528 Hi Tech Parkway, Oakdale, CA 95361
1-800-764-5220
www.safedrainusa.com

October 2, 2020

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

Re: Trash Treatment Control Device Certification Application
For
Safe Drain Stormwater Holdings, Inc. (SAFE DRAIN)
STORM VECTOR GUARD (SVG)

Dear Mr. Favila:

Thank you for the opportunity to submit our application for approval of the SAFE DRAIN Full Capture System Trash Treatment Control Device, our "**Storm Vector Guard**" (hereinafter, the "SVG"). Information is presented and organized herein in accordance with the Trash Treatment Control Device Certification and Fact Sheet Update Requirements updated July 2020. Per the submittal requirements, the following document is broken into the following eight sections:

1. Cover Letter;
2. Table of Contents;
3. Physical Description;
4. Installation Guidance;
5. Operation and Maintenance Information;
6. Vector Control Accessibility;
7. Reliability Information; and,
8. Field/Lab Testing Information and Analysis

Appendices

Thank you for reviewing this application, if any additional information is required please feel free to contact me directly at (209)255-8070. We appreciate your assistance in processing our application.

Sincerely,

/Kenneth A. Murray, Jr./ 2020-10-02

Ken Murray
Vice President & General Counsel
Safe Drain Stormwater Holdings, Inc.

1. COVER LETTER

a. General Description

The SAFE DRAIN STORM VECTOR GUARD ("SVG") is an engineered, patent-pending custom-manufactured stainless-steel perforated catch basin insert designed to effectively capture trash and debris as well as sediment and silt. The SVG is placed directly under a catch basin drainage grate and/or suspended below a catch basin curb inlet/opening to collect and capture trash and debris from surface stormwater runoff. In particular, the SVG is configured with an easily accessible port which penetrates the bottom of the basin to allow mosquito vector control personnel and technicians to quickly inspect and retrieve samples from the interior of the catch basin below the SVG. The SVG is based on SAFE DRAIN technologies that have been in use for 30+ years.

b. Applicant Contact Information and Location(s)

California-based Point of Contact:

Mr. Ken Murray
800-764-5220
ken@safedrainusa.com
Vice President & General Counsel
528 Hi-Tech Parkway
Oakdale, CA 95631

Manufacturing Facility Point of Contact:

Mr. John Deming
408-568-6752
john@safedrainusa.com
President / CEO
528 Hi-Tech Parkway
Oakdale, CA 95631

c. Manufacturing Location

The SAFE DRAIN SVG is designed and manufactured at our facilities at 528 Hi-Tech Parkway, Oakdale, California 95631. They are stocked locally at this same facility.

d. Brief Summary - Field/Lab Testing Results Summary.

Multiple models of the SAFE DRAIN SVG's have been field tested at ten separate sites as part

of a trial program with the City of Modesto, CA. The SAFE DRAIN SVG's were installed in August of 2019. Over the course of this time, periodic surveys to include inspection and service (cleaning and filter replacement) were performed on the SAFE DRAIN SVG's. During the 3-month period (October, November and December 2019), the SVG's were manually cleaned and the captured debris was weighed for each SVG location. The total debris collected for the quarter was approximately 234 pounds (107 cubic feet) across all 10 drains for an average collection of approximately 23.4 pounds (10.7 cubic feet) per drain. On an annual level assuming installation across all 11,500 drains in Modesto, approximately 1 million pounds (490,000 cubic feet) of debris, sand, sediment, silt and other contaminants would be captured and prevented from entering surrounding surface waters and associated dry wells.

SAFE DRAIN has also deployed several systems at various locations for the California Department of Transportation.

Still further, SAFE DRAIN has deployed and operated pilot systems for the County of Santa Cruz, emphasizing capture of trash as well as sand and sediment. Given its coastal location, Santa Cruz has an ongoing issue with the accumulation of sand, sediment and silt in its catch basin. The "Sand Capture" SVG has successfully addressed this issue for Santa Cruz and the pilot project is now being expanded.

Additional detail on the Modesto program and an excerpt from a service report can be found in Appendix A.

e. Brief Summary - Device Limitations

The **SVG** is produced in several standard sizes but is also custom-designed to ensure proper fit for installations below a grate and within the mouth of a curb inlet. The SVG is designed to fit the California market for the majority of standard catch basin openings and grate sizes. Due to some variability in "standard" or "as-built" catch basin openings, and other unique catch basin configurations, SAFE DRAIN uses its Measurement Guidelines (see Appendix E) to ensure each SVG is manufactured to properly fit each storm drain inlet and the associated catch basin.

An SVG can be installed directly in the storm drain inlet opening on the lip used to support the storm drain grate, or, on struts positioned and anchored further down in the catch basin. Use of struts allows the capacity of the SVG to be increased dramatically by leveraging a portion of the volume of the associated catch basin.

For curb inlet wall mount, the SVG may be inserted through the associated manhole opening, support struts are secured to the catch basin wall beneath the curb opening, and the SVG is mounted onto the support struts. For many catch basins, installation only takes a few minutes via "drop-in" installation in the mouth of the drain inlet. Where support struts are used, each SVG can be installed within approximately 60 minutes, depending on the length of the SVG.

Maintenance frequency, i.e., cleanout and filter replacement, is typically performed when the SVG baskets are one-third to one-half full, or preferably, at least every 3 months. Maintenance frequency may be increased or decreased depending on location loading, insert storage capacity, wind driven trash and wet weather event frequency and anticipated contaminant loading. Trash/debris removal is easily accomplished using an industrial vacuum, typically accompanied by some manual removal of larger debris.

Due to SAFE DRAIN's ability to configure each basin to fit any drain inlet or catch basin, there are effectively minimal limitations associated with the use of SAFE DRAIN SVG technology and systems.

f. Installation Locations

SAFE DRAIN has sold its flagship stainless steel insert baskets and spill containment systems (i.e., the original "Safe Drains,") into a plurality of US and international markets, including California, with excellent results. SAFE DRAIN has been installing such systems for over 30 years with no failures. As indicated above, the SVG, which is a derivative of the original "Safe Drain" spill containment and filtration technology, is most recently installed in California in Modesto and Stanislaus county, along with other locations for the California Department of Transportation. Please refer to Appendix A for more detailed information concerning the Modesto installations.

SAFE DRAIN has provided filtration systems with its spill containment devices targeting various levels of particle size and pollutant/contaminant removal since 1990 with well over 4000 installations throughout the country and internally. SAFE DRAIN's 14 GA perforated stainless-steel walls and bottom include ½" (3.175 mm) perforations with a 40% open flow area. Larger perforations may be provided but the current configuration ensures that 5 mm or larger debris is captured and filtered from any stormwater runoff without impeding flow. Field test results in Modesto, CA and Stanislaus County, CA have been successful in capturing cigarette butts, leaves and trash and other debris without re-suspension. The 3.175 mm perforations allow ample flow during a wet weather event and will not blind from sand and sediment loading off streets and parking lots. Optimal performance is ensured by incorporating appropriate operational services to remove trash and debris on a regular basis.

g. Certification Clause.

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

/Kenneth A. Murray, Jr./ 2020-10-02

Ken Murray
Vice President & General Counsel
Safe Drain Stormwater Holdings, Inc.

2. Table of Contents

3. Physical Description

a. Trash Capture

"Describe how the device traps all trash particles 5 mm or greater in size."

The SAFE DRAIN SVG insert ensures that all particles greater than or equal to 5mm are captured by constructing the filtering body of the insert from uniformly punched stainless steel with 3.175 mm (½") or 4.7625 mm (3/16") openings. This ensures that no particles larger than 4.7625 mm can pass through the filter, which complies with current regulatory requirements of preventing the passage of particles 5 mm or greater in size. SVG inserts are sized to fit the mouth of the catch-basin and include panels fitted to the catch basin to prevent overflow of trash into the catch basin. The size of the SVG insert is directly related to the size of the catch-basin. The performance characteristics generally scale with the size of the SVG.

SAFE DRAIN has established a catalog of common sized inserts based on the standard drainage structures found throughout California. An Installer (Contactor) will inspect the plans and/or worksite to determine the quantity and size of each drainage structure casting type. The catch basin design, casting number, or the exact grate and clear opening size will provide the information necessary to identify the required SAFE DRAIN SVG insert part number. Inserts are supplied to the field pre-configured to fit the specified drainage structure. Generally, flow capacity and trash storage capacity may be increased by increasing the depth of the SVG insert.

b. Peak Flows/Trash Volumes

"Explain how the SVG is sized for varying peak flow rates and trash capture volumes."

(1) **Peak Flow Rates -** The design engineer will need to select the appropriately sized SVG for the corresponding catch basin. The size of a catch basin is typically configured to accommodate specific peak flow rates. The corresponding size of the SVG will likewise be sized to accommodate the corresponding peak flow rates. Peak flow rates may be increased by increasing the depth of the SVG, thereby increasing the open flow area.

(2) **Trash Volume Capacity -** The trash volume capacity for each SVG will vary based on size of the SVG fitted to the related catch basin. Where additional capacity is desired for a specific sized catch basin, the depth of the SVG may be increased.

c. Hydraulic Capacity

1) *"For all standard sizes, provide a table of the hydraulic capacity (flow rate) when the device is empty and at several intervals of trash capture volumes up to the device's recommended maximum trash capture volume; and*
2) *If the devices have alternative configurations that impact the hydraulic capacity, include a table of the hydraulic capacity for each device configuration.*
3) *If hydraulic capacities are calculated, provide the formulas used and at least one example of the completed calculations. If hydraulic capacity was observed through laboratory or field testing, provide the testing report."*

See Appendices C-1, C-2 and C-3.

d. Comparison Table

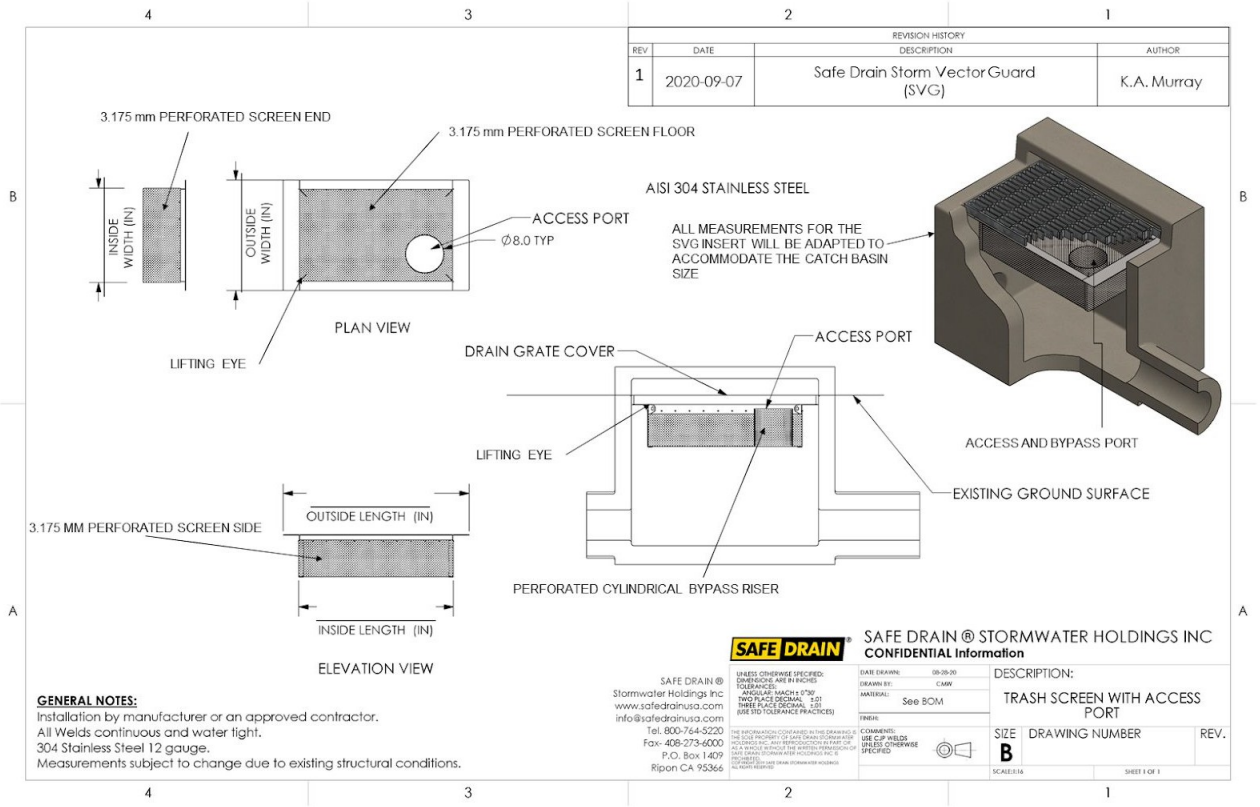
"For all standard sizes, provide a table that includes the peak flow rates, and recommended maximum trash capture volume."

SVG Dimensions (L, W, H) (in)	L (in)	W (in)	H (in)	Surface Area (sq. in.)	Holes Per Square Inch	Total Number of Holes	Flow Rate Per 3/16" Perforation (gpm)	Peak Flow Rate Total (gpm)	Peak Flow Rate Total (cfs)	Maximum Trash Capture Volume (cu. ft.)
48x48x12	48	48	12	4608	15	69120	0.59084	40839	91	16
48x48x18	48	48	18	5760	15	86400	0.59084	51049	113	24
48x48x24	48	48	24	6912	15	103680	0.59084	61258	136	32
48x48x36	48	48	36	9216	15	138240	0.59084	81678	182	48
48x36x12	48	36	12	3744	15	56160	0.59084	33182	74	12
48x36x18	48	36	18	4752	15	71280	0.59084	42115	94	18
48x36x24	48	36	24	5760	15	86400	0.59084	51049	113	24
36x36x12	36	36	12	3024	15	45360	0.59084	26801	60	9
36x36x18	36	36	18	3888	15	58320	0.59084	34458	77	14
36x24x12	36	24	12	2304	15	34560	0.59084	20419	45	6
36x24x18	36	24	18	3024	15	45360	0.59084	26801	60	9
24x24x12	24	24	12	1728	15	25920	0.59084	15315	34	4
24x24x18	24	24	18	2304	15	34560	0.59084	20419	45	6
24x24x24	24	24	24	2880	15	43200	0.59084	25524	57	8

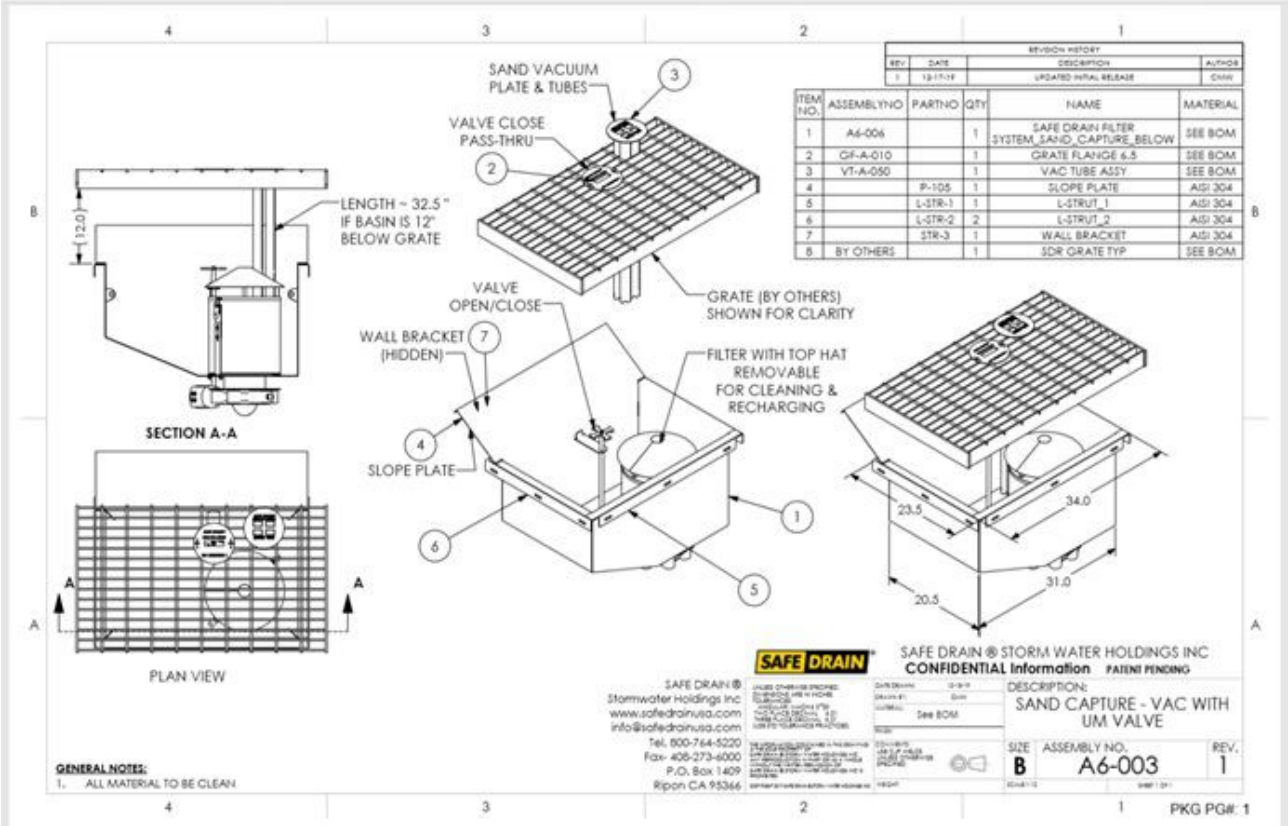
e. Design Drawings

"Provide design drawings for all standard device sizes and, if any, alternative configurations (e.g., reflector screen, filter media, etc.)

1 - Flexible Stove Pipe Configuration for Vector Control Accessibility with Perforated Walls



2 - Sloped Basin Configuration with Centralized Riser for Filtration Module and Vector Control Accessibility with Optional Conical Cap and Undermount Control Valve and Extractor Array



ITEM NO.	ASSEMBLY NO	PART NO	QTY	NAME	MATERIAL
1	A6-006		1	SAFE DRAIN FILTER SYSTEM_SAND_CAPTURE_BELOW	SEE BOM
2	GF-A-010		1	GRATE FLANGE 6.5	SEE BOM
3	VT-A-050		1	VAC TUBE ASSY	SEE BOM
4		P-105	1	SLOPE PLATE	AISI 304
5		L-STR-1	1	L-STRUT_1	AISI 304
6		L-STR-2	2	L-STRUT_2	AISI 304
7		STR-3	1	WALL BRACKET	AISI 304
8	BY OTHERS		1	SDR GRATE TYP	SEE BOM

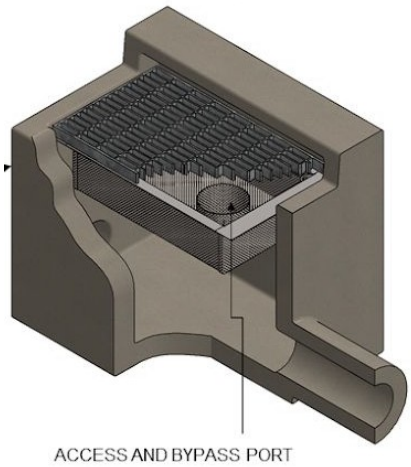
f. Alternative Configurations

"If the device includes alternative configurations, explain the purpose of each configuration and mandatory installation conditions."

See Section 3.j., below, "Photos (and Alternative Configurations)".

g. Internal Bypass

"If the Device has an internal bypass, explain how the bypass functions to only allow a bypass of flows exceeding the peak flow rate."



The bypass region of the SVG is provided via a cylindrical riser extending from the floor of the SVG. As flow increases or

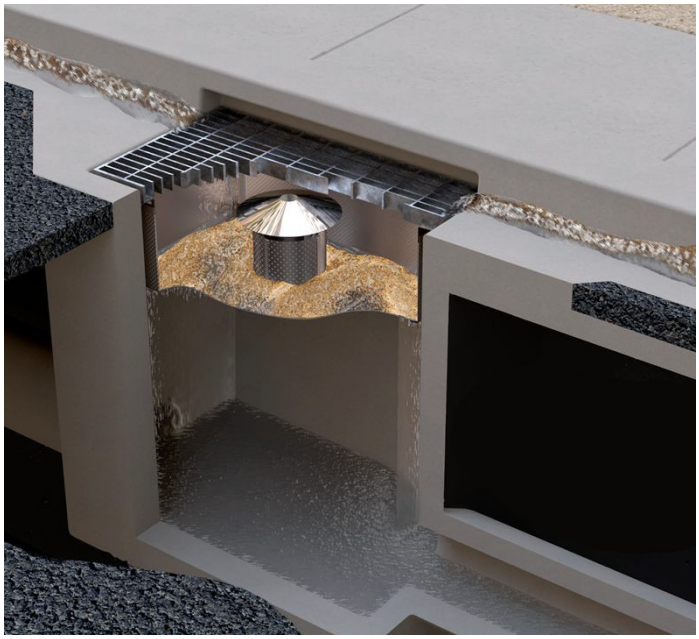
debris/trash collects in the SVG, the storm water runoff can overflow into the bypass region of the cylindrical riser. The peak flow capacity of the bypass varies based upon the diameter of the cylindrical riser. Multiple risers may be installed to increase overflow capacity.

The bypass only becomes active should the basket become completely filled with storm water, trash, or debris. In these cases the water spills over the top of the wall of the cylindrical bypass and is deemed to have entered bypass mode.

Hydraulic calculations for the bypass region of the SD SVG inserts can be found in Appendix C-2. The customer engineer is responsible for confirming that ultimate bypass capacity of the SVG is sufficient based upon a one-hour one year peak flow from the subdrainage area. The diameter of the bypass can be increased to accommodate higher bypass capacity requirements. Typical sizes are from 4" to 10" diameter. The bypass is also sized to allow passage of a dipping cup used by mosquito vector control field personnel for taking samples in the catch basin to check for mosquito larvae and eggs.

h. Previously Trapped Trash

"Explain the conditions under which the device re-introduces previously trapped trash (e.g,. via the internal bypass)."



The SVG will not reintroduce previously trapped trash unless there is a backflow in the storm conveyance system. If water is entering the SVG capture compartment normally through the drainage grate, the previously trapped trash will continually compact into the basket and will be prevented from passing through the overflow bypass region by a perforated or conical cap placed over the bypass stove pipe. The cap may have perforations that are no larger than 3/16" or 4.7625 mm in diameter to prevent particles greater than 5 mm in diameter from passing through. However, the density of perforations in the cap may be increased to adjust to differing required flow rates. The cap may be removed if necessary to further increase flow rate of the bypass. The conical configuration of the cap prevents floatables from bypassing and entering the catch basin via the overflow, while still allowing stormwater overflow.

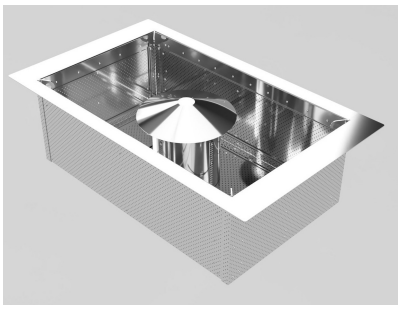
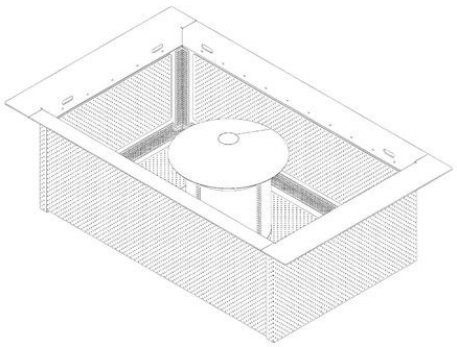
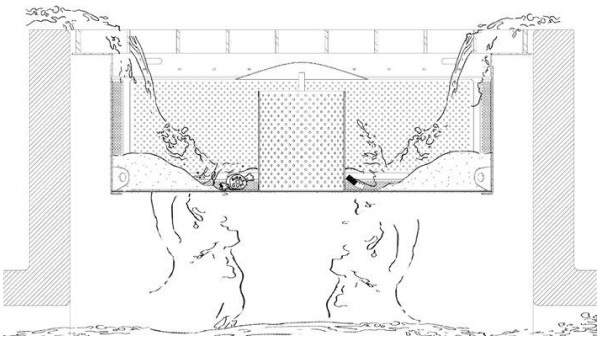
i. Calibration Features

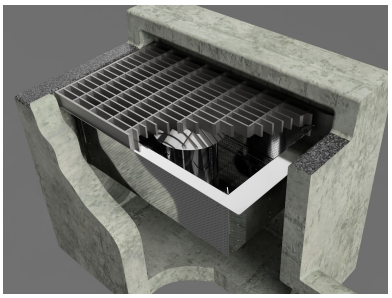
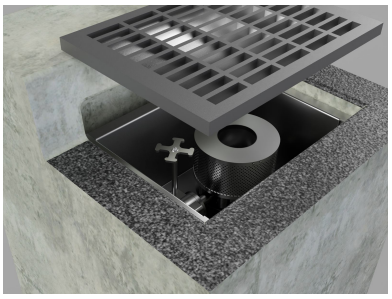
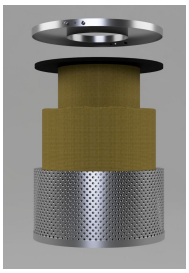
"If the device includes an adjustable calibration feature, describe how the calibration feature functions."

Not Applicable.

j. Photos (and Alternative Configurations)

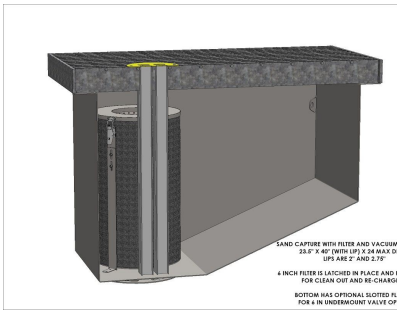
"If any, provide device installation photographs."

Description	Image
1 - Safe Drain Stainless Steel "Storm Vector Guard" SVG with perforated bottom, sides and central riser where centralized cylindrical riser serves as both overflow bypass region and vector control access port with optional cap.	  

2 - SVG Installed In Catch Basin Cutaway of curb-based SVG installed in the catch basin under storm drain grate with cylindrical overflow bypass and vector control access cap.	
3 - SVG with Valve and Filtration Cartridge SVG installed in curb drain inlet further including manual control valve and filtration cartridge around vector control access and overflow bypass.	
4 - Filtration Cartridge Module Versions of the SVG may include a filtration module incorporated with the cylindrical overflow bypass. In other versions, the filtration module may be incorporated with a control valve.	
5 - Sloped Basin - Sand, Silter and Full Trash Capture Device Other versions of the SVG include a sloped portion to cause sand, silt, trash and debris to slide down in closer proximity to the cylindrical riser for easier extraction. Sides and floor of the sloped basin may not include perforations. Flow capacity and filtration is then provided through the filtration module having 3/16" perforations.	

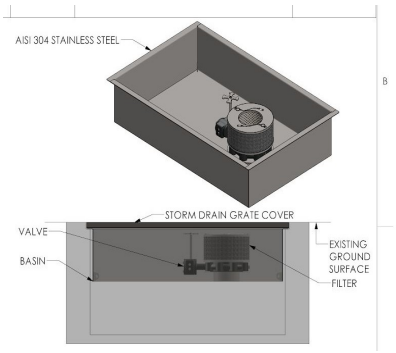
6 - Extractor Array - Sloped Basin

Still another version of the SVG may include an extractor array deployed through the storm drain grate and used to vacuum, wash down and treat the interior of the SVG. The extractor array is shown as part of a sloped basin, but may also be used in a standard basin.



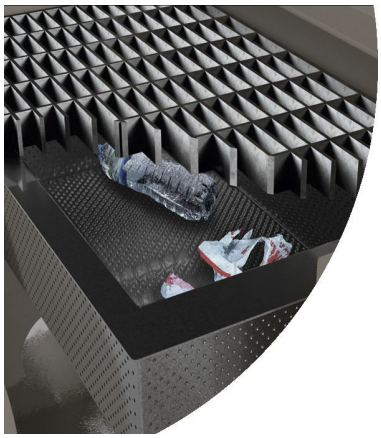
7 - Control Valve

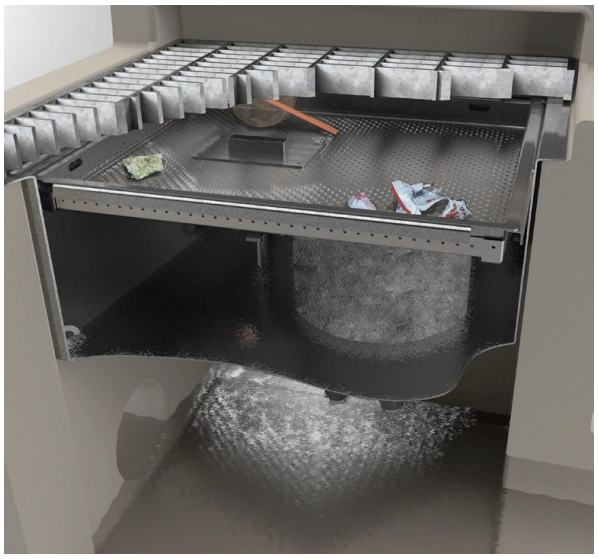
Other versions of the SVG may include a control valve located adjacent to the floor of the SVG, typically, a butterfly-type valve. The butterfly valve may be opened or closed to allow or prevent flow into the catch basin, with filtration performed via the filtration module. The valve may also be positioned underneath the floor of the basin, i.e., an undermount valve installation.



8 - Basic Full Trash Capture Device

A basic version of the full trash capture device may be rectangular, square or circular, depending on the shape of the drain inlet. This basic version may not include a vector control access port and would need to be removed to provide access to the lower portion of the catch basin. Overflow capacity is provided via slots around the upper perimeter.



9 - Retrofit Trash Capture Tray Another version of the full trash capture device comprises a 3/16" perforated tray placed above an existing insert basin to prevent trash from entering an existing insert basin and passing into the catch basin.	

Device Installation Photographs

Please see Appendix E for a plurality of device installation photographs.

k. Material Type

"Provide each material and material grade used to construct the Device (e.g., stainless steel, plastic, etc.)"

The SVG is constructed from 304 stainless steel of varying gauges. The insert basket includes internal lifting eyes to facilitate installation and removal of the SVG into and out of the storm drain inlet structure/catch basin. Internal support flanges used within a catch basin are typically 12 GA 304 stainless steel, depending on the size of the SVG. These support flanges are configured to ensure that all runoff flows into the basket with any overflow bypassing into a cylindrical riser whose upper level is lower than the top elevation of the support flanges to avoid flooding.The cylindrical overflow bypass riser is designed to accommodate anticipated overflow requirements.

The active perforated filtering component is 12 GA perforated stainless steel. The basket is uniformly punched with 3/16" dia. holes (4.7625 mm) in such a pattern that the basket has approximately 40% open area and retains any particles 5 mm or larger.

There are no plastic components associated with the SVG.

l. Design Life

"Provide the estimated design life."

The SVG inserts have an estimated 20 to 30 year design life when used in storm water

applications exposed to moderate levels of salt and other naturally occurring roadway contaminants. The loading for each size insert is considered and the support materials have been tested with considerable safety factor based on 125 lbs. per cubic ft. storage capacity. For applications in proximity to a marine environment, 316L stainless steel is recommended due to its resistance to salt.

4. Installation Guidance

a. Standard Device Installation Procedures and Considerations.

1 - Installation into Standard Grated Drainage Structures (Area Drains):

Remove the storm drain grate from the casting or concrete drainage structure using a grate removal tool. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Apply food grade sealing adhesive about the entirety of the ledge to create a leak proof seal with the SVG. Lower the SVG through the clear opening and be sure the support flanges of the SVG rest firmly on the support ledge of the structure. Replace the grate and confirm it is elevated no more than ½".

Alternatively, where it is desirable to avoid any rise in grate elevation, a support frame may be installed underneath the grate using support struts to hold the SVG and to ensure that no rise of the grate occurs. Ensure that any small gaps around the perimeter of the SVG and the concrete ledge of the catch basin are sealed with appropriate adhesive/caulk.

***2* - Installation into Curb Inlets:**

Installation for curb inlet applications will depend on whether the SVG needs to be slid through the curb mouth or whether there exists access via an adjacent manhole. For curb inlet wall mount inserts, the SVG basket profile size is typically 12" h x 12" d with lengths up to 48". Where manhole access exists, the SVG may be lowered into the catch basin through the manhole opening. Then, wall mount support bracket locations are marked on the basin wall beneath the street/curb opening. A hammer drill is then used to install wedge anchor bolts into the concrete wall to secure the support brackets.The SVG is then lifted to engage the support brackets allowing the basket to hang within the catch basin, capturing all runoff entering the mouth of the curb inlet. For multiple lengths on longer curb openings, multiple SVG insert baskets may be hung to cover the entire length of the curb inlet. Where manhole access is not available, the SD SVG insert basket may be custom-sized to ensure that it can be slid through the mouth of the curb inlet. The SVG may be supported via anchors that are installed in close proximity to the mouth of the curb inlet, providing sufficient support to allow the entire SVG to span across the catch basin to the further wall.

b. Device Installation Limitations and/or Non-standard Device Installation Procedures

Not applicable.

c. Methods for Diagnosing and Correcting Installation Errors.

SAFE DRAIN has found that "as-built" dimensions for catch basins may differ due to activities during construction that can result in "non-standard" sized configurations. Consequently, SAFE DRAIN obtains actual dimensions for each storm drain rather than relying on a presumption of standardization. SAFE DRAIN assists each customer with measurement by the provision of measuring guidelines for each type of storm drain configuration. SAFE DRAIN can build SVG inserts for any catch basin configuration. SAFE DRAIN "Measuring Guidelines" are provided in Appendix E for various types of catch basin and drain inlet shapes.

5. Operation and Maintenance Information

a. Inspection Procedures and Frequency Considerations.

Each SVG may be visually inspected by personnel through the overlying storm grate to determine whether service is required. The visual inspection may be performed by either looking through the storm grate openings or by removing the storm grate if visibility is an issue. Upon inspection, it is recommended that the SVG be emptied if the trash level is at ½ full, or as directed by the engineer, city, or municipal contract.

For servicing, in one instance, the service crew will remove the storm drain grate and use an industrial vacuum to remove the trash and debris that has collected in the SVG basket. The service crew will remove any caked on trash and debris from the basket to ensure proper flow. After the SVG basket has been cleaned, the grate is replaced. A record of the maintenance should be entered in an appropriate maintenance log.

Depending on the size of the storm drain inlet and associated catch basin, the volumetric capacity will vary. Where the storm drain inlet/catch basin is smaller in size, and thus, the SVG is necessarily also smaller in size, more frequent inspection and servicing is likely required. The frequency should be adapted as personnel identify problematic areas.

b. Maintenance Frequency Considerations Regarding Hydraulic Capacity at Various Levels of Trash Capture Volume

As with all stormwater BMPs, inspection and maintenance must occur on a regular basis or the trash capture and filtration mechanism can become overloaded and rendered useless, causing stormwater and associated entrained debris to flow into the bypass area. If inadequate maintenance occurs, the SVG may become completely filled with trash and debris until reaching the overflow bypass which would still allow full water flow but without filtration or trash capture. Any additional trash entering the drainage structure could then be transported directly into the storm sewer system.

Depending on the site, monthly or quarterly inspections are recommended. Maintenance frequency will vary based on the location and associated weather events. Inspections will allow the operator to adjust maintenance frequency as necessary to ensure that the SVG is able to operate at optimal capacity.

Safe Drain recommends that inspections preferably occur at least four times per year (every quarter). Where extreme wet weather events are anticipated, which might result in flooding if

the SVG has not been cleaned, more frequent maintenance will be required. Over time, and based on maintenance logs, those troublesome areas, i.e., "hotspots", will be identified and can be placed on a more frequent inspection and maintenance schedule. Likewise, less problematic areas may be cleaned less frequently.

c. Maintenance Procedures, Including Procedures to Clean the Trash Capture Screen

In its simplest form, the SVG may be manually cleaned using a small shovel, spade and brush to remove debris and material. Alternatively, an industrial vacuum cleaner may be used to remove the majority of debris with some manual removal of pieces too large to fit through the hose of the vacuum. Furthermore, the industrial vacuum cleaner may be used in conjunction with a pressure washer to more thoroughly clean the basket of the SVG.

Whenever particulate material including trash blinds any portion of the trash capture screens of the SVG, a stiff bristle brush may be used to remove the debris across the perforations. The debris may then be removed manually or using an industrial vacuum cleaner. If a filtration module is present, it should be inspected and changed as necessary.

d. Essential Equipment and Materials for Proper Maintenance Activities

The SVG's are easily cleaned using a minimum of equipment. In its simplest form, the SVG may be manually cleaned using a small shovel, spade and brush to remove debris and material. Alternatively, an industrial vacuum cleaner may be used to remove the majority of debris with some manual removal of pieces too large to fit through the hose of the vacuum. Furthermore, the industrial vacuum cleaner may be used in conjunction with a pressure washer to more thoroughly clean the basket of the SVG.

Field service personnel must wear appropriate personal protective equipment (PPE) including safety glasses/goggles, gloves, steel toed boots, and hard hats. The hard hats should include a device, such as a strap, to prevent the hard hat from falling off during cleaning and service activities. Depending on the circumstance and location, service personnel should also wear protective clothing and respirators designed to protect from any contaminants, fumes, dust or other chemicals that might have been collected by the SVG, e.g., hydrocarbons, odors from decomposition.

e. Deferred Maintenance Effects

Typically, the structural integrity of each Safe Drain SVG is not impacted by deferred maintenance. However, operationally, deferred maintenance can result in filling of the SVG basin with trash and debris which will reduce flow capacity based on covering and blinding of the screen perforations. In addition, deferred maintenance might result in odors where the trash has collected, remains in a moist state and begins to decompose. However, in most

cases, the Safe Drain SVG will continue to drain after a wet weather event so that any captured debris has the opportunity to dry.

f. Repair Procedures for Structural and Screening Components

Although unlikely, if damaged, the SVG's are preferably replaced rather than repaired. Since the SVG's are constructed of stainless steel and may be serviced in place, there is little potential for damage during service or operation. The SVG's are welded to form one robust structure that is sized to fit within the associated catch basin adjacent to the mouth of each storm drain inlet.

6. Vector Control Accessibility

a. MVCAC Certification Submittal Date: October 2, 2020

b. Description of Accessibility - Observation and Treatment

Mosquito Vector Control (MVC) personnel can readily access the bottom of the storm water vault through a throat of the SVG cylindrical bypass riser, i.e., the mosquito vector access control and overflow port. In certain configurations, the throat of the bypass riser will be open as an overflow passage. In other configurations, the overflow riser will include a perforated or solid cap covering the throat of the filter assembly riser. The cap is easily lifted off, removed or pivoted to provide direct access through the throat of the riser for both visualization and treatment. The cap on the riser helps to prevent entry of trash or debris through the bypass throat during a wet weather event.

Currently, MVC personnel will need to remove the overlying storm grate for visual assessment and treatment access. The SVG insert basins provide a bypass area with a minimum 6" opening to allow vector control insertion of mosquito pellets into the catch basin without requiring removal of the SVG basin. Furthermore, the perforations in the filter screen ensure that standing water does not accumulate, discouraging mosquito breeding. Each SVG basin is configured to drain to a lower point, ensuring minimal water/moisture retention. In configurations including a shutoff valve, the valve is preferably mounted under the floor of the SVG basin to ensure complete drainage.

If additional access is required, the entire SVG insert basin may be removed using lifting hooks at each corner of the insert basin. The SVG insert basin may be removed using straps attached to these hooks by 2 persons.

c. Letter of Verification: PENDING

7. Reliability Information

a. Estimated Design Life of Device Components Before Major Overhaul

The Safe Drain SVG has an estimated design life of 30 years before any major overhaul might be required. Safe Drain has existing systems that have been deployed and operational for over 20 years without the need for any overhaul. Safe Drain SVG's are durable and robust stainless steel insert basins. The primary stainless steel components of the SVG will not corrode or break down even when subjected to heavy loading conditions, exposure to salt or chemicals, or during extreme temperature conditions. The Safe Drain SVG's do not rely on fabric/mesh material to capture trash and debris. Such material is known to quickly degrade and fail during extreme weather conditions or due to neglect.

In accordance with regulatory requirements, the SVG perforated stainless steel basin is designed to remove and filter trash and debris of 5 mm diameter size or greater. The perforated portion does not address concerns over capturing smaller particles or other contaminants, such as hydrocarbons, nutrients, or heavy metals. However, Safe Drain provides other proprietary filter modules and media inserts to trap and capture smaller particles and contaminants while still supporting adequate flow performance. The stainless steel screen perforated openings will not prematurely blind like geotextile filter elements, ensuring continuous flow during a wet weather event.

b. Warranty information

The stainless steel materials along with product construction are warranted for a period of 10 years from the date of installation. During the warranty period, the SVG insert basin (excluding filter media or valve assemblies) will be replaced at no charge to the end user provided the SVGs were originally installed properly for their intended use as a full trash capture treatment device.

c. Customer Support Information

SAFE DRAIN has a support team with local field representatives and product managers. The California Product Manager is John Deming and he can be reached at 1-800-764-5220 or john@safedrainusa.com.

SAFE DRAIN headquarters can address any engineering and design questions at 800-764-5220 or john@safedrainusa.com.

SAFE DRAIN website: www.safedrainusa.com

8. Field/Lab Testing Information and Analysis

a. Provide available field or lab testing information that demonstrates Device functionality and performance.

Appendix A includes information associated with a pilot study performed with the City of Modesto, CA for various SVG configurations supplied by Safe Drain. Additional data regarding performance values for the catch basin inserts can be found in Appendix C-1 and C-2.

Safe Drain's SVG's were installed for a pilot test in Modesto,CA in August of 2019 to capture trash, debris, leaves and other materials in high traffic areas of downtown Modesto. The ultimate overflow bypass associated with the SVG prevents ponding should the basin become completely filled with trash, sediment or other debris, e.g., leaves. The ultimate overflow bypass includes ports significantly larger than 5mm which will allow larger material, such as leaves, to pass through in an emergent situation where the basin may not have been adequately serviced.

b. Lack of 5 mm Screen

Not applicable.

Appendix A: City of Modesto, California - Pilot Program Service Report

The City of Modesto Trash Capture Pilot Program has been ongoing since August 8, 2019 in 10 different storm drains. Different versions of the SVG were installed to check effectiveness in both trash capture performance and storm water filtration.

Four of the ten Modesto inserts were Safe Drain's flagship valved filtration systems ("SDV"), known throughout industry as "Safe Drains." The "Safe Drain" type system has typically been used in industry primarily for spill containment purposes but also uniquely functions as both a trash capture and contaminant filtration solution. The SDV-type basins are made of 14 GA stainless steel. A butterfly valve is situated in the bottom floor of the SDV basin. A perforated filtration riser cage extends upward from the floor of the SDV basin concentric with the valve opening. The filtration riser cage is wrapped with a filtration donut composed of an external nylon mesh material filled with Safe Drain's proprietary filtration media. The Safe Drain proprietary filtration media removes hydrocarbons and various other contaminants likely to be washed into the basin from the adjacent impervious surfaces. The nylon mesh has a tight weave that prevents particles and debris greater than 5 mm from entering the catch basin, while still supporting sufficient flow during a wet weather event.

In each SDV-type installation, as shown by the images in the following report, trash capture was effective and silt and sediment was also captured. The SDV allows the valve to be closed and the SDV to be isolated from the storm sewer network during cleaning and service. Consequently, a service crew is able to use a pressure wash system to thoroughly clean and disinfect the basin after vacuuming or manually removing the debris from the SDV basin. At each service, the filter media was checked to determine if flow properties were diminished due to clogging by silt and soil, then replaced as necessary. Consequently, the SDV can be safely used as both a spill containment mechanism and as a trash capture device.

The remaining six Modesto insert basins do not include control valves, but instead are configured strictly for full trash capture and filtration, consisting of perforated walls of 14 GA stainless steel.

Following is an excerpt of a Service Report provided to the City of Modesto for the month of October, 2019 addressing the performance of the 10 SDV/SVG systems associated with the pilot project. Additional services have been provided over the past year resulting in a significant recovery of trash and debris.

SAFE DRAIN®

Storm Water Pollution Prevention Systems

SAFE DRAIN®
Field Service Report

Customer:
City of Modesto
1010 10th St Modesto Ca
Contact: Paul King

Date: 11/07/2019
Temp:
Conditions: Clear, cool

Purpose: To document the field service activities and allow for tracking and trending of site conditions, product performance, and proof of service. These reports are confidential in nature and must not be furnished to any parties outside of Safe Drain Stormwater Holdings, Inc. personnel and/or their respective customer contacts.

General Information

Safe Drain® Unit ID: #6 La Hermosa
Location: 7th and H st. **Type:** Trash Capture

Site Evaluation

Pollutants: (circle one) ☒ *Trash* ☒ *Organic* ☒ *Sediment* ☐ *Chemicals** ☐ *Oil* ☐ *Metallic*

Unit Condition: (circle one) ***Excellent*** *Very Good* *Good* *Fair* *Poor* *Damaged*

Does Unit Contain Standing Water? (circle one) ☐ *YES* ☒ *NO* **Water Test Results: pH N/A**
Notes: (this can include potential sources) trash, leaves, Plastic

Results: Weight 9 Lbs. Volume 20.5 Cu Ft.

Actions: Cleaned unit

BEFORE RESULTS AFTER

* If Chemicals are detected using the Spilfyter® strips – notify Safe Drain® headquarters and do not proceed until clearance is received. Immediately report the presence of any unsafe conditions to the customer and Safe Drain Supervisor

SAFE DRAIN®
Storm Water Pollution Prevention Systems

SAFE DRAIN®
Field Service Report

Customer:
City of Modesto
1010 10th St Modesto Ca
Contact: Paul King

Date: 11/07/2019
Temp:
Conditions: Clear, cool

Purpose: To document the field service activities and allow for tracking and trending of site conditions, product performance, and proof of service. These reports are confidential in nature and must not be furnished to any parties outside of Safe Drain Stormwater Holdings, Inc. personnel and/or their respective customer contacts.

General Information

Safe Drain® Unit ID: #7 Valero
Location: 7th and H st. **Type:** Trash Capture

Site Evaluation

Pollutants: (circle one) ☒ *Trash* ☒ *Organic* ☒ *Sediment* ☐ *Chemicals** ☐ *Oil* ☐ *Metallic*

Unit Condition: (circle one) ***Excellent*** *Very Good* *Good* *Fair* *Poor* *Damaged*

Does Unit Contain Standing Water? (circle one) ☐ *YES* ☒ *NO* **Water Test Results: pH N/A**
Notes: (this can include potential sources) trash, leaves, Plastic

Results: Weight 3.5 Lbs. Volume .5 Cu Ft.

Actions: Cleaned unit

BEFORE

AFTER

* If Chemicals are detected using the Spilfyter® strips – notify Safe Drain® headquarters and do not proceed until clearance is received. Immediately report the presence of any unsafe conditions to the customer and Safe Drain Supervisor

SAFE DRAIN®
Storm Water Pollution Prevention Systems

SAFE DRAIN®
Field Service Report

Customer:
City of Modesto
1010 10th St Modesto Ca
Contact: Paul King

Date: 11/07/2019
Temp:
Conditions: Clear, cool

Purpose: To document the field service activities and allow for tracking and trending of site conditions, product performance, and proof of service. These reports are confidential in nature and must not be furnished to any parties outside of Safe Drain Stormwater Holdings, Inc. personnel and/or their respective customer contacts.

General Information

Safe Drain® Unit ID: #8 Former Austins
Location: 7th and I st. **Type:** Trash Capture

Site Evaluation

Pollutants: (circle one) ☒ *Trash* ☒ *Organic* ☒ *Sediment* ☐ *Chemicals** ☐ *Oil* ☐ *Metallic*

Unit Condition: (circle one) ***Excellent*** *Very Good* *Good* *Fair* *Poor* *Damaged*

Does Unit Contain Standing Water? (circle one) ☐ *YES* ☒ *NO* **Water Test Results: pH N/A**
Notes: (this can include potential sources) trash, leaves, Plastic

Results: Weight 1.25 Lbs. Volume 1.0 Cu Ft.

Actions: Cleaned unit

BEFORE

RESULTS

AFTER

* If Chemicals are detected using the Spilfyter® strips – notify Safe Drain® headquarters and do not proceed until clearance is received. Immediately report the presence of any unsafe conditions to the customer and Safe Drain Supervisor

SAFE DRAIN®
Storm Water Pollution Prevention Systems

SAFE DRAIN®
Field Service Report

Customer:
City of Modesto
1010 10th St Modesto Ca
Contact: Paul King

Date: 11/07/2019
Temp:
Conditions: Clear, cool

Purpose: To document the field service activities and allow for tracking and trending of site conditions, product performance, and proof of service. These reports are confidential in nature and must not be furnished to any parties outside of Safe Drain Stormwater Holdings, Inc. personnel and/or their respective customer contacts.

General Information

Safe Drain® Unit ID: #9 Sutter and Paradise
Location: Sutter Ave and Paradise Ave **Type: Safe Drain Valve**

Site Evaluation

Pollutants: (circle one) ☒ *Trash* ☒ *Organic* ☒ *Sediment* ☐ *Chemicals** ☐ *Oil* ☐ *Metallic*

Unit Condition: (circle one) ***Excellent*** *Very Good* *Good* *Fair* *Poor* *Damaged*

Does Unit Contain Standing Water? (circle one) ☒ *YES* ☐ *NO* **Water Test Results: pH N/A**
Notes: (this can include potential sources) trash, leaves, Plastic

Results: Weight 1.5 Lbs. Volume .25 Cu Ft.

Actions: Cleaned unit

BEFORE


RESULTS

AFTER

* If Chemicals are detected using the Spilfyter® strips – notify Safe Drain® headquarters and do not proceed until clearance is received. Immediately report the presence of any unsafe conditions to the customer and Safe Drain Supervisor

SAFE DRAIN®

Storm Water Pollution Prevention Systems

SAFE DRAIN®
Field Service Report

Customer:
City of Modesto
1010 10th St Modesto Ca
Contact: Paul King

Date: 11/07/2019
Temp:
Conditions: Clear, cool

Purpose: To document the field service activities and allow for tracking and trending of site conditions, product performance, and proof of service. These reports are confidential in nature and must not be furnished to any parties outside of Safe Drain Stormwater Holdings, Inc. personnel and/or their respective customer contacts.

General Information

Safe Drain® Unit ID: #10 Mellis Park
Location: MLK and Walnut **Type: Safe Drain Valve**

Site Evaluation

Pollutants: (circle one) ☒ *Trash* ☒ *Organic* ☒ *Sediment* ☐ *Chemicals** ☐ *Oil* ☐ *Metallic*

Unit Condition: (circle one) ***Excellent*** *Very Good* *Good* *Fair* *Poor* *Damaged*

Does Unit Contain Standing Water? (circle one) ☒ *YES* ☐ *NO* **Water Test Results: pH N/A**

Notes: (this can include potential sources) trash, leaves, Plastic

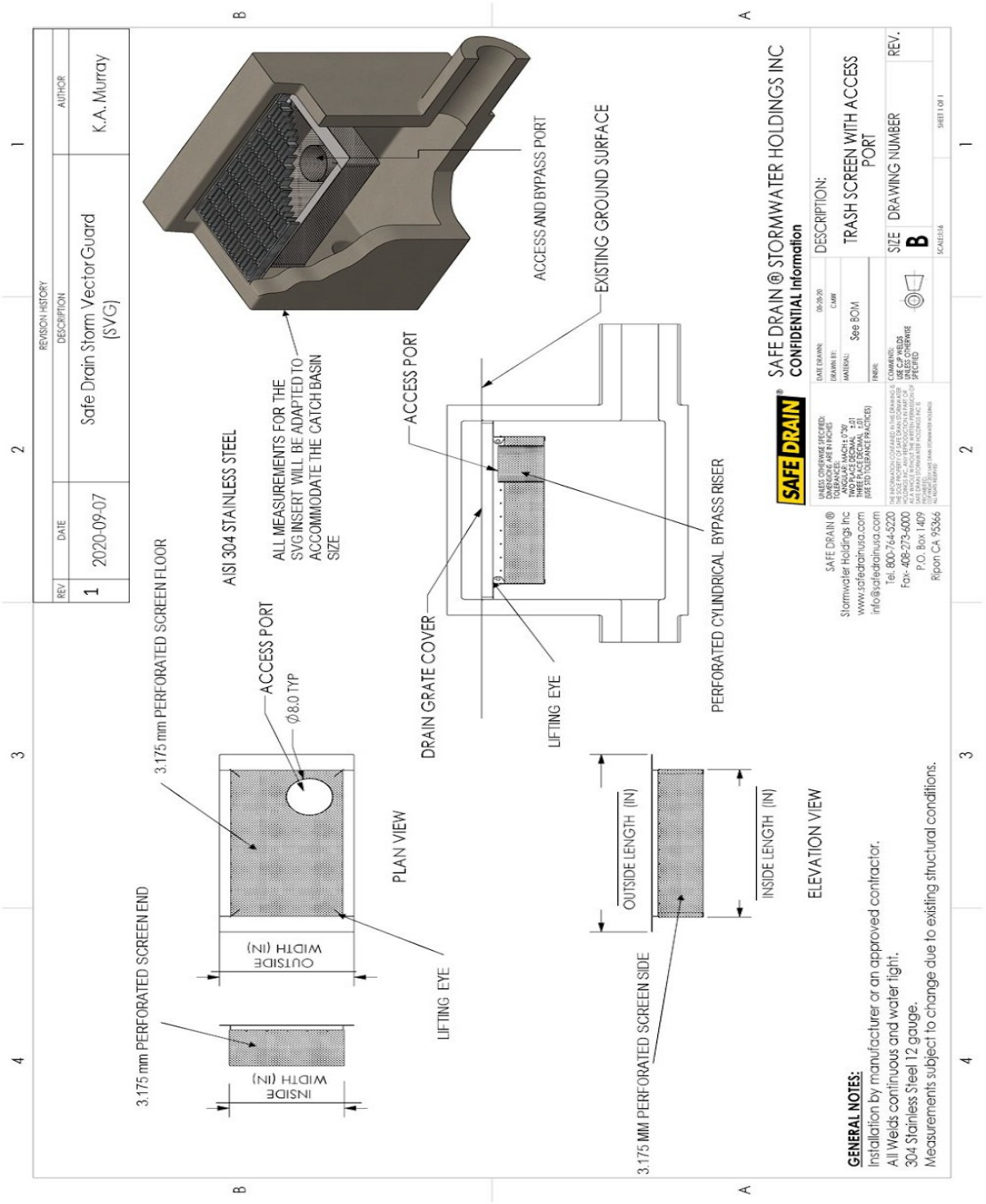
Results: Weight 3.7 Lbs. Volume .25 Cu Ft.

Actions: Cleaned unit

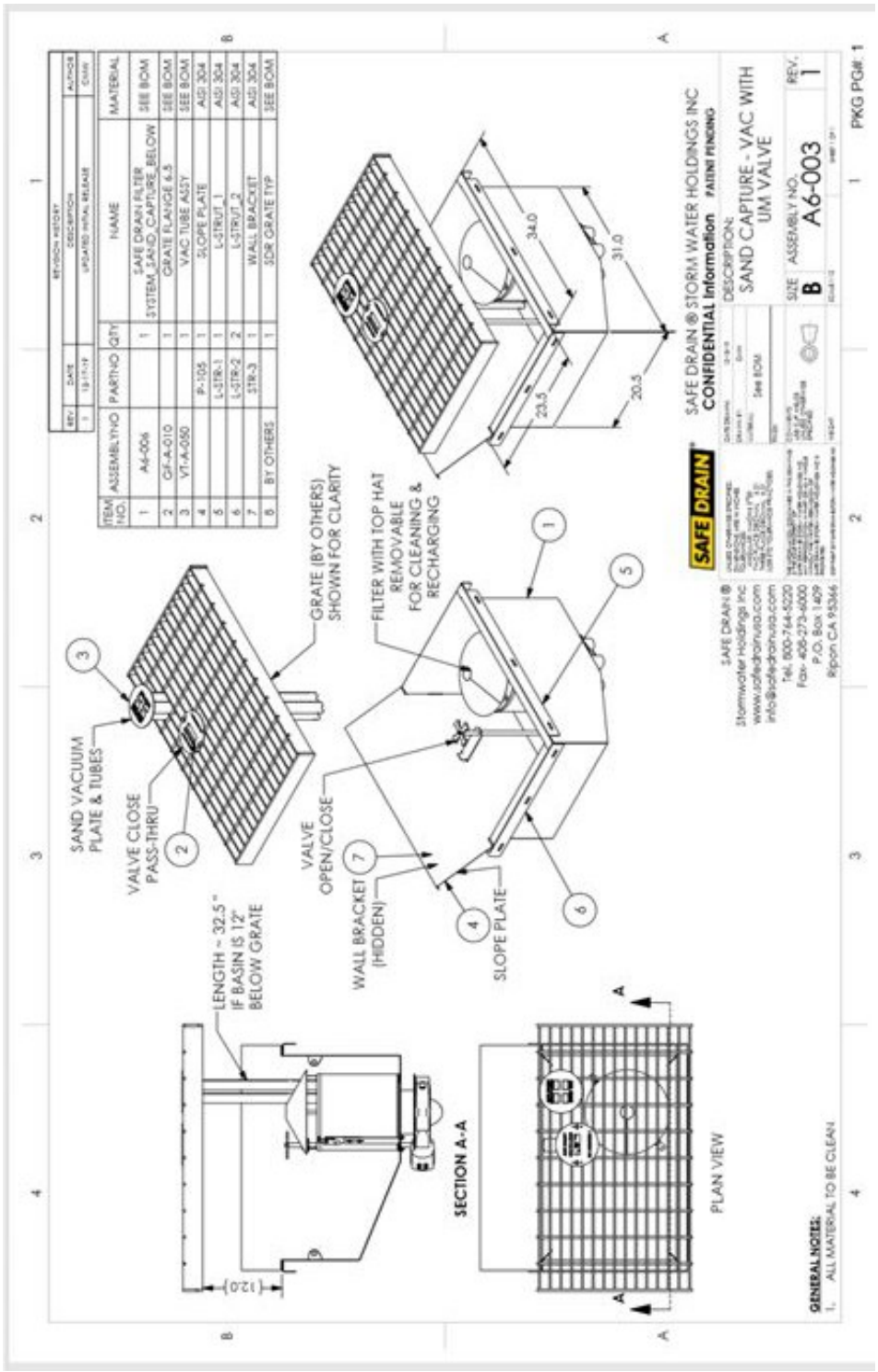
BEFORE RESULTS AFTER

* If Chemicals are detected using the Spilfyter® strips – notify Safe Drain® headquarters and do not proceed until clearance is received. Immediately report the presence of any unsafe conditions to the customer and Safe Drain Supervisor

Appendix B-1: Design Drawings - Safe Drain "Storm Vector Guard" (SVG) Full Trash Capture Device



Appendix B-2: Design Drawings - Safe Drain "Sand, Silt and Full Trash Capture Device" (SSFTC)



Appendix C-1: Hydraulic Calculations for Safe Drain SVG Perforated Stainless Steel Basket

Example Flow Through Calculation for:

- 35" x 21" x 18" SVG
- 3/16" Diameter Perforations
- 40% Open Flow Area

Method for determining flow rate through 3/16" (0.1875") diameter perforations in SVG stainless steel insert creating a maximum pass-through diameter of 4.7625 mm opening to prevent particles 5 mm and above from passing through the basket and into the catch basin.

In order to determine the flow rate through the exemplary SVG perforated basket, we first determine the total number of 3/16" holes in the perforated steel basket. Then we determine an average pressure difference in the water between the top of the basket and the perforated holes. Then, that pressure difference is used to calculate the flow rate of water through a single 3/16" opening. That flow rate is multiplied by the total number of holes to give a flow rate for the entire basket.

1. Determine the number of holes in a 35 x 21 x 18 SVG perforated steel basket:

The equation for the surface area (SA) of a rectangular prism with one open side where:

- L=**35"**
- W=**21"**
- H=**18"**

$$SA = A_{sides} + A_{ends} + A_{floor}$$

$$SA = (2 * L * H) + (2 * W * H) + (L * W)$$

$$= (2 * 35 * 18) + (2 * 21 * 18) + (35 * 21) = \mathbf{2961\ in^2}$$

From physical measurements and open area calculations, it was determined that there are approximately **15 holes/in^2** in the perforated material. Therefore:

$$2961\ in^2 * 15\ holes/\ in^2 = \mathbf{44{,}415\ holes}$$

2. Determine the flow rate of water through a 3/16" orifice:

Water exerts pressure at 0.433 psi per foot.

Assumed water level above the basket of 1.5 ft (18"), *therefore* P = 0.6495 psi.

Note: Since water level will normally change during the course of a wet weather event, it was assumed that an initial pressure, P, based on the standard 18" depth of the SVG, was a reasonable presumption. The differential pressure at any time is sufficiently low that the flow rate through an orifice is not substantially impacted.

To determine the flow rate through a 3/16"opening, we first determine the pressure difference of water before and after it flows through the orifice. It is assumed that once the water exits a perforated opening, the pressure is 0 psi. Before exiting the orifice, it is assumed the water has a pressure equal to the depth of the basket opening beneath the curb line (0.6495 psi). Based on accepted flow calculators and a pressure differential of 0.6495 psi based on 18" of water (see https://www.tlv.com/global/US/calculator/water-flow-rate-through-orifice.html), we are able to calculate the flow rate through a 3/16" orifice under those conditions to be **0.59084 gpm.**

At 50% of that pressure, with 9" of water providing differential pressure of 0.3248 psi, the flow rate through a 3/16" orifice is **0.43663 gpm.**

At 25% of that pressure, with 4.5" of water providing differential pressure of 0.1624 psi, the flow rate through a 3/16" orifice is **0.30844 gpm.**

With a fully open basket, 44,415 holes, and water at the brim of the SVG, the total available flow capacity at 100% is approximately **26,242 gpm (70.2 cfs)**. The following table provides calculated flow rates for water levels of 18", 9" and 4.5" for a fully open basket.

SVG Basket - No Debris Covering - 100% Flow Capacity

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	44,415	26,242	70
9	0.3248	0.43663	44,415	19,393	52
4.5	0.1624	0.30844	44,415	13,699	37

To determine the flow rate through the perforations of the basket when it is 50% full with material, we simply make a change to the surface area calculation. Since it is assumed that 50% of the sidewall flow area and the entirety of the bottom of the basket is blocked with debris, the surface area equation becomes:

$$SA = 2 * L * H/2 + 2 * H/2 * W = \mathbf{1008\ in^2}$$

Multiplying that surface area by the 15 openings per square inch yields:

$$1008\ in^2 * 15\ holes/\ in^2 = \mathbf{15{,}120\ holes}$$

SVG Basket - 50% full of debris

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	15,120	9042	24
9	0.3248	0.43663	15,120	6601	18
4.5	0.1624	0.30844	15,120	4664	12

SVG Basket - 75% full of debris

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	7,060	4222	11
9	0.3248	0.43663	7,060	3083	8
4.5	0.1624	0.30844	7,060	2178	6

As evidenced by the above calculations, the SVG will be able to handle stormwater runoff flow rates at a minimum of 6 cfs. This calculation addresses only flow through the perforated screens. Additional flow capacity is provided via the cylindrical bypass, whose calculations are provided in the next Appendix C-2.

Appendix C-2: Hydraulic Calculations of Cylindrical Ultimate Bypass Region Orifice

Flow through the Cylindrical Ultimate Bypass Region is calculated with the same equations as flow through an orifice.

$$Q = C * A * V$$

Q = Flow through an orifice in cfs

C = Coefficient of discharge from opening (assumed to be .67 for bypass area),

A = Area of the orifice/circular bypass region (ft^2), and

V = Velocity of water as it passes through the orifice/circular bypass region (ft/s).

Velocity, V, can be expanded:

$$V = \sqrt{2 * g * h}$$

Where g = acceleration due to gravity ($32.2 ft/s^2$), and,

h = height of water above centroid of orifice's opening (ft) (18" or 1.5 ft)

The area, A, of the ultimate bypass region is determined by the equation:

$$A = \mathrm{n} * r * r$$

Where A is the area of the circular bypass region and r is the radius of the circular bypass region.

Calculate velocity, V, of flow as it passes through the bypass area, A:

$$V = C * \sqrt{2 * g * h} = 0.67 * \sqrt{2 * 32.2 * 1.5} = 6.4 f/s$$

Therefore, for a bypass region having a cylindrical bypass diameter of 4" and radius of 2":

$$Q = A * V = 0.09 * 6.4 = 0.58 \, cu.ft./sec$$ (161 gpm)

Based on the above calculation it can be shown that with 18" (1.5 ft) of water over the grate, an

SVG having a 4-inch diameter cylindrical bypass riser will bypass approximately 0.58 cfs (161 gpm). The bypass flow rate, Q , for SVG's having bypass diameters of 4", 6", 8" and 10" is provided in the table below:

Bypass Flow Calculations for Cylindrical Riser Bypass Region of Different Bypass Diameters

Bypass Diameter (in)	Bypass Flow Area (sq. in.)	Bypass Flow Area (sq. ft.)	Flow Velocity (ft/second)	Bypass Flow Rate (cfs)	Bypass Flow Rate (cfh)	Bypass Flow Rate (gpm)	Bypass Flow Rate (gph)
4	13	0.09	6.4	0.58	35	216	12,960
6	28	0.19	6.4.	1.216	73	454	27,240
8	50	0.35	6.4	2.24	134	837	50,220
10	79	0.55	6.4	3.52	211	1315	78,900

Appendix C-3: Hydraulic Calculations of Cylindrical Perforated Riser

Example Flow Through Calculation for:

- 24" H x 12" D
- 3/16" Diameter Perforations
- 40% Open Flow Area

Method for determining flow rate through 3/16" (0.1875") diameter perforations in SVG stainless steel insert creating a maximum pass-through diameter of 4.7625 mm opening to prevent particles 5 mm and above from passing through the basket and into the catch basin.

In order to determine the flow rate through the exemplary cylindrical perforated riser, we first determine the total number of 3/16" holes in the perforated steel riser. Then we determine an average pressure difference in the water between the top of the basket and the perforated holes. Then, that pressure difference is used to calculate the flow rate of water through a single 3/16" opening. That flow rate is multiplied by the total number of holes to give a flow rate for the entire cylindrical riser.

1. Determine the number of holes in a 24" height X 12" diameter perforated cylindrical riser:

The equation for the surface area (SA) of a cylindrical riser:

- H = **24**"
- D = **12**"
- r = **6"**

$$SA = H * (2 * \pi * r)$$

$$SA = (24 * (2 * \pi * 6) = \mathbf{904\ in^2}$$

From physical measurements and open area calculations, it was determined that there are approximately **15 holes/in^2** in the perforated material. Therefore:

$$904\ in^2 * 15\ holes/\ in^2 = \mathbf{13{,}572\ holes}$$

2. Determine the flow rate of water through a 3/16" orifice:

Water exerts pressure at 0.433 psi per foot.

Assumed water level above the basket of 1.5 ft (18"), *therefore* P = 0.6495 psi.

Note: Since water level will normally change during the course of a wet weather event, it was assumed that an initial pressure, P, based on the standard 18" depth of the SVG, was a reasonable presumption. The differential pressure at any time is sufficiently low that the flow rate through an orifice is not substantially impacted.

To determine the flow rate through a 3/16"opening, we first determine the pressure difference of water before and after it flows through the orifice. It is assumed that once the water exits a perforated opening, the pressure is 0 psi. Before exiting the orifice, it is assumed the water has a pressure equal to the depth of the basket opening beneath the curb line (0.6495 psi). Based on accepted flow calculators and a pressure differential of 0.6495 psi based on 18" of water (see https://www.tlv.com/global/US/calculator/water-flow-rate-through-orifice.html), we are able to calculate the flow rate through a 3/16" orifice under those conditions to be **0.59084 gpm.**

At 50% of that pressure, with 9" of water providing differential pressure of 0.3248 psi, the flow rate through a 3/16" orifice is **0.43663 gpm.**

At 25% of that pressure, with 4.5" of water providing differential pressure of 0.1624 psi, the flow rate through a 3/16" orifice is **0.30844 gpm.**

With a fully open basket, 13,572 holes in the cylindrical riser, and water at the brim, the total available flow capacity at 100% is approximately **8,019 gpm (70.2 cfs)**. The following table provides calculated flow rates for water levels of 18", 9" and 4.5" for a fully open basket.

SVG Basket - No Debris Covering - 100% Flow Capacity

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	13,572	8019	18
9	0.3248	0.43663	13,572	5926	13
4.5	0.1624	0.30844	13,572	4186	9

To determine the flow rate through the perforations of the basket when it is 50% full with material, we simply take 50% of the total surface area:

$$SA_{50\%} = 904 / 2 = \mathbf{452\ in^2}$$

Multiplying that surface area by the 15 openings per square inch yields:

$$452\ in^2 * 15\ holes/\ in^2 = \mathbf{6{,}780\ holes}$$

SVG Basket - 50% full of debris

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	6,780	4006	9
9	0.3248	0.43663	6,780	2960	7
4.5	0.1624	0.30844	6,780	2091	5

SVG Basket - 75% full of debris

Water Level (in)	Water Pressure (psi)	Flow Rate 3/16" Orifice (gpm)	# Holes	Total Flow Rate (gpm)	Total Flow Rate (cfs)
18	0.6495	0.59084	3390	2003	4
9	0.3248	0.43663	3390	1480	3
4.5	0.1624	0.30844	3390	1046	2

As evidenced by the above calculations, the SVG will be able to handle stormwater runoff flow rates at a minimum of 2 cfs with the basket 75% full of debris. This calculation addresses only flow through the perforated screens. Additional flow capacity is provided via the cylindrical bypass, whose calculations are provided in the preceding Appendix C-2.

Appendix D: Measuring Guidelines

1 - Circular Deep Cut Grate

2 - Circular Flat Grate

3 - Rectangular Deep Cut Grate

4 - Rectangular Flat Grate

5 - Square Grate and Circular Inlet

1 - Circular Deep Cut Grate

Storm Drain Measuring Guidelines

For a 'CIRCULAR DEEP CUT GRATE' Spill Safe™ Safe Drain®

Customer Name:_____ **Drain Location:**_____

Follow these steps to properly measure the grate and the interior dimensions of the drain.

STEP 1: Determine the Type of Grate You Have, *Flat* or *Deep-Cut.* A Deep Cut Grate Has an Inset on the BOTTOM of the Grate (see image).
*** If Flat Grate (not having an inset) Please use Flat Grate Measurement Guidelines*

☐ **Deep Cut Grate**

STEP 2: Measure the TOP of the Grate. Indicate Measurement as **Dimension A** Below. Measure the BOTTOM *(inset part)* of the grate that extends down into the storm drain opening. Indicate this measurement as **Dimension B** in the space below.
**If Deep Cut Angled please indicate below (Deep Cut Angled indicates a slope on the bottom of the grate)*

Dimension A: _____
Dimension B: _____
Deep Cut Angled: **YES** **NO**

STEP 3: Measure the Depth of the Storm Drain. Indicate as **Dimension C** below.
*** The Safe Drain® catch basin requires a minimum depth clearance of 12 inches to properly fit into the storm drain. Insure that the interior storm drain walls are smooth and have no protrusions for at least 12 inches.*

Dimension C: _____

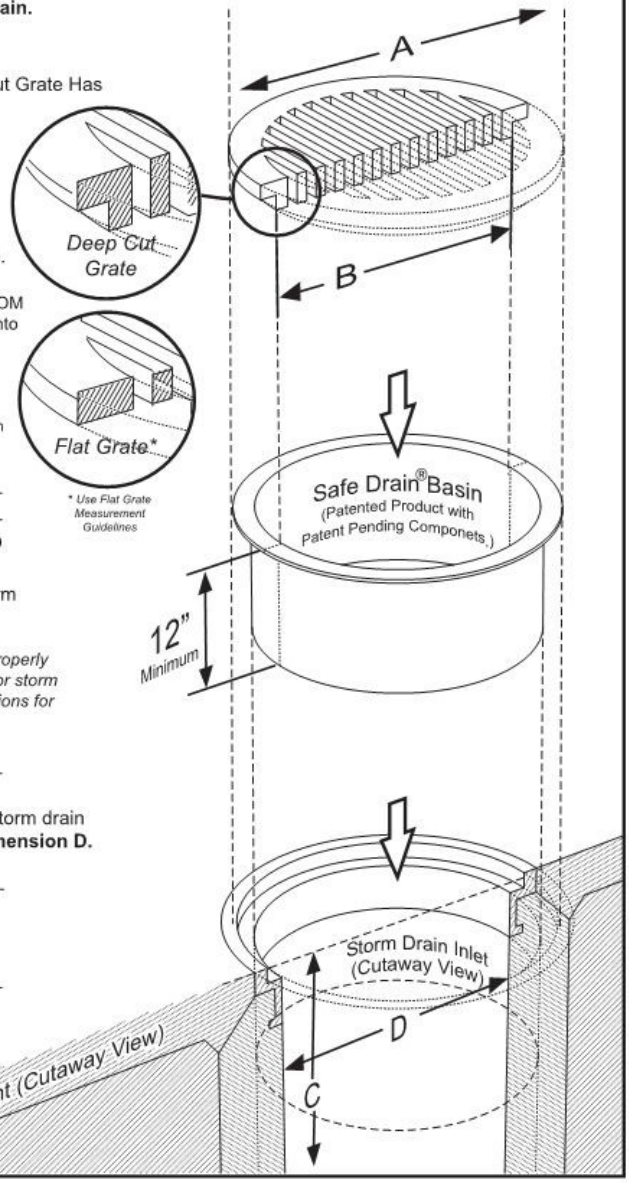
STEP 4: Measure interior diameter of storm drain inlet opening and indicate below as **Dimension D.**

Dimension D: _____

Measurements Taken By:

_____

LEGEND
A= Exterior diameter of TOP of grate
B= Exterior diameter of BOTTOM of grate
C= Interior depth of storm drain inlet
D= Interior diameter of storm drain inlet



Questions, please call 800.764.5220 or 408.738.6600; Measuring Guidelines can be faxed to 408.273.6000

Please Provide Digital Photos Which Show:
1) Full view of the open catch basin including the grate collar area and 2) Full view of the bottom of the grate.

2 - Circular Flat Grate

Storm Drain Measuring Guidelines

For a 'CIRCULAR FLAT GRATE' Spill Safe™ Safe Drain®

Customer Name:_____ **Drain Location:**_____

Follow these steps to properly measure the grate and the interior dimensions of the drain.

STEP 1: Determine the Type of Grate You Have, *Flat* or *Deep-Cut.* A Flat Grate Does Not Have an Inset of Any Kind on the BOTTOM of the Grate (see image).
*** If Deep Cut (having an inset) Please use Deep Cut Measurement Guidelines*

☐ **Flat Grate**

STEP 2: Measure the TOP of the Grate. Indicate Measurement as **Dimension A** Below.

Dimension A: _____

STEP 3: Measure the Depth of the Storm Drain. Indicate as **Dimension B** Below.
*** The Safe Drain® catch basin requires a minimum depth clearance of 12 inches to properly fit into the storm drain. Insure that the interior storm drain walls are smooth and have no protrusions for at least 12 inches.*

Dimension B: _____

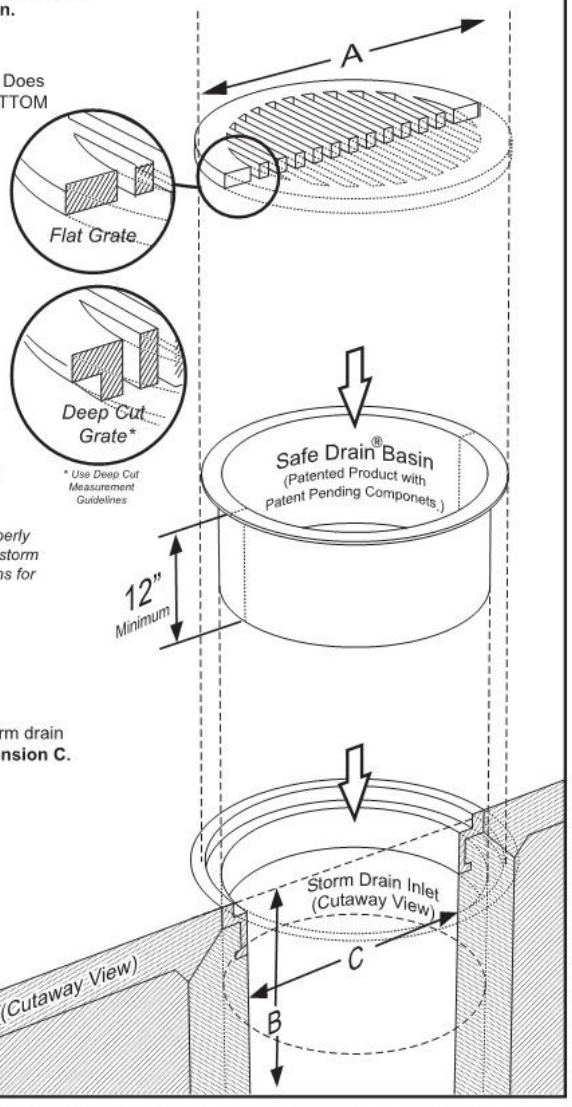
STEP 4: Measure interior diameter of storm drain inlet opening and indicate below as **Dimension C.**

Dimension C: _____

Measurements Taken By:

_____

LEGEND
A= Exterior diameter of TOP of grate
B= Interior depth of storm drain inlet
C= Interior diameter of storm drain inlet



Questions, please call 800.764.5220 or 408.738.6600; Measuring Guidelines can be faxed to 408.273.6000

Please Provide Digital Photos Which Show:
1) Full view of the open catch basin including the grate collar area and 2) Full view of the bottom of the grate.

3 - Rectangular Deep Cut

Storm Drain Measuring Guidelines

For a 'RECTANGULAR DEEP CUT' Spill Safe™ Safe Drain®

Customer Name:_____ **Drain Location:**_____

Follow these steps to properly measure the grate and the interior dimensions of the drain.

STEP 1: Determine the Type of Grate You Have, *Flat* or *Deep-Cut.* A Deep Cut Grate Hasan Inset on the BOTTOM of the Grate (see image).
*** If Flat Grate (not having an inset) Please use Flat Grate Measurement Guidelines*

☐ **Deep Cut Grate**

STEP 2: Measure the TOP of the Grate. Indicate Measurements as **Dimension A** (Length) and **Dimension B** (Width) below. Measure the BOTTOM(*inset part)* of the grate that extends down into the storm drain opening. Indicate this measurements as **Dimension C** (Length) **and Dimension D** (Width) in the space below.
*If Deep Cut Angled please indicate below (Deep Cut Angled indicates a slope on the bottom of the grate)

Dimension A: _____
Dimension B: _____
Dimension C: _____
Dimension D: _____
Deep Cut Angled: YES NO

STEP 3: Measure the Depth of the Storm Drain. Indicate as **Dimension C** below.
*** The Safe Drain® catch basin requires a minimum depth clearance of 12 inches to properly fit into the storm drain. Insure that the interior storm drain walls are smooth and have no protrusions for at least 12 inches.*

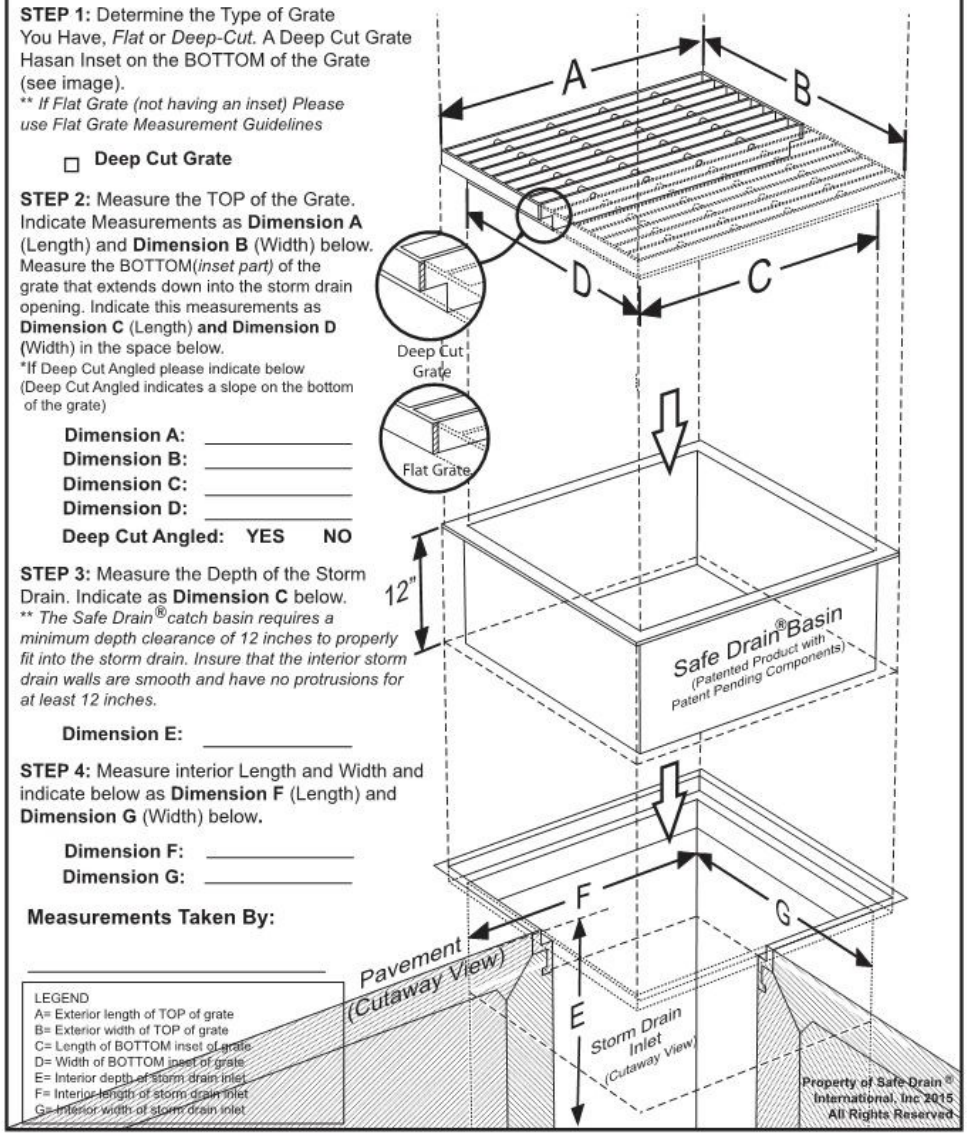
Dimension E: _____

STEP 4: Measure interior Length and Width and indicate below as **Dimension F** (Length) and **Dimension G** (Width) below.

Dimension F: _____
Dimension G: _____

Measurements Taken By:

_____



Questions, please call 800.764.5220 or 408.738.6600; Measuring Guidelines can be faxed to 408.273.6000

Please Provide Digital Photos Which Show:
1) Full view of the open catch basin including the grate collar area and 2) Full view of the bottom of the grate.

4 - Rectangular Flat

Storm Drain Measuring Guidelines

For a 'RECTANGULAR' FLAT Spill Safe™ Safe Drain®

Customer Name:_____ **Drain Location:**_____

Follow these steps to properly measure the grate and the interior dimensions of the drain.

STEP 1: Determine the Type of Grate You Have, *Flat* or *Deep-Cut*. A Flat Grate Does Not Have an Inset of Any Kind on the BOTTOM of the Grate (see image).
*** If Deep Cut (having an inset) Please use Deep Cut Measurement Guidelines*

☐ **Flat Grate**

STEP 2: Measure the TOP of the Grate, both Length and Width. Indicate Measurements as **Dimension A** (Length) and **Dimension B** (Width) below.

Dimension A: _____

Dimension B: _____

STEP 3: Measure the Depth of the Storm Drain. Indicate as **Dimension C** Below.
*** The Safe Drain® catch basin requires a minimum depth clearance of 12 inches to properlyfit into the storm drain. Insure that the interior stormdrain walls are smooth and have no protrusions for at least 12 inches.*

Dimension C: _____

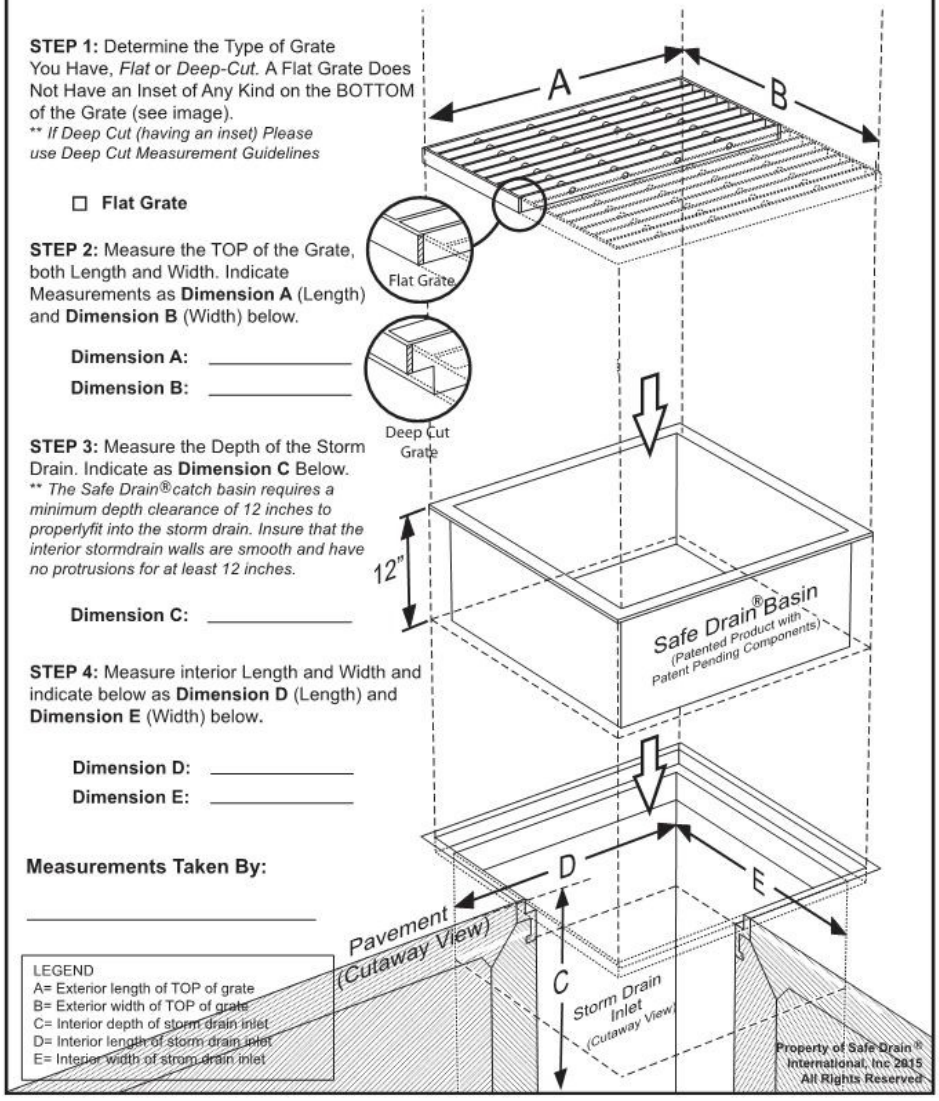
STEP 4: Measure interior Length and Width and indicate below as **Dimension D** (Length) and **Dimension E** (Width) below.

Dimension D: _____

Dimension E: _____

Measurements Taken By:

_____



LEGEND
A= Exterior length of TOP of grate
B= Exterior width of TOP of grate
C= Interior depth of storm drain inlet
D= Interior length of storm drain inlet
E= Interior width of strom drain inlet

Questions, please call 800.764.5220 or 408.738.6600; Measuring Guidelines can be faxed to 408.273.6000

Please Provide Digital Photos Which Show:
1) Full view of the open catch basin including the grate collar area and 2) Full view of the bottom of the grate.

5 - Square Grate & Circular Inlet

Storm Drain Measuring Guidelines

For a 'Square Grate & Circular Inlet' Spill Safe™ Safe Drain™

Customer Name:_____ **Drain Location:**_____

Follow these steps to properly measure the grate and the interior dimensions of the drain.

STEP 1: Determine the type of grate you have, *Flat* or *Deep-Cut*. A deep-cut grate has an inset portion that extends down into the storm drain opening and is thicker than a flat grate (see image). Indicate your grate type below.

- ☐ **Flat Grate**
- ☐ **Deep-Cut Grate**

STEP 2: For *flat, deep-cut or deep-cut angled* grate, measure the exterior edge of the grate. Indicate this measurement as:
Dimension A = Length;
Dimension B = Width

Dimension A: _____

Dimension B: _____

For *flat, deep-cut* or *deep-cut angled* grate only, measure the exterior edge of the*inset part* of the grate that extends down into the storm drain opening. Indicate this measurement as:
Dimension C = Length;
Dimension D = Width

Dimension C: _____

Dimension D: _____

STEP 3: The Safe Drain™ catch basin requires a minimum depth clearance of 12 inches to properly fit into the storm drain. Insure that the interior storm drain walls are smooth and have no protrusions for at least 12 inches down into the drain opening.

STEP 4: Measure interior Width (**E**) and Length (**F**) of storm drain inlet opening and indicate measurements below.

Dimension E: _____

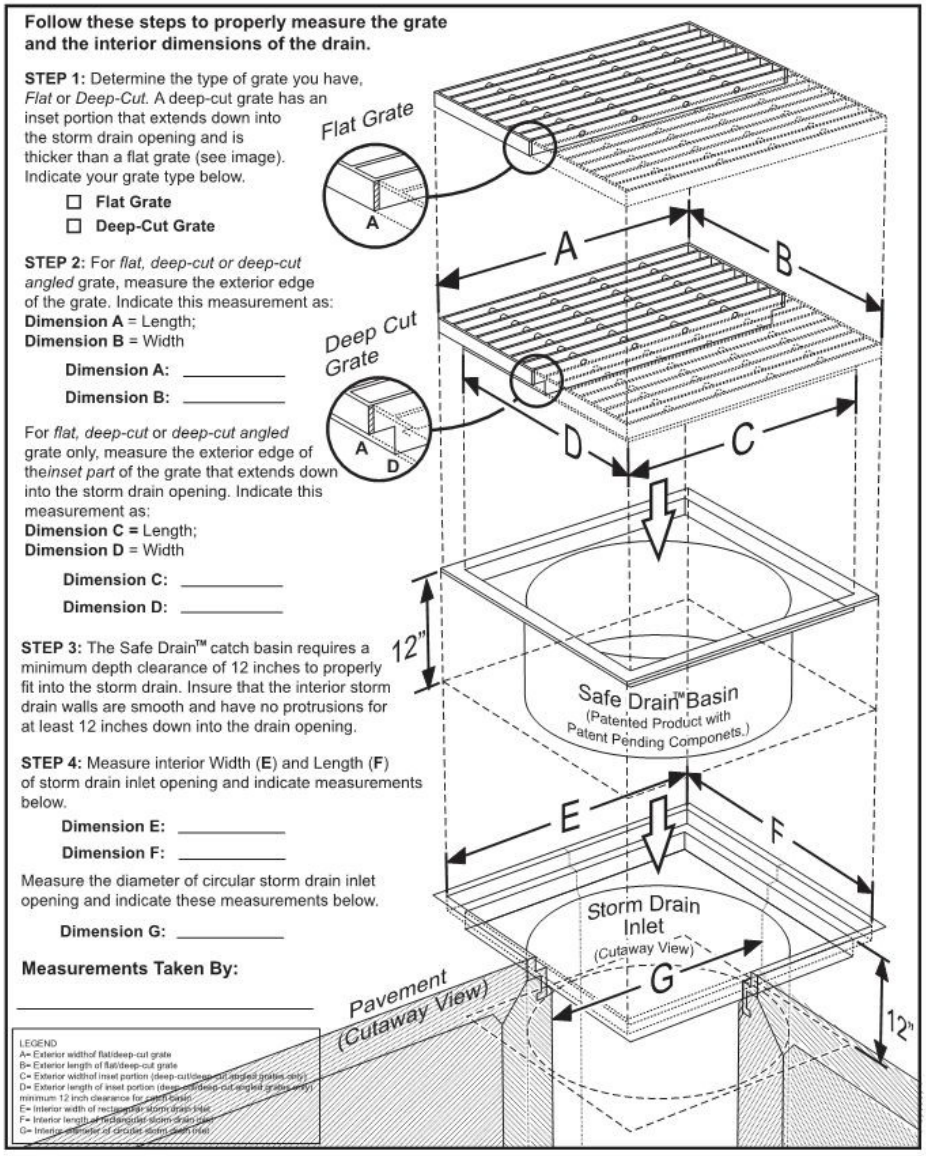
Dimension F: _____

Measure the diameter of circular storm drain inlet opening and indicate these measurements below.

Dimension G: _____

Measurements Taken By:

_____



LEGEND
A= Exterior width of flat/deep-cut grate
B= Exterior length of flat/deep-cut grate
C= Exterior width of inset portion (deep-cut/deep-cut angled grates only)
D= Exterior length of inset portion (deep-cut/deep-cut angled grates only)
minimum 12 inch clearance for catch basin
E= Interior width of rectangular storm drain inlet
F= Interior length of rectangular storm drain inlet
G= Interior diameter of circular storm drain inlet

Questions, please call 800.764.5220 or 408.738.6600; Measuring Guidelines can be faxed to 408.273.6000

It would be very helpful if digital photos could be provided which show:
1) Full view of the open catch basin including the grate collar area and 2) Full view of the bottom of the grate.

Appendix E - Photo Gallery - Installations

FIG. 1 - Modesto Full Trash Capture Device - Single Overflow Stove Pipe and Vector Access Port - All Surfaces Perforated - Debris Captured

FIG. 2 - Modesto Full Trash Capture Device - Single Overflow Stove Pipe and Vector Access Port - All Surfaces Perforated - Cleaned Out

FIG. 3 - Modesto Full Trash Capture Device - Single Overflow Stove Pipe and Vector Access Port - All Surfaces Perforated - Cleaned Out - Perforated Cover Cap Installed

FIG. 4 - Modesto Full Trash Capture Device - Dual Stove Pipe Overflow and Vector Control Access Ports - All Surfaces Perforated - 3.175 mm - No Cover Cap

FIG. 5 - Modesto Full Trash Capture Device - Dual Stove Pipe Overflow and Vector Control Access Ports - All Surfaces Perforated - 3.175 mm - Cover Caps Installed

FIG. 6 - Santa Cruz Sand, Silt and Full Trash Capture Device - Sloped Basin - Perforated Filtration Module with Vector Access and Overflow Port - Sand Capture Cleanout - Central Filtration Module Riser

FIG. 7 - Santa Cruz Sand, Silt and Full Trash Capture Device - Cleaned

8 - Santa Cruz Sand, Silt and Full Trash Capture Device - Sand and Debris Recovered