

REQUEST FOR FACT SHEET UPDATE

**TRASH TREATMENT CONTROL DEVICE CERTIFICATION—
CONNECTOR PIPE TRASH SCREEN DEVICE**

**California Water Boards
State Water Resources Control Board
1001 “I” Street
Sacramento, CA 95814
Attn: Leo Cosentini**

Submitted by



14000 E. Valley Blvd.
City of Industry, CA 91746

January 29, 2022



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Subject: Request for Fact Sheet Update—Connector Pipe Trash Screen Device

Mr. Cosentini,

United Storm Water, Inc. (United) is pleased to submit the enclosed Fact Sheet Update to add additional Connector Pipe Screen (CPS) device models per the Water Board's December 2020 requirements. This request is a revision to the Fact Sheet Update dated 8/6/2021 that has been approved by the Water Board and the Mosquito and Vector Control Association of California (MVCAC). The new models differ only in having a fixed front screen panel, and all hydrology, flow data, and sizing are the same as the existing models having removable front screen panels.

Device Product Name & General Description

- Existing CPS Device Models:
 - USW-1M1 Removable Screen With Swivel Access Plate (Exhibit A1.1)
 - USW-1M2 Removable Screen With Hinged Deflector Access (Exhibit A1.2)
- New CPS Device Models:
 - USW-2M1 Fixed Screen With Swivel Access Plate (Exhibit A2.1)
 - USW-2M2 Fixed Screen With Hinged Deflector Access (Exhibit A2.2)
- United Storm Water's Connector Pipe Screens (CPS) meet the full trash capture definition as they are capable of trapping all particles larger than 5 mm in size.
- Design options include mosquito abatement features having removable and fixed front screen panels. The USW-1M1 and USW-1M2 models have removable front screen panels that are best suited for shallow catch basin applications. The USW-2M1 and USW-2M2 models have fixed front screen panels that are best suited for deeper catch basins and or larger inlet/outlet pipe diameters.
- All models allow for visual access and treatment of mosquitos by vector control district staff via the swivel access plate or hinged deflector access. Individual catch basin configurations will determine if USW-1M1/USW-2M1 (swivel access plate) or USW-1M2/USW-2M2 (hinged deflector) configurations will be the best design regarding accessibility for mosquito abatement activities. The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully.
- CPS sizing for all models is the same and is described in Exhibit B.

Device Owner

- Device Owner: United Storm Water, Inc.
- Device Owner Contact: Eduardo Perry Jr., President
 - 14000 E. Valley Blvd., Industry, CA 91746
 - edperry@unitedpumping.com
 - Cell 626/ 890-7074; Office 626/ 961-9326
- Authorized Representative Contact: Lydia Perry, Vice President of Marketing & Sales
 - 14000 E. Valley Blvd., Industry, CA 91746
 - lydia@unitedstormwater.com
 - Cell 626/ 890-7078; Office 626/ 961-9326

Owner's Website

United manufactures its CPS device in-house and can be found on its company website: www.unitedstormwater.com

Location of Device Manufacturing

United manufactures portions of its CPS device at its corporate facility, and the majority of fabrication is performed onsite while retrofitting each individual catch basin for a custom fit: United Storm Water Inc., 14000 E. Valley Blvd., Industry, CA 91746

Summary of Test Results

United Storm Water's Connector Pipe Screen (CPS) design is constructed from 5 mm screen material and is based on Los Angeles County CPS specifications per their submittal to the Water Board dated October 17, 2006. Engineers from the County of Los Angeles Department of Public Works (Public Works) performed hydrologic analysis to establish a method of calculating the maximum treatment flow resulting from a one-year, one-hour storm. Using this information, they performed hydraulic analyses to establish minimum sizing requirements for the CPS screen. Public Works engineers also established minimum sizes for the bypass opening, which provides flood protection during large storm events.

All related test data is provided in the Los Angeles County Technical Report titled "Connector Pipe Screen Design Full Capture TMDL Compliance Screen and Bypass Sizing Requirements" dated April 2007 (reference Exhibit C). United was thereafter contracted by LA County to fabricate and install CPS devices per their Water Board approved design specifications. United's CPS design and sizing criteria mimics that of LA County with the exception of the newly added mosquito abatement features. These features do not alter the hydrology of the device. United's CPS device, engineered by LA County, has proven to function as designed in the field after having been installed by United in thousands of catch basins for various cities throughout the United States.

Prior to the Water Boards December 2020 fact sheet updates United's device was also field tested by the San Francisco Estuary Partnership as an approved full trash capture device with mosquito abatement features.

Summary of Device Limitations

United's CPS device can be used in conjunction with other above or below ground BMPs for added effectiveness based on the level of trash and debris that commonly accumulates at the site. Field inspections of catch basins will determine if this product is appropriate for each respective catch basin to be retrofitted. A CPS unit is not recommended for installation in sump type catch basins nor catch basins having a "v-depth" less than 2.5 feet (30-inches). See attached Exhibit B for sizing tables. Individual catch basin configurations will determine if USW-1M1/USW-2M1 (swivel access plate) or USW-1M2/USW-2M2 (hinged deflector) configurations will be the best design regarding accessibility for mosquito abatement activities. The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully.

For best performance of a CPS unit United Storm Water recommends regularly scheduled street sweeping to remove accumulated trash and gross solids from surrounding street areas. This will prevent large volumes of trash and gross solids

from entering the storm drain system during a rain event that may impede water flow through the unit. Other required maintenance may include periodic inspections after a rain event to ensure that objects have not become lodged within the overflow bypass area. The CPS device should be cleaned before the screen is 40% covered with debris to maintain water flow through the device and to prevent the bypass of pollutants during a rain event.

Device Installation Locations

United Storm Water's CPS devices have been installed in various locations throughout California, and below are references for public agencies for each model type (removable and fixed front screen panels):

Agency Name: City of Berkeley
Contact Info: Danny Akagi; 510/ 981-6394
Device Model Installed: USW-1M1 and or USW-1M2 (Removable Front Screen Panels)
Qty of Devices Installed: Approximately 215 CPS

Agency Name: City of Burlingame
Contact Info: Mike Heathcote; 650/ 558-7679
Device Model Installed: USW-1M1 and or USW-1M2 (Removable Front Screen Panels)
Qty of Devices Installed: Approximately 41 CPS

Agency Name: City of Union City
Contact Info: Sean Vincent; 510/ 675-5423
Device Model Installed: USW-1M1 and or USW-1M2 (Removable Front Screen Panels)
Qty of Devices Installed: Approximately 200 CPS

Agency Name: City of San Bernardino
Contact Info: Karen Castro; (909) 384-5174
Device Model Installed: USW-2M2 (Fixed Front Screen Panels)
Qty of Devices Installed: 52 CPS

Certification Statement

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.

Attached hereto find the required fact sheet update for United Storm Water's full trash capture devices, USW-1M1/USW-1M2 (existing CPS models) and USW-2M1/USW-2M2 (new CPS models). Please contact me directly should you require clarification or additional information as part of the certification process.

Sincerely,



Lydia Perry
V.P. of Marketing & Sales
lydia@unitedstormwater.com
626/ 890-7078

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3. Physical Description

a. Trash Capture

This metal screen assembly is installed inside a catch basin, in front of the outlet pipe, for preventing debris from entering the storm drain system. A CPS unit thereby retains trash and gross solids within the catch basin so that it is not allowed to enter the storm drain system during a rain event. Fabricated from 5 mm perforated stainless steel, the CPS unit is designed to retain all trash and gross solids larger than 5 mm (0.197 inches) in the catch basin. Once in place it also retains sediment within the catch basin area. Therefore, the trash capture and storage capacity of this product is dependent upon the size of the catch basin where it is installed. Additionally, this product is configured with a deflector plate or screen that prevents trash and gross solids from falling between the screen and connector pipe. See attached Technical Drawing Exhibits A1.1, A1.2, A2.1 and A2.2.

b. Peak Flows/Trash Volumes

United Storm Water's Connector Pipe Screen (CPS) designs were hydrologically analyzed to establish a method of calculating the maximum treatment flow resulting from a one-year, on-hour storm. Using this information, engineers performed hydraulic analyses and field testing to establish minimum sizing requirements for the CPS screen. Minimum sizes for the bypass opening were also established, which provides flood protection during large storm events.

United's CPS devices are sized per the attached Exhibit B, CPS Sizing Tables. The sizing tables were engineered to ensure that essential clearances are adhered to for providing flood protection for standard catch basin sizes. To use the sizing table a designer would find the row corresponding to the catch basin type and size, and would then size a screen that met the minimum height and length.

c. Hydraulic Capacity

The flow through the CPS screen is a function of the open area of the screen and the differential head between the upstream and downstream side of the screen. United's CPS devices are constructed from 5mm perforated stainless steel having an open area of 50%. The following equation was used to calculate the flow through the CPS screen where (c) is the orifice coefficient; (A) is the open area of the screen; (g) is gravity; and (h) is head loss:

$$Q_{screen} = cA_{screen} \sqrt{2gh}$$

Values of peak flow rates for California standard catch basin types/sizes when the device is empty and at 50% blockage is provided in Table 1 below, CPS Hydraulic Capacity and Trash Capture Volume Table. These flow rates apply for all United CPS models based on the catch basin type/size where the CPS device will be installed as the flow equation is a function of head loss within the catch basin. For these calculations the head loss was assumed to be 43% of the screen height, which is in line with field test results in the Los Angeles County Technical Report. The following assumptions were made in making the calculations:

- Coefficient of Screen Orifice, $c = 0.53$
- Open Area of Screen, $A = (\text{Screen Length} \times \text{Screen Height}) \times 0.50$
Open area of screen using 5 mm perforated sheet metal having 50% open area
- Gravity, $g = 32.2 \text{ ft sq/sec sq}$
- Head Loss, $h = \text{Assume head loss to be 43\% of screen height}$
- Table 1 applies to all United CPS models for the catch basin types/sizes and corresponding CPS device sizes shown

Calif. Standard Catch Basin (Type No.)	Catch Basin "V-Depth" (ft)	Catch Basin Width (ft)	Catch Basin (No. Grates)	Catch Basin Length (ft)	CPS Bypass Height (in)	CPS Screen Height (in)	CPS Screen Length (ft)	Treatment Flow (CFS)		Trash Capture Volume (ft³)	
								Maximum	50% Blockage	Max CB Volume	Max 40% Recommended
300	3.0	3.5	-	3.17	8	12	3	4.18	2.09	11.1	4.4
		7	-	3.17	8	12	4	5.58	2.79	22.2	8.9
		10	-	3.17	8	12	6	8.37	4.18	31.7	12.7
		14	-	3.17	8	14	6	10.54	5.27	51.8	20.7
		21	-	3.17	8	14	7	12.30	6.15	77.7	31.1
		28	-	3.17	8	14	8	14.06	7.03	103.6	41.4
	3.5	3.5	-	3.17	8	18	3	7.69	3.84	16.6	6.7
		7	-	3.17	8	18	4	10.25	5.12	33.3	13.3
		10	-	3.17	8	18	6	15.37	7.69	47.6	19.0
		14	-	3.17	8	18	6	15.37	7.69	66.6	26.6
		21	-	3.17	10	16	7	15.03	7.51	88.8	35.5
		28	-	3.17	10	16	8	17.18	8.59	118.3	47.3
	4.0	3.5	-	3.17	12	20	3	9.00	4.50	18.5	7.4
		7	-	3.17	12	20	4	12.00	6.00	37.0	14.8
		10	-	3.17	12	20	6	18.00	9.00	52.8	21.1
		14	-	3.17	12	20	6	18.00	9.00	74.0	29.6
		21	-	3.17	12	20	7	21.00	10.50	111.0	44.4
		28	-	3.17	12	20	8	24.00	12.00	147.9	59.2
	4.5 or Greater	3.5	-	3.17	12	24	3	11.83	5.92	22.2	8.9
		7	-	3.17	12	24	4	15.78	7.89	44.4	17.8
		10	-	3.17	12	24	6	23.67	11.83	63.4	25.4
		14	-	3.17	12	24	6	23.67	11.83	88.8	35.5
		21	-	3.17	12	24	7	27.61	13.80	133.1	53.3
		28	-	3.17	12	24	8	31.55	15.78	177.5	71.0
301	3.0	7	1	-	8	10	4	4.24	2.12	19.1	7.6
		10	2	-	8	10	5	5.30	2.65	31.1	12.5
		14	1	-	8	10	4	4.24	2.12	32.9	13.2
		14	2	-	8	10	5	5.30	2.65	39.0	15.6
	3.5	7	1	-	10	12	4	5.58	2.79	22.9	9.2
		10	2	-	10	12	5	6.97	3.49	37.4	14.9
		14	1	-	10	12	4	5.58	2.79	39.5	15.8
		14	2	-	10	12	5	6.97	3.49	46.9	18.7
	4.0	7	1	-	12	15	4	7.80	3.90	28.6	11.4
		10	2	-	12	15	5	9.74	4.87	46.7	18.7
		14	1	-	12	15	4	7.80	3.90	49.4	19.8
		14	2	-	12	15	5	9.74	4.87	58.6	23.4
4.5 or Greater	7	1	-	12	18	4	10.25	5.12	34.3	13.7	
	10	2	-	12	18	5	12.81	6.40	56.0	22.4	
	14	1	-	12	18	4	10.25	5.12	59.3	23.7	
	14	2	-	12	18	5	12.81	6.40	70.3	28.1	
302	3	2.95	1	2.83	9	9	2.5	2.26	1.13	6.3	2.5
		6.40	2	2.83	9	9	4	3.62	1.81	13.6	5.4
		9.85	3	2.83	9	9	5	4.53	2.26	20.9	8.4
	3.5	2.95	1	2.83	10	12	2.5	3.49	1.74	8.3	3.3
		6.40	2	2.83	10	12	4	5.58	2.79	18.1	7.2
		9.85	3	2.83	10	12	5	6.97	3.49	27.9	11.2
	4.0 or Greater	2.95	1	2.83	10	18	2.5	6.40	3.20	12.5	5.0
		6.40	2	2.83	10	18	4	10.25	5.12	27.2	10.9
		9.85	3	2.83	10	18	5	12.81	6.40	41.8	16.7
303	3	2.95	1	2.13	9	9	2.5	2.26	1.13	4.7	1.9
		6.40	2	2.13	9	9	4	3.62	1.81	10.2	4.1
		9.85	3	2.13	9	9	5	4.53	2.26	15.7	6.3
	3.5	2.95	1	2.13	10	12	2.5	3.49	1.74	6.3	2.5
		6.40	2	2.13	10	12	4	5.58	2.79	13.6	5.4
		9.85	3	2.13	10	12	5	6.97	3.49	20.9	8.4
	4	2.95	1	2.13	12	16	2.5	5.37	2.68	8.4	3.3
		6.40	2	2.13	12	16	4	8.59	4.29	18.1	7.3
		9.85	3	2.13	12	16	5	10.73	5.37	27.9	11.2
	4.5 or Greater	2.95	1	2.13	12	22	2.5	8.65	4.33	11.5	4.6
		6.40	2	2.13	12	22	4	13.85	6.92	24.9	10.0
		9.85	3	2.13	12	22	5	17.31	8.65	38.4	15.3

Table 1: CPS Hydraulic Capacity and Trash Capture Volume Table

d. Comparison Table

A CPS device is installed inside a catch basin, in front of the outlet pipe, therefore, the trash capture and storage capacity of this product is dependent upon the size of the catch basin where it is installed. Values for peak flow rates and trash capture volumes (maximum and recommended) are provided in Table 1 above, CPS Hydraulic Capacity and Trash Capture Volume Table. Recommended maximum trash capture volume for this device of any size is 40% of the screen height. Painting of a staff gauge on the catch basin wall (as depicted in Exhibit B) facilitates inspections for determining when the CPS device and corresponding catch basin should be cleaned.

e. Design Drawings

Individual catch basin configurations will determine if USW-1M1/USW-2M1 (swivel access plate) or USW-1M2/USW-2M2 (hinged deflector) configurations will be the best design regarding accessibility for mosquito abatement activities. The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully. See Exhibits A1.1, A1.2, A2.1, and A2.2 for technical drawings.

f. Alternative Configurations

Custom made for each catch basin where they will be installed, United offers the CPS vector control accessibility configurations described below. The Customer may request the desired model based on the configuration of the catch basin where they will be installed and United's recommendations for the perfect fit and functionality:

- Models USW-1M1 (removable front screen panel) and USW-2M1 (fixed front screen panel)—Have a swivel access plate located on top of the deflector panel for performing vector control activities (Exhibit A1.1, and A2.1). The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully.
- Models USW-1M2 (removable front screen panel) and USW-2M2 (fixed front screen panel)—Have a hinged deflector component for performing vector control activities. The hinge can be installed to be located at the front or back of the device to accommodate various catch basin configurations that may be present including shallow catch basins (Exhibits A1.2 and A2.2).

g. Internal Bypass

A CPS is a vertical screen with 5 mm openings, installed inside a catch basin directly upstream of the connector pipe in such a manner that all water entering the basin must pass through the device. A vertical opening (overflow bypass) is provided around the upper perimeter of the screen to allow storm water to bypass in the event of a large storm or if the screen becomes clogged.

The CPS devices have been designed to have a bypass or overflow mechanism equivalent to the catch basin design capacity. See page 10 of attached Los Angeles County Technical Report, Exhibit C, for the methods used for determining bypass flow calculations and bypass sizing to prevent flooding. The bypass structure must be able to pass the maximum catch basin flow in order to provide proper flood protection.

h. Previously Trapped Trash

Should the catchment area be laden with trash and debris during a rain event where the CPS screen is over 40% covered, water and associated trapped pollutants may bypass the CPS device, and loose trash may be allowed to escape the catch basin and enter the outlet pipe. The overflow bypass feature of the device is intended for flood control purposes.

i. Calibration Feature

These devices have no moving parts and are custom made and sized to properly fit each catch basin where they will be installed. Calibration is therefore not required.

j. Photos

Below are photos of United's CPS installation variations. Individual catch basin configurations will determine if USW-1M1/USW-2M1 (swivel access plate) or USW-1M2/USW-2M2 (hinged deflector) configurations will be the best design regarding accessibility for mosquito abatement activities. The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully. Additional photos available upon request:



USW-1M1/USW-2M1, Standard



USW-1M1/USW-2M1, Corner



USW-1M2/USW-2M2, Back Hinge (Closed)



USW-1M2/USW-2M2, Back Hinge (Open)



USW-1M2/USW-2M2, Front Hinge W/Media Packs



USW-1M2/USW-2M2, Front Hinge (Open)

k. Material Type

CPS devices will be constructed from non-corrosive materials with all components made from stainless steel.

- The CPS unit has a minimum vertical height of 2 feet per the CPS Sizing Table, Exhibit B.
- The CPS unit is manufactured/fabricated from perforated metal of S-304 stainless steel.
- The perforated metal provided for this project will have an open area of 50%
- The CPS unit will have its outer edges finished to prevent handling injuries and to ensure that trash does not become ensnared.
- The assembly bolts, screws, nuts, and washers are fabricated from S-304 stainless steel.
- The concrete anchors for the CPS are 3/8-inch wedge type.

l. Design Life

United's CPS devices will be constructed from high quality materials that can withstand normal wear and tear and have a structural integrity to withstand a force of standing water within the catchment area. Damage that may be caused to any part of the unit by foreign objects, vandalism, or product mistreatment may be repaired at a discounted rate to the purchaser. Attempted vandalism/robbery of this product may be due to the value of the stainless steel that the product is made from, yet is unlikely since the unit is out of sight and located at the bottom of the catch basin. Damage generally only occurs due to mishandling/abuse of the product. Should a CPS unit become damaged the unit may be replaced at a discounted rate to the purchaser.

4. Installation Guidance

a. Standard Device Installation Procedures

Before the start of installation United's Project Manager will coordinate with the Client's Project Manager to discuss the proposed installation schedule by service zones. For work performed in areas that encroach on traffic right-of-way, an encroachment permit will be obtained from the appropriate entity and there will be a written and approved traffic plan. When proposed work zones have been accepted United will install CPS units in the designated storm drains.

It will require approximately one hour to install each CPS. See the attached Technical Manual, Exhibit E, for a detailed description of the required installation process for this product.

b. Device Installation Limitations

United's CPS devices can be used in conjunction with other above or below ground BMPs for added effectiveness based on the level of trash and debris that commonly accumulates at the site. Field inspections of catch basins will determine if this product is appropriate for each respective catch basin to be retrofitted. A CPS unit is not recommended for installation in sump type catch basins nor catch basins having a "v-depth" less than 2.5 feet (30-inches). See attached Exhibit B for sizing tables.

Individual catch basin configurations will determine if USW-1M1/USW-2M1 (swivel access plate) or USW-1M2/USW-2M2 (hinged deflector) configurations will be the best design regarding accessibility for mosquito abatement activities. The swivel access plate models are used when there is not adequate clearance for a hinged deflector to open fully. See Exhibits A1.1, A1.2, A2.1, and A2.2 for technical drawings.

Due to the fact that United's CPS devices are custom made for each catch basin where they will be installed, vector control accessibility designs can be adjusted per Customer request for the perfect fit and functionality. See Technical Drawings Exhibits A1.1, A1.2, A2.1, A2.2, and photos provided in section 3.j of this submittal.

c. Methods of Diagnosing & Correcting Installation Errors

Utilizing maps and/or installation site locations provided by the Customer, devices will be custom made to fit each respective catch basin based on measurements taken by United's Service Staff. Fabrication sizing will be based on the CPS Sizing Tables, Exhibit B. After installation of the CPS device Field Inspector(s) will compare the fabricated device to the measurement and sizing sheets, and any required product adjustments/resizing will be performed and noted on the sizing sheet.

5. Operation and Maintenance Information

a. Inspection Procedures and Frequency Considerations

For best performance of a CPS unit United Storm Water recommends inspections as often as once during the dry season (June-September) and in the wet season (October-May) between or during scheduled cleaning events (depending on actual established schedule). Average number of separate inspections is three per year. Actual scheduling will be based on United recommendations and Customer approval based on county stormwater management ordinances and the storm drain flows and loads subjected to the site.

The Customer is specifically advised to inspect streets where CPS devices have been installed, as well as in front of each device installed, removing any debris including plastic bags, newspaper, leaves, branches, etc., which can effectively block the opening to the device or obstruct the device "overflow bypass" area. This inspection and clearing away should be performed immediately prior to a known storm system, during, and after a storm. It is the obligation and duty of the Customer to inspect and remove all obstructions to prevent the possibility of flooding.

Inspection services will ensure that the product is functioning properly and will aid in establishing/changing cleaning schedules accordingly. Any items in need of repair/replacement should be performed as soon as it is safe to do so. If failure of the product indicates that it is inappropriate or inadequate to the circumstances, the product must be modified or upgraded to prevent any further failure in the same or similar circumstances.

b. Maintenance Frequency

The CPS devices should be cleaned once during the dry season (June-September) and as often as monthly during the wet season (October-May) for effective filtration and to prevent the possibility of flooding. The CPS devices and corresponding catch basin should be cleaned before the screen is 40% covered with debris to maintain water flow through the device and to prevent the bypass of pollutants during a rain event. Average number of cleanings is two per year. Cleaning is particularly important prior to the wet season and after the first storm event of 3/4" of rain to prevent the possibility of flooding. Actual scheduling will be based on United recommendations and Customer approval based on county stormwater management ordinances and the storm drain flows and loads subjected to the site.

c. Maintenance Procedures

For best performance of a CPS unit United Storm Water recommends regularly scheduled street sweeping to remove accumulated trash and gross solids from surrounding street areas. This will prevent large volumes of trash and gross solids from entering the storm drain system during a rain event that may impede water flow through the unit. Other required maintenance may include periodic inspections after a rain event to ensure that objects have not become lodged within the overflow bypass area. For additional information regarding CPS maintenance refer to the attached Technical Manual, Exhibit E.

d. Essential Equipment and Materials for Maintenance

A CPS unit can be cleaned by means of industrial vacuum (may require confined space entry) and use of a metal brush or pressure washer for removing any material that may have become caked on the device screen.

e. Effects of Deferred Maintenance

Maintenance of the surrounding area and the CPS device's screen and overflow area is key for the CPS to operate as designed. Care should be taken to ensure that regular street sweeping and catch basin cleaning in front of the CPS device is undertaken. Parked cars which prevent street sweeping which in turn may allow the accumulation of paper, plastic bags, vegetation, etc. in front of, and adhering to the screen of the CPS device, may result in flooding or ponding of streets. Failure to clear streets and the screen of the device from accumulated items such as trash, debris or vegetation will prevent water from flowing through the screen cover and or overflow area. This in turn will likely result in flooding as a storm drain will have been effectively eliminated from the street flood control system. Failure to maintain this system will void all warranties.

f. Repair Procedures

The CPS device shall not be altered in any way by the Customer after having been installed by United. Such alterations could affect the integrity of the device. Contact United Storm Water should any repairs be required.

6. Vector Control Accessibility

a. Date of Device Application Submittal

The device fact sheet update dated 8/6/2021 for existing models USW-1M1 and USW-1M2 (removable front screen panels) was submitted for vector control accessibility design verification via email to the Mosquito Vector Control Association of California (MVCAC) (trashreatment@mvcac.org), and was approved on 8/5/2021.

The device fact sheet update dated 1/29/2022 for adding new models USW-2M1 and USW-2M2 (fixed front screen panels) was submitted for vector control accessibility design verification via email to the Mosquito Vector Control Association of California (MVCAC) (trashreatment@mvcac.org), and was approved on 1/26/2022.

b. Description of Mosquito Vector Control Accessibility

Mosquito vector control personnel can readily access the bottom of the storm water vault and/or device for visual observation and mosquito treatment as follows (reference Technical Drawing Exhibits A1.1, A1.2, A2.1, A2.2, and photos provided in section 3.j of this submittal):

- USW-1M1 and USW-2M1—From outside the open manway area, use a hook to rotate the swivel access plate to the open position.
- USW-1M2 and USW-2M2—From outside the open manway area, use a hook to pull the hinged deflector component to the open position. The hinge can be installed to be located at the front or back of the device to accommodate various catch basin configurations that may be present including shallow catch basins.

c. MVCAC Letter of Verification

MVCAC Letter of Verification for adding models USW-2M1 and USW-2M2 (fixed front screen panel) was approved on 1/26/2022. This letter supersedes the previous approval dated 8/5/2021 for models USW-1M1 and USW-1M2 alone. See attached recent letter

7. Reliability Information

a. Estimated Design Life

United's CPS devices will be constructed from high quality materials that can withstand normal wear and tear and have a structural integrity to withstand a force of standing water within the catchment area. Damage that may be caused to any part of the unit by foreign objects, vandalism, or product mistreatment may be repaired at a discounted rate to the purchaser. Attempted vandalism/robbery of this product may be due to the value of the stainless steel that the product is made from, yet is unlikely since the unit is out of sight and located at the bottom of the catch basin. Damage generally only occurs due to mishandling/abuse of the product. Should a CPS unit become damaged the unit may be replaced at a discounted rate to the purchaser.

b. Warranty Information

United Storm Water agrees to repair and or replace any part of this product at no cost to the purchaser for a period of three (3) years from the date of delivery should failure occur during normal use. The purchaser of this product must be aware that the CPS screen may become damaged due to retention of items such as trash and debris. Such damage falls outside of the coverage of this warranty yet may be replaced at a discounted rate to the purchaser.

It is the obligation of the Customer, not United, to inspect and keep obstructions away from the CPS devices. All warranties that are made by United are void if there is a failure to maintain the integrity of the CPS system as recommended herein (e.g., instituting an inspection/maintenance program to keep the water path to the CPS devices free of obstructions). See attached Warranty, Exhibit F, for further details.

c. Customer Support Information

No replacement parts are required. United's CPS devices are constructed from durable stainless steel and damage generally occurs due to mishandling/abuse of the product. Should a CPS unit become damaged the unit may be replaced at a discounted rate to the purchaser. For any issues regarding this product the Customer may contact:

United Storm Water, Inc.
14000 E. Valley Blvd
City of Industry, Ca 91746
Phone: 626-961-9326
Fax: 626-434-6994
Contact: Eugene Hernandez, Manufacturing Manager

8. Field/Lab Testing Information and Analysis

United Storm Water's Connector Pipe Screen (CPS) designs are constructed from 5 mm screen material and are based on Los Angeles County CPS specifications per their submittal to the Water Board dated October 17, 2006. Engineers from the County of Los Angeles Department of Public Works (Public Works) performed hydrologic analysis to establish a method of calculating the maximum treatment flow resulting from a one-year, one-hour storm. Using this information, they performed hydraulic analyses to establish minimum sizing requirements for the CPS screen. Public Works engineers also established minimum sizes for the bypass opening, which provides flood protection during large storm events.

All related test data is provided in the Los Angeles County Technical Report titled "Connector Pipe Screen Design Full Capture TMDL Compliance Screen and Bypass Sizing Requirements" dated April 2007 (reference Exhibit C). United was thereafter contracted by LA County to fabricate and install CPS devices per their Water Board approved design specifications. United's CPS designs and sizing criteria mimic that of LA County with the exception of the newly added mosquito abatement features. These features do not alter the hydrology of the device. United's CPS devices, engineered by LA County, have proven to function as designed in the field after having been installed by United in thousands of catch basins for various cities throughout the United States.

Prior to the Water Boards December 2020 fact sheet updates United's device was also field tested by the San Francisco Estuary Partnership as an approved full trash capture device with mosquito abatement features.

LIST OF EXHIBITS

- Exhibit A1.1—Technical Drawing USW-1M1 Removable Screen With Swivel Access Plate
- Exhibit A1.2—Technical Drawing USW-1M2 Removable Screen With Hinged Deflector Access
- Exhibit A2.1—Technical Drawing USW-2M1 Fixed Screen With Swivel Access Plate
- Exhibit A2.2—Technical Drawing USW-2M2 Fixed Screen With Hinged Deflector Access
- Exhibit B—CPS Sizing Tables
- Exhibit C—LA County Technical Report
- Exhibit D—Does Not Exist
- Exhibit E—Technical Manual
- Exhibit F—Warranty
- Exhibit G—MCVAC Letter of Verification for Models USW-1M1, USW-1M2, USW-2M1, and USW-2M2

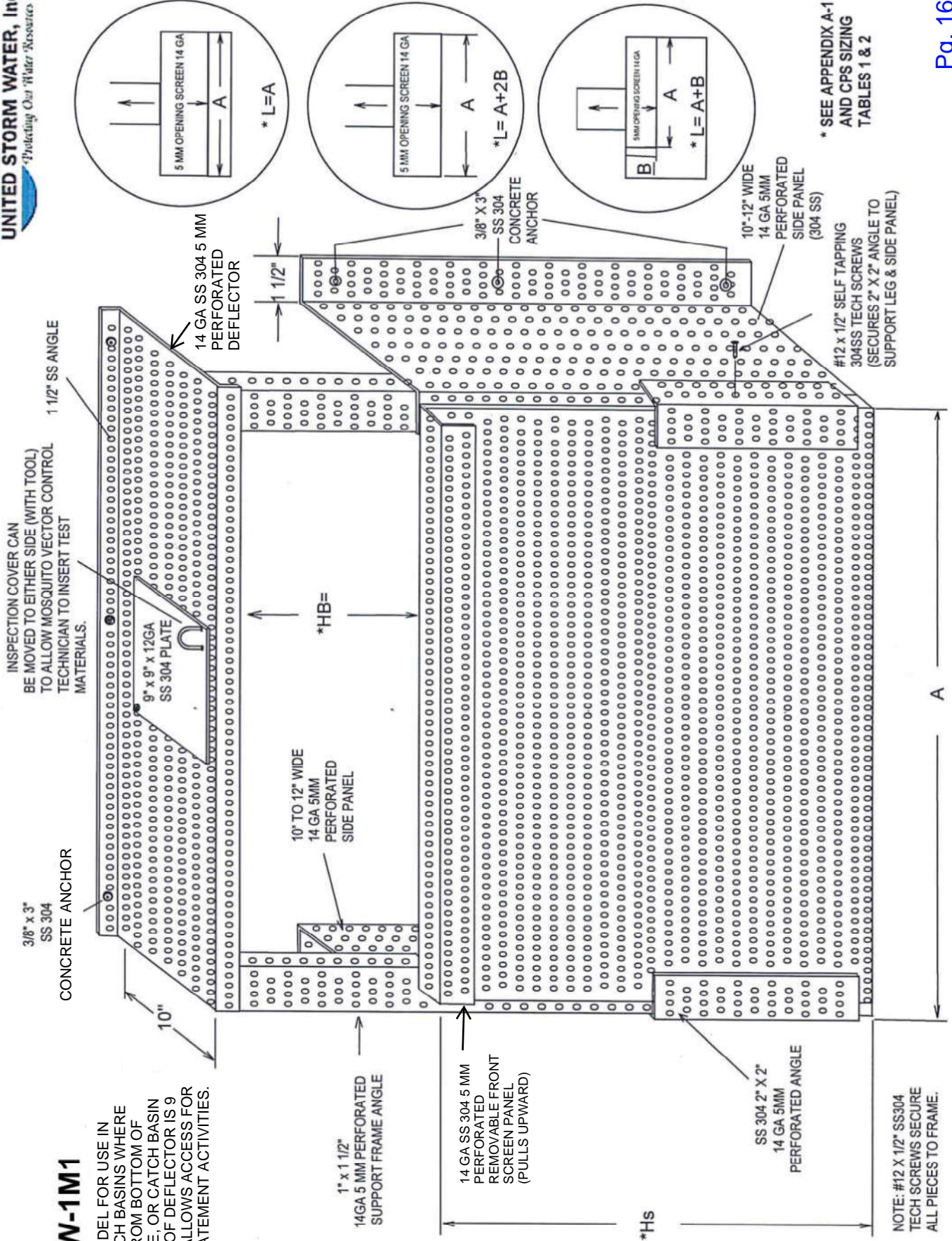


UNITED STORM WATER, Inc.
Protecting Our Water Resources

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-1M1 REMOVABLE SCREEN WITH SWIVEL ACCESS PLATE

USW-1M1

NOTE: THIS MODEL FOR USE IN SHALLOW CATCH BASINS WHERE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR IS 9 1/2" OR LESS. ALLOWS ACCESS FOR MOSQUITO ABATEMENT ACTIVITIES.



* SEE APPENDIX A-1 AND CPS SIZING TABLES 1 & 2

NOTE: #12 X 1/2\"/>

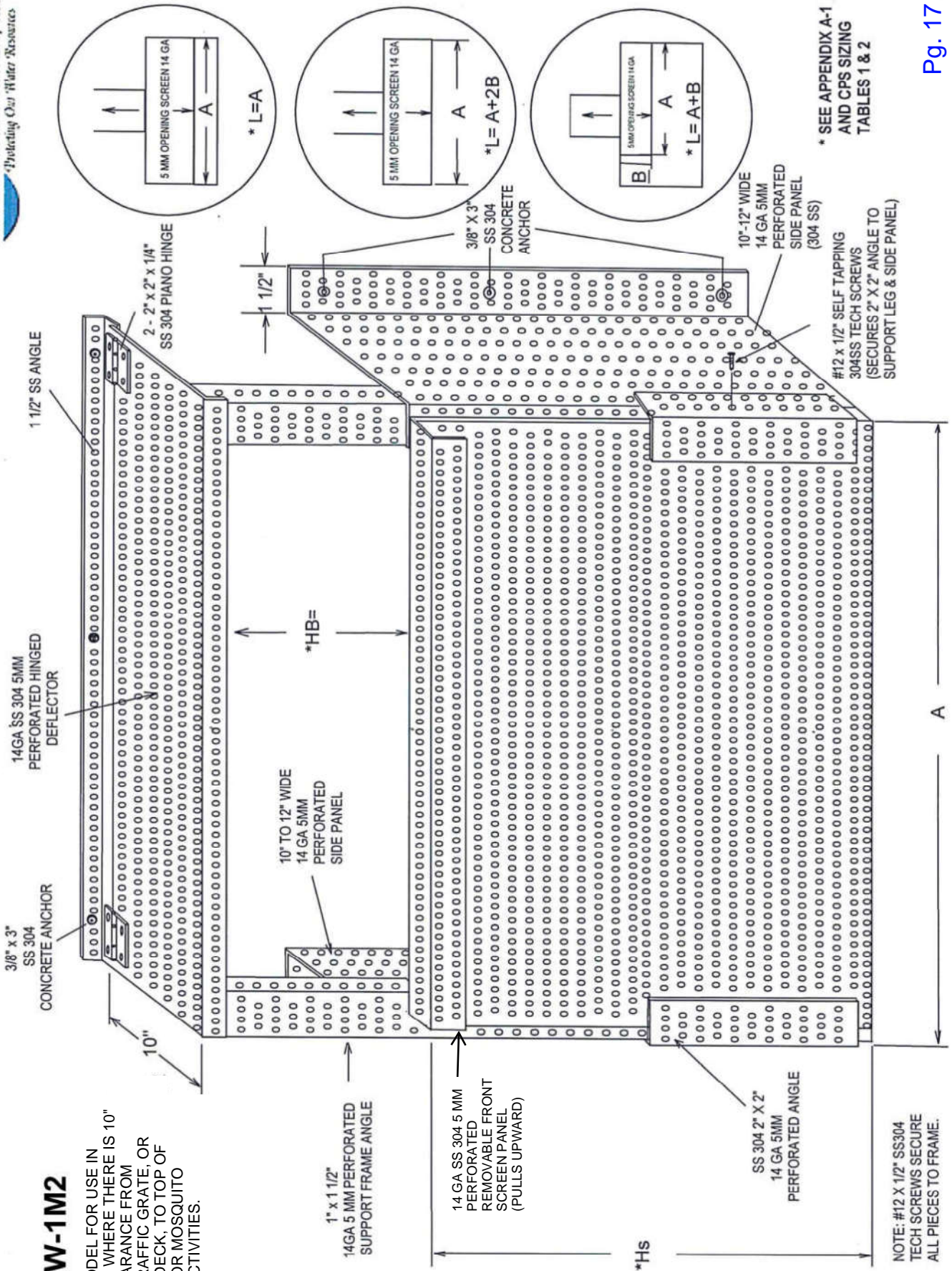
**CONNECTOR PIPE SCREEN (CPS)
MODEL USW-1M2 REMOVABLE SCREEN WITH HINGED DEFLECTOR ACCESS**



UNITED STORM WATER, Inc.
Protecting Our Water Resources

USW-1M2

NOTE: THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.



* SEE APPENDIX A-1 AND CPS SIZING TABLES 1 & 2

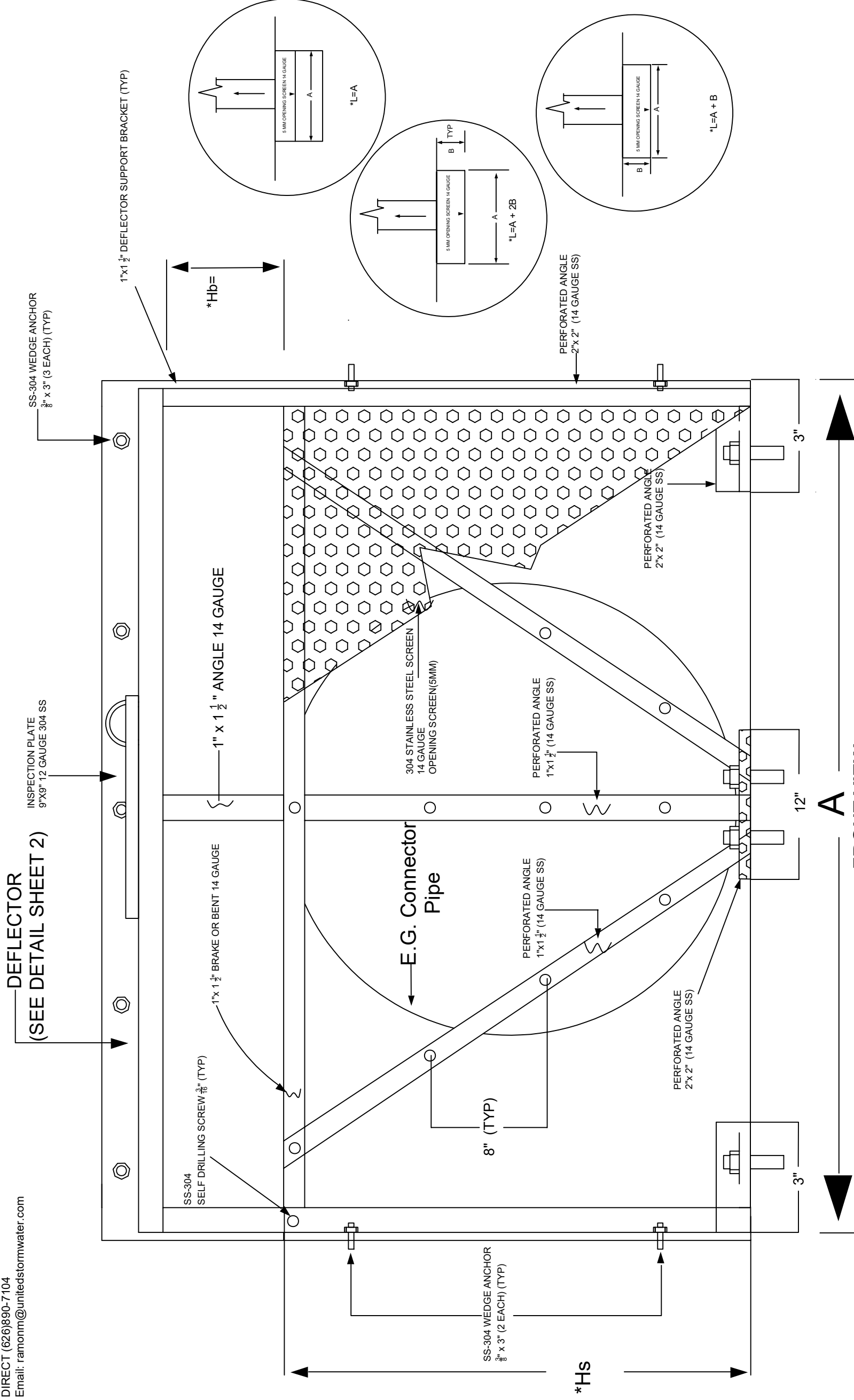
NOTE: #12 X 1/2\"/>



14000 E. VALLEY BLVD
 CITY OF INDUSTRY CA 91746
 RAMON MENJIVAR
 OFFICE (626)961-9326 FAX (626)-434-6994
 DIRECT (626)890-7104
 Email: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M1 FIXED SCREEN WITH SWIVEL ACCESS PLATE

"EXHIBIT A2.1"



A
FRONT VIEW

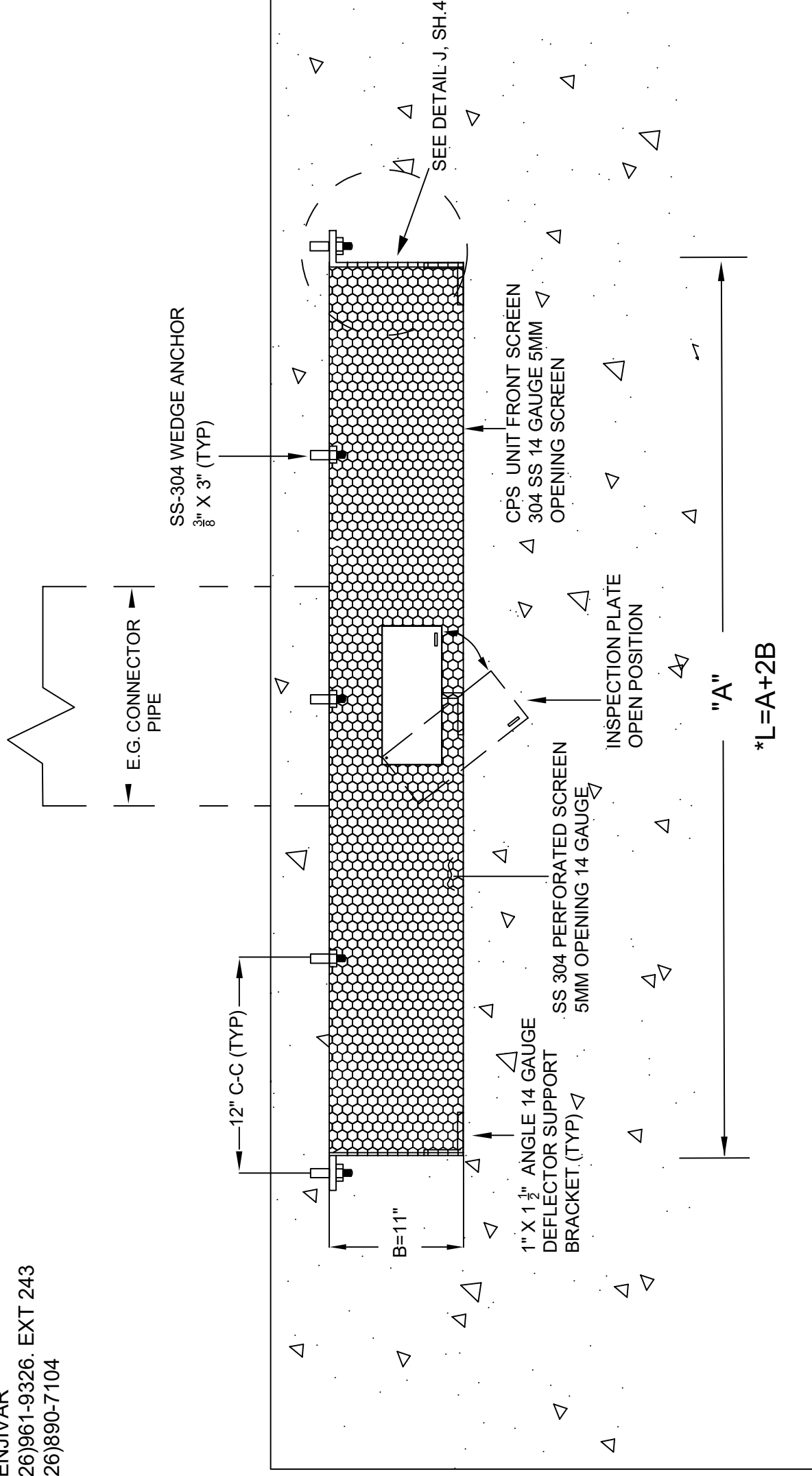
<p>General Notes</p> <p>*SEE APPENDIX A-1 AND CPS SIZING TABLE 1&2</p> <p>**INSPECTION COVER CAN BE MOVED TO EITHER SIDE (WITH TOOL) TO ALLOW MOSQUITO VECTOR CONTROL TECHNICIAN TO INSERT TEST MATERIALS</p> <p>THIS MODEL FOR USE IN SHALLOW CATCH BASINS WHERE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR IS 9 1/2" OR LESS. ALLOWS ACCESS FOR MOSQUITO ABATEMENT ACTIVITIES.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No.</th> <th>Revision/Issue</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No.	Revision/Issue	Date				<p>Project Name and Address</p> <p style="text-align: center;"> UNITED STORM WATER INC. <small>Producing Our Water Responsibly</small></p> <p>14000 E. VALLEY BLVD CITY OF INDUSTRY CA 91746</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Project</td> <td>USW-2M1</td> <td style="width: 30%;">Sheet</td> <td>1 OF 4</td> </tr> <tr> <td>Date</td> <td>10/25/2021</td> <td>Scale</td> <td>NOT TO SCALE</td> </tr> </table>	Project	USW-2M1	Sheet	1 OF 4	Date	10/25/2021	Scale	NOT TO SCALE
No.	Revision/Issue	Date														
Project	USW-2M1	Sheet	1 OF 4													
Date	10/25/2021	Scale	NOT TO SCALE													



UNITED STORM WATER, Inc.
Protecting Our Water Resources

14000 E VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326. EXT 243
DIRECT (626)890-7104

**CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M1 FIXED SCREEN WITH SWIVEL ACCESS PLATE**



DEFLECTOR DETAIL
PLAIN VIEW (SHEET 1)

General Notes

- * SEE APPENDIX A-1 AND CPS SIZING TABLES 1&2
- ** INSPECTION COVER CAN BE MOVED TO EITHER SIDE (WITH TOOL) TO ALLOW MOSQUITO VECTOR CONTROL TECHNICIAN TO INSERT TEST MATERIAL.

THIS MODEL FOR USE IN SHALLOW CATCH BASINS WHERE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE OR CATCH BASIN DECK TO TOP OF DEFLECTOR IS 9 1/2" OR LESS. ALLOWS ACCESS FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

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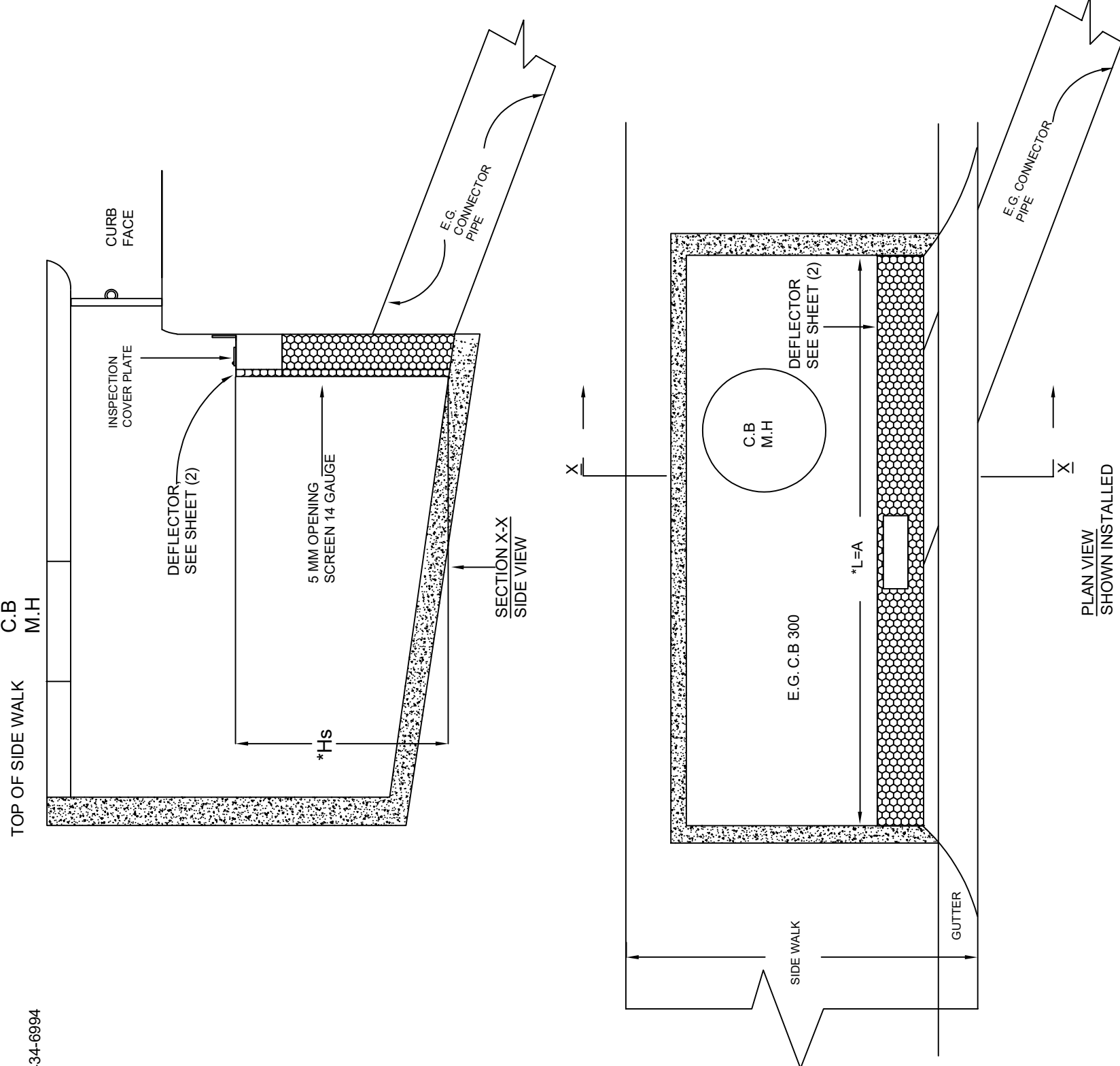
Project Name and Address

Project	Sheet
USW- 2M1	2 OF 4
Date	Scale
10/25/2021	NOT TO SCALE



14000 E. VALLEY BLVD
 CITY OF INDUSTRY, CA 91746
 RAMON MENJIVAR
 OFFICE (626)961-9326 EXT 243 FAX (626)434-6994
 DIRECT (626)890-7104
 EMAIL:ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M1 FIXED SCREEN WITH SWIVEL ACCESS PLATE



PLAN VIEW
 SHOWN INSTALLED
 *L=A

General Notes
 * SEE APPENDIX A-1
 AND APPENDIX B CPS
 SIZING TABLE 1 & 2

THIS MODEL FOR USE IN SHALLOW
 CATCH BASINS WHERE CLEARANCE
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 OR CATCH BASIN DECK TO TOP OF
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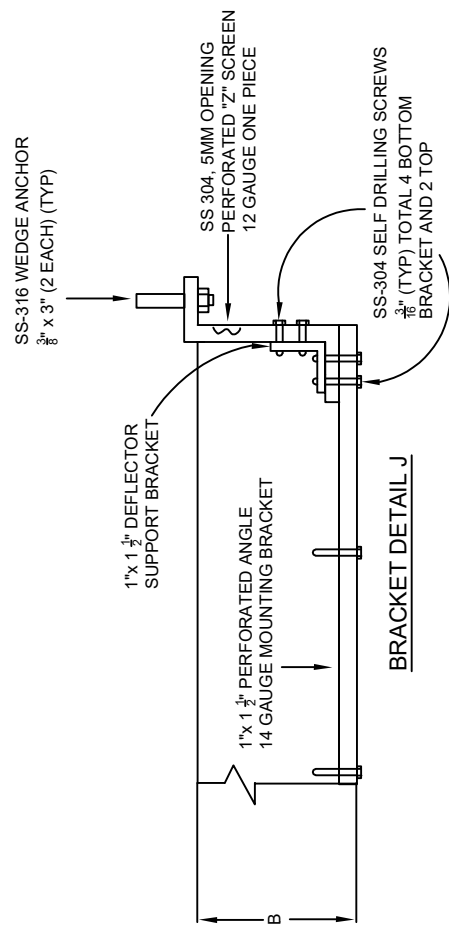
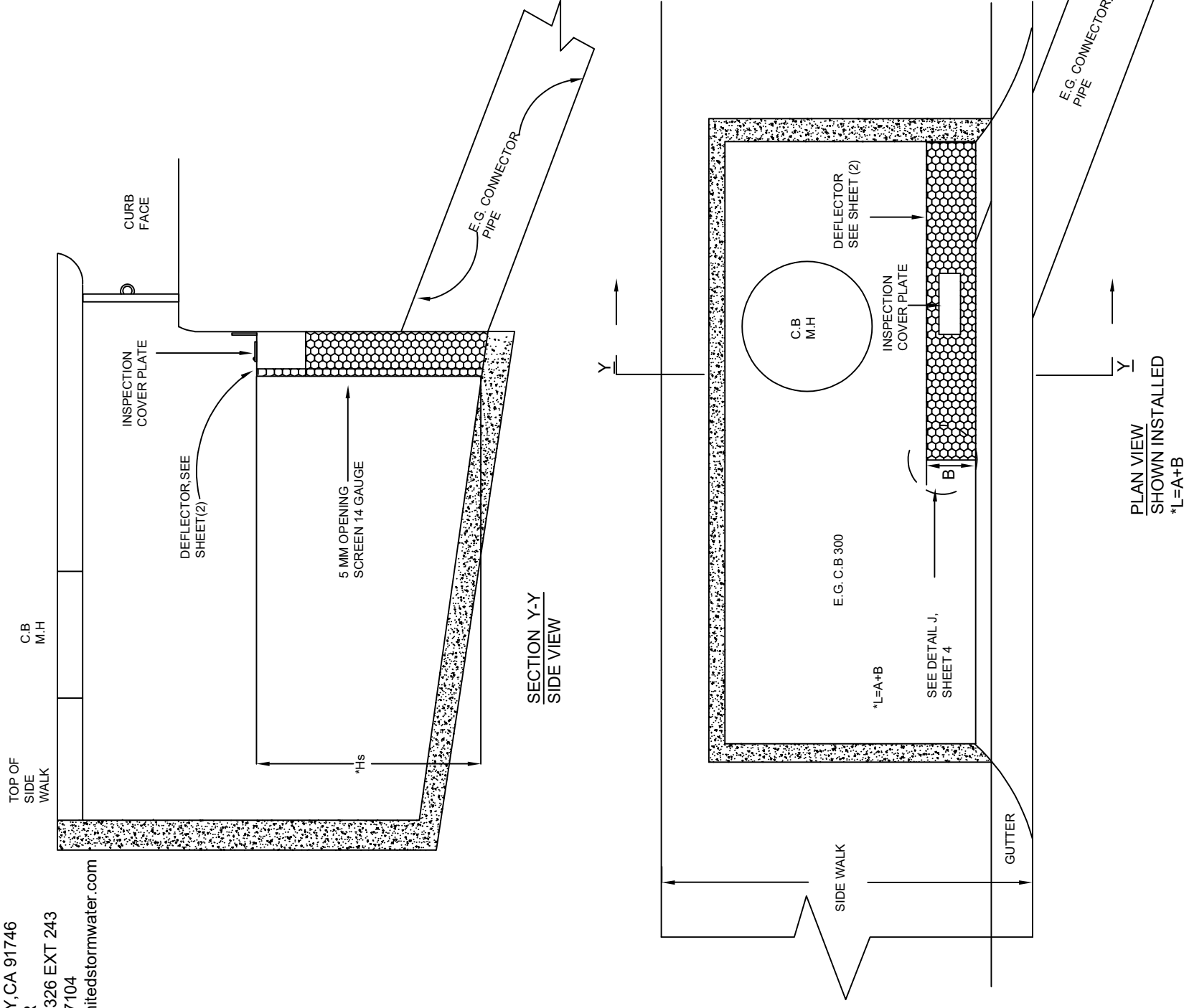
No.	Revision/Issue	Date

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 CITY OF INDUSTRY CA 91746

Project Name and Address

Project	USW-2M1	Sheet	3 OF 4
Date	10/25/2021		
Scale	NOT TO SCALE		

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M1 FIXED SCREEN WITH SWIVEL ACCESS PLATE



General Notes

- SEE APPENDIX A-1 AND APPENDIX B CPS SIZING TABLE 1 & 2

THIS MODEL FOR USE IN SHALLOW CATCH BASINS WHERE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE OR CATCH BASIN DECK TO TOP OF DEFLECTOR IS 9 1/2" OR LESS. ALLOWS ACCESS FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

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Project Name and Address

Project	USW-2M1	Sheet	4 OF 4
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 CITY OF INDUSTRY, CA 91746
 RAMON MENJIVAR
 OFFICE (626)961-9326 FAX (626)-434-6994
 DIRECT (626)890-7104
 Email: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

"EXHIBIT A2.2"

General Notes
 * SEE APPENDIX A-1
 AND CPS SIZING TABLE 1&2

THIS MODEL FOR USE IN CATCH
 BASINS WHERE THERE IS 10" OR
 MORE CLEARANCE FROM BOTTOM
 OF TRAFFIC GRATE, OR CATCH
 BASIN DECK, TO TOP OF DEFLECTOR
 FOR MOSQUITO ABATEMENT
 ACTIVITIES.

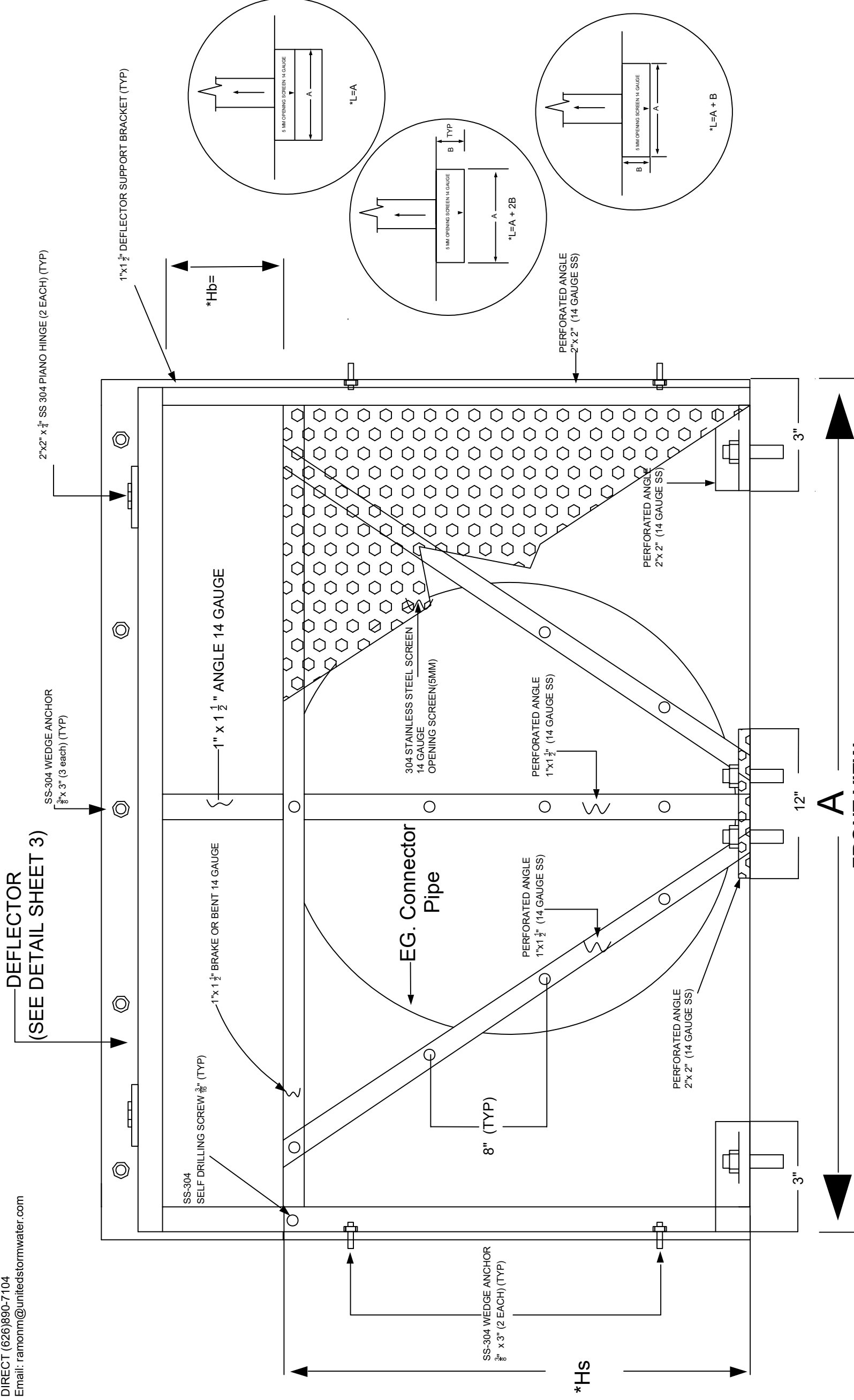
No.	Revision/Issue	Date

Firm Name and Address

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 City of Industry CA 91746

Project Name and Address
 Project: USW-2M2
 Date: 10/10/2021
 Scale: NOT TO SCALE

Sheet	1 of 5



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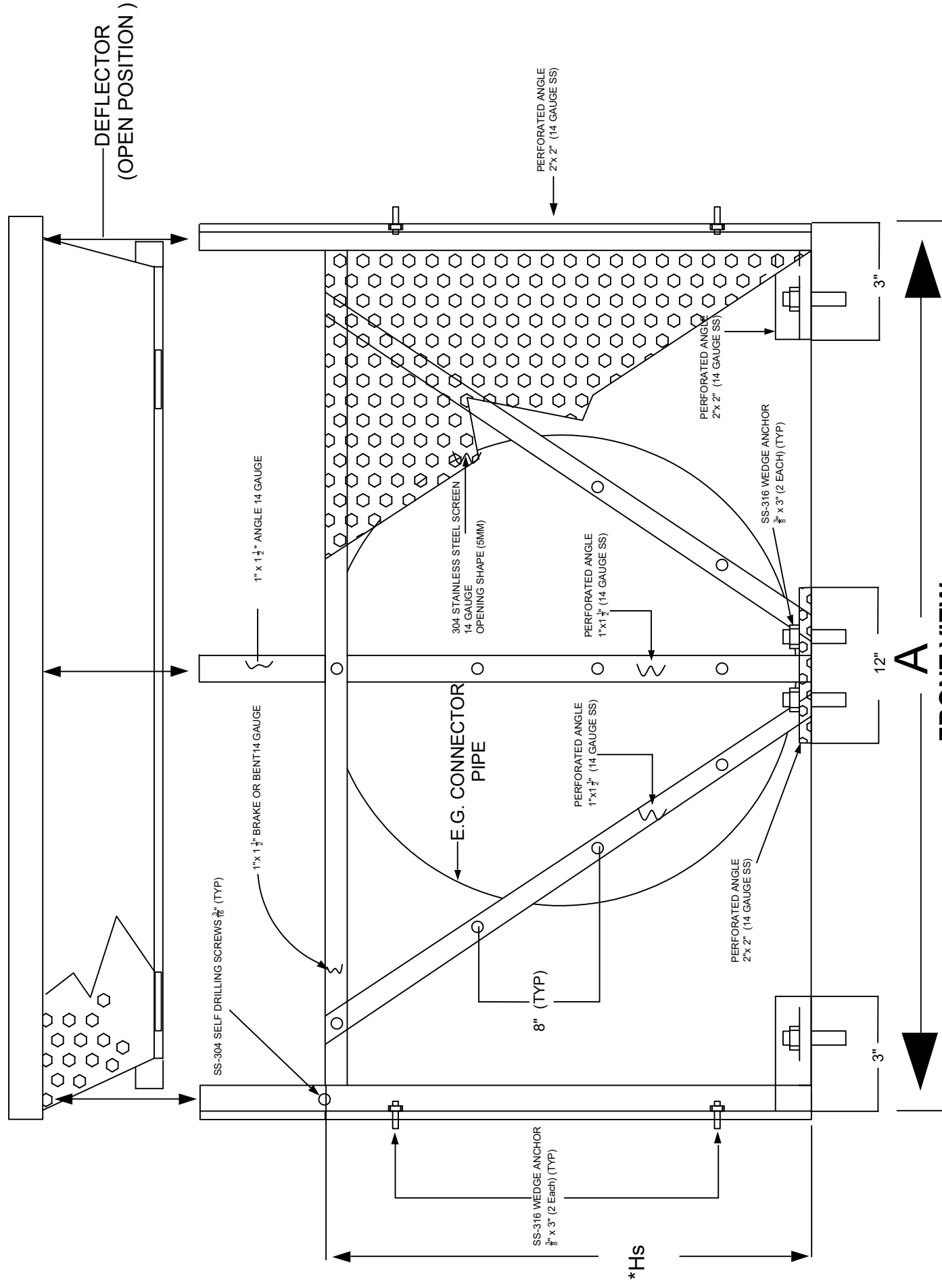
FRONT VIEW
 SHOWN WITH DEFLECTOR CLOSED



14000 E. VALLEY BLVD
 CITY OF INDUSTRY, CA 91746
 RAMON MENUJAR
 OFFICE (626) 961-9326 FAX (626)434-6994
 DIRECT (626) 890-7104
 EMAIL: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

DEFLECTOR
 (SEE DETAIL SHEET 3)



FRONT VIEW
SHOWN WITH DEFLECTOR OPEN

General Notes

* SEE APPENDIX A-1 AND CPS SIZING TABLE 1&2

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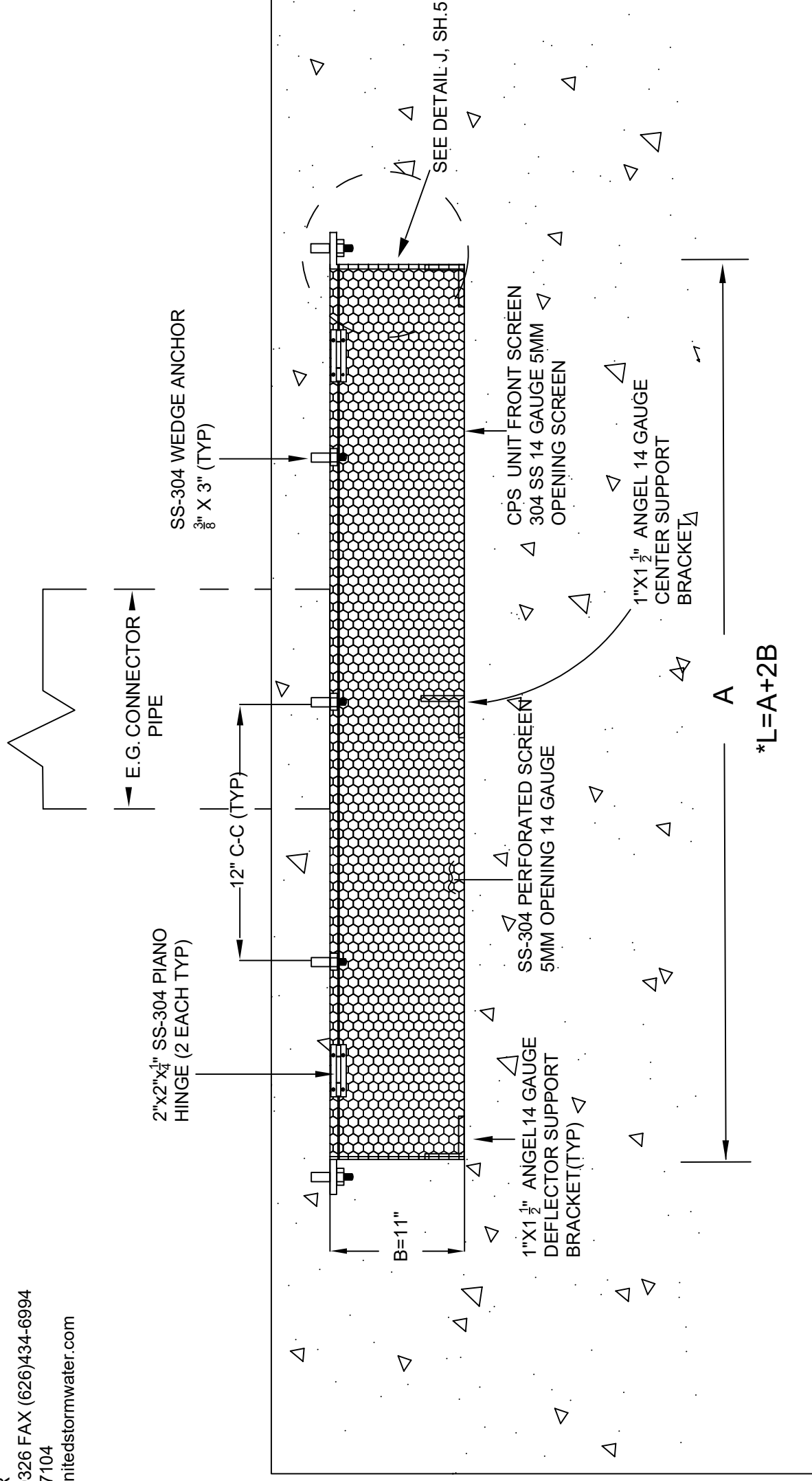
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 Date: 10/10/21
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Project	USW-2M2	Sheet	2 of 5
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 CITY OF INDUSTRY, CA 91746
 RAMON MENJIVAR
 OFFICE (626)961-9326 FAX (626)434-6994
 DIRECT (626)890-7104
 EMAIL: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS



DEFLECTOR DETAIL
 PLAN VIEW (SHEET 1)

General Notes

* SEE APPENDIX A-1 AND CPS SIZING TABLE 1 & 2

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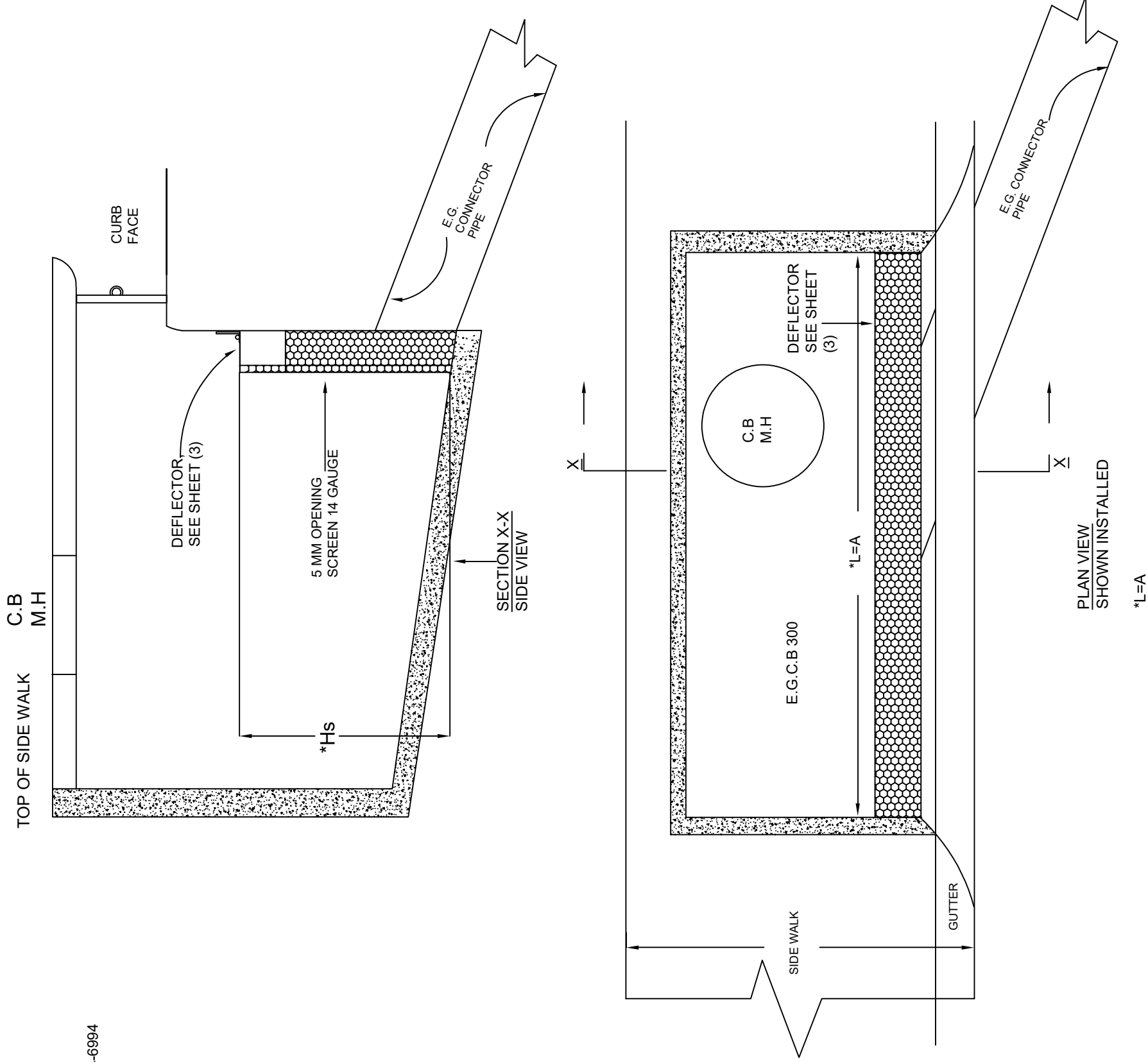
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Project	USW-2M2	Sheet	3 of 5
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 CITY OF INDUSTRY, CA 91746
 RAMON MENJIVAR
 OFFICE (626)961-9326 EXT 243 FAX (626)434-6994
 DIRECT (626)890-7104
 EMAIL: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS



PLAN VIEW
 SHOWN INSTALLED
 *L=A

General Notes

* SEE APPENDIX
 A-1 AND APPENDIX B CPS
 SIZING TABLE 1&2

THIS MODEL FOR USE IN CATCH
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No.	Revision/Issue	Date

Firm Name and Address

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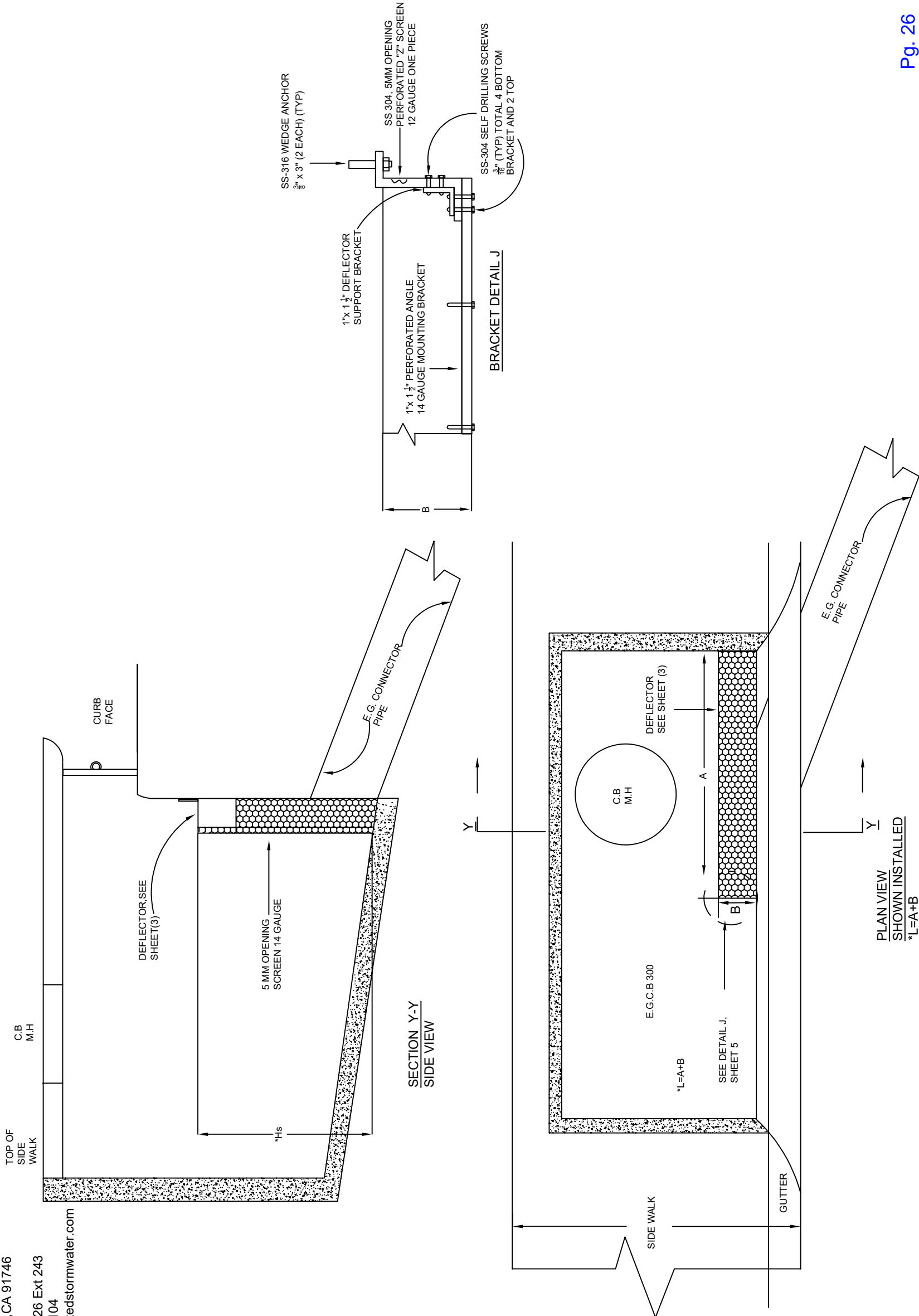
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Project	USW-2M2	Sheet	4 of 5
Date	10/10/2021	NOT TO SCALE	

CONNECTOR PIPE SCREEN (CPS) MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

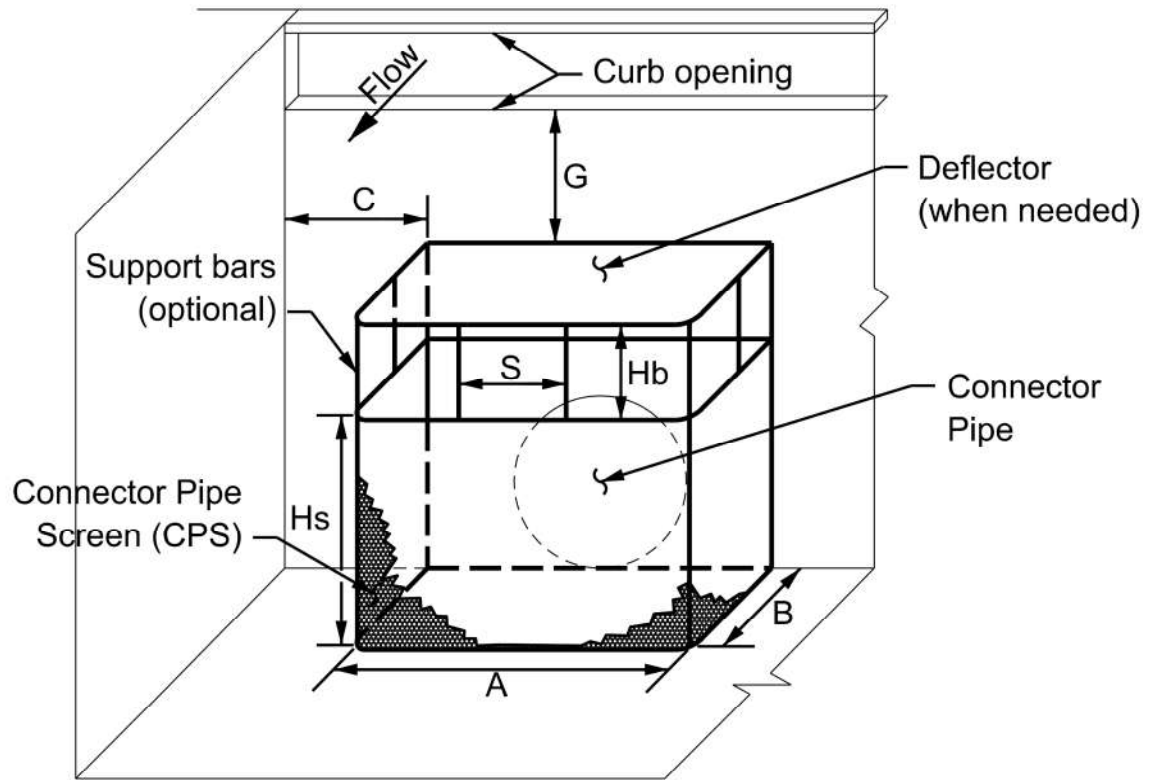


14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326 Ext 243
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EMAIL:ramonm@unitedstormwater.com



<p>General Notes</p> <ul style="list-style-type: none"> * SEE APPENDIX A-1 AND APPENDIX B CFS SIZING TABLE ** BOTH LEGS OF DEFLECTOR SUPPORT BRACKET MUST EXTEND TO THE TOP OF THE DEFLECTOR AND ALSO EXTEND AT LEAST TO THE BOTTOM OF THE MOUNTING BRACKET THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES. 	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">No.</td> <td style="width: 40%;">Revision/Issue</td> <td style="width: 40%;">Date</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table> <p style="font-size: small;">Firm Name and Address</p> <p>14000 E. VALLEY BLVD CITY OF INDUSTRY, CA 91746</p> <p style="font-size: small;">Project Name and Address</p> <p>Project: USW-2M2 Date: 10/10/2021 Scale: Not to Scale</p> <p style="text-align: right; font-size: small;">Sheet 5 OF 5</p>	No.	Revision/Issue	Date			
No.	Revision/Issue	Date					

APPENDIX A-1: CPS CONFIGURATION



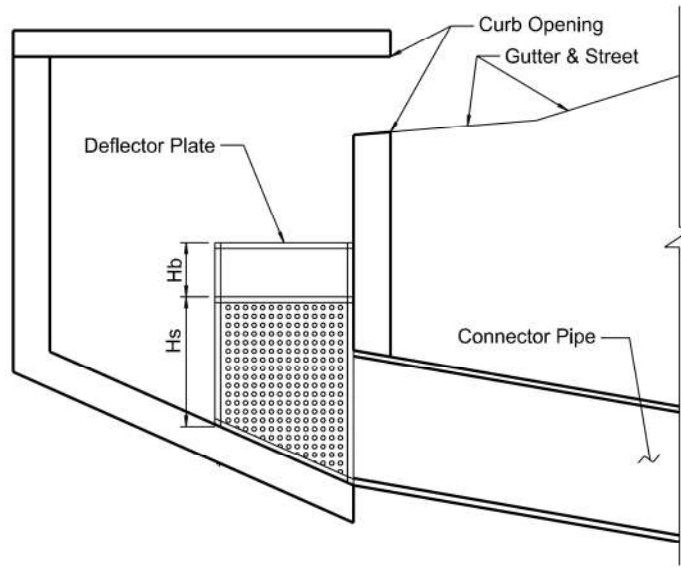
CATCH BASIN INTERIOR VIEW
(Not to scale)

CPS Length	$L = A + 2B$
CPS Height	H_s
Bypass Height	H_b
Minimum Wall Clearance	$C \geq 4"$
Minimum Bar Spacing	$S \geq 6"$
Minimum Interior Spacing	$B \geq 10"$
Minimum Distance from Street Flow Line	$G \geq 4"$

NOTES

1. The CPS shown above is for illustrative purposes only. The catch basin connector pipe location and the shape and design of the CPS may significantly deviate from the above example.
2. For grated catch basins, "G" shall be measured from the bottom of the grate to the top of the deflector plate.

APPENDIX A-2: CATCH BASIN



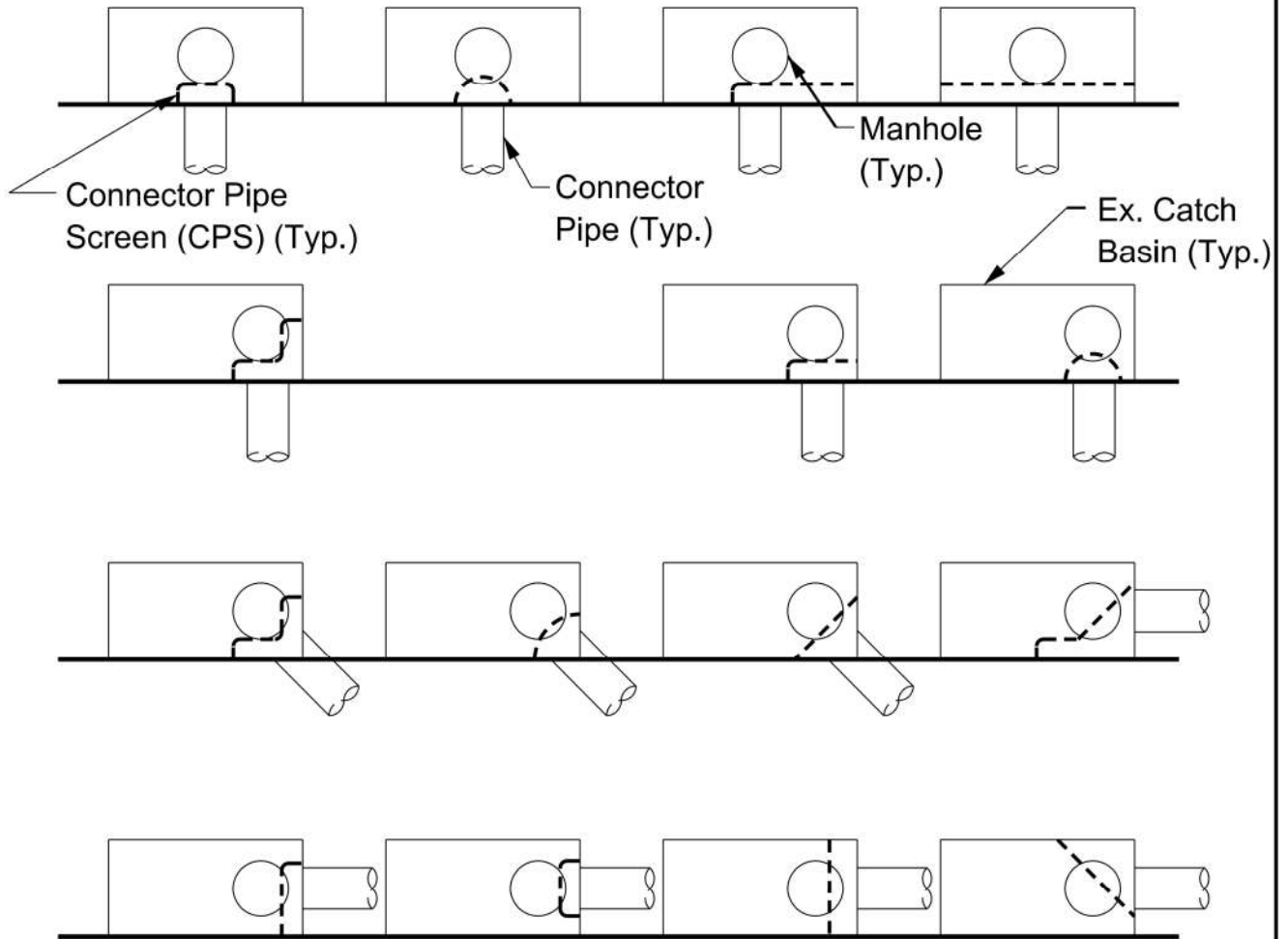
ELEVATION VIEW
NTS

NOTES

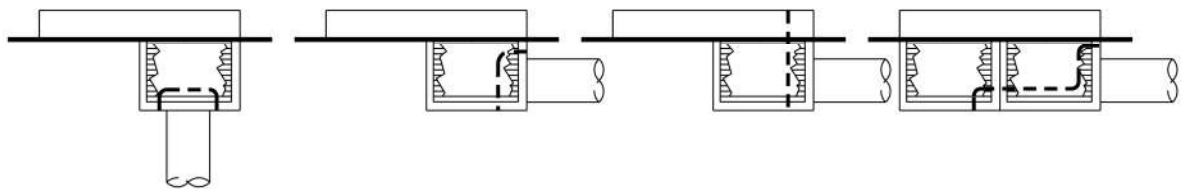
1. The CPS shown above is for illustrative purposes only.
2. CPS shall be flush with catch basin walls and invert. Contractor to verify dimensions prior to fabrication.

APPENDIX A-3: EXAMPLE CPS LAYOUTS

CURB OPENING CATCH BASINS (TYPES 300, 306)

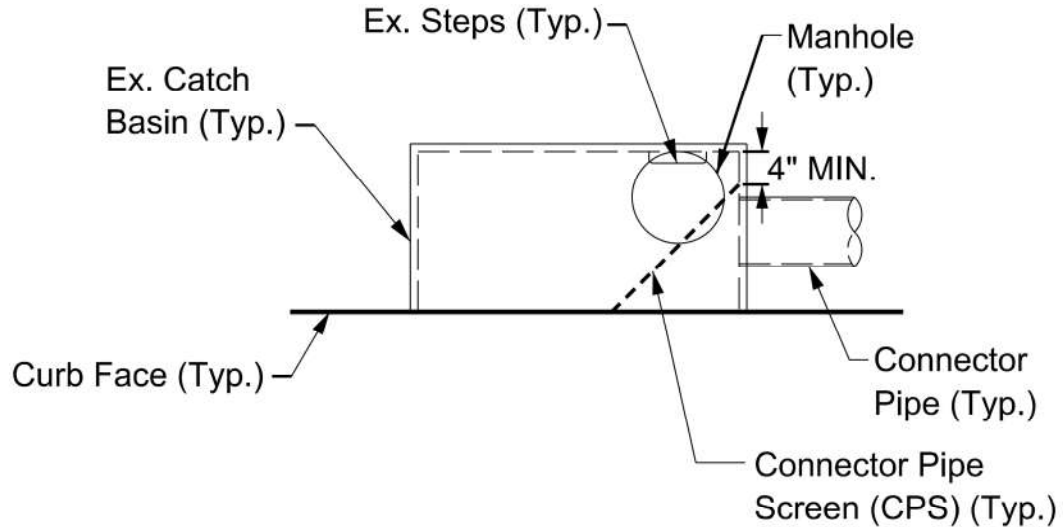


CURB OPENING CATCH BASINS WITH GRATES (TYPES 301, 302)



APPENDIX A-3: EXAMPLE CPS LAYOUTS (CONT.)

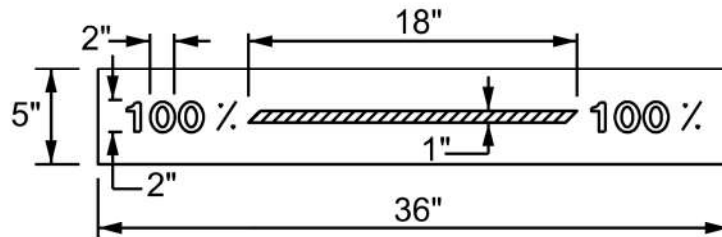
CURB OPENING CATCH BASINS (TYPES 300)



NOTES:

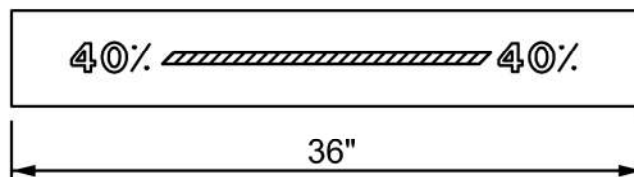
1. The CPS configurations shown above are for illustrative purposes only. This is not a comprehensive list.
2. The CPS unit may encroach into the manhole opening no more than 4 inches.

APPENDIX A-4: STAFF GAUGE



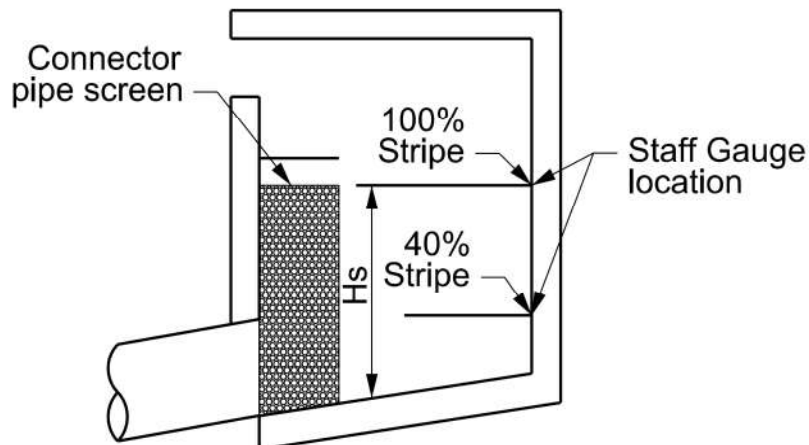
100% STRIPE

(Red Stripe and Numbers on White Background)



40% STRIPE

(Red Stripe and Numbers on White Background)



EXAMPLE LAYOUT

"THE PAINT TYPE AND SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT FOR REVIEW AND APPROVAL PRIOR TO USE."

1. The Contractor shall paint a staff gauge as shown on an externally visible interior wall of each catch basin.
2. The Contractor shall paint red stripes and numbers on white background labeling 40% and 100% screen height (Hs) as shown above.
3. Surfaces must be clean, dry and free from all contaminants including rust that may impair adhesion.

APPENDIX B - CPS SIZING TABLE
TABLE 1

Revised 5/4/2016

CPS SIZING TABLE FOR NON-SUMP CONDITIONS

Catch Basin Type	*V-depth (ft)	CB Width (ft)	No. Grates	** Bypass Height H _b (in)	**Screen Height H _s (in)	**Screen Length L (ft)	**G (in)
300	2.5 (30 inch)	3.5	-	8	8	3.0	4
		7				4.0	
		10				6.0	
		14				7.0	
	2.67 (32 inch)	3.5	-	8	10	3.0	4
		7				4.0	
		10				6.0	
		14				7.0	
	2.83 (34 inch)	3.5	-	8	12	3.0	4
		7				4.0	
		10				6.0	
		14				6.0	
		21				7.0	
	3.0	3.5	-	8	12	3.0	6
		7				4.0	
		10				6.0	
		14		8	14	6.0	4
		21				7.0	
		28				8.0	
	3.5	3.5	-	8	18	3.0	6
		7				4.0	
		10				6.0	
		14		10	16	6.0	
		21				7.0	
		28				8.0	
	4.0	3.5	-	12	20	3.0	6
		7				4.0	
		10				6.0	
14		6.0					
21		7.0					
28		8.0					
4.5 or greater	3.5	-	12	24	3.0	≥ 8	
	7				4.0		
	10				6.0		
	14				6.0		
	21				7.0		
	28				8.0		

* CB's with V-depth values less than given above, the CB must be removed from the project.
** H_b, H_s, L, and G values given above are minimum values.

APPENDIX B - CPS SIZING TABLE
TABLE 1

Revised 5/4/2016

CPS SIZING TABLE FOR NON-SUMP CONDITIONS

Catch Basin Type	*V-depth (ft)	CB Width (ft)	No. Grates	** Bypass Height H _b (in)	**Screen Height H _s (in)	**Screen Length L (ft)	**G (in)
301	3.0 (36 inch)	7	1	8	10	4.0	10
		10	2			5.0	
		14	1			4.0	
		14	2			5.0	
	3.5	7	1	10	12	4.0	12
		10	2			5.0	
		14	1			4.0	
		14	2			5.0	
	4.0	7	1	12	15	4.0	13
		10	2			5.0	
		14	1			4.0	
		14	2			5.0	
	4.5 or greater	7	1	12	18	4.0	≥ 16
		10	2			5.0	
		14	1			4.0	
		14	2			5.0	
302	3.0 (36 inch)	-	1	9	9	2.5	10
		-	2			4.0	
		-	3			5.0	
	3.5	-	1	10	12	2.5	12
		-	2			4.0	
		-	3			5.0	
	4.0 or greater	-	1	10	18	2.5	≥ 12
		-	2			4.0	
		-	3			5.0	
303	3.0 (36 inch)	-	1	9	9	2.5	10
		-	2			4.0	
		-	3			5.0	
	3.5	-	1	10	12	2.5	12
		-	2			4.0	
		-	3			5.0	
	4.0	-	1	12	16	2.5	12
		-	2			4.0	
		-	3			5.0	
	4.5 or greater	-	1	12	22	2.5	≥ 12
		-	2			4.0	
		-	3			5.0	

* CB's with V-depth values less than given above, the CB must be removed from the project.
** H_b, H_s, L, and G values given above are minimum values.



COUNTY OF LOS ANGELES

"EXHIBIT C"

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
www.ladpw.org

DONALD L. WOLFE, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

October 17, 2006

IN REPLY PLEASE
REFER TO FILE: WM-7

Dr. Xavier Swamikannu
Stormwater Chief
California Regional Water Quality
Control Board – Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343

Dear Dr. Swamikannu:

CATCH BASIN BEST MANAGEMENT PRACTICES FULL-CAPTURE DEVICE

Public Works is aggressively testing new Best Management Practices (BMPs) to comply with the Ballona Creek Trash Total Maximum Daily Load. Our research is focused on trash removal BMPs that are cost-effective, easy to maintain, and meet the Regional Water Quality Control Board's standard for full-capture status as defined in the Ballona Creek Trash Total Maximum Daily Load:

A full-capture device is any device or system that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow resulting from a one-year, one-hour, storm (determined to be 0.6 inch per hour for the Los Angeles River Watershed, and assumed to be similar for the Ballona Creek Watershed).

Recent testing of a catch basin device has produced results that meet the full-capture standard. The BMPs we tested consisted of a semicircular screen with a 1.5-foot radius, 2.5 feet high with 5 mm openings that provided approximately 50 percent open area in the screen. The screen was attached around the catch basin connector pipe opening to keep debris inside the catch basin.

It had a semicircular horizontal screen on top and a 1-foot-high vertical opening around the perimeter at the top of the screen. This allowed water to flow over the screen in the event of a large storm or the screen became clogged. Photos of the installation and testing are enclosed.

Dr. Xavier Swamikannu
October 17, 2006
Page 2

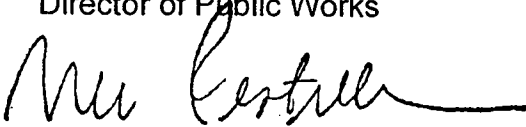
Under this simulated condition, the device performed at a satisfactory level to warrant full-capture status based on the Regional Board's standard. It is our intention to use the device as part of our full-capture implementation strategy and establish maintenance protocols to ensure flood protection and a treatment capacity of all flows resulting from a one-year, one-hour storm.

We recommend that the Regional Board accept this type of device as a full-capture device for trash removal in storm drains. We would appreciate a prompt response in order to facilitate our planning efforts to comply with the Ballona Creek Trash Total Maximum Daily Load.

Should you require further information or have any comments, please contact Mr. Jason Pereira of my staff at (626) 458-7171.

Very truly yours,

DONALD L. WOLFE
Director of Public Works



MARK PESTRELLA
Assistant Deputy Director
Watershed Management Division

JP:ad

P:\wmpub\SMB Watershed\Ballona Creek Watershed\Trash TMDL\2006-10-04 StormTek Device.doc\C06438

Enc.

cc: Carlos Urrunaga

bc: Design (Soliman, Thurow, Zandieh)
Watershed Management (DePoto)

TECHNICAL REPORT

CONNECTOR PIPE SCREEN DESIGN

FULL CAPTURE TMDL COMPLIANCE
SCREEN AND BYPASS SIZING REQUIREMENTS



April 2007



**COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS**

PREPARED BY DESIGN DIVISION

Taejin Moon, P.E., Associate Civil Engineer
Josh Svensson, P.E., Associate Civil Engineer

DIRECTED BY:

Mike Soliman, P.E., Principal Engineer

SUPERVISED BY:

Jim Thurow, P.E., Senior Civil Engineer
Amir Zandieh, P.E., Civil Engineer

ASSISTED BY:

Richard Weyermuller, P.E., Field Modeling
Ben Willardson, P.E., Hydrology Engineering

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I. Purpose and Scope

The intent of this report is to establish a conservative sizing criterion for connector pipe screens (CPS) to comply with the Ballona Creek and Los Angeles River Trash Total Maximum Daily Load (Trash TMDL) full capture standard while maintaining the existing level of flood protection for Los Angeles County Flood Control District (LACFCD) facilities.

II. Abstract

CPS devices are vertically oriented screens installed inside a catch basin (CB), directly upstream of the connector pipe as shown in Figure 1. Connector Pipe Screens are fabricated from 5mm mesh screen and are designed to comply with the Regional Water Quality Control Board's (RWQCB) definition of a full capture system.

Engineers from the County of Los Angeles Department of Public Works (Public Works) performed hydrologic analysis to establish a method of calculating the maximum treatment flow resulting from a one-year, one-hour storm. Using this information, they performed hydraulic analyses to establish minimum sizing requirements for the CPS screen. Public Works engineers also established minimum sizes for the bypass opening, which provides flood protection during large storm events.



Figure 1: CPS inside catch basin

III. Background

Public Works has been given the responsibility to bring its flood control facilities into compliance with the TMDLs established by the RWQCB. Public Works has undertaken an aggressive testing program to find devices that may be used to retrofit existing flood control infrastructure. Potential devices are tested for their ability to meet the TMDL requirements and to ensure that they do not reduce flood control protection. As defined by the RWQCB, the standard for full-capture status is the following:

Compliance with the final Waste Load Allocation may be achieved through a full capture system; which is defined as any device or series of devices that traps all particles retained by a 5mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour storm in the sub-drainage area.
(CA RWQCB TENTATIVE RESOLUTION NO. 07-0XX, Sec. 12, page 3, July 12, 2007)

A CPS is a vertical screen with 5 mm openings, installed inside a catch basin directly upstream of the connector pipe in such a manner that all water entering the basin must pass through the device. A vertical opening is provided around the perimeter of the screen to allow storm water to bypass in the event of a large storm or if the screen becomes clogged. Connector Pipe Screens are currently manufactured and installed by Advanced Solutions (Stormtek) and American Storm Water (Debris Dam).

IV. Hydrology Study

Since the majority of LACFCD facilities are designed for a 10-year design storm frequency (Q_{10}), the calculations in this report will design the CPS for a CB designed with a 10-year storm frequency.

In order to determine the 1-year 1-hour TMDL flow, we need to establish a conservative conversion factor, k , from a 10-year storm, Q_{10} , to a TMDL flow (Q_{1-1}) as shown in Equation 1.

Equation 1:
$$Q_{1-1} \leq k \cdot Q_{10}$$

To develop this conversion factor (k), we first compared storm frequency ratios. This involved comparing the magnitude of one 24-hour storm frequency with another 24-hour storm frequency. The results of this analysis are shown in Table 1 as a ratio used to convert one storm frequency to another based only on the 24-hour isohyetal values for different storm frequencies. The ratios are consistent with the ratios provided in the Los Angeles County 2006 Hydrology Manual¹ for scaling storm frequencies.

Storm Frequency Conversion Factor ($Q_x \cdot k = Q_{1-1}$)					
	2-yr	5-yr	10-yr	25-yr	50-yr
k	0.413	0.274	0.224	0.182	0.160

Table 1: Storm frequency conversion factors based on rainfall frequencies

Based on the conversion of storm frequencies, a value of $k = 0.224$ would be appropriate for use in the conversion. However, this value does not take into account the changes to runoff that occur due to changes in infiltration rates and times of concentration.

To better quantify these hydrologic effects, we used the Time of Concentration Calculator² to model over 360,000 different hydrologic scenarios of varying storm frequencies and watershed characteristics. Table 2 shows the values used for the 1-year vs. 10-year flow comparisons.

Watershed Parameter	Values Used
Lengths	1000, 1500, 2000
Area	1 and 10 acres
Soils	2 through 180
Slope	0.01, 0.05, 0.08, 0.10, 0.15, 0.20
Imperviousness	0.15, 0.45, 0.95
10-yr Isohyets	1, 2, 4, 6, 8, 10, 12
Possible Combinations	90,216

Table 2: Runoff analyses variables for 1-yr vs. 10-yr

¹ Available from the Public Works website at <http://www.ladpw.org/wrd/publication/>

² An Excel spreadsheet available from the Public Works website at <http://www.ladpw.org/wrd/publication/>

Hydrologic modeling using the modified rational method provided insight into the combined effects of watershed characteristics on the runoff ratios. The maximum runoff ratio measured in the extensive testing is being used for the k factor. Table 3 contains the maximum value selected for k based on these studies.

Statistics	1-yr/2-yr	1-yr/5-yr	1-yr/10-yr	1-yr/25-yr	1-yr/50-yr
Maximum	0.3023	0.2021	0.1646	0.1345	0.1167
Count	67,662	67,662	90,216	67,662	67,662

Table 3. Statistics of Runoff Frequency Ratios Based on Modified Rational Modeling

Figure 2 is provided to show the probability distributions of the runoff ratios generated during the testing.

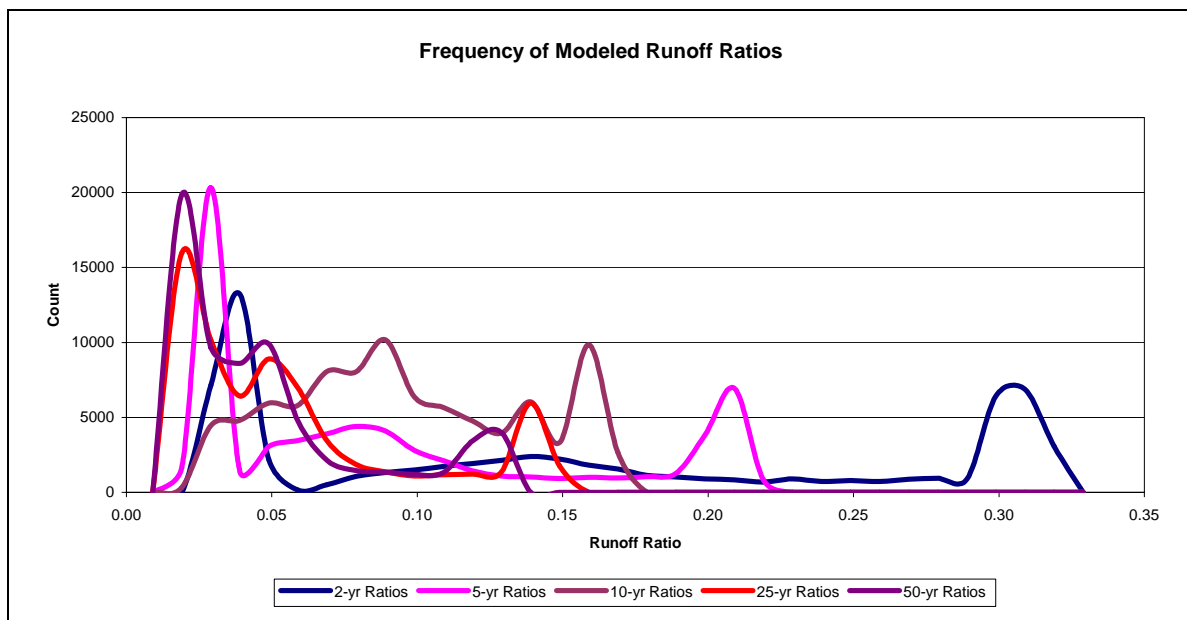


Figure 2. Frequency of runoff ratios resulting from modified rational modeling

Based on a comparison of Table 1 and 3, k values from Table 1 have been verified to be a very conservative values for converting an n -year frequency storm to a 1-year frequency storm. A 10-year frequency storm conversion is shown in Equation 2.

Equation 2:
$$Q_{1-1} \leq 0.22 \cdot Q_{10}$$

This k value will be a conservative assumption that compensates for different land uses, soil types, areas, slopes, isohyets, and travel path lengths.

In most cases of the CPS design, the bypass flow requirements will govern the design, and the screen capacity will be more than adequate to pass the Q_{1-1} flow. Currently, LACFCD is not installing BMP devices on deficient systems (5 year frequency capacity and less) due to uncertainty of flooding risk and maintenance liability.

V. Catch Basin Flow

A conservative (i.e. maximum) estimate of catch basin flows based on curb opening widths must be determined in order to calculate the Q_{1-1} . The bypass structure must also be able to pass the maximum catch basin flow in order to provide proper flood protection.

Two parameters of catch basin flow (curb flow depth and street slope) must be conservatively assumed in order to calculate the design flow into a catch basin. Based on the LACFCD Hydraulic Manual³ (Chart D-10D), the street slope does not have a large impact on side-opening catch basin flow, as shown in Table 4 and Figure 3.

Street Width (ft)	Street Slope (ft/ft)			
	0.005	0.01	0.03	0.05
3.5	3.7	4	4.3	4.6
7	7.3	7.8	8.4	9
10	10.1	11	11.9	12.7
14	13.7	14.9	16	17.2
21	18.7	20.7	22.6	24.3
28	23	25.5	27.8	30.1

Table 4: Catch basin flow (cfs) for various street slopes
(depth of flow = 8", local depression=2")

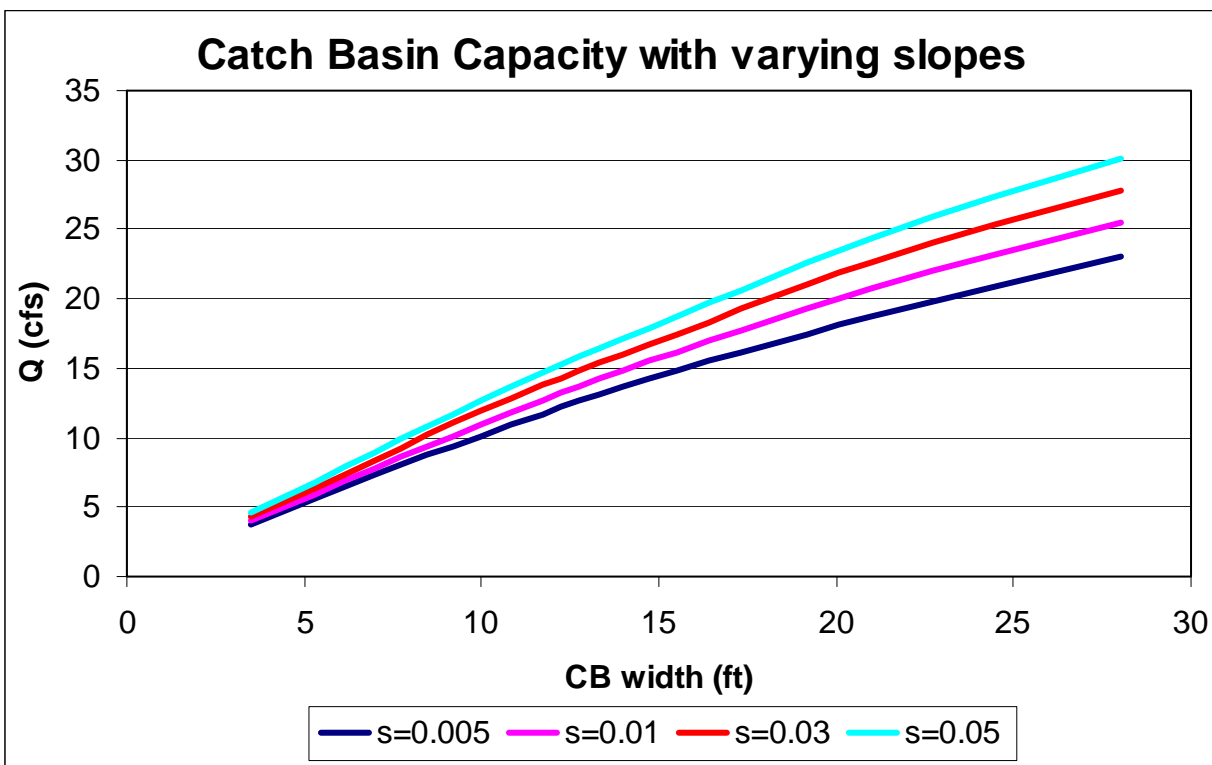


Figure 3: Catch basin flow for various street slopes

³ Available for download at http://www.ladpw.org/wrd/publication/Engineering/design_manual.pdf Pg. 42

Street Slope

Although street slope does not have a major impact on CB flows, flows do increase slightly as the slope increases. Curb opening catch basins are not installed on slopes larger than 0.04, so a slope of 0.04 can be assumed to be the maximum slope

Local Depression

The local depression will also impact the flow to the catch basin up to 25%. However, the vast majority of Public Works catch basins have a local depression of 2 inches, so 2 inches will be used in this study.

Curb Flow Depth

A depth of 6-inches can be assumed to be a conservative value for the depth of flow. A depth of flow of 8-inches (up to the curb height) would be very unlikely, especially on a steeply inclined street (slope ≥ 0.04).

Analysis Parameters

In summary, the criteria used for the hydraulic analysis of catch basins was:

Basin type: Side Opening Catch Basin (SPPWC Standard Plan 300)

Depth of flow: 6"

Street slope: 0.04 ft/ft

Local depression: 2"

Results for the maximum flow for different catch basins of various widths are shown in the center column of Table 5. Using Equation 2, we can calculate the Q_{1-1} for catch basins of various widths as shown in the right column of Table 5.

CB width (ft)	Max Q_{10} (cfs)	Max Q_{1-1} (cfs)
3.5	2.8	0.6
7	5.3	1.2
10	7.5	1.7
14	10.0	2.2
21	13.9	3.1
28	17.3	3.8

Table 5: Maximum Q_{1-1} flow

VI. Screen Flow Calculations

To calculate the loss in hydraulic head and flow through the CPS screen, we used an orifice equation to determine the theoretic flow rate. See Figure 4.

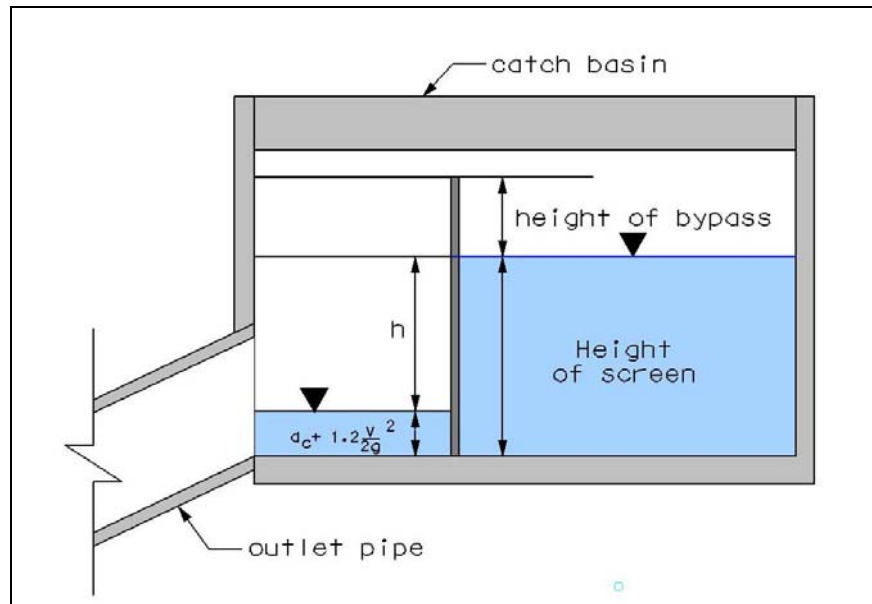


Figure 4: Catch basin profile

Equation 3:
$$Q_{screen} = cA_{screen}\sqrt{2gh}$$

The flow through the screen is a function of the open area (A) of the screen and the differential head between the upstream and downstream side of the screen, h . The orifice coefficient, c , is an empirically determined constant which accounts for friction and turbulence at the orifice. This coefficient is unique to each orifice geometry, and was established in our hydraulic laboratory at the San Gabriel Dam (See Section VII).

Since Q_{1-1} flows are small relative to design flows and most connector pipes have steep slopes (>0.10) and therefore supercritical flow, critical depth and critical velocity losses can be assumed to be a conservative approximation of the water depth on the downstream face of the screen. The velocity head multiplier (1.2) in Equation 4 is the loss encountered at the entrance of the connector pipe per the LACFCD hydraulic manual.

Equation 4:
$$\text{Downstream depth } (D_d) = d_c + 1.2 \frac{V^2}{2g}$$

To find the flow through the screen, Equations 3 and 4 must be solved simultaneously using an iterative process since the critical depth is a function of the flow passing through the screen.

VII. Field Testing

Due to the fact that orifice conditions for the screen holes differ substantially from the conditions used to determine the standard orifice coefficients, Design Division performed field tests at the San Gabriel Dam catch basin testing facility (Figure 5) in order to determine the coefficient c_{screen} for Equation 3. Figure 6 and Table 6 present results of the field-testing data.



Figure 5: CPS Testing

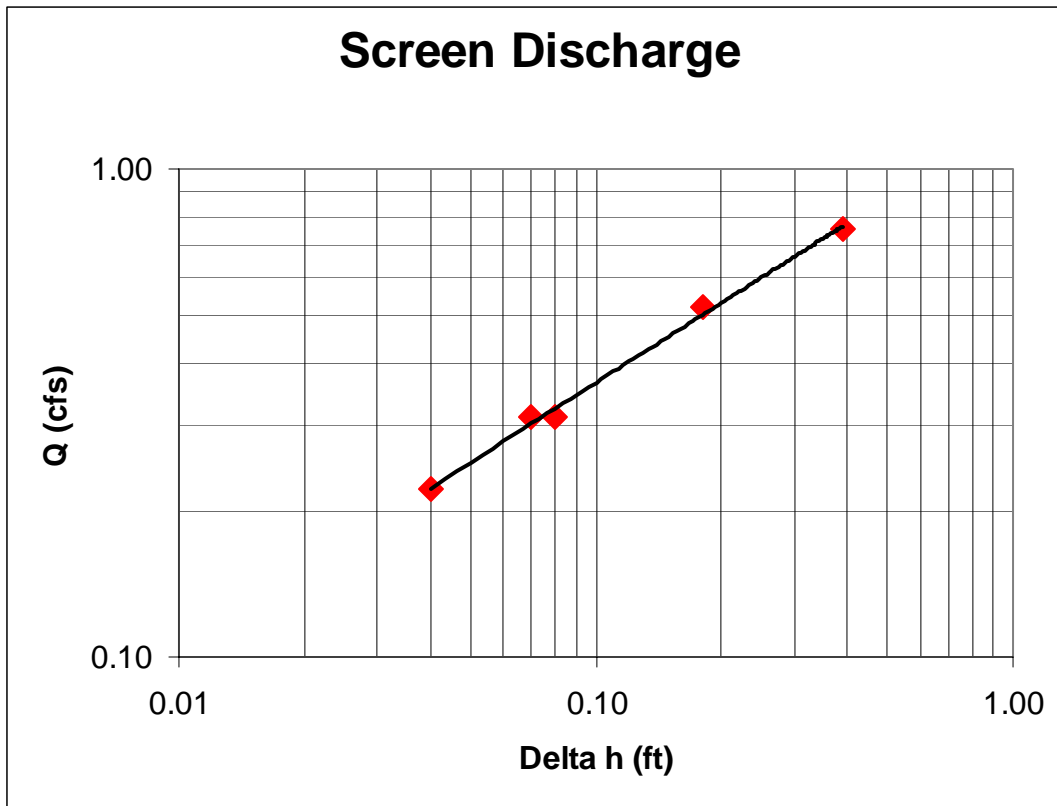


Figure 6: Field test data

Run	Q (cfs)	U/S screen depth (ft)	D/S screen depth (ft)	h (ft)	Area (ft ²)	Orifice coefficient, c
1	0.31	1.62	1.55	0.07	0.228	0.640
2	0.52	1.80	1.62	0.18	0.253	0.603
3	0.75	2.00	1.61	0.39	0.282	0.532
4	0.22	1.61	1.57	0.04	0.248	0.553
5	0.31	1.67	1.59	0.08	0.257	0.531
Average c_{screen}						0.572

Table 6: Field test data

Figure 6 shows that there is clearly a relationship between Q and h, which confirms that Equation 3 is applicable. The varying values for c_{screen} in Table 6 can be attributed to debris lodged in the screen, which is difficult to measure. Even the slightest change in area can drastically impact the c_{screen} coefficient. We will use the smallest, most conservative value, $c_{screen} = 0.53$, in our calculations.

VIII. Bypass Flow Calculations

For the bypass flow calculation, an orifice equation can also be used. A weir equation can be used but since the maximum water depth will be above the bypass area, an orifice equation is more appropriate (See Equation 5). The maximum depth of flow can be assumed to be anywhere between the flow line or 6-inches below the flow line. Figure 7 shows this situation more clearly.

Equation 5:
$$Q_{bypass} = c_{bypass} A_{bypass} \sqrt{2gH}$$

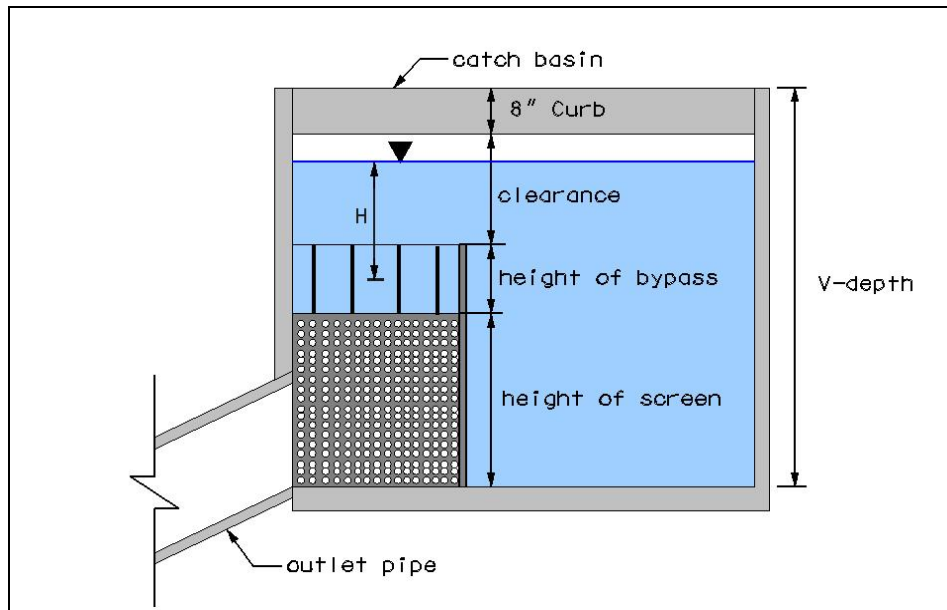


Figure 7. Catch Basin with screen and bypass with zero freeboard.

As part of our retrofit program, Public Works is also intending to use automatic retractable screens (ARS) to further limit trash entering the catch basin. A minimum clearance of 4-inches is required between the top of the bypass and the flow line due to physical restrictions from the ARS See Figure 8.



Figure 8. Minimum clearance due to ARS

IX. Results

The bypass height (H_{bypass}) and length (L) requirements to pass the design flow were first established. With a given bypass height, a height for the screen can be calculated using the remaining depth of the catch basin while ensuring the minimum 6-inch clearance between the flow line and top of the bypass structure. The required length (as shown in Figure 9) of the bypass will be the same length for the screen. The screen capacity was calculated to ensure that the height and length of the screen will pass the Q_{1-1} flow. The freeboard was encroached when necessary.

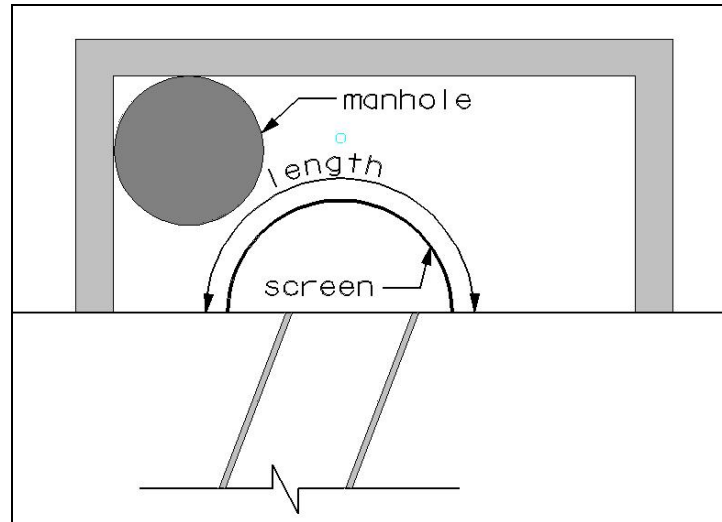


Figure 9: Plan view of catch basin

The following assumptions are made in these calculations:

Screen Clogged % = 50% (conservative assumption from observation)

Open area of screen = 44% (area open for a Stormwater screen, min. area open)

Example Calculation

For V depth = 3.5', CB Width = 3.5', $Q_{10} = 2.8$ cfs, $Q_{1-1} = 0.6$ cfs,
assume $H_{bypass} = 6''$, $H_{screen} = 18''$

Check Clearance:

$$= V\text{-depth} - H_{screen} - H_{bypass} - \text{curb height}$$

$$= 3.5' - 1.5' - 0.5' - 8/12' = 10 \text{ inches clearance to flow line} > \text{min. } 4''$$

Size Bypass Using Equation 5, $Q_{bypass} = c_{bypass} A_{bypass} \sqrt{2gH} = c_{bypass} H_{bypass} L \sqrt{2gH}$

$H_{bypass} = 6$ inches, with $c_{bypass} = 0.6$, $g = 32.2$,

$$H = \frac{H_{bypass}}{2} + 10'' - 6'' \text{ freeboard}$$

$$= \frac{6''}{2} + 10'' - 6'' = 7''$$

$$Q_{bypass} = c_{bypass} H_{bypass} L \sqrt{2gH}$$

$$2.8 = 0.6 \times 0.5' \times L \sqrt{2 \times 32.2 \times 7 / 12}$$

$$L = 1.52 \text{ feet}$$

Then using Equation 3, the screen area can be checked to see if it can pass the Q_{1-1} . Based on a $L=1.53$ feet and a height of 1.5 feet, the screen can pass 1.5 cfs which is greater than the 0.6 cfs it needs to pass, thus the dimensions are satisfactory.

The following Table 7 provides an example of sizing recommendations for screen and bypass heights and lengths for a V-depth of 3.5 feet. To use this table, a designer would find the row corresponding to the CB width, and would then size a screen that met the minimum height and length.

"V-depth" (ft)	CB Width (ft)	Max Q_{10} (cfs)	Bypass Height (in)	Free-board (in)	Screen Height (in)	Q_{1-1} (cfs)	Clearance (in)	Screen Length (ft)	Screen Capacity (cfs)
3.5	3.5	2.8	6.0	6.0	18	0.6	10.00	1.5	1.5
3.5	7	5.3	6.0	6.0	18	1.2	10.00	2.9	2.9
3.5	10	7.5	6.0	5.0	18	1.7	10.00	3.8	3.8
3.5	14	10.0	8.0	0.0	18	2.2	8.00	3.1	3.1
3.5	21	13.9	8.0	0.0	18	3.1	8.00	4.3	4.3
3.5	28	17.3	12.0	0.0	18	3.8	4.00	3.9	3.9

Table 7: Recommended values for a V=3.5' catch basin

Note that these are only recommended values. Different values may have capacity to pass the design and TMDL flows. Please see the attached appendix for CPS sizing recommendations for most common catch basin sizes.

Some combinations of V-depths and connector pipe sizes made installation of a practically sized CPS impossible, thus the height of the screen had to be reduced below our recommended standards (the total area and therefore treatment capacity of the screen is still adequate even in these unusual scenarios).

A size recommendation was made based on the most practical size. For example, a 15" radius screen, with a 180-degree angle will result in a length of 3.9 feet, or a 15" radius screen with a 90-degree angle will result in a length of 1.96 feet. Thus, the bypass height, screen height were calculated with the goal to calculate a length close to 3.9 feet or 1.9 feet. Increasing the radius or installing rectangular screens to increase the lengths can accommodate any lengths larger than the recommended value.

The screen does not have to be a semi-circular arc, as long as the minimum length and height requirements are satisfied, it will pass the TMDL and design flow regardless of shape. Figure 10 shows an example of a non-circular screen.



Figure 10. Rectangular screen across CB corner

X. Catch Basins in Series

For parallel catch basins in series (See Figure 10A), only the upstream catch basin shall have a CPS, since the low flow will only enter the upstream basin. The upstream CPS can be sized just like an individual basin.

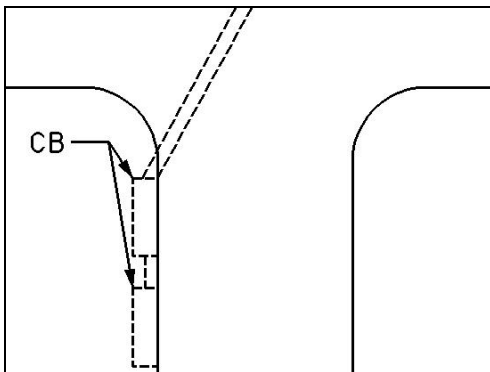


Figure 10A: Same side catch basin in series

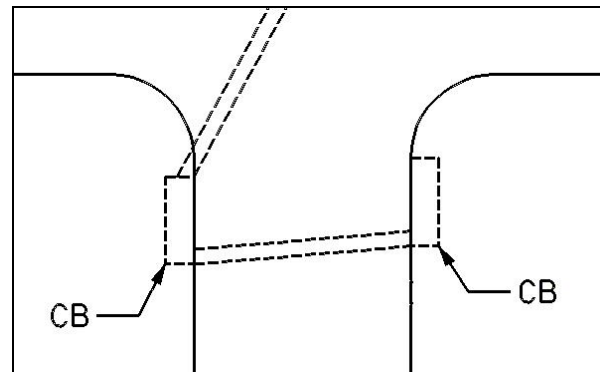


Figure 10B: Opposite side catch basin in series

For catch basins in series across from each other (See figure 10B), the upstream and downstream CB CPS shall be designed as individual basins. However, the downstream basin will need to bypass its design flow and the upstream design flow. The downstream basin shall be designed such that the width of the basin is the sum of the downstream and upstream basin. For example, for two seven-foot basins, the downstream basin shall be designed as a 14-foot basin.

XI. Maintenance Requirements

The purpose of a Connector Pipe Screen (CPS) is to contain trash within a catch basin, excluding it from the storm drain system. Routine maintenance will be necessary to remove trash from the catch basin to prevent it from accumulating to a point that would affect the performance of the CPS or the catch basin itself.

Proposed Maintenance Approach

- Inspect and clean each catch basin between May 1 and September 30 of each year.
- Inspect and provide additional cleaning of any catch basin that is at least 40% full of trash and/or debris.

Based on field testing at the San Gabriel Dam catch basin testing facility, visual observation of City of Los Angeles Vertical screens, and recommendations from the City of Los Angeles, the following physical requirements were established.

- Minimum V-depth = 3.5
- Minimum screen height = diameter of connector pipe
- 6" spacing for vertical bars for bypass
- 6" minimum bypass height
- 4" minimum clearance from flow line to top of bypass structure.
- When low flows have the potential to fall from the curb to behind the CPS, a deflector or screen must be installed on the top of the structure.
- Where manhole access is impeded due to the internal screen, a new manhole shall be constructed.

Full Capture CPS Hydraulic Analysis and Sizing

"V-depth" (ft)	CB Width (ft)	No. Grates	Max Q ₁₀ (cfs)	Bypass Height (in)	Free-board (in)	Screen Height (in)	Q ₁₋₁ (cfs)	Clearance (in)	Curb Height (in)	Head (ft)	Screen Length (ft)	Screen Capacity (cfs)
CB 300												
18" connector pipe												
3.5	3.5	–	2.8	6.0	6.0	18	0.6	10.00	8.00	0.58	1.5	1.5
	7	–	5.3	6.0	6.0	18	1.2	10.00	8.00	0.58	2.9	2.9
	10	–	7.5	6.0	5.0	18	1.7	10.00	8.00	0.67	3.8	3.8
	14	–	10.0	8.0	0.0	18	2.2	8.00	8.00	1.00	3.1	3.1
	21	–	13.9	8.0	0.0	18	3.1	8.00	8.00	1.00	4.3	4.3
	28	–	17.3	12.0	0.0	18	3.8	4.00	8.00	0.83	3.9	3.9
CB 300												
24" connector pipe												
3.5	3.5	–	2.8	6.0	0.0	24	0.6	4.00	8.00	0.58	1.5	2.0
	7	–	5.3	6.0	0.0	24	1.2	4.00	8.00	0.58	2.9	3.8
	10	–	7.5	6.0	0.0	24	1.7	4.00	8.00	0.58	4.1	5.4
	14	–	10.0	6.0	0.0	18	2.2	10.00	8.00	1.08	4.0	4.0
	21	–	13.9	9.0	0.0	18	3.1	7.00	8.00	0.96	3.9	3.9
	28	–	17.3	12.0	0.0	18	3.8	4.00	8.00	0.83	3.9	3.9
CB 300												
18" or 24" connector pipe												
4.0	3.5	–	2.8	6.0	6.0	24	0.6	10.00	8.00	0.58	1.5	2.0
	7	–	5.3	6.0	6.0	24	1.2	10.00	8.00	0.58	2.9	3.8
	10	–	7.5	8.0	6.0	24	1.7	8.00	8.00	0.50	3.3	4.4
	14	–	10.0	10.0	6.0	24	2.2	6.00	8.00	0.42	3.9	5.1
	21	–	13.9	12.0	3.0	24	3.1	4.00	8.00	0.58	3.8	5.0
	28	–	17.3	12.0	0.0	24	3.8	4.00	8.00	0.83	3.9	5.2
4.5	3.5	–	2.8	6.0	6.0	24	0.6	16.00	8.00	1.08	1.1	1.5
	7	–	5.3	6.0	6.0	24	1.2	16.00	8.00	1.08	2.1	2.8
	10	–	7.5	6.0	6.0	24	1.7	16.00	8.00	1.08	3.0	4.0
	14	–	10.0	8.0	6.0	24	2.2	16.00	8.00	1.17	3.1	4.1
	21	–	13.9	10.0	6.0	24	3.1	12.00	8.00	0.92	3.6	4.8
	28	–	17.3	12.0	6.0	24	3.8	10.00	8.00	0.83	3.9	5.2

Full Capture CPS Hydraulic Analysis and Sizing

"V-depth" (ft)	CB Width (ft)	No. Grates	Max Q ₁₀ (cfs)	Bypass Height (in)	Free- board (in)	Screen Height (in)	Q ₁₋₁ (cfs)	Clearance (in)	Curb Height (in)	Head (ft)	Screen Length (ft)	Screen Capacity (cfs)
CB 300	18" or 24" connector pipe											
5.0	3.5	–	2.8	6.0	6.0	30	0.6	16.00	8.00	1.08	1.1	1.8
	7	–	5.3	6.0	6.0	30	1.2	16.00	8.00	1.08	2.1	3.5
	10	–	7.5	6.0	6.0	30	1.7	16.00	8.00	1.08	3.0	5.0
	14	–	10.0	8.0	6.0	30	2.2	16.00	8.00	1.17	3.1	5.1
	21	–	13.9	10.0	6.0	30	3.1	12.00	8.00	0.92	3.6	6.0
	28	–	17.3	12.0	6.0	30	3.8	10.00	8.00	0.83	3.9	6.5
5.5	3.5	–	2.8	6.0	6.0	36	0.6	16.00	8.00	1.08	1.1	2.2
	7	–	5.3	6.0	6.0	36	1.2	16.00	8.00	1.08	2.1	4.2
	10	–	7.5	6.0	6.0	36	1.7	16.00	8.00	1.08	3.0	6.0
	14	–	10.0	8.0	6.0	36	2.2	16.00	8.00	1.17	3.1	6.2
	21	–	13.9	10.0	6.0	36	3.1	12.00	8.00	0.92	3.6	7.1
	28	–	17.3	12.0	6.0	36	3.8	10.00	8.00	0.83	3.9	7.7
6.0	3.5	–	2.8	6.0	6.0	42	0.6	16.00	8.00	1.08	1.1	2.5
	7	–	5.3	6.0	6.0	42	1.2	16.00	8.00	1.08	2.1	4.9
	10	–	7.5	6.0	6.0	42	1.7	16.00	8.00	1.08	3.0	6.9
	14	–	10.0	8.0	6.0	42	2.2	16.00	8.00	1.17	3.1	7.2
	21	–	13.9	10.0	6.0	42	3.1	12.00	8.00	0.92	3.6	8.3
	28	–	17.3	12.0	6.0	42	3.8	10.00	8.00	0.83	3.9	9.0

Full Capture CPS Hydraulic Analysis and Sizing

"V-depth" (ft)	CB Width (ft)	No. Grates	Max Q ₁₀ (cfs)	Bypass Height (in)	Free-board (in)	Screen Height (in)	Q ₁₋₁ (cfs)	Clearance (in)	Curb Height (in)	Head (ft)	Screen Length (ft)	Screen Capacity (cfs)
CB 301												
18" connector pipe												
3.5	7	1	10.7	8	0.0	18	2.4	8.00	8.00	1.00	3.3	3.3
	10.5	2	13.0	10	0.0	18	2.9	8.00	8.00	1.08	3.4	3.4
	14	1	13.6	10	0.0	18	3.0	7.00	8.00	1.00	3.5	3.5
	17.5	2	15.3	10	0.0	18	3.4	6.00	8.00	0.92	4.0	4.0
CB 301												
24" connector pipe												
3.5	7	1	10.7	8	0.0	18	2.4	8.00	8.00	1.00	3.3	3.3
	10.5	2	13.0	10	0.0	18	2.9	8.00	8.00	1.08	3.4	3.4
	14	1	13.6	10	0.0	18	3.0	7.00	8.00	1.00	3.5	3.5
	17.5	2	15.3	10	0.0	18	3.4	6.00	8.00	0.92	4.0	4.0
CB 301												
18" or 24" connector pipe												
4.0	7	1	10.7	8	0.0	24	2.4	8.00	8.00	1.00	3.3	4.4
	10.5	2	13.0	10	0.0	24	2.9	6.00	8.00	0.92	3.4	4.5
	14	1	13.6	10	0.0	24	3.0	6.00	8.00	0.92	3.5	4.7
	17.5	2	15.3	10	0.0	24	3.4	6.00	8.00	0.92	4.0	5.3
4.5	7	1	10.7	8	6.0	24	2.4	8.00	8.00	0.50	3.3	4.4
	10.5	2	13.0	10	6.0	24	2.9	6.00	8.00	0.42	3.4	4.5
	14	1	13.6	10	6.0	24	3.0	6.00	8.00	0.42	3.5	4.6
	17.5	2	15.3	10	6.0	24	3.4	6.00	8.00	0.42	4.0	5.3
5.0	7	1	10.7	8	6.0	30	2.4	8.00	8.00	0.50	3.3	5.5
	10.5	2	13.0	10	6.0	30	2.9	6.00	8.00	0.42	3.4	5.6
	14	1	13.6	10	6.0	30	3.0	6.00	8.00	0.42	3.5	5.8
	17.5	2	15.3	10	6.0	30	3.4	6.00	8.00	0.42	4.0	6.6
5.5	7	1	10.7	8	6.0	36	2.4	8.00	8.00	0.50	3.3	6.6
	10.5	2	13.0	10	6.0	36	2.9	6.00	8.00	0.42	3.4	6.7
	14	1	13.6	10	6.0	36	3.0	6.00	8.00	0.42	3.5	6.9
	17.5	2	15.3	10	6.0	36	3.4	6.00	8.00	0.42	4.0	7.9
6.0	7	1	10.7	8	6.0	42	2.4	8.00	8.00	0.50	3.3	7.6
	10.5	2	13.0	10	6.0	42	2.9	6.00	8.00	0.42	3.4	7.9
	14	1	13.6	10	6.0	42	3.0	6.00	8.00	0.42	3.5	8.1
	17.5	2	15.3	10	6.0	42	3.4	6.00	8.00	0.42	4.0	9.3

Full Capture CPS Hydraulic Analysis and Sizing

"V-depth" (ft)	CB Width (ft)	No. Grates	Max Q ₁₀ (cfs)	Bypass Height (in)	Free-board (in)	Screen Height (in)	Q ₁₋₁ (cfs)	Clearance (in)	Curb Height (in)	Head (ft)	Screen Length (ft)	Screen Capacity (cfs)
CB 303												
18" connector pipe												
3.5	–	1	9.7	8	0.0	18	2.1	8.00	8.00	1.00	3.0	3.0
	–	2	10.9	8	0.0	18	2.4	8.00	8.00	1.00	3.4	3.4
	–	3	12.4	8	0.0	18	2.7	8.00	8.00	1.00	3.9	3.8
CB 303												
24" connector pipe												
3.5	–	1	9.7	8	0.0	18	2.1	8.00	8.00	1.00	3.0	3.0
	–	2	10.9	8	0.0	18	2.4	8.00	8.00	1.00	3.4	3.4
	–	3	12.4	8	0.0	18	2.7	8.00	8.00	1.00	3.9	3.9
CB 303												
18" or 24" connector pipe												
4.0	–	1	9.7	8	0.0	24	2.1	8.00	8.00	1.00	3.0	4.0
	–	2	10.9	8	0.0	24	2.4	8.00	8.00	1.00	3.4	4.5
	–	3	12.4	8	0.0	24	2.7	8.00	8.00	1.00	3.9	5.2
4.5	–	1	9.7	6	6.0	24	2.1	10.00	8.00	0.58	3.0	4.0
	–	2	10.9	8	6.0	24	2.4	8.00	8.00	0.50	3.4	4.5
	–	3	12.4	8	6.0	24	2.7	8.00	8.00	0.50	3.9	5.2
5.0	–	1	9.7	6	6.0	30	2.1	16.00	8.00	1.08	3.0	5.0
	–	2	10.9	6	6.0	30	2.4	16.00	8.00	1.08	3.4	5.6
	–	3	12.4	8	6.0	30	2.7	14.00	8.00	1.00	3.9	6.5
5.5	–	1	9.7	8	6.0	36	2.1	8.00	8.00	0.50	3.0	6.0
	–	2	10.9	8	6.0	36	2.4	8.00	8.00	0.50	3.4	6.7
	–	3	12.4	8	6.0	36	2.7	8.00	8.00	0.50	3.9	7.7
6.0	–	1	9.7	6	6.0	42	2.1	16.00	8.00	1.08	3.0	6.9
	–	2	10.9	6	6.0	42	2.4	16.00	8.00	1.08	3.4	7.9
	–	3	12.4	8	6.0	42	2.7	14.00	8.00	1.00	3.9	9.0

UNITED STORM WATER- CPS
Connector Pipe Screen

Technical Manual

Rev 8/20/14

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Manufacturer, Supplier, and Service Information

Manufacturer:

United Storm Water, Inc.
14000 E. Valley Blvd
City of Industry, Ca 91746
Phone: 626-961-9326
Fax: 626-434-6994
Contact: Eugene Hernandez, Manufacturing Manager

Supplier:

United Storm Water, Inc.
14000 E. Valley Blvd
City of Industry, Ca 91746
Phone: 626-961-9326
Fax: 626-434-6994
Contact: Lydia Perry, V.P. of Marketing & Sales

For all spare parts and service, Contact:

United Storm Water, Inc.
14000 E. Valley Blvd.
City of Industry, Ca 91746
Contact: Eugene Hernandez

United Storm Water, Inc. Connector Pipe Screen Installation Instructions:

1. Bring the CPS unit into the catch basin and set in front of outlet hole. The unit has 3 components, deflector, (2) "Z" panels, and the front screen, depending on the size of the catch basin opening. Establish a definite location for your first "Z" Panel and then mark your holes for drilling. Do the same for your second Panel.
2. Remove the CPS unit from the installation wall. Drill 3/8" x 4" holes where you marked. Make sure to drill straight into the catch basin wall to avoid mounting difficulties.
3. Hammer 3/8" x 3.75" stainless steel anchor bolts into the holes.
4. After all of the anchor bolts are hammered into place, attach the "Z" panels.
5. Deflector device: measure and cut a length of deflector stock same length as CPS unit. Make cuts using a compact grinder. Be sure to "grind smooth" any sharp edges. Place deflector on wall in catch basin and establish a definite location for the deflector, directly above the CPS device. Next, mark and drill 3/8"x3.75" holes.
6. Hammer 3/8"x3.75" stainless steel anchor bolts into the holes.
7. After all of the anchor bolts are hammered into place, attach the deflector onto the anchor bolts and securely tighten.
8. Scribe and cut the bottom of the front panel to conform to the catch basin bottom surface, then attach the front panel to the 2 "Z" panels using the self tapping screws provided.
9. Attach deflector support bracket (1" x 1 1/2" perforated angle) behind 1" lip of deflector to top corners of CPS device. Secure with self tapping screws provided.
10. Only when CPS unit is wider than 30", 1"x1" angles need to be install from top corner of the CPS unit to bottom Center Support Bracket, secure with self tapping screws provided.
11. Install front screen of the CPS unit; tighten all bolts and screws to assure a tight fit.

Preventative Maintenance:

Maintenance crews should regularly check catch basins and establish a maintenance schedule based on the level of debris collected. Some areas will require more frequent cleaning than others. Catch basins should be cleared of debris to allow for water to freely flow through the screen. Pressure-washing the unit may additionally benefit but is not necessary.

Yearly Maintenance Schedule:

Visual Inspection:

1. Built-up debris and foreign object debris can hinder the unit's operation. Remove any visible debris that may be on, in front of, and nearby the unit.
2. Look for any visible signs of vandalism or damage that may compromise the unit's ability to properly function. Attempted vandalism and slight damage should be inspected closely to ensure no future damage may result.

Replacement Schedule:

All components on United Storm Water Connector Pipe Screen are made from 304 stainless steel. Unless the unit is somehow damaged, e. g., vandalism, etc., no scheduled replacement is required. United Storm Water, Inc. should be notified if a replacement is required.

Tools Required:

For removal of United Storm Water Connector Pipe Screen, use a 9/16" socket wrench to remove the anchor bolt nuts. A socket extension may be needed for hard to reach areas.

Disassembly and Reassembly:

For removal of United Storm Water Connector Pipe Screen, use a 9/16" socket wrench to remove the anchor bolt nuts. A socket extension may be needed for hard to reach areas. Carefully remove the unit once all anchor bolt nuts have been removed. Realign the unit on the anchor bolts and securely tighten anchor bolt nuts for reassembly.

For removal of the Deflector United Storm Water Connector Pipe Screen, use a 9/16" socket wrench to remove the anchor bolt nuts. Realign the bypass section and tighten the screws for reassembly.



CONNECTOR PIPE SCREEN WARRANTY

United Storm Water Inc. (United) agrees to provide a 3-year warranty for Connector Pipe Screen (CPS) device(s) installed for the undersigned Purchaser by United. This warranty assumes that the Owner is conducting a consistent and formal maintenance program in accordance with the maintenance guidelines set forth herein. As with all storm water devices, static or dynamic, there are maintenance requirements. These devices must be checked and inspected immediately prior to and after each rain event to ensure that overflow areas are not obstructed. Lack of maintenance and any alteration(s) made to this product after having been installed by United voids all warranties.

United makes no representations with respect to the current design of any flood control system in place in which its CPS product is placed; nor does it make any representation of the effectiveness of this product to avoid flooding or ponding if the system, including the surrounding streets, are not properly maintained to remove trash prior to a storm.

The CPS device(s) and hardware that are installed by United are warranted from 3 years of the date of acceptance. All parts and devices installed by United are warranted against corrosion, excessive wearing of moving parts (if applicable), and operational malfunction, except if said malfunction is the result direct or indirect of obstructions, and/or failure to maintain the CPS device(s) installed. Failure to maintain the systems, as further described in the Owner Obligations section is a key cause of potential failure, and is the absolute obligation of the Owner.

If a device installed by United becomes defective due to faulty materials, workmanship, or lack of conformity (excepting vandalism or other negligent damage by others) within the stated 3 years, United warrants to replace defective parts, repair products subjected to fair wear and tear, or replace such products to ensure minimum inconvenience to the customer unless the Customer/Owner has failed to properly maintain the product as outlined herein, and such failure has caused damage.

United shall provide at no cost to Owner all labor, material and equipment required to repair or replace devices during said warranty period, including but not limited to, calibration and adjustment of moving parts (if applicable) to ensure the device operates properly.

Claims for warranty should be made directly to: United Storm Water, Inc.; 14000 E. Valley Blvd., Industry, Ca. 91746, 626/961-9326

OWNER OBLIGATIONS & ROUTINE MAINTENANCE REQUIREMENTS

All CPS systems require scheduled, routine maintenance to ensure that they operate as designed. Routine maintenance should include regular inspections of the inlet and device "overflow areas" to ensure that there is an unobstructed water flow. Trash and debris such as plastic bags, newspaper, leaves, branches, etc. can effectively block these devices, which could prevent water flow. Lack of open water flow area may result in flooding causing property damage, and loss of life should the flooding become severe. It is the obligation of the Owner, not United, to inspect and keep obstructions away from the CPS device(s). All warranties that are made by United are void if there is a failure to maintain the integrity of the CPS system as recommended herein (e.g., instituting an

inspection/maintenance program to keep the water path to the CPS device(s) free of obstructions). All warranties are also void if any alterations are made to this product after having been installed by United.

The Owner is specifically advised to inspect streets where CPS devices have been installed, as well as in front of each device installed, removing any debris including plastic bags, newspaper, leaves, branches, etc., which can effectively block the opening to the device or obstruct the device "overflow area". This inspection/clearing away should be performed immediately prior to a known storm event, during and after a storm. It is the obligation and duty for the Owner to inspect and remove all obstructions. Failure to maintain this system will void all warranties.

Maintenance of the surrounding area where a CPS device is installed is key for it to operate as designed. Care should be taken to ensure that regular street sweeping is undertaken. Parked cars which prevent street sweeping which in turn may allow the accumulation of paper, plastic bags, vegetation, etc. to enter the catch basin, and adhere to the CPS device, may result in flooding or ponding of streets. Failure to clear streets and the CPS device(s) of accumulated items such as trash, debris or vegetation will prevent water from flowing through the device. This in turn will likely result in flooding as a storm drain will have been effectively eliminated from the street flood control system. Flooding can lead to property damage or personal injury which is not within the control of United Storm Water, Inc.

PROJECT NAME & NUMBER: _____

UNITED REFERENCE INVOICE NUMBER(S): _____

THIRD-PARTY PURCHASER ACKNOWLEDGEMENT (IF APPLICABLE)

Representative's Name: _____ Title: _____

Signature: _____ Date: _____

Date of Field Acceptance: _____

OWNER ACKNOWLEDGEMENT

Representative's Name: _____ Title: _____

Signature: _____ Date: _____

Date of Field Acceptance: _____

SUPPLIER

Signature: _____
Lydia Perry, VP of Marketing & Sales
United Storm Water, Inc.

Date: _____



.....
One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p: (916) 440-0826 • f: (916) 444-7462 • e: mvcac@mvcac.org

United Storm Water, Inc.
14000 E. Valley Blvd.,
Industry, CA 91746

"EXHIBIT G"

January 26, 2022

Dear Ms. Perry,

Thank you for the submission of the United Storm Water Connector Pipe Trash Screen, USW-1M1, USW-1M2, USW-2M1, and USW-2M2 full trash capture devices for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the United Storm Water Connector Pipe Trash Screen, USW-1M1, USW-1M2, USW-2M1, and USW-2M2 and verifies that provisions have been included in the designs that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the United Storm Water Connector Pipe Trash Screen, USW-1M1, USW-1M2, USW-2M1, and USW-2M2 as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,

Bob Achermann,
MVCAC Executive Director