass:	Both						
		Systen	n Perforn	nance				
Breifly describe how dat	a were colected (field,	lab, third party, g	rab sample	e, auto-con	nposite, etc.)			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS TP	Dis. Cu [	Dis. Zn	Dis. Cd	Dis. Pb	ТРН	cPAHs	PCBs
	٨	lotes, Comment	s, Additio	onal Refe	rences			
Mobile device works on Device components have			onstruction	n sites for t	urbidity reductio	n in addition to s	sediment ren	noval.



Manufacturer: Name of Technology:	,		n Systems sh Filter	_	Contact N			Garbon riumsystms.com	
# of Installations in					Contact Pl			06-6193	
Washington:			1	_	Contact W	ebsite:	www.imbrium	systems.com	
		Tre	atment T	ype/Applicati	on Ichack	all that o	unnly)		
Downspout		Oil/Water Sep		Filtration (med		an that a	_	ange column	✓ Stormwater
Drain Inlet Insert		Settling					_	_	
		Hydrodynamic	Sonaration	Filtration (fabri	-			osmosis	Groundwater
Below Ground Vault				Filtration (biofi	tration)			oagulation	Wastewater
✓ Above Ground Vault	<b>✓</b>	Floatables Bat	fle	Filtration (chen	nically enhance	ed)	Chemica	al Treatment	Process water
				Estimated	Costs				
Estimated Installation C Estimated Annual O&M				iction cost):		low:		high:_ high:_	
			S	ystem Hydrau	lics/Desig	ın			
Design Flow Rate (gpm)	:			low:	60	high	2300		
System aboveground fo	otpı	rint (sq ft):		low:	12	high	113		
Required head loss (ft):				low:	1	high	2		
Internal or External Byp	ass:	-	Internal or	External Bypass					
				System Perfo	rmance				
				,					
Briefly describe how date									
Performance data is from thi samples of the entire crossed									
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):	_	74							
Median Effluent (mg/L):	:	8							
Median Removal (%):		89							
			Total Ma	tala	Disc	aluad Ma	tala	ľ	
		Cu	Total Me Pb	Zn	Cu	olved Me	Zn		
Median Influent (mg/L):		78	35	1.45	Cu	rυ			
Median Effluent (mg/L):		0.3	5	0.6					
Median Removal (%):		99	86	59					
			Notes Co	· · · · · · · · · · · · · · · · · · ·	litional D	of o vo vo co		•	
Copper concentrations are in	mic			omments, Add		-		o aro in mis-	ograms por liter. The
O&M cost ranges from \$0.00							CONCENTRATOR	is are in micro	ogranis per inter. The



Manufacturer:	Brown Minner	•	_	Contact N		Allan McComas	
Name of Technology: Technology Category:	Kleerw Below Grou		_	Contact P		amccomas@bmt-tank.com (360) 482-1724	
Technology Process:			<del>-</del>	Contact W	/ebsite:	bmt-tank.com	
# of Installations in Wa	shington:			-			
	Treatme	nt Type/App	lication (	check all tl	nat apply	)	
Downspout	✓ Oil/Water Separartion		Filtration	n (media)		☐ Ion exchange column	✓ Stormwater
Drain Inlet Insert	Settling		Filtration	n (fabric)		Reverse osmosis	Groundwater
Below Ground Vault	Hydrodynamic Separation		Filtration	(biofiltration)		Electrocoagulation	✓ Wastewater
Above Ground Vault	Floatables Baffle		Filtration	n (chemically er	nhanced)	Chemical Treatment	Process water
		Estin	nated Cos	ts			
Estimated Installation 0 Estimated Annual O&N	_	Varies by size Nominal	_	Varies by ir Nominal	nstallation	size	
		Syster	n Hydrau	lics			
Design Flow Rate (gpm	=	low	25 gpm	high:	10,000 gpi	<u>m</u>	
Required head loss (ft):	•	Gravi		-			
Internal or External By	Dass:	Exteri	nai	-			
		System	Perform	ince			
Breifly describe how da	ata were collected (field,	lab, third part	tv. grah sai	nnle, auto-	composit	e. etc.)	
All data collected and veri	fied by third party inspecto	rs and Underwr	iters Labora	ories (UL).	•	-	
Parameter:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb TPH	cPAHs PCBs
# of sample:	133	ır	Dis. Cu	DI3. 211	Dis. Cu	DIS. FO IFII	CFAIIS FCDS
Median Influent (mg/L):							
Median Effluent (mg/L):							
% Removal:							
• Underwriters Laboratori	ies tested and listed per UL-	s, Comments	s, Additio	nai Refere	ences		
	or confined space entry wl		routine mai	ntenance.			
	larger influent flows, allow				naller sepa	ration tanks, less installa	ation costs.
<ul> <li>Kleerwater<sup>™</sup> separators</li> </ul>	utilizes Stokes Law for defi	ning rates of rise	e of oil sphe	es in a liquio	d medium		
1 ' '	aration process enhances o	il from water se	paration eff	iciencies			
Separation efficiencies d			! '6' ! '				
Separator material of co	isual alarms available for pr	eset ievei alarm	notification	S			
•	el configurations available						
	termittent influent flow rat	es.					
	t remove oils with a specific		than 0.95, di	ssolved hydi	ocarbons,	or volatile organic comp	pounds.
For additional information	n, please visit www.kleerwa	ter.net					
I							



# of Installations in Washington:    Downspout	d construction cost): eated - based on pea	System Hyd low: low: low: System P System P y, grab sample, au 2008. The system hele performance ana	rate):  rate):  rate):  22  16  2  Internal (Exter	e: site:  call that appl low: low: low: high: high: high: high: high: high: hetc.)	760-43 www.biocleane  yy    lon exchange column   Reverse osmosis   Electrocoagulation   Chemical Treatment  12,000 \$ 8.26  120 84 4 tuations)	high: high:	\$ 10.50
Downspout Oil/Water Separa Downspout Settling Drain Inlet Insert Settling Below Ground Vault Hydrodynamic Se Above Ground Vault Floatables Baffle  stimated Installation Cost (unit cost an stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon	Treatm ion paration  d construction cost): reated - based on pea  (field, lab, third part) n used in the field since Id and laboratory provid	Filtration (media) Filtration (fabric) Filtration (biofiltra Filtration (chemic  Estima  k treatment flow  System Hyd low: low: System P  y, grab sample, au  2008. The system he performance ana	cation (check cation (check cation) cally enhanced) sted Costs rate): raulics/Desig 22 16 2 Internal (Exter Performance uto-composite, mas be independe	low: low: high: high: high: high: high: high: high: high: heal in Some Sid	www.biocleane  (y)    Ion exchange column   Reverse osmosis   Electrocoagulation   Chemical Treatment  12,000   \$ 8.26  120   84   4   tuations)	high: high:	Groundwater Wastewater Process water  25,000 \$ 10.50
Downspout Downsp	Treatm ion paration  d construction cost): reated - based on pea  (field, lab, third part) n used in the field since Id and laboratory provid	Filtration (media) Filtration (fabric) Filtration (biofiltra Filtration (chemic  Estima  k treatment flow  System Hyd low: low: System P  y, grab sample, au  2008. The system he performance ana	ation (check ation) (ally enhanced) (atted Costs rate):  [raulics/Designate	low: low: high: high: high: high: high: heal in Some Sid	Jon exchange column     Reverse osmosis     Electrocoagulation     Chemical Treatment     12,000     8.26     120     84     4     tuations	high: high:	Groundwater Wastewater Process water  25,000 \$ 10.50
y Drain Inlet Insert  y Drain Inlet Insert  y Below Ground Vault  Hydrodynamic Se  Above Ground Vault  Floatables Baffle  Estimated Installation Cost (unit cost and stimated Annual O&M Cost (\$/gallon to the stimated Annual O&M Cost (\$/gall	d construction cost): reated - based on pea	Filtration (media) Filtration (fabric) Filtration (biofiltra Filtration (chemic  Estima  k treatment flow  System Hyd low: low: System P  y, grab sample, au  2008. The system he performance ana	rate):  raulics/Designation 22 16 2 Internal (Exter	low: low: low: high: high: high: high: high: hetc.)	I lon exchange column Reverse osmosis I Electroccagulation Chemical Treatment 12,000 \$ 8.26  120 84 4 tuations)	_ high: _ high: _ _ _ _ _ d field under variou	Groundwater Wastewater Process water  25,000 \$ 10.50
Drain Inlet Insert  Drain Inlet Insert  Design Floatables Baffle  Design Flow Rate (gpm):  Sestimated Annual O&M Cost (\$/gallon to the stimated Annual O&M	d construction cost): eated - based on pea	Filtration (fabric) Filtration (biofiltra Filtration (chemic  Estima  k treatment flow  System Hyd low: low: low: System P  y, grab sample, au  2008. The system he performance ana	rate):  rate):  rate):  rate):  22  16  2  Internal (Exter  Performance  uto-composite,  nas be independe lysis on the syste	low: low: ggn high: high: high: some Sid	Reverse osmosis  Electrocoagulation  Chemical Treatment  12,000  \$ 8.26  120  84  4  tuations)	_ high: _ high: _ _ _ _ _ d field under variou	Groundwater Wastewater Process water  25,000 \$ 10.50
Below Ground Vault  Above Ground Vault  Above Ground Vault  Floatables Baffle  stimated Installation Cost (unit cost anstimated Annual O&M Cost (\$/gallon to the stimated Annual O&M Cost (\$/gallon to	d construction cost): reated - based on pea	Filtration (biofiltration chemical Filtration (chemical Filtration (chem	rate):  rate):  raulics/Designate  22  16  2 Internal (Externance  uto-composite,  nas be independently sis on the system  and	low: low: low:  gn high: high: high: etc.)	Electrocoagulation   Chemical Treatment   12,000   \$ 8.26   120   84   4   4   4   tuations)	_ high: _ high: - - - -	Wastewater Process water  25,000 \$ 10.50
Above Ground Vault   Floatables Baffle  stimated Installation Cost (unit cost anstimated Annual O&M Cost (\$/gallon to  design Flow Rate (gpm): ystem aboveground footprint (sq ft): dequired head loss (ft): internal or External Bypass:  striefly describe how data were collected the Modular Wetland System Linear has bee composite grab samples were used in the fiele. Full Scale Independent Field Testing  TSS Median Influent (mg/L): 270 Median Effluent (mg/L): 3 Median Removal (%): 98  Cu Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): not tested Median Removal (%): 158 Median Influent (mg/L): 45.67	d construction cost): reated - based on pea	Estima  k treatment flow  System Hyd  low: low: System P  y, grab sample, au  2008. The system h le performance ana	rate):  rate):  raulics/Designate  22  16  2 Internal (Externance  uto-composite,  nas be independently sis on the system  and	low: low: gn high: high: high: some Sid etc.)	12,000 \$ 8.26  120 84 4 tuations)	_ high: _ high: - - - -	25,000 \$ 10.50
Stimated Installation Cost (unit cost and stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual O&M Cost (\$/gallon to stimated Annual OMM Cost (\$/	l (field, lab, third part	Estima  k treatment flow  System Hyd  low: low: System P  y, grab sample, au  2008. The system he performance ana	rate):  raulics/Designer 22 16 2 Internal (Exter Performance uto-composite, has be independe	low: low: gn high: high: high: high: etc.)	12,000 \$ 8.26 120 84 4 tuations)	_ high: _ high: - - - -	25,000 \$ 10.50
Design Flow Rate (gpm): ystem aboveground footprint (sq ft): dequired head loss (ft): internal or External Bypass:  definition of External Bypass:  definition	l (field, lab, third part	System Hyd low: low: low: System P System P y, grab sample, au 2008. The system hele performance ana	rate):  raulics/Designation 22 16 2 Internal (External Cerformance auto-composite) as be independently sis on the systematic auto-composite auto-composite).	low:  gn high: high: high: high: etc.)	\$ 8.26  120 84 4 tuations)	high:	\$ 10.50
Design Flow Rate (gpm): System aboveground footprint (sq ft): System aboveground footprint (sq ft): Stequired head loss (ft): Internal or External Bypass:  Striefly describe how data were collected The Modular Wetland System Linear has bee omposite grab samples were used in the fiele.  Full Scale Independent Field Testing  TSS TACIONAL TESTING  TSS TACIONAL TESTING  TSS TACIONAL TESTING  Cu TACIONAL TESTING  Cu TACIONAL TESTING  Cu TACIONAL TESTING  Acion Effluent (mg/L): TO Use tested TACIONAL TESTING  Acion Effluent (mg/L): TO Use tested TACIONAL TESTING  TSS TACIONAL TESTING  TSS TACIONAL TESTING  TSS TACIONAL TESTING TSS TACION	l (field, lab, third part	System Hyd low: low: low: System P y, grab sample, au 2008. The system h le performance ana	16 2 Internal (Exter	low:  gn high: high: high: high: etc.)	\$ 8.26  120 84 4 tuations)	high:	\$ 10.50
ystem aboveground footprint (sq ft): lequired head loss (ft): Internal or External Bypass:  Iriefly describe how data were collected the Modular Wetland System Linear has bee composite grab samples were used in the field Testing  TSS  Median Influent (mg/L): 270  Median Effluent (mg/L): 3  Median Removal (%): 98  Cu  Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): 158  Median Removal (%): 158  Median Influent (mg/L): 158	n used in the field since Id and laboratory provid	System P y, grab sample, au 2008. The system he performance ana Oil & grease	22 16 2 Internal (Exter Performance uto-composite, mas be independe	high: high: high: nal in Some Sid etc.)	84 4 tuations)		
riefly describe how data were collected the Modular Wetland System Linear has been been proposite grab samples were used in the field Testing  TSS  Median Influent (mg/L):  Median Removal (%):  Median Influent (mg/L):	n used in the field since Id and laboratory provid	System P y, grab sample, au 2008. The system h le performance ana Oil & grease	16 2 Internal (External Cerformance auto-composite) as be independedlysis on the systematic systema	high: high: nal in Some Side etc.)	84 4 tuations)		
riefly describe how data were collected the Modular Wetland System Linear has bee tomposite grab samples were used in the fie Full Scale Independent Field Testing  TSS Median Influent (mg/L): 270 Median Effluent (mg/L): 3 Median Removal (%): 98  Cu Median Effluent (mg/L): not tested Median Effluent (mg/L): not tested Median Removal (%): 158 Median Removal (%): 158 Median Removal (%): 158 Median Influent (mg/L): 158 Median Removal (%): 158 Median Influent (mg/L): 158 Median Influent (mg/L): 158 Median Influent (mg/L): 158 Median Influent (mg/L): 45.67	n used in the field since Id and laboratory provid	System P y, grab sample, au 2008. The system h le performance ana Oil & grease	2 Internal (Exter Performance uto-composite, nas be independe lysis on the syste	high: nal in Some Sit etc.)	4 tuations) the laboratory and		
he Modular Wetland System Linear has bee omposite grab samples were used in the field Testing  TSS  Median Influent (mg/L): 270  Median Removal (%): 98  Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 45.67	n used in the field since Id and laboratory provid	System P y, grab sample, au 2008. The system h le performance ana Oil & grease	Internal (Exter Performance uto-composite, has be independentlysis on the system	etc.)	tuations) the laboratory and		
the Modular Wetland System Linear has bee omposite grab samples were used in the field Testing  TSS  Median Influent (mg/L): 270  Median Effluent (mg/L): 3  Median Removal (%): 98  Cu  Median Effluent (mg/L): not tested  Median Removal (%): not tested  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Removal (%): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 45.67	n used in the field since Id and laboratory provid	2008. The system he performance ana	Performance uto-composite, has be independentlysis on the system	etc.)	the laboratory and		
The Modular Wetland System Linear has bee omposite grab samples were used in the fier-Full Scale Independent Field Testing  Quarter Scale Lab Testing  TSS  Median Influent (mg/L): 270  Median Effluent (mg/L): 3  Median Removal (%): 98  Cu  Median Influent (mg/L): not tested  Median Effluent (mg/L): not tested  Median Removal (%): not tested  Median Removal (%): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 158  Median Influent (mg/L): 45.67	n used in the field since Id and laboratory provid	2008. The system he performance ana	nas be independe lysis on the syste	ently tested in			
he Modular Wetland System Linear has bee omposite grab samples were used in the fie Full Scale Independent Field Testing  uarter Scale Lab Testing  TSS  Median Influent (mg/L): 270  Median Effluent (mg/L): 3  Median Removal (%): 98  Cu  Median Influent (mg/L): not tested not tested  Median Removal (%): not tested  Median Removal (%): 155  Median Removal (%): 155  Median Removal (%): 155  Median Influent (mg/L): 155  Median Influent (mg/L): 45.67	n used in the field since Id and laboratory provid	2008. The system has performance and Oil & grease	nas be independo lysis on the systo	ently tested in			
TSS  Median Influent (mg/L): 270  Median Effluent (mg/L): 3  Median Removal (%): 98  Cu  Median Influent (mg/L): not tested  Median Effluent (mg/L): not tested  Median Removal (%): not tested  Indian Removal (%): not tested  Median Removal (%): not tested  TSS  Median Influent (mg/L): 45.67	ТРН		SVOCs				
Aedian Influent (mg/L): 270 Aedian Effluent (mg/L): 3 Aedian Removal (%): 98  Cu Aedian Influent (mg/L): not tested Aedian Effluent (mg/L): not tested Aedian Removal (%): not tested  In tested In	TPH		SVOCe				
Addian Influent (mg/L): Addian Effluent (mg/L): Addian Removal (%):  Cu Addian Influent (mg/L): Addian Effluent (mg/L): Addian Effluent (mg/L): Addian Removal (%):  Nedian Removal (%):  TSS Addian Influent (mg/L):  45.67				PCBs	Dioxins	CPAHs	
Addian Effluent (mg/L):  Addian Removal (%):  Cu  Addian Influent (mg/L):  Addian Effluent (mg/L):  Addian Removal (%):  Addian Removal (%):  Indian Removal (%):  TSS  Addian Influent (mg/L):  45.67	19	4	not tested	not tested	not tested	not tested	
Aedian Influent (mg/L): All Median Effluent (mg/L): All Median Removal (%):  Including the standard control of the standard co	0	n/d	not tested	not tested	not tested	not tested	
Median Influent (mg/L): not tested Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): TSS Median Influent (mg/L): 45.67	>99	>99%	not tested	not tested	not tested	not tested	
Median Influent (mg/L): not tested Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): TSS Median Influent (mg/L): 45.67	T-4-184-4-1-			N' I I 8 4 - 4	-1-		
Median Influent (mg/L): not tested Median Effluent (mg/L): not tested Median Removal (%): not tested Median Removal (%): not tested  Median Field Testing  TSS Median Influent (mg/L): 45.67	Total Metals Pb	Zn		Dissolved Met Pb	zais Zn	-	
Iedian Effluent (mg/L): not tested Iedian Removal (%): not tested Iedian Removal (%): not tested Iedian Field Testing TSS Iedian Influent (mg/L): 45.67	not tested	not tested	<b>Cu</b> 0.757	0.543	0.95		
Aledian Removal (%): not tested  ull Scale Field Testing  TSS  Aledian Influent (mg/L): 45.67	not tested	not tested	0.0552	0.543	0.185		
TSS Median Influent (mg/L): 45.67	not tested	not tested	93	81	80		
TSS Median Influent (mg/L): 45.67							
Median Influent (mg/L): 45.67	TPH - Motor Oil	Oil 9 grasss	SVOCe	DCPs	Diovins	CDAHe	
	0.83	Oil & grease not tested	SVOCs not tested	PCBs not tested	Dioxins not tested	CPAHs not tested	
Median Effluent (mg/L): 8.24	0.83	not tested	not tested	not tested	not tested	not tested	
Median Removal (%): 82	>99	not tested	not tested	not tested	not tested	not tested	
	Total Metals	7		Dissolved Met		Nutrients	
Cu Nedian Influent (mg/L): 0.04	Pb	Zn	Cu	Pb not tosted	Zn not tosted	1	
Median Influent (mg/L): 0.04  Median Effluent (mg/L): n/d	n/d n/d	0.24 n/d	not tested not tested	not tested not tested	not tested not tested	1	
Median Removal (%): >50	,	>79	not tested	not tested	not tested	1	
.,,							ı
			Additional R	eferences			
			Additional R	eferences			



HERRERA	iviani	ijacturer rec	nnology ke	port				
Manufacturer:	Bio Clean	Environmental		Contact Name	e:	Greg	Kent	
Name of Technology:	Nutrient Sep	arating Baffle Box	_	Contact Email	l:	gkent@biocleane	nvironmental.net	-
# of Installations in				Contact Phon		760-43		-
Washington:	0 wa,	4 UT, 3 OR	_	Contact Webs		www.biocleanen	<u>vironmental.net</u>	-
			ent Type/Appli					
☐ Downspout ☑		l	Filtration (media)	)		Ion exchange column	1	✓ Stormwater
	Settling		Filtration (fabric)			Reverse osmosis		☐ Groundwate
✓ Below Ground Vault	Hydrodynamic Separ	ration	Filtration (biofiltr	ation)		Electrocoagulation		☐ Wastewater
Above Ground Vault	Floatables Baffle		Filtration (chemic	cally enhanced)		Chemical Treatment		Process wa
			Estima	ted Costs				
Estimated Installation Cos Estimated Annual O&M Co	•	•	ak treatment flov	v rate):	low: low:	\$ 0.33	high: high:	
		· .		raulics/Desi	an			
Design Flow Rate (gpm):			low:		high:	8,858		
System aboveground foot	print (sq ft):		low:		high:	0		
Required head loss (ft):			low:	0	high:	0		
Internal or External Bypas	ss:			Internal (Exter	– nal in Some Si	tuations)		
			System D	erformance				
			System F	erjormance				
Briefly describe how data	were collected (	field, lab, third par	ty, grab sample, a	uto-composit	e, etc.)			
reports are being listed belov City of Santa Monica field d Brevard County field testing NJ CAT Full Scale Labratory	data is independen g is independent a 7 Testing Tier 1	•		•	antic			1
Santa Monica Independent F	ield Data TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):	366	not tested	4	not tested	not tested	not tested	not tested	1
Median Effluent (mg/L):	48	not tested	n/d	not tested	not tested	not tested	not tested	1
Median Removal (%):	86.8	not tested	>99%	not tested	not tested	not tested	not tested	1
			•		•	•		]
		Total Metals	1		issolved Me		Nutrients	1
	Cu	Pb	Zn	Cu	Pb	Zn	TP	
Median Influent (mg/L):	0.07	not tested	0.318	not tested	not tested	not tested	not tested	
Median Effluent (mg/L): Median Removal (%):	0.042 40	not tested not tested	0.222 30.25	not tested not tested	not tested not tested	not tested not tested	not tested not tested	
iviedian Kemovai (70).	40	not tested	30.23	not tested	not tested	not tested	not tested	ł
Brevard County Stormwater	Monitoring - Micco	o Basin						ነ
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	]
Median Influent (mg/L):	16.55	not tested	]					
Median Effluent (mg/L):	8.63	not tested	]					
Median Removal (%):	47.9	not tested						
								ł
		Total Metals	7		Dissolved Met		Nutrients	
Median Influent (mg/L):	Cu	Pb not tosted	Zn	Cu	Pb not tosted	Zn	TP	
Median Effluent (mg/L):	not tested not tested	not tested not tested	not tested not tested	not tested not tested	not tested not tested	not tested not tested	0.055 0.0425	1
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	23	1
								1
Brevard County Storwater M	onitoring - Indiatla	intic						1
,	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	1
Median Influent (mg/L):	32.9	not tested	]					
Median Effluent (mg/L):	7.6	not tested	]					
Median Removal (%):	76.9	not tested						

		Total Metals		D	issolved Met	tals	Nutrients
	Cu	Pb	Zn	Cu	Pb	Zn	TP
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	1.49
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	0.44
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	70

NJ CAT Testing - Tier 1 - 63 Micron Mean Particle Size PSD

ĺ								
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):	varies	not tested	not tested	not tested	not tested	not tested	not tested	
Median Effluent (mg/L):	varies	not tested	not tested	not tested	not tested	not tested	not tested	
Median Removal (%):	67.3	not tested	not tested	not tested	not tested	not tested	not tested	
		<b>Total Metals</b>		D	issolved Met	tals	Nutrients	
	Cu	Pb	Zn	Cu	Pb	Zn	TP	
Median Influent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested	
Median Effluent (mg/L):	not tested	not tested	not tested	not tested	not tested	not tested	not tested	
Median Removal (%):	not tested	not tested	not tested	not tested	not tested	not tested	not tested	
Atlantic Beach Baffle Box Teas	sting - 5th St							
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):	85	not tested	not tested	not tested	not tested	not tested	not tested	
Median Effluent (mg/L):	27	not tested	not tested	not tested	not tested	not tested	not tested	
Median Removal (%):	68	not tested	not tested	not tested	not tested	not tested	not tested	
	Total Metals Dissolved Metals							
	Cu	Pb	Zn	Cu	Pb	Zn	TP	
Median Influent (mg/L):	0.017	0.014	0.088	not tested	not tested	not tested	0.31	
Median Effluent (mg/L):	0.01	0.0065	0.038	not tested	not tested	not tested	0.21	
Median Removal (%):	41	54	57	not tested	not tested	not tested	32	

#### Notes, Comments, Additional References

The Nutrient Separating Baffle Box employees screening, three chambered hydrodynamic spearation and absoptive polymer media for the removal of gross solids, TSS, particulate pollutants and hydrocarbons. To see how the system operates visit:

http://www.biocleanenvironmental.com/video/?path=/content/product/ns\_baffle\_box/NS\_Baffle\_Box-Product\_Video.flv&w=768&h=576

THE PATENTED SEPARATION AND DRY STATE STORAGE OF GROSS SOLIDS SUCH AS LEAVES AND GRASS CLIPPINGS MINIMIZES NUTRIENT LOADS SEE FOLLOWING ARTICLE http://www.biocleanenvironmental.com/content/product/ns\_baffle\_box/Brochure%20-%20Leaching%20Article%20-%20NSBB.pdf



## HERRERA Manufacturer Technology Report

Manufacturer:	Kristar En	terprises, Inc.		Contact Na	me:		Michael Kimberlain	
Name of Technology:		k Filter	-	Contact En	nail:		oerlain@kristar.com	-
# of Installations in			-	Contact Ph	one:		(800) 579-8819	-
Washington:		15		Contact W	ebsite:	w	ww.kristar.com	-
		Tuest	- out Tune /A		/ · l · · · l · · !! ·	_		- 
Daymanaut [7	Oil/Mater Ser		nent Type/A	-	(спеск ан			Ctormustor
□ Downspout ✓		Jai ai liuri	Filtration (med	lia)		Ion exchange of	column	✓ Stormwater
☐ Drain Inlet Insert	Settling		Filtration (fabri	ic)		Reverse osmos	iis	Groundwater
✓ Below Ground Vault	Hydrodynam	ic Separation	Filtration (biofi	iltration)		Electrocoagula	tion	Wastewater
Above Ground Vault	Floatables Ba	iffle	Filtration (chen	mically enhanced	i)	Chemical Treat	ment	Process water
			Est	imated Co	sts			
<b>Estimated Installation Cos</b>	t:	low:	\$10,000	high:	\$200,000			
Estimated Annual O&M C	ost:	low:	\$1,200	high:	\$10,000			
			System I	Hydraulics	s/Design			
Design Flow Rate (gpm):		low:	12	high:	1,000			
System footprint (sq ft):		low:	10	high:	150	_		
Required head loss (ft):		low:	1.7	high:	3.5			
Internal or External Bypas	s:	In	ternal			<del></del>		
			Syste	m Perforn	nance			
Breifly describe how data Internal lab testing performed by						•	•	
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):	70	20	20				20	
Median Effluent (mg/L):	11	5	5				5	
Median Removal (%):	82	75	75				75	]
		Total Met	als	Di	ssolved Met	tals		
	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):	0.052	0.15	0.25					
Median Effluent (mg/L):	0.02	0.05	0.1					
Median Removal (%):	62	68	61					
		No	tes, Commen	its, Additi	onal Refer	rences		



Manufacturer:		Fnvironm	ent 21, LLC		(	Contact N	ame:	Dino Pezzimen	+i		
Name of Technology:			Storm			Contact IV		dino@env2			
# of Installations in						Contact Pl		585-815-4714			
Washington:			0		(	Contact W	ebsite:	www.env2	1.com		
		Tre	atment Ty	ne/Annl	icatio	on Icheck	all that a	nnlv)			
Downspout	✓ Oil/\	Water Sepa		Filtration			un that a	_	ange column	<b>V</b>	Stormwater
☐ Drain Inlet Insert	✓ Sett			✓ Filtration	•	•		Reverse	_		Groundwater
☐ Below Ground Vault	_	•	Separation	Filtration	•	•			oagulation		Wastewater
Above Ground Vault		atables Baf		_	•	ŕ	-11	_	l Treatment		Process water
ADOVE GIOUIIU Vauit	- 100	itabics ba.			`	ically enhance	ed)	Спеппа	I freatment	Ц	Process water
				Estimo	ated	Costs					
Estimated Installation C			low:	\$3,000			\$25,000	_			
Estimated Annual O&M	Cost:		low:	0		high:	\$10,000	-			
			Sys	tem Hyd	Iraul	ics/Desig	jn				
Design Flow Rate (gpm)			low:	0		high:	2,000	_			
System footprint (sq ft):	:		low:	9		high:	600	_			
Required head loss (ft):			low:	0		high:	0.5	=			
Internal or External Byp	ass:	-	В	oth							
Breifly describe how dat Field studies are not in progre						ab sample	, auto-cor	nposite, et	c.)		
	-	TSS	TPH	Oil & gre	ase	SVOCs	PCBs	Dioxins	CPAHs		
Median Influent (mg/L):		*250	**400	**400	+	**400	**400	**400	**400		
Median Effluent (mg/L):		*175	**80	**80		**80	**80	**80	**80		
Median Removal (%):		*80	**80	**80		**80	**80	**80	**80		
								,			
		_	Total Meta				olved Me				
84 - diam Indicant (may/1)	- ++	Cu	Pb	Zn	+	Cu	Pb	Zn			
Median Influent (mg/L): Median Effluent (mg/L):		**0.08 **0.04	***0.79 ***0.28	***0.3 ***0.0		NA NA	NA NA	NA NA			
Median Removal (%):		**50	***65	***80		NA NA	NA NA	NA NA			
Wiedian Nemovai (/e/.		50	0.5		<u> </u>	INA	No	N/A			
			Notes, Cor	nments,	Addi	itional Re	eference	s			
*The TSS removal efficiency i	s also de						-		ption of a PSI	D with	a d <sub>50</sub> of 60
microns was used.											
**Any oil based removal dep mean oil droplet size of 100 r ***Testing is not complete for	micron ar	nd a spgr	of 0.89 are use	d. The rem	oval ef				zed data is u	navaila	able; therefore a



Manufacturer:					rironmental Filtration, Inc.		Contact Name: Lyle Clemens				
Name of Technology:	•	Ra	ynfiltr			Contact E	mail:	cei@pcc	nline.com		
# of Installations in				_		Contact P	hone:	763-4	25-1167		
Washington:		1 (a	airport)			Contact W	/ebsite:	www.ra	ynfiltr.org		
		T.,,	o estudo est T		/Annlianti	010 /-11					
□ Decement				_	/Applicati		all that d	_			Ctamountan
Downspout		Oil/Water Sep	Jai ai tiori	<b>✓</b>	Filtration (med	a)		Ion exc	nange column	Ш	Stormwater
✓ Drain Inlet Insert	Ш	Settling		<b>✓</b>	Filtration (fabri	c)		Reverse	osmosis		Groundwater
✓ Below Ground Vault		Hydrodynami	ic Separation		Filtration (biofi	tration)		Electrod	oagulation		Wastewater
✓ Above Ground Vault	<b>✓</b>	Floatables Ba	iffle		Filtration (chen	nically enhance	ed)	Chemica	al Treatment		Process water
				ı	Estimated	Costs					
Estimated Installation Co	ost:		low	:	531	high:	554				
Estimated Annual O&M			low			high:		_			
			Sı	ıste	m Hydrau	lics/Desid	n	<del>-</del>			
Design Flow Rate (gpm):			low		rryaraar O	high:	900				
System footprint (sq ft):			low		0	_	300	_			
Required head loss (ft):			low			high:		_			
Internal or External Bypa	ass:		.011			6		_			
				C	ataus Daufe						
				Sys	stem Perfo	rmance					
Breifly describe how dat	. a w	ere colect	ad (field la	h th	ird party or	ah camplo	auto-co	mnosita a	tc \		
breilly describe now dat	.a w	ere colect	eu (neiu, ia	o, tii	iiu paity, gi	ab sample	, auto-co	iiposite, e	,		
		TSS	TPH	Oi	il & grease	SVOCs	PCBs	Dioxins	CPAHs		
Median Influent (mg/L):											
Median Effluent (mg/L):											
Median Removal (%):											
,				•				•			
			Total Me	tals		Diss	olved Me	etals			
		Cu	Pb		Zn	Cu	Pb	Zn			
Median Influent (mg/L):											
Median Effluent (mg/L):											
Median Removal (%):											
			Notes Co		nents, Add	itional D	oforonce				
Costs per catch basin			Notes, Co	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ients, Aud	itionai K	ејегенсе	:5			
Costs per catch basin											
L											



Manufacturer:	Deep Root Partners, L.P	. Contact Name:	Brenda Guglielmina	
Name of Technology:	Silva Cell	- Contact Email:	orenda@deeproot.con	
Technology Category:	Below Ground Vault	Contact Phone:		
Technology Process:		Contact Website:		
# of Installations in Was	hington:	<u>-</u> '		
	Treatment Tv	pe/Application (check all t	hat apply)	
✓ Downspout	Oil/Water Separartion	Filtration (media)	Ion exchange column	✓ Stormwater
Drain Inlet Insert	Settling		Reverse osmosis	Groundwater
Rolow Cround Vault	Hydrodynamic Separation	Filtration (fabric)		
Below Ground Vault	_ , , .	Filtration (biofiltration)	Electrocoagulation	Wastewater
Above Ground Vault	Floatables Baffle	Filtration (chemically enhanced)	Chemical Treatment	Process water
		Estimated Costs		
Estimated Installation Co	ost: low	: 4,000-\$5,60 <b>high:</b> 0,000-\$14	4,000	
Estimated Annual O&M		\$100-\$200 <b>high:</b> \$100-\$20		
		System Hydraulics		
Design Flow Rate (gpm):	. low	: 20"/hour high: 3"/hou	r	
Required head loss (ft):	n,		<u> </u>	
Internal or External Bypa				
	•	System Performance		
Braifly describe how dat	a wore colected (field	lab, third party, grab sample,	auto composito etc.)	
		based on research by Davis at U		Hunt at the Universi
lerature search. The water (	quality filtering values are	based off research by Davis at O	iliversity of ivial yland and	ridit at the oniversi
Parameter:	TSS TP	Dis. Cu Dis. Zn Dis. Co	Dis. Pb TPH	cPAHs PCBs
# of sample:				
Median Influent (mg/L):				
Median Effluent (mg/L):				
% Removal:	80% 68%	90%+ 90%+ 90%+		
	Notes, Cor	nments, Additional Refer	ences	
Prince Georges County S	Stormwater Manual Bri	tish Columbia Stormwater Ma	nual. State of Washingt	on Department of
Trince deorges country s	toriniwater Manual, Di	Ecology	man, state or washingt	on Department of
		LCOIUSY		



## HERRERA Manufacturer Technology Report

Manufacturer: Name of Technology: # of Installations in	-		industries sin/Stormpod	<u>-</u>		Contact P	mail:		oco-industries.c	<u>-</u> : <u>om</u>	
# of installations in Washington:			<20	_		Contact V		207.831.2795 www.fabco-inc	dustries.com	=	
		Tre	eatment Ty	vpe	/Applicati	on (checl	k all that	apply)			
✓ Downspout		Oil/Water Sep	-	,, 	Filtration (medi			_	nange column	✓ Sto	ormwater
✓ Drain Inlet Insert	<b>V</b>	Settling			Filtration (fabric			_	osmosis	☐ Gro	oundwater
☐ Below Ground Vault		Hydrodynami	ic Separation		Filtration (biofil	•			oagulation		stewater
✓ Above Ground Vault	<b>✓</b>	Floatables Ba	ıffle		Filtration (chem	•	ed)		al Treatment		ocess water
	—			<u> </u>	Estimated						
Estimated Installation C	`ost·		low:		750	high:	2000				
Estimated Annual O&M			low:		200	high:		<b>-</b> -			
	—		Sy	ste	m Hydraul	lics/Desi	an				
Design Flow Rate (gpm)	):		low:		50	high:	_				
System footprint (sq ft)			low:		4	high:		_			
Required head loss (ft):			low:	:	1.25	high:	2.5	_			
Internal or External Byp	ass:			both		•		_			
				Sys	stem Perfo	rmance					
					-			_	_		
FABCO stormbasin/stormpoo								-	_		
		TSS	TPH	Oi	il & grease	SVOCs	PCBs	Dioxins	CPAHs	Total P	Total N
Median Influent (mg/L)	_	111.9		L	59.5			Ţ		0.57	4
Median Effluent (mg/L)	:	2.7	<b></b>	$oldsymbol{ol}}}}}}}}}}}}}}}}}}$	<5					0.3	1.5
Median Removal (%):		97.8		丄	>90					47	63
	1	<u> </u>	Total Met	tals.		Dis	solved M	otals		Pactoria	
	}	Cu	Pb	T	Zn	Cu	Pb	Zn	ECOLI	Bacteria Fecal	Enter
Median Influent (mg/L)	:		0.018	$\vdash$	0.335		. ~		1550	1600	430
Median Effluent (mg/L)	_		0.0049	$\vdash$	0.175		<del>                                     </del>	+ -	270	430	230
Median Removal (%):			73		48		<u> </u>		83	73	47
				_							
					nents, Add		-				
FABCO was awarded a comp long island, ny. Since 2009 FA											
110 um. Hydrocarbons/oil&	ABCO	Wd5 Ilistalie	יוב טטט אוי	OHIID							
				%. Ni	itrogen >40%.	Bacteria. >7	በ%. Stormb	asin is a great	t retrofit dev	vice for ind	
facilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea	t retrofit dev	vice for ind	ustriai
racilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea:	t retrofit de\	vice for ind	ustriai
racilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea <sup>.</sup>	t retrofit dev	vice for ind	ustriai
racilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea <sup>.</sup>	t retrofit dev	vice for ind	ustriai
nacilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea <sup>.</sup>	t retrofit dev	vice for ind	ustriai
nacilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea <sup>.</sup>	t retrofit dev	vice for ind	ustriai
radilities and is considered a	greas	se: >80%Ph	osphorus: >50		-			oasin is a grea	t retrofit dev	vice for ina	ustrial



Manufacturer:	Imbriun	n Systems		<b>Contact N</b>	ame:	Justin Arno	tt	_		
Name of Technology:	Storm	nceptor		Contact E	mail:	Jarnott@ImbriumSystems.com				
<b>Technology Category:</b>	Below Gr	ound Vault		Contact P	hone:	(403) 389-9	9593	_		
Technology Process:	Sedim	entation	_	Contact W	/ebsite:	www.imbriums	systems.com	_		
# of Installations in Was	hington:	51	.0+							
	Tred	itment Ty	pe/Applic	<b>ation</b> (ch	eck all th	at apply)				
Downspout	✓ Oil/Water S	Separartion	Filtration	(media)		On excha	ange column	✓ Storm	nwater	
✓ Drain Inlet Insert	✓ Settling		Filtration	(fabric)		Reverse	osmosis	Grou	ndwater	
■ Below Ground Vault	✓ Hydrodyna	ımic Separation	_	(biofiltration)		☐ Electroco	agulation		ewater	
Above Ground Vault	Floatables	Baffle		(chemically e	nhanced)		Treatment		ess water	
			 Estimat	ed Costs						
Fatimental Installation 6		1								
Estimated Installation C		low			\$15,000	-				
Estimated Annual O&M	Cost:	low	\$500	high:	\$5,000	-				
			System F	lydraulic	S					
Design Flow Rate (gpm)		low	: 0	high:	11000	_				
Required head loss (ft):	-	0.	22							
Internal or External Byp	ass:	Inte	rnal							
			System Pe	rforman	се					
The data detailed below is										
studies were conducted 3r	u party with i	ootii autoiiia	alic aliu grab	samplers. II	nuividual te	est reports a	re availabl	е ироптеч	uest.	
Dougmoton	TCC	TD	Dia Cu	Dis. Zn	Die C4	Die Dh	TDU	eDAUe	DCDa	
Parameter:	TSS	TP	Dis. Cu	DIS. ZII	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs	
# of sample: Median Influent (mg/L):	57 159	38 0.275					15 29			
Median Effluent (mg/L):	59	0.175					4			
% Removal:	53	21.8	27.5	35.3		41.8	73			
		Notes, Cor	nments, A	dditiona	l Refere	nces				
Despite the above average	s, the Stormo	eptor syster	m, when sized	d with PCSV	VMM for S	tormceptor	has a 0.94	correlation	(r-	
squared regression value)								-		
confidently and accurately									D are	
taken into account. Furthe										
performance at flow rates	-								OE GULD	
are merely a hydraulic mai	ker within th	e system tha	at indicates w	hen the un	it begins to	inhibit scou	ır from the	e unit.		
1										



Manufacturer: Name of Technology: # of Installations in Washington:	-	StormFil	ruction Product: nc. lter - ZPG	s _ _	Contact N Contact E Contact P Contact W	mail: hone:	darcys@conted	<del></del>	
		Tre	atment 1	Type/Applicati	ion (check	k all that d	(vlaar		
✓ Downspout		Oil/Water Sepa		✓ Filtration (med			_	ange column	✓ Stormwater
Drain Inlet Insert	<b>V</b>	Settling		Filtration (fabri			Reverse	_	Groundwater
✓ Below Ground Vault		Hydrodynamic	Separation	Filtration (biofil	•			pagulation	Wastewater
✓ Above Ground Vault	<b>√</b>	Floatables Baff	fle	Filtration (chen	,	ed)		I Treatment	Process water
				Estimated	Costs				
Estimated Installation C Estimated Annual O&M				ction cost):		low:	\$10K 0.00008		\$2.5 M 0.00024
			S	ystem Hydrau	lics/Desi	gn			
Design Flow Rate (gpm): System aboveground for Required head loss (ft): Internal or External Byp.	otpr	int (sq ft): _	Both	low: low: low:	2 8 1.8	high: high: high:	6050		
				System Perf	ormance				
a) Stormwater Management composite samples; b) Milwa weighted, peer reviewed, cor StormFilter (2008): field, third	ukee npos	Riverwalk ET site samples; o ty, composite	·V; Third Part d) EvTec Lake e.	ty, Field, Flow weigh e Union Ultra-Urban	ted. c) Heri Stormwater	tage Market Technology	place Field E	valution (200 stormwater N	4): field, flow-
Madian Influent (mg/L)	$\dashv$	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L): Median Effluent (mg/L):	_	23		+				0.12	
Median Removal (%):	$\dashv$	82		+				42	
iviculari itemovar (70).		02						72	
			Total Me	tals	Diss	olved Me	tals		
	[	Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):		0.0425	0.12	0.225	0.00464		0.0599		
Median Effluent (mg/L):	$\dashv$	0.0335	0.0435	0.12767	0.00423		0.0532		
Median Removal (%):		47	24	62	11		15		
			Notes C	ommonts Ade	litional D	oforonce			
TSS reference a; Metals refer requested analytes. Ranges v		s b & c; cPAF	ls reference of		sene as the	parameter a	as it was the i		



Manufacturer: Name of Technology:		Fabco Industries Stormsafe-Helix				Contact N Contact E	mail:		Gornean bco-industries.co	<u>om</u>	
# of Installations in Washington:		n	one			Contact VI		207-8 www.fabco-in	31-2795		
washington.				-					dustries.com		
				ype,	/Applicati	<b>on</b> (check	all that				
Downspout	$\checkmark$	Oil/Water Sep	arartion		Filtration (med	ia)		Ion excl	nange column	∐ Sto	mwater
Drain Inlet Insert		Settling		<b>√</b>	Filtration (fabri	c)		Reverse	osmosis	Gro	undwater
✓ Below Ground Vault		Hydrodynami	c Separation		Filtration (biofi	Itration)		Electrod	coagulation	☐ Was	tewater
Above Ground Vault	<b>✓</b>	Floatables Ba	ffle	<b>√</b>	Filtration (chen	nically enhance	ed)	Chemic	al Treatment	Pro	cess water
					Estimated	Costs					
Estimated Installation (	ost:		low	:	20000	high:	60000				
Estimated Annual O&N	Cos	st:	low	:	2000	high:	6000	_			
			Sv	iste	m Hydrau	lics/Desid	n				
Design Flow Rate (gpm)	:		low		3	high:	9				
System footprint (sq ft)			low		160	high:	250	_			
Required head loss (ft):			low	:	0	high:	3	_			
Internal or External Byp		:		both				_			
				_							
				3 <i>y</i> s	stem Perfo	ormance					
Breifly describe how da	ta w	ere colect	ed (field, lal	o, th	ird party, gr	ab sample	, auto-co	mposite, e	tc.)		
We have conducted lab and	field	studies as de	scried in our o	online	e reports, we a	re currently	undergoing	g 3rd party fie	eld testing at	a wastewa	ter
treatment plant, treating 10	acre	s of stormwa	ter runoff.								
		TSS	TPH		il & grease	SVOCs	PCBs	Dioxins	CPAHs		
Median Influent (mg/L)	•	133			ii & grease	34003	1 CD3	DIOXIIIS	CIAIIS		
Median Effluent (mg/L)											
Median Removal (%):				<del> </del>							
								-!			
			Total Me	tals		Diss	olved M	etals	Bate	eria	_
		Cu	Pb		Zn	Cu	Pb	Zn	Total coli	Fecal	
Median Influent (mg/L)	:								4388	3948	
Median Effluent (mg/L)	:								1360	934	
Median Removal (%):									69	76	]
			Notes Co	100 10	nents, Add	litional D	oforono				
The Stormsafe-helix technology	201/14	vas roloasod i					-		ly procooded	by a protr	natmont
device like a hydrodynamic s											eatillellt
pathogen/bacteria impaired											



Manufacturer:	_	Kristar Ent	terprises, Inc.	_	Contact Na	ıme:		Michael Kimberlain	_
Name of Technology:	_	SwaleGar	rd Pre-filter	_	Contact En		mkir	mberlain@kristar.com	_
# of Installations in					Contact Ph			(800) 579-8819	_
Washington:	_		2	_	Contact W	ebsite:		www.kristar.com	_
			Treatm	nent Type/Ap	plication	(check all	that apply	<i>'</i> )	
Downspout	<b>√</b> (	Oil/Water Sepa	arartion	Filtration (med	dia)		☐ Ion excha	ange column	✓ Stormwater
✓ Drain Inlet Insert		Settling		✓ Filtration (fabr	ric)		Reverse o	osmosis	Groundwater
Below Ground Vault		Hydrodynamic	Separation	Filtration (biof	filtration)		☐ Electrocoa	agulation	Wastewater
Above Ground Vault	✓ I	Floatables Baf	ffle	Filtration (che	emically enhanced	(t	Chemical	Treatment	Process water
				Esti	imated Cos	sts			
Estimated Installation C	ost:		low:	\$4,500	high:	\$4,500			
Estimated Annual O&M		t:	low:		high:	\$300	<u> </u>		
				System F		/Desian			
Design Flow Rate (gpm)	:		low:	-	high:	800			
System footprint (sq ft):			low:		_ high:	16			
Required head loss (ft):			low:		_ bigh:	0.5			
Internal or External Byp		_	In	nternal	 -		_		
				Svster	m Perform	ance			
				-,					
Breifly describe how da									
Lab - UCLA, Univeristy of Haw	vaii, C	ity of Auckla	and, NZ, CSUS	- OWP. Field Stud	dy - University	of Hawaii ar	nd City of Auc	ckland	
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	7
Median Influent (mg/L):		100	35	35				35	
Median Effluent (mg/L):	:	20	7	7	<u> </u>				
Median Removal (%):		80	80	80				7	
	Г		Total Met	talç	Dis	solved M		٦	
	H	Cu	Pb	Zn	Cu	Pb	Zn	+	
Median Influent (mg/L):	:			10	1		+	†	
Median Effluent (mg/L):				6	1			7	
Median Removal (%):				60				]	
			81-1			1 Defe			
			Not	tes, Commen	ts, Aaaitio	паі кете	rences		



Manufacturer:		Kristar Ent	erprises, Inc.		<b>Contact Na</b>	me:	Mich	ael Kimberlain		
Name of Technology:	_	TreePoo	d Biofilter	-	Contact Em	ail:	mkimberl	ain@kristar.com	-	
# of Installations in	_			-	<b>Contact Ph</b>	one:	(80	0) 579-8819	-	
Washington:	_		0	_	Contact We	ebsite:	www	.kristar.com	_	
			Treatr	nent Type/A	pplication	(check all t	hat apply)			
Downspout	<b>V</b>	Oil/Water Sep		Filtration (med	-		Ion exchange colun	nn	<b>~</b>	Stormwater
☐ Drain Inlet Insert	<b>V</b>	Settling		Filtration (fabr	ic)		Reverse osmosis			Groundwater
✓ Below Ground Vault		Hydrodynamic	Separation	✓ Filtration (biofi			Electrocoagulation			Wastewater
✓ Above Ground Vault	<b>V</b>	Floatables Baf	fle	_	nically enhanced	)	Chemical Treatmen	t		Process water
					imated Co					
				ESI		313				
Estimated Installation C			low:	\$10,000	high:	\$50,000				
Estimated Annual O&M	Cos	st:	low:	\$400	high:	\$750	_			
				System	Hydraulics	/Design				
Design Flow Rate (gpm)	:		low:	16	high:	72	_			
System footprint (sq ft):	:		low:	24	high:	84				
Required head loss (ft):			low:	0	high:	0.5				
Internal or External Byp	ass:	:_	In	ternal	-					
				Systa	m Perforn	ance				
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	7	
Median Influent (mg/L):	:	TBD	TBD	TBD	34003	1 003	DIOXIIIS	TBD	†	
Median Effluent (mg/L):		TBD	TBD	TBD				TBD	†	
Median Removal (%):		TBD	TBD	TBD				TBD	]	
	Г		T	.1.						
	-	C··	Total Met	1		solved Meta				
Median Influent (mg/L):	. +	Cu TBD	Pb TBD	Zn TBD	Cu TBD	Pb TBD	<b>Zn</b> TBD			
Median Effluent (mg/L):	$\overline{}$	TBD	TBD	TBD	TBD	TBD	TBD			
Median Removal (%):		TBD	TBD	TBD	TBD	TBD	TBD			
					· ·					
			No	tes, Commen	its, Additio	onal Refere	ences			



# HERRERA Manufacturer Technology Report

Manufacturer: Name of Technology:		acturing)		Contact Na	ame:	Marcel Sloa	ne		
• • • • • • • • • • • • • • • • • • • •	•	p Inlet Insert	_	Contact Er		marcel@remfil	ters.com	•	
Technology Category:			_	Contact Pl	none:	(925) 858-80		•	
Technology Process:	_	Contact W	ebsite:	remfilters.co		•			
# of Installations in Was	shington:	Estimat	- ed: 100					•	
	Tred	atment Ty	pe/Appli	c <b>ation</b> (cl	heck all tl	hat apply)			
Downspout	Oil/Water S	eparartion	✓ Filtration	(media)		on exchai	nge column	✓ Storm	water
✓ Drain Inlet Insert	Settling		✓ Filtration	(fabric)		Reverse o	smosis	Groun	dwater
Below Ground Vault	Hydrodyna	mic Separation	Filtration	(biofiltration)		Electrocoa	gulation	☐ Waste	water
Above Ground Vault	Floatables	Baffle	_	(chemically er	nhanced)	Chemical	Treatment	_	ss water
			Estima	ted Costs	<u> </u>				
Fatimated Installation C	Cont.	lavv	ć100	hiah.	¢700				
Estimated Installation C Estimated Annual O&M		low		high:	\$700	=			
Estimated Annual O&IV	i Cost:	low	\$40	high:	\$120	=			
			System	Hydraulio	cs .				
Design Flow Rate (gpm)	):	low	-	high:	9233				
Required head loss (ft):		.5	"			_			
Internal or External Byp	oass:	nternal 721	gpm to 23,0	00 gpm					
				,		_			
			System P	erforman	ice				
Proifly describe how do	ta wara sala	stad (field	lab third n	artu arab	comple c	uito compo	cita ata l		
Breifly describe how da Treatment flow rates will v								a tha siza ar	ad chano
of the specific catch basin.		_	_		_				iu siiape
TOT LITE SDECITIC CALCIT DASITI.					mact cami	man filtar car		nadia canfid	turations
	. See attached	recuernence	now rate ma	trix for the i	most com	mon filter car	tridge and n	nedia config	gurations.
	. See uttached	rereactivene	now rate ma	trix for the i	most comi	non filter car	tridge and r	nedia config	gurations.
	. See attached	rtreatment	now rate ma	trix for the i	most comi	non filter car	tridge and r	nedia confi <sub>ễ</sub>	gurations.
	. See attached	rticutileit	now rate ma	trix for the i	most comi	non filter car	tridge and r	nedia confi <sub>e</sub>	gurations.
	. See attached	i dedinene	now rate ma	trix for the i	most comi	non filter car	tridge and r	nedia config	gurations.
	. see uttueriee	. it cutilies	now rate ma	trix for the i	most comi	mon filter car	tridge and r	nedia config	gurations.
Parameter:	TSS	ТР	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb	TPH	cPAHs	PCBs
Parameter:									
Parameter: # of sample:									
Parameter: # of sample: Median Influent (mg/L):									
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L):	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L):	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP Notes, Co	Dis. Cu mments, A	Dis. Zn	Dis. Cd	Dis. Pb			



Manufacturer:	Abī	AbTech Industries			ame:	Jonathan Thatcher				
Name of Technology: Ultra Urban Filter			<u></u>	Contact Email:			jthatcher@abtechindustries.com			
# of Installations in				Contact P		(480) 874-400	0			
Washington:	-			Contact W	/ebsite:	abtechindustr	ies.com			
		Treatment T	Type/Applicati	on (check	all that o	ipply)				
Downspout	✓ Oil/Water	Separation	Filtration (med	ia)		☐ Ion exch	nange column	✓ Stormwater		
✓ Drain Inlet Insert	Settling		Filtration (fabri	ic)		Reverse	osmosis	Groundwater		
Below Ground Vault	Hydrodyn	amic Separation	Filtration (biofi	Itration)		Electroc	oagulation	Wastewater		
Above Ground Vault	Floatables	s Baffle	Filtration (cher	mically enhance	ed)	Chemica	al Treatment	✓ Process water		
			Estimated	Costs						
Estimated Installation C	ost (unit co	st and constr	uction cost):		low	\$400	high:	\$1,700		
Estimated Annual O&M	Cost (\$/gal	lon treated):			low	:	high:			
		S	ystem Hydrau	lics/Desig	gn					
Design Flow Rate (gpm)	:		low:	190	high	: 500				
System aboveground for	otprint (sq f	ft):	low:	0	high	:				
Required head loss (ft):			low:	0.5	high	1.5	<u>.</u>			
Internal or External Byp	ass:	Inte	rnal Bypass	-						
			System Perfo	ormance						
Briefly describe how da	ta were coll	ected (field	ah third narty g	rah samnlı	e auto-co	mnosite e	tc )			
Primary analysis of AbTech II								ing grab samples from		
established test protocols de										
evaluate the effectiviness of				ed. The testi	ng methods	used by the	municipalitie	s were governed by		
the state regulatory body, in	which that mu	unicipality was lo	ocated.							
	TSS	TPH	Oil & grosso	SVOCs	PCBs	Dioxins	CPAHs			
Median Influent (mg/L)		>100	Oil & grease	180	PCDS	DIOXIIIS	>100			
Median Effluent (mg/L)		<10	<10	>4.4			>10			
Median Removal (%):	*80%	90%	85%	**40%			**60%			
		•	•			•				
		Total Me		i e	solved Me	1				
BA - 12 - 1 - (1 1 / /1)	Cu	Pb	Zn	Cu	Pb	Zn				
Median Influent (mg/L) Median Effluent (mg/L)							,			
Median Removal (%):	:		+			<del>                                     </del>	,			
ivieulali Kelliovai (70).							l			
		Notes, C	omments, Ada	litional R	eference	?S				
* Data based on Particle Size					_			_		
**Reduction of soluble disso	•					-		•		
Filtration of dissolved phase hydrocarbons. Bench scale t	•	_					-	•		
standard.	esting can be o	Londucted on the	eiu sairipies to estab	iisii viabiiity i	iii a specific	environinen	t or to meet a	specific discharge		
Total Metals Removal: Based				y separate To	otal Metals	from the wat	er column, b	ut AbTech products		
have no Chemical or Biologic	al exchange di	uring the filtration	on of Total Metals.							



Manufacturer:		Environm	nent 21, LLC			Contact N	Name:	Dino Pezzimen	ti		
Name of Technology: # of Installations in			Screen	-	 Contact Email: Contact Phone:			dino@env			
				-				585-815-4714			
Washington:	-		0	_		Contact \	Nebsite:	www.env2	1.com		
		Tre	atment Ty	vne/	<u> </u>	on Ichec	k all that a	innly)			
Downspout	<b>V</b>	Oil/Water Sepa	-		Filtration (medi	•	N W		ange column	<b>V</b>	Stormwater
Drain Inlet Insert	<b>▽</b>	Settling			Filtration (fabric	•			osmosis		Groundwater
✓ Below Ground Vault		Hydrodynamic	Separation	_	Filtration (biofil	•		_	oagulation		
		Floatables Baf	·	_	,	•	15	_	•		Wastewater
Above Ground Vault	<u> </u>	Fluatables bui			Filtration (chem	,	ced)		al Treatment		Process water
				Es	stimated	Costs					
Estimated Installation C	ost:		low:	::	\$2,000	high	\$15,000	=			
Estimated Annual O&M	Cos	t:	low:	:	0	high	\$2,000	_ _			
			Sy	sten	n Hydraul	lics/Desi	ian				
Design Flow Rate (gpm)	:		low:		0	high	_				
System footprint (sq ft):			low:	:	20	high		<del>-</del> -			
Required head loss (ft):			low:		0	high	: 0.5	<del>-</del>			
Internal or External Byp	ass:	-	!	Both							
				Svst	tem Perfo	rmance	,				
				-,-	···· - ,						
Breifly describe how dat						ab sampl	e, auto-cor	nposite, et	.c.)		
Field studies are not in progre	ess a	t this time. F	uture studies	are pla	anned.						
		TSS	TPH	_	& grease	SVOCs	PCBs	Dioxins	CPAHs		
Median Influent (mg/L):		*250	**400	+	**400	**400	**400	**400	**400		
Median Effluent (mg/L):	;	*175	**150		**150	**150	**150	**150	**150		
Median Removal (%):		*80	**62.5		**62.5	**62.5	**62.5	**62.5	**62.5		
	Γ		Total Met		ls Dissolved M			tals			
	-	Cu	Pb	T	Zn	Cu	Pb	Zn			
Median Influent (mg/L):		***0.08	***0.79	†	***0.3	NA	NA	NA			
Median Effluent (mg/L):		***0.06	***0.56	*	***0.18	NA	NA	NA			
Median Removal (%):		***20	***27		***40	NA	NA	NA			
<u>-</u>			Notes, Co		-						
*The TSS removal efficiency i	s also	o dependent	upon the Part	cicle Siz	e Distributio	on (PSD). Fo	or this produc	ct, the assum	ption of a PSI	D with	ı a d <sub>50</sub> of 150
microns was used.											
**Any oil based removal dep mean oil droplet size of 100 r		•	•	_			•		zed data is u	navail	able; therefore a
***Testing is not complete for						IIICIETICIES a	Te estimated	ı <b>.</b>			
			0,								



Manufacturer:	Environm	ent 21, LLC		Contact N	ame:	Dino Pezzimen	ti		
Name of Technology:	•	Storm	_	Contact E		dino@env			
# of Installations in			Contact Phone:			585-815-4714	2100111		
Washington:		0		Contact W		www.env2	1.com		
	-	-	ype/Applicati		all that a				
☐ Downspout ☐	Oil/Water Sep	arartion	Filtration (med	ia)		☐ Ion exch	ange column	✓ Stormw	ater
Drain Inlet Insert	Settling		Filtration (fabri		Reverse	osmosis	Ground	water	
✓ Below Ground Vault	Hydrodynamic	Separation	Filtration (biofi	ltration) Electro			oagulation	Wastew	ater
Above Ground Vault	Floatables Baf	fle	Filtration (cher	nically enhance	ed)	Chemica	l Treatment	Process	water
			Estimated	Costs					
Estimated Installation Cos	t:	low	\$2,000	high:	\$15,000				
Estimated Annual O&M Co		low			\$2,000	<del>-</del> -			
		Çı.	stem Hydrau	lics/Desig	70				
Design Flow Rate (gpm):		low	•	high:					
System footprint (sq ft):		low	-	high:	135	_			
Required head loss (ft):		low	-	high:	0.5	_			
Internal or External Bypas	s:		NA NA			_			
	-			•					
Field studies are not in progress									
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs		
Median Influent (mg/L):	*250	**400	**400	**400	**400	**400	**400		
Median Effluent (mg/L):	*175	**150	**150	**150	**150	**150	**150		
Median Removal (%):	*80	**62.5	**62.5	**62.5	**62.5	**62.5	**62.5		
							_		
	<u></u>	Total Me	1	_	solved Me	1			
Median Influent (mg/L):	***0.00	***0.70	<b>Zn</b> ***0.3	Cu	Pb	Zn			
Median Effluent (mg/L):	***0.08 ***0.06	***0.79 ***0.56	***0.18	NA NA	NA NA	NA NA			
Median Removal (%):	***20	***27	***40	NA NA	NA NA	NA NA			
iviculari Kemovai (70).	20	27	40	IVA	IVA	IVA			
		Notes. Co	mments, Add	litional R	eference	<u></u>			
*The TSS removal efficiency is a					-		ption of a PSI	D with a d <sub>50</sub> of	f 150
microns was used.	÷				÷	'		55	
**Any oil based removal depen	ds on the drop	let size and sp	ecific gravity of the	oil. For this	product, ac	curate, analy	zed data is u	ınavailable; th	erefore a
mean oil droplet size of 100 mic ***Testing is not complete for r				fficiencies ar	e estimated	l.			



Manufacturer:	Hydro Inte	ernational		Contact N	ame:	Fred	Kraeke			
Name of Technology:	Up-Flo	Filter®	_	Contact E	mail:	fkraek	el@hil-te	ch.com	_	
<b>Technology Category:</b>	Below Gro	ound Vault	_	Contact P	none:	207-3	321-373	33	_	
Technology Process:	Fil	ter	_	<b>Contact W</b>	ebsite:	www.	nydro-int	ernational.biz	_	
# of Installations in Was	hington:		-						_	
	Tr	eatment i	Type/App	lication	(check al	l that	apply)			
Downspout	✓ Oil/Water Se	eparartion	Filtration	(media)			n exchar	nge column	√ Sto	rmwater
Drain Inlet Insert	✓ Settling		Filtration	(fabric)		□R	everse os	smosis	Gre	undwater
✓ Below Ground Vault	Hydrodynar	nic Separation		(biofiltration)		E	lectrocoa	gulation	□ Wa	stewater
Above Ground Vault	✓ Floatables E	Baffle		(chemically e	nhanced)		hemical 1	Freatment	_	cess water
			Estin	nated Co	sts					
Estimated Installation Co	ost:	low:		high:						
Estimated Annual O&M		low:		high:		<del>-</del> -				
			Syster	n Hydrau	lics					
Design Flow Rate (gpm):	:	low:		high:		_				
Required head loss (ft):	_									
Internal or External Bypa	ass:									
			Cuctom	Perform	anco					
Parameter: # of sample: Median Influent (mg/L): Median Effluent (mg/L): % Removal:	TSS	TP	Dis. Cu	Dis. Zn	Dis. Cd	Dis	. Pb	ТРН	cPAHs	PCBs
		Notes, C	omments	, Additio	nal Refe	erenc	es			
The Up-Flo Filter® is a a l	nigh rate, up	flow filtration	on system	designed t	o remove	fine s	uspen	ded sediment	and assoc	iated
pollutants like nutrients	and heavy m	etals, depe	nding on th	ne type of	media use	ed. Th	ie mod	ular, subsurfa	ce filtratio	on system
is housed in a 4-ft diame		·=						_		
as a complete system. T	_	-	_	-		_		_		_
filtration of stormwater										
installations. Pollutant										
metals (iron, chromium,			=			-		_	=	iro
International at 1-800-84	18-2706 or v	isit the wel	bsite www.	hydro-inte	ernationa	l.biz fo	or mor	e information.		



Manufacturer:		CONTECH Cons	truction Products	s Inc.	Contact Na	ame:	Sean	Darcy	
Name of Technology:		UrbanGre	een BioFilter	_	Contact En	nail:	darcys@cont	ech-cpi.com	
# of Installations in					<b>Contact Ph</b>	none:	503-25	8-3105	
Pacific Northwest:			> 25	_	Contact W	ebsite:	contech	ı-cpi.com	
				- /					
				Type/Applicat		all that d			
Downspout		Oil/Water Sep	paration	✓ Filtration (med	ia)		✓ Ion exch	ange column	✓ Stormwater
Drain Inlet Insert	✓	Settling		Filtration (fabri	c)		Reverse	osmosis	Groundwater
✓ Below Ground Vault		Hydrodynami	c Separation	✓ Filtration (biofi	Itration)		Electroc	oagulation	Wastewater
Above Ground Vault		Floatables Ba	ffle	Filtration (cher	nically enhance	d)	Chemica	al Treatment	Process water
		·		Estimated	Costs				
Estimated Installation (	Cost	(unit cost a	and constru	iction cost):		low:	\$10k	high:	\$250K
Estimated Annual O&N				•		low:	0.0001	high:	0.0003
			5	ystem Hydrau	lics/Desig				
Design Flow Rate (gpm)				low:	4	high:			
System aboveground for		rint (sq ft):		low:		high:			
Required head loss (ft):				low:	3	high:	6		
Internal or External Byp	ass:		Both	n available					
				System Perf	ormance				
				System Perj	Jilliulice				
Briefly describe how da	ıta w	iere collect	ted (field la	ah third narty g	rah samnle	auto-co	mnosita a	tc )	
Drieny describe now do		Tere conce	ica (neia, ic	ab, tima party, 5	rab sample	., auto co	inposite, e	,	
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L)	:								
Median Effluent (mg/L)									
Median Removal (%):									
,				1					
			Total Me	tals	Diss	olved Me	tals	,	
		Cu	Pb	Zn	Cu	Pb	Zn	•	
Median Influent (mg/L)	):							,	
Median Effluent (mg/L)								,	
Median Removal (%):								•	
				•			•	•	
			Notes. Co	omments, Add	litional R	eference	?S		
			,	, , , , , , , , , , , , , , , , , , , ,		-,			



☐ Drain Inlet Insert ✓ Settl	V2B1  0  Treatment Ty  Water Separartion	-	Contact Na Contact Er Contact Ph Contact W	nail: none:	Dino Pezzimen dino@envi 585-815-4714		
# of Installations in Washington:  Downspout Oil/WDrain Inlet Insert Settle	Treatment Ty Water Separartion	-			585-815-4714		
☐ Downspout ☑ Oil/W ☐ Drain Inlet Insert ☑ Settl	Treatment Ty Water Separartion	_	Contact W	obcito:			
☐ Drain Inlet Insert ✓ Settl	Vater Separartion	pe/Applicati		ensite.	www.env2	1.com	
☐ Drain Inlet Insert ✓ Settl			on (check	all that a	pply)		
	ling	Filtration (medi	ia)		☐ Ion exch	ange column	✓ Stormwater
D. Balancessand Vanille	iiig	Filtration (fabric	c)		Reverse	osmosis	Groundwater
✓ Below Ground Vault ✓ Hydr	rodynamic Separation	Filtration (biofil	tration)		Electroco	oagulation	Wastewater
Above Ground Vault	tables Baffle	Filtration (chem	nically enhance	d)	Chemica	l Treatment	Process water
		Estimated	Costs				
Estimated Installation Cost:	low:	\$2,000	high:	\$15,000			
Estimated Annual O&M Cost:	low:		high:	\$2,000	<del>-</del>		
	Sy	stem Hydraul	lics/Desig	ın			
Design Flow Rate (gpm):	low:	0	high:	63,000			
System footprint (sq ft):	low:	20	high:	800	<del>-</del> =		
Required head loss (ft):	low:	0	high:	0.5	=		
Internal or External Bypass:		Both					
		System Perfo	rmance				
Breifly describe how data were Third party lab studies are complete ar	•				nposite, et	c.)	
Time party lab studies are complete ar	na the hela stadies are	planned to begin	within one ye	car.			
1	TSS TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L): *	<sup>*</sup> 250 **400	**400	**400	**400	**400	**400	
Median Effluent (mg/L): *	*175 **150	**150	**150	**150	**150	**150	
Median Removal (%):	*80 **62.5	**62.5	**62.5	**62.5	**62.5	**62.5	
	Total Met	als	Disc	olved Me	tals		
	Cu Pb	Zn	Cu	Pb	Zn		
	*0.08 ***0.79	***0.3	NA NA	NA NA	NA NA		
	*0.05 ***0.35	***0.09	NA NA	NA	NA NA		
	**40 ***55	***70	NA	NA	NA		
		mments, Add					
*The TSS removal efficiency is also dep	pendent upon the Part	icle Size Distributio	on (PSD). For	this produc	t, the assum	ption of a PSI	O with a d <sub>50</sub> of 110
microns was used.							
**Any oil based removal depends on the	·			-		zed data is u	navailable; therefore a
mean oil droplet size of 100 micron and ***Testing is not complete for metals;	10		fficiencies are	e estimated	•		



Name of Technology: # of Installations in Pacific Northwest:		Inc.		Contact N	ame:	Sea	n Darcy	_
	Vo	rtClarex	_	Contact E		darcys@conted	ch-cpi.com	-
Pacitic Northwest				Contact P		503-2	258-3105	-
r define Northwest.		>25	_	Contact W	/ebsite:	conte	ch-cpi.com	-
	7	reatment	Type/Applice	ation (che	ck all that	t apply)		
☐ Downspout ✓	Oil/Water Se	paration	Filtration (me	dia)		On exch	ange column	✓ Stormwater
☐ Drain Inlet Insert	Settling		Filtration (fab	ric)		Reverse	osmosis	Groundwater
✓ Below Ground Vault	] Hydrodynam	ic Separation	Filtration (bio	filtration)		Electroco	agulation	Wastewater
Above Ground Vault	Floatables Ba	iffle	Filtration (che	emically enhance	ed)	Chemica	l Treatment	Process water
			Estimat	ed Costs				
Estimated Installation Cost Estimated Annual O&M Co			uction cost):		low low		high: high:	\$300K 0.001
			System Hydro	aulics/Des	sign			
Design Flow Rate (gpm):			low	: 100	high			
System aboveground footp	orint (sq ft)	:	low		high			
Required head loss (ft):		5	low	: 0.1	high	:		
Internal or External Bypass	i:	Boti	h available	_				
			System Pe	rformance	2			
Briefly describe how data v	were collec	ted (field, la	ab, third party,	grab sampl	e, auto-co	mposite, e	tc.)	
	TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	
Median Influent (mg/L):								
Median Effluent (mg/L):								
Median Removal (%):								
		Tatal NAs	4-1-	D:-	l l	. d. a l. a		
	Cu		ı			1		
Median Influent (mg/I)	Cu	ru	211	Cu	רט	411		
	<del>                                     </del>							
	†							
			_					
		Notes,	Comments, A	dditional	Referen	ces		
			•					
Median Influent (mg/L): Median Effluent (mg/L): Median Removal (%):	Cu	Total Me Pb  Notes,	ztals Zn Zn Comments, A	Cu	Pb Reference	Zn		



## HERRERA Manufacturer Technology Report

Manufacturer: Name of Technology: # of Installations in Washington:	-	Vortec	hs System	<del>-</del>	Contact Na Contact En Contact Ph Contact W	nail: ione:	Sean E  darcys@contech-  503-258  contech-	<u>cpi.com</u> 3-3105	- - -
				Type/Applica	tion (che	ck all that	t apply)		
Downspout	<b>✓</b>	Oil/Water Sep	aration	Filtration (medi	a)		☐ Ion exchan	ge column	✓ Stormwater
Drain Inlet Insert	$\checkmark$	Settling		Filtration (fabri	c)		Reverse os	mosis	Groundwater
✓ Below Ground Vault	<b>✓</b>	Hydrodynami	c Separation	Filtration (biofil	tration)		Electrocoa	gulation	Wastewater
Above Ground Vault	<b>✓</b>	Floatables Ba	ffle	Filtration (chen	nically enhance	d)	Chemical T	reatment	Process water
				Estimate	d Costs				
Estimated Installation C Estimated Annual O&M			treated):				\$20K \$0.00001	high:	
				System Hydra	ulics/Des	ign			
Design Flow Rate (gpm)				low:	50	high:			
System aboveground for	otpr	int (sq ft):		low:	NA	high:			
Required head loss (ft): Internal or External Byp			Dath	low:	0.1	high:		-	
internal or External Byp	ass:	-	Botr	n Available					
Briefly describe how date The WAWA Route 37 Stormw					rab sample	, auto-co			ite.
		TSS	TPH	Oil & grease	SVOCs	PCBs	Dioxins	CPAHs	SSC<50 um
Median Influent (mg/L):	_	108							24
Median Effluent (mg/L):	:	28							8
Median Removal (%):		93							70
	[		Total Me	tals	Dis	solved M	etals	]	
		Cu	Pb	Zn	Cu	Pb	Zn		
Median Influent (mg/L):	:	-	-		-				
Median Effluent (mg/L):	_								
Median Removal (%):									
			Notes.	Comments, Ad	ditional	Referen	ces		

### **APPENDIX C**

# **Technology Product Information**

#### **Appendix C Index (by Treatment System Name)**

				Graphic/	O&M		<del></del>
Treatment System Name	Manufacturer/Vendor Name	Brochure	<b>Drawings Specs</b>			Testing	Other
Active Treatment Systems							
ACISTBox®	Water Tectonics, Inc.	X					
Arkal Filter (Spin Klin System)	Arkal Filtration Systems/PEP (U.S. Distributor)				X		
Arkal Media Filter	Arkal Filtration Systems/PEP (U.S. Distributor)	X					
Baker Tank with Sand Filter	BakerCorp	X	X				
Chitosan-Enhanced Sand Filtration Using FlocClear™	Clear Creek Systems				X	X	
Fuzzy Filter	Schreiber	X	X	X		X	
High-Flo Electrocoagulation	Kaselco		X			X	
OilTrap ElectroPulse Water Treatment System	OilTrap Environmental	X	X			X	
pHATBox®	Water Tectonics, Inc.	X					
Purus® Stormwater Polishing System	StormwateRx	X					
Redbox	Morselt Borne BV	X					
Wastewater Ion Exchange System (WWIX)	Siemens Water Technologies Inc.	X					
WaterTrak Ion Exchange	Aquatech	X			X		
WaterTrak Pressurized Media Filter	Aquatech	X			X		
WaterTrak Reverse Osmosis	Aquatech	X			X		
WaterTrak Ultrafiltration	Aquatech	X			X		
WaveIonics <sup>TM</sup>	Water Tectonics, Inc.	X				X	
Wetsep	Waste & Environmental Technologies Ltd.	X	X	X			
Passive Treatment Systems							
ADS® Water Quality Unit	Advanced Drainage Systems, Inc	X	X		X	X	X
Adsorb-It	Eco-Tec, Inc.	X	X			X	X
Aqua Shield Aqua-Filter System	AquaShieldTM, Inc.	X	X		X		X
Aqua Shield Aqua-Swirl Concentrator	AquaShieldTM, Inc.	X		X	X		X
Aqua-Guardian™ Catch Basin Insert	AquaShieldTM, Inc.	X			X		X
Aquip® Enhanced Stormwater Filtration System	StormwateRx	X		X			
BayFilter®	BaySaver Technologies, Inc.		X X			X	X
BaySeparator®	BaySaver Technologies, Inc.		X X			X	X
Bio Clean Curb Inlet Basket	BioClean Environmental Services, Inc.	X	X X			X	
Bio Clean Downspout Filter	BioClean Environmental Services, Inc.	X	X			X	
Bio Clean Flume Filter	BioClean Environmental Services, Inc.	X					X
Bio Clean Grate Inlet Skimmer Box	BioClean Environmental Services, Inc.	X					X
Bio Clean Trench Drain Filter	BioClean Environmental Services, Inc.	X					X
Bio Clean Water Polisher	BioClean Environmental Services, Inc.	X	X				
BioSTORM	Bio-Microbics, Inc.	X	X		X		X
CDS <sup>TM</sup> Stormwater Treatment System	CONTECH Stormwater Solutions Inc.	X	X X		X		
Clara® Gravity Stormwater Separator Vault	StormwateRx	X		X			
Clean Way Downspout Filtration Unit	Clean Way	X					X
ClearWater BMP	ClearWater Solutions, Inc.	X	X		X		
Coanda Curb Inlet Filter	Coanda, Inc.	X	X X			X	
Coanda Downspout Filter	Coanda, Inc.	X					

#### Appendix C Index (by Treatment System Name)

					Graphic/	O&M		
Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Schematic		Testing	Other
Passive Treatment Systems (cont.)							Ü	
CrystalClean Separator	CrystalStream Technologies	X	X				X	X
CrystalCombo Hybrid Polisher	CrystalStream Technologies	X			X		X	X
Downstream Defender	Hydro International, Inc.	X	X	X		X		X
DrainPac <sup>TM</sup>	United Storm Water, Inc.		X	X		X	X	X
ecoLine A®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X					
ecoLine B®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X		X	X		X
EcoSense <sup>TM</sup> Stormwater Filtration Systems	EcoSense International	X			X		X	
ecoSep®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X		X		X
ecoStorm ®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X	X	X		X
ecoStorm Plus®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X	X	X		X
ecoTop®	Royal Environmental Systems, Inc./Water Tectonics, Inc.	X	X	X				
EcoVault <sup>TM</sup> Baffle Box	EcoSense International	X					X	
Enviro-Drain®	Enviro-Drain, Inc.	X	X					
EnviroSafe <sup>TM</sup>	Transpo Industries, Inc.	X						
EnviroSafe <sup>TM</sup> Storm Safe HF10	Transpo Industries, Inc.	X				X		
EnviroTrap Catch Basin Insert	Environment 21	X	X	X			X	
Filterra® Roofdrain System	Filterra, DBAAmericast, Inc.		X		X	X		X
Filterra® System	Filterra, DBAAmericast, Inc.		X		X	X		X
First Flush 1640FF	ABT, Inc.	X	X					
FloGard+PLUS®	Kristar Enterprises, Inc.	X	X			X		X
FloGard® Downspout Filter	Kristar Enterprises, Inc.	X	X			X		
FloGard® Dual-Vortex Hydrodynamic Separator	Kristar Enterprises, Inc.	X	X			X		
FloGard® LoPro Matrix Filter	Kristar Enterprises, Inc.	X	X			X		
FloGard® LoPro Trench Drain Filter	Kristar Enterprises, Inc.	X	X			X		
Flo-Gard® Trash & Debris Guard	Kristar Enterprises, Inc.	X	X			X		
Go-Filter	AquaShieldTM, Inc.	X						X
Hancor Storm Water Quality Unit	Hancor, Inc.	X		X		X	X	X
HUBER Hydro Filt	Huber Technology, Inc.	X			X			
HydroFilter	Hydroworks				X			
HydroGuard	Hydroworks	X	X			X	X	X
Hydro-Kleen <sup>TM</sup>	ACF Environmental, Inc.	X			X			X
Inceptor®	Stormdrain Solutions	X					X	X
Jellyfish <sup>TM</sup> Filter	Imbrium Systems Corp	X	X	X		X		X
·	Brown-Minneapolis Tank Co./							
Kleerwater <sup>TM</sup>	Kleerwater Technologies, LLC	X		X	X			X
	Modular Wetland Systems, Inc./							
Modular Wetland System – Linear	BioClean Environmental Services, Inc.	X	X	X		X	X	X
Nutrient Separating Baffle Box	BioClean Environmental Services, Inc.	X	X	X			X	
Perimeter Sandfilter (Delaware Sandfilter)	Rotondo Environmental Solutions, LLC		X	-			-	
Perk Filter <sup>TM</sup>	Kristar Enterprises, Inc.	X	X			X		
PSI Separator	PSI International, Inc.				X	X		X

#### Appendix C Index (by Treatment System Name)

					Graphic/	O&M		
Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Schematic	Manual	Testing	Other
Passive Treatment Systems (cont.)								
PuriStorm	Environment 21	X	X					
Raynfiltr <sup>TM</sup>	Environmental Filtration, Inc.	X	X					
RSF (Rapid Stormwater Filtration) 100	EcoSol Wastewater Filtration Systems	X	X	X			X	X
RSF (Rapid Stormwater Filtration) 1000	EcoSol Wastewater Filtration Systems	X	X	X			X	X
RSF (Rapid Stormwater Filtration) 4000	EcoSol Wastewater Filtration Systems	X	X	X			X	X
Silva Cell	DeepRoot Partners	X		X	X	X		X
SNOUT®	Nyloplast/Hancor, Inc.	X						
Sorbtive™ FILTER	Imbrium Systems Corp	X	X			X	X	X
Storm PURE <sup>TM</sup>	Nyloplast/Hancor, Inc.	X						
StormBasin <sup>TM</sup>	Fabco Industries, Inc.	X	X			X	X	X
Stormceptor®	Imbrium Systems Corp	X	X	X		X		X
StormClean Catch Basin Insert	Clean Way	X	X					X
StormClean Curb Inlet Insert	Clean Way	X						X
StormClean Wall Mount Filtration Unit	Clean Way	X						X
Stormfilter using ZPG Media	CONTECH Stormwater Solutions Inc.	X	X	X		X	X	
StormPod <sup>TM</sup>	Fabco Industries, Inc.	X	X			X	X	X
StormSafe <sup>TM</sup> Helix	Fabco Industries, Inc.	X			X	X		
StormTrooper®	Park USA	X	X					X
StormTrooper® EX Extra-Duty	Park USA	X	X					X
SwaleGard® Pre-filter	Kristar Enterprises, Inc.	X	X			X		
Terre Kleen <sup>TM</sup>	Terre Hill Concrete Products		X	X				X
TREEPOD® Biofilter	Kristar Enterprises, Inc.	X	X			X		
Tolden Donn Lelet Learnet	Revel Environmental Manufacturing, Inc./							
Triton Drop Inlet Insert	CONTECH Stormwater Solutions Inc.	X	X	X		X	X	
Ultra-Urban Filter <sup>TM</sup>	Abtech Industries	X						
Underground Sandfilter (DC Sandfilter)	Rotondo Environmental Solutions, LLC		X					
UniScreen	Environment 21	X	X	X			X	
UniStorm	Environment 21	X	X	X		X	X	
Up-Flo™ Filter	Hydro International, Inc.	X	X	X		X	X	
UrbanGreen BioFilter	CONTECH Stormwater Solutions Inc.	X	X	X		X		X
V2B1 Treatment System	Environment 21	X	X	X			X	
VortClarex	CONTECH Stormwater Solutions Inc.	X	X	X		X		
Vortechs System	CONTECH Stormwater Solutions Inc.	X	X	X		X	X	X

#### Appendix C Index (by Manufacturer/Vendor Name)

					Graphic/	O&M		
Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings S	Specs	Schematic	Manual	Testing	Other
Active Treatment Systems								
Aquatech	WaterTrak Ion Exchange	X				X		
Aquatech	WaterTrak Pressurized Media Filter	X				X		
Aquatech	WaterTrak Reverse Osmosis	X				X		
Aquatech	WaterTrak Ultrafiltration	X				X		
Arkal Filtration Systems/PEP (U.S. Distributor)	Arkal Filter (Spin Klin System)					X		
Arkal Filtration Systems/PEP (U.S. Distributor)	Arkal Media Filter	X						
BakerCorp	Baker Tank with Sand Filter	X		X				
Clear Creek Systems	Chitosan-Enhanced Sand Filtration Using FlocClear™					X	X	
Kaselco	High-Flo Electrocoagulation			X			X	
Morselt Borne BV	Redbox	X						
OilTrap Environmental	OilTrap ElectroPulse Water Treatment System	X		X			X	
Schreiber	Fuzzy Filter	X		X	X		X	
Siemens Water Technologies Inc.	Wastewater Ion Exchange System (WWIX)	X						
StormwateRx	Purus® Stormwater Polishing System	X						
Waste & Environmental Technologies Ltd.	Wetsep	X		X	X			
Water Tectonics, Inc.	ACISTBox®	X						
Water Tectonics, Inc.	pHATBox®	X						
Water Tectonics, Inc.	WaveIonics <sup>TM</sup>	X					X	
Passive Treatment Systems								
ABT, Inc.	First Flush 1640FF	X	X					
Abtech Industries	Ultra-Urban Filter <sup>TM</sup>	X						
ACF Environmental, Inc.	Hydro-Kleen <sup>TM</sup>	X			X			X
Advanced Drainage Systems, Inc	ADS® Water Quality Unit	X	X			X	X	X
AquaShieldTM, Inc.	Aqua Shield Aqua-Filter System	X		X		X		X
AquaShieldTM, Inc.	Aqua Shield Aqua-Swirl Concentrator	X			X	X		X
AquaShieldTM, Inc.	Aqua-Guardian™ Catch Basin Insert	X				X		X
AquaShieldTM, Inc.	Go-Filter	X						X
BaySaver Technologies, Inc.	BayFilter®		X	X			X	X
BaySaver Technologies, Inc.	BaySeparator®		X	X			X	X
BioClean Environmental Services, Inc.	Bio Clean Curb Inlet Basket	X	X	X			X	
BioClean Environmental Services, Inc.	Bio Clean Downspout Filter	X	X				X	
BioClean Environmental Services, Inc.	Bio Clean Flume Filter	X						X
BioClean Environmental Services, Inc.	Bio Clean Grate Inlet Skimmer Box	X						X
BioClean Environmental Services, Inc.	Bio Clean Trench Drain Filter	X						X
BioClean Environmental Services, Inc.	Bio Clean Water Polisher	X	X					
BioClean Environmental Services, Inc.	Nutrient Separating Baffle Box	X	X	X			X	
Bio-Microbics, Inc.	BioSTORM	X	X			X		X
Brown-Minneapolis Tank Co./								
Kleerwater Technologies, LLC	Kleerwater <sup>TM</sup>	X		X	X			X

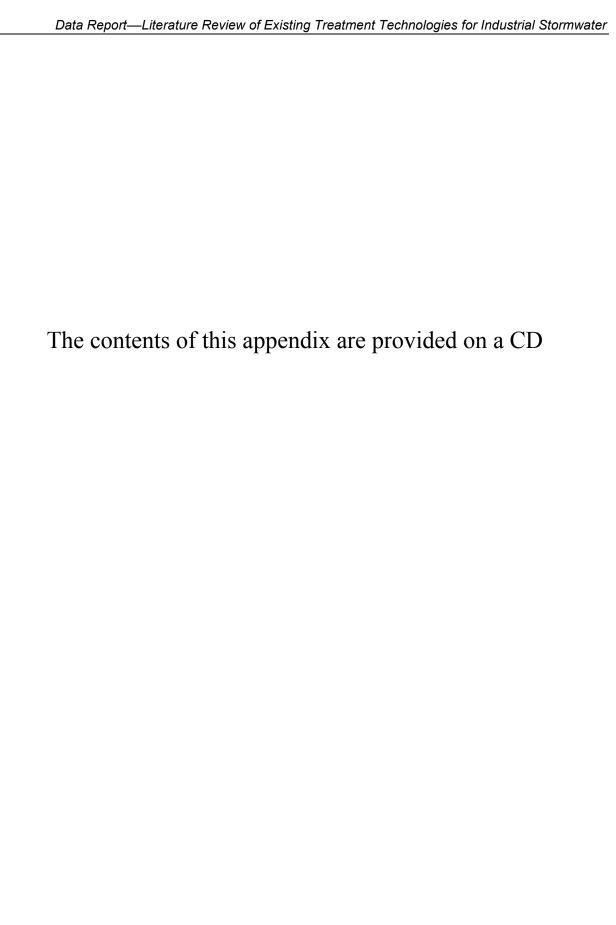
#### Appendix C Index (by Manufacturer/Vendor Name)

					Graphic/	O&M		
Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Schematic	Manual	Testing	Other
Passive Treatment Systems (cont.)								
Clean Way	Clean Way Downspout Filtration Unit	X						X
Clean Way	StormClean Catch Basin Insert	X	X					X
Clean Way	StormClean Curb Inlet Insert	X						X
Clean Way	StormClean Wall Mount Filtration Unit	X						X
ClearWater Solutions, Inc.	ClearWater BMP	X	X			X		
Coanda, Inc.	Coanda Curb Inlet Filter	X	X	X			X	
Coanda, Inc.	Coanda Downspout Filter	X						
CONTECH Stormwater Solutions Inc.	CDS <sup>TM</sup> Stormwater Treatment System	X	X	X		X		
CONTECH Stormwater Solutions Inc.	Stormfilter using ZPG Media	X	X	X		X	X	
CONTECH Stormwater Solutions Inc.	UrbanGreen BioFilter	X	X	X		X		X
CONTECH Stormwater Solutions Inc.	VortClarex	X	X	X		X		
CONTECH Stormwater Solutions Inc.	Vortechs System	X	X	X		X	X	X
CrystalStream Technologies	CrystalClean Separator	X	X				X	X
CrystalStream Technologies	CrystalCombo Hybrid Polisher	X			X		X	X
DeepRoot Partners	Silva Cell	X		X	X	X		X
EcoSense International	EcoSense <sup>TM</sup> Stormwater Filtration Systems	X			X		X	
EcoSense International	EcoVault <sup>TM</sup> Baffle Box	X					X	
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 100	X	X	X			X	X
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 1000	X	X	X			X	X
EcoSol Wastewater Filtration Systems	RSF (Rapid Stormwater Filtration) 4000	X	X	X			X	X
Eco-Tec, Inc.	Adsorb-It	X	X				X	X
Enviro-Drain, Inc.	Enviro-Drain®	X	X					
Environment 21	EnviroTrap Catch Basin Insert	X	X	X			X	
Environment 21	PuriStorm	X	X					
Environment 21	UniScreen	X	X	X			X	
Environment 21	UniStorm	X	X	X		X	X	
Environment 21	V2B1 Treatment System	X	X	X			X	
Environmental Filtration, Inc.	Raynfiltr <sup>TM</sup>	X	X					
Fabco Industries, Inc.	StormBasin <sup>TM</sup>	X	X			X	X	X
Fabco Industries, Inc.	$StormPod^{TM}$	X	X			X	X	X
Fabco Industries, Inc.	StormSafe <sup>TM</sup> Helix	X			X	X		
Filterra, DBAAmericast, Inc.	Filterra® Roofdrain System		X		X	X		X
Filterra, DBAAmericast, Inc.	Filterra® System		X		X	X		X
Hancor, Inc.	Hancor Storm Water Quality Unit	X		X		X	X	X
Huber Technology, Inc.	HUBER Hydro Filt	X			X			
Hydro International, Inc.	Downstream Defender	X	X	X		X		X
Hydro International, Inc.	Up-Flo™ Filter	X	X	X		X	X	
Hydroworks	HydroFilter				X			
Hydroworks	HydroGuard	X	X			X	X	X
Imbrium Systems Corp	Jellyfish <sup>TM</sup> Filter	X	X	X		X		X

#### Appendix C Index (by Manufacturer/Vendor Name)

					Graphic/	O&M		
Treatment System Name	Manufacturer/Vendor Name	Brochure	Drawings	Specs	Schematic	Manual	Testing	Other
Passive Treatment Systems (cont.)								
Imbrium Systems Corp	Sorbtive <sup>TM</sup> FILTER	X	X			X	X	X
Imbrium Systems Corp	Stormceptor®	X	X	X		X		X
Kristar Enterprises, Inc.	FloGard+PLUS®	X	X			X		X
Kristar Enterprises, Inc.	FloGard® Downspout Filter	X	X			X		
Kristar Enterprises, Inc.	FloGard® Dual-Vortex Hydrodynamic Separator	X	X			X		
Kristar Enterprises, Inc.	FloGard® LoPro Matrix Filter	X	X			X		
Kristar Enterprises, Inc.	FloGard® LoPro Trench Drain Filter	X	X			X		
Kristar Enterprises, Inc.	Flo-Gard® Trash & Debris Guard	X	X			X		
Kristar Enterprises, Inc.	Perk Filter <sup>TM</sup>	X	X			X		
Kristar Enterprises, Inc.	SwaleGard® Pre-filter	X	X			X		
Kristar Enterprises, Inc.	TREEPOD® Biofilter	X	X			X		
Modular Wetland Systems, Inc./	Madalan Waland Cartana Linnan							
BioClean Environmental Services, Inc.	Modular Wetland System – Linear	X	X	X		X	X	X
Nyloplast/Hancor, Inc.	SNOUT®	X						
Nyloplast/Hancor, Inc.	Storm PURE <sup>TM</sup>	X						
Park USA	StormTrooper®	X	X					X
Park USA	StormTrooper® EX Extra-Duty	X	X					X
PSI International, Inc.	PSI Separator				X	X		X
Revel Environmental Manufacturing, Inc./	Tritan Dung Inlat Innast							
CONTECH Stormwater Solutions Inc.	Triton Drop Inlet Insert	X	X	X		X	X	
Rotondo Environmental Solutions, LLC	Perimeter Sandfilter (Delaware Sandfilter)		X					
Rotondo Environmental Solutions, LLC	Underground Sandfilter (DC Sandfilter)		X					
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoLine A®	X	X					
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoLine B®	X	X		X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoSep®	X	X	X		X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoStorm ®	X	X	X	X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoStorm Plus®	X	X	X	X	X		X
Royal Environmental Systems, Inc./Water Tectonics, Inc.	ecoTop®	X	X	X				
Stormdrain Solutions	Inceptor®	X					X	X
StormwateRx	Aquip® Enhanced Stormwater Filtration System	X			X			
StormwateRx	Clara® Gravity Stormwater Separator Vault	X			X			
Terre Hill Concrete Products	Terre Kleen <sup>TM</sup>		X	X				X
Transpo Industries, Inc.	EnviroSafe <sup>TM</sup>	X						
Transpo Industries, Inc.	EnviroSafe™ Storm Safe HF10	X				X		
United Storm Water, Inc.	DrainPac <sup>TM</sup>		X	X		X	X	X

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### APPENDIX D

## Excel Versions of Tables 3 through 12

