

Low Impact Development (LID) Plan

Prepared for:
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Property:
Torrance 1
APN: 7362-032-058
TR 84623
1407-1455 Crenshaw Boulevard
El Monte, CA 97131

Prepared by:
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Preparation Date:
September 2024

Receipt of WDID
REPLACE THIS SHEET

To be provided prior to final approval

Notice of Intent
REPLACE THIS SHEET

To be provided prior to final approval

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**Owner/Developer
Approval and Certification
of the
Preliminary Low Impact Development (LID) Plan**

Project Name: TR 84623, Torrance 1
Project Number: Vesting Tract 84623
APN 7362-032-058
Project Address: 1407-1455 Crenshaw Boulevard
Torrance, CA 90501

This Preliminary Low Impact Development (LID) Plan for the **TR 84623, Torrance 1** project has been prepared for City Ventures Homebuilding, LLC by C&V Consulting, Inc. It is intended to comply with the requirements of the City of Torrance's Conditions of Approval.

The undersigned is authorized to approve implementation of provisions of this plan as appropriate and will strive to have the plan carried out by successors consistent with the County of Los Angeles LID Manual and the intent of the NPDES storm water requirements.

"I certify under penalty of law that this document and all attachments were prepared under my jurisdiction 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 who manage the system or those persons directly responsible for gathered 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."

Owner/Developer Signature

Date

Michael You, Director of Development

(408) 828-9498

Owner/Developer's Name and Title

Telephone Number

Section 200

A. Contact Information/List of Responsible Parties

The property contact information is:

Michael You
Tel: (408) 828-9498
City Ventures Homebuilding, LLC
3121 Michelson Drive, Suite 150
Irvine, CA 92612

The property owner shall have primary responsibility and significant authority for the implementation, maintenance, and inspection of the property BMPs. Duties of the Owner include but are not limited to:

- Implementing all elements of the LID, including but not limited to:
 - Implementation of prompt and effective erosion and sediment control measures
 - Implementing all non-storm water management, and materials and waste management activities, such as: monitoring, discharges, general site clean-up; vehicle and equipment cleaning, spill control; good construction housekeeping to ensure that no materials other than storm water are discharged which may have an adverse effect on receiving waters or storm drain systems, etc.
- Pre-storm inspections
- Storm event inspections
- Post-storm inspections
- Routine inspections as described in the LID
- Ensuring elimination of all unauthorized discharges
- The Owner shall be assigned authority to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate all of the necessary corrections/repairs are made immediately, and that the project complies with the LID at all times.
- Managing and report any Illicit Connections or Illegal Discharges.

Section 300

A. References

The following documents are made a part of this LID by reference:

- Vesting Tentative Tract Map for the City of Torrance to support the **TR 84623, Torrance 1** project, prepared by C&V Consulting, Inc., 9830 Irvine Center Drive, Irvine, CA 92618.
- County of Los Angeles Department of Public Works, Low Impact Development Standards Manual dated February 2014
- State Water Resources Control Board (SWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-0009-DWQ, NPDES No. CAS000002 dated July 1, 2010
- California Stormwater BMP Handbook – Construction, January 2009.
- California Stormwater BMP Handbook – New Development and Redevelopment, January 2003.
- Los Angeles County Municipal Stormwater/ NPDES Permit Order R4-2012-0175

Section 400 – Body of LID

A. Objectives

This Low Impact Development (LID) Plan has four main objectives:

- 1) Identify all pollutant sources, including sources of sediment that may affect the quality of storm water discharges associated with daily use / activity (storm water discharges) from the property site.
- 2) Identify non-storm water discharges.
- 3) Identify, construct, implement and maintain Best Management Practices (BMPs) to reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from the property site.
- 4) Develop a maintenance schedule for BMPs designed to reduce or eliminate pollutants.

B. Project Background and Description

The proposed project is located at 1407-1455 Crenshaw Boulevard, in the City of Torrance. The site is bounded by the existing single family/ commercial to the north and south and existing single-family only to the west. The proposed development includes the construction of five (5) buildings consisting of 35 attached 3-story condominiums units. The proposed 1.33-acre site will include private drive aisles, private garages, sidewalks, guest parking, and associated landscaping and open space areas. The proposed site will be accessible via a single driveway entrance/ exit along Crenshaw Boulevard.

The site is currently occupied by two (2) existing commercial buildings and an associated parking lot. The elevation within the site generally varies from approximately 91' to 88' with surface runoff flowing in the westerly direction. Drainage at the site generally sheet flows towards the existing driveway entrance at Crenshaw Boulevard. There are a few drainage inlets between the two buildings which capture any landscape flows and direct them towards Crenshaw Boulevard via an existing parkway drain. As the site is surrounded by an existing block wall, there is no off-site runoff impacts in the existing conditions, though there are a few drainage inlets along the southern property which convey storm water directly to the existing 18" RCP that runs underground within the site.

C. Vicinity Map

The proposed project is located at 1407-1455 Crenshaw Boulevard, in the City of Torrance. The site is bounded by the existing single family/ commercial to the north and south and existing single-family only to the west.

Refer to Figures 1 & 2 for Vicinity and Location Maps.

D. Existing Site Drainage Condition

Drainage at the site generally sheet flows towards the existing driveway entrance at Crenshaw Boulevard. There are a few drainage inlets between the two buildings which capture any landscape flows and direct them towards Crenshaw Boulevard via an existing parkway drain. As the site is surrounded by an existing block wall, there is no off-site runoff impacts in the existing conditions, though there are a few drainage inlets along the southern property which convey storm water directly to the existing 18" RCP that runs underground within the site. There is an existing City owned 18" reinforced concrete pipe (RCP) storm drain system that flows west through the site before turning in the northerly direction, approximately 48.5' west of Crenshaw Boulevard centerline. Stormwater runoff along the site frontages on Crenshaw Boulevard are tributary to this existing system due to the existing catch basin located near the northwest corner of Crenshaw Boulevard and EL Dorado Street intersection. Stormwater runoff entering the existing 18" RCP storm drain system continues shortly in the northerly direction prior to turning east into El Dorado Street. This existing storm drain snakes its way south and east, increasing in size until it finally connects to the existing LACFCD owned 39" RCP at W. Carson Street and Madrid Ave. This storm drain system continues east, converging with other storm drain lines until ultimately discharging to the Torrance Carson Channel. The Torrance Carson Channel continues east and converges with the Dominguez Channel at the Dominguez Channel Estuary which outlets to Los Angeles Harbor then Long Beach Inner and Outer Harbor and ultimately the Pacific Ocean at San Pedro Bay.

Water bodies to which site runoff is tributary to are listed on the most current 303(d) list for the following:

- Torrance Carson Channel
 - Lead (TMDL)
 - Indicator Bacteria
 - Copper (TDML)
- Dominguez Channel Estuary
 - PCBs (Polychlorinated biphenyls) (TDML)
 - Benzo(a)pyrene (TDML)
 - Pyrene (TDML)
 - Phenanthrene (TDML)
 - Chrysene (C1-C4) (TDML)
 - Benzo(a)anthracene (TDML)
 - Dieldrin (tissue) (TDML)
 - Indicator Bacteria
 - Lead (TDML)
 - Benthic Community Effects (TDML)
 - Toxicity (TDML)
 - Chlordane (tissue) (TDML)
 - Copper (TDML)
 - DDT (tissues & sediment) (TDML)
- Los Angeles Harbor
 - Chromium (TDML)

- Toxaphene (tissue) (TDML)
- Zinc (sediment) (TDML)
- Mercury (sediment) (TDML)
- Copper (sediment) (TDML)
- Phenanthrene (TDML)
- Dieldrin (TDML)
- Chlordane (tissue & sediment) (TDML)
- Cadmium (sediment) (TDML)
- 2-Methylnaphthalene (TDML)
- Benzo(a)anthracene (TDML)
- Benthic Community Effects (TDML)
- Pyrene (TDML)
- Chrysene (C1-C4) (TDML)
- DDT (Tissue & sediment) (TDML)
- Toxicity (TDML)
- Benzo(a)pyrene (TDML)
- PCBs (polychlorinated biphenyls) (tissue & sediment) (TDML)
- Lead (sediment) (TDML)
- Long Beach Inner Harbor
 - DDT (Dichlorodiphenyltrichloroethane) (TDML)
 - Benthic Community Effects (TDML)
 - PCBs (polychlorinated biphenyls) (TDML)
 - Copper (sediment) (TDML)
 - Toxicity (TDML)
 - Chrysene (C1-C4) (TDML)
 - Benzo(a)pyrene (TDML)
 - Zinc (TDML)
- Long Beach Outer Harbor
 - PCBs (polychlorinated biphenyls) (TDML)
 - DDT (Dichlorodiphenyltrichloroethane) (TDML)
 - Toxicity (TDML)
- San Pedro Bay
 - Total DDT (sum of 4,4'- and 2,4'-isomers of DDT, DDE, ad DDD) (TDML)
 - PCBs (polychlorinated biphenyls) (TDML)
 - Toxicity (TDML)
 - Chlordane (TDML)

Surface runoff from the site drains through only engineered facilities to the Pacific Ocean, therefore Hydromodification Control requirements are not applicable for this project.

E. Proposed Site Drainage Conditions

The proposed site will also utilize a single subarea based on the proposed grading/drainage design. The proposed development will include private drive aisles and parking spaces throughout. Proposed site drainage will direct flows to the private drive aisles, where runoff will be conveyed via proposed curb/ gutter towards a single proposed sump curb inlet catch basin. The proposed site impervious area amounts to 85% of the site. The site will utilize an area drain system and underground storm drain piping to collect and convey the stormwater runoff to a proposed ADS Stormtech Infiltration system to promote subsurface infiltration. The Infiltration System has been designed to detain and infiltrate the required Storm Water Quality Design Volume (SWQDv) for water quality treatment. The project site has no off-site runoff that will impact the proposed conditions. During larger storm events producing a greater volume than the SWQDv, including the 25-, 50-, and 100-year storm events, stormwater will overflow out of the Detention/ Infiltration system and out of the proposed catch basin and be conveyed to the public 18" RCP via an overflow pipe connection. The proposed overflow pipe will be conservatively sized to accommodate the 100-year storm event. In the event the stormwater conveyance system becomes clogged, stormwater will pond near the proposed catch basin eventually overflow to Crenshaw Boulevard via the proposed driveway entrances. Upon entering the public right-of-way, site runoff will follow the historic drainage pattern.

Refer to Figure 3, DMA Exhibit for additional information.

F. LID Project Types, Characteristics, & Activities

Per the Los Angeles Department of Public Works (LACDPW), *Low Impact Development Standards Manual*, dated February 2014, the proposed project is classified as a "Designated Project." A "Designated Project" is defined by the LACDPW as follows:

"Redevelopment projects, which are developments that result in creation or addition or replacement of either: (1) 5,000 square feet or more of impervious surface on a site that was previously developed as described in the above bullets; or (2) 10,000 square feet or more of impervious surface area on a site that was previously developed as a single-family home."

G. Pollutant Source Identification and BMP Selection

The following is a list of materials to be used in the daily construction activities at the project site, which will potentially contribute to pollutants, other than sediment, to storm water runoff. Control Practices for each activity are identified below:

- Vehicle fluids, including oil, grease, petroleum, and coolants from personal vehicles
- Landscaping materials and wastes (topsoil, plant materials, herbicides, fertilizers, mulch, pesticides)
- General trash debris and litter

- Pet waste (bacteria/ fecal coliforms)

The Best Management Practices (BMPs) that have been selected for implementation on this project are detailed in the following sections.

H. Source Control BMPs

Project proponents shall implement Site Design concepts that achieve each of the following:

- Minimize Urban Runoff
- Minimize Impervious Footprint
- Conserve Natural Areas
- Minimize Directly Connected Impervious Areas (DCIAs)

Table-1 identifies the source control and treatment BMPs and how each is implemented to achieve each Site Design concept. BMP fact sheets are provided by the LACDPW *Low Impact Development Standards Manual* and the California Stormwater Quality Association.

Table-1: Source Control BMPs

BMP	BMP DESCRIPTION	CHECK ONE		IF NOT APPLICABLE, STATE BRIEF REASON
		INCLUDED?	NOT APPLICABLE	
	Non-Structural Source Control BMPs:			
	Education for Leasers, Operators, Occupants, or Employees	X		
	Activity Restrictions (CC&Rs)	X		
S-8	Landscape Irrigation Practices	X		
SD-32	Common Area Litter Control		X	No proposed trash enclosures.
SE-7	Street Sweeping Private Streets and Parking Lots	X		
	Drainage Facility Inspection and Maintenance	X		

BMP	BMP DESCRIPTION	CHECK ONE		IF NOT APPLICABLE, STATE BRIEF REASON
		INCLUDED?	NOT APPLICABLE	
	Structural Source Control BMPs:			
S-1	Storm Drain Message and Signage	X		
S-8	Landscape Irrigation Practices	X		
SD-11	Roof Runoff Controls	X		
	Protect Slopes and Channels		X	No proposed slopes and channels.
S-6	Outdoor Vehicle/Equipment/Accessory Washing Area		X	Car Wash Racks are not permitted within the proposed development – Not Applicable.
	Proper Site Design:			
S-7	Fuel and Maintenance Area		X	No Fueling Areas
SD-33	Air/Water Supply Area Drainage		X	No Air/Water Supply
S-3	Outdoor Trash Storage and Waste Handling Area		X	
S-4	Outdoor Loading/Unloading Dock Area		X	Not Applicable
S-5	Outdoor Vehicle/Equipment Repair/Maintenance Area		X	No Maintenance Bays
S-6	Outdoor Vehicle/Equipment/Accessory Washing Area		X	No Wash Areas
S-2	Outdoor Material Storage Area		X	No Material Storage
SD-36	Outdoor Work Areas or Processing Areas		X	No Work Areas
	Provide Wash Water Controls for Food Preparation Areas		X	No Food Prep Areas

Non-Structural Measures

Non-structural BMPs are generally managerial, educational, inspection and/ or maintenance oriented. These items consist of educating employees and occupants, developing, and implementing HOA guidelines, implementing BMPs and enforcing Code requirements. Non-structural BMPs used for this project are summarized below:

Education for Employees and Occupants

Practical informational materials will be provided to homeowners, HOA and employees on general good housekeeping practices that contribute to protection of storm water quality. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins and storm drains. Initially, the Owner will provide these materials. Thereafter, such materials will be available through the HOA education program.

This program must be maintained, enforced, and updated periodically by the HOA. Educational materials including, but not limited to, the materials included in Appendix H of this plan will be made available to the employees and contractors of the HOA.

Activity Restrictions

Activities on this site will be limited to activities related to residential living. The project's Conditions, Covenants, and Restrictions (CC&Rs) will outline the activities that are restricted on the property. Such activities related to the LID include car washing, car maintenance and disposal of used motor fluids, pet waste cleanup, and trash container areas.

Efficient Landscape System & Landscape Maintenance

Management programs will be designed and established by the HOA, who will maintain the communal areas within the project site. These programs will include how to mitigate the potential dangers of fertilizer and pesticide usage (refer to the Maintenance and Frequency Table). Ongoing maintenance will be consistent with the State of California Model- Water Efficient Landscape Ordinance. Fertilizer and pesticide usage shall be consistent with County Management Guidelines for use of Fertilizers and Pesticides.

Common Area Litter Control

The HOA will be required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. The HOA may also contract with their landscape maintenance firm to provide this service during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations and reporting the violations to the HOA for remediation.

Street Sweeping in Private Streets and Parking Lots

The HOA shall have all streets and parking lots swept on a weekly basis. This procedure will be intensified around October 15th of each year prior to and throughout rainstorm period.

Drainage Facility Inspection & Maintenance

The HOA will be responsible for implementing each of the BMPs detailed in this plan. The HOA will also be responsible for cleaning and maintaining the BMPs on a regular basis. Refer to Appendix F for the Operation and Maintenance Plan. Refer to Appendix C for site specific drainage BMP information.

Storm Drain Stenciling/ Signage

Phrase "No Dumping – Drains to Ocean" or equally effective phrase to be stenciled on catch basins to alert the public to the destination of pollutants discharged into storm water. This stenciling will be inspected and re-stenciled on a periodic basis by the HOA. Refer to Table 4 for maintenance frequency.

Landscape & Irrigation System Design

As part of the design of all common area landscape irrigation shall employ water conservation principals, including, but not limited to, such provisions as water sensors, programmable irrigation times (for short cycles), etc. will be used. Such common areas will be maintained by the HOA.

Title 22 CC&R Compliance

The HOA will comply with this Regulation as part of the development's CC&Rs. CC&Rs will be prepared as a separate document and reviewed by the City's Attorney.

Uniform Fire Code Implementation

The HOA will comply with this Code as part of the development's CC&Rs. CC&Rs will be prepared as a separate document and reviewed by the City's Attorney.

Employee Training

A training program will be established as it would apply to future employees, contractors, and homeowners of the HOA to inform and train in maintenance activities regarding the impact of dumping oil, paints, solvents, or other potentially harmful chemicals into storm drains; the proper use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of littering and improper water disposal.

The HOA (or a hired firm) will conduct the training program which will include targeted training sessions with specific construction disciplines (landscaping, concrete finishers, painters, etc.). See Appendix H for examples of educational materials that will be provided to the Employees.

The project's CC&Rs will include provisions for future employee training programs conducted on a yearly based prior to the rainy season.

I. Structural BMPs

Structural BMPs shall be installed by the developer, through the construction and development of the project, for instance; landscaping and irrigation systems shall be designed by licensed landscape architects and installed by qualified contractors to specifications and standards of the City of El Monte. The structural BMPs used for this project are summarized below:

Expected pollutants associated with this development include vehicle discharge fluids, landscaping materials and waste, litter, and pet waste. To mitigate these pollutants, the structural best management practices summarized in Table-2 are proposed.

Table-2: Design BMPs

BMP	TECHNIQUE	INCLUDED?		BRIEF DESCRIPTION OF METHOD
		YES	NO	
SD-10	Minimize Impervious Area/Maximize Permeability (C-Factor Reduction)	X		We have incorporated landscape areas wherever possible within the project site. See Appendix B for details.
	Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)	X		We minimize DCIAs by limiting sidewalks and parking areas to the minimum necessary for proper use. Stepping stones are used in areas with minimal foot traffic.
	Create Reduced or “Zero Discharge” Areas (Runoff Volume Reduction)	X		The entire SWQDv will be retained onsite through infiltration.

Table-3: Treatment BMPs

BMP	NAME	INCLUDED?		IF NOT APPLICABLE, STATE BRIEF REASON
		YES	NO	
VEG-1	Green Roof		X	
VEG-2	Stormwater Planter		X	
VEG-3	Tree-Well Filter		X	
VEG-4	Vegetated Swale		X	Space not available for BMP
VEG-5	Vegetated Filter Strip		X	Space not available for BMP
T-1	Sand Filter		X	Space not available for BMP
T-2	Consulted Wetland		X	

BMP	NAME	INCLUDED?		IF NOT APPLICABLE, STATE BRIEF REASON
		YES	NO	
T-3	Extended Detention Basin		X	Space not available for BMP
T-4	Wet Pond		X	This is not a wetland area/ development
T-5	Permeable Pavement with an Underdrain		X	This is not a wetland area/ development.
T-6	Proprietary Treatment Control Measures		X	Space not available for BMP
RET-1	Bioretention		X	Alternative BMP utilized
RET-2	Infiltration Basin		X	Alternative BMP utilized
RET-3	Infiltration Trench	X		An ADS MC-7200 StormTech Chambers infiltration system will be utilized on this site.
RET-4	Drywell		X	Alternative BMP utilized
RET-5	Permeable Pavement without an Underdrain		X	Space not available for BMP, Infiltration has been determined infeasible – Refer to Appendix G for site percolation testing results.
RET-6	Rain Barrel/ Cistern		X	
TC-40	Media Filter		X	Alternative BMP utilized
BIO-1	Biofiltration		X	Alternative BMP utilized

Drainage Management Area (DMA)	Size (ac)	Storm Water Quality Design Volume (SWQDv) (cf)	System Detention Capacity (cf)	Treatment Capacity over 48 hrs (cf)
A1	1.33	3,361	4,032	5,452

The proposed 1.33-acre site will generate a Storm Water Quality Design Volume (SWQDv) of approximately 3,361 cf. Stormwater runoff will be collected and conveyed to an ADS Stormtech Infiltration System that has a detention capacity of approximately 4,032 cf and provide approximately 5,452 cf of infiltrated volume over 48 hours, therefore the Infiltration/ Detention System as designed will provide more than enough treatment and storage capacity for the site.

The ADS Stormtech system will be installed under the proposed parking lot near the main entrance. Drainage from roof tops and landscape areas will be collected through area drains and piped to the proposed underground storm drain/ detention pipe. Runoff

from these areas is pretreated through landscaping. Street runoff will be collected via a proposed curb inlet catch basin and conveyed directly to the ADS Stormtech.

The ADS StormTech system is equipped with an Isolator Row which provides pretreatment and allows for settlement of the silt/ sediment, trash capture and absorption of hydrocarbons prior to infiltration. Once the detention/ infiltration system reaches capacity, stormwater runoff will overflow through the upstream catch basin and discharge to the existing 18" RCP via a proposed overflow pipe. Emergency overflow will convey stormwater runoff through the proposed driveway to the public right-of-way of Crenshaw Boulevard. Upon entering the public right-of-way, site runoff will follow the historic drainage pattern.

Biofiltration

The project does not propose biofiltration because the entire SWQDv will be retained onsite and will infiltrate within 48 hours.

Catch Basin Inspection

The HOA will maintain the drainage systems, including catch basins and culverts. The HOA is required to have catch basins inspected and, if necessary, cleaned prior to the storm season, no later than October 15th each year or prior to the first 24-hour storm event, whichever occurs first. These duties may be contracted out to the landscape maintenance firm hired by the HOA. Refer to Appendix F for the Operation and Maintenance Plan.

Runoff-Minimizing Landscape Design

As part of the design of all common area landscape areas, similar planting material with similar water requirements will be used in order to reduce excess irrigation runoff and promote surface filtration. Such common areas will be maintained by the HOA.

Community Car Wash Racks

No community car wash rack or area will be provided, therefore, washing of vehicles by residents on the property will not be allowed per the CC&Rs.

Wash Water Controls for Food Preparation Areas

A sign will be posted indicating that discharge of wash water to the municipal storm drain system is prohibited. All wash water should be disposed of to the sanitary sewer system. Restrictions will be enforced per the CC&Rs.

Self-Contained Washing

Self-contained washing of vehicles by residents or owners on the property will not be allowed per the CC&Rs.

Outdoor Material Storage Areas

Outdoor material storage areas refer to storage areas or storage facilities solely for the storage of materials. Improper storage of materials outdoors may provide an opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and

other pollutants to enter the storm water conveyance system. Outdoor Storage by residents or owners on the property will not be allowed per the CC&Rs.

J. BMP Maintenance, Inspection, and Repair

Inspections will be conducted as follows:

- Annually and prior to the start of the rainy season
- Every (1) month during rainy season
- At any other time(s) or intervals of time specified in the contract documents

Repairs and/ or maintenance procedures shall be carried out at the soonest possible time.

K. Inspection, Maintenance, and Responsibility for BMPs

Table-4 and Table-5 show the lists of the post-construction BMPs (routine non-structural and structural), the required ongoing maintenance, the inspection and maintenance frequency, the inspection criteria, and the entity or party responsible for implementation, maintenance, and/or inspection.

Table-4: Non-Structural BMP Maintenance Responsibility/Frequency Matrix

BMP	RESPONSIBILITY	FREQUENCY
Homeowner/ Business owner Education, Activity Restrictions	HOA will provide educational materials. Those materials and responsibilities must be passed onto subsequent property owners.	Continuous. CC&Rs to be provided to homeowners at the time they purchase the property and updates provided by the HOA as they occur.
Common Area Landscape Management	HOA will appoint a landscape maintenance contractor	Monthly during regular maintenance and use with management guidelines for use of fertilizers and pesticides.

BMP	RESPONSIBILITY	FREQUENCY
Parking Areas and Drives Management	HOA will appoint a landscape maintenance contractor	The Drives Aisles are to be swept on a routine scheduled basis to facilitate the pickup of trash and debris (plant or otherwise) and to remove excessive oil, grease, and build-up. During sweeping, debris is to be removed from the parking areas and drives and then scrubbed and rinsed. This sweeping schedule will be at a minimum occurrence of once a week and as necessary to rid / reduce active pollutants from the pavement areas. This maintenance requirement will be listed in the Convent, Conditions and Restrictions (CC&Rs) of this project. These CC&Rs will be recorded to the property at the County Recorder's Office and be included on the final Title report of these properties.
Litter Control by Sweeping	HOA will appoint a landscape maintenance contractor.	Weekly inspection of trash receptacles to ensure that lids are closed and pick up any excess trash on the ground, noting trash disposal violations to the HOA for remediation.
Employee Training	HOA will appoint a landscape contractor after construction.	Monthly for maintenance personnel and employees to include the educational materials contained in the approved LID.
Common Area Catch Basin Inspection & Cleaning	HOA will appoint a landscape maintenance contractor for common areas and storm drain facilities.	Inspect basins once a month. Clean debris and silt in bottom of catch basins as needed. Intensified on or about October 15th each year or prior to the first 24-hour storm event, whichever occurs first. Refer to Appendix F.

Table-5: Structural BMP Maintenance Responsibility/ Frequency Matrix

BMP	RESPONSIBILITY	FREQUENCY
Common Area Efficient Irrigation	HOA will appoint a landscape contractor after construction	Once a week, in conjunction with maintenance activities. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance

BMP	RESPONSIBILITY	FREQUENCY
		with water demands, given time of year, weather and day or night time temperatures.
Common Area Runoff Efficient Landscape Design	HOA will appoint a landscaping contractor	Once a week in conjunction with maintenance activities and prior to finalizing any replanting schemes. Verify that plants continue to be grouped according to similar water requirements in order to reduce excess irrigation runoff.
ADS StormTech Detention/ Infiltration System	HOA	Inspect and service all screens and filters, replace the floating absorbent blankets/ pillows and geotextile fabric at the bottom of chambers. Repair any portion of drywell as needed per manufacturer's recommendations. Record inspection observations and maintenances operations. Inspections shall occur 2 times per year and prior to any major rain event. Cleanings and replacements shall occur every 12 months, and prior to start of rainy season. Refer to manufacturer's specifications for specific system maintenance requirements.

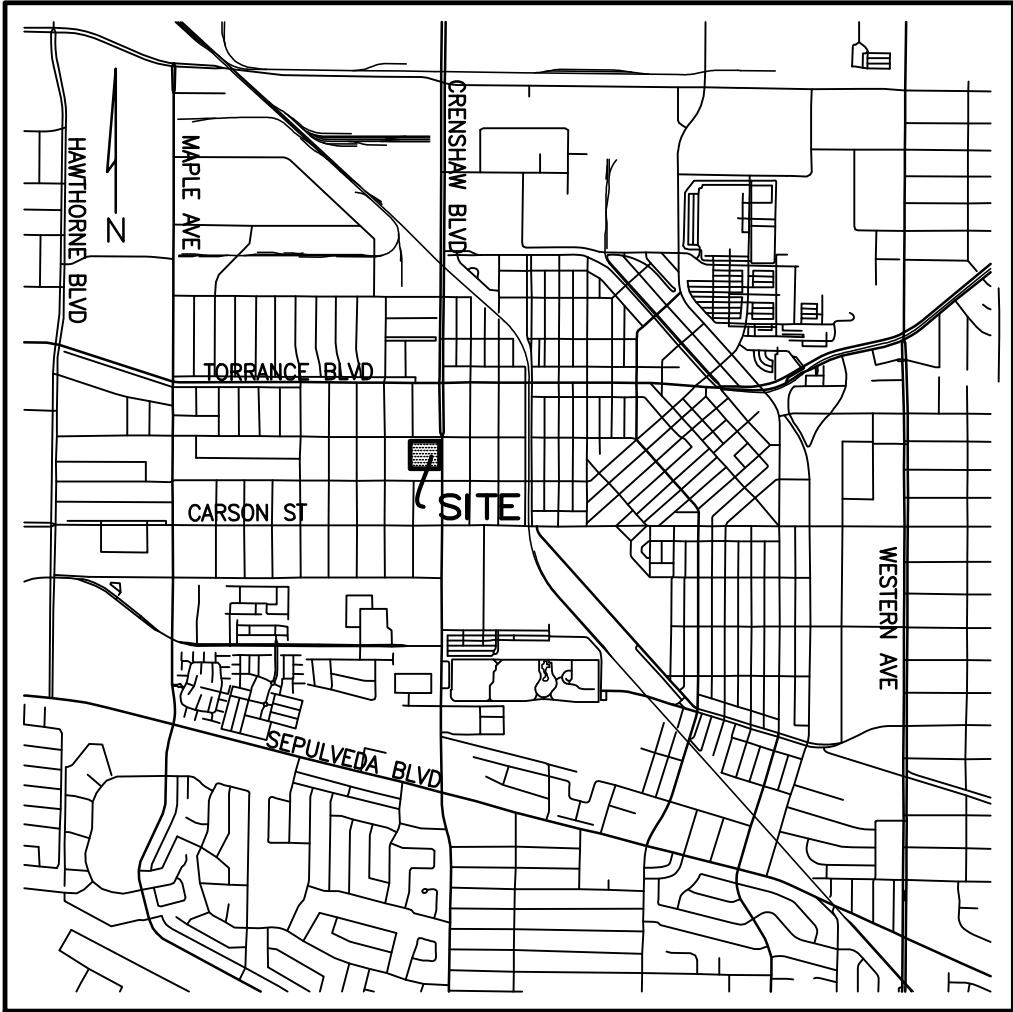
L. Operation/Maintenance Funding after Project Completion

The post-construction BMPs as described above will be funded and maintained by:

Michael You
Tel: (408) 828-9498
City Ventures Homebuilding, LLC
3121 Michelson Drive, Suite 150
Irvine, CA 92612

Maintenance and requirements of the maintenance for the properties will be listed in the Convent, Conditions and Restrictions (CC&Rs) of this project and will be the responsibility of the property owner at all times. These CC&Rs will be recorded to the property at the County Recorder's Office and be included on the Title report of these properties.

Figure -1:
Project Vicinity Map



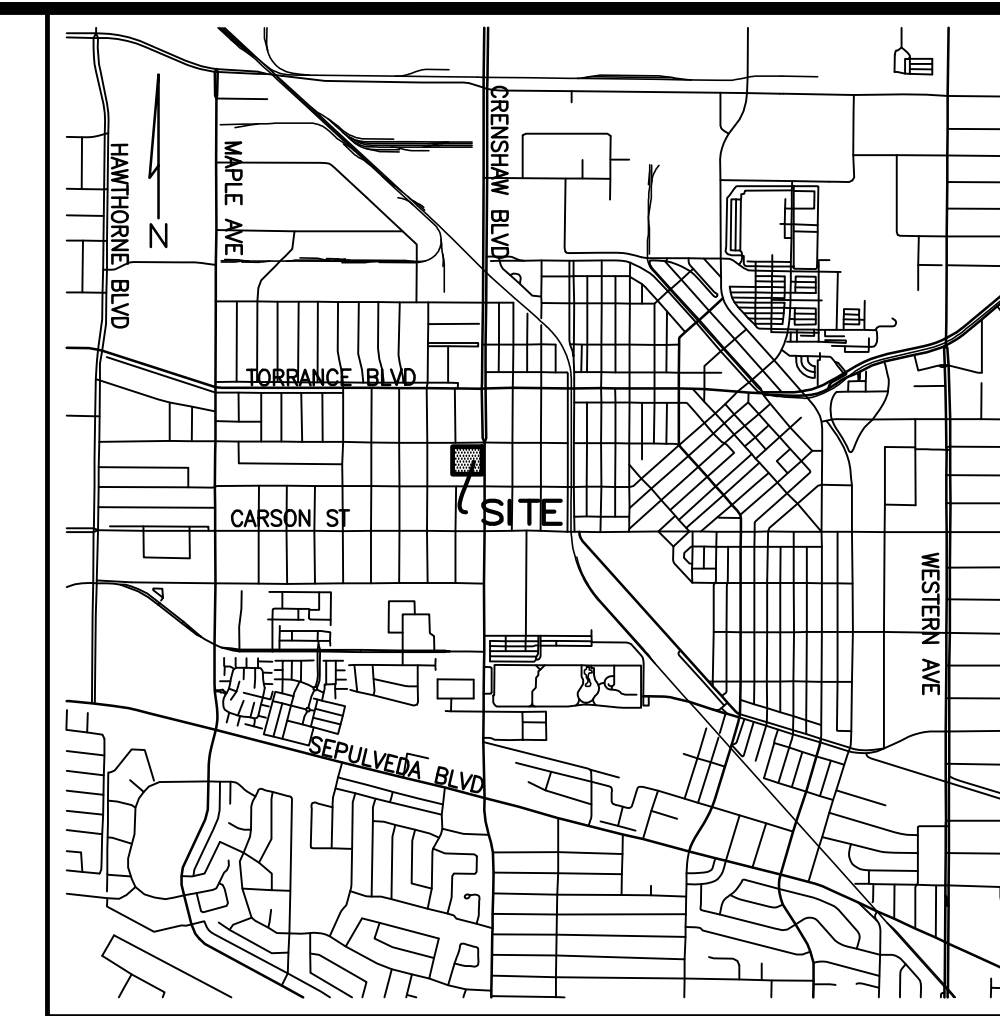
VICINITY MAP

SCALE: N.T.S.

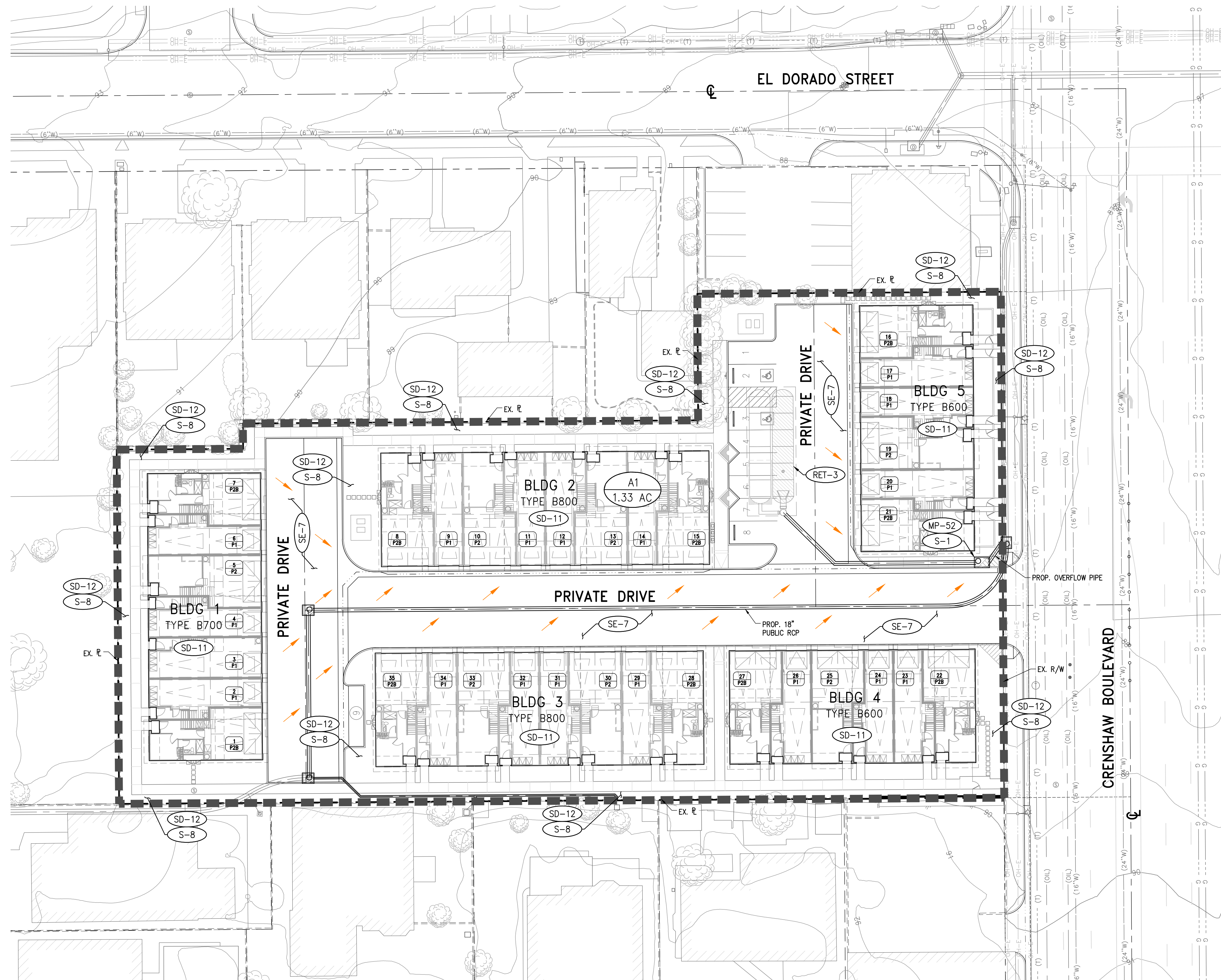
Figure -2:
DMA Exhibit

BMP EXHIBIT

TR 84623
1407-1455 CRENSHAW BOULEVARD
CITY OF TORRANCE, COUNTY OF LOS ANGELES



VICINITY MAP
N.T.S.

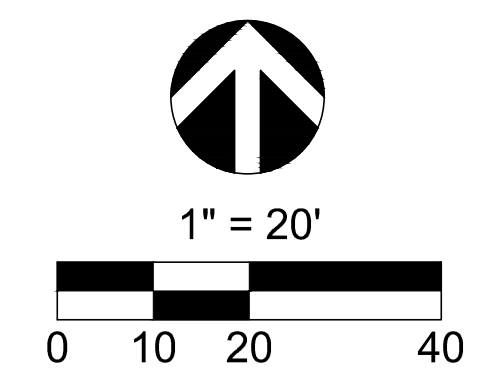


LEGEND

- EXISTING RIGHT-OF-WAY/ BOUNDARY
- - - PROPOSED PROPERTY LINE
- ▬ DRAINAGE MANAGEMENT AREA (DMA)
- ▬ PROPOSED STORM DRAIN
- DRAINAGE FLOW ARROWS
- SURFACE FLOW PATH
- PIPE FLOW PATH
- PROPOSED CATCH BASIN
- DMA X
X-XX AC
- ▨ PERVIOUS AREA

BEST MANGEMENT PRACTICES (BMPs)

- S-1 STORM DRAIN SIGNAGE
- S-8 SITE DESIGN & LANDSCAPE PLANNING
- SD-11 ROOF RUNOFF CONTROLS
- SD-12 EFFICIENT IRRIGATION
- SE-7 STREET SWEEPING & VACUUMING
- MP-S2 OLDCASTLE FLOORGRAB CATCH BASIN INSERT FILTERS (OR APPROVED EQUAL)
- RET-3 ADS STORMTECH INFILTRATION SYSTEM



PREPARED BY:
C&V CONSULTING, INC.
 CIVIL ENGINEERING
 LAND PLANNING & SURVEYING
 9830 IRVINE CENTER DRIVE
 IRVINE, CALIFORNIA 92618
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CITY OF TORRANCE
 PUBLIC WORKS/ ENGINEERING DEPARTMENT
 TENTATIVE PARCEL MAP NO. 84623
 1407-1455 CRENSHAW BOULEVARD
 TORRANCE, CA
 BMP EXHIBIT

SHEET
 1
 OF
 1

Figure -3:
Impaired Waters

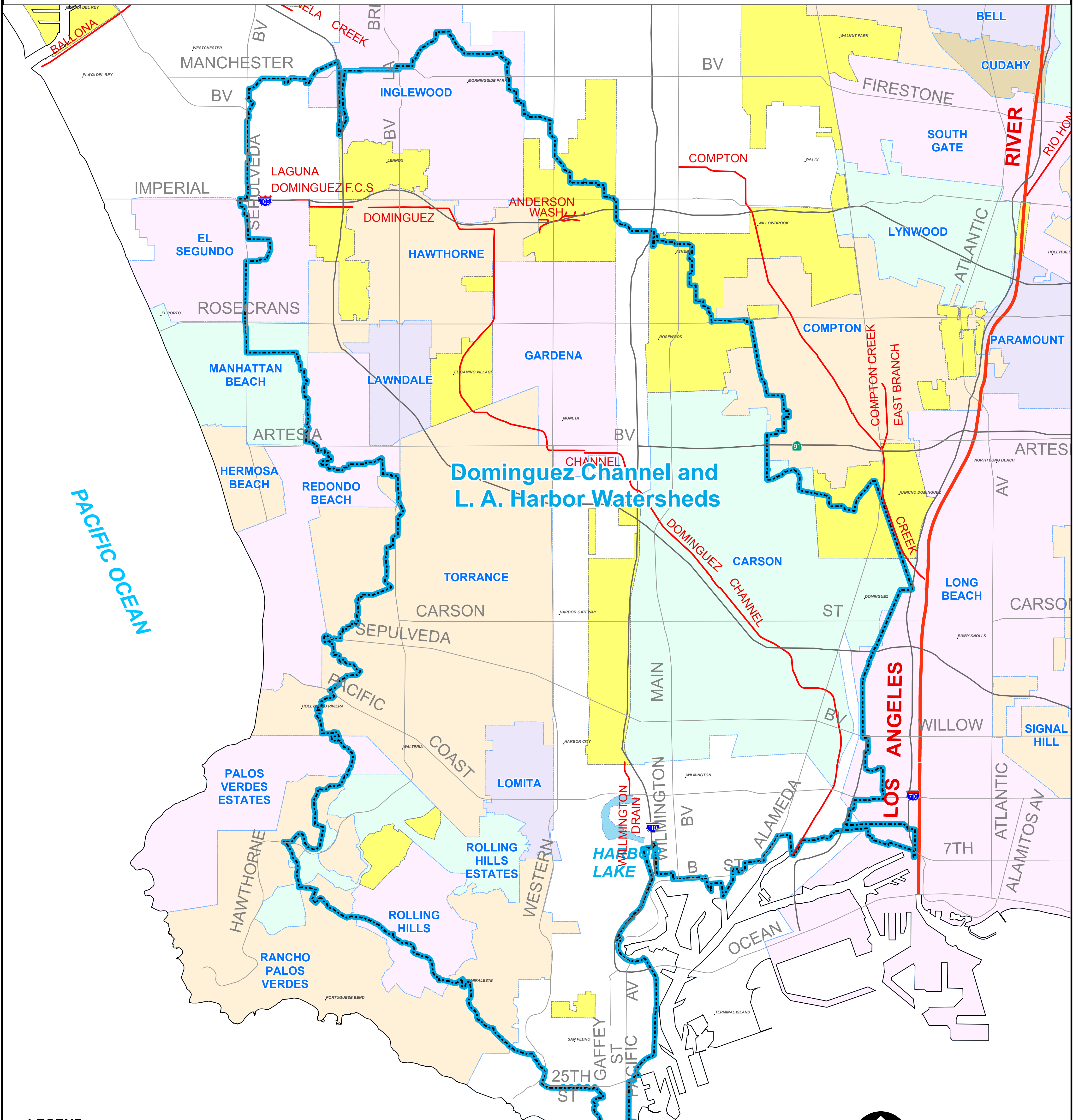




COUNTY OF LOS ANGELES



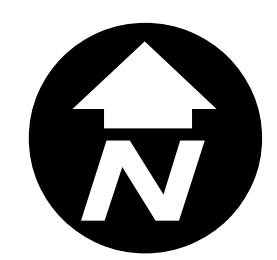
DOMINGUEZ CHANNEL & LA HARBOR WATERSHEDS



Dominguez Channel and L. A. Harbor Watersheds

LEGEND

- DOMINGUEZ CHANNEL & L.A. HARBOR WATERSHED
- UNINCORPORATED AREA
- DAM / LAKE / RESERVOIR
- MAJOR RIVER
- MAJOR CHANNEL



Data contained in this map is produced in whole or part from the Los Angeles County Department of Public Works' digital database.

Appendix A:
Volume and Flow Rate Calculations & Hydrologic Report

DMA A

A = 1.33 ac

% Imp = 85%

V_{0.75 inch} = 2,801 cf

V_{85th Percentile} = **3,361 cf ✓**

ADS StormTech Detention & Infiltration Calculations:

Total DCV = 3,361 cf

K_{DESIGN} = 6.2 in/hr *

Factor of Safety = 4.5

K_{DESIGN} = 1.38 in/hr *

Surface Area of ADS StormTech System = 989.2 sf

Total Storage of ADS StormTech System = 4,032 cf

V_{INFIL-72 HRS} = (1 ft/ 12 in)(1.38 in/hr)(989.2 sf)(48 hrs) = 5,451.8 cf > **DCV = 3,361 cf ✓**

Refer to HydroCalc output calculations hereon.

*Refer to the Summary of Infiltration Testing prepared by ALTA California Geotechnical, Inc. dated August 27, 2024, for infiltration testing information and Summary of Groundwater Conditions. An estimated design infiltration rate of 1.38 in/hr with an applied factor of safety was utilized within the above calculations.

Peak Flow Hydrologic Analysis

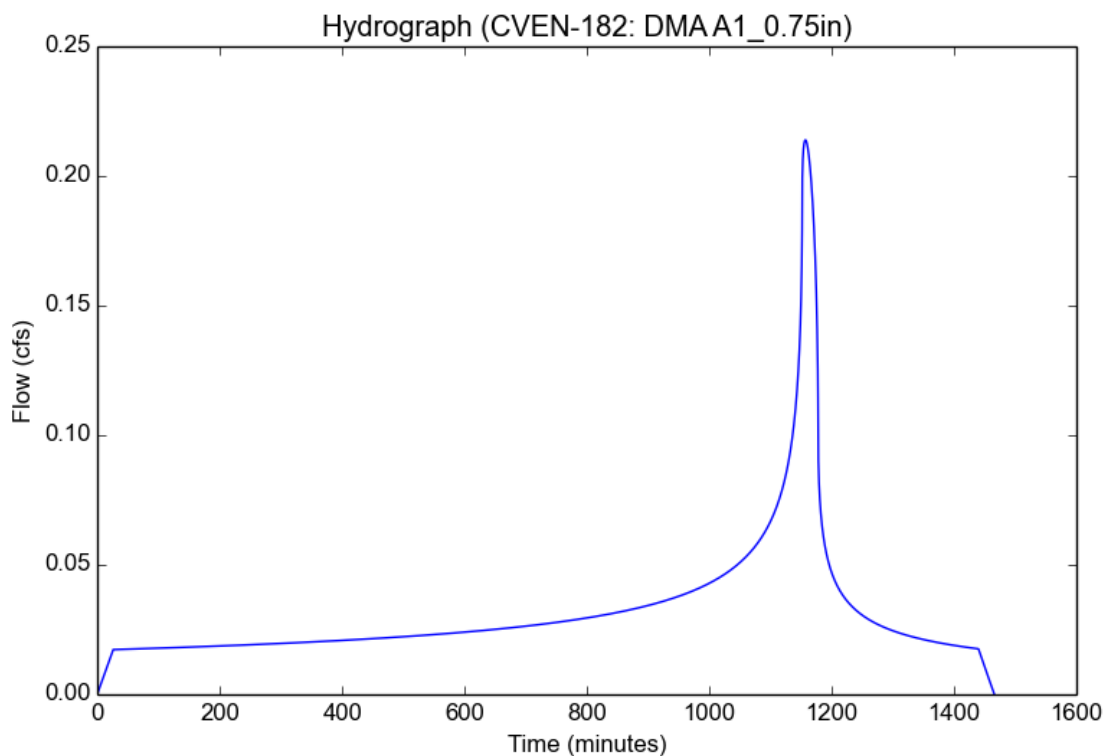
File location: P:/C/CVEN-182/Admin/Reports/LID/Appendix A - Calcs/CVEN-182 - DMA A1_0.75in.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-182
Subarea ID	DMA A1_0.75in
Area (ac)	1.33
Flow Path Length (ft)	352.0
Flow Path Slope (vft/hft)	0.008
0.75-inch Rainfall Depth (in)	0.75
Percent Impervious	0.85
Soil Type	10
Design Storm Frequency	0.75 inch storm
Fire Factor	0
LID	True

Output Results

Modeled (0.75 inch storm) Rainfall Depth (in)	0.75
Peak Intensity (in/hr)	0.2062
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.78
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.2139
Burned Peak Flow Rate (cfs)	0.2139
24-Hr Clear Runoff Volume (ac-ft)	0.0643
24-Hr Clear Runoff Volume (cu-ft)	2801.0041



Peak Flow Hydrologic Analysis

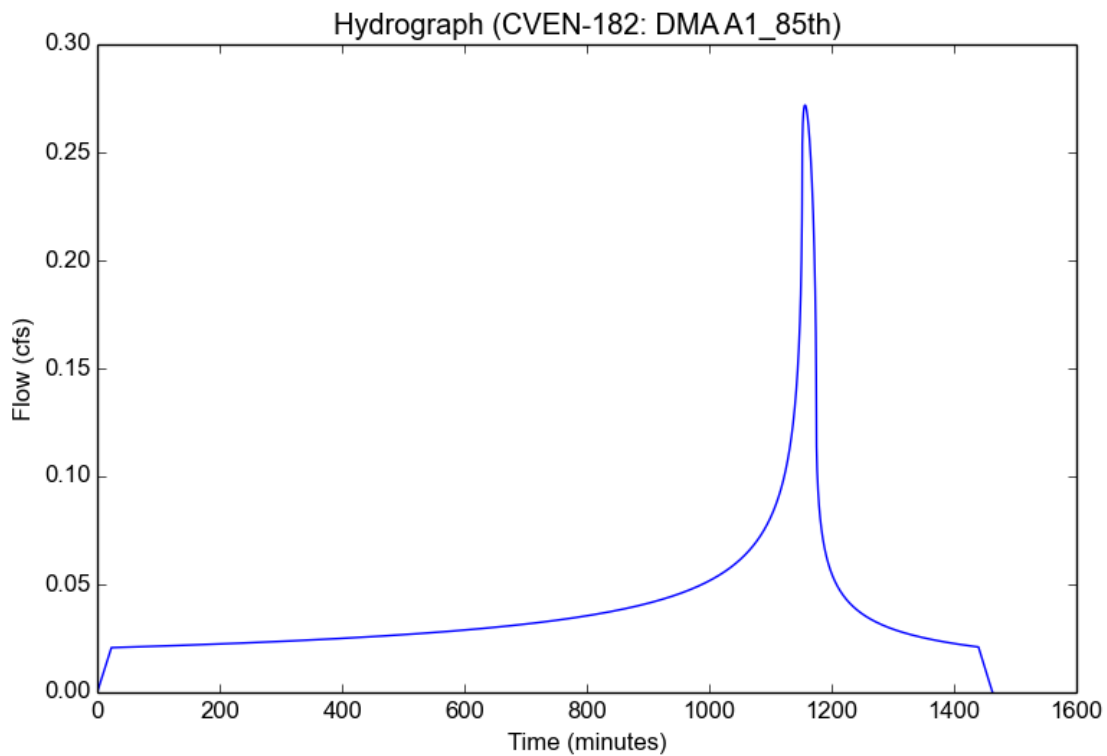
File location: P:/C/CVEN-182/Admin/Reports/LID/Appendix A - Calcs/CVEN-182 - DMA A1_85th.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-182
Subarea ID	DMA A1_85th
Area (ac)	1.33
Flow Path Length (ft)	352.0
Flow Path Slope (vft/hft)	0.008
85th Percentile Rainfall Depth (in)	0.9
Percent Impervious	0.85
Soil Type	10
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	0.9
Peak Intensity (in/hr)	0.2621
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.78
Time of Concentration (min)	23.0
Clear Peak Flow Rate (cfs)	0.2719
Burned Peak Flow Rate (cfs)	0.2719
24-Hr Clear Runoff Volume (ac-ft)	0.0772
24-Hr Clear Runoff Volume (cu-ft)	3361.1986



Appendix B:
Site BMPs

S-1: Storm Drain Message and Signage

Purpose

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

General Guidance

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

Design Specifications

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.
- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., “No Dumping – Drains to the Ocean”) are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

Maintenance Requirements

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner’s association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.

S-1: Storm Drain Message and Signage

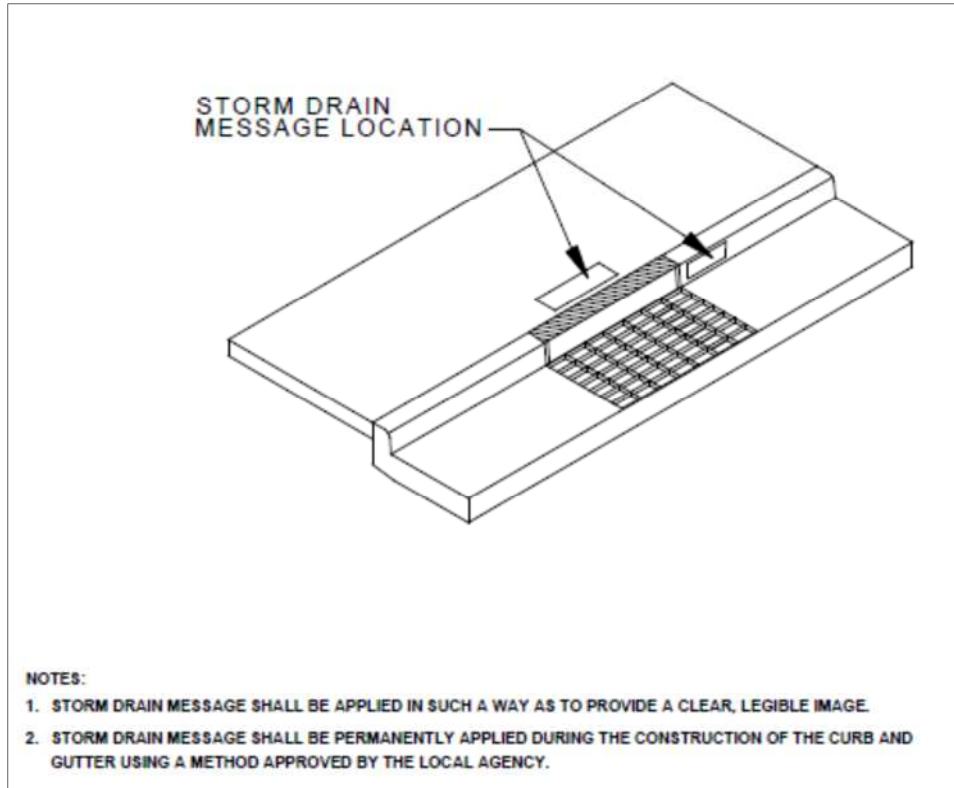


Figure D-1. Storm Drain Message Location – Curb Type Inlet

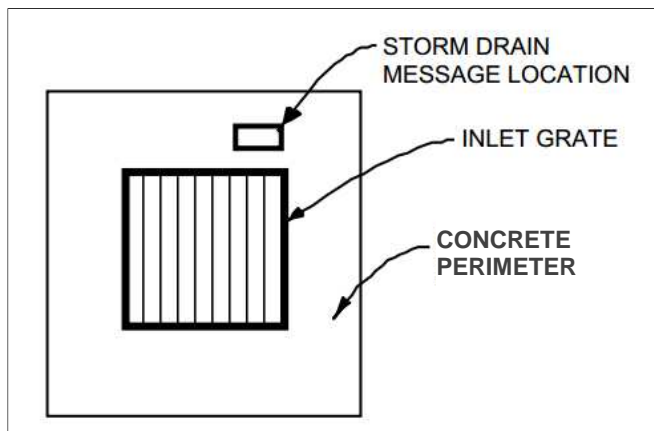


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet

S-8: Landscape Irrigation Practices

Purpose

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

General Guidance

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

Design Specifications

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.¹ The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

¹ If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.

S-8: Landscape Irrigation Practices

- For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.²
- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

Maintenance Requirements

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

² As determined by the City of Los Angeles, Building and Safety Division



Rain Garden

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain



barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say 1/4 to 1/2 inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Supplemental Information

Examples

- City of Ottawa’s Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, “Low-Impact Development”, January/February 2003.
www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD.
www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.



- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
 - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
 - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
 - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
 - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

Objectives

EC	Erosion Control	
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	<input checked="" type="checkbox"/>
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- Primary Objective
- Secondary Objective

Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	

Potential Alternatives

None



SE-7 Street Sweeping and Vacuuming

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd³ hopper) to \$88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

RET-3: Infiltration Trench



Description

An infiltration trench is a narrow trench constructed in naturally pervious soils designed for retaining and infiltrating stormwater runoff into the underlying native soils and groundwater table. Infiltration trenches are typically filled with gravel and sand, although use of manufactured percolation tank modules may be considered in place of gravel fill. Infiltration trenches provide stormwater runoff treatment through a variety of natural mechanisms (i.e., filtration, adsorption,

biological degradation) as water flows through the soil profile.

Infiltration trenches differ from infiltration basins in that the former are used for small drainage areas and stores stormwater runoff out of sight underground within the void spaces of rocks or stones or percolation tank modules. Infiltration basins are used for larger drainage areas and stormwater is stored within a visible ponded surface.

Infiltration vaults and infiltration leach fields are subsurface variations of the infiltration trench concept in which stormwater runoff is distributed to the upper zone of the subsurface gravel bed by means of perforated pipes.

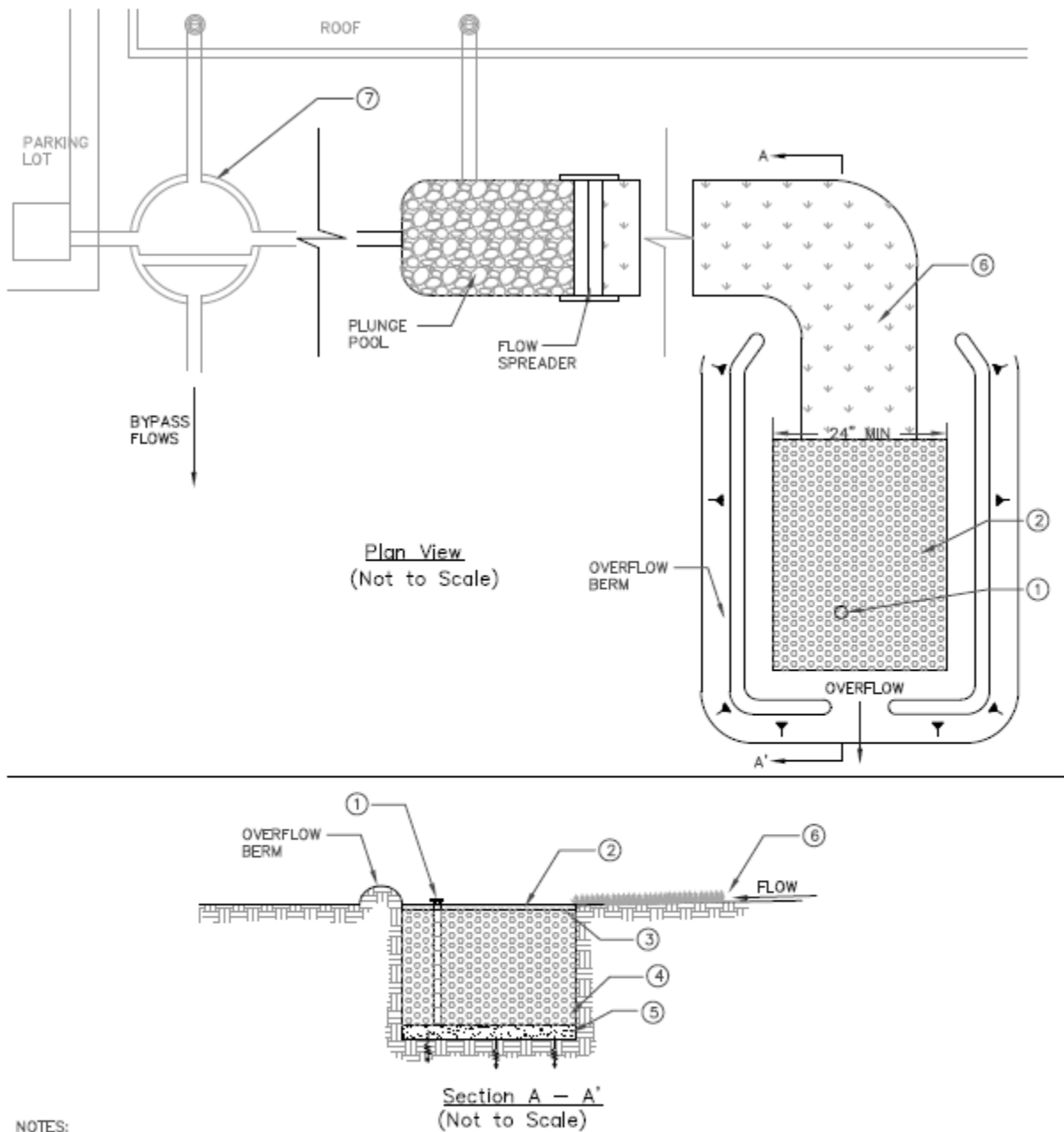
A schematic of a typical infiltration trench is presented in Figure E-3.

LID Ordinance Requirements

Infiltration trenches can be used to meet the on-site retention requirements of the LID Ordinance. Infiltration trenches will prevent pollutants in the SWQDv from being discharged off-site.

Advantages

- Reduces or eliminates stormwater runoff discharge to receiving water for most storm events
- Reduces peak stormwater runoff, which provides erosion control
- Provides groundwater recharge
- Provides effective treatment through settling and filtering while requiring relatively small space.
- Fits in narrow areas and unused areas of a development site.
- Is suitable for use when water is not available for irrigation or base flow.



NOTES:

- ① OBSERVATION WELL WITH LOCKABLE ABOVE-GROUND CAP
- ② 2" PEA GRAVEL FILTER LAYER
- ③ PROVIDE FILTER FABRIC IF NO PRETREATMENT IS PROVIDED
- ④ 3' - 5' DEEP TRENCH FILLED WITH 2" - 6" DIAMETER CLEAN STONE WITH 30% - 40% VOIDS
- ⑤ 6" DEEP SAND FILTER LAYER (OR FABRIC EQUIVALENT)
- ⑥ RUNOFF FILTERS THROUGH GRASS FILTER STRIP OR VEGETATED SWALE
- ⑦ OPTIONAL FLOW CONTROL DEVICE FOR OFF-LINE CONFIGURATIONS

Figure E-3. Infiltration Trench Schematic

Disadvantages

- Is not appropriate for areas with too low or too high permeability soils
- May not be appropriate for industrial sites or locations with contaminated soils or where spills may occur because of the potential threat to groundwater contamination
- Must be protected from high sediment loads
- May result in standing water, which may allow vector breeding
- Is not appropriate on fill or sites with steep slopes

General Constraints and Implementation Considerations

- Infiltration trenches can be integrated into open space buffers and other landscape areas.
- The potential for groundwater contamination must be carefully considered,. Infiltration trenches are not suitable for sites that:
 - Use or store chemicals or hazardous materials, unless they are prevented from entering the trench; or
 - Un-remediated “brownfield sites” where there is known groundwater or soil contamination.
- Infiltration trenches should be sited away from tree drip lines and kept free of vegetation.
- If the corrected in-situ infiltration rate exceed 2.4 in/hr, then stormwater runoff may need to be fully-treated with an upstream stormwater quality control measure prior to infiltration to protect groundwater quality.
- Infiltration trenches cannot be located on sites with a slope greater than 15 percent.
- Pretreatment to remove sediment is required to protect infiltration trench from high sediment loads.
- If possible, the entire tributary area of the infiltration trench should be stabilized before construction begins. If this is not possible, all flows should be diverted around the infiltration trench to protect it from sediment loads during construction or the top two inches of soil from the infiltration trench floor should be removed after the site has been stabilized. Excavated material should be stored such that it cannot be washed back into the infiltration trench if a storm occurs during construction.
- The equipment used to construct the infiltration trench should have extra wide low-pressure tires. Construction traffic should not enter the infiltration trench because it can compact soil, which reduces infiltration capacity. If heavy equipment is used on the base of the infiltration trench, the infiltrative capacity may be restored by tilling or aerating prior to placing the infiltrative bed.

- Clean, washed gravel should be placed in the excavated trench in lifts and lightly compacted with a plate compactor. Use of unwashed gravel can result in clogging.
- A geomembrane liner should be installed generously with overlapping seams on sides, bottom, and one foot below the surface of the infiltration trench.
- After construction is completed, the entire tributary area of the infiltration trench should be stabilized before allowing stormwater runoff to enter it.
- An observation well must be installed to check water levels, detention time, and evidence of clogging. An access road along the entire length of the infiltration trench is required unless it is located along an existing road or parking lot that can be safely used for maintenance access.

Design Specifications

The following sections provide design specifications for infiltration trenches.

Geotechnical

Due to the potential to contaminate groundwater, cause slope instability, impact surrounding structures, and potential for insufficient infiltration capacity, an extensive geotechnical site investigation must be conducted during the site planning process to verify site suitability for an infiltration trench. All geotechnical investigations must be performed according to the most recent GMED Policy GS 200.1. Soil infiltration rates and the groundwater table depth must be evaluated to ensure that conditions are satisfactory for proper operation of an infiltration trench. The project applicant must demonstrate through infiltration testing, soil logs, and the written opinion of a licensed civil engineer that sufficiently permeable soils exist on-site to allow the construction of a properly functioning infiltration trench.

Infiltration trenches are appropriate for soils with a minimum corrected in-situ infiltration rate of 0.3 in/hr. The geotechnical report must determine if the proposed project site is suitable for an infiltration trench and must recommend a design infiltration rate (see “Design Infiltration Rate” under the “Sizing” section). The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move through the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Pretreatment

Pretreatment is important for all structural stormwater quality control measures, but it is particularly important for retention facilities. Pretreatment refers to design features that provide settling of large particles before stormwater runoff enters a stormwater quality control measure in order to reduce the long-term maintenance burden. Pretreatment should be provided to reduce the sediment load entering an infiltration trench in order to maintain the infiltration rate of the infiltration trench. To ensure that infiltration trenches are effective, the project applicant must incorporate pretreatment devices that provide

sediment reduction (e.g., vegetated swales, vegetated filter strips, sedimentation manholes, and proprietary devices).

Setbacks

Infiltration trenches must be sited following the setbacks from the most recent GMED Policy GS 200.1.

Geometry

- Infiltration trenches must be designed and constructed to be at least 24 inches wide and 3 to 5 feet deep.
- The longitudinal slope of the trench should not exceed three percent.
- The filter bed media layers must have the following composition and thickness:
 - Top layer: 2 inches of pea gravel
 - Middle layer: 3 to 5 feet of washed 2- to 6-inch gravel; void spaces should be approximately 30 to 40 percent
 - Bottom layer: 6 inches of sand or geomembrane liner equivalent.

Sizing

Infiltration trenches are sized a simple sizing method where the SWQDv must be completely infiltrated within 96 hours. Infiltration trenches provide stormwater runoff storage in the voids of the rock fill or percolation tank modules.

Step 1: Determine the SWQDv

Infiltration trenches must be designed to capture and retain the SWQDv (see Section 6 for SWQDv calculation procedures).

Step 2: Determine the design infiltration rate

Determine the corrected in-situ infiltration rate (f_{design}) of the native soil using the procedures described in the most recent GMED Policy GS 200.1.

Step 3: Calculate the surface area

Determine the size of the required infiltration surface by assuming the SWQDv will fill the available void spaces of the gravel storage layer. The maximum depth of stormwater runoff that can be infiltrated within the maximum retention time (96 hrs) is calculated using the following equation:

$$d_{max} = \frac{f_{design}}{12} \times t$$

Where:

d_{max} = Maximum depth of water that can be infiltrated within the maximum retention time [ft];
 f_{design} = Design infiltration rate [in/hr]; and
 t = Maximum retention time (max 96 hrs) [hr].

Select the infiltration trench depth (d_t) such that:

$$d_t \leq \frac{d_{max}}{n_t}$$

Where:

d_t = Depth of infiltration trench [ft];
 d_{max} = Maximum depth of water that can be infiltrated within the maximum retention time [ft]; and
 n_t = Infiltration trench fill porosity.

Calculate the infiltrating surface area (bottom of the infiltration trench) required:

$$A = \frac{SWQDv}{d_t \times n_t}$$

Where:

A = Surface area of the bottom of the infiltration trench [ft²];
 $SWQDv$ = Stormwater quality design volume [ft³];
 d_t = Depth of infiltration trench fill [ft]; and
 n_t = Infiltration trench porosity.

Flow Entrance and Energy Dissipation

Energy dissipation controls, constructed of sound materials such as stones, concrete, or proprietary devices that are rated to withstand the energy of the influent flow, must be installed at the inlet to the infiltration trench. Flow velocity at the inlet must be 4 ft/s or less. Consult with LACDPW for the type and design of energy dissipation structure.

Drainage

The specifications for designing drainage systems for infiltration trenches are presented below:

- The bottom of infiltration trench must be native soil that is over-excavated at least one foot in depth with the soil replaced uniformly without compaction. Amending the excavated soil with two to four inches (~15 to 30 percent) of coarse sand is recommended.

- The use of vertical piping, either for distribution or infiltration enhancement, is prohibited. This application may be classified as a Class V Injection Well per 40 CFR Part 146.5(e)(4).
- The infiltration capacity of the subsurface layers should be sufficient to ensure a maximum detention time of 96 hours. An observation well must be installed to allow observation of detention time.

Hydraulic Restriction Layer

The entire infiltrative area, including the side slopes must lined with a geomembrane liner to prevent soil from migrating into the top layer and reducing the infiltration capacity. The specifications of the geomembrane liner are presented in Table E-5. The entire trench area, including the sides, must be lined with a geomembrane liner prior to placing the media bed. Provide generous overlap at the seams.

Table E-5. Geomembrane Liner Specifications for Infiltration Trenches

Parameter	Test Method	Specifications
Material		Nonwoven geomembrane liner
Unit weight		8 oz/yd ³ (minimum)
Filtration rate		0.08 in/sec (minimum)
Puncture strength	ASTM D-751 (Modified)	125 lbs (minimum)
Mullen burst strength	ASTM D-751	400 lb/in ² (minimum)
Tensile strength	AST D-1682	300 lbs (minimum)
Equiv. opening size	US Standard Sieve	No. 80 (minimum)

Observation Well

The observation well is a vertical section of perforated PVC pipe, four- to six-inch diameter, installed flush with the top of the infiltration trench on a footplate and with a locking, removable cap. The observation well is needed to monitor the infiltration rate in infiltration trench and is useful for marking the location of the infiltration trench.

Vegetation

- Infiltration trenches must be kept free of vegetation.
- Trees and other large vegetation should be planted away from infiltration trenches such that drip lines do not overhang the infiltration area.

Restricted Construction Materials

Use of pressure-treated wood or galvanized metal at or around an infiltration trench is prohibited.

Overflow Device

An overflow device must be provided in the event that stormwater runoff overtops the infiltration trench or if the infiltration trench becomes clogged. The overflow device must be able to convey stormwater runoff to a downstream conveyance system or other acceptable discharge point.

Maintenance Access

The infiltration trench must be safely accessible during wet and dry weather conditions if it is publicly-maintained. An access road along the entire length of the infiltration trench is required unless the trench is located along an existing road or parking lot that can be safely used for maintenance access. If the infiltration trench becomes plugged and fails, access is needed to excavate the infiltration trench and replace the filter bed media. All dimensions of the infiltration trench should also be increased by two inches to provide a fresh surface for infiltration. To prevent damage and compaction, access must be able to accommodate a backhoe working at “arm’s length” from the infiltration trench.

Maintenance Requirements

Maintenance and regular inspections are important for proper function of infiltration trenches. The following are general maintenance requirements:

- Conduct regular inspection and routine maintenance for pretreatment devices.
- Inspect infiltration trench and its observation well frequently to ensure that water infiltrates into the subsurface completely within the maximum detention time of 96 hours. If water is present in the observation well more than 96 hours after a major storm, the infiltration trench may be clogged. Maintenance activities triggered by a potentially clogged facility include:
 - Check for debris/sediment accumulation, rake surface and remove sediment (if any), and evaluate potential sources of sediment and vegetative or other debris (i.e., embankment erosion, channel scour, overhanging trees). If suspected upstream sources are outside of the County's jurisdiction, additional pretreatment (i.e., trash racks, vegetated swales) may be necessary.
 - Assess the condition of the top aggregate layer for sediment buildup and crusting. Remove the top layer of pea gravel and replace. If slow draining conditions persist, the entire infiltration trench may need to be excavated and replaced.
- Eliminate standing water to prevent vector breeding.
- Inspect infiltration trenches annually. Remove and dispose of trash and debris as needed, but at least prior to the beginning of the wet season.
- Inspect overflow devices for obstructions or debris, which should be removed immediately. Repair or replace damaged pipes upon discovery.

A summary of potential problems that may need to be addressed by maintenance activities is presented in Table E-6.

The County requires execution of a maintenance agreement to be recorded by the property owner for the on-going maintenance of any privately-maintained stormwater quality control measures. The property owner is responsible for compliance with the maintenance agreement. A sample maintenance agreement is presented in Appendix H.

Table E-6. Infiltration Trench Troubleshooting Summary

Problem	Conditions When Maintenance Is Needed	Maintenance Required
Trash and Debris	Trash and debris > 5 ft ³ /1,000 ft ²	Remove and dispose of trash and debris.
Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants	Remove any evidence of visual contamination.
Erosion/Sediment Accumulation	Undercut or eroded areas at inlet structures	Repair eroded areas and re-grade if necessary.
	Accumulation of sediment, debris, and oil/grease in pretreatment devices	Remove sediment, debris, and/or oil/grease.
	Accumulation of sediment, debris, and oil/grease on surface, inlet or overflow structures	Remove sediment, debris, and/or oil/grease.
Water Drainage Rate	Standing water, or by inspection of observation wells	Remove the top layer of the infiltration trench bottom and replace if necessary.

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer’s guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- ✓ Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.



one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than \$100 to about \$2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

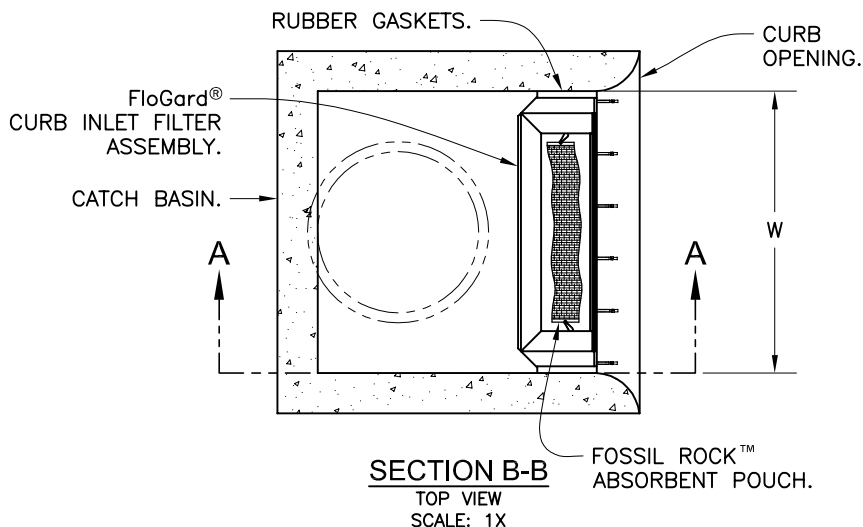
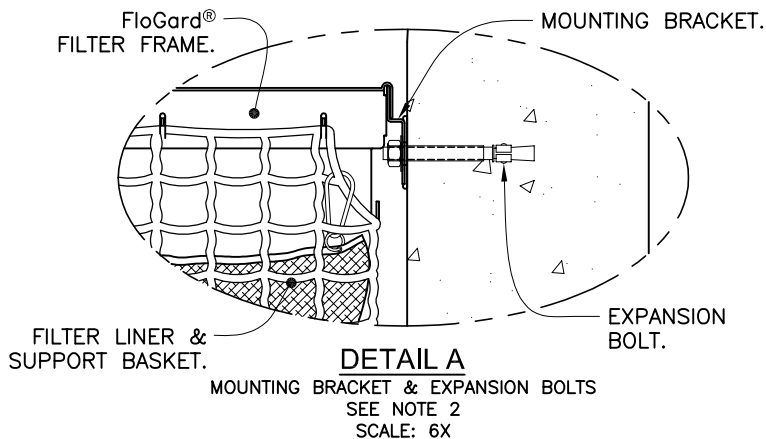
Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

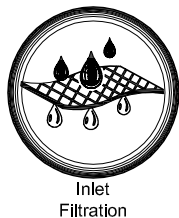
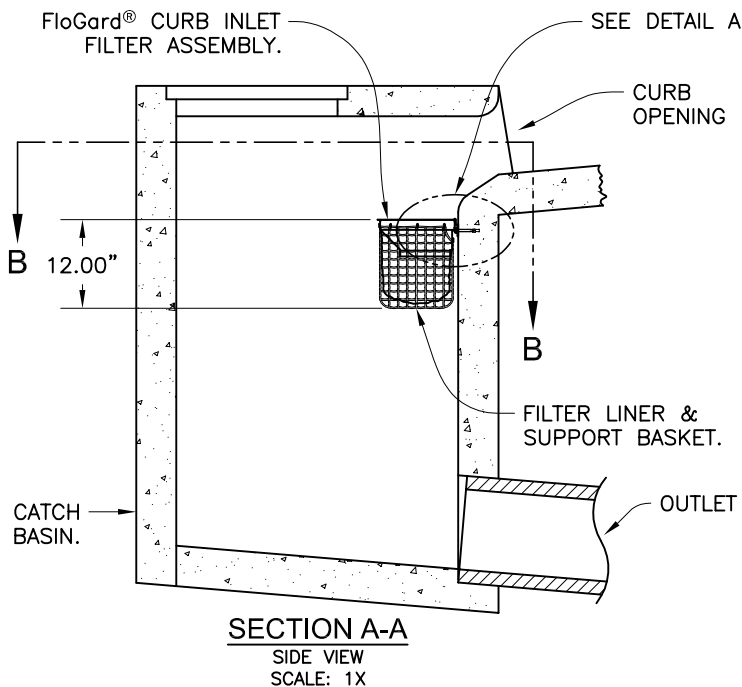
Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.



SPECIFIER CHART				
MODEL NO.	Curb Opening Width - W -	Storage Capacity - Cu. Ft. -	Filtered Flow Rate - GPM/CFS -	Bypass Flow Rate - GPM/CFS -
FGP-24CI	2.0' (24")	.95	338 / .75	2,513 / 5.6
FGP-30CI	2.5' (30")	1.20	450 / 1.00	3,008 / 6.7
FGP-36CI	3.0' (36")	1.50	563 / 1.25	3,547 / 7.9
FGP-42CI	3.5' (42")	1.80	675 / 1.50	3,951 / 8.8
FGP-48CI	4.0' (48")	2.10	768 / 1.76	4,445 / 9.9
FGP-5.0CI	5.0' (60")	2.40	900 / 2.00	5,208 / 11.6
FGP-6.0CI	6.0' (72")	3.05	1,126 / 2.51	6,196 / 13.8
FGP-7.0CI	7.0' (84")	3.65	1,350 / 3.01	7,139 / 15.9
FGP-8.0CI	8.0' (96")	4.25	1,576 / 3.51	8,082 / 18.0
FGP-10.0CI	10.0' (120")	4.85	1,800 / 4.01	9,833 / 21.9
FGP-12.0CI	12.0' (144")	6.10	2,252 / 5.02	11,764 / 26.2
FGP-14.0CI	14.0' (168")	7.30	2,700 / 6.02	13,515 / 30.1
FGP-16.0CI	16.0' (192")	8.55	3,152 / 7.02	15,446 / 34.4
FGP-18.0CI	18.0' (216")	9.45	3,490 / 7.78	17,152 / 38.2
FGP-21.0CI	21.0' (252")	10.95	4,050 / 9.02	19,891 / 44.3
FGP-28.0CI	28.0' (336")	14.60	5,400 / 12.03	26,311 / 58.6

NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock™*, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.



FloGard®
Catch Basin Insert Filter
Curb Inlet Style



Oldcastle®
Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com
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Appendix C:
ADS Stormtech Infiltration System

User Inputs

Chamber Model:	MC-7200
Outlet Control Structure:	No
Project Name:	CVEN-182
Engineer:	Samyam Manandhar Manandhar
Project Location:	California
Measurement Type:	Imperial
Required Storage Volume:	3700 cubic ft.
Stone Porosity:	40%
Stone Foundation Depth:	9 in.
Stone Above Chambers:	12 in.
Design Constraint Dimensions:	(20 ft. x 65 ft.)

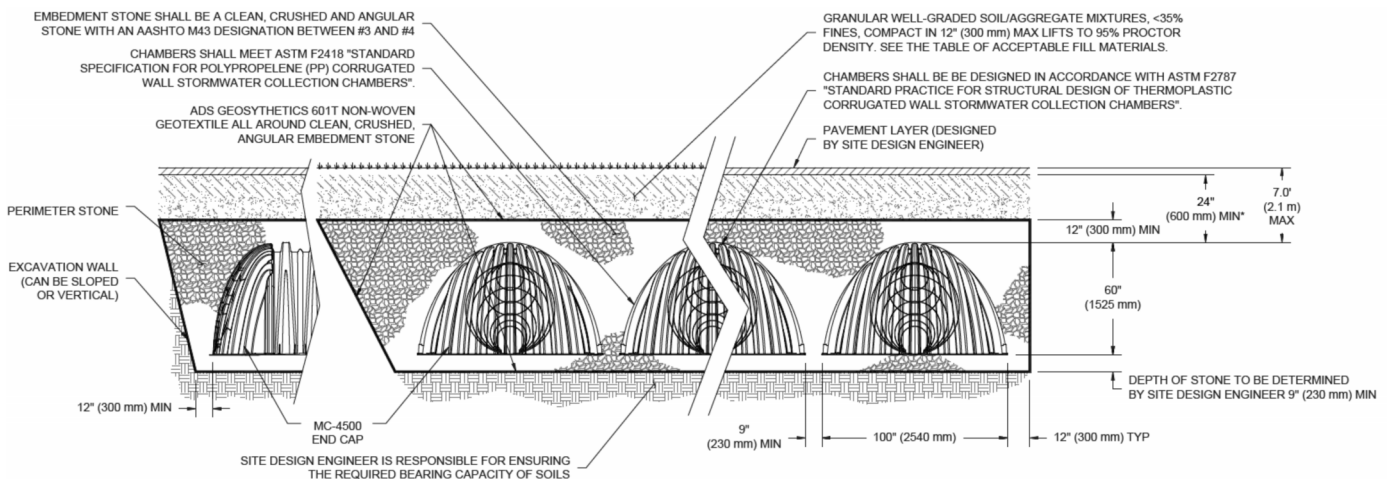
Results

System Volume and Bed Size

Installed Storage Volume:	4032.22 cubic ft.
Storage Volume Per Chamber:	175.90 cubic ft.
Number Of Chambers Required:	12
Number Of End Caps Required:	4
Chamber Rows:	2
Maximum Length:	50.95 ft.
Maximum Width:	19.42 ft.
Approx. Bed Size Required:	989.24 square ft.
Average Cover Over Chambers:	N/A .

System Components

Amount Of Stone Required:	164 cubic yards
Volume Of Excavation (Not Including Fill):	248 cubic yards
Total Non-woven Geotextile Required:	391 square yards
Woven Geotextile Required (excluding Isolator Row):	30 square yards
Woven Geotextile Required (Isolator Row):	106 square yards
Total Woven Geotextile Required:	135 square yards
Impervious Liner Required:	0 square yards



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	



CVEN-182

TORRANCE, CA, USA

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH MC-7200.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
- CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
- THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
- CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT²%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
- ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
 - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
 - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
 - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
- CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- ADS DOES NOT DESIGN OR PROVIDE MEMBRANE LINER SYSTEMS. TO MINIMIZE THE LEAKAGE POTENTIAL OF LINER SYSTEMS, THE MEMBRANE LINER SYSTEM SHOULD BE DESIGNED BY A KNOWLEDGEABLE GEOTEXTILE PROFESSIONAL AND INSTALLED BY A QUALIFIED CONTRACTOR.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

- STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
- CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
 - STONESHOOTER LOCATED OFF THE CHAMBER BED.
 - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
 - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
- THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
- JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
- MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
- INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
- EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
- STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
- STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
- THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
- ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

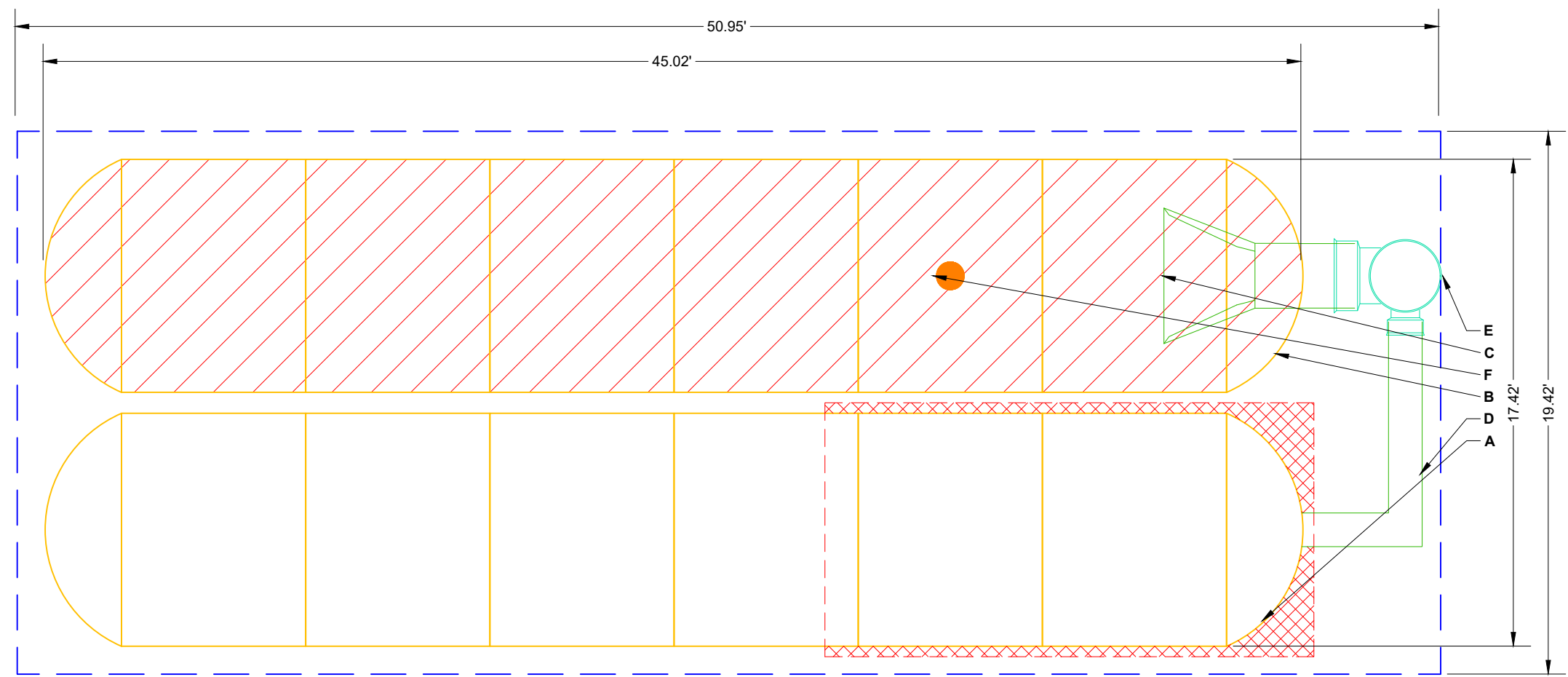
NOTES FOR CONSTRUCTION EQUIPMENT

- STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
- THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
 - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
 - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
 - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
- FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-800-821-6710 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:		*INVERT ABOVE BASE OF CHAMBER				
				PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
12	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75					
4	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25	PREFABRICATED END CAP	A	12" TOP PARTIAL CUT END CAP, PART#: MC7200IEPP12T / TYP OF ALL 12" TOP CONNECTIONS	35.69"	
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75					
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75	PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75					
4032	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75	FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
		TOP OF MC-7200 CHAMBER:	5.75	MANIFOLD	D	12" x 12" TOP MANIFOLD, ADS N-12	35.69"	
		12" x 12" TOP MANIFOLD INVERT:	3.72	NYLOPLAST (INLET W/ ISO PLUS ROW)	E	30" DIAMETER (24.00" SUMP MIN)		2.5 CFS IN
		24" ISOLATOR ROW PLUS INVERT:	0.94					
989	SYSTEM AREA (SF)	BOTTOM OF MC-7200 CHAMBER:	0.75	INSPECTION PORT	F	4" SEE DETAIL		
140.7	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00					



- ISOLATOR ROW PLUS (SEE DETAIL)
- PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

— BED LIMITS

NOTES

- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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2 OF 6

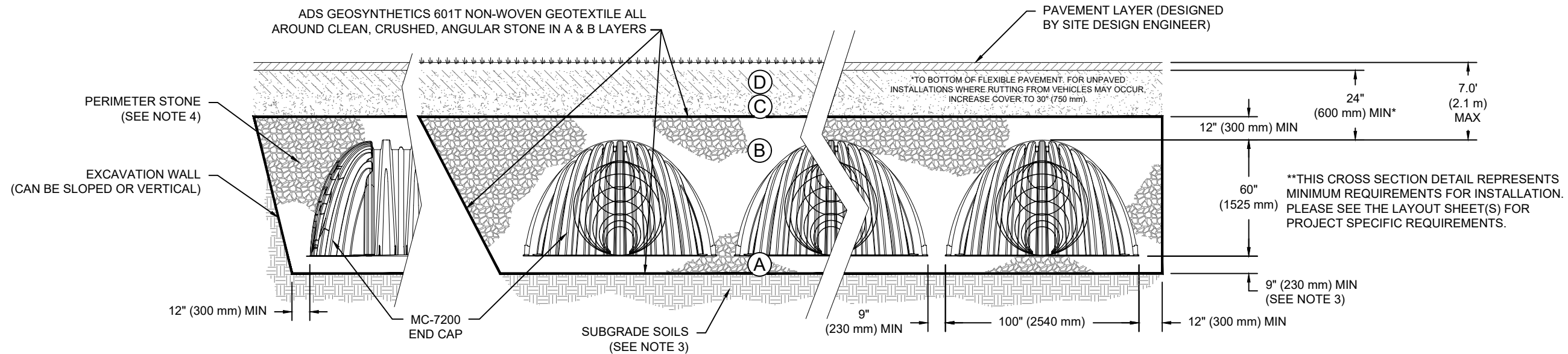
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ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145 ¹ A-1, A-2-4, A-3 OR AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE ⁵	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE ⁵	AASHTO M43 ¹ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

- THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
- STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
- WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
- ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
- WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS. REFERENCE STORMTECH DESIGN MANUAL FOR BEARING CAPACITY GUIDANCE.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
 - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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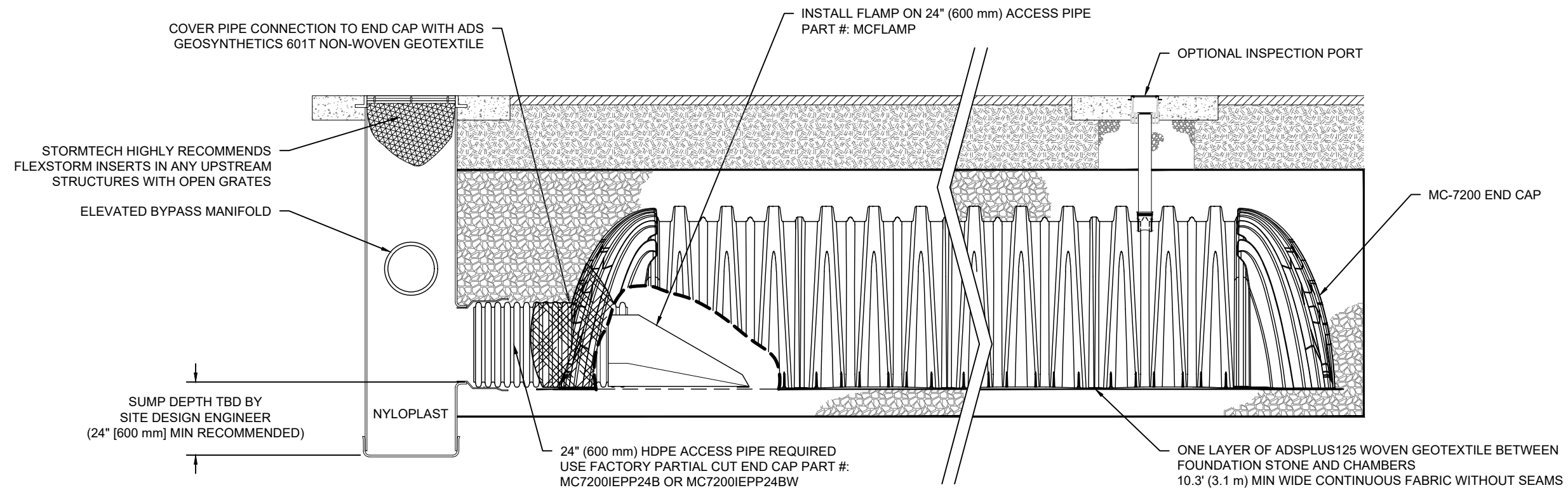
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MC-7200 ISOLATOR ROW PLUS DETAIL

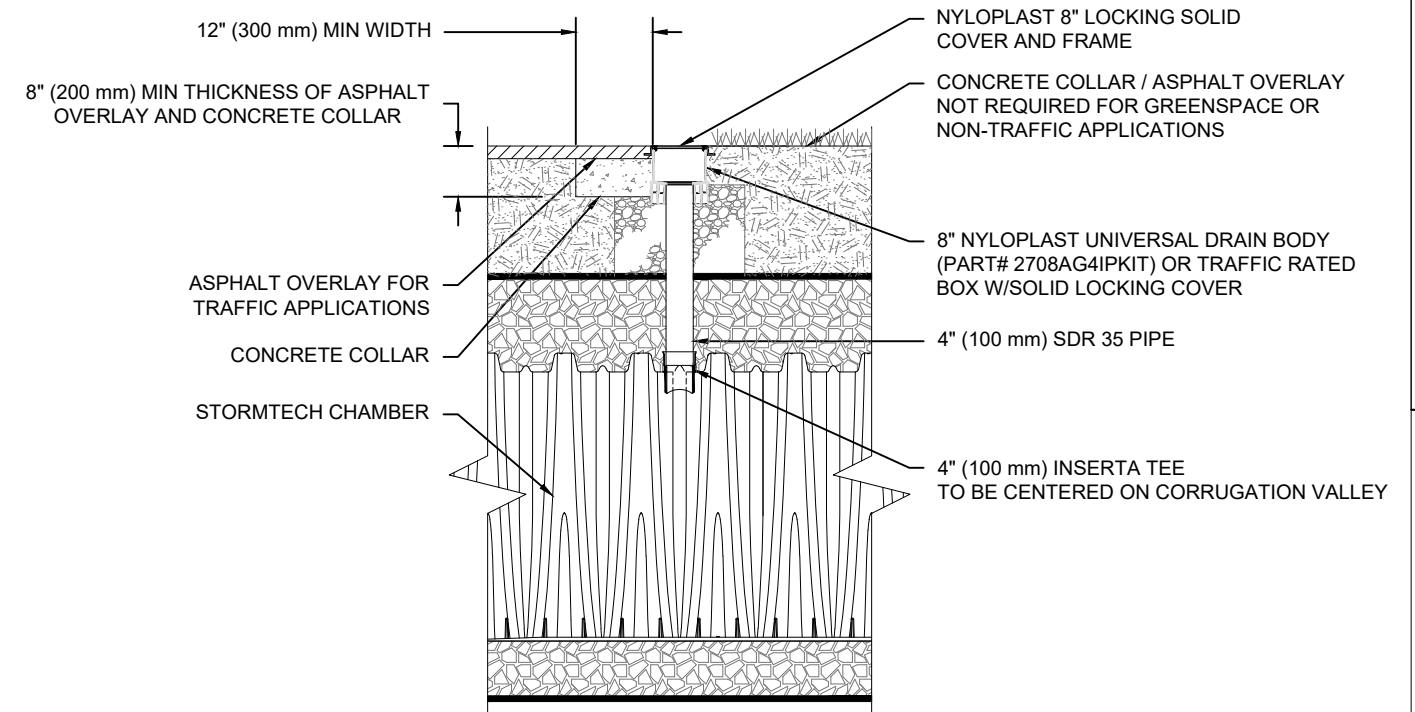
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INSPECTION & MAINTENANCE

- STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
 - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
 - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
 - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
 - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
 - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
 - B. ALL ISOLATOR PLUS ROWS
 - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
 - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
 - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
 - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
 - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
 - B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
 - C. VACUUM STRUCTURE SUMP AS REQUIRED
- STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.
- STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

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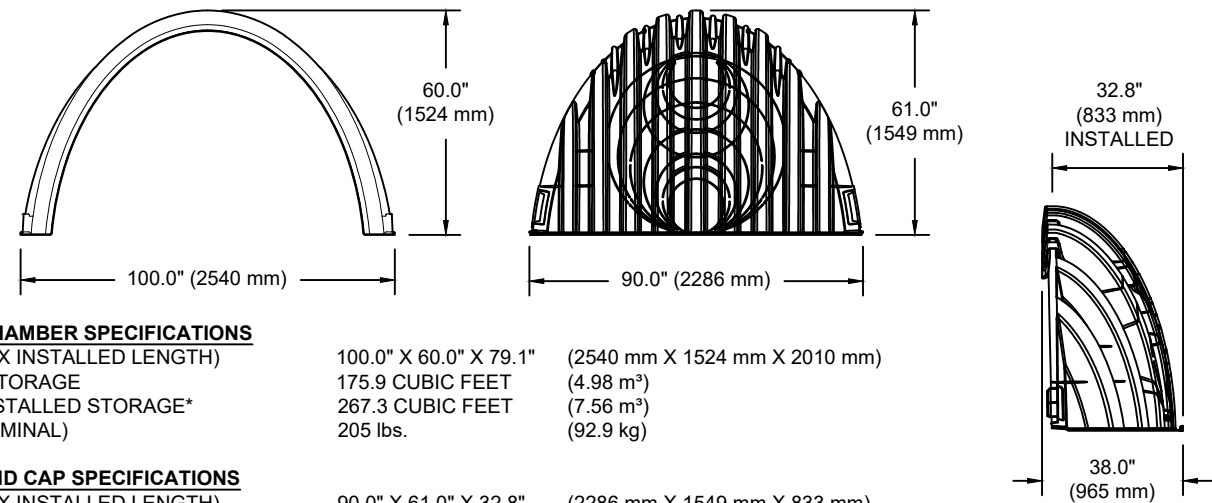
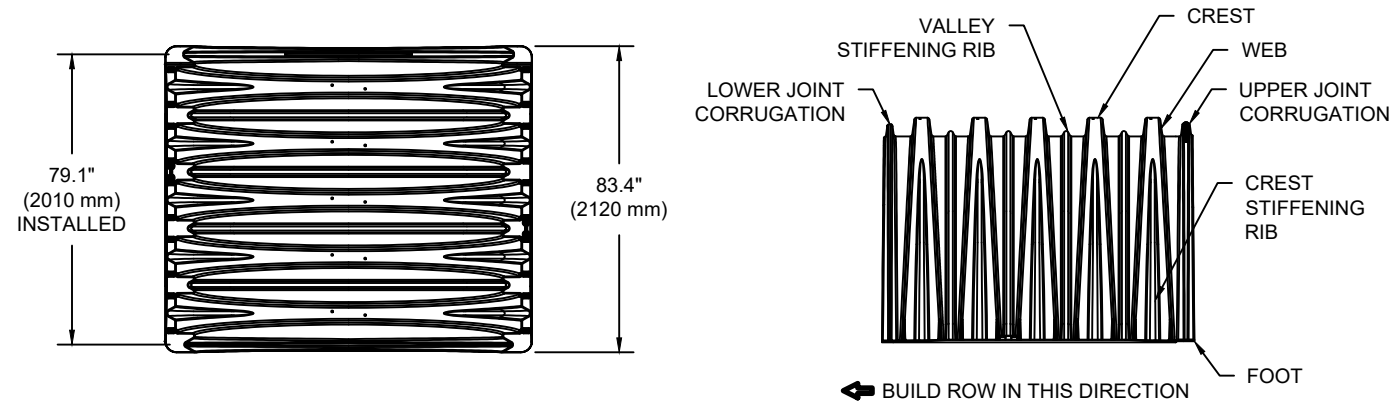
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MC-7200 TECHNICAL SPECIFICATION

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NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m ³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m ³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m ³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m ³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

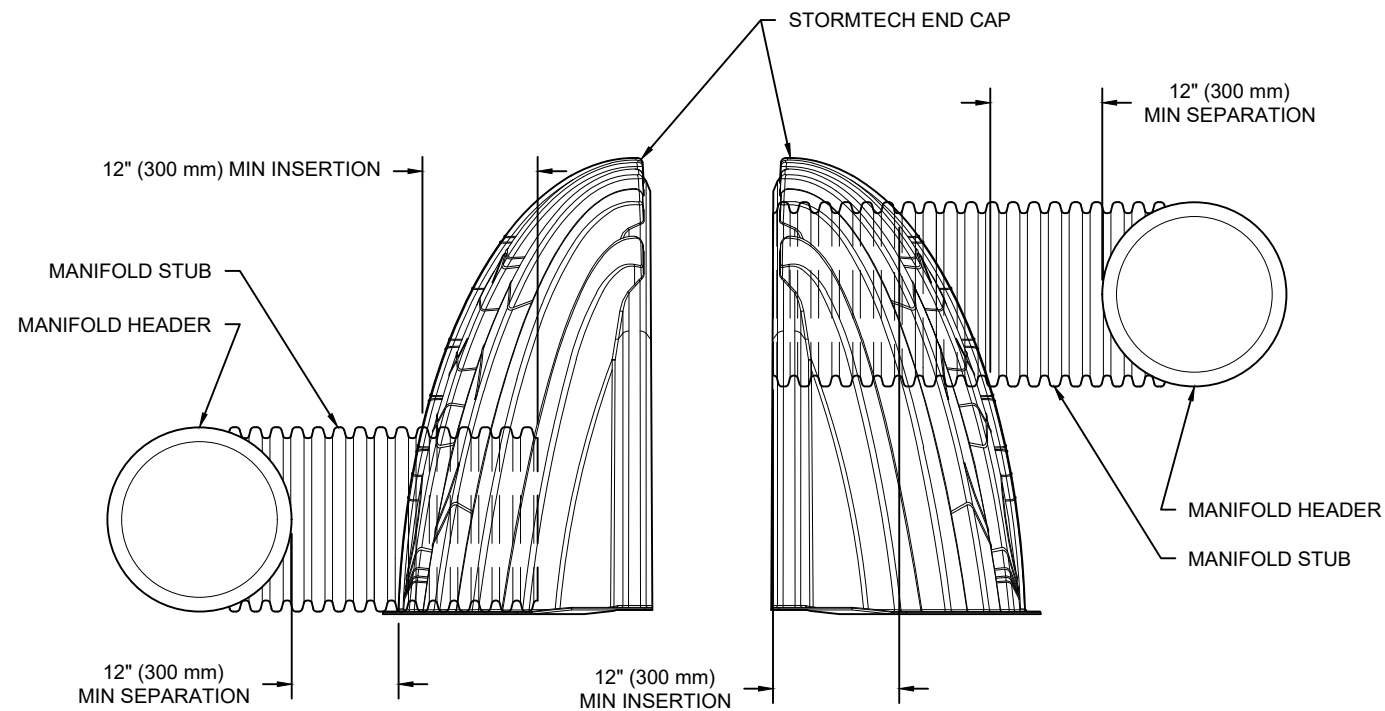
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
 PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
 END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW		---	1.97" (50 mm)
MC7200IEPP18B		---	---
MC7200IEPP18BW		---	---
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW		---	2.26" (57 mm)
MC7200IEPP24B	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP24BW		---	3.25" (83 mm)
MC7200IEPP30BW	36" (900 mm)	---	3.55" (90 mm)
MC7200IEPP36BW	42" (1050 mm)	---	---

CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

MC-SERIES END CAP INSERTION DETAIL

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NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

NOTE: ALL DIMENSIONS ARE NOMINAL

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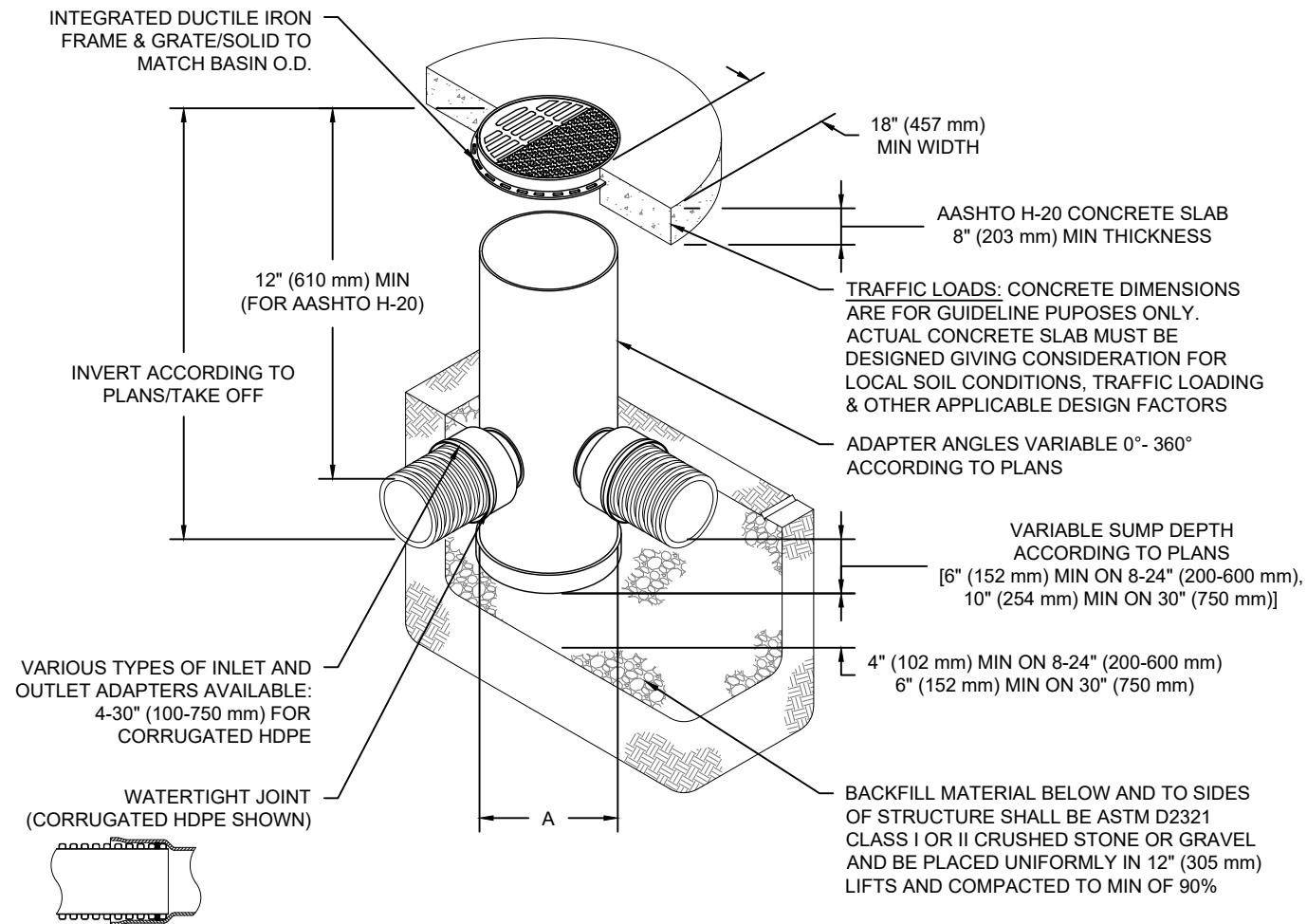
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NYLOPLAST DRAIN BASIN

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NOTES

- 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
- 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
- DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
- DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
- FOR COMPLETE DESIGN AND PRODUCT INFORMATION: WWW.NYLOPLAST-US.COM
- TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

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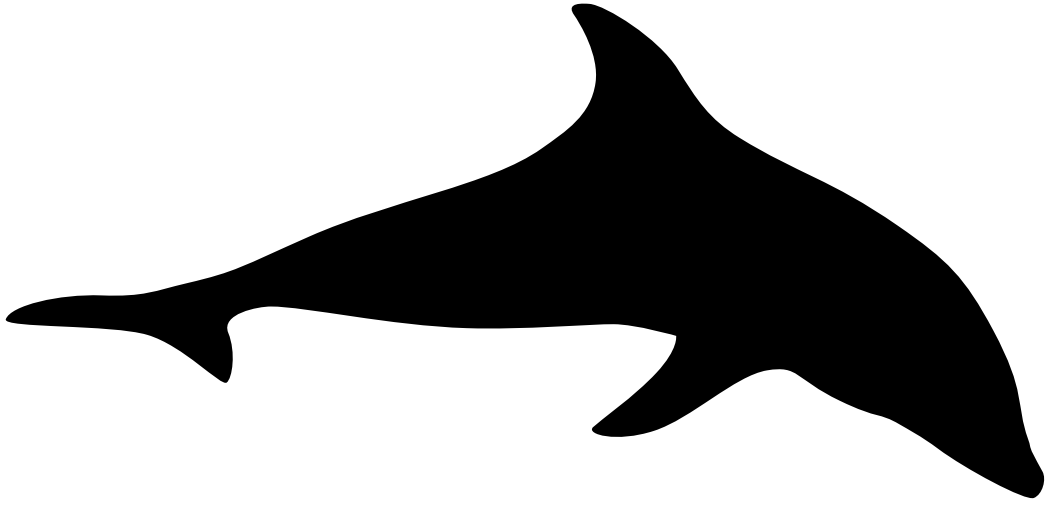
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Appendix D:
“NO DUMPING – DRAINS TO OCEAN” Stencil Examples



Sample Stencil 1

NO DUMPING



**DRAINS TO
OCEAN**

Appendix E:
Catch Basin Cleaning

OPERATION & MAINTENANCE PLAN FOR FILTER INSERT

The maintenance program will include the following key components:

1. REGULAR SWEEPING AND REMOVAL OF DEBRIS:

Vehicle parking lot will be swept on a regular basis. Sediment and debris (litter, leaves, papers and cans, etc.) within the area, especially around the drainage inlet, will be collected and removed. The frequency of sweeping will be based on the amount of sediment and debris generated.

2. REGULAR INSPECTIONS:

The catch basin, downspout, or trench drain filter insert will be inspected on a regular basis. The frequency of inspection will be based on pollutant loading, amount of debris, leaves, etc., and amount of runoff. At a minimum, there will be three inspections per year.

3. CONDUCT OF THE VISUAL INSPECTION:

- a. Broom sweep around the inlet and remove the inlet grate.
- b. Inspect the filter liner for serviceability. If called for, the filter body will be replaced.
- c. Check the condition of the adsorbent pouches and visually check the condition of the enclosed adsorbent. If the surface of the granules is more than 50% coated with a dark gray or black substance, the pouches will be replaced with new ones.
- d. Check for loose or missing nuts (on some models) and gaps between the filter and the inlet wall, which would allow bypass of the filter during low flows.
- e. The filter components will be replaced in the inlet and the grate replaced.

4. CLEANING OUT THE FILTER INSERT:

Regardless of the model of filter insert, the devices must be cleaned out on a recurring basis. The manufacturer recommends at least three cleanings per year – more in high exposure areas. For the Flo-Gard+Plus filters, the filter must be cleaned when the solids level reaches close to the full tip.

- a. The Standard Filter, in most cases, can be cleaned out by removing the device from the inlet and dumping the contents into a DOT approved drum for later disposal. If the oil-adsorbant pouches need to be changed, the time to change them is immediately after dumping and before the filter is replaced in the inlet.
- b. Because of weight, method of installation and so forth, some filter inserts will be cleaned with the aid of a vactor truck. If necessary, the oil-adsorbant pouches will be changed after the pollutants have been removed and as the filter is being returned to service.

5. MAINTENANCE LOG:

Keep a log of all inspections and maintenance performed on the catch basins, trench drains, and filter inserts. Keep this log on-site.

CATCH BASIN MAINTENANCE RECORD

SITE INFORMATION	
Contact:	Phone: ()
Project Name:	
Address:	
Filter No. & Model:	

SERVICE INFORMATION		
Date of Service:	By:	
<input type="checkbox"/> Inspection	<input type="checkbox"/> Clean Debris	<input type="checkbox"/> Clean Silt/Sediment
<input type="checkbox"/> Replace Pouch	<input type="checkbox"/> Replace Rock	<input type="checkbox"/> Repair/Replace Parts
Comments:		
Approval Signature:		

SITE INFORMATION	
Contact:	Phone: ()
Project Name:	
Address:	
Filter No. & Model:	

SERVICE INFORMATION		
Date of Service:	By:	
<input type="checkbox"/> Inspection	<input type="checkbox"/> Clean Debris	<input type="checkbox"/> Clean Silt/Sediment
<input type="checkbox"/> Replace Pouch	<input type="checkbox"/> Replace Rock	<input type="checkbox"/> Repair/Replace Parts
Comments:		
Approval Signature:		

Appendix F:
LID Covenant

RECORDING REQUESTED BY
AND MAIL TO:

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUILDING AND SAFETY DIVISION
900 S. FREMONT AVENUE, 3RD FLOOR
ALHAMBRA, CA 91803-1331

Space above this line is for Recorder's use

COVENANT AND AGREEMENT
REGARDING THE MAINTENANCE OF LOW IMPACT DEVELOPMENT (LID) &
NATIONAL POLLUTANTS DISCHARGE ELIMINATION SYSTEM (NPDES) BMPs

The undersigned, _____ ("Owner"), hereby certifies that it owns the real property described as follows ("Subject Property"), located in the County of Los Angeles, State of California:

LEGAL DESCRIPTION

ASSESSOR'S ID # _____ TRACT NO. _____ LOT NO. _____

ADDRESS: _____

Owner is aware of the requirements of the County of Los Angeles' Green Building Standards Code, Title 31, Section 4.106.4 (LID), and National Pollutant Discharge Elimination System (NPDES) permit. The following post-construction BMP features have been installed on the Subject Property:

- Porous pavement
- Cistern/rain barrel
- Infiltration trench/pit
- Bioretention or biofiltration
- Rain garden/planter box
- Disconnect impervious surfaces
- Dry Well
- Storage containers
- Landscaping and landscape irrigation
- Green roof
- Other _____

The location, including GPS x-y coordinates, and type of each post-construction BMP feature installed on the Subject Property is identified on the site diagram attached hereto as Exhibit 1.

Owner hereby covenants and agrees to maintain the above-described post-construction BMP features in a good and operable condition at all times, and in accordance with the LID/NPDES Maintenance Guidelines, attached hereto as Exhibit 2.

Owner further covenants and agrees that the above-described post-construction BMP features shall not be removed from the Subject Property unless and until they have been replaced with other post-construction BMP features in accordance with County of Los Angeles' Green Building Standards Code, Title 31 and NPDES permit.

Owner further covenants and agrees that if Owner hereafter sells the Subject Property, Owner shall provide printed educational materials to the buyer regarding the post-construction BMP features that are located on the Subject Property, including the type(s) and location(s) of all such features, and instructions for properly maintaining all such features.

Owner makes this Covenant and Agreement on behalf of itself and its successors and assigns. This Covenant and Agreement shall run with the Subject Property and shall be binding upon owner, future owners, and their heirs, successors and assignees, and shall continue in effect until the release of this Covenant and Agreement by the County of Los Angeles, in its sole discretion.

Owner(s):

By: _____ Date: _____

By: _____ Date: _____

(PLEASE ATTACH NOTARY)

REFERENCE

PLAN CHECK NO.: _____ DISTRICT OFFICE NO.: _____

ATTACHMENTS

RECORDING REQUEST BY AND MAIL TO:

County of Los Angeles
Department of Public Works

Building and Safety – Drainage and Grading Section
Land Development – Drainage and Grading Section

P.O. Box 1460
Alhambra, California 91802-1460

Space above this line is for Recorder's use

COVENANT FOR MAINTENANCE OF WATER QUALITY (WQ) DEVICES

I (we) _____, hereby certify that I (we) am (are) the legal owner(s) of Tract # _____, and as such owners for the mutual benefit of future purchasers, their heirs, successors, and assigns, do hereby fix the following protective conditions to which their property, or portions thereof, shall be held, sold and/or conveyed.

That owner(s) shall maintain the WQ system shown on attached Exhibit A map and on Grading Plan GPC # _____, on file in the office of the Director of Public Works, in a good and functional condition at least once a year and retain proof of the inspection. The owner(s) shall perform this responsibility, unless the County discharges this obligation through a subsequently recorded written instrument.

The undersigned also covenants and agrees for himself, his heirs, successors, and assigns, to indemnify, defend, and save harmless the County, its agents, officers and employees from and against any and all liability, expenses, including defense costs and legal fees, and claims for damages of any nature whatsoever, including, but not limited to, bodily injury, death, personal injury, or property damage arising from or connected with the construction or maintenance of said work.

Owner(s):

By: _____ Date: _____

By: _____ Date: _____

NOTARY ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF _____)

ON _____ BEFORE ME, _____
(INSERT NAME AND TITLE OF THE OFFICER)

PERSONALLY APPEARED _____,
WHO PROVED TO ME ON THE BASIS OF SATISFACTORY EVIDENCE TO BE THE PERSON(S) WHOSE NAME(S) IS/ARE SUBSCRIBED TO THE WITHIN INSTRUMENT AND ACKNOWLEDGED TO ME THAT HE/SHE/THEY EXECUTED THE SAME IN HIS/HER/THEIR AUTHORIZED CAPACITY(IES), AND THAT BY HIS/HER/THEIR SIGNATURE(S) ON THE INSTRUMENT THE PERSON(S), OR THE ENTITY UPON BEHALF OF WHICH THE PERSON(S) ACTED, EXECUTED THE INSTRUMENT.

I CERTIFY UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF CALIFORNIA THAT THE FOREGOIN PARAGRAPH IS TRUE AND CORRECT.

WITNESS MY HAND

SIGNATURE _____

MY PRINCIPAL PLACE OF
BUSINESS IS IN

PRINTED NAME _____

_____ COUNTY

MY COMMISSION NO. _____
MY COMMISSION EXPIRES _____

Isolator[®] Row

O&M Manual



The Isolator[®] Row

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row

The Isolator Row is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row. After Stormwater flows through the Isolator Row and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

The Isolator Row may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row to minimize maintenance requirements and maintenance costs.

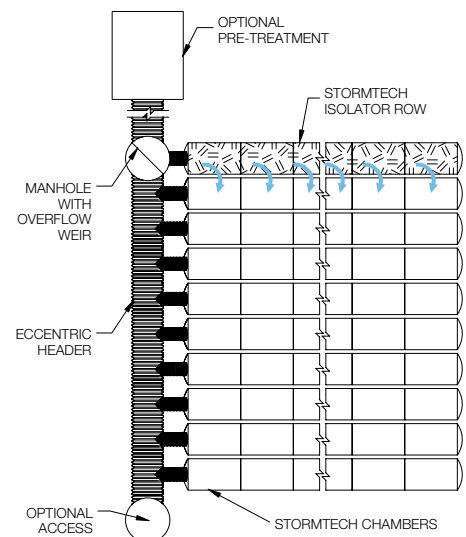
Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.



Looking down the Isolator Row from the manhole opening, woven geotextile fabric is shown between the chamber and stone base.



StormTech Isolator Row with Overflow Spillway (not to scale)



Isolator Row Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the **actual frequency of inspection and maintenance practices**.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

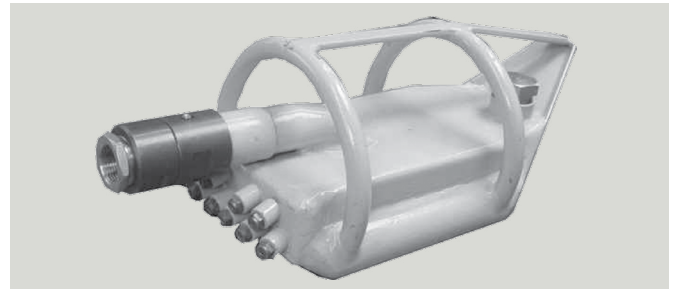
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

Maintenance

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided

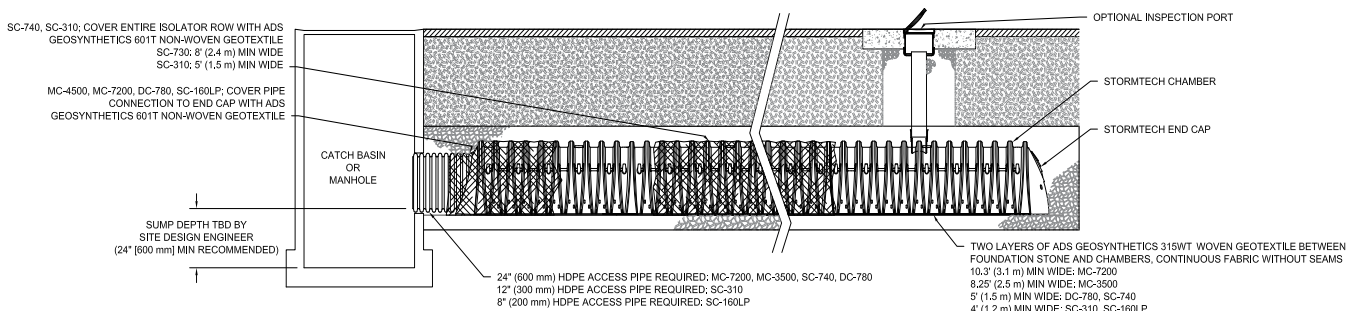
via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row lengths up to 200" (61 m). **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**



StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row.



Isolator Row Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row for sediment.

- A) Inspection ports (if present)
 - i. Remove lid from floor box frame
 - ii. Remove cap from inspection riser
 - iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
 - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Row
 - i. Remove cover from manhole at upstream end of Isolator Row
 - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
 - 1. Mirrors on poles or cameras may be used to avoid a confined space entry
 - 2. Follow OSHA regulations for confined space entry if entering manhole
 - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

Step 2

Clean out Isolator Row using the JetVac process.

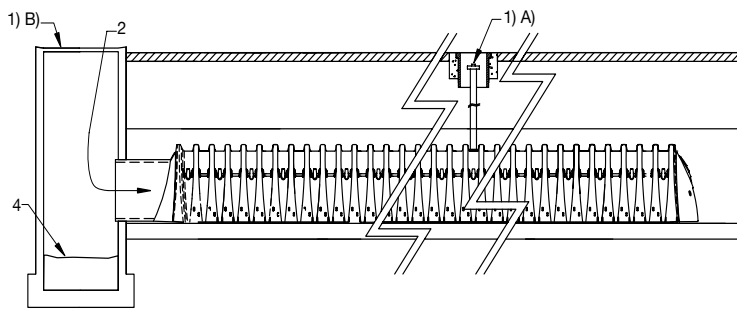
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sedi- ment Depth (1)-(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

adspipe.com

800-821-6710



FLOGARD+PLUS® CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide



A division of
Oldcastle Precast

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an onsite evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts.)
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS[®]

CATCH BASIN INSERT FILTER

OUR MARKETS



BUILDING
STRUCTURES



COMMUNICATIONS



WATER



ENERGY



TRANSPORTATION

Appendix G:
Soils Report

CITY VENTURES

3121 Michelson Drive, Suite 150
Irvine, California 92612

August 27, 2024

Project Number 1-0544

Attention: Mr. Michael You

Subject: **SUMMARY OF INFILTRATION TESTING**
1407 Crenshaw Boulevard,
City of Torrance, Los Angeles County, California

- References:
1. California Division of Mines and Geology, 1998, Seismic Hazard Zone Report for the Torrance 7.5-Minute Quadrangle, Los Angeles County, California, Report 035.
 2. State Water Resources Board, Geotracker, accessed August, 2024, <http://geotracker.waterboards.ca.gov>

Dear Mr. You:

Presented herein is Alta California Geotechnical, Inc.'s (Alta's) summary of infiltration testing for the proposed development at 1407 Crenshaw Boulevard, in the City of Torrance, Los Angeles County, California. The scope of this testing is based on Alta's subsurface investigation and typical WQMP requirements. Presented below is a summary of pertinent groundwater information and our infiltration testing, and conclusions and recommendations based on the data.

Site Geotechnical Conditions

Based on our literature review and subsurface investigation, the site is underlain by younger alluvium and older eolian deposits. No groundwater was encountered during our subsurface investigation to a depth of 51.5 feet below the ground surface (bgs). The Seismic Hazard Zone Report for the Torrance Quadrangle indicates that historic high groundwater is greater than 10 feet bgs (CDMG, 1998). Groundwater data provided by the State Water Resources Control Board of a LUST cleanup site located at 1640 Crenshaw Boulevard indicates that groundwater was approximately 94 feet below the ground surface in 2021 (Geotracker, 2024).

Infiltration Testing

Two infiltration tests were recently conducted at locations shown on Plate 1, identified as P-1 and P-2. These tests were conducted in 5-foot deep borings, excavated with a hollow stem auger drill rig, utilizing percolation test methods in general conformance with the Los Angeles County Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration.

A summary of the test results is presented below in Table A. The results do not include a factor of safety.

Table A – Summary of Infiltration Testing (No Factor of Safety)		
Test Designation	P-1	P-2
Approximate Depth of Test	5.0 feet	5.0 feet
Final Time Interval	10 Minutes	10 Minutes
Radius of Test Hole	4 inches	4 inches
Average Head over Time (Havg)	23 inches	17 inches
Tested Infiltration Rate	6.2 inches/hour	9.2 inches/hour

Conclusions and Recommendations

Based on our observations and testing, the soil encountered on-site are comprised of silty sands in a slightly moist, loose condition resulting in infiltration rates of 6.2 to 9.2-inches per hour with no factor of safety. The WQMP designer should review the test results and determine if the proposed BMP system is appropriate for the site. A factor of safety should be applied to the results that is in accordance with City of Torrance requirements.

From a geotechnical perspective, allowing storm water to infiltrate the onsite soil in concentrated areas increases the potential for settlement, liquefaction, and water-related

damage to structures/improvements, such as wet slabs or pumping subgrade. Care should be taken in designing systems that control the storm water as much as possible. A methodology for dealing with overflow should the infiltration system become clogged or full should be developed and maintained.

It is recommended that the Project Geotechnical Consultant observe the BMP excavations during construction to verify that the infiltration rates presented herein are appropriate. If it is determined that rates may be variable, additional infiltration testing should be undertaken.

Limitations

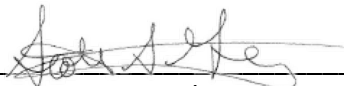
The conclusions and recommendations presented in this report are based on our infiltration test results and experience with similar soil conditions on similar projects. Materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not observed.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.



LOGAN A. MARQUETTE
Civil Engineering Associate
Project Manager



SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-24
Registered Geotechnical Engineer
President



APPENDIX A

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description	Major Divisions	grf	ltr	Description		
Coarse Grained Soils	Gravel and Gravelly Soils	More than 50% of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels or gravel sand mixtures, little or no fines	Fine Grained Soils	Silts And Clays LL, <50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity		
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity		
			GC	Clayey gravels, gravel-sand-clay mixtures			MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts		
	Sand and Sandy Soils	More than 50% of coarse fraction passes on No. 4 sieve	SW	Well-graded sands or gravelly sands, little or no fines		More than 50% passes on No. 200 sieve	Silts And Clays LL, <50	VH	Inorganic clays of high plasticity, fat clays	
			SP	Poorly-graded sands or gravelly sands, little or no fines				OH	Organic clays of medium to high plasticity	
			SM	Silty sands, sand-silt mixtures				Highly Organic Soils	PT	Peat and other highly organic soils
			SC	Clayey sands, and-clay mixtures						

BOUNDARY CLASSIFICATION: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4"	3"	12"	
Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot (SPT)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

CONSISTENCY CLASSIFICATION

Silts and Clays	Criteria
Very Soft	Thumb penetrates soil >1 in.
Soft	Thumb penetrates soil 1 in.
Firm	Thumb penetrates soil 1/4 in.
Stiff	Readily indented with thumbnail
Very Stiff	Thumbnail will not indent soil

HARDNESS

Bedrock
Soft
Moderately Hard
Hard
Very Hard

LABORATORY TESTS

Symbol	Test
DS	Direct Shear
DSR	Direct Shear (Remolded)
CON	Sieve Analysis
SA	Maximum Density
MAX	Resistance (R) Value
RV	Expansion Index
EI	Sand Equivalent
SE	Atterberg Limits
AL	Chemical Analysis
CHEM	Hydrometer Analysis
HY	

SOIL MOISTURE

Increasing Visual Moisture Content
↓
Dry - Dry to touch
Moist - Damp, but no visible free water
wet - Visible free water

SIZE PROPORTIONS

Trace - <5%
Few - 5 to 10%
Some - 15 to 25%




GEOTECHNICAL BORING LOG

PROJECT NO. 1-0544
 DATE STARTED 8/15/24
 DATE FINISHED 8/15/24
 DRILLER 2R Drilling Inc.
 TYPE OF DRILL RIG 8" Hollow Stem

PROJECT NAME 1407 Crenshaw Boulevard
 GROUND ELEV. _____
 GW DEPTH (FT) _____
 DRIVE WT. N/A
 DROP N/A

BORING DESIG. P-1
 LOGGED BY NL
 NOTE _____

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
5					SM	<p>ASPHALT, 6" asphaltic concrete on native soil.</p> <p>YOUNG ALLUVIUM (Qya): SILTY SAND, fine grained, dark yellowish brown, slightly moist, loose.</p>				
TOTAL DEPTH: 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED										

SAMPLE TYPES:
 RING (DRIVE) SAMPLE
 SPT (SPLIT SPOON) SAMPLE
 BULK SAMPLE TUBE SAMPLE

GROUNDWATER
 SEEPAGE
 J: JOINTING C: CONTACT
 B: BEDDING F: FAULT
 S: SHEAR RS: RUPTURE SURFACE


Alta California Geotechnical, Inc.
 P.N. 1-0544 PLATE B-1

GEOTECHNICAL BORING LOG

PROJECT NO. 1-0544
 DATE STARTED 8/15/24
 DATE FINISHED 8/15/24
 DRILLER 2R Drilling Inc.
 TYPE OF DRILL RIG 8" Hollow Stem

PROJECT NAME 1407 Crenshaw Boulevard
 GROUND ELEV. _____
 GW DEPTH (FT) _____
 DRIVE WT. N/A
 DROP N/A

BORING DESIG. P-2
 LOGGED BY NL
 NOTE _____

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
5					SM	<p>ASPHALT, 5" asphaltic concrete on native soil.</p> <p>YOUNG ALLUVIUM (Qya): SILTY SAND, fine grained, dark yellowish brown, slightly moist, loose.</p>				
						<p>TOTAL DEPTH: 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED</p>				

<p>SAMPLE TYPES:</p> <p><input checked="" type="checkbox"/> RING (DRIVE) SAMPLE</p> <p><input checked="" type="checkbox"/> SPT (SPLIT SPOON) SAMPLE</p> <p><input type="checkbox"/> BULK SAMPLE <input type="checkbox"/> TUBE SAMPLE</p>	<p><input checked="" type="checkbox"/> GROUNDWATER</p> <p><input type="checkbox"/> SEEPAGE</p> <p>J: JOINTING C: CONTACT B: BEDDING F: FAULT S: SHEAR RS: RUPTURE SURFACE</p>	<p>Alta California Geotechnical, Inc.</p> <p>P.N. 1-0544 PLATE B-2</p>
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Appendix H:
Educational Materials

To be provided prior to final approval