

MOJAVE RIVER WATERSHED

Preliminary Water Quality Management Plan

For:

FREIGHT CO.
NW CORNER - US HWY 395 & AVENAL STREET
A.P.N. 3064-371-12

Prepared for:

FREIGHT CO.
11025 TAMARIND AVENUE
BLOOMINGTON, CA 92316
PH: (909) 241-7464
CONTACT: VARINDER SANGHA

Prepared by:

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Submittal Date: APRIL 22, 2021

Revision No. and Date: #1 – SEPTEMBER 08, 2021

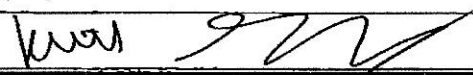
Revision No. and Date: #2 – MAY 22, 2022

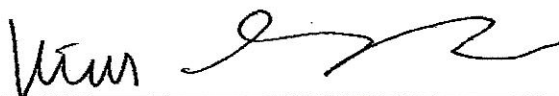
Final Approval Date: _____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for **FREIGHT CO.** by **SITETECH, INC.** The WQMP is intended to comply with the requirements of the **CITY OF HESPERIA** and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the **CITY OF HESPERIA** shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			A.P.N. 3064-371-12
Owner's Signature			
Owner Name: VARINDER SANGHA			
Title	OWNER		
Company	FREIGHT CO.		
Address	11025 TAMARIND AVENUE, BLOOMINGTON, CA 92316		
Email			
Telephone #	(909) 241-7464		
Signature			Date: 6-27-2022



Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			A.P.N. 3064-371-12

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of State of California Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: BERNHARD K. MAYER		PE Stamp Below 
Title	PRESIDENT	
Company	SITETECH, INC.	
Address	8061 Church Street – PO Box 592 - Highland, CA 92346	
Email	bmayer@sitetechnic.com	
Telephone #	(909) 864-3180	
Signature		
Date	05/22/2022	

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Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name		TRACT NO. 20104			
Project Owner Contact Name:		THOMAS STEENO			
Mailing Address:	17055 LAS LUNAS STREET, HESPERIA, CA 92345	E-Mail Address:		Telephone:	(760) 244-5001
Permit/Application Number(s):		Tract/Parcel Map Number(s):			
Additional Information/ Comments:		SITE ADDRESS: NW CORNER – US HWY 395 & AVENAL STREET, HESPERIA, CA 92345 Number of Drainage Areas (DA) = 1 Number of Drainage Management Areas (DMA) = 1 Existing Lot Area = 190,696 square-feet (4.378 acres) Existing Pervious Area = 190,696 square-feet Existing Impervious Area = 0 square-feet Proposed Lot Area (GROSS WQMP) = 175,933 square-feet (4.039 acres) Proposed Pervious Area = 21,148 square-feet Proposed Impervious Area = 154,785 square-feet # of Below Ground Infiltration System = 1 # of Above Ground Infiltration Rain Gardens = 6 DA 1 DCV = 9,822 cubic-feet (10,237 cubic-feet – PROVIDED)			
Description of Project:		FREIGHT CO.: This project consists of the development of an existing 4.378-acre parcel in the City of Hesperia, County of San Bernardino. The parcel is located at the northwest corner from the intersection of U.S. Highway 395 and Avenal Street, having an A.P.N. of 3064-371-12. The pre-developed land cover is classified as "Barren (rock land, eroded and graded land)" with multiple Joshua trees and no existing structures. The development of the existing parcel will include and offer of dedication along both U.S. Highway 395 and Avenal Street, dedications being 13-feet and 15-feet, respectively. The proposed site will be reduced to a 4.039-acre parcel. The proposed improvements to this parcel include the construction of a 12,000 square-foot warehouse, 1,500 square-foot office area, commercial landscaping/trees, perimeter walls/fencing, concrete curbs and gutters, concrete walkways, asphalt pavement, underground utilities, underground storm drain, catch basin and underground infiltration chambers. Automobile parking will be located along the east and west ends of the warehouse/office building with loading dock access to the warehouse being along the north and south ends. Additional trailer parking will be located at the westerly portion of the site. The post-developed condition will mimic the same flow pattern as the pre-developed condition. Stormwater will begin to be generated at the southwesterly corner of the proposed asphalt parking lot and sheet flow northeasterly. Flows will then be concentrated in a concrete v-gutter that will flow northerly and then easterly parallel to the northerly property line of this parcel. A catch basin is proposed at the northeasterly corner along U.S. Highway 395. Stormwater will then be captured and transported to the underground infiltration chambers via a 12-inch storm drain pipe. There are a total of 6 infiltration rain gardens proposed throughout the site. The roof drains will outlet to these proposed rain gardens. Stormwater flows and volume that exceed the capacity of the 12-inch storm drain and			

MOJAVE RIVER WATERSHED Water Quality Management Plan (WQMP)

	underground infiltration chambers will release into the public right-of-way along Highway 395 in the same manner as the pre-developed condition.
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long-term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single-family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project

¹ Regulated Development Project Category (Select all that apply):

☒ #1 New development involving the creation of 5,000 ft² or more of impervious surface collectively over entire site

☐ #2 Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site

☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface

☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface

☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.

² Project Area (ft²):

175,933

³ Number of Dwelling Units:

⁴ SIC Code:

4225

⁵ Is Project going to be phased? Yes ☐ No ☒ If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

FREIGHT CO.

11025 TAMARIND AVENUE

BLOOMINGTON, CA 92316

CONTACT: VARINDER SANGHA

PHONE: (909) 241-7464

E-MAIL:

Las Lunas Street infrastructure will be transferred to a public agency after project completion.

A property owner's association (POA) will not be formed for long-term maintenance of project stormwater facility. Owner will maintain ownership of all units and they will be rental only.

The owner will be responsible for maintenance of the BMPs on the project site.

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Common runoff pollutant from pavement and landscape areas, including wild birds and animals together with garbage
Nutrients - Phosphorous	E ☒	N ☐	Common runoff pollutant from landscaping, including fertilizer, food waste, and garbage
Nutrients - Nitrogen	E ☒	N ☐	Common runoff pollutant from landscaping, including fertilizers, and food waste
Noxious Aquatic Plants	E ☒	N ☐	Runoff pollutant from landscaping
Sediment	E ☒	N ☐	Runoff pollutant from pavement, landscaping, graded slopes and rooftops
Metals	E ☒	N ☐	Runoff pollutant from vehicular traffic
Oil and Grease	E ☒	N ☐	Runoff pollutant from vehicular traffic
Trash/Debris	E ☒	N ☐	Runoff pollutant from poorly maintained trash containers and parking areas
Pesticides / Herbicides	E ☒	N ☐	Runoff pollutant from landscaping
Organic Compounds	E ☒	N ☐	Runoff pollutant from overuse of fertilizer
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed Drainage Management Areas (DMAs)) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet. A map presenting the DMAs must be included as an appendix to the WQMP document.

Form 3-1 Site Location and Hydrologic Features			
Site coordinates take GPS measurement at approximate center of site	Latitude 34.4381	Longitude -117.4006	Thomas Bros Map page Page 4475
¹ San Bernardino County climatic region: ☒ Desert			
² Does the site have more than one drainage area (DA): Yes ☐ No ☒ If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached			
Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA		
	Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property		

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area sub-watershed DMA, provide the following characteristics	DA 1 DMA A			
¹ DMA drainage area (ft ²)	190,696			
² Existing site impervious area (ft ²)	0			
³ Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf	AMC II			
⁴ Hydrologic soil group Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf	A			
⁵ Longest flowpath length (ft)	703			
⁶ Longest flowpath slope (ft/ft)	0.0164			
⁷ Current land cover type(s) Select from Fig C-3 of Hydrology Manual	BARREN			
⁸ Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating	POOR < 50%			

Form 3-3 Watershed Description for Drainage Area 1	
Receiving waters Refer to CWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Oro Grande Wash Mojave River
Applicable TMDLs http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River: Fluoride
303(d) listed impairments http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River: Fluoride
Environmentally Sensitive Areas (ESA) Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	Desert Tortoise Habitat Cat 3, Desert Tortoise Habitat Cat 2
Hydromodification Assessment	☒ Yes Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal ☐ No BASINS MITIGATE INCREASED RUNOFF

Section 4 Best Management Practices (BMP)

4.1 Source Control and Site Design BMPs

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

Non-structural and structural source control BMPs are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

Form 4.1-1 Non-Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The owner will implement an education program for BMP information and maintenance. Material will be provided by owner to hired contractors regarding the protection of storm water quality. The provided materials will include, but not limited to, approved "County of San Bernardino Stormwater Pollution Prevention" education materials for residential sites and applicable maintenance specifications for proposed BMPs. BMP education material found in, but not limited to, Section 6.4 of this report and accessible for contractors and maintenance crews of the property. The property owner will maintain, enforce and revise the BMP education program as necessary.
N2	Activity Restrictions	☒	☐	Owner will be prohibited from any discharges into the on-site infiltration basins and paved areas. Other prohibited discharges listed in the City of Hesperia Ordinances will be restricted. Prohibition of these discharges will prevent comingling of on-site pollutants to the existing drainage system.
N3	Landscape Management BMPs	☒	☐	Landscaped areas adjacent to curbs and sidewalks will be installed at a minimum of 1-inch below the finished surface. Landscape will be maintained in accordance with County of San Bernardino "Stormwater Pollution Prevention: Landscape Maintenance", located in Section 6.4 of this report.
N4	BMP Maintenance	☒	☐	BMPs will be maintained per Form 5-1 of this report.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials will be stored or generated on-site.
N6	Local Water Quality Ordinances	☒	☐	Owner will comply with all City of Hesperia Water Quality Ordinances. Stormwater runoff from the site will be treated in the infiltration basins prior to leaving the site.
N7	Spill Contingency Plan	☐	☒	No underground storage tanks on this site.
N8	Underground Storage Tank Compliance	☐	☒	No hazardous materials will be stored or generated on-site.

Form 4.1-1 Non-Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials will be stored or generated on-site.
N10	Uniform Fire Code Implementation	☒	☐	All fire code requirements regarding products storage and safety from Article 80 of the Uniform Fire Code shall be implemented.
N11	Litter/Debris Control Program	☒	☐	Trash will be stored in City approved trash enclosure with approved trash bin with lid and will be picked up weekly via by waste company, will be put into effect at time of occupancy. Maintenance employees will pick up litter in parking lot and common areas on a weekly basis.
N12	Employee Training	☒	☐	Property owner will be provided a copy of this WQMP to train any hired contractors on post-construction storm water treatment management.
N13	Housekeeping of Loading Docks	☒	☐	Loading docks will be monitored for trash/debris on weekly basis. All trash/debris will be collected and disposed of in appropriate bins.
N14	Catch Basin Inspection Program	☒	☐	The on-site catch basins shall be inspected before the rainy season (October 1st) and before and after each storm to ensure proper operation. The owner shall contract with a qualified landscape contractor to inspect and clean out accumulation of trash, litter and sediment. Evidence of illegal dumping shall be reported to the City.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowing and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be swept monthly
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public agency project.
N17	Comply with all other applicable NPDES permits	☒	☐	Will comply with Construction General Permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	All drainage inlets will be stenciled or signage will be provided that indicates "NO DUMPING-DRAINS TO RIVER". Stenciling shall be blue on a white background with lettering 2" in height. A fish or similar water dependent creature silhouette may be included subject to City approval. A catch basin curb marker, circular or rectangular, at least 4" in height or diameter, may be used. Legibility of stencils and signs must be maintained and will be inspected monthly.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor material storage areas proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash will be stored in an approved trash bin with a lid of which will be held in a city approved trash enclosure
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation systems will be designed to supply just the right amount of water for the landscape to flourish and not overwater. Timed irrigation systems will be used. Rain sensors for automatic shut off of sprinklers when it is raining will be used. Shut-off valves triggered by a pressure drop to control water loss in the event of a broken sprinkler head or broken line will be used.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscaped areas adjacent to curbs and sidewalks will be installed at a minimum of 1-inch below the finished hardscape surface. Inspection will occur before rainy season (October 1st).
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	No proposed slopes for this development.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	Loading dock will be covered to prevent direct precipitation contact. No run-on or runoff will occur from loading dock to truck wells. Cleaning of loading docks will consist of sweeping activities and no cleaning with water.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays proposed.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No vehicle wash areas proposed.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No processing areas proposed.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash areas proposed.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas proposed.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No significant hillsides.
S14	Wash water control for food preparation areas	☐	☒	No food preparation areas proposed.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community car wash racks proposed.

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Site Design Practices Checklist
Site Design Practices If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets
Minimize impervious areas: Yes ☒ No ☐ Explanation: The proposed site includes designing drive aisles and sidewalks to the minimum required widths. More pervious landscaped around the development were designed by minimizing these impervious areas to their minimum widths.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: The proposed BMP will use the site's infiltration capacity to capture/treat stormwater.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Existing drainage pattern is being maintained by allowing the site to continue to drain to the existing outlet of the proposed development, the site will first drain to the infiltration chambers which will increase the time of concentration.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain: Yes ☐ No ☒ Explanation: Roof downspouts are designed to drain directly to concrete splash pad.
Use of Porous Pavement: Yes ☐ No ☒ Explanation: No porous pavement will be used. Site will be treated in the infiltration basin before leaving the site.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: Full site will be developed, no sensitive areas located on this site.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation: Yes ☒ No ☐ Explanation: Pervious areas within the limits of construction vegetated with drought resistant vegetation.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Infiltration chambers to be staked off and constructed with minimal compaction at bottom to allow storm water to infiltrate and be treated.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: Graded swales will be used where possible but drain pipes are necessary for site drainage.

Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐

Explanation: Proposed landscape areas will be staked off to ensure minimal compaction.

Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems: Yes ☐ No ☒

Explanation: No rain barrels or cisterns will be used, the entire site will be treated in the infiltration basin.

Stream Setbacks. Includes a specified distance from an adjacent stream: Yes ☐ No ☒

Explanation: No streams on or near site.

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -

<http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795>

Recommended High-Desert Plants -

<http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553>

Mojave Water Agency:

Desert Ranch: <http://www.mojavewater.org/files/desertranchgardenprototype.pdf>

Summertree: <http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf>

Thornless Garden: <http://www.mojavewater.org/files/thornlessgardenprototype.pdf>

Mediterranean Garden: <http://www.mojavewater.org/files/mediterraneangardenprototype.pdf>

Lush and Efficient Garden: <http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf>

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – <http://hdawac.org/save-outdoors.html>

4.2 Treatment BMPs

After implementation and design of both Source Control and Site Design BMPs, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evapotranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

RUNOFF VOLUME:

SEE SECTION 6.4 FOR RUNOFF VOLUME CALCULATIONS.

TIME OF CONCENTRATION:

SEE SECTION 6.4 FOR TIME OF CONCENTRATION CALCULATIONS.

PEAK RUNOFF:

SEE SECTION 6.4 FOR PEAK RUNOFF CALCULATIONS.

SITE IS CAPTURING AND TREATING FULL 10-YEAR STORM EVENT. NO ADDITIONAL HCOC MITIGATION IS REQUIRED

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1 DMA A)

¹ Project area DMA A (ft ²): 175,933	² Imperviousness after applying preventative site design practices (Imp%): 88%	³ Runoff Coefficient (Rc): 0.702 $R_c = 0.858(\text{Imp}\%)^3 - 0.78(\text{Imp}\%)^2 + 0.774(\text{Imp}\%) + 0.04$
⁴ Determine 1-hour rainfall depth for a 2-year return period $P_{2\text{yr}-1\text{hr}}$ (in): 0.436 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
⁵ Compute P_6 , Mean 6-hr Precipitation (inches): 0.539 $P_6 = \text{Item 4} * C_1$, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)		
⁶ Drawdown Rate Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.		24-hrs ☐ 48-hrs ☒
⁷ Compute design capture volume, DCV (ft ³): 9,822 $DCV = 1/12 * [\text{Item 1} * \text{Item 3} * \text{Item 5} * C_2]$, where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2		

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft ³)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 --- Form 4.2-3 Item 12	2 --- Form 4.2-4 Item 13	3 --- Form 4.2-5 Item 10
Post-developed	4 --- Form 4.2-3 Item 13	5 --- Form 4.2-4 Item 14	6 --- Form 4.2-5 Item 14
Difference	7 --- Item 4 – Item 1	8 --- Item 2 – Item 5	9 --- Item 6 – Item 3
Difference (as % of pre-developed)	10 --- Item 7 / Item 1	11 --- Item 8 / Item 2	12 --- Item 9 / Item 3

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: <u>Pre</u> -developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H								
1a Land Cover type																
2a Hydrologic Soil Group (HSG)																
3a DMA Area, ft ² sum of areas of DMA should equal area of DA																
4a Curve Number (CN) use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP																
Weighted Curve Number Determination for: <u>Post</u> -developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H								
1b Land Cover type																
2b Hydrologic Soil Group (HSG)																
3b DMA Area, ft ² sum of areas of DMA should equal area of DA																
4b Curve Number (CN) use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP																
5 Pre-Developed area-weighted CN:	7 Pre-developed soil storage capacity, S (in): S = (1000 / Item 5) - 10					9 Initial abstraction, I _a (in): I _a = 0.2 * Item 7										
6 Post-Developed area-weighted CN:	8 Post-developed soil storage capacity, S (in): S = (1000 / Item 6) - 10					10 Initial abstraction, I _a (in): I _a = 0.2 * Item 8										
11 Precipitation for 10 yr, 24 hr storm (in): Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html																
12 Pre-developed Volume (ft ³): $V_{pre} = (1 / 12) * (\text{Item sum of Item 3}) * [(\text{Item 11} - \text{Item 9})^2 / ((\text{Item 11} - \text{Item 9} + \text{Item 7}))]$																
13 Post-developed Volume (ft ³): $V_{pre} = (1 / 12) * (\text{Item sum of Item 3}) * [(\text{Item 11} - \text{Item 10})^2 / ((\text{Item 11} - \text{Item 10} + \text{Item 8}))]$																
14 Volume Reduction needed to meet hydromodification requirement, (ft ³): V _{hydro} = (Item 13 * 0.95) – Item 12																

Form 4.2-4 Hydromodification Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA (For projects using the Hydrology Manual complete the form below)

Variables	Pre-developed DA1 Use additional forms if there are more than 4 DMA				Post-developed DA1 Use additional forms if there are more than 4 DMA			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) Use Form 3-2 Item 5 for pre-developed condition								
2 Change in elevation (ft)								
3 Slope (ft/ft), $S_o = \text{Item 2} / \text{Item 1}$								
4 Land cover								
5 Initial DMA Time of Concentration (min) Appendix C-1 of the TGD for WQMP								
6 Length of conveyance from DMA outlet to project site outlet (ft) May be zero if DMA outlet is at project site outlet								
7 Cross-sectional area of channel (ft ²)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) $V_{fps} = (1.49 / \text{Item 9}) * (\text{Item 7} / \text{Item 8})^{0.67} * (\text{Item 3})^{0.5}$								
11 Travel time to outlet (min) $T_t = \text{Item 6} / (\text{Item 10} * 60)$								
12 Total time of concentration (min) $T_c = \text{Item 5} + \text{Item 11}$								
13 Pre-developed time of concentration (min):	Minimum of Item 12 pre-developed DMA							
14 Post-developed time of concentration (min):	Minimum of Item 12 post-developed DMA							
15 Additional time of concentration needed to meet hydromodification requirement (min):	$T_{C-Hydro} = (\text{Item 13} * 0.95) - \text{Item 14}$							

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables	Pre-developed DA to Project Outlet (Use additional forms if more than 3 DMA)			Post-developed DA to Project Outlet (Use additional forms if more than 3 DMA)							
	DMA A	DMA B	DMA C	DMA A	DMA B	DMA C					
1 Rainfall Intensity for storm duration equal to time of concentration $I_{peak} = 10^{(LOG \text{ Form 4.2-1 Item 4} - 0.7 LOG \text{ Form 4.2-4 Item 5} / 60)}$											
2 Drainage Area of each DMA (Acres) For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)											
3 Ratio of pervious area to total area For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)											
4 Pervious area infiltration rate (in/hr) Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP											
5 Maximum loss rate (in/hr) $F_m = \text{Item 3} * \text{Item 4}$ Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)											
6 Peak Flow from DMA (cfs) $Q_p = \text{Item 2} * 0.9 * (\text{Item 1} - \text{Item 5})$											
7 Time of concentration adjustment factor for other DMA to site discharge point Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)	DMA A	n/a		n/a							
	DMA B		n/a		n/a						
	DMA C		n/a			n/a					
8 Pre-developed Q_p at T_c for DMA A: $Q_p = \text{Item 6}_{DMAA} + [\text{Item 6}_{DMAB} * (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAB}) / (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAB}) * \text{Item 7}_{DMAA/2}] + [\text{Item 6}_{DMAC} * (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAC}) / (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAC}) * \text{Item 7}_{DMAA/3}]$	9 Pre-developed Q_p at T_c for DMA B: $Q_p = \text{Item 6}_{DMAB} + [\text{Item 6}_{DMAA} * (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAA}) / (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAA}) * \text{Item 7}_{DMAB/1}] + [\text{Item 6}_{DMAC} * (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAC}) / (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAC}) * \text{Item 7}_{DMAB/3}]$		10 Pre-developed Q_p at T_c for DMA C: $Q_p = \text{Item 6}_{DMAC} + [\text{Item 6}_{DMAA} * (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAA}) / (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAA}) * \text{Item 7}_{DMAC/1}] + [\text{Item 6}_{DMAB} * (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAB}) / (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAB}) * \text{Item 7}_{DMAC/2}]$								
10 Peak runoff from pre-developed condition confluence analysis (cfs): Maximum of Item 8, 9, and 10 (including additional forms as needed)											
11 Post-developed Q_p at T_c for DMA A: Same as Item 8 for post-developed values	12 Post-developed Q_p at T_c for DMA B: Same as Item 9 for post-developed values		13 Post-developed Q_p at T_c for DMA C: Same as Item 10 for post-developed values								
14 Peak runoff from post-developed condition confluence analysis (cfs): Maximum of Item 11, 12, and 13 (including additional forms as needed)											
15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): $Q_{p-hydro} = (\text{Item 14} * 0.95) - \text{Item 10}$											

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretenention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design BMPs (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is “Yes,” provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable Site Design BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combinations of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

- 1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
- 2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and
- 3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

¹ Would infiltration BMP pose significant risk for groundwater related concerns?

Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

² Would installation of infiltration BMP significantly increase the risk of geotechnical hazards?

Yes ☐ No ☒

(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than ten feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

³ Would infiltration of runoff on a Project site violate downstream water rights?

Yes ☐ No ☒

If Yes, Provide basis: (attach)

⁴ Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?

Yes ☐ No ☒

If Yes, Provide basis: (attach)

⁵ Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?

Yes ☐ No ☒

If Yes, Provide basis: (attach)

⁶ Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses?

Yes ☐ No ☒

See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

⁷ Any answer from Item 1 through Item 3 is "Yes":

Yes ☐ No ☒

If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP BMP.
If no, then proceed to Item 8 below.

⁸ Any answer from Item 4 through Item 6 is "Yes":

Yes ☐ No ☒

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.
If no, then proceed to Item 9, below.

⁹ All answers to Item 1 through Item 6 are "No":

Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Site Design BMPs.

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1)			
1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ If yes, complete Items 2-5; If no, proceed to Item 6	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Total impervious area draining to pervious area (ft ²)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft ³) $V = \text{Item 2} * \text{Item 3} * (0.5/12)$, assuming retention of 0.5 inches of runoff			
5 Sum of retention volume achieved from impervious area dispersion (ft ³): 0 $V_{\text{retention}} = \text{Sum of Item 4 for all BMPs}$			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☒ No ☐ If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #1	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #2	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #3
7 Ponding surface area (ft ²)	811	324	225
8 Ponding depth (ft) (min. 0.5 ft.)	0.5	0.5	0.5
9 Surface area of amended soil/gravel (ft ²)	811	324	225
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)	1.0	1.0	1.0
11 Average porosity of amended soil/gravel	0.30	0.30	0.30
12 Retention volume achieved from on-lot infiltration (ft ³) $V_{\text{retention}} = (\text{Item 7} * \text{Item 8}) + (\text{Item 9} * \text{Item 10} * \text{Item 11})$	649	259	180
13 Runoff volume retention from on-lot infiltration (ft ³): 1,088 $V_{\text{retention}} = \text{Sum of Item 12 for all BMPs}$			

Form 4.3-2 Site Design BMPs (DA 1)

14 Implementation of Street Trees: Yes ☐ No ☒ If yes, complete Items 14-18. If no, proceed to Item 19	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft ²)			
17 Runoff volume retention from street trees (ft ³) $V_{\text{retention}} = \text{Item 15} * \text{Item 16} * (0.05/12)$ assume runoff retention of 0.05 inches			
18 Runoff volume retention from street tree BMPs (ft ³): 0 $V_{\text{retention}} = \text{Sum of Item 17 for all BMPs}$			
19 Total Retention Volume from Site Design BMPs: 1,088 Sum of Items 5, 13 and 18			

Form 4.3-2 Site Design BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ If yes, complete Items 2-5; If no, proceed to Item 6	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Total impervious area draining to pervious area (ft ²)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft ³) $V = \text{Item 2} * \text{Item 3} * (0.5/12)$, assuming retention of 0.5 inches of runoff			
5 Sum of retention volume achieved from impervious area dispersion (ft ³): 0 $V_{\text{retention}} = \text{Sum of Item 4 for all BMPs}$			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☒ No ☐ If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #4	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #5	DA 1 DMA A BMP Type INFILTRATION RAIN GARDEN #6
7 Ponding surface area (ft ²)	580	109	98
8 Ponding depth (ft) (min. 0.5 ft.)	0.5	0.5	0.5
9 Surface area of amended soil/gravel (ft ²)	580	109	98
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)	1.0	1.0	1.0
11 Average porosity of amended soil/gravel	0.30	0.30	0.30

Form 4.3-2 Site Design BMPs (DA 1)			
12 Retention volume achieved from on-lot infiltration (ft ³) $V_{\text{retention}} = (\text{Item 7} * \text{Item 8}) + (\text{Item 9} * \text{Item 10} * \text{Item 11})$	464	87	78
13 Runoff volume retention from on-lot infiltration (ft ³): 629 $V_{\text{retention}} = \text{Sum of Item 12 for all BMPs}$			
14 Implementation of Street Trees: Yes ☐ No ☒ If yes, complete Items 14-18. If no, proceed to Item 19	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft ²)			
17 Runoff volume retention from street trees (ft ³) $V_{\text{retention}} = \text{Item 15} * \text{Item 16} * (0.05/12)$ assume runoff retention of 0.05 inches			
18 Runoff volume retention from street tree BMPs (ft ³): 0 $V_{\text{retention}} = \text{Sum of Item 17 for all BMPs}$			
19 Total Retention Volume from Site Design BMPs: 629 Sum of Items 5, 13 and 18			

4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

- 1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.
- 2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).
- 3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.
- 4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide additional treatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with little chance of spill migration.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)			
1 Remaining LID DCV not met by site design BMP (ft ³): DMA A = 9,822 $V_{unmet} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 19}$			
BMP Type Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs	DA 1 DMA A BMP Type Stormtech Infiltration Chambers	DA DMA BMP Type	
2 Infiltration rate of underlying soils (in/hr) See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods	5.95		
3 Infiltration safety factor See TGD Section 5.4.2 and Appendix D	3.5		
4 Design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$	1.7		
5 Pondered water drawdown time (hr) Copy Item 6 in Form 4.2-1	48		
6 Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details	6.75		
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$	6.75		
8 Infiltrating surface area, SA_{BMP} (ft ²) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP	2,437		
9 Amended soil depth, d_{media} (ft)	---		
10 Amended soil porosity	---		
11 Gravel depth, d_{media} (ft)	VARIES		
12 Gravel porosity	40%		
13 Duration of storm as basin is filling (hrs) Typical ~ 3hrs	3		
14 Above Ground Retention Volume (ft ³) $V_{retention} = \text{Item 8} * [\text{Item 7} + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$	---		
15 Underground Retention Volume (ft ³) Volume determined using manufacturer's specifications and calculations	10,237 (per Manufacturer's Specifications, see Section 6.4)		
16 Total Retention Volume from LID Infiltration BMPs: 10,237 (Sum of Items 14 and 15 for all infiltration BMP included in plan)			
17 Fraction of DCV achieved with infiltration BMP: 104% $\text{Retention\%} = \text{Item 16} / \text{Form 4.2-1 Item 7}$			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)			
¹ Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft ³): 0 Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16		List pollutants of concern Copy from Form 2.3-1.	
² Biotreatment BMP Selected (Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)	Volume-based biotreatment Use Forms 4.3-5 and 4.3-6 to compute treated volume		Flow-based biotreatment Use Form 4.3-7 to compute treated flow
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention		☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
³ Volume biotreated in volume based biotreatment BMP (ft ³): Form 4.3-5 Item 15 + Form 4.3-6 Item 13		⁴ Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft ³): Item 1 – Item 3	⁵ Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % Item 4 / Item 1
⁶ Flow-based biotreatment BMP capacity provided (cfs): Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)			
⁷ Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.			

Form 4.3-5 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type (Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP			
2 Amended soil infiltration rate Typical ~ 5.0			
3 Amended soil infiltration safety factor Typical ~ 2.0			
4 Amended soil design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$			
5 Ponded water drawdown time (hr) Copy Item 6 from Form 4.2-1			
6 Maximum ponding depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$			
8 Amended soil surface area (ft ²)			
9 Amended soil depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
10 Amended soil porosity, n			
11 Gravel depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
12 Gravel porosity, n			
13 Duration of storm as basin is filling (hrs) Typical ~ 3hrs			
14 Biotreated Volume (ft ³) $V_{biotreated} = \text{Item 8} * [(\text{Item 7} / 2) + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: Sum of Item 14 for all volume-based BMPs included in this form			

Form 4.3-6 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.	DA DMA BMP Type		DA DMA BMP Type (Use additional forms for more BMPs)	
	Forebay	Basin	Forebay	Basin
¹ Pollutants addressed with BMP forebay and basin List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP				
² Bottom width (ft)				
³ Bottom length (ft)				
⁴ Bottom area (ft ²) $A_{\text{bottom}} = \text{Item 2} * \text{Item 3}$				
⁵ Side slope (ft/ft)				
⁶ Depth of storage (ft)				
⁷ Water surface area (ft ²) $A_{\text{surface}} = (\text{Item 2} + (2 * \text{Item 5} * \text{Item 6})) * (\text{Item 3} + (2 * \text{Item 5} * \text{Item 6}))$				
⁸ Storage volume (ft ³) For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details $V = \text{Item 6} / 3 * [\text{Item 4} + \text{Item 7} + (\text{Item 4} * \text{Item 7})^{0.5}]$				
⁹ Drawdown Time (hrs) Copy Item 6 from Form 2.1				
¹⁰ Outflow rate (cfs) $Q_{\text{BMP}} = (\text{Item 8}_{\text{forebay}} + \text{Item 8}_{\text{basin}}) / (\text{Item 9} * 3600)$				
¹¹ Duration of design storm event (hrs)				
¹² Biotreated Volume (ft ³) $V_{\text{biotreated}} = (\text{Item 8}_{\text{forebay}} + \text{Item 8}_{\text{basin}}) + (\text{Item 10} * \text{Item 11} * 3600)$				
¹³ Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention: (Sum of Item 12 for all BMP included in plan)				

Form 4.3-7 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type Vegetated swale, vegetated filter strip, or other comparable proprietary BMP	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5			
2 Flow depth for water quality treatment (ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
3 Bed slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
4 Manning's roughness coefficient			
5 Bottom width (ft) $b_w = (\text{Form 4.3-5 Item 6} * \text{Item 4}) / (1.49 * \text{Item 2}^{1.67} * \text{Item 3}^{0.5})$			
6 Side Slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
7 Cross sectional area (ft ²) $A = (\text{Item 5} * \text{Item 2}) + (\text{Item 6} * \text{Item 2}^2)$			
8 Water quality flow velocity (ft/sec) $V = \text{Form 4.3-5 Item 6} / \text{Item 7}$			
9 Hydraulic residence time (min) Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
10 Length of flow based BMP (ft) $L = \text{Item 8} * \text{Item 9} * 60$			
11 Water surface area at water quality flow depth (ft ²) $SA_{top} = (\text{Item 5} + (2 * \text{Item 2} * \text{Item 6})) * \text{Item 10}$			

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)	
1	Total LID DCV for the Project DA-1 (ft ³): 9,822 Copy Item 7 in Form 4.2-1
2	On-site retention with site design BMP (ft ³): 1,718 Copy Item 18 in Form 4.3-2
3	On-site retention with LID infiltration BMP (ft ³): 10,237 Copy Item 16 in Form 4.3-3
4	On-site biotreatment with volume based biotreatment BMP (ft ³): 0 Copy Item 3 in Form 4.3-4
5	Flow capacity provided by flow based biotreatment BMP (cfs): 0 Copy Item 6 in Form 4.3-4
6	LID BMP performance criteria are achieved if answer to any of the following is "Yes": - Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐ If yes, sum of Items 2, 3, and 4 is greater than Item 1 - Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐ If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3-5 Item 6 and Items 2, 3 and 4 are maximized - On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐ If yes, Form 4.3-1 Items 7 and 8 were both checked yes
7	If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance: - Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐ Checked yes if Form 4.3-4 Item 7 is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, $V_{alt} = (Item\ 1 - Item\ 2 - Item\ 3 - Item\ 4 - Item\ 5) * (100 - Form\ 2.4-1\ Item\ 2)\%$ - Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: 1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐ 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐ 3) Equal or greater protection against shock loadings and spills; ☐ 4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 1)	
1 Volume reduction needed for hydromodification performance criteria (ft ³): --- (Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1	2 On-site retention with site design and infiltration, BMP (ft ³): --- Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction
3 Remaining volume for hydromodification volume capture (ft ³): --- Item 1 – Item 2	4 Volume capture provided by incorporating additional on-site BMPs (ft ³): ---
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐ If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below: • Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐ • Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐ If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below: • Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☐	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

- 1) Equal or greater amount of runoff infiltrated or evapotranspired;
- 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;
- 3) Equal or greater protection against shock loadings and spills;
- 4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Covenant must be completed, signed, notarized and submitted to the Town's Engineering Department

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
UNDERGROUND INFILTRATION CHAMBERS	PROPERTY OWNER	INSPECT, REMOVE TRASH AND DEBRIS. IF 48-HOUR DRAWDOWN IS NOT ACHIEVED, OWNER WILL REMOVE SILT, REMOVE AND REPLACE AMENDED SOIL AND RE-SCARIFY A MINIMUM OF 2" ALONG BASIN BOTTOM TO PROVIDE FRESH INFILTRATION SURFACE.	INSPECT SYSTEM MONTHLY, REMOVE TRASH AND DEBRIS. RESCARIFY WHEN DRAWDOWN IS NOT MET
GRADED LANDSCAPE SWALE	PROPERTY OWNER	INSPECT, REMOVE SEDIMENT BUILD-UP, TRASH AND DEBRIS.	INSPECT VEGETATED SWALES ON A MONTHLY BASIS
LANDSCAPING	PROPERTY OWNER	MAINTAIN LANDSCAPING, DISPOSE OF GREEN WASTE PROPERLY, REMOVE ANY TRASH IN LANDSCAPE AREAS & INSPECT IRRIGATION SYSTEMS	WEEKLY BASIS
TRASH & WASTE	PROPERTY OWNER	INSPECT TRASH RECEPTACLES FOR ANY LEAKAGE. TRASH TO BE PICKED UP ON A WEEKLY BASIS.	WEEKLY BASIS
DRIVEWAY/ PARKING LOT SWEEPING	PROPERTY OWNER	DRIVEWAYS/PARKING LOTS TO BE SWEEPED AND LITTER TO BE REMOVED	SWEEP PARKING LOTS QUARTERLY AND REMOVE LITTER AS NEEDED

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

WQMP Exhibit	A
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6.2 Post Construction

Electronic Data (to be completed during Final WQMP)	A
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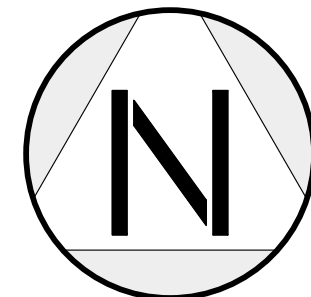
6.3 Post Construction

Maintenance Agreement (to be completed during Final WQMP)	A
Operation and Maintenance	B

6.4 Other Supporting Documentation

Soils Information.....	A
Soils Factor of Safety Calculation.....	B
BMP Design	C
County Education Materials.....	D
HCOC Information (to be completed during Final WQMP)	E

6.1.A – WQMP Exhibit



SCALE: 1"=30'



OWNER/APPLICANT:

SANGHA, VARINDER PAUL
11025 TAMARIND AVENUE
BLOOMINGTON, CA 92316
PH: (909) 241-7464

ENGINEER/MAP PREPARER:

SITETECH, INC.
8061 CHURCH STREET, P.O. BOX 592
HIGHLAND, CA 92346
CONTACT: BERNIE MAYER
PH: (909) 864-3180
E-MAIL: bmayer@sitetechinc.com

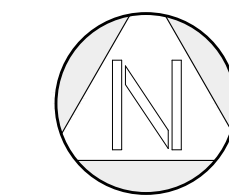
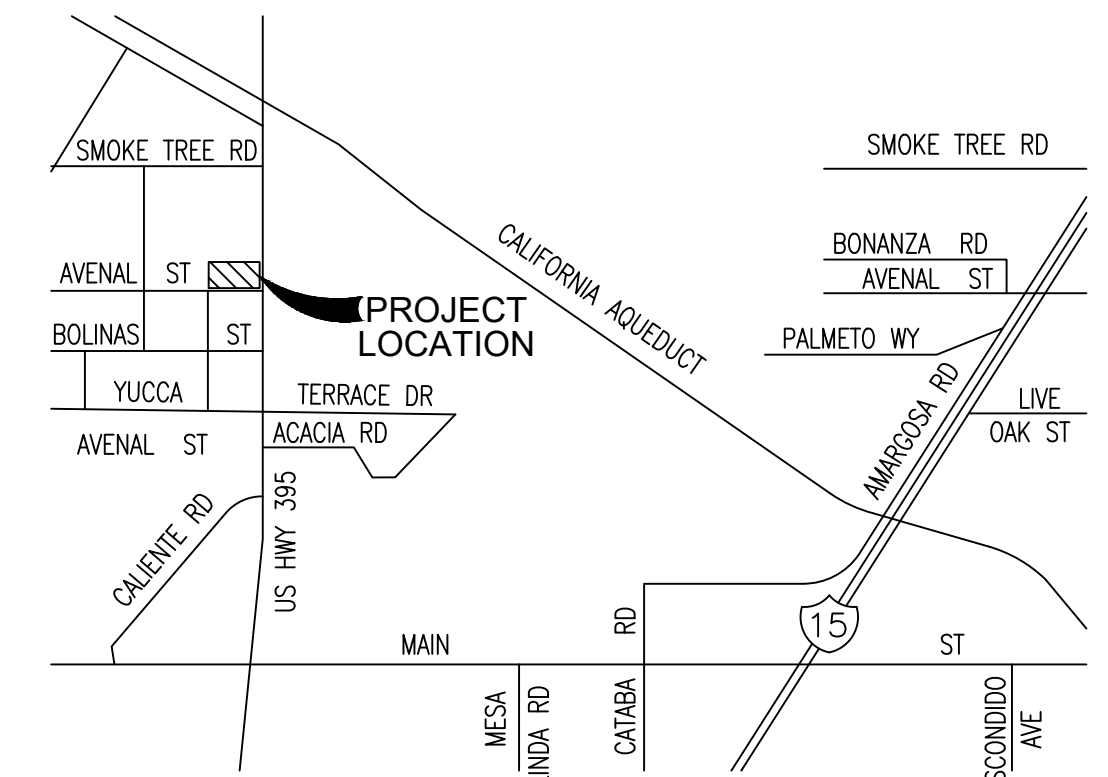
AREA OF PROPOSED WQMP:

TOTAL AREA (EXISTING): 190,696 S.F. (4.378-ACRES)
EXISTING PERVIOUS AREA: 190,696 S.F. (4.378-ACRES)
EXISTING IMPERVIOUS AREA: 0 S.F. (0.0-ACRES)

TOTAL AREA (GROSS WQMP): 175,933 S.F. (4.039-ACRES)
PROPOSED PERVIOUS AREA: 21,148 S.F. (0.485-ACRES)
PROPOSED IMPERVIOUS AREA: 154,785 S.F. (3.554-ACRES)

PWQMP SUMMARY				
DRAINAGE AREA	REQUIRED DCV (FT ³)	STORMTECH MC-4500 CHAMBERS (FT ³)	INFILTRATION RAIN GARDENS (FT ³)	TOTAL DCV CAPTURED (%)
DA1	9,822	8,519	1,718	104%

IN THE CITY OF HESPERIA, CALIFORNIA
**PRELIMINARY WATER
QUALITY MANAGEMENT PLAN**
FREIGHT CO.
A.P.N. 3064-371-12



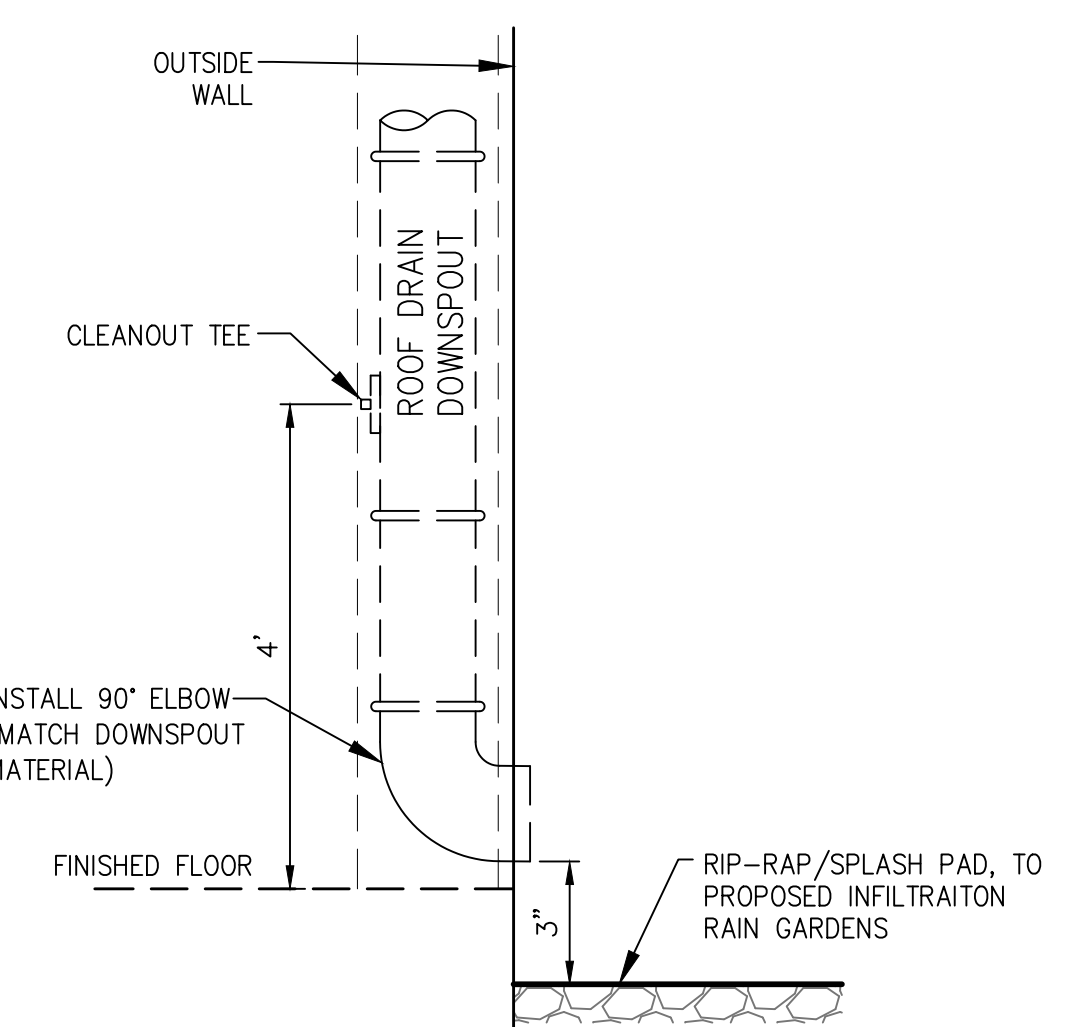
VICINITY MAP
NO SCALE

WATER QUALITY MANAGEMENT NOTES:

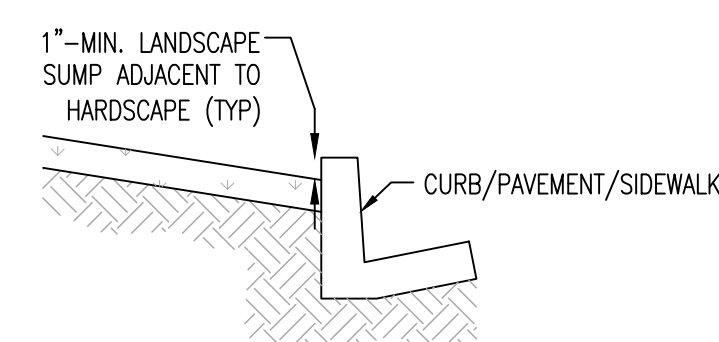
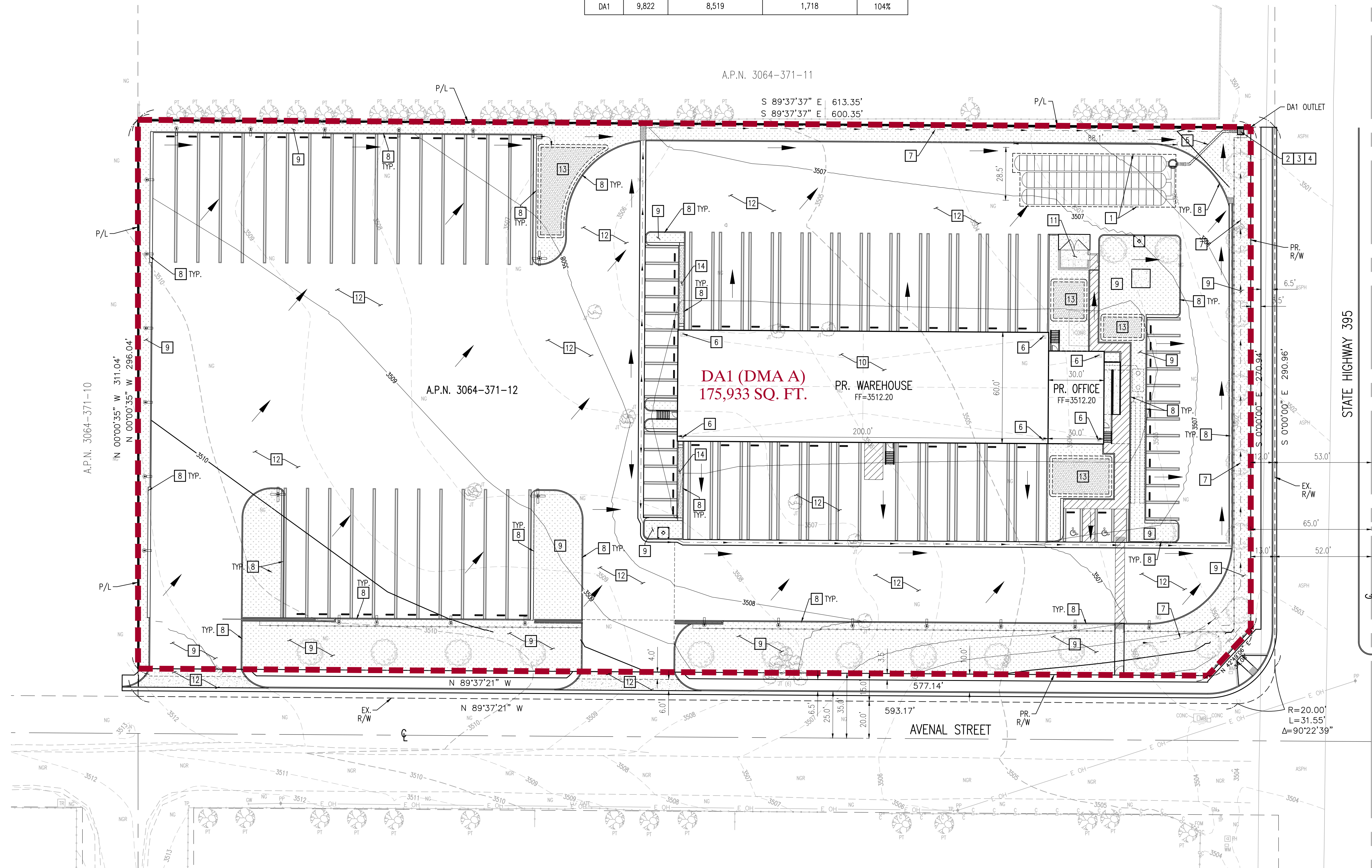
- 8,519 CUBIC FEET STORMTECH MC-4500 INFILTRATION CHAMBERS FOR DA1 (9,822 C.F. REQUIRED) OR APPROVED EQUAL, DETAIL ON SHEET 2.
- INSTALL 24"x24" OLD CASTLE CATCH BASIN, PRODUCT NO. 2424CB, CATCH BASIN OR APPROVED EQUAL, DETAIL ON SHEET 2.
- INSTALL FLO-GARD CATCH BASIN INSERT FILTER FOR PRE-TREATMENT OR APPROVED EQUAL, PER DETAIL ON SHEET 2.
- INSTALL "NO DUMPING - DRAINS TO RIVER" SIGN ON CATCH BASIN INLETS, PER DETAIL ON SHEET 1.
- INSTALL 12" H.D.P.E. STORM DRAIN AT 2.0% MIN.
- CONSTRUCT ROOF DRAIN DOWNSPOUTS TO OUTLET ONTO SPLASH PAD, PER DETAIL ON SHEET 1.
- CONSTRUCT GRADED LANDSCAPE FLOWLINE AT 2.0% MINIMUM GRADE, PER DETAIL ON SHEET 1.
- GRADE AND INSTALL LANDSCAPE ADJACENT TO HARDSCAPE AT 1" MINIMUM SUMP, PER DETAIL ON SHEET 1.
- INSTALL AND MAINTAIN IRRIGATION OF LANDSCAPED AREAS PER CASQA BMP SD-12 (S5).
- PREPARE SPILL CONTAINMENT PLAN PER CASQA BMP SD-36 (S9).
- COVERED TRASH ENCLOSURE TO BE MAINTAINED PER CASQA BMP SD-32 (S3).
- PERFORM DRIVEWAY SWEEPING ON A MONTHLY BASIS.
- CONSTRUCT RAIN GARDEN BMP #1-#4, PER DETAIL ON SHEET 2.
- CONSTRUCT RAIN GARDEN BMP #5 & #6, PER DETAIL ON SHEET 2.

LEGEND:

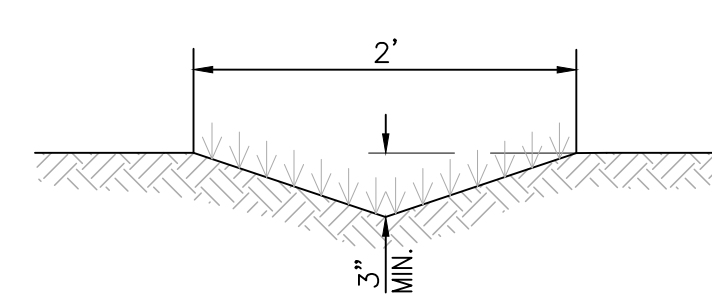
- INDICATES EXISTING CONTOUR
- INDICATES PROPOSED CONTOUR
- INDICATES STREET CENTERLINE
- INDICATES CURB LINE
- INDICATES BOUNDARY LINE
- INDICATES DRAINAGE AREA LIMITS
- INDICATES FLOW LINE
- INDICATES FLOW DIRECTION



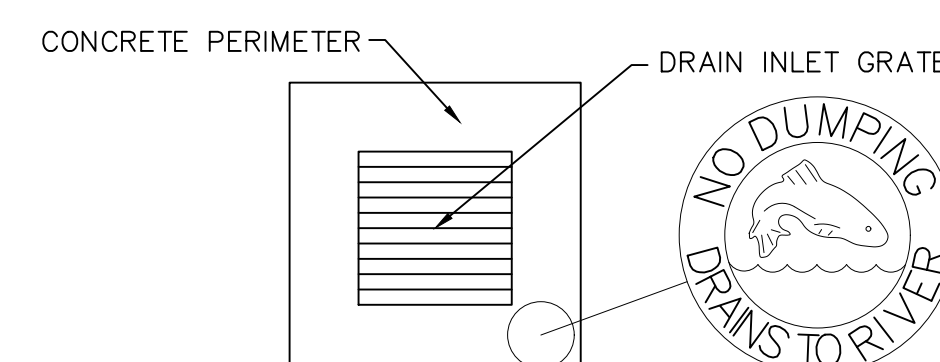
ROOF DRAIN DOWNSPOUT
NOT TO SCALE



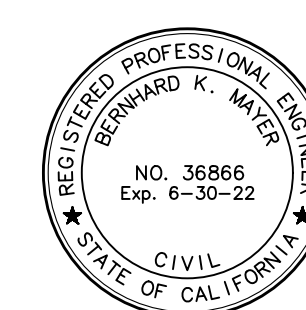
LANDSCAPE TO HARDSCAPE DETAIL
NOT TO SCALE



LANDSCAPED FLOWLINE DETAIL
NOT TO SCALE



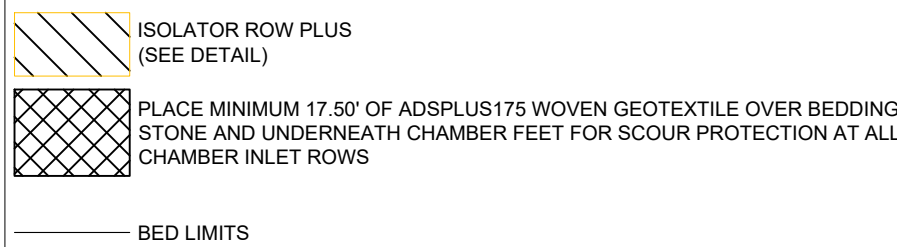
STORM DRAIN MESSAGE TO BE PERMANENTLY APPLIED DURING THE CONST. OF DRAIN INLET
STORM DRAIN MESSAGE DETAIL
NOT TO SCALE



SITETECH INC.
8061 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909) 864-3180, FAX: (909) 864-0850

BERNHARD K. MAYER R.C.E. 36866 DATE MAY 22, 2022

CITY OF HESPERIA PRELIMINARY WATER QUALITY MANAGEMENT PLAN			
PREPARED FOR:		FREIGHT CO.	
DATE:	MAY 22, 2022	MAILING ADDRESS:	SITE ADDRESS:
A.P.N. 3064-371-12		11025 TAMARIND AVENUE BLOOMINGTON, CA 92316	A.P.N. 3064-371-12 HESPERIA, CA 92345
SCALE:	1"=30'	PHONE:	SHEET:
		(909) 241-7464	1 OF 2

[illegible]

NOTES

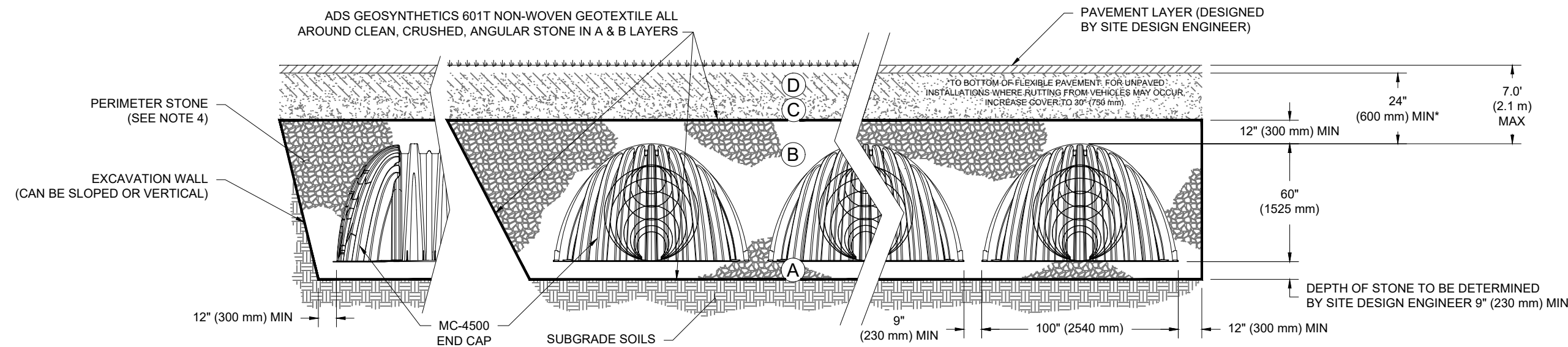
- * MANHOLE SIZE TO BE DETERMINED BY THE SITE DESIGN ENGINEER. SEE TECH NOTE #32 FOR MANHOLE SIZING GUIDANCE.
- * TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONDITIONS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANHOLE COMPONENTS IN THE FIELD.
- * THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADD JOIST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- * THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE IN-SITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.

NOT FOR CONSTRUCTION: THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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 90% 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	AASHTO M43 ¹ 3, 4	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43 ¹ 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. ^{2,3}

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS FOR ONE STONE. MOST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #1 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTCH COMPACTOR REQUIREMENTS ARE MET FOR "A" LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (M3) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. 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 DESIGNERS, CONTACT STORMTCH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER "C" IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER "D" UP TO THE FINISHED GRADE. MOST FLAVOUR SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER "C" OR "D" AT THE SITE DESIGN ENGINEER'S DISCRETION.



1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x120.
2. MC-450 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. 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.
4. PERMITTER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
 - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
 - AND ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 9".
 - TO ENSURE THE IN-PLACE STIFFNESS OF THE ARCH STRUCTURE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN² 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.

NOT TO SCALE



FILE NAME: 266-24x24-DIC
ISSUE DATE: JANUARY, 2008

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Inlet Filtration

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.

Oldcastle®
Stormwater Solutions

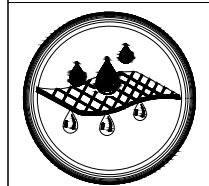
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

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DRAWING NO.	REV	ECO	DATE	SHEET
FGP-0001	G	ECO-0142	JPR 11/3/06	1
		JPR 7/13/16		



SPECIFIER CHART								
MODEL NO.	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW)			STANDARD DEPTH 20 inches		MODEL NO.	SHALLOW DEPTH 12 inches	
STANDARD DEPTH	INLET ID Outside Dimension (inch x inch)	GRATE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)	SHALLOW DEPTH	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25



FloGard® 3
Catch Basin Insert Filter
Grated Inlet Style

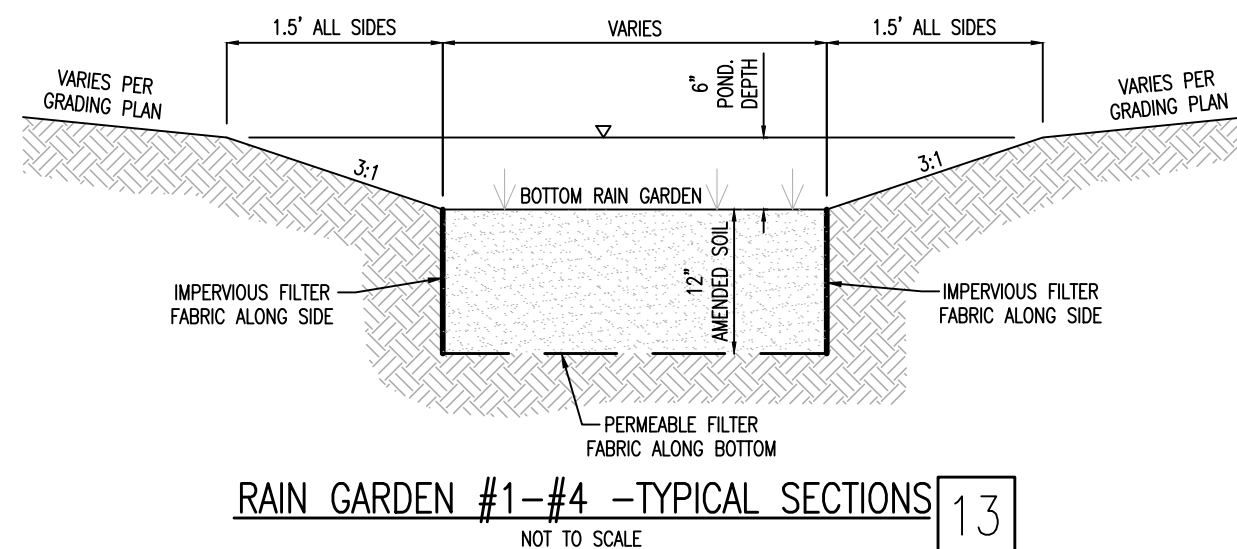


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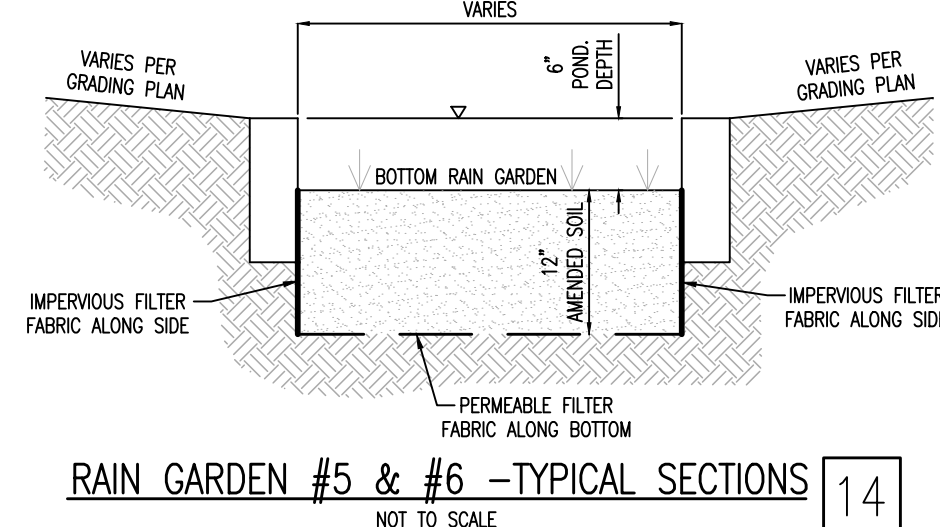
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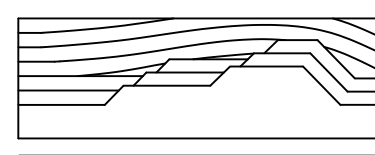
DRAWING NO.	REV	ECO	DATE	SHEET 2 OF
FGP-0001	G	ECO-0142	JPR 11/3/06	
		JPR 7/13/16		



RAIN GARDEN #1-#4 -TYPICAL SECTIONS



RAIN GARDEN #5 & #6 -TYPICAL SECTIONS



8061 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909) 864-3180, FAX: (909) 864-0850

BERNHARD K. MAYER

R.C.E. 36866

DATE _____

PREPARED FOR:

FREIGHT CO.

DATE: MAY 22 2022

MAY 22, 2022

APN 3064-371-12

MAILING ADDRESS:

11025 TAMARIND AVENUE

BLOOMINGTON, CA 923

SITE ADDRESS:

A.P.N. 3064-371-12

HESPERIA, CA 92345

2 OF 2

6.2.A – Electronic Data

TO BE COMPLETED DURING FINAL WQMP

6.3.A – Maintenance Agreement

TO BE COMPLETED DURING FINAL WQMP

6.3.B – Operation and Maintenance

Post Construction – Operations and Maintenance

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

1. Project Information

APN: 3064-371-12
Address: NORTHWEST CORNER FROM HIGHWAY 395 AND AVENAL STREET
Site Size: 175,933 S.F.

2. Responsible Party

The responsible party (RP) for implementation of this WQMP is:

Owner Name: VARINDER SANGHA
Title: OWNER
Company: FREIGHT CO.
Address: 11025 TAMARIND AVENUE, BLOOMINGTON, CA 92316
Telephone #: (909) 241-7464

3. Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in Appendix D of this document.

The WQMP Verification Form (Appendix D) shall be completed accurately and retained as part of this document.

4. Vector Control

Standing water which exists for longer than 72 hours may contribute to mosquito breeding areas. Best Management Practices (BMPs) shall be inspected for standing water on a regular basis. Standing water may indicate that the BMP is not functioning properly and proper action to remedy the situation shall be taken in a timely manner.

elimination of standing water and managing garbage, lawn clippings, and pet droppings, can help decrease the presence of mosquitoes and flies in the area.

The County Vector Control District may be contacted for more information and support.

5. Inspections

The local jurisdiction may conduct a site inspection to evaluate compliance with the project specific WQMP. This document, including the appendix logs and the applicable WQMP should be shown to the inspector, as proof of maintenance.

6. Annual BMP Maintenance Budget

Annual estimate is \$460: 8 labor Hours @ \$45/hour = \$360 + Debris Removal/Haul-off = \$100

Maintenance Responsibility

With TRACT 20104 development project site being in the City of Yucaipa's limits, the property owner's ongoing maintenance responsibilities, site design and treatment BMPs have been designed to keep maintenance efforts in line with project maintenance activities.

Maintenance Responsibilities: Infiltration Basin, Landscape maintenance and maintenance of driveways.

General Operation and Maintenance Activities

Operation and maintenance (O&M) activities are described below. The categories of O&M activities are "routine" and "major" where routine refer to activity conducted on a regular schedule, whereas major refers to infrequent activities triggered mainly by need. Each category and its respective activities are described in the following sections.

Routine Operation and Maintenance Activities

O&M responsibility, initially by Developer/Builder until PROPERTY OWNER, O&M, normally performed by PROPERTY OWNER as part of normal/scheduled maintenance activities.

Site Inspection

The storm drain inlets will be inspected on a regular, scheduled basis to ensure that the facility is operating properly, to record observations, and to initiate any actions that may be required. While the frequency of site inspections may vary depending on the season, it will typically be on a monthly basis.

Trash & Debris Removal

Litter may be picked up at any time during site visits for other purposes. Regular, scheduled trash/debris removal will be performed at all sites on a quarterly basis and/or after storm events that result in heavy trash accumulations.

Minor Vegetation Removal/Thinning

Vegetation growth will be inspected annually, and removed or thinned as necessary. Vegetation at inlets and outlets will be manually or mechanically removed if vegetation is found to be clogging or otherwise affecting the operation of the facility. Access roads will remain clear of vegetation and obstructions. Significant vegetation removal is covered under the major maintenance activities section below.

Snag Removal

This work typically includes the removal of sticks, dead branches, brush, and small trees that block water flow or otherwise interfere with the operations. This work may be performed as needed on a quarterly basis.

Minor Sediment Removal

It is expected that there will be a minor amount of sediment deposition at points within the storm drain inlet. When such deposits obstruct water flow, the deposits will be removed.

Underground Infiltration System:

Facility: Underground Infiltration Chambers
Maintained By: Property Owner
O&M: Inspect inlet, remove trash and debris on a monthly basis. If 48-hour drawdown is not achieved, owner will remove and replace gravel and re-scarify a minimum of 2" on all sides to provide fresh infiltration surface.

**BMP OPERATION & MAINTENANCE LOG
FREIGHT CO.**

Today's Date: _____

Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

**EDUCATIONAL LOG
FREIGHT CO.**

Date of Training/Educational Activity: _____

Person Performing Activity (Printed): _____

Signature: _____

Topic of Training/Educational Activity: _____

Name of Participant	Signature of Participant

Date of Training/Educational Activity: _____

Person Performing Activity (Printed): _____

Signature: _____

Topic of Training/Educational Activity: _____

Name of Participant	Signature of Participant

INF-7: Underground Infiltration

Underground infiltration is a vault or chamber with an open bottom that used to store runoff and percolate into the subsurface. A number of vendors offer proprietary infiltration products that allow for similar or enhanced rates of infiltration and subsurface storage while offering durable prefrabricated structures. There are many varieties of proprietary infiltration BMPs that can be used for roads and parking lots, parks and open spaces, single and multi-family residential, or mixed-use and commercial uses.

Also known as:

- *Infiltration vault*
- *Recharge vault*



Underground Infiltration

Source: <http://www.contech-cpi.com>

Feasibility Screening Considerations

- Infiltration bails shall pass infeasible screening criteria to be considered for use.
- Underground infiltration galleries pose a potential risk of groundwater contamination; pretreatment should be used.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Appropriate for sites with limited surface space.
- Can be placed beneath roads, parking lots, parks, and athletic fields.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, single-family and multi-family, roads and parking lots, and parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.
- ☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should not be directed to the facility.
- ☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.
- ☐ Design infiltration rate should be determined as described in [Appendix VII](#).
- ☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

- ☐ For infiltration facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.

Computing Underground Infiltration Device Size

Underground infiltration devices vary by design and by proprietary designs. The sizing method selected for use must be based on the BMP type it most strongly resembles.

- For underground infiltration devices with open pore volume (e.g., vaults, crates, pipe sections, etc), sizing will be most similar to infiltration basins.
- For underground infiltration devices with pore space (e.g., aggregate reservoirs), sizing will be most similar to permeable pavement.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5:
http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850

PRE-2: Catch Basin Insert Fact Sheet

Catch basin inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris and may include sorbent media (oil absorbent pouches) to remove floating oils and grease. Catch basin inserts are selected specifically based upon the orientation of the inlet and the expected sediment and debris loading.

Opportunity Criteria

- Catch basin inserts come in such a wide range of configurations that it is practically impossible to generalize the expected performance. Inserts should mainly be used for catching coarse sediments and floatable trash and are effective as pretreatment in combination with other types of structures that are recognized as water quality treatment BMPs. Trash and large objects can greatly reduce the effectiveness of catch basin inserts with respect to sediment and hydrocarbon capture.
- Catch basin inserts are applicable for drainage area that include parking lots, vehicle maintenance areas, and roadways with catch basins that discharge directly to a receiving water.

Also known as:

- Drop Inlet Filters
- Catch Basin Filters



Catch Basin Insert (DrainPac™)

OC-Specific Design Criteria and Considerations

- ☐ Frequent maintenance and the use of screens and grates to keep trash out may decrease the likelihood of clogging and prevent obstruction and bypass of incoming flows.
- ☐ Consult proprietors for specific criteria concerning the design of catch basin inserts.
- ☐ Catch basin inserts can be installed with specific media for pollutants of concern.

Proprietary Manufacturer / Supplier Websites

- **Table XIV.2** is a list of manufacturers that provide catch basin inserts. The inclusion of these manufacturers does not represent an endorse of their products. Other devices and manufacturers may be acceptable for pretreatment.

Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

Device	Manufacturer	Website
AbTech Industries Ultra-Urban Filter™	AbTech Industries	www.abtechindustries.com
Aquashield Aqua-Guardian™ Catch Basin Insert	Aquashield™ Inc.	www.aquashieldinc.com
Bowhead StreamGuard™	Bowhead Environmental & Safety, Inc.	http://www.shopbowhead.com/
Contech® Triton Catch Basin Filter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Triton Curb Inlet Filter™	Contech® Construction Products Inc.	www.contech-cpi.com

Table XIV.2: Proprietary Catch Basin Insert Manufacturer Websites

Device	Manufacturer	Website
Contech® Triton Basin StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Contech® Curb Inlet StormFilter™	Contech® Construction Products Inc.	www.contech-cpi.com
Curb Inlet Basket	SunTree Technologies Inc.	www.suntreetech.com
Curb Inlet Grates	EcoSense International™	http://www.ecosenseint.com/
DrainPac™	United Storm Water, Inc.	http://www.unitedstormwater.com
Grate Inlet Skimmer Box	SunTree Technologies Inc.	www.suntreetech.com
KriStar FloGard+PLUS®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard®	KriStar Enterprises Inc.	www.kristar.com
KriStar FloGard LoPro Matrix Filter®	KriStar Enterprises Inc.	www.kristar.com
Nyloplast Storm-PURE Catch Basin Insert	Nyloplast Engineered Surface Drainage Products	www.nyloplast-us.com
StormBasin®	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Interceptor	FabCo® Industries Inc.	www.fabco-industries.com
Stormdrain Solutions Inceptor®	Stormdrain Solutions	www.stormdrains.com
StormPod®	FabCo® Industries Inc.	www.fabco-industries.com
Stormwater Filtration Systems	EcoSense International™	http://www.ecosenseint.com/
Ultra-CurbGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-DrainGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GrateGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-GutterGuard®	UltraTech International Inc.	www.spillcontainment.com
Ultra-InletGuard®	UltraTech International Inc.	www.spillcontainment.com

APPENDIX XV. WORKSHEETS

This section provides hyperlinks to each of the worksheets embedded in text of these TGD Appendices.

- [Worksheet A: Hydrologic Source Control Calculation Form \(III-7\)](#)
- [Worksheet B: Simple Design Capture Volume Sizing Method \(III-16\)](#)
- [Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs \(III-20\)](#)
- [Worksheet D: Capture Efficiency Method for Flow-Based BMPs \(III-24\)](#)
- [Worksheet E: Determining Capture Efficiency of Volume Based, Constant Drawdown BMP based on Design Volume \(III-29\)](#)
- [Worksheet F: Determining Capture Efficiency of a Flow-based BMP based on Treatment Capacity \(III-33\)](#)
- [Worksheet G: Alternative Compliance Volume Worksheet \(VI-7\)](#)
- [Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet \(VII-35\)](#)
- [Worksheet I: Summary of Groundwater-related Feasibility Criteria \(VIII-13\)](#)
- [Worksheet J: Summary of Harvested Water Demand and Feasibility \(X-13\)](#)
- [Worksheet SOC-1: Calculating Provided Biofiltration Volume as a Fraction of Remaining DCV \(III-41\)](#)

INF-3: Bioretention with no Underdrain

Bioretention stormwater treatment facilities are landscaped shallow depressions that capture and filter stormwater runoff. These facilities function as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. The facilities normally consist of a ponding area, mulch layer, planting soils, and plants. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. For areas with low permeability native soils or steep slopes, bioretention areas can be designed with an underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration.

Also known as:

- *Rain gardens*
- *Infiltration planter*



Bioretention

Source: Geosyntec Consultants

Feasibility Screening Considerations

- Bioretention with no underdrains shall pass infiltration infeasibility screening criteria to be considered for use.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, and road medians.
- Drainage area is ≤ 5 acres, preferably ≤ 1 acre.
- Area available for infiltration.
- Soils are adequate for infiltration or can be amended to improve infiltration capacity. Site slope is less than 15 percent.

OC-Specific Design Criteria and Considerations

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ Depth to mounded seasonally high groundwater shall not be less than 5 feet.
- ☐ If sheet flow is conveyed to the treatment area over stabilized grassed areas, the site must be graded in such a way that minimizes erosive conditions; sheet flow velocities should not exceed 1 foot per second.
- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth exceeds 6 inches to mitigate the risk of drowning.
- ☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media
- ☐ The minimum amended soil depth is 1.5 feet (3 feet is preferred).
- ☐ The maximum drawdown time of the planting soil is 48 hours.

- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native plant species and/or hardy cultivars that are not invasive and do not require chemical fertilizers or pesticides should be used to the maximum extent feasible.
- ☐ The bioretention area should be covered with 2-4 inches (average 3 inches) of mulch at startup and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ An optional gravel drainage layer may be installed below planting media to augment storage volume.
- ☐ An overflow device is required at the top of the ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.

Simple Sizing Method for Bioretention with no Underdrain

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioretention area with underdrains, the user calculates the DCV and designs the system with geometry required to draw down the DCV in 48 hours. The sizing steps are as follows:

Step 1: Determine the Bioretention Design Capture Volume

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Determine the 48-hour Ponding Depth

The depth of effective storage depth that can be drawn down in 48 hours can be calculated using the following equation:

$$d_{48} = K_{\text{DESIGN}} \times 4$$

Where:

d_{48} = bioretention 48-hour effective depth, ft

K_{DESIGN} = bioretention design infiltration rate, in/hr (See **Appendix VII**)

This is the maximum effective depth of the basin below the overflow device to achieve drawdown in 48 hours. Effective depth includes ponding water and media/aggregate pore space.

Step 3: Design System Geometry to Provide d_{48}

Design system geometry such that

$$d_{48} \geq d_{\text{EFFECTIVE}} = (d_P + n_M d_M + n_G d_G)$$

Where:

d_{48} = depth of water that can drain in 48 hours

$d_{\text{EFFECTIVE}}$ = total effective depth of water stored in bioretention area, ft

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

Step 4: Calculate the Required Infiltrating Area

The required infiltrating area (i.e. measured at the media surface) can be calculated using the following equation:

$$A = DCV / d_{EFFECTIVE}$$

Where:

A = required infiltrating area, sq-ft (measured as the media surface area)

DCV = design capture volume, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint.

Capture Efficiency Method for Bioretention with no Underdrain

If BMP geometry has already been defined and deviates from the 48 hour drawdown time, the designer can use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See [Appendix III.3.2](#)) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected basin geometry

$$DD = (d_{EFFECTIVE} / K_{DESIGN}) \times 12 \text{ in/ft}$$

Where:

DD = time to completely drain infiltration basin ponding depth, hours

$$d_{EFFECTIVE} \leq (d_P + n_M d_M + n_G d_G)$$

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See [Appendix VII](#))

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See [Appendix III.3.2](#)) to calculate the fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the basin drawdown time calculated above.

Step 4: Check that the Bioretention Effective Depth Drains in no Greater than 96 Hours

$$DD = (d_{EFFECTIVE} / K_{DESIGN}) \times 12$$

Where:

DD = time to completely drain bioretention facility, hours

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

K_{DESIGN} = basin design infiltration rate, in/hr (See [Appendix VII](#))

If DD_{ALL} is greater than 96 hours, adjust bioretention media depth and/or gravel layer depth until DD is less than 96 hours. This duration is based on preventing extended periods of saturation from causing plant mortality.

Step 5: Determine the Basin Infiltrating Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$$A = DCV / d_{EFFECTIVE}$$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

DCV = design capture volume, adjusted for drawdown time, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Bioretention areas may be preceded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the bioretention cell.
- Bioretention areas can be incorporated in a treatment train to provide enhanced water quality treatment and reductions in runoff volume and rate. For example, runoff can be collected from a roadway in a vegetated swale that then flows to a bioretention area. Similarly, bioretention could be used to manage overflow from a cistern.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment:
<http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf>
 - SMC LID Manual (pp 68):
http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
 - Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5:
http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
 - San Diego County LID Handbook Appendix 4 (Factsheet 7):
<http://www.sdcountry.ca.gov/dplu/docs/LID-Appendices.pdf>
 - Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4.
http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5:
http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

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) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

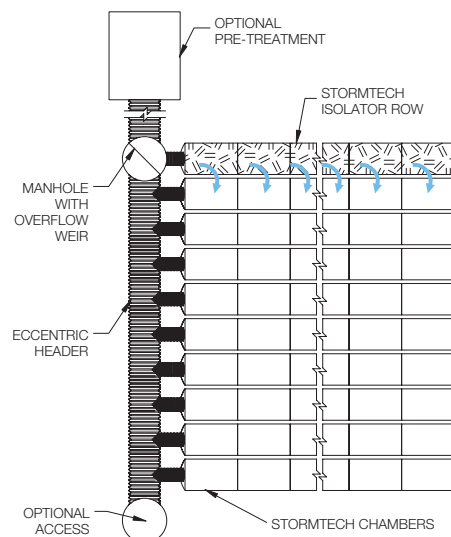
Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.



Looking down the Isolator Row from the manhole opening, woven geotextile 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.

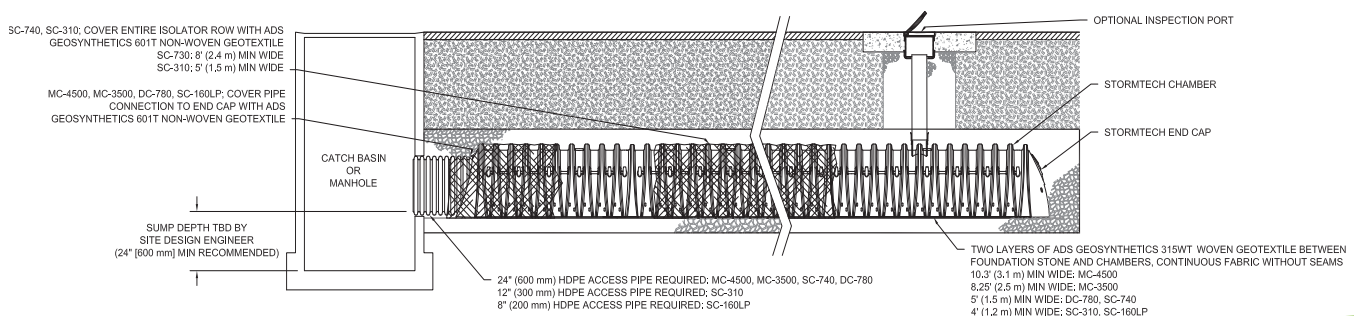
MAINTENANCE

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. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **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-4500 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 Rows
 - 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.

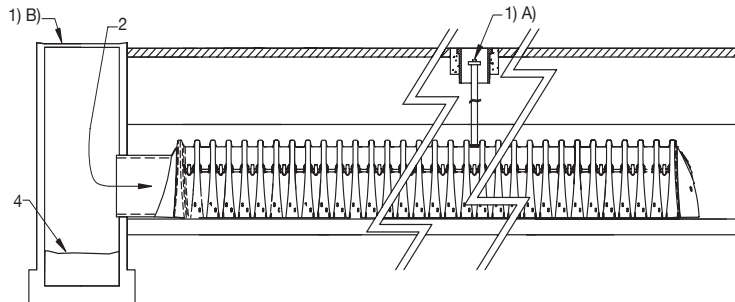
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

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		Sediment 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

StormTech Maintenance Log

Project Name:	
Location:	

Location:

[illegible]



FLOGARD® CATCH BASIN INSERT FILTER

Submittal Package



TABLE OF CONTENTS

1 - Submittal Drawing

2 - Features & Benefits

3 - Accessories

4 - Inspection & Maintenance

5 - Product Specifications

SECTION 1

Submittal Drawing

SECTION 2

Features & Benefits



STORM WATER

PUT A STOP to TSS

Removes Pollutants from Runoff Prior to Entering Waterways

Efficient System

Catches pollutants where they are easiest to catch, at the inlet.

Variable Design

Able to be retrofitted or used in new projects.

Treatment Train

Can be incorporated as part of a "Treatment Train".

No Standing Water

Helps to minimize bacteria and odor problems.

Focused Treatment

Removes petroleum hydrocarbons, trash and Total Suspended Solids (TSS).

Maximum Flexibility

Available in a variety of standard sizes to fit round and square inlets.

Economical

Earn a higher return on system investment.

Two-part stainless-steel insert to filter solids and oils/grease.



Easy to install, inspect and maintain, even on small and confined sites.

By the Numbers*:

Filter will remove up to 80% of Total Suspended Solids (TSS), at least 70% of oils and grease, and up to 40% of Total Phosphorus (TP) associated with organic debris as well as Polycyclic Aromatic Hydrocarbons (PAH) from oil leaks and spills.

*Approximate for urban street application.

CATCH BASIN FILTER TEST RESULTS SUMMARY

Testing Agency	% TSS Removal	% Oil & Grease Removal	% PAH Removal
UCLA	80	70 to 80	
U of Auckland Tonking & Taylor, Ltd (for City of Auckland)	78 to 95		
U of Hawaii (for City of Honolulu)	80		20 to 40

INLET FILTRATION

Multi-Purpose Catch Basin Insert Retains Sediment, Debris, Trash and Oils/Grease

FloGard® catch basin insert filters are recommended for areas subject to silt and debris as well as low-to-moderate levels of petroleum hydrocarbons (oils and grease). Examples of such areas include vehicle parking lots, aircraft ramps, truck and bus storage yards, business parks, residential and public streets.

CATCH BASIN FILTER COMPETITIVE FEATURE COMPARISON		
Evaluation of Catch Basin Filters (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity - Sludge & Oil	7	7
Service Life	10	3
Installation - Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	10	2

*Approximate, based on field sediment removal testing in urban street application

**Average

Long-Term Value Comparison (Based on flow-comparable units) (Scale 1-10)	Oldcastle	Other Insert Filter Types**
Unit Value - Initial (\$/cfs treated)	10	4
Installation Value (\$/cfs treated)	10	7
Absorbent Replacement (annual avg (\$/cfs treated))	10	2
Materials Replacement Value (annual avg (\$/cfs treated))	10	10
Maintenance Value (annual avg (\$/cfs treated))	10	7
Total First Year ROI (\$/cfs treated)	10	5
Total Annual Avg Value (\$/cfs treated, avg over 20 yrs)*	10	5



Combination Inlet



Flat-Grated Inlet



Circular Frame Inlet



Captured debris from FloGard catch basin insert filter in Dana Point, California.



(800) 579-8819

oldcastleinfrastructure.com



FLOGARD®

Catch Basin Insert Filter

Catch basin insert designed to capture sediment, gross solids, trash and petroleum hydrocarbons from low ("first flush") flows, even during the most extreme weather conditions

Example Types, Sizes and Capacities: Additional sizes, including regional and custom options are available.

FloGard Combination Inlet SPECIFIER CHART								
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRADE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-1633FGO	16 X 33	18 X 36	7.0	2.5	1.7	FGP-1633FGO8	1.4	1.1
FGP-1836FGO	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836FGO8	1.3	.9
FGP-2234FGO	22 X 34	24 X 36	8.1	3.6	2.1	FGP-2234FGO8	2.1	1.4
FGP-2436FGO	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436FGO8	1.95	1.15

FloGard Flat Grated Inlet SPECIFIER CHART								
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRADE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	24 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-32F-TN	28 X 28	32 X 32	6.3	2.2	1.5	FGP-32F8-TN	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-1633F	16 X 34	18 X 36	6.9	2.3	1.6	FGP-1633F8	1.3	.9
FGP-2234F	22 X 34	24 X 36	8.0	3.4	2.0	FGP-2234F8	1.95	1.15

FloGard Circular Grated Inlet SPECIFIER CHART					
MODEL NUMBER	INLET ID (inches)	GRADE OD (inches)	SOLIDS STORAGE CAPACITY (CU FT)	FILTERED FLOW (CSF)	TOTAL BYPASS CAPACITY (CFS)
FGP-RF15F	15	18	0.3	0.4	2.8
FGP-RF18F	18	20	0.8	0.7	4.7
FGP-RF20F	20	23	0.8	0.7	4.7
FGP-RF21F	21	23.5	0.8	0.7	4.7
FGP-RF22F	22	24	0.8	0.7	4.7
FGP-RF24F	24	26	0.8	0.7	4.7
FGP-RF30F	30	32	2.2	1.5	6.1
FGP-RF36F	36	39	3.6	2.0	8.1



Combination Inlet



Flat-Grated Inlet

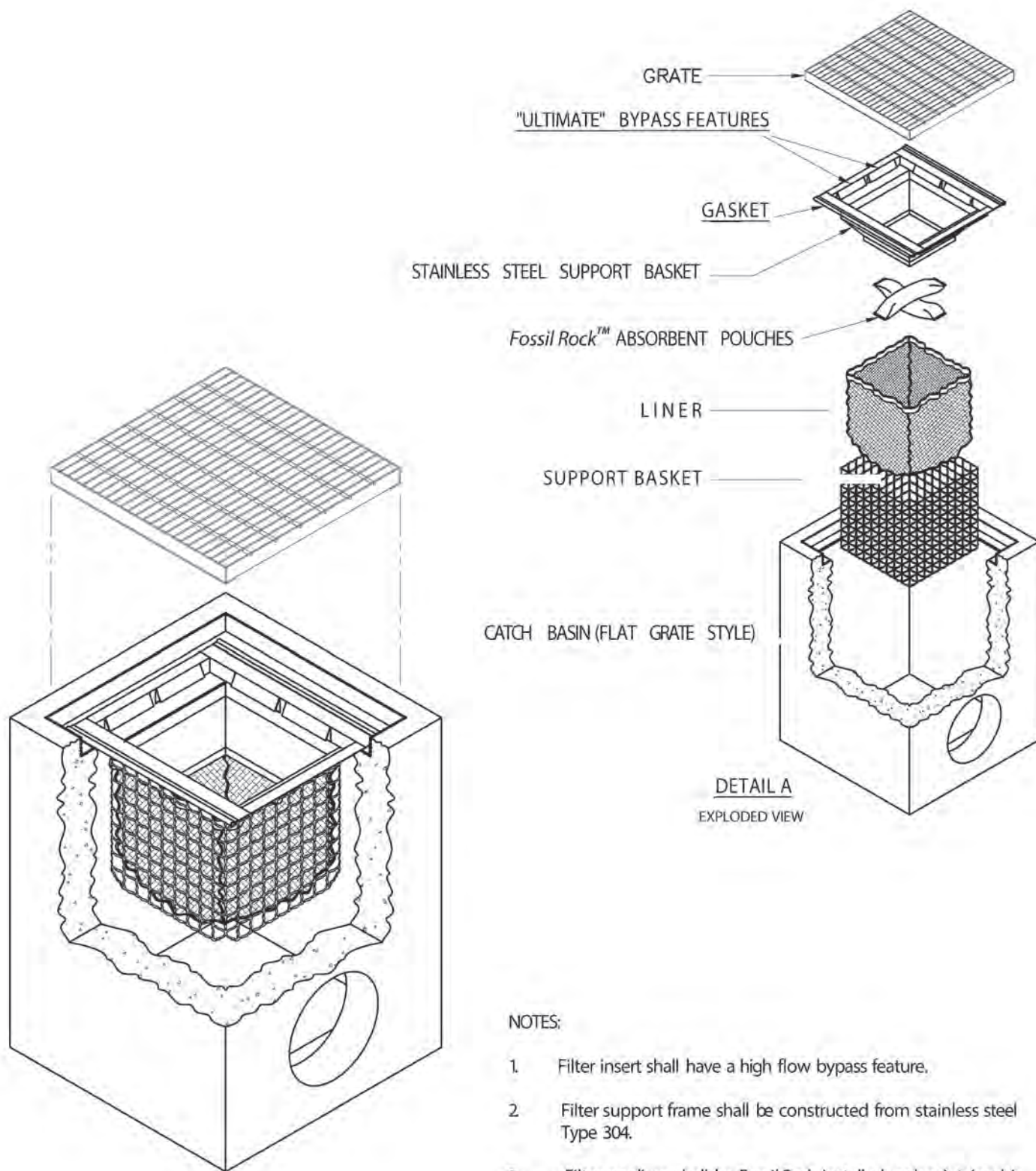


Circular Frame Inlet

INLET FILTRATION

SECTION 3

Accessories



FloGard® FILTER

-INSTALLED INTO CATCH BASIN-

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.

How Rubberizer[®] (Fossil Rock) Products Work*

Rubberizer[®] transforms spilled hydrocarbons into a rubber-like solid on contact, and does not re-release when it is retrieved. The solidification process is non-chemical in nature allowing the US EPA to classify Rubberizer as a sorbent.

This product, which comes in booms, pillows or granular form, can be used to clean oil from bilges, deck spills, around hydraulic storage tanks, under hydraulic machinery, in all engineering spaces and most importantly, in any hydrocarbon fuel spill where leaking oil comes in contact with water.

Rubberizer has been used in clean-up operations around the world and is patented in 22 countries.

The key advantages of the Rubberizer product line when compared to many of the characteristics of the more conventional products include:

- Works on land or water borne spills
- Remains buoyant
- Solidifies and is landfill approved
- Resistant to leaching
- Does not release solidified oils under pressure
- Incinerates with less than .1% residual ash
- Reduces overall clean-up time
- Reduces overall costs

Rubberizer products sorb and transform into a rubber-like material similar to many petroleum based products like:

- Gasoline
- Jet Fuel
- Diesel Fuels
- Transformer Oils
- Hydraulic Oils
- Lube Oils
- Aromatic Solvents
- Chlorinated Solvents
- Light Crudes

Rubberizer particulate is a mixture of hydrocarbon polymers plus additives resulting in a grainy material used primarily for cleanup operations where sweeping and shoveling are involved. It can also be used for clarification of various emulsions, or solidification and removal of various petroleum based slicks from the surface of water which is in a controlled state.



This product, (and the booms and pillows) in which it is the filler, exhibit characteristics that include:

- Lightweight enabling rapid deployment and retrieval (apparent specific gravity approximately = 0.4)
- Rapid sorption and solidification (measured in minutes), hydrophobic (no affinity for water)
- Permanently buoyant (both before and after sorption)
- Will not release solidified liquids under pressure
- Resistant to leaching upon aqueous contact
- High sorbed liquid to sorbent ratios (nominally 5 parts liquid to 1 part sorbent)
- Minimal incineration residue (less than .1%)
- Little volume increase of sorbed liquids (15% in laboratory tests, nominally 25% in field applications)



One pound of this product will solidify into a rubber-like material up to 2/3 gallon of jet fuel, diesel, gasoline, transformer oil, hydraulic oils, light crude and many other liquids.

*Rubberizer® = Fossil Rock

SECTION 4

Inspection & Maintenance



FLOGARD+PLUS® CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide



A division of
Oldcastle Infrastructure

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 on-site 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 (wash racks, 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.
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.

SECTION 5

Product Specifications

PART 1 — GENERAL

1.1 Section Includes

FloGard® Catch Basin Insert Filter – catch basin filtration device for stormwater treatment.

1.2 References

American Society for Testing and Materials (ASTM)

1. ASTM A240
2. ASTM D3786
3. ASTM D4355
4. ASTM D4491
5. ASTM D4533
6. ASTM D4632
7. ASTM D4751
8. ASTM D4833
9. ASTM D4991
10. ASTM D5261

PART 2 — PRODUCTS

2.1 Description

This specification describes a Catch Basin Filtration Device that removes sediment, debris, trash and petroleum hydrocarbons (oil and grease) from water flowing into the drainage inlets during low flows (first flush) without impeding the inlet's maximum design flow. Hydraulic calculations shall be supplied upon request.

The filtration device shall incorporate a sorbent capable of collecting and containing non-soluble pollutants including, but not limited to, petroleum hydrocarbons (oil and grease). Sorbent shall be contained in separate removable containers that can easily be replaced without removing the filter liner. Filtration device shall not rely on collected sediment, debris, trash or filter liner as the medium for hydrocarbon collection.

High capacity filtration devices shall incorporate a debris trap, designed to retain floatable pollutants during high flow periods and both an initial filtering bypass for moderate flows and an ultimate bypass for peak design flows. The installed device shall not impede drainage inlet's peak design flow prior to or after the device has reached its pollutant storage capacity.

2.2 Materials

Filtration device support frame and hardware shall be manufactured from Type 304 stainless steel. It shall be designed to support maximum anticipated loads from the collected pollutants and water.

Field modifications, welding or painting of the device shall not be allowed.

Device shall incorporate a removable filter liner made from a woven polypropylene monofilament geotextile with an apparent opening size less than 35 US Mesh and a clean flow rate of not less than 145 gallons per minute (gpm) per square foot, or stainless steel screen with opening size between 4 and 200 US Mesh. The use of a

non-woven geotextile filter liner shall not be allowed.

Sorbent shall be a hydrophobic material treated to attract and retain petroleum hydrocarbons and other non-soluble pollutants. It shall be non-biodegradable and non-leaching and contain no hazardous ingredients as defined by the U.S. Environmental Protection Agency (EPA).

2.3 Manufacturer

Each catch basin filter device shall be a FloGard as manufactured by Oldcastle Infrastructure, 7100 Longe St, Stockton, California 95206. Phone: (800) 579-8819.

PART 3 — EXECUTION

3.1 Installation

Installation of filtration device shall not require extensive modification of the catch basin and shall be performed by a manufacturer-approved installation contractor. Installation contractor shall be licensed and insured in accordance with agency requirements.

Filtration devices installed into grated, or combination grate with curb opening inlets shall be either supported by resting the support brackets on the grate bearing ledge (installed without the use of bolts or other anchoring devices) or mounted to the catch basin wall with easily removable separate wall mount brackets to allow for quick access to the piping system in the event of an emergency.

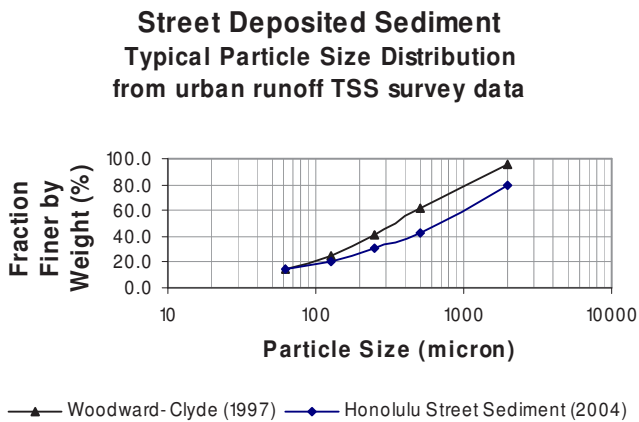
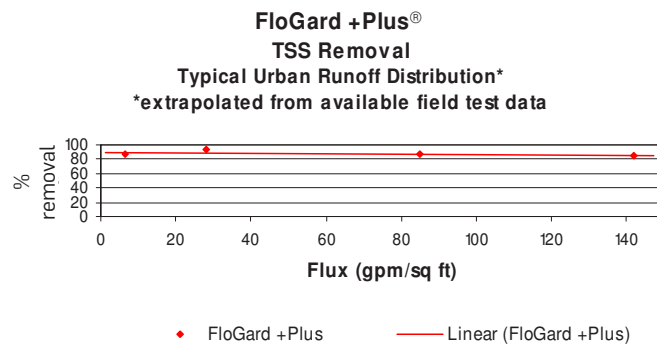
Devices for curb opening style inlets (no grate) shall be installed across the entire width of the curb opening and shall be secured to inlet wall, across and beneath the curb opening, using corrosion-resistant anchors (Type 304 stainless steel). The use of chains or cable to secure the device shall not be allowed.

Filtration devices shall be installed in such a manner as to direct all flows into the device. Distance (gaps) between the inlet wall and the device shall not exceed one half inch. Gaps of less than one half inch shall be sealed with a flexible weatherproof sealant, as approved by agency.

Installation contractor shall supply agency (engineer) with an installation record, denoting the date of installation, drainage inlet location, type of drainage inlet and type and/or size of filtration device.

FLOGARD +PLUS[®]

Independent field tests conducted in Hawaii and New Zealand on FloGard +PLUS[®] Catch Basin Insert Filters to determine removal efficiency of Total Suspended Solids (TSS). Results were extrapolated to a typical street deposited sediment particle size. Removal efficiencies were plotted and reflect effective TSS removal over a typical range of operating flow rates. Results are shown below as a function of unit internal surface area.



Units are sized to fit most common styles of drainage inlet grate frames or inlet widths. Rated filtered flow capacities for each model typically exceed the required “first flush” treatment flow rate, and account for reduction in capacity as the unit accumulates suspended pollutants. Rated bypass capacity for each model also typically exceeds the inlet capacity of the catch basin.

FloGard +PLUS[®] Catch Basin Insert Filter is an efficient inlet prefilter designed to remove suspended sediment and floatable trash and hydrocarbons from stormwater runoff in new or retrofit applications. It is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas, or may form part of a treatment train. The device features a unique dual-bypass design, durable components, flexible installation options and easy maintenance access.

FloGard +PLUS[®] Test Results Summary

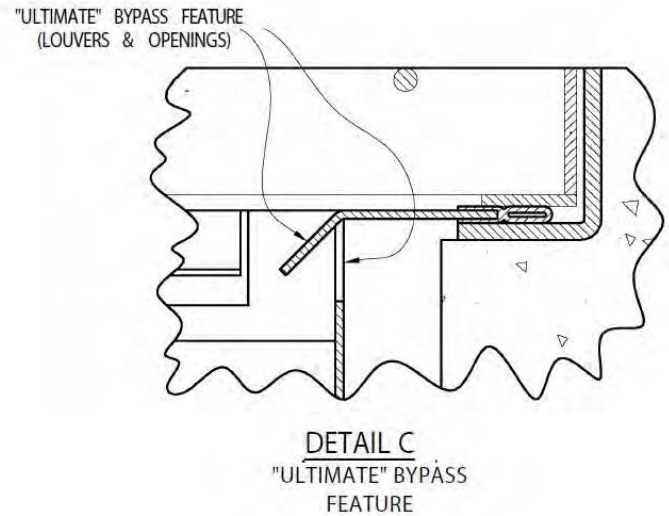
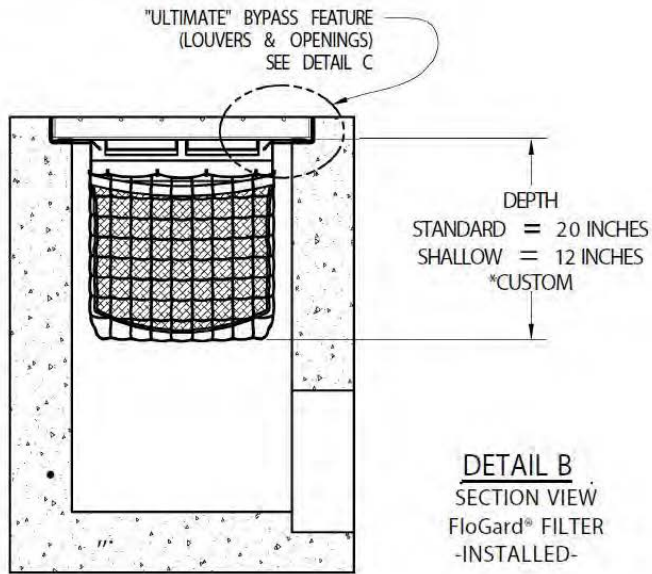
Testing Agency	%TSS Removal	% Oil & Grease Removal
UCLA	80*	70-80
U of Auckland Tonkin & Taylor LTD (City of Auckland)	95** 78-86***	
U of Hawaii (City of Honolulu)	80***	

*Sand larger than ~ 575 µm

**Sand distribution ~ 100-1000 µm

***Local street sweep material (distribution consistent with NURP)

See product specifications for standard model details.



* **MANY** OTHER STANDARD & CUSTOM SIZES AND DEPTHS AVAILABLE UPON REQUEST.

FloGard Flat Grated Inlet								
SPECIFIER CHART								
MODEL NO. STANDARD DEPTH	STANDARD & SHALLOW DEPTH (Data in these columns is the same for both STANDARD & SHALLOW versions)			STANDARD DEPTH -20 Inches-		MODEL NO. SHALLOW DEPTH	SHALLOW DEPTH -12 Inches-	
	INLET ID Inside Dimension (inch x inch)	GRADE OD Outside Dimension (inch x inch)	TOTAL BYPASS CAPACITY (cu. ft. / sec.)	SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)		SOLIDS STORAGE CAPACITY (cu. ft.)	FILTERED FLOW (cu. ft. / sec.)
FGP-12F	12 X 12	12 X 14	2.8	0.3	0.4	FGP-12F8	.15	.25
FGP-16F	16 X 16	16 X 19	4.7	0.8	0.7	FGP-16F8	.45	.4
FGP-18F	18 X 18	18 X 20	4.7	0.8	0.7	FGP-18F8	.45	.4
FGP-1836F	18 X 36	18 X 40	6.9	2.3	1.6	FGP-1836F8	1.3	.9
FGP-21F	22 X 22	22 X 24	6.1	2.2	1.5	FGP-21F8	1.25	.85
FGP-24F	24 X 24	24 X 27	6.1	2.2	1.5	FGP-24F8	1.25	.85
FGP-2436F	24 X 36	24 X 40	8.0	3.4	2.0	FGP-2436F8	1.95	1.15
FGP-2448F	24 X 48	24 X 48	9.3	4.4	2.4	FGP-2448F8	2.5	1.35
FGP-32F-TN	28 X 28	32 X 32	6.3	2.2	1.5	FGP-32F8-TN	1.25	.85
FGP-30F	30 X 30	30 X 34	8.1	3.6	2.0	FGP-30F8	2.05	1.15
FGP-36F	36 X 36	36 X 40	9.1	4.6	2.4	FGP-36F8	2.65	1.35
FGP-3648F	36 X 48	40 X 48	11.5	6.8	3.2	FGP-3648F8	3.9	1.85
FGP-48F	48 X 48	48 X 54	13.2	9.5	3.9	FGP-48F8	5.45	2.25
FGP-1633F	16 X 34	18 X 36	6.9	2.3	1.6	FGP-1633F8	1.3	.9
FGP-2234F	22 X 34	24 X 36	8.0	3.4	2.0	FGP-2234F8	1.95	1.15

FLOGARD® CATCH BASIN INSERT FILTER

OUR MARKETS



**BUILDING
STRUCTURES**



COMMUNICATIONS



WATER



ENERGY



TRANSPORTATION

6.4.A – Soils Information



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for San Bernardino County, California, Mojave River Area



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area

Survey Area Data: Version 12, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 26, 2019—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	4.2	100.0%
Totals for Area of Interest		4.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Bernardino County, California, Mojave River Area

112—CAJON SAND, 0 TO 2 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrj
Elevation: 1,800 to 3,200 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 7 inches: sand
H2 - 7 to 25 inches: sand
H3 - 25 to 45 inches: gravelly sand
H4 - 45 to 60 inches: stratified sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Helendale

Percent of map unit: 5 percent

Custom Soil Resource Report

Manet

Percent of map unit: 5 percent

Landform: Playas

Hydric soil rating: Yes

Kimberlina

Percent of map unit: 5 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Saturated Hydraulic Conductivity (Ksat), Standard Classes

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits. The classes are:

Very low: 0.00 to 0.01

Low: 0.01 to 0.1

Custom Soil Resource Report

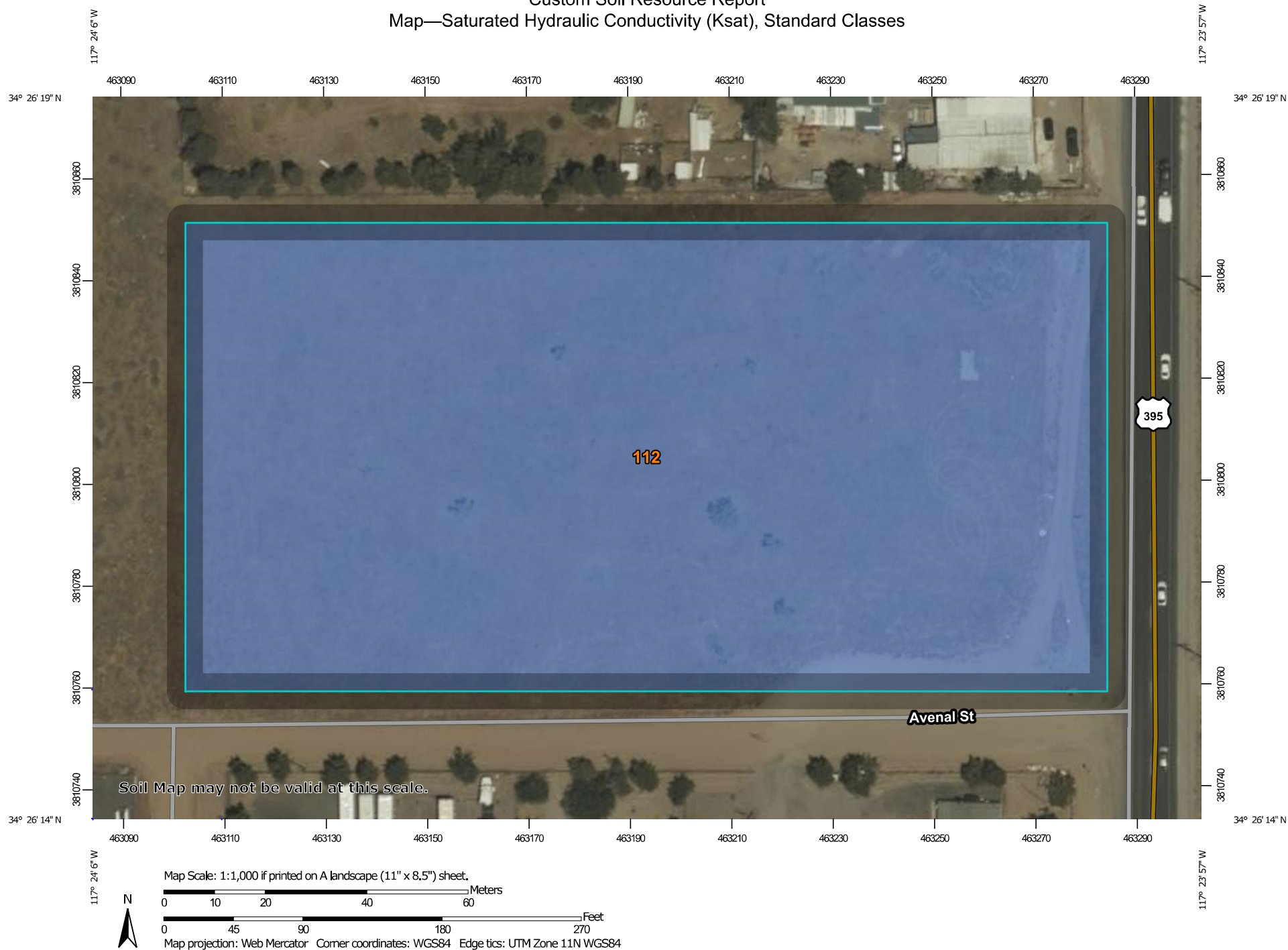
Moderately low: 0.1 to 1.0

Moderately high: 1 to 10

High: 10 to 100

Very high: 100 to 705

Custom Soil Resource Report
Map—Saturated Hydraulic Conductivity (Ksat), Standard Classes



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

-  Very Low (0.0 - 0.01)
-  Low (0.01 - 0.1)
-  Moderately Low (0.1 - 1)
-  Moderately High (1 - 10)
-  High (10 - 100)
-  Very High (100 - 705)
-  Not rated or not available

Soil Rating Lines

-  Very Low (0.0 - 0.01)
-  Low (0.01 - 0.1)
-  Moderately Low (0.1 - 1)
-  Moderately High (1 - 10)
-  High (10 - 100)
-  Very High (100 - 705)
-  Not rated or not available

Soil Rating Points

-  Very Low (0.0 - 0.01)
-  Low (0.01 - 0.1)
-  Moderately Low (0.1 - 1)
-  Moderately High (1 - 10)
-  High (10 - 100)
-  Very High (100 - 705)

 Not rated or not available

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 12, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 26, 2019—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	92.0000	4.2	100.0%
Totals for Area of Interest			4.2	100.0%

Rating Options—Saturated Hydraulic Conductivity (Ksat), Standard Classes

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): All Layers (Weighted Average)

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Custom Soil Resource Report

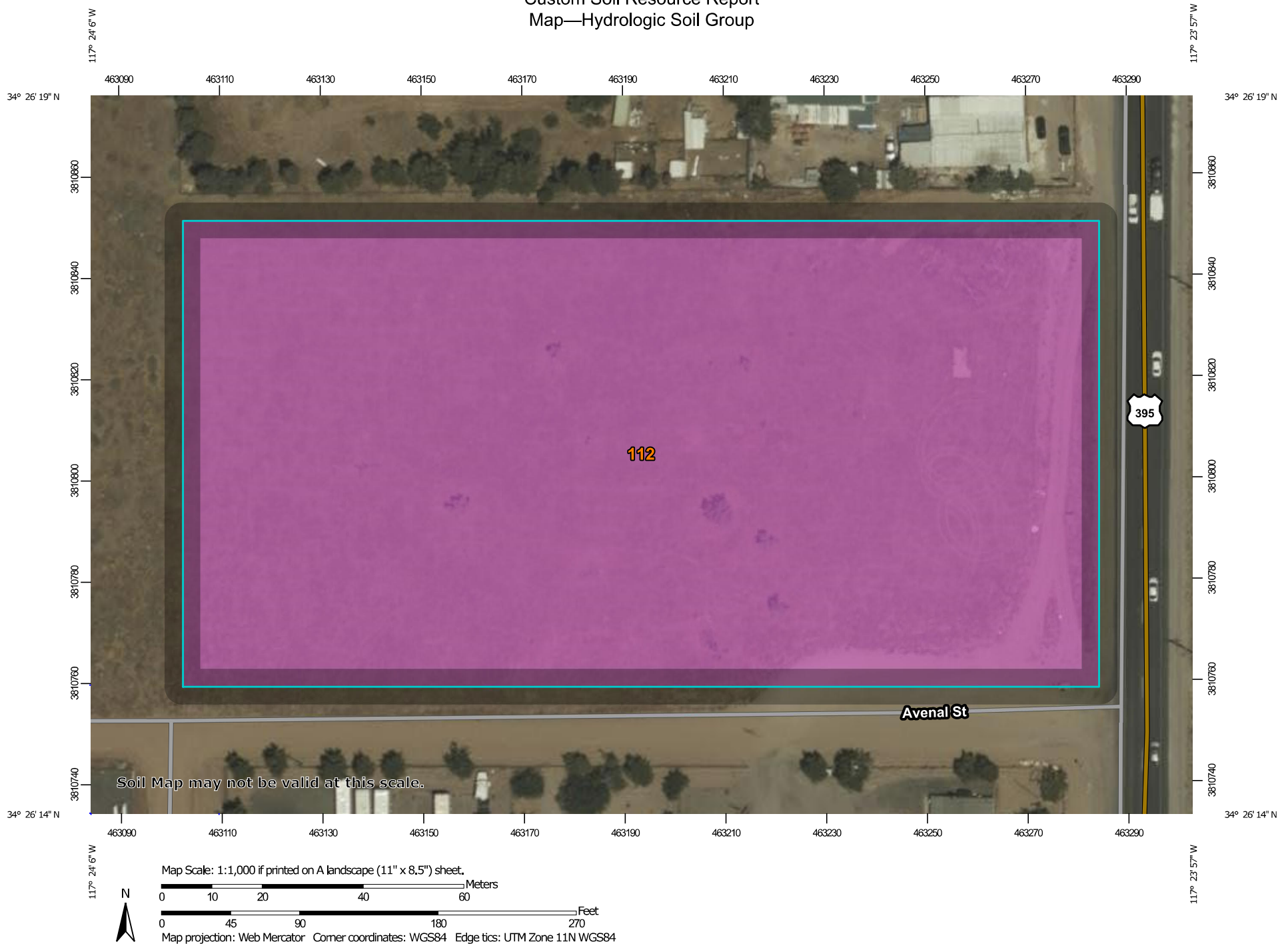
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report Map—Hydrologic Soil Group



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area
 Survey Area Data: Version 12, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 26, 2019—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	A	4.2	100.0%
Totals for Area of Interest			4.2	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

HYDROLOGIC SOIL GROUP

<http://permitrack.sbcounty.gov/wap/>



6.4.B – Soils Factor of Safety Calculation

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	3	0.75
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$				3.5	
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)				5.95	
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$				1.7	

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

***Infiltration rate was obtained by using the online resource, WebSoilSurvey. The soils data can be found in Section 6.4.B of this report.**

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

TECHNICAL GUIDANCE DOCUMENT APPENDICES

VII.4.1. Site Suitability Considerations

Suitability assessment related considerations include (Table VII.3):

- Soil assessment methods – the site assessment extent (e.g., number of borings, test pits, etc.) and the measurement method used to estimate the short-term infiltration rate.
- Predominant soil texture/percent fines – soil texture and the percent of fines can greatly influence the potential for clogging.
- Site soil variability – site with spatially heterogeneous soils (vertically or horizontally) as determined from site investigations are more difficult to estimate average properties for resulting in a higher level of uncertainty associated with initial estimates.
- Depth to seasonal high groundwater/impervious layer – groundwater mounding may become an issue during excessively wet conditions where shallow aquifers or shallow clay lenses are present.

Table VII.3: Suitability Assessment Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern	Medium Concern	Low Concern
Assessment methods (see explanation below)	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates	Direct measurement of ≥ 20 percent of infiltration area with localized infiltration measurement methods (e.g., infiltrometer)	Direct measurement of ≥ 50 percent of infiltration area with localized infiltration measurement methods or Use of extensive test pit infiltration measurement methods
Texture Class	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site soil variability	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment	Soil borings/test pits indicate moderately homogeneous soils	Multiple soil borings/test pits indicate relatively homogeneous soils
Depth to groundwater/ impervious layer	<5 ft below facility bottom	5-10 ft below facility bottom	>10 below facility bottom

Localized infiltration testing refers to methods such as the double ring infiltrometer test (ASTM D3385-88) which measure infiltration rates over an area less than 10 sq-ft, may include lateral

TECHNICAL GUIDANCE DOCUMENT APPENDICES

Table VII.4: Design Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern	Medium Concern	Low Concern
Tributary area size	Greater than 10 acres.	Greater than 2 acres but less than 10 acres.	2 acres or less.
Level of pretreatment/ expected influent sediment loads	Pretreatment from gross solids removal devices only, such as hydrodynamic separators, racks and screens AND tributary area includes landscaped areas, steep slopes, high traffic areas, or any other areas expected to produce high sediment, trash, or debris loads.	Good pretreatment with BMPs that mitigate coarse sediments such as vegetated swales AND influent sediment loads from the tributary area are expected to be relatively low (e.g., low traffic, mild slopes, disconnected impervious areas, etc.).	Excellent pretreatment with BMPs that mitigate fine sediments such as bioretention or media filtration OR sedimentation or facility only treats runoff from relatively clean surfaces, such as rooftops.
Redundancy of treatment	No redundancy in BMP treatment train.	Medium redundancy, other BMPs available in treatment train to maintain at least 50% of function of facility in event of failure.	High redundancy, multiple components capable of operating independently and in parallel, maintaining at least 90% of facility functionality in event of failure.
Compaction during construction	Construction of facility on a compacted site or elevated probability of unintended/ indirect compaction.	Medium probability of unintended/ indirect compaction.	Heavy equipment actively prohibited from infiltration areas during construction and low probability of unintended/ indirect compaction.

6.4.C – BMP Design

SAN BERNARDINO COUNTY STORMWATER PROGRAM
MODEL WATER QUALITY MANAGEMENT PLAN GUIDANCE

BMP Drainage Area	Area (Acres)	Impervious Area Ratio	Region	NOAA Atlas 14 Precipitation on Depth (2yr, 1Hr)	Factor of Saftey ¹	Volume Base BMP drawdown time ²	Composite runoff coefficient, C _{BMP}	Intensity regression coefficient, I	Design rainfall intensity, I _{BMP}	6-hour rainfall regression coefficient	6-hour mean storm rainfall, P ₆ inches	Drawdown time regression constant, a	Maximized detention volume, P ₀	Targe capture volume, V ₀ Acre-Feet	Targe caputre volume, V ₀ Ft ³
DMA A	4.04	0.83	Desert	0.436	2	48	0.633	0.325	0.283	1.237	0.539	1.963	0.670	0.225	9822
SUM=														9822	

Regression Coefficients for Intensity (I) and 6-hour mean storm rainfall (P ₆)			
Quantity	Valley	Mountain	Desert
85% upper confidence limits			
I	0.2787	0.3614	0.3250
P ₆	1.4807	1.9090	1.2371

Drawdown Time Regression Constant, a	
Time hours	a
24	1.582
48	1.963

Notes:

¹ The SBC MWQMPG recommends a factor of safety of 2.

² The SBC MWQMPG recommends a drawdown time of 48 hours. (A shorter time is not feasible for all soil types. A longer time can negatively affect vector control efforts.)



NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4381°, Longitude: -117.4006°
Elevation: 3503.4 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.082 (0.068-0.100)	0.118 (0.097-0.144)	0.165 (0.136-0.202)	0.204 (0.166-0.252)	0.256 (0.203-0.328)	0.297 (0.230-0.388)	0.339 (0.256-0.453)	0.382 (0.280-0.525)	0.441 (0.311-0.632)	0.487 (0.331-0.723)
10-min	0.117 (0.097-0.143)	0.169 (0.139-0.206)	0.236 (0.195-0.290)	0.292 (0.239-0.361)	0.367 (0.290-0.469)	0.426 (0.330-0.556)	0.485 (0.367-0.649)	0.547 (0.402-0.753)	0.632 (0.445-0.906)	0.698 (0.475-1.04)
15-min	0.142 (0.117-0.173)	0.204 (0.169-0.250)	0.286 (0.236-0.351)	0.353 (0.288-0.436)	0.444 (0.351-0.568)	0.515 (0.399-0.672)	0.587 (0.443-0.785)	0.662 (0.486-0.910)	0.764 (0.538-1.10)	0.844 (0.575-1.25)
30-min	0.217 (0.179-0.264)	0.312 (0.258-0.381)	0.437 (0.360-0.535)	0.539 (0.441-0.666)	0.678 (0.536-0.867)	0.786 (0.609-1.03)	0.897 (0.677-1.20)	1.01 (0.742-1.39)	1.17 (0.822-1.67)	1.29 (0.877-1.91)
60-min	0.303 (0.251-0.370)	0.436 (0.360-0.533)	0.611 (0.503-0.749)	0.754 (0.616-0.932)	0.949 (0.750-1.21)	1.10 (0.851-1.44)	1.25 (0.947-1.68)	1.41 (1.04-1.95)	1.63 (1.15-2.34)	1.80 (1.23-2.68)
2-hr	0.436 (0.361-0.532)	0.594 (0.490-0.726)	0.807 (0.665-0.989)	0.986 (0.806-1.22)	1.24 (0.978-1.58)	1.44 (1.11-1.88)	1.65 (1.24-2.20)	1.87 (1.37-2.57)	2.18 (1.54-3.13)	2.44 (1.66-3.62)
3-hr	0.551 (0.456-0.673)	0.737 (0.609-0.901)	0.993 (0.818-1.22)	1.21 (0.989-1.50)	1.52 (1.20-1.94)	1.77 (1.37-2.31)	2.04 (1.54-2.72)	2.32 (1.70-3.19)	2.73 (1.92-3.91)	3.06 (2.08-4.54)
6-hr	0.772 (0.639-0.943)	1.02 (0.845-1.25)	1.37 (1.13-1.68)	1.68 (1.37-2.07)	2.12 (1.67-2.70)	2.48 (1.92-3.23)	2.87 (2.17-3.83)	3.29 (2.42-4.53)	3.91 (2.75-5.60)	4.42 (3.01-6.56)
12-hr	0.987 (0.817-1.21)	1.35 (1.12-1.65)	1.86 (1.54-2.29)	2.31 (1.89-2.85)	2.95 (2.33-3.77)	3.48 (2.69-4.54)	4.05 (3.06-5.42)	4.67 (3.43-6.43)	5.58 (3.93-8.00)	6.34 (4.31-9.41)
24-hr	1.35 (1.19-1.55)	1.92 (1.70-2.21)	2.72 (2.40-3.14)	3.41 (2.98-3.97)	4.41 (3.73-5.31)	5.23 (4.34-6.43)	6.11 (4.95-7.70)	7.08 (5.58-9.17)	8.48 (6.41-11.4)	9.64 (7.04-13.5)
2-day	1.51 (1.34-1.74)	2.13 (1.89-2.46)	3.02 (2.66-3.49)	3.79 (3.32-4.41)	4.92 (4.17-5.92)	5.86 (4.86-7.20)	6.88 (5.57-8.66)	8.00 (6.30-10.4)	9.65 (7.29-13.0)	11.0 (8.06-15.4)
3-day	1.62 (1.43-1.86)	2.27 (2.01-2.62)	3.20 (2.83-3.70)	4.02 (3.52-4.68)	5.22 (4.43-6.29)	6.23 (5.17-7.66)	7.32 (5.93-9.23)	8.54 (6.73-11.1)	10.3 (7.80-13.9)	11.8 (8.64-16.5)
4-day	1.75 (1.55-2.01)	2.45 (2.17-2.82)	3.44 (3.04-3.97)	4.31 (3.77-5.02)	5.60 (4.74-6.74)	6.67 (5.54-8.20)	7.84 (6.35-9.88)	9.14 (7.20-11.8)	11.1 (8.36-14.9)	12.7 (9.26-17.7)
7-day	1.94 (1.72-2.24)	2.69 (2.39-3.11)	3.75 (3.31-4.33)	4.67 (4.09-5.44)	6.03 (5.11-7.26)	7.16 (5.94-8.80)	8.39 (6.79-10.6)	9.74 (7.67-12.6)	11.7 (8.87-15.8)	13.4 (9.80-18.7)
10-day	2.09 (1.85-2.40)	2.87 (2.54-3.31)	3.97 (3.51-4.59)	4.93 (4.32-5.75)	6.33 (5.37-7.63)	7.50 (6.22-9.22)	8.76 (7.10-11.0)	10.2 (8.00-13.2)	12.2 (9.21-16.5)	13.9 (10.2-19.4)
20-day	2.54 (2.25-2.92)	3.46 (3.06-3.99)	4.74 (4.19-5.48)	5.85 (5.13-6.82)	7.46 (6.32-8.99)	8.79 (7.30-10.8)	10.2 (8.29-12.9)	11.8 (9.30-15.3)	14.1 (10.7-19.1)	16.1 (11.7-22.4)
30-day	3.00 (2.66-3.45)	4.06 (3.59-4.68)	5.52 (4.87-6.38)	6.78 (5.94-7.90)	8.60 (7.29-10.4)	10.1 (8.38-12.4)	11.7 (9.50-14.8)	13.5 (10.6-17.5)	16.1 (12.2-21.8)	18.3 (13.4-25.6)
45-day	3.56 (3.16-4.10)	4.75 (4.20-5.47)	6.38 (5.63-7.37)	7.78 (6.82-9.07)	9.80 (8.31-11.8)	11.5 (9.52-14.1)	13.3 (10.7-16.7)	15.3 (12.0-19.8)	18.2 (13.7-24.5)	20.6 (15.1-28.8)
60-day	4.05 (3.59-4.67)	5.32 (4.71-6.13)	7.05 (6.23-8.15)	8.54 (7.48-9.95)	10.7 (9.05-12.9)	12.4 (10.3-15.3)	14.4 (11.6-18.1)	16.5 (13.0-21.3)	19.6 (14.8-26.4)	22.2 (16.2-31.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

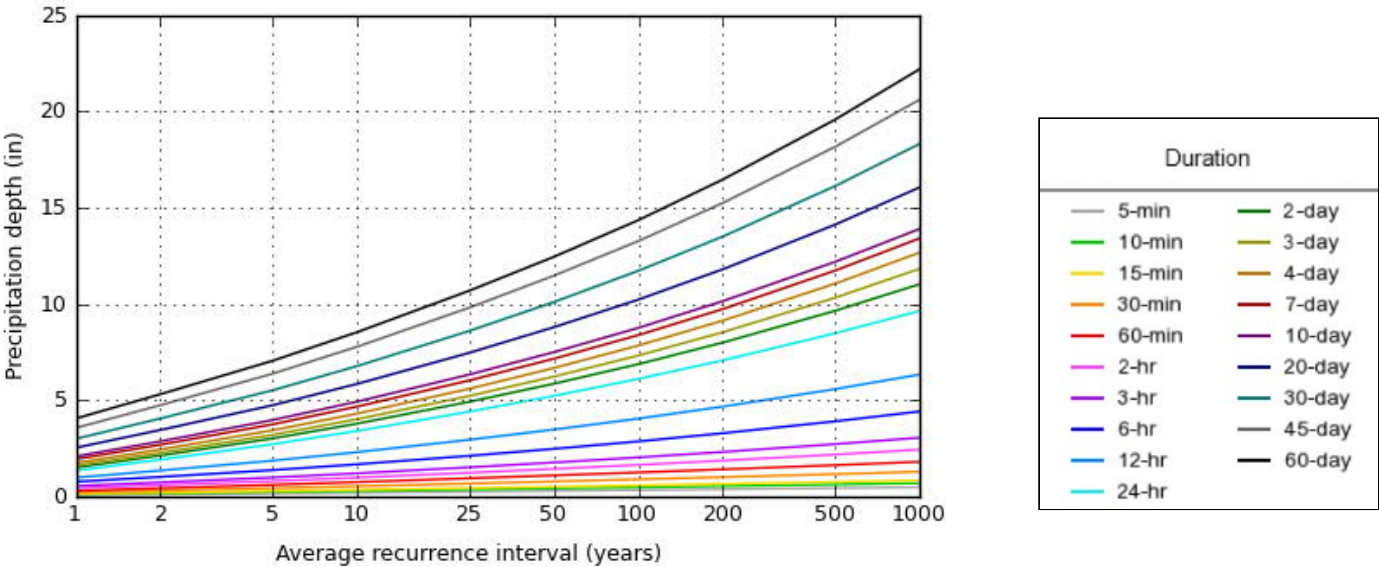
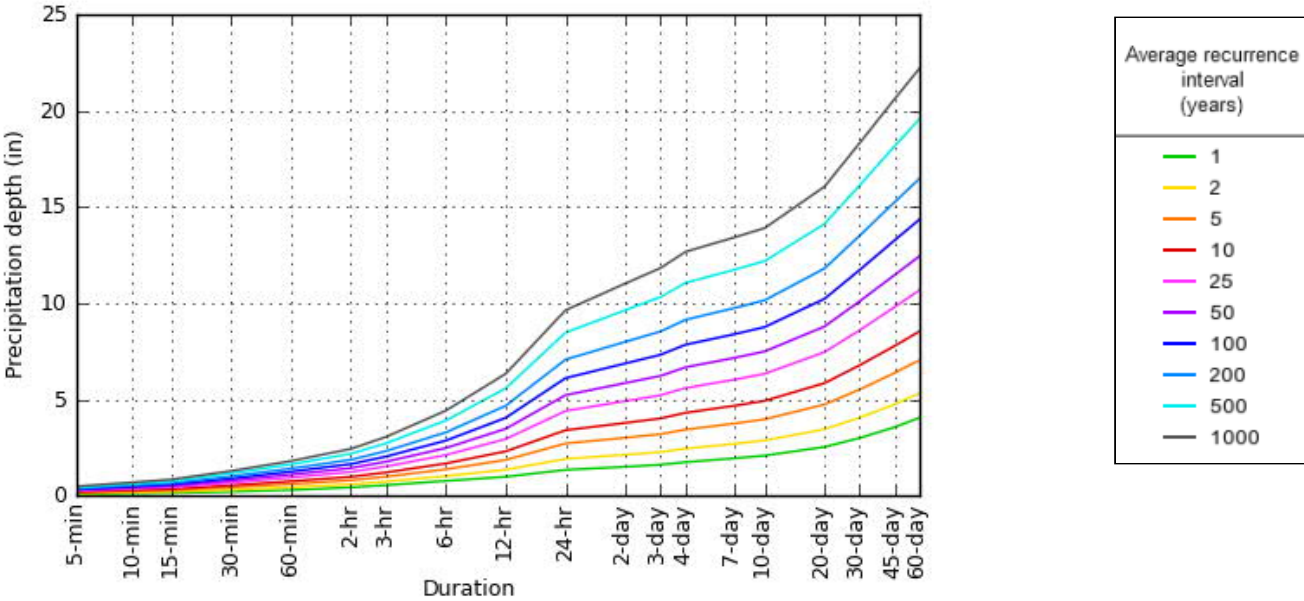
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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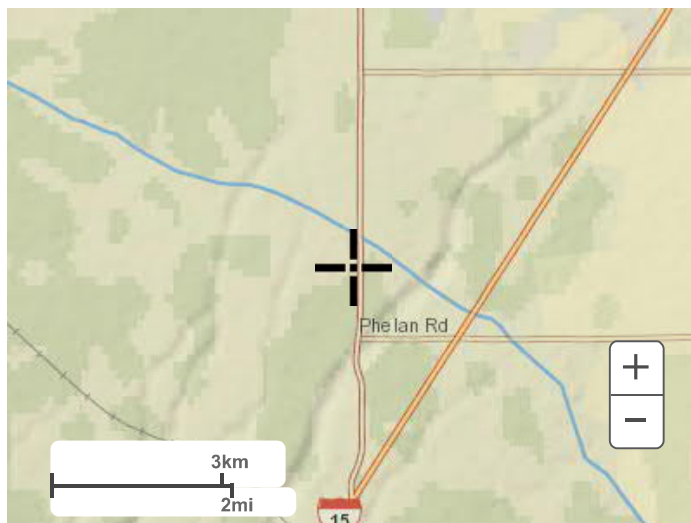
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.4381°, Longitude: -117.4006°



Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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LANDIN ASSOC HESPERIA SANGHA

HESPERIA, CA

MC-4500 STORMTECH CHAMBER SPECIFICATIONS

- CHAMBERS SHALL BE STORMTECH MC-4500.
- CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "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 AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. 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.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

- STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 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.

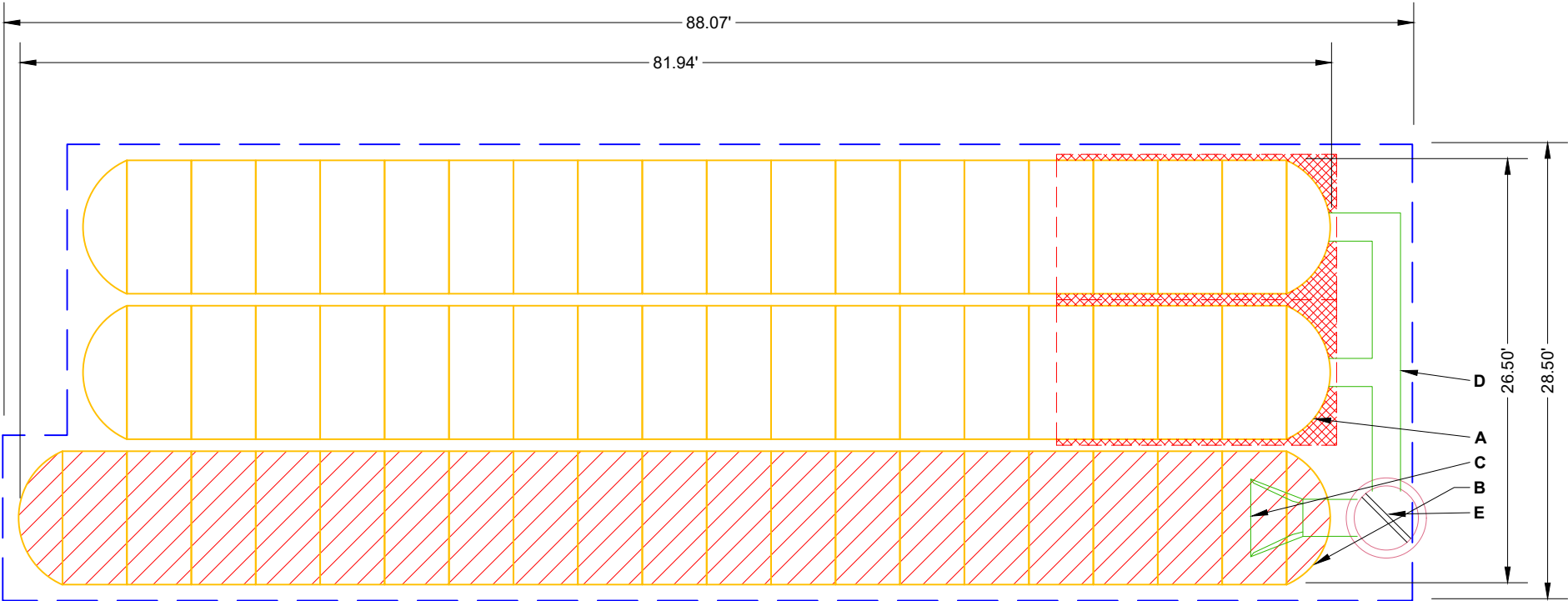
NOTES FOR CONSTRUCTION EQUIPMENT

- STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
- THE USE OF EQUIPMENT OVER MC-4500 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-4500 CONSTRUCTION GUIDE".
 - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 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 1-888-892-2694 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
55	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75	PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
6	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25					
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75	PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC4500IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75					
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75	FLAMP MANIFOLD CONCRETE STRUCTURE W/WEIR	C D E	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MC450024RAMP 18" x 18" BOTTOM MANIFOLD, ADS N-12 (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		11.0 CFS IN
10237	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75					
		TOP OF MC-4500 CHAMBER:	5.75					
		24" ISOLATOR ROW PLUS INVERT:	0.94					
		18" x 18" BOTTOM MANIFOLD INVERT:	0.91					
2437	SYSTEM AREA (SF)	BOTTOM OF MC-4500 CHAMBER:	0.75					
233.2	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00					



 ISOLATOR ROW PLUS (SEE DETAIL)

 PLACE MINIMUM 17.50' OF ADSPPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

 BED LIMITS

NOTES

- 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.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

LANDIN ASSOC HESPERIA SANGHA

HESPERIA, CA

DATE:

PROJECT #:

DRAWN: KW

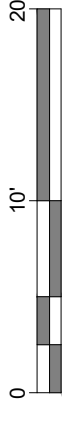
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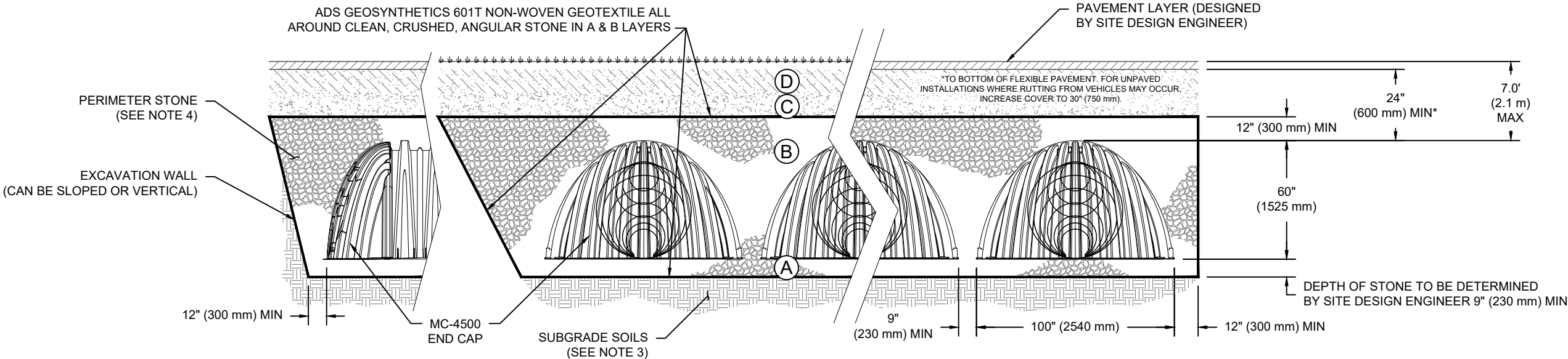
2 OF 5

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ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 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	AASHTO M43 ¹ 3, 4	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43 ¹ 3, 4	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.



NOTES:

- CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
- MC-4500 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.
- 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 AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. 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.

LANDIN ASSOC HESPERIA SANGHA
HESPERIA, CA

DESCRIPTION

CHK

DRW

REV

DATE:

DRAWN: KW

PROJECT #:

CHECKED: N/A

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1-800-733-7473

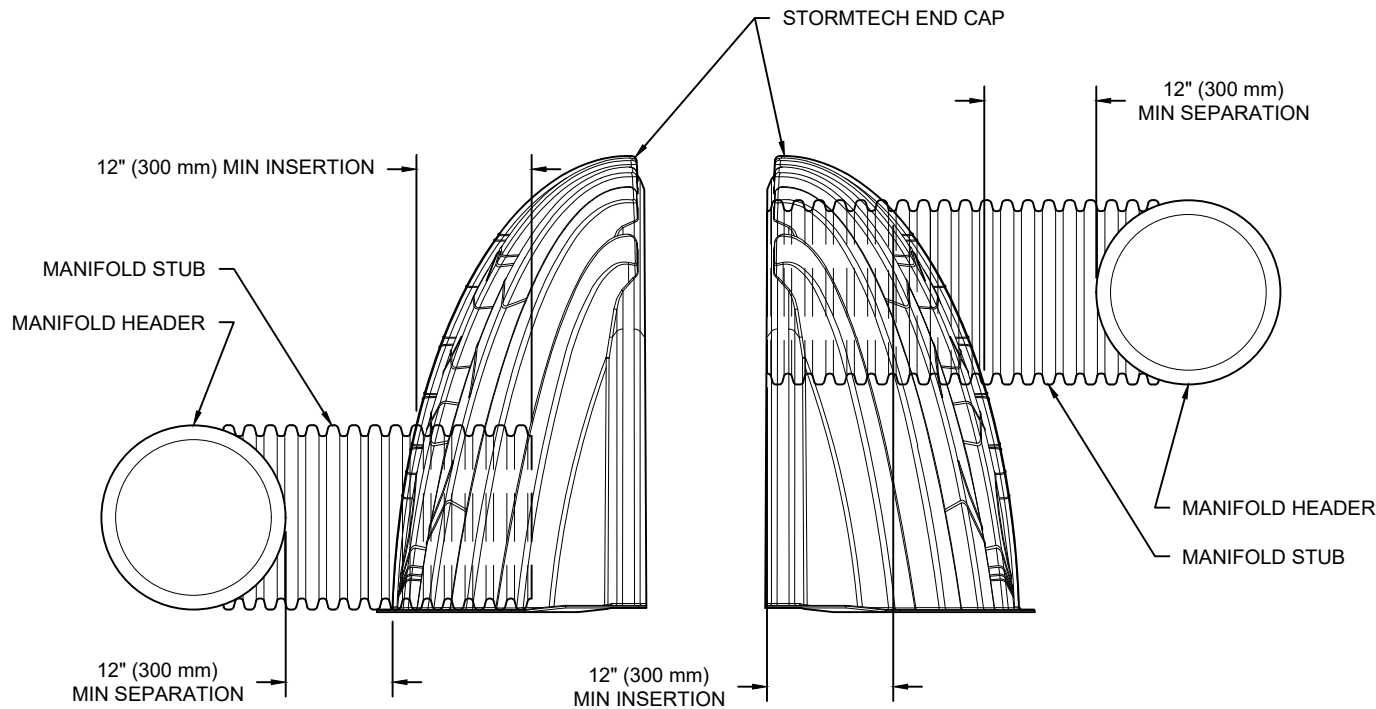
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3 OF 5

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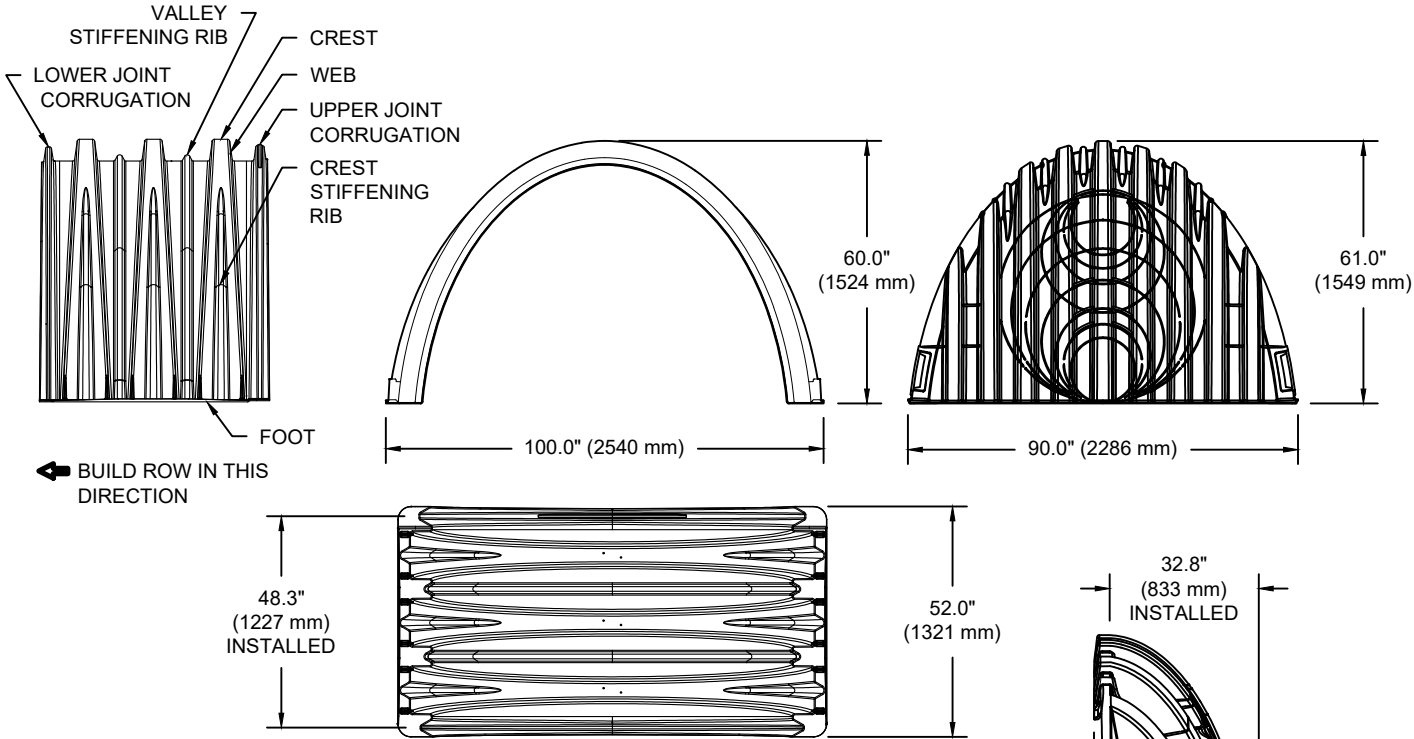
MC-SERIES END CAP INSERTION DETAIL



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

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT (NOMINAL)	125.0 lbs.	(56.7 kg)

NOMINAL END CAP SPECIFICATIONS

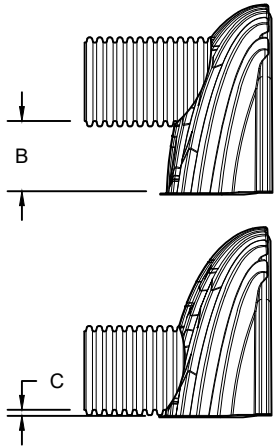
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*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.

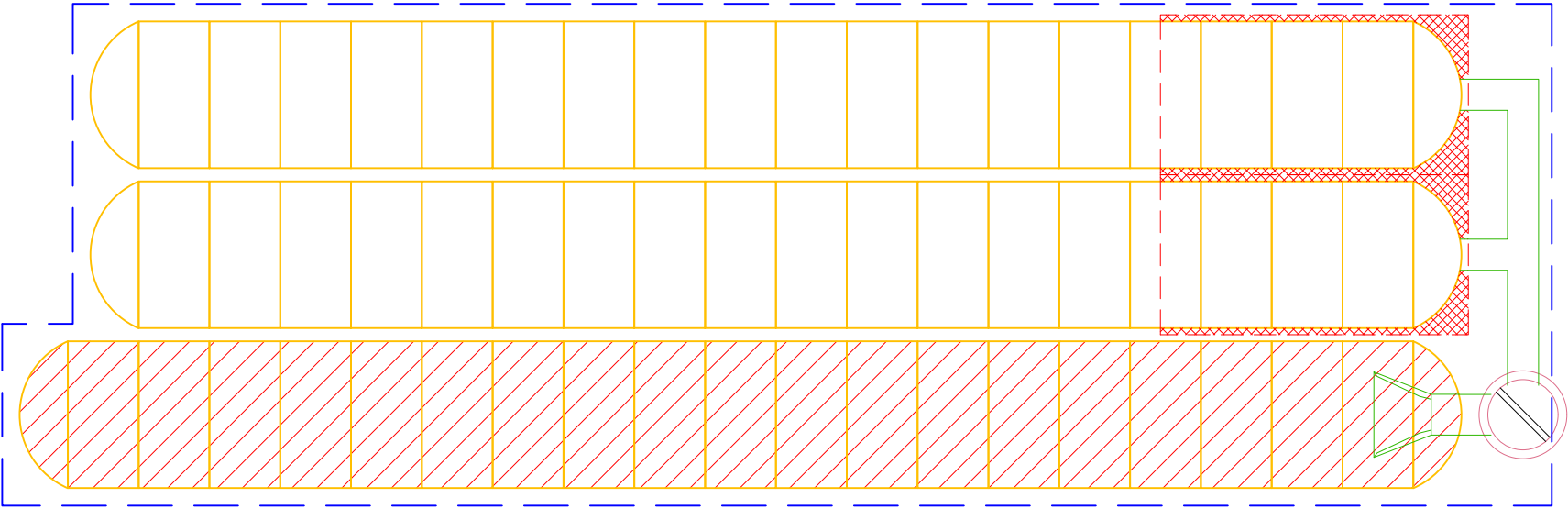
PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC4500IEPP06B		---	0.86" (22 mm)
MC4500IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC4500IEPP08B		---	1.01" (26 mm)
MC4500IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC4500IEPP10B		---	1.33" (34 mm)
MC4500IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC4500IEPP12B		---	1.55" (39 mm)
MC4500IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC4500IEPP15B		---	1.70" (43 mm)
MC4500IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC4500IEPP18TW		---	1.97" (50 mm)
MC4500IEPP18B		---	1.97" (50 mm)
MC4500IEPP18BW	24" (600 mm)	23.05" (585 mm)	---
MC4500IEPP24T		---	2.26" (57 mm)
MC4500IEPP24TW		---	2.26" (57 mm)
MC4500IEPP24B	30" (750 mm)	---	2.95" (75 mm)
MC4500IEPP24BW		---	2.95" (75 mm)
MC4500IEPP30BW		---	3.25" (83 mm)
MC4500IEPP36BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT 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-4500 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.



STORMTECH MC-4500 DMA A	
	DA1 DMA 'A'
V _{storage} (ft ³)	10237
Infiltration Rate (in/hr)	6.0
Factory of Safety	3.5
Design Infiltration Rate (in/hr)	1.7
Infiltration Surface Area (ft ²)	2437
BMP Drawdown Time (Hr)	29.7
	Okay

RAIN GARDEN #1 - DMA A			
Ponding Surface Area (ft ²)	811	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	811	Retention Volume (ft³)	649
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	9822
Amended Soil Porosity	30%	Remaining DCV (ft ³)	9173
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

RAIN GARDEN #2 - DMA A			
Ponding Surface Area (ft ²)	324	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	324	Retention Volume (ft³)	259
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	9173
Amended Soil Porosity	30%	Remaining DCV (ft ³)	8914
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

RAIN GARDEN #3 - DMA A			
Ponding Surface Area (ft ²)	225	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	225	Retention Volume (ft³)	180
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	8914
Amended Soil Porosity	30%	Remaining DCV (ft ³)	8734
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

RAIN GARDEN #4 - DMA A			
Ponding Surface Area (ft ²)	580	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	580	Retention Volume (ft³)	464
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	8734
Amended Soil Porosity	30%	Remaining DCV (ft ³)	8270
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

RAIN GARDEN #5 - DMA A			
Ponding Surface Area (ft ²)	109	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	109	Retention Volume (ft³)	87
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	8270
Amended Soil Porosity	30%	Remaining DCV (ft ³)	8183
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

RAIN GARDEN #6 - DMA A			
Ponding Surface Area (ft ²)	98	Gravel Depth, 0.5 min. (ft)	0.0
Ponding Depth, 0.5 min. (ft)	0.5	Gravel Porosity	40%
Soil/Gravel Surface Area (ft ²)	98	Retention Volume (ft³)	78
Amended Soil Depth, 1.0 min. (ft)	1.0	DCV (ft ³)	8183
Amended Soil Porosity	30%	Remaining DCV (ft ³)	8104
		INPUT DATA	
		CALCULATED DATA	

* Retention Volume = (Surface Area x Ponding Depth) + (Surface Area x Amended Soil Depth x Amended Soil Porosity) + (Surface Area x Gravel Depth x Gravel Porosity)

6.4.D – County Education Materials

POLLUTION ^{STORMWATER} Prevention

Important Phone Numbers

San Bernardino County Flood Control
(909) 387-8112

County of San Bernardino
(909) 387-8109

City of Big Bear Lake
(909) 866-5831

City of Chino (909) 591-9850

City of Chino Hills (909) 364-2722

City of Colton (909) 370-6128

City of Fontana (909) 350-6772

City of Grand Terrace
(909) 824-6671 x 226

City of Highland (909) 864-8732 x 230

City of Loma Linda (909) 799-4405

City of Montclair (909) 625-9470

City of Ontario (909) 395-2025

City of Rancho Cucamonga
(909) 477-2740 x 4063

City of Redlands (909) 798-7655

City of Rialto (909) 421-4921

City of San Bernardino (909) 384-5154

City of Upland (909) 931-4370

City of Yucaipa (909) 797-2489 x 243



San Bernardino County Stormwater Program

825 East Third Street • Room 201
San Bernardino, CA 94215-0835

POLLUTION ^{STORMWATER} Prevention

INDUSTRIAL AND COMMERCIAL FACILITIES



Pollution ^{STORMWATER} Prevention

To reduce the amount of pollutants reaching our storm drain system, which leads to the Santa Ana River and Pacific Ocean, the San Bernardino County Stormwater Program has developed Best Management Practices (BMPs) for Industrial and Commercial Facilities. City and County ordinances require that businesses comply with these BMPs, where applicable, to protect local water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.



Prohibited Discharges

- Discontinue all non-stormwater discharges to the storm drain system. It is prohibited to discharge any chemicals, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, except when in direct use.
- Sweep outdoor areas instead of using a hose or pressure washer.

Outdoor Processes

- Move all process operations including vehicle and equipment maintenance inside of the building or into a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to city standards, then discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Ups

- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials and followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors, vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the County Fire Department at (909) 386-8401.

Industrial and Commercial Facilities

- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator either at (800) CLEANUP or as listed at www.sbcounty.gov/stormwater.
- Report hazardous materials spills to (800) 33 TOXIC and your local Fire Department Hazmat Team at 911.

Training

Train employees in spill response procedures and prohibited discharges to the storm drain system, as prescribed in your local Stormwater Ordinance and in applicable Best Management Practices available at www.cabmphandbooks.com and www.sbcounty.gov/stormwater.

Permitting

Stormwater discharges associated with specific categories of commercial and industrial facilities are regulated by the State Water Resources Control Board (SWRCB) through an Industrial Storm Water General Permit. A copy of the General Permit and application forms are available at: www.waterboards.ca.gov/stormwtr/industrial.html

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

or visit our websites at:

www.sbcounty.gov/stormwater

www.1800cleanup.org



Prevención de Contaminación AL SISTEMA DE DRENAJE

Números de Teléfono Importantes

San Bernardino County Flood Control
(909) 387-8112

County of San Bernardino
(909) 387-8109

City of Big Bear Lake
(909) 866-5831

City of Chino (909) 591-9850

City of Chino Hills (909) 364-2722

City of Colton (909) 370-6128

City of Fontana (909) 350-6772

City of Grand Terrace
(909) 824-6671 x 226

City of Highland (909) 864-8732 x 230

City of Loma Linda (909) 799-4405

City of Montclair (909) 625-9470

City of Ontario (909) 395-2025

City of Rancho Cucamonga
(909) 477-2740 x 4063

City of Redlands (909) 798-7655

City of Rialto (909) 421-4921

City of San Bernardino (909) 384-5154

City of Upland (909) 931-4370

City of Yucaipa (909) 797-2489 x 243

San Bernardino County Stormwater Program

825 East Third Street • Room 201
San Bernardino, CA 94215-0835



Prevención de Contaminación AL SISTEMA DE DRENAJE

INSTALACIONES INDUSTRIALES Y COMERCIALES



Prevención de Contaminación AL SISTEMA DE DRENAJE

Para reducir la cantidad de contaminantes que alcanzan nuestro sistema de aguas pluviales, las cuales desembocan en el Río Santa Ana y el Océano Pacífico, el Programa del Condado de San Bernardino ha desarrollado las pautas de Mejores Prácticas de Manejo (BMPs, por sus siglas en inglés) para instalaciones industriales y comerciales. Los decretos de la ciudad y del condado establecen que todas las empresas deben de cumplir con estas BMPs, cuando corresponda, para proteger la calidad del agua local. Las ciudades locales y el condado tienen la obligación de verificar la implementación de estas BMPs al llevar a cabo inspecciones regulares en sus instalaciones.



Desagües Prohibidos

- Descontinúe todo desagüe de aguas no pluviales al sistema de drenaje de aguas pluviales. Está prohibido descargar cualquier sustancia química, residuo o agua residual a los drenajes de la cuneta, de la calle o de aguas pluviales.

Almacenamiento al Aire Libre

- Instale cubiertas y áreas de retención secundarias para todos los materiales peligrosos y residuos almacenados al aire libre, estas instalaciones deberán de cumplir con los estándares establecidos por el condado y/o la ciudad.
- Mantenga todos los recipientes temporales de residuos cubiertos, con la excepción de cuando se estén utilizando directamente.
- Barra todas las áreas al aire libre en lugar de usar una manguera o un equipo de limpieza con agua a alta presión.

Procesos al Aire Libre

- Reubique todos los procesos u operaciones, incluyendo el mantenimiento de vehículos y equipo, dentro de un edificio en una área cubierta e independiente.
- Lave el equipo y los vehículos en una fosa de lavado independiente que tenga un anillo cerrado o bien, esté conectada a un clarificador del tamaño de los estándares municipales, luego elimine los residuos en un drenaje sanitario o llévelos a un lavador de carros comercial.

Derrames y Limpieza

- Limpie los derrames inmediatamente, utilice métodos de limpieza en seco como son el uso de materiales absorbentes y elimine estos materiales de la manera adecuada.
- Siempre tenga a la mano un estuche para derrames cerca de las puertas de los muelles de carga de sustancias químicas, en las áreas de mantenimiento de vehículos y en las áreas de combustible.
- Siga su Plan de Emergencia Comercial, como lo registró con el Departamento de Bomberos del

Instalaciones Industriales y Comerciales

Condado marcando al (909) 386-8401.

- Reporte todos los desagües prohibidos y cualquier punto no implementado de las BMPs a su coordinador local de Aguas Pluviales llamando al (800) CLEANUP o como se indica en el enlace www.sbcounty.gov/stormwater.
- Reporte cualquier derrame peligroso al (800) 33 TOXIC y al equipo Hazmat de su departamento local de bomberos marcando al 911.

Capacitación

Capacite a los empleados sobre los procedimientos de respuesta ante un derrame y los desagües prohibidos al sistema de aguas pluviales, como lo indica el decreto local de aguas pluviales de Mejores Prácticas de Manejo (BMPs) disponibles en el sitio www.cabmphandbooks.com y www.sbcounty.gov/stormwater.

Autoridad Competente

Los desagües de aguas pluviales relacionados con categorías específicas de instalaciones comerciales e industriales están regulados por la Junta Estatal de Control de Recursos Acuáticos (State Water Resources Control Board, SWRCB) a través de un permiso industrial general de aguas pluviales. Para obtener una copia de este permiso general y una solicitud, visite el sitio: www.waterboards.ca.gov/stormwtr/industrial.html

Para reportar el desagüe de residuos ilegales o para obtener información adicional sobre la prevención de contaminación a las aguas pluviales, llame a:

1 (800) CLEANUP

o visite nuestro sitio:

www.sbcounty.gov/stormwater

www.1800cleanup.org



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San Bernardino County Stormwater Program

825 East Third Street - Room 127

San Bernardino, CA 94215-0835



STORMWATER Pollution Prevention

LANDSCAPE MAINTENANCE



Pollution ^{STORMWATER} Prevention

Stormwater Management Practices for Commercial Landscape Maintenance

Yard waste, sediments, and toxic lawn/garden chemicals used in commercial landscape maintenance often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates local waterways, making them unsafe for people and wildlife. Following these best management practices will prevent pollution, comply with regulations and protect public health.

Recycle Yard Waste

Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Try grasscycling – the natural recycling of grass by leaving clippings on the lawn when mowing. Grass clippings will quickly decompose, returning valuable nutrients to the soil. Further information can be obtained at www.ciwmb.ca.gov/Organics.

Use Fertilizers, Herbicides and Pesticides Safely

Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use of natural, non-toxic alternatives to the traditional fertilizers, herbicides and pesticides is highly recommended. If you must use chemical fertilizers, herbicides, or pesticides:

- Spot apply pesticides and herbicides, rather than blanketing entire areas.
- Avoid applying near curbs and driveways, and never apply before a rain.
- Apply fertilizers as needed, when plants can best use it, and when the potential for it being carried away by runoff is low.

Recycle Hazardous Waste

Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility, which accepts these types of materials. For information on proper disposal call, (909) 386-8401.

Use Water Wisely

Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff. Periodically inspect, fix leaks and realign sprinkler heads. Plant native vegetation to reduce the need of water, fertilizers, herbicides, and pesticides.

Prevent Erosion

Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways.

- Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff.
- Avoid excavation or grading during wet weather.

Store Materials Safely

Keep landscaping materials and debris away from the street, gutter and storm drains. On-site stockpiles of materials must be covered with plastic sheeting to protect from rain, wind and runoff.

To report illegal dumping call
(877) WASTE18
or visit our website:
sbcountystormwater.org



POLLUTION ^{STORMWATER} Prevention

FRESH CONCRETE & MORTAR APPLICATION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



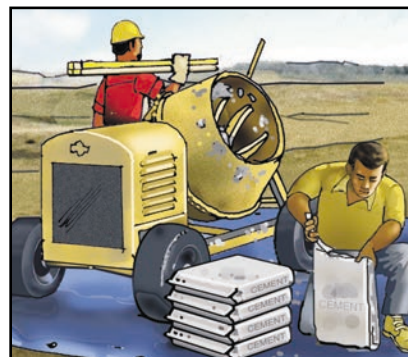
Storing Materials

Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. Call (909) 386-8401 for recycling and disposal information.



During Construction

Schedule excavation and grading during dry weather. Prevent mortar and cement from entering the street and storm drains by placing erosion controls. Setup small mixers on tarps or drop cloths, for easy cleanup of debris. Never bury waste material. Recycle or dispose of it as hazardous waste.

Cleaning Up

Wash concrete dust onto designated dirt areas, not down driveways or into the street or storm drains. Wash out concrete mixers and equipment in specified washout areas, where water can flow into a containment pond. Cement washwater can be recycled by pumping it back into cement mixers for reuse. Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

APLICANDO CONCRETO FRESCO

Cemento, grava, asfalto y líquidos de auto, tierra y residuos peligrosos de lugares de concreto fresco por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas prácticas para prevenir la contaminación y proteger la salud pública.



Almacenando Materiales

Manten materiales de construcción y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cubiertos con algún plástico para protegerlos de la lluvia, el aire y el desagüe.



Ordenando Materiales & Reciclando

Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales reciclables cuando sea posible. Cuando estes rompiendo el pavimento, recicla los pedasos en la compañía demolidora. Se puede reciclar el asfalto, concreto, madera y la vegetación. Materiales no reciclados se deberian llevar a lugares de desechos peligrosos. Llama al (909) 386-8401 para más información.



Durante Construcción

Planea las excavaciones durante clima seco. No dejes que el cemento o la cal lleguen hasta las calles o drenajes, evita esto con plantas temporales para detener el desagüe. Cubre las maquinas de mezclar con alguna garra para que se facilite la limpieza de residuos. Nunca entierres los desechos. Recicla todos los desechos peligrosos.

Limpiando

Lava la cal en un area designada, no la eches hacia la cochera o en la calle. Lava las mezcladoras y las herramientas en un lugar especifico, donde el agua llegue a un contenedor. El agua de cemento se puede reciclar volviendola a usar en las mezcladoras. Nunca dejes el agua de cemento que corra hacia las calles, alcantarillas o drenajes.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al :

1 (800) CLEANUP

www.1800cleanup.org



Pollution Prevention

CONSTRUCTION

Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.



Store Materials Safely

Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



Ordering Materials & Recycling Waste

Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.



Cleaning & Preventing Spills

Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.



Preventing Erosion

Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydromulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Channels can be lined with grass or roughened pavement to reduce runoff velocity.



Maintaining Vehicles & Equipment

Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, brake and radiator fluids.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

CONSTRUCCIÓN

Cemento, sedimentos, líquidos de auto, polvos y residuos peligrosos acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.



Almacenando Materiales Cuidadosamente

Manten materiales de construcción y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y herramientas para excavar cubiertos con algun plastico para protegerlos de la lluvia, el aire y el desagüe.



Ordenando Materiales & Reciclando Desechos

Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales que se puedan reciclar cuando sea posible. Se puede reciclar el asfalto, concreto, madera y la vegetacion. Materiales no reciclados se deben llevar a lugares de desechos peligrosos. Para mas información llama al (909) 386-8401.



Limpiando & Previendo Derrames

Usa siempre un embudo al vaciar líquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Para reportar derrames llama al 911.



Previendo Erosiones

Evita las excavaciones durante lluvia. Planta vegetacion temporal en colinas donde aun no hay planes de construccion y planta vegetacion permanente al terminar las excavaciones. Construye algunos canales para el desagüe. Estos pueden ser creados con pasto y cemento para reducir la velocidad del desagüe.



Mantenimiento de Vehiculos & Herramientas

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura y preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador.

Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al :

1 (800) CLEANUP

www.1800cleanup.org



POLLUTION ^{STORMWATER} Prevention

HOME & GARDEN

Yard waste and household toxics like paints and pesticides often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.



Recycle Household Hazardous Waste

Household products like paint, pesticides, solvents and cleaners are too dangerous to dump and too toxic to trash. Take them to be recycled at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



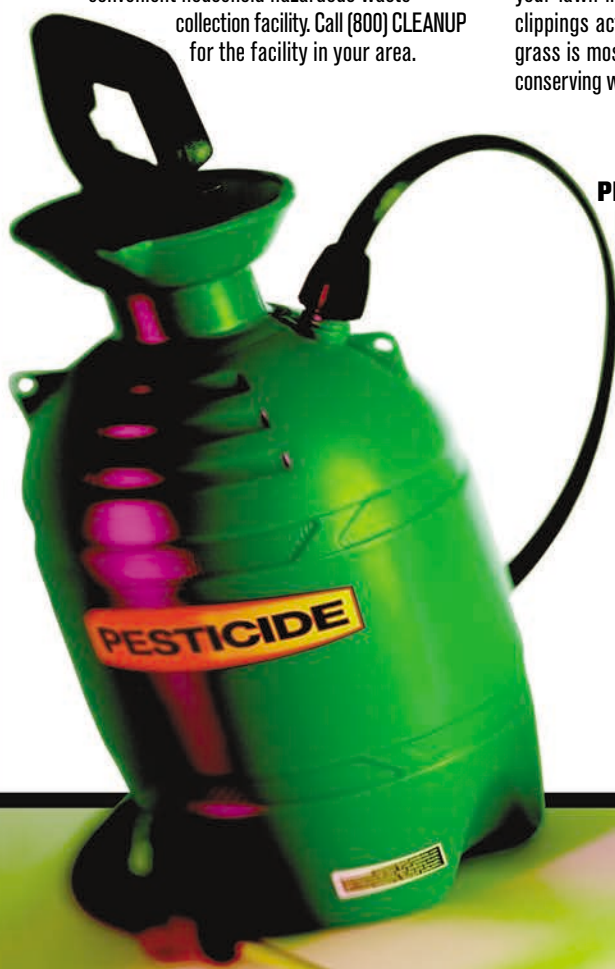
Disposing of Yard Waste

Recycle leaves, grass clippings and other yard waste, instead of blowing, sweeping or hosing into the street. Try grasscycling, leaving grass clippings on your lawn instead of using a grass catcher. The clippings act as a natural fertilizer, and because grass is mostly water, it also irrigates your lawn, conserving water.



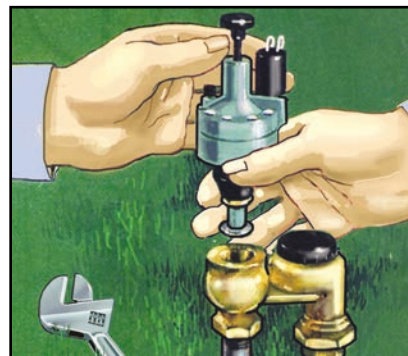
Use Fertilizers & Pesticides Safely

Fertilizers and pesticides are often carried into the storm drain system by sprinkler runoff. Try using organic or non-toxic alternatives. If you use chemical fertilizers or pesticides, avoid applying near curbs and driveways and never apply before a rain.



Planting in the Yard

Produce less yard waste and save water by planting low maintenance, drought-tolerant trees and shrubs. Using drip irrigation, soaker hoses or micro-spray systems for flower beds and vegetation can also help reduce your water bill and prevent runoff.



Use Water Wisely

Cut your water costs and prevent runoff by controlling the amount of water and direction of sprinklers. The average lawn needs about an inch of water a week, including rainfall, or 10 to 20 minutes of watering. A half-inch per week is enough for fall and spring. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

JARDIN

Basura del jardín y otros tóxicos caseros como pintura, pesticidas y otros más acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas prácticas para prevenir la contaminación y proteger la salud pública.



Disponiendo Desechos del Jardín

Recicla hojas, pasto y otras basuras del jardín en ves de soplarlas, barrerlas hacia la calle. El pasto sirve como fertilizante, y como el pasto es la mayoría agua también riega tu jardín, ahorrándote agua.



Reciclando Materiales del Hogar Peligrosos

Limpiadores del hogar como pintura, pesticidas, solventes y limpiadores son demasiado tóxicos para tirarlos en la basura. Desechalos en un lugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu área.



Usando Fertilizantes & Pesticidas Adecuadamente

Fertilizantes y pesticidas muchas veces terminan en los drenajes. Usa alternativas que no sean tóxicas. Si tu usas fertilizantes y pesticidas con químicos, no los uses cerca de las banquetas y cocheras y nunca los uses en tiempos de lluvia.



Cembrando en el Jardín

Reduce la basura del jardín y ahorra agua plantando árboles y plantas de bajo mantenimiento. Riega moderadamente con mangueras u otros métodos para las flores o vegetación así reducirás tu pago del mes y previenes el desagüe.



Usando el Agua Adecuadamente

Reduce el pago del agua y previene el desagüe controlando la cantidad y dirección de tus regaderas para el jardín. Solo necesitas regar de 10 a 20 minutos a la semana. Durante la primavera y otoño es la mitad. Las regaderas del jardín deberían estar ajustadas a que rieguen lo suficiente y evitar el desagüe.

Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al :

1 (800) CLEANUP

www.1800cleanup.org



POLLUTION ^{STORMWATER} Prevention

HOME REPAIR & REMODELING

Paints, solvents, adhesives and other toxic substances used in home repair and remodeling often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.



Construction Projects

Keep construction debris away from the street, gutter and storm drains. Schedule grading and excavation projects for dry weather. Cover excavated material and stockpiles of soil, sand or gravel, protected from rain, wind and runoff. Prevent erosion by planting fast-growing annual and perennial grass, which can shield and bind soil.

Recycle Household Hazardous Waste

Household cleaners, paint and other home improvement products like wallpaper and tile adhesives are too toxic to trash. Recycle them instead, at a convenient household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



Landscaping & Gardening

Avoid applying fertilizers or pesticide near curbs and driveways, and store covered, protected from rain, wind and runoff. Try using organic or non-toxic alternatives. Reduce runoff and lower your water bill by using drip irrigation, soaker hoses or micro-spray systems. Recycle leaves instead of blowing, sweeping or raking them into the street, gutter or storm drain.

Paint Removal

Paint stripping residue, chips and dust from marine paints and paints containing lead or tributyl tin are hazardous wastes. Sweep them up instead of hosing into the street and dispose of them safely at a household hazardous waste collection facility.



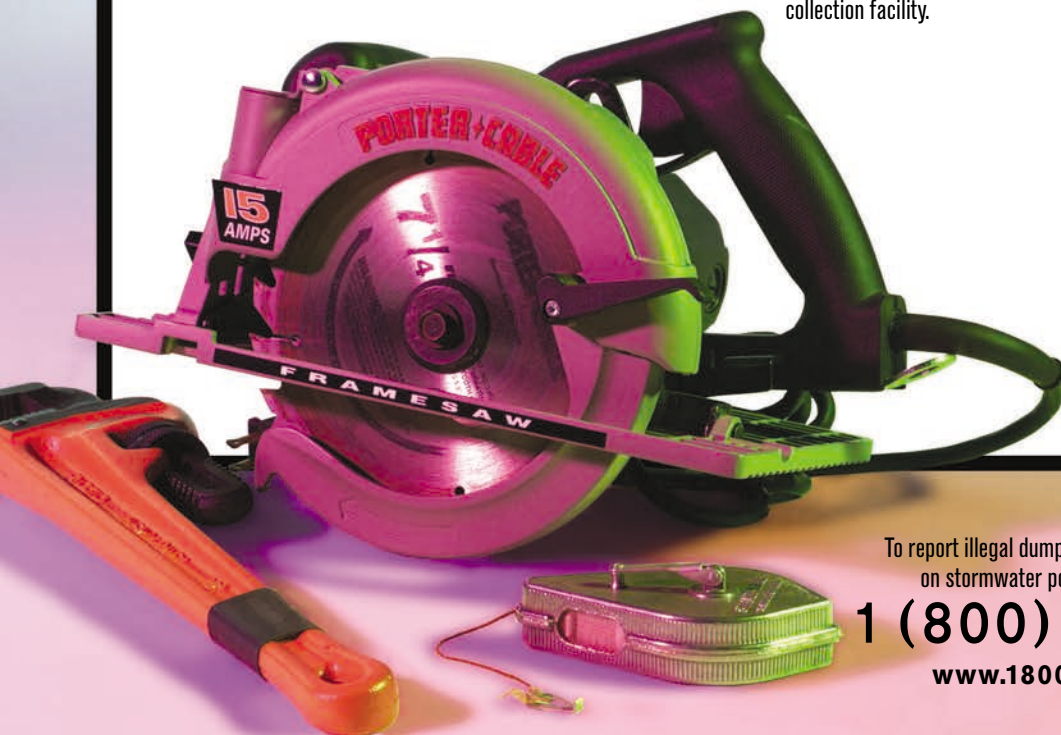
Painting Cleanup

Avoid cleaning brushes or rinsing paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink. Clean oil-based paints with thinner, which you can filter and reuse. Recycle leftover paint at a household hazardous waste collection facility, save it for touch ups or give it to someone who can use it, like a theatre group, school, city or community organization.



Concrete and Masonry

Store bags of cement and plaster away from gutters and storm drains, and cover them to protect against rain, wind and runoff. Sweep or scoop up cement washout or concrete dust instead of hosing into driveways, streets, gutters or storm drains.



To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

MEJORAS DEL HOGAR

Pintura, solventes y otros químicos peligrosos que se usan al las mejoras del hogar acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciendola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.



Proyectos de Construcción

No dejes que los residuos de la construcción terminen en la calle, coladeras o desagües. Planea tus excavaciones durante el clima seco. Cubre tus excavaciones durante el clima seco. Cubre tus excavaciones durante el clima seco. Cubre tus excavaciones durante el clima seco. Cubre tus excavaciones durante el clima seco.

Reciclando Materiales del Hogar Peligrosos

Limpiadores del hogar, pintura y otros productos como la pegadura para el papel para las paredes y azulejo son demasiado toxicos para tirarlos a la basura. Desechalos en un lugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.



Jardineria

Evita usar los fertilizantes o pesticidas cerca de la banqueta o cocheras, y tapalos bien para protegerlas de la lluvia, el aire y el desagües. Usa productos no toxicos u organicos. Reduce tu pago del agua usando otros tipos de erosiones. Recicla las hojas en ves de soplarlas o barrerlas asia la calle, coladeras o alcantarillas.



Limpiando Pintura

Nunca laves las brochas ni los contenedores de pintura en la calle, coladeras o desagües. Las de pintura de agua limpialas en el labavo y las de pintura de aceite con thinner, y vuelvelas a guardar en un frasco, para un uso futuro. Envuelve los residuos de pintura en un periodico y tiralos a la basura.

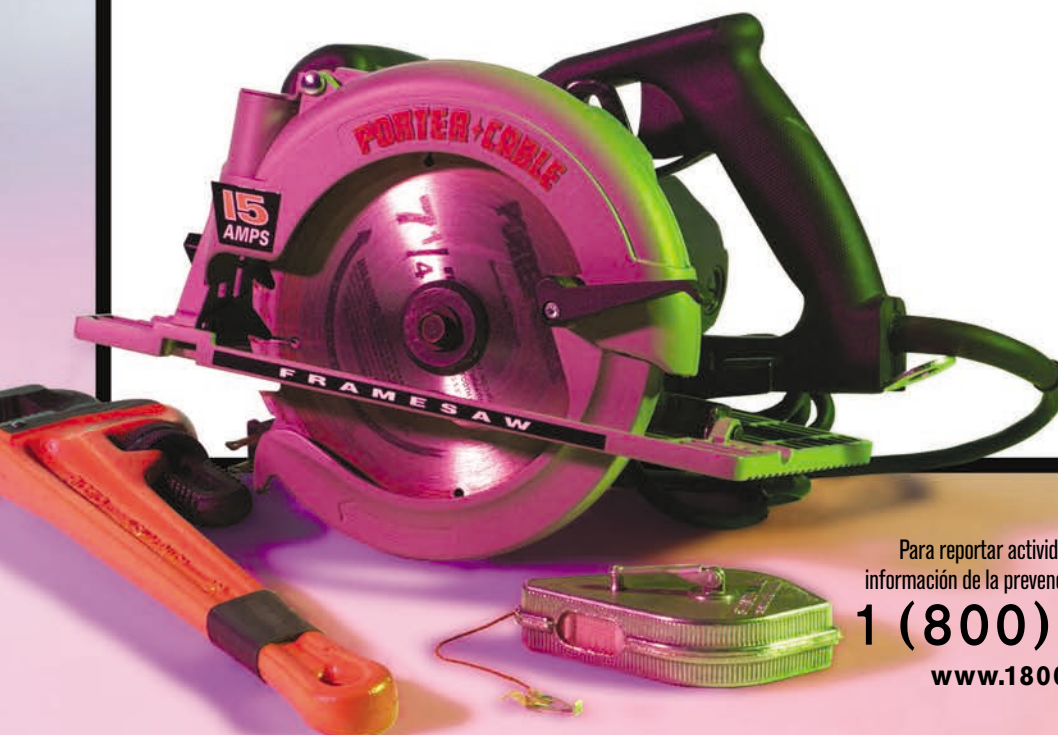
Removiendo Pintura

Residuos de pintura, polvo de pintura y pinturas que contienen plomo son peligrosas. Barrelos en ves de lavarlos con la manguera y desechalos en un lugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.



Concreto & Albañilería

Almacena bolsas de cemento y pegaduras lejos de las coladeras y alcantarillas, y cubrelos para protegerlos de la lluvia, viento y desagües. Barre o recoge el cemento o concreto en ves de lavarlos con la manguera hacia la cochera, calles o drenajes.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al :

1 (800) CLEANUP

www.1800cleanup.org



POLLUTION ^{STORMWATER} Prevention

PAINTING

Paints, solvents, adhesives and other toxic chemicals used in painting often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect our health.



Water-Based Paints

Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."



Paint Removal

Sweep up paint stripping residue, chips and dust instead of hosing into the street and dispose of them safely at a household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



Painting Cleanup

Never clean brushes or rinse paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink. Clean oil-based paints with thinner, which can be reused by putting it in a jar to settle out the paint particles and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.

Exterior Paint Removal

When stripping or cleaning building exteriors with high-pressure water, block nearby storm drains and divert washwater onto a designated dirt area. Ask your local wastewater treatment authority if you can collect building cleaning water and discharge it to the sewer.



Recycling Paint

Recycle leftover paint at a household hazardous waste collection facility, save it for touch ups or give it to someone who can use it, like a theatre group, school, city or community organization.

To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org



Prevención de Contaminación del Desagüe

PINTURA

Pintura, solventes y otros químicos peligrosos que se usan al pintar acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciéndola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.



Pinturas de Agua

Usa pinturas de agua cuando sea posible. Son menos toxicas que las pinturas de aceite y mas faciles para limpiar. Busca los productos "latex" or "cleans with water".



Removiendo Pintura

Residuos de pintura, polvo de pintura y pinturas que contienen plomo son peligrosas. Barrelos en ves de lavarlos con la manguera y desechalos en un lugar de colección de desechos peligrosos. Llama al (800) CLEANUP para un lugar en tu area.



Limpiando Pintura

Nunca laves las brochas ni los contenedores de pintura en la calle, coladeras o desagües. Las de pintura de agua limpialas en el lavabo y las de pintura de aceite con thinner, y vuélvelas a guardar en un frasco, para un uso futuro. Envuelve los residuos de pintura en un periodico y tiralos a la basura.

Removiendo Pintura en Exteriores

Al despintar o lavar exteriores de los edificios con agua de alta presión bloquea los drenajes cercanos y desvia el desagüe. Pregunta las autoridades si puedes desecharla en las alcantailas.



Reciclando Pintura

Recicla la pintura que sobra en un lugar de colección de materiales peligrosos, guardala para re-toques or regalala a alguien que la use, como a un teatro, a la escuela, una oraganizacion de la ciudad o de la comunidad.

Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al :

1 (800) CLEANUP

www.1800cleanup.org



Fertilizer Tips to Prevent Pollution

Water that runs off your lawn and garden can carry fertilizer into the San Bernardino County storm drain system, and it does not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.

- Read the product label and follow the directions carefully, using only as directed.
- Avoid applying near driveways or gutters.
- Never apply fertilizer before a rain.
- Store fertilizers and chemicals in a covered area and in sealed, waterproof containers.
- Take unwanted lawn or garden chemicals to a household hazardous waste collection facility. Call (800) 253-2687 for the location of your city's facility.
- Use non-toxic products for your garden and lawn whenever possible.



To report illegal dumping or for more information on Stormwater pollution prevention, call:

1 (800) CLEANUP
www.1800cleanup.org

Consejos de Prevención Para la Contaminación de Fertilizantes.

El desagüe del jardín puede llevar fertilizantes que acaben por llegar a los drenajes del Condado de San Bernardino y terminando en el Río de Santa Ana. Esto contamina el agua que tomamos, haciendola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.

- Leer las etiquetas del producto y seguir las instrucciones cuidadosamente, usarlas tal como se indica.
- Evita aplicarlos cerca de la cocheras o las alcantarillas.
- Nunca aplicar el fertilizante antes de llover.
- Guarda los fertilizantes y otros quimicos en un lugar cuvierto y en contenedores contra agua.
- Desechalos en un lugar de colección de desechos peligrosos. Llama al (800) 253-2687 para información de un centro cerca a ti.
- Trata de usar productos no-toxicos para tu jardín cada vez que sea posible.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al:

1 (800) CLEANUP
www.1800cleanup.org

English side

Spanish side

Paint Tips to Prevent Pollution

Washing a paint brush or dumping rinse water in the gutter allows toxic chemicals to flow into the San Bernardino County storm drain system, and they do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.

- Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."
 - Don't clean brushes or rinse paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink and oil-based paints with thinner.
- Recycle leftover paint at a household hazardous waste collection facility. Call (800) 253-2687 for the location of your city's facility.



To report illegal dumping or for more information on Stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

Consejos de Prevención Para la Contaminación de Pintura.

Lavar las brochas de pintura o arrojar agua sucia en el desagüe acaba por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.

- Usa pinturas de agua cuando sea posible. Son menos toxicas que las pinturas de aceite y mas faciles para limpiar. Busca los productos "latex" or "cleans with water".
- Nunca laves las brochas ni los contenedores de pintura en la calle, coladeras o desagües. Las de pintura de agua limpialas en el labavo y las de pintura de aceite con thinner.
- Recicla la pintura que sobra en un lugar de colección de materiales peligrosos. Llama al (800) 253-2687 para información de un centro cerca a ti.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al:

1 (800) CLEANUP

www.1800cleanup.org

English side

Spanish side

Pesticide Tips to Prevent Pollution

Water that runs off your lawn and garden can carry pesticide into the San Bernardino County storm drain system, and it does not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these simple tips to prevent pollution and protect your health.

- Read the product label and follow the directions carefully, using only as directed.
- Spot apply rather than blanketing an entire area.
- Don't apply pesticide before a rain.
- Use non-toxic products for your garden and lawn whenever possible.
- Take unwanted lawn or garden chemicals to a household hazardous waste collection facility. Call (800) 253-2687 for the location of your city's facility.



To report illegal dumping or for more information on Stormwater pollution prevention, call:

1 (800) CLEANUP
www.1800cleanup.org

Consejos de Prevención Para la Contaminación de Pesticidas.

El desagüe del jardín puede llevar pesticidas que acaben por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligrosa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y proteger la salud publica.

- Leer las etiquetas del producto y seguir las instrucciones cuidadosamente, usarlas tal como se indica.
- Apliqua solo parte por parte, no en areas grandes.
- No aplique los pesticidas antes de que llueva.
- Trata de usar productos no-toxicos para tu jardín cada vez que sea posible.
- Desechalos en un lugar de colección de desechos peligrosos. Llama al (800) 253-2687 para información de un centro cerca a ti.



Para reportar actividades ilegales u obtener más información de la prevención de contaminación llamar al:

1 (800) CLEANUP
www.1800cleanup.org

English side

Spanish side

6.4.E – HCOC Information

TO BE COMPLETED DURING FINAL WQMP



WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Tuesday, March 02, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	306437110, 306437112
Project Site Acreage:	9.268
HCOE Exempt Area:	No
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	System Number - Facility Name - Oro Grande Wash Owner - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	NULL
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	No
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A
Environmentally Sensitive Areas within 200':	DESERT TORTOISE HABITAT CAT 3, DESERT TORTOISE HABITAT CAT 2
Groundwater Depth (FT):	No data available
Parcels with potential septic tanks within 1000':	Yes
Known Groundwater Contamination Plumes within 1000':	No
Studies and Reports Related to Project Site:	

SANGHA HESPERIA PWQMP - DMAs						
		FT ²	AC	%	COMPOSITE CN VALUE	DESCRIPTION
EXISTING CONDITION	A _T =	190696	4.378	---	78	CHAPARRAL, NARROWLEAF (CHAMISE AND REDSHANK)
	A _{PERV} =	190696	4.378	100.00%		
	A _{IMP} =	0	0.000	0.00%		
DMA A	A _T =	190696	4.378	---	78	CHAPARRAL, NARROWLEAF (CHAMISE AND REDSHANK)
	A _{PERV} =	190696	4.378	100.00%		
	A _{IMP} =	0	0.000	0.00%		
PROPOSED CONDITION	A _T =	175933	4.039	---	87	COMBINATION OF: Building, LANDSCAPING, PCC and AC
	A _{PERV} =	30325	0.696	17.24%		
	A _{IMP} =	145608	3.343	82.76%		
DMA A	A _T =	175933	4.039	---	87	COMBINATION OF: LANDSCAPING, PCC and AC
	A _{PERV} =	30325	0.696	17.24%		
	A _{IMP} =	145608	3.343	82.76%		
CN VALUES USED: COMMERCIAL LANDSCAPING (32), BARREN (78) AND BLDG/PCC/AC PAVEMENT (98). THIS SITE IS CLASSIFIED AS HYDROLOGIC SOIL GROUP A.						

Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>NATURAL COVERS -</u>					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
<u>URBAN COVERS -</u>					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
<u>AGRICULTURAL COVERS -</u>					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**CURVE NUMBERS
FOR
PERVIOUS AREAS**

Curve (I) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group			
		A	B	C	D
<u>AGRICULTURAL COVERS</u> (Continued)					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87

Notes:

1. All curve numbers are for Antecedent Moisture Condition (AMC) II.
2. Quality of cover definitions:

Poor-Heavily grazed, regularly burned areas, or areas of high burn potential. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.

Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.

Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Figure C-2 for definition of cover types.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

**CURVE NUMBERS
FOR
PERVIOUS AREAS**