Appendix E-2

Mojave River Watershed Preliminary Water Quality Management Plan for Tamarisk Apartment Complex-2, APN 3057-121-08

Allard Engineering

October 7, 2024

MOJAVE RIVER WATERSHED
Preliminary
Water Quality Management Plan

For:

TAMARISK APARTMENT COMPLEX-2

APN: 3057-121-08

Prepared for:

Munem Maida

13302 Ranchero Road

Hesperia, CA 92344

Tel.

Prepared by:

Allard Engineering

16866 Seville Avenue

Fontana, CA 92335

Tel. 909-356-1815

Submittal Date: 5/6/2024

Revision No. and Date: #1 7/19/2024, #2 10/7/2024

Final Approval Date:_____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Munem Maida l, Owner of the proposed project by Allard Engineering. 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/county/town 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):			APN: 3057-121-08

Owner's Signature			
Owner Name: Munem Maida			
Title	Owner		
Company			
Address	13302 Ranchero Road, Hesperia, CA 92344		
Email			
Telephone #			
Signature		Date	

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):			APN: 3057-121-08

"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 the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: BOBBY ALLARD		PE Stamp Below
Title	VICE PRESIDENT	
Company	Allard Engineering	
Address	16866 Seville Avenue, Fontana, CA 92335	
Email	rallard@allardeng.com	
Telephone #	909-356-1815	
Signature	*Robert K. Allard*	
Date	7-19-2024	

Table of Contents

Forms

Section I – Introduction

This WQMP 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 (LRWQCB).

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name: Apartment Complex Tamarisk Avenue		APN: 3057-121-08			
Project Owner Contact Name:		Munem Maida			
Mailing Address:	13302 Ranchero Road, Hesperia, CA 92344	E-mail Address:		Telephone:	
Permit/Application Number(s):			Tract/Parcel Map Number(s):	APN: 3057-121-08	
Additional Information/ Comments: Site Coordinates	LATITUDE 34.42357 N. LONGDITUDE -117.35218 W				
Description of Project:	The project site is 4.9 acre of proposed development of apartment complex located in the City of Hesperia, County of San Bernardino, State of California. Club House, Office, eight multi-stored apartment building, private street, drive allys, parking lots, landscape areas and planters. The proposed site development of a single drainage area DA-1.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	The proposed apartment complex development consist of a single drainage area (DA-1) with a single drainage management area (DMA-1). On site drainage systems consist of graded area, concrete swale/ribbon gutter, grate/drop inlets with filter inserts for pre-treatment, and pipes will convey the flows to the proposed below surface Stormtech infiltration/retention chamber system-1 &2 and the below surface Contech Inf./Ret. Chamber System (Chamber System 1&2) in the drainage area DA-1(DMA-1). It is also proposed to utilize “Site Design Measures-Rooftop and Impervious Area Disconnection” to re-route water from rooftop and impervious area into the proposed landscape area’s and planters prior to draining into the proposed structural BMPs. The proposed infiltration/retention basin-1&2. Stormtech Chamber System 1&2 (Structural BMPs) are sized to qualify for both required WQMP volume (16,314 CF) as well as the required detention volume (25,933 CF) from the drainage area DA-1 (DMA-1). Detention volume has been calculated based on the City of Hesperia "13.5-cf per 100-sf of impervious area" rule. Detention volume (25,933 CF) for DA-1 (DMA-1) exceeds the water quality volume (16,314 CF). Stromwater in excess of detention/infiltration volume will overflow tto the adjacent streets when he Stormtech Inf./Ret. Chamber System (Chamber System 1&2) reaches the detention capacity. The onsite grate inlets stop taking in storm water and the water drain out onto Tamarisk Avenue through a proposed under sidewalk parkway drain. The water will drain to the north in Tamarisk Ave and then to the east on Main Street on surface and into any city storm drain systems, and finally drain into the Mojave River.				

Section 2 Project Description

2.1 Project Information

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):	213,444	[3] Number of Dwelling Units:	65	[4] SIC Code:	6513

[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:

Munem Maida will be responsible to build the site and will maintain the post-developed BMPs upon completion of construction.

Address:

Munem Maida

13302 Ranchero Road

Hesperia, CA 92344

Phone Number:

2.3 Potential Stormwater Pollutants

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Bacteria and viruses are a potential pollutant for apartment developments if the land use involves animal waste. Due to the nature of the development, there will be minimal animal waste associated with this land use, and the site will be treated using site and source and treatment control BMPs. Bacteria and virus can also be detected in pavement runoff; therefore, the site has incorporated treatment control throughout. All paved and hardened surfaces will flow through basins as part of Low Impact Design (LID).
Nutrients - Phosphorous	E ☒	N ☐	
Nutrients - Nitrogen	E ☒	N ☐	
Noxious Aquatic Plants	E ☒	N ☐	
Sediment	E ☒	N ☐	
Metals	E ☐	N ☒	Not identified in TGD Table 3.3 with detached SFR lots.
Oil and Grease	E ☒	N ☐	
Trash/Debris	E ☒	N ☐	
Pesticides / Herbicides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	

Section 3 Site and Watershed Description

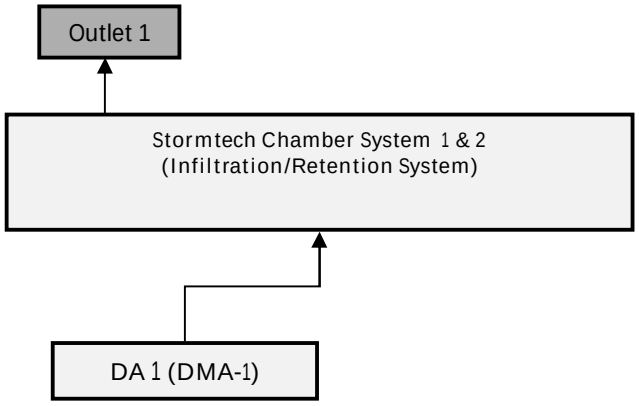
Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (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 34.42357 N	Longitude -117.35218	Thomas Bros Map page

[1] San Bernardino County climatic region: ☒ Valley

[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*



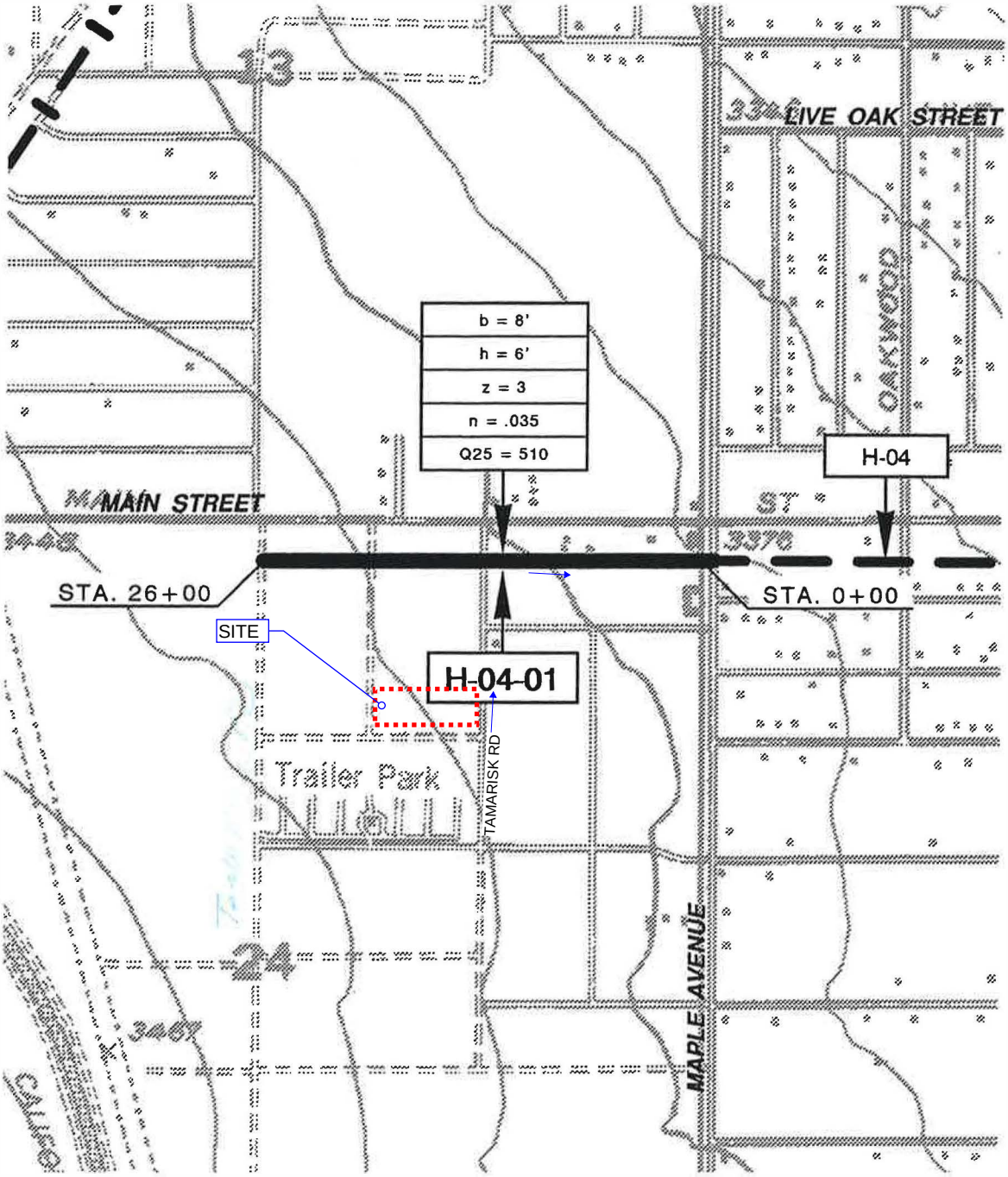
Conveyance	
DA1 (DMA-1) to Outlet 1	The proposed apartment complex development consist of a single drainage area (DA-1) with a single drainage management area (DMA-1). On site drainage systems consist of graded area, concrete swale/ribbon gutter, grate/drop inlets with filter inserts for pre-treatment, and pipes will convey the flows to the proposed below surface Stormtech infiltration/retention chamber system-1 &2 and the below surface Contech Inf./Ret. Chamber System (Chamber System 1&2) in the drainage area DA-1(DMA-1). It is also proposed to utilize "Site Design Measures-Rooftop and Impervious Area Disconnection" to re-route water from rooftop and impervious area into the proposed landscape are/plantersd prior to drain into the proposed structural BMPs. The proposed infiltration/retention basin-1&2. Stormtech Chamber System 1&2 (Structural BMPs) are sized to qualify for both required WQMP volume (16,314 CF) as well as the required detention volume (25,933 CF) from the drainage area DA-1 (DMA-1). Detention volume has been calculated based on the

	City of Hesperia "13.5-cf per 100-sf of impervious area" rule. Detention volume (25,933 CF) for DA-1 (DMA-1) exceeds the water quality volume (16,314 CF). Stromwater in excess of detention/infiltration volume will overflow the Stormtech Inf./Ret. Chamber System (Chamber System 1&2) when they reches the detention capacity. The onsite grate inlets stop taking in storm water. The stormwater will surface drains to perimeter streets. Finally the water drain out onto Tamarisk Avenue street gutter via the proposed under sidewalk parkway drain. The water will drain to the north in Tamarisk Ave and then to the east on Main Street on surface and finally drain into the Mojave River.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area (DA-1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 1	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	213,444			
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*	III			
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)	740			
6 Longest flowpath slope (ft/ft)	2%			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural Cover Open Brush			
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			


VICINITY MAP
APN: 3057-121-08
Main St
Main St
McDonald's
Bad Ass Coffee
Partners Personnel
Tamarisk Ave
Yucca St
LP
3409.0
34.42357, -117.35218
SITE: 4.9 AC
HP
3421.0
Orange St
Primrose Ave
N
Google Earth
700 ft

Form 3-3 Watershed Description for Drainage Area (DA-1)	
Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Surface Flow along Tamarisk Ave/Main Street Mojave River
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	None
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	Mojave River: Mojave Forks Reservoir Outlet to Upper Narrows: -Fluoride Upper Narrows to Lower Narrows: -Fluoride -Sulfates -Total Dissolved Solids
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Desert Tortoise Habitat Cat 3
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



LEGEND

- PROPOSED FACILITY
- FACILITY SHOWN ELSEWHERE
- WATERSHED BOUNDARY
- FLOODPLAIN
- FLOODWAY
- DETENTION BASIN

MASTER PLAN OF DRAINAGE

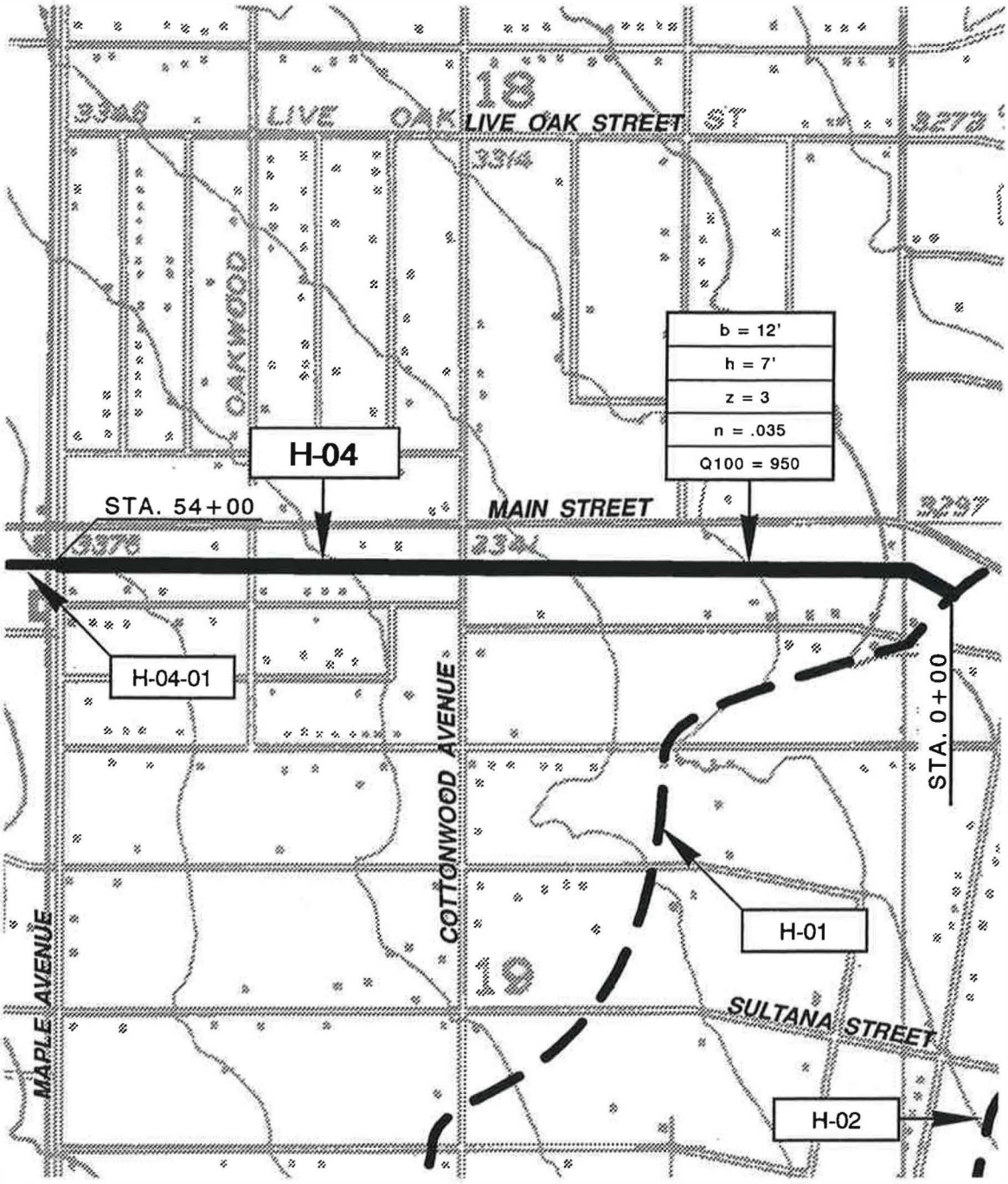
HESPERIA
H-04-01
SHEET 1 OF 1

WILLIAMSON & SCHMID

W/S

SCALE 1" = 1000'

N



LEGEND

PROPOSED FACILITY
FACILITY SHOWN ELSEWHERE
WATERSHED BOUNDARY
FLOODPLAIN
FLOODWAY
DETENTION BASIN

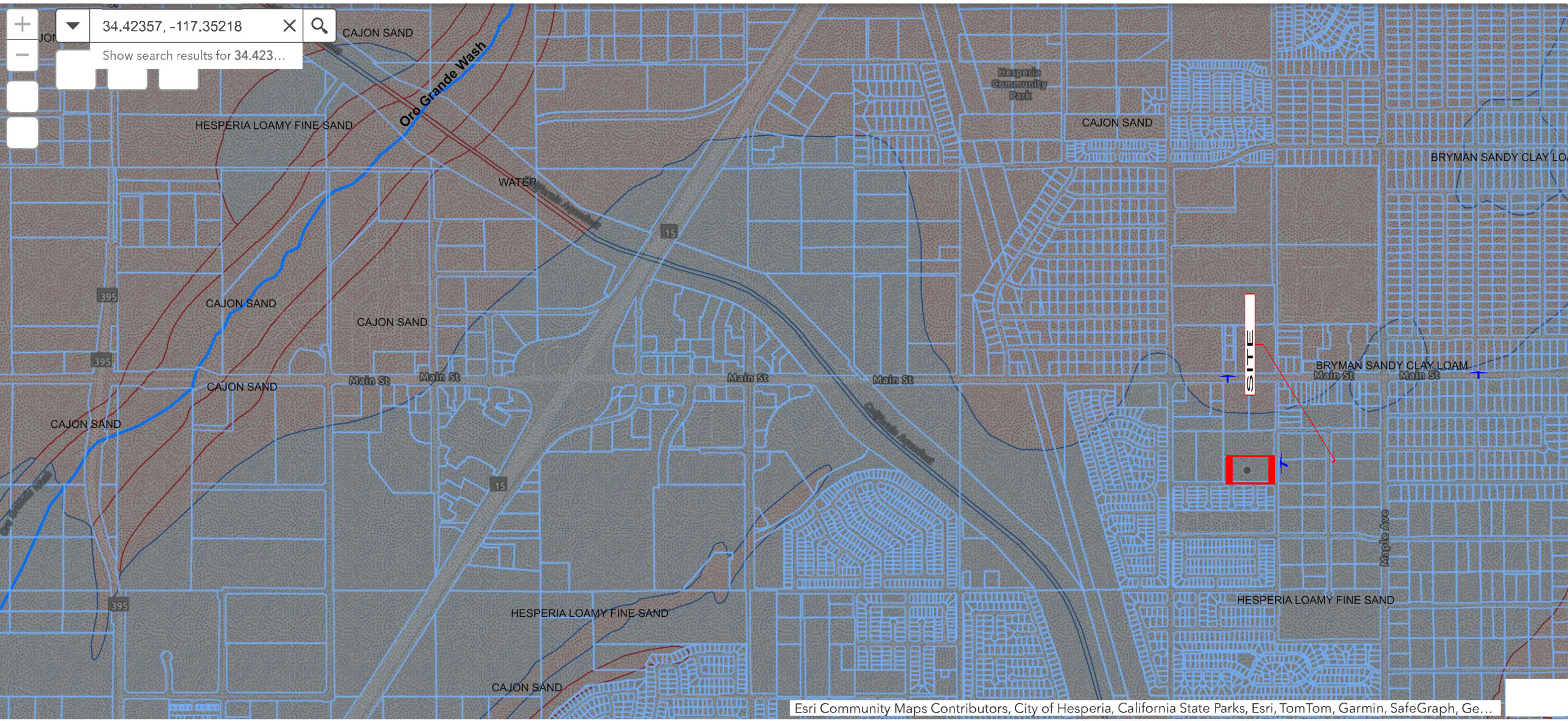
MASTER PLAN OF DRAINAGE

HESPERIA
H-04
SHEET 1 OF 1

WILLIAMSON & SCHMID

SCALE
1" = 1000'

Stormwater Facility Mapping Tool



Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

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 BMP 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	☒	☐	Practical education materials will be provided to property owner and commercial faciity, Maintenance staffs covering various water quality issues that will need to be addressed on their specific site. These materials will include general practices that contribute to the protection of storm water quality and BMP's that eliminate or reduce pollution during property improvements. The developer will request these materials in writing at least 30 days prior to intended distribution and will then be responsible for publication and distribution.
N2	Activity Restrictions	☒	☐	Restrictions may be developed by property owner or other mechanisms. Pesticide applications will be performed by an applicator certified by the California Department of Pesticide Regulation. Vehicle washing will be prohibited.
N3	Landscape Management BMPs	☒	☐	According to the California Stormwater Quality Associations Stormwater Best Management Practice Handbook, landscape planning is implemented to reduce groundwater and storm water contamination. This will be accomplished through the below surface infiltration chamber system, and landscape areas.
N4	BMP Maintenance	☒	☐	Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in Section V of this WQMP, with documented records of inspections and maintenance activities completed. Cleaning of all structural BMP Facilities is scheduled by future Owner.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	The proposed apartment complex development will not generate waste subject to Title 22 CCR Compliance.
N6	Local Water Quality Ordinances	☐	☒	Not applicable
N7	Spill Contingency Plan	☒	☐	Soil Contingency Plan shall be provided in accordance with Section 6.95 of the California Health Safety Code.

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	
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tank on the site.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials on the Site..
N10	Uniform Fire Code Implementation	☐	☒	The proposed apartment complex project will not store toxic or highly toxic compressed gases.
N11	Litter/Debris Control Program	☒	☐	Litter control onsite will include the use of litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.
N12	Employee Training	☒	☐	All employees, contractors and subcontractors of the property management shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.
N13	Housekeeping of Loading Docks	☒	☐	Apartment complex facility, maintenance staffs/Operators will be instructed to keep all areas of loading docks clean and free of Trash / debris at all time.
N14	Drop Inlets Inspection Program	☒	☐	As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period. Drainage facilities include catch basins (storm drain inlets) and Stormtech inf. chamber system.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	The project's private streets drives parking lot shall be swept, at minimum, prior to the start of the traditional rainy season and as needed.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	No other non-structural measures required.
N17	Comply with all other applicable NPDES permits	☐	☒	No other applicable NPDES permits required.

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 stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and re-stenciled as needed to maintain legibility.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	Project does not propose outdoor storage areas.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☐	☒	Where and how Trash, debris and refuge Cpntainers are stored is dictated by municipal code.
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)	☒	☐	In conjunction with routine landscaping maintenance activities, inspect irrigation for signs of leaks, overspray and repair or adjust accordingly. Adjust system cycle to accommodate seasonal fluctuations in water demand and temperatures. Ensure use of native or drought tolerant/non-invasive plant species to minimize water consumption.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	New landscaped areas will be constructed at a minimum of 1 inch below existing paved areas
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	Not Applicable
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	Project does not propose covered dock areas, Not applicable
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No Bays, Not applicable
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No Vehicle Wash at the site, Not applicable

S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor Processing, Not applicable
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash areas, Not applicable
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No Fueling Areas, Not applicable
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No Hillside Landscaping, Not applicable
S14	Wash water control for food preparation areas	☐	☒	No food Preparation, Not applicable
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No Community Car Wash, Not applicable

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.

Proposed site design practices and their implementation at this site is provided in Form 4.1-3 (Site Design Practices Check List). Please refer to Form 4.1-3.

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 site has landscaped areas along the perimeter, multiple planter areas in addition to multiple below surface infiltration/retention Chamber System.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Runoff from impervious surfaces will be conveyed on surfaceinto the landscaped areas along site perimeter and the planters so that infiltration is maximized. Runoff will also be intercepted by the below surface infiltration/retention chamber system-1,2.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: The site currently drains Northeast. Post developed flow will also drain Northeast this is consistent with existing flow patterns.
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 runoff will be rerouted into the landscape areas, also part of the impervious areas will be rerouting into landscape/planters prior to drain into the below surface infiltration/retention chamber system 1,2.
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Due to the low infiltration capability of the underlying soil and site constraint, the site is proposed to drain into the infiltration/retention chamber system 1,2.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: There are no environmentally sensitive portions onsite and existing vegetation will be kept as much as possible.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: Part of the disturbed areas will be revegeated with drought tolerant vegetation.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: No compaction will be performed within the area where the infiltration Chamber System 1&2 are proposed.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Instead the roof runoff and the part of the paved area runoff will be rerouted into the proposed landscape area where feasible and will be conveyed via swale & drain into the infiltration/retention chamber system 1,2 for infiltration.
Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐ Explanation: No compaction will be performed within the area where landscape areas are proposed.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: Instead, the site is utilizing the proposed Infiltration/retention chamber system 1&2 for water collection and infiltration.
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: There are no adjacent steams to the site.

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, 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

<table>
<tr><th colspan="3">Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume
(DA 1)</th></tr>
<tr><td>[1] Project area DA 1 (ft^2):
213,444</td><td>[2] Imperviousness after applying preventative site design practices (Imp%): 90%</td><td>[3] Runoff Coefficient (Rc): 0.73
$R_c = 0.76\ (Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$</td></tr>
<tr><td colspan="3">[4] Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.432 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html</td></tr>
<tr><td colspan="3">[5] Compute P_6, Mean 6-hr Precipitation (inches): 0.6398
P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1481)</td></tr>
<tr><td colspan="2">[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.</td><td>24-hrs ☐
48-hrs ☒</td></tr>
<tr><td colspan="3">[7] Compute design capture volume, DCV (ft^3): 16,314
DCV = 1/12 * [Item 1* Item 3 *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</td></tr>
</table>

PROPOSED LAND AREA COVERAGE

Target Captured Volume
Watershed DMA 1

1) Calculate the "Watershed Imperviousness Ratio", I which is equal to the percent of impervious area in the BMP Drainage Area divided by 100

Imperviousness(i)= **0.9**

Total Acreage(A) = **4.90** 213444 sf

2) Calculate the composite Runoff Coefficient C_{bmp} for the drainage area

$C_{bmp} = 0.858i^3-0.78i^2+0.774i+0.04$

C_{bmp} = 0.73

3) Determine which Regression Coefficient to use by region the project is located in

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

4) Determine the area averaged "6 hour Mean Storm Rainfall" , P_6

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.432** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 0.6398 inches

5) Determine Regression Constant (a) for 48 hour drawdown

a for 24 hour = 1.582
a for 48 hour = 1.963

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

$P_0 = C \times a \times P6$

Po(inches) = 0.9172

7) Calculate the Target Capture Volume, V_0, in acre feet

$V_0 = (P_0 * A)/12$

V_0 = 0.37 acre-feet
V_0 = 16,314 CF

REQD. WQ VOL. : 16,314 CF

8) Retention Volume Calculation:

Use City rule of "13.5-cf of retention per 100-sf of impervious area"

***Retention Volume:** **25,933 CF** [{(4.9*43560)*0.90}*13.5]/100

***Required Retention Volume for HCOC mitigation.**

HCOC DET. VOL. EXCEEDS WQ VOL.

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

Figure C-4

NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4236°, Longitude: -117.3522°
Elevation: 3420 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	0.085 (0.071-0.104)	0.121 (0.100-0.147)	0.168 (0.138-0.205)	0.206 (0.169-0.255)	0.260 (0.205-0.332)	0.302 (0.234-0.394)	0.345 (0.261-0.462)	0.390 (0.287-0.537)	0.453 (0.319-0.650)	0.502 (0.342-0.746)
10-min	0.122 (0.101-0.149)	0.173 (0.143-0.211)	0.240 (0.198-0.294)	0.296 (0.242-0.365)	0.373 (0.295-0.476)	0.433 (0.335-0.565)	0.495 (0.374-0.662)	0.560 (0.411-0.770)	0.649 (0.457-0.931)	0.720 (0.490-1.07)
15-min	0.148 (0.122-0.180)	0.209 (0.173-0.256)	0.290 (0.239-0.356)	0.358 (0.292-0.442)	0.451 (0.356-0.576)	0.523 (0.405-0.683)	0.598 (0.452-0.800)	0.677 (0.497-0.931)	0.785 (0.553-1.13)	0.871 (0.593-1.29)
30-min	0.221 (0.183-0.270)	0.313 (0.258-0.382)	0.434 (0.358-0.532)	0.535 (0.437-0.661)	0.674 (0.533-0.861)	0.782 (0.606-1.02)	0.895 (0.676-1.20)	1.01 (0.743-1.39)	1.17 (0.827-1.68)	1.30 (0.886-1.93)
60-min	0.306 (0.253-0.373)	0.432 (0.357-0.528)	0.601 (0.495-0.736)	0.740 (0.604-0.914)	0.932 (0.737-1.19)	1.08 (0.838-1.41)	1.24 (0.935-1.66)	1.40 (1.03-1.92)	1.62 (1.14-2.33)	1.80 (1.23-2.67)
2-hr	0.442 (0.365-0.539)	0.596 (0.492-0.728)	0.804 (0.663-0.986)	0.979 (0.801-1.21)	1.22 (0.969-1.57)	1.42 (1.10-1.86)	1.63 (1.23-2.17)	1.84 (1.35-2.53)	2.15 (1.51-3.08)	2.39 (1.63-3.54)
3-hr	0.554 (0.459-0.677)	0.737 (0.609-0.900)	0.985 (0.812-1.21)	1.20 (0.977-1.48)	1.49 (1.18-1.91)	1.73 (1.34-2.26)	1.98 (1.50-2.65)	2.25 (1.65-3.10)	2.63 (1.85-3.77)	2.94 (2.00-4.36)
6-hr	0.777 (0.643-0.949)	1.02 (0.846-1.25)	1.36 (1.12-1.67)	1.65 (1.35-2.04)	2.07 (1.64-2.64)	2.40 (1.86-3.14)	2.76 (2.08-3.69)	3.15 (2.31-4.33)	3.70 (2.60-5.30)	4.15 (2.82-6.16)
12-hr	1.00 (0.829-1.22)	1.36 (1.12-1.66)	1.84 (1.52-2.26)	2.26 (1.85-2.79)	2.86 (2.26-3.65)	3.34 (2.58-4.35)	3.85 (2.91-5.14)	4.40 (3.23-6.05)	5.19 (3.65-7.44)	5.83 (3.97-8.66)
24-hr	1.36 (1.20-1.56)	1.90 (1.68-2.19)	2.64 (2.33-3.05)	3.28 (2.87-3.82)	4.18 (3.54-5.03)	4.91 (4.07-6.03)	5.68 (4.60-7.15)	6.51 (5.13-8.44)	7.70 (5.82-10.4)	8.68 (6.34-12.1)
2-day	1.54 (1.37-1.78)	2.16 (1.92-2.49)	3.02 (2.67-3.49)	3.76 (3.29-4.38)	4.83 (4.09-5.81)	5.70 (4.73-7.00)	6.63 (5.37-8.35)	7.64 (6.02-9.89)	9.10 (6.88-12.3)	10.3 (7.53-14.4)
3-day	1.65 (1.47-1.90)	2.32 (2.05-2.67)	3.24 (2.86-3.75)	4.04 (3.54-4.71)	5.20 (4.41-6.26)	6.15 (5.11-7.57)	7.18 (5.82-9.04)	8.30 (6.54-10.7)	9.92 (7.50-13.4)	11.3 (8.24-15.8)
4-day	1.78 (1.58-2.05)	2.50 (2.21-2.88)	3.49 (3.08-4.03)	4.35 (3.81-5.07)	5.60 (4.75-6.74)	6.63 (5.50-8.15)	7.74 (6.27-9.75)	8.95 (7.05-11.6)	10.7 (8.10-14.5)	12.2 (8.90-17.0)
7-day	1.99 (1.76-2.29)	2.76 (2.44-3.18)	3.84 (3.39-4.44)	4.77 (4.18-5.56)	6.12 (5.18-7.37)	7.22 (6.00-8.88)	8.42 (6.82-10.6)	9.72 (7.65-12.6)	11.6 (8.77-15.7)	13.2 (9.62-18.4)
10-day	2.12 (1.88-2.45)	2.94 (2.61-3.39)	4.08 (3.60-4.71)	5.06 (4.43-5.89)	6.47 (5.48-7.79)	7.63 (6.33-9.38)	8.87 (7.19-11.2)	10.2 (8.06-13.2)	12.2 (9.22-16.5)	13.8 (10.1-19.3)
20-day	2.56 (2.27-2.94)	3.53 (3.12-4.07)	4.88 (4.30-5.63)	6.03 (5.28-7.03)	7.70 (6.52-9.27)	9.06 (7.52-11.1)	10.5 (8.53-13.3)	12.1 (9.55-15.7)	14.4 (10.9-19.5)	16.3 (11.9-22.8)
30-day	3.01 (2.66-3.46)	4.13 (3.66-4.76)	5.68 (5.02-6.56)	7.02 (6.14-8.17)	8.94 (7.58-10.8)	10.5 (8.73-12.9)	12.2 (9.89-15.4)	14.1 (11.1-18.2)	16.7 (12.6-22.6)	19.0 (13.8-26.5)
45-day	3.56 (3.16-4.10)	4.84 (4.29-5.58)	6.62 (5.84-7.65)	8.15 (7.14-9.49)	10.4 (8.77-12.5)	12.2 (10.1-15.0)	14.1 (11.4-17.8)	16.2 (12.8-21.0)	19.3 (14.6-26.1)	21.9 (16.0-30.6)
60-day	4.05 (3.59-4.67)	5.43 (4.81-6.26)	7.35 (6.49-8.49)	9.00 (7.88-10.5)	11.4 (9.65-13.7)	13.3 (11.1-16.4)	15.5 (12.5-19.5)	17.8 (14.0-23.1)	21.2 (16.0-28.6)	24.1 (17.6-33.6)

[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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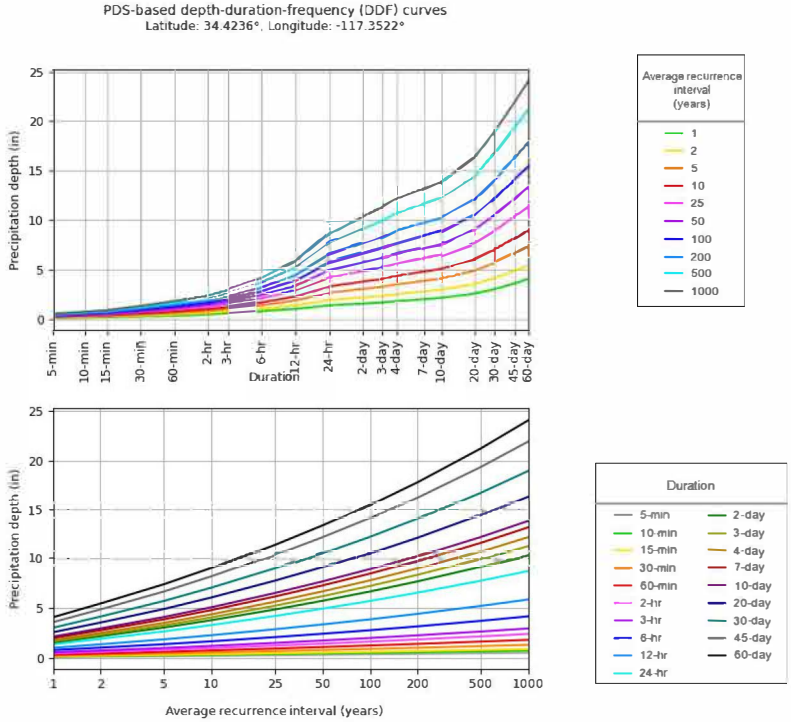
PF graphical



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Maps & aerials

Small scale terrain

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*

HCOC Mitigation:

In developed condition the site will drain to the proposed below surface Infiltration/Retention Chamber System 1&2 for mitigation of WQMP volume and the Detention Volume per the City requirement.

The "13.5-cf of retention per 100-sf of impervious area" rule was used to quantify and mitigate onsite retention volume to comply with the City mitigation requirement.

When the below surface Chamber System 1&2 reach their capacity, it will drain to the street gutter in Tamarisk Avenue and surface drain to Main Street to further north. Water will ultimately drains to Mojave River via the existing surface drainage courses.

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) 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:

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.
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.

4.3.3 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).

.

Form 4.3-3 Infiltration LID BMP – Above Ground Infiltration Basin (DA 1)

1 Remaining LID DCV not met by site design BMP (ft³): 16,314 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*

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-1) BMP Type Chamber 1	DA 1 (DMA-1) BMP Type Chamber 2	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	3.96	3.96	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	3.0	3.0	
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.32	1.32	
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	5.0	5.0	
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	5.0	5.0	
8 Infiltrating surface area, *SA_{BMP}* (ft²) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	3,904	2,277	
9 Amended soil depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0	0	
10 Amended soil porosity	0	0	
11 Gravel depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0	0	
12 Gravel porosity	-	-	
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	-	-	
14 Above Ground Retention Volume (ft³) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	16,642	9,563	
15 Underground Retention Volume (ft³) *Volume determined using manufacturer's specifications and calculations*			

16 Total Retention Volume from LID Infiltration BMPs: 26,205 CF *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 161% *Retention% = Item 16 / Form 4.2-1 Item 7*

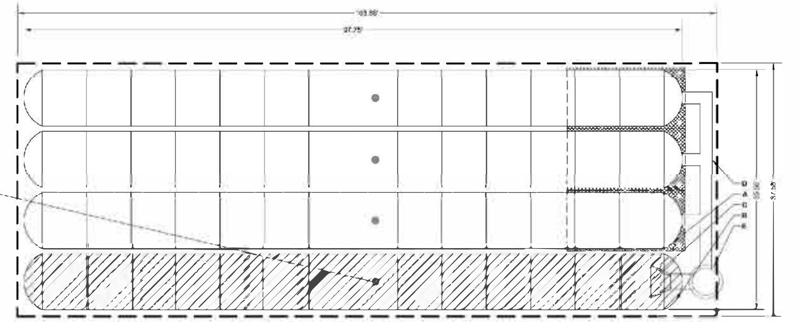
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

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.

PROPOSED LAYOUT: BED 1		CONCEPTUAL ELEVATIONS	
56	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
8	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
16642	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-7200 CHAMBER:	5.75
		24" ISOLATOR ROW PLUS INVERT:	0.94
		18" x 18" BOTTOM MANIFOLD INVERT:	0.91
3904	SYSTEM AREA (SF)	BOTTOM OF MC-7200 CHAMBER:	0.75
282.9	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADSN-12	1.97"	
30" ADS MANHOLE	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		16.5 CFS IN
INSPECTION PORT	F	4" SEE DETAIL (TYP 4 PLACES)		



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

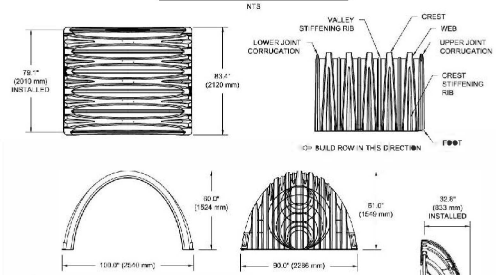
- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE 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.

SPACE INTENTIONALLY LEFT BLANK

SPACE INTENTIONALLY LEFT BLANK

MC-7200 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

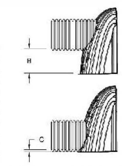
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

*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"

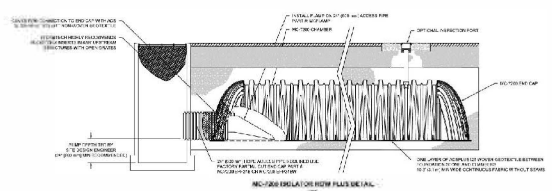
PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	[illegible]	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	[illegible]	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	[illegible]	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



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

2 MC-7200 TECHNICAL SPECIFICATION



MC-7200 ISOLATOR ROW PLUS DETAIL

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INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

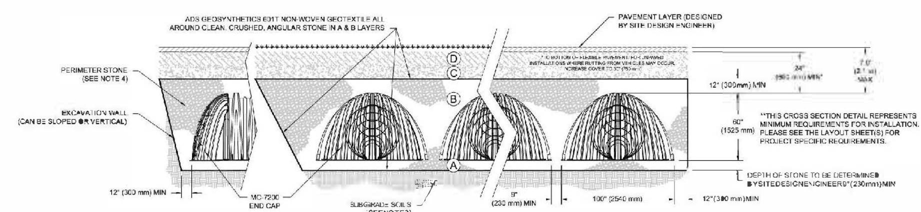
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-7200 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145¹ A-1, A-2-4, A-3 OR AASHTO M43¹ 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	EMBEDMENT STONE: FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE⁵	AASHTO M43¹ 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE⁵	AASHTO M43¹ 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. 2,3

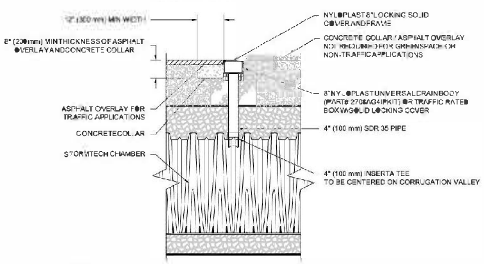
PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
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 DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. 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.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 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. PERIMETER 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.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-7200 CROSS SECTION DETAIL



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

4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

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MC-SERIES END CAP INSERTION DETAIL

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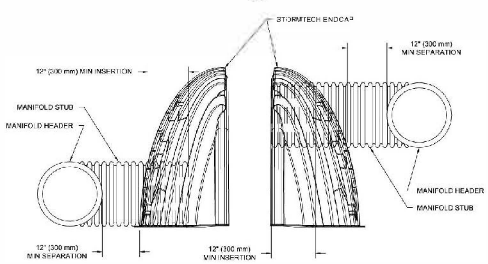


NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

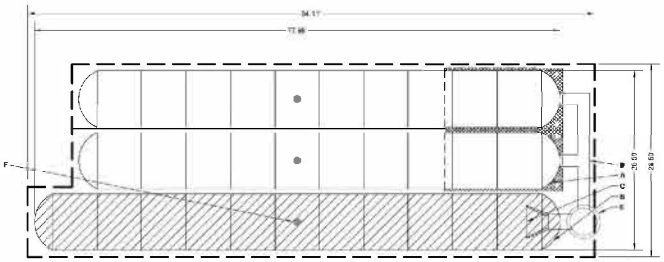
4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

5 MC-SERIES END CAP INSERTION DETAIL

PROPOSED LAYOUT: BED 2		CONCEPTUAL ELEVATIONS	
20	STORMTECH MC-7200 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.75
6	STORMTECH MC-7200 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	8.25
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	7.75
9	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	7.75
40	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	7.75
[illegible]	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	6.75
		TOP OF MC-7200 CHAMBER:	5.75
		24" ISOLATOR ROW PLUS INVERT:	0.94
		18" x 18" BOTTOM MANIFOLD INVERT:	0.91
2277	SYSTEM AREA (SF)	BOTTOM OF MC-7200 CHAMBER:	0.75
225.2	SYSTEM PERIMETER (ft)	BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.90"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.90"	
30" ADS MANHOLE	E	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		11.0 CFS IN
INSPECTION PORT	F	4" SEE DETAIL (TYP 3 PLACES)		



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 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.

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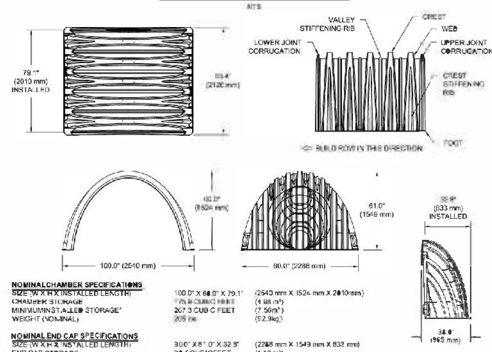
MC-7200 TECHNICAL SPECIFICATION

NTS



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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"

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MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	—
MC7200IEPP15B		—	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	—
MC7200IEPP18TW			
MC7200IEPP18B		—	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	—
MC7200IEPP24TW			
MC7200IEPP24B		—	2.26" (57 mm)
MC7200IEPP24BW			
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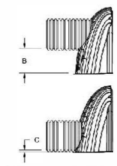

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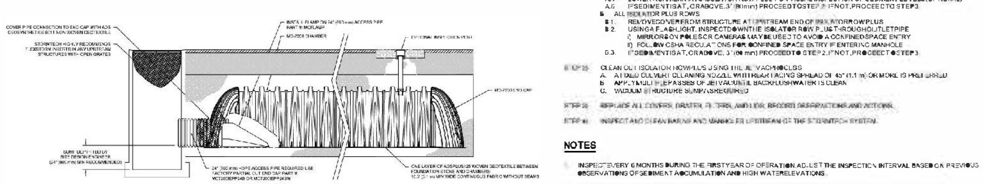

MC-7200 ISOLATOR ROW PLUS DETAIL

NTS

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A.3 USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
A.4 LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
A.5 IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
B. ALL ISOLATOR PLUS ROWS
B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
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i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
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STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

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NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
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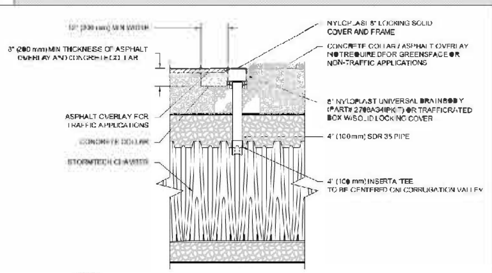
A	FOUNDATION STONE: FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:

1. 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".
2. 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.
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 DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. 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.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



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

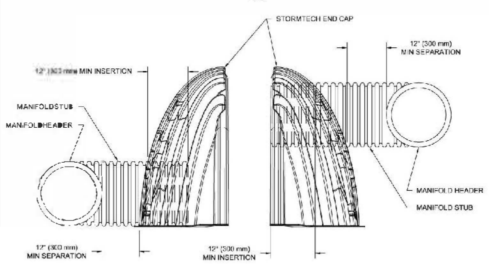
4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

NTS

4 4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

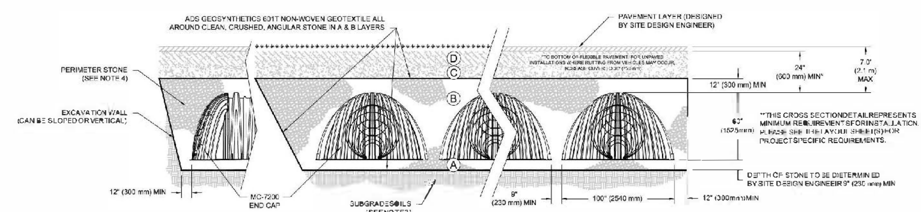
MC-SERIES END CAP INSERTION DETAIL

NTS



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

5 MC-SERIES END CAP INSERTION DETAIL



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 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. PERIMETER 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.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/ %. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-7200 CROSS SECTION DETAIL

Worksheet H: Factor of Safety and Design Infiltration Rate and 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	2	0.50
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.50
		Level of pretreatment/ expected sediment loads	0.25	2	0.50
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.0
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					3.00
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					3.96
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$					1.32

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Average Inf. Rate : 3.96 in/hr from USDA WebSoil Report
Design Inf Rate: 3.96/3.0 = 1.32"/hr

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

San Bernardino County, California, Mojave River Area

134—HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hks7
Elevation: 200 to 4,000 feet
Mean annual precipitation: 6 to 9 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 150 to 250 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Hesperia

Setting

Landform: Fan aprons
Landform position (two-dimensional): Footslope
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 6 inches: loamy fine sand
H2 - 6 to 60 inches: sandy loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Avg: 3.96"/hr

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R030XE006CA - COARSE LOAMY

Hydric soil rating: No

Minor Components

Wrightwood
Percent of map unit: 5 percent
Hydric soil rating: No

Cajon
Percent of map unit: 5 percent
Hydric soil rating: No

Bull trail
Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed soils
Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 15, Aug 30, 2023

Map Scale: 1:1,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

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 15, Aug 30, 2023

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

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background 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
134	HESPERIA LOAMY FINE SAND, 2 TO 5 PERCENT SLOPES	4.2	100.0%
Totals for Area of Interest		**4.2**	**100.0%**

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): 16,314 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): 0 *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 26,205 CF *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 7is 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. ☐

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 Agreement must be completed, signed, notarized and submitted to the County Stormwater 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
Stormtech Inf/Ret Chamber System 1&2	Munem Maida	Inspect Stormtrch Chamber System through the access/inspection manholes to determine the depth of sediment. Follow local and OSHA rules for a confined space entry. JetVac maintenenace is recommended if sediment accumulation depth exceed 3"	*Immidiately after construction* *Thereafter Bi-annual inspection*
Education of Property Owners, Tenants and Occupants on Stormwater BMPs	Munem Maida	Practical education materials will be provided to property owners covering various water quality issues that will need to be addressed on their specific site. These materials will include general good house keeping practices that contribute to the protection of storm water quality and BMP's that eliminate or reduce pollution during property improvements.	*Ongoing*
Vegetated Swale / Landscape maintenance	Munem Maida	Landscape planning is implemented to reduce groundwater and storm water contamination. This will be accomplished through an infiltration basin, and landscape areas.	
BMP maintenance	Munem Maida	See BMP fact sheets and Table 5-1 details hereon	Ongoing with every visit
Employee training	Munem Maida	Employee training may be developed by the owner	As stated

Litter debris control program	Munem Maida	Litter debris control program may be developed by City of Hesperia	Ongoing with every visit
Drop Inlets inspection program	Munem Maida	Catch basins will be inspected a minimum of once every three months during the dry season and a minimum of once every two months during the rainy season.	Place at grate installation and inspect once a year
Provide storm drain system stencilling and signage	Munem Maida	Signs will be placed above storm drain inlets to warn the public of prohibitions against waste disposal	Inspect once a year
Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Munem Maida	Rain sensors will be incorporated into the onsite sprinkler system so that no unnecessary watering of landscaped areas occurs after storm events.	Once a year or according to Manufacturer Manuals
Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	Munem Maida	New landscaped areas will be constructed at a minimum of 1 inch below existing paved areas	Inspect once a year
Street Sweeping	Munem Maida	Street weeping and Vaccuming	Bi Monthly

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan (WQMP BMP Exhibit)

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements

RECORDING REQUESTED BY

City of Hesperia: Engineering Division

AND WHEN RECORDED MAIL DOCUMENT TO:

NAME **City Clerk: c/o** _____

STREET ADDRESS 9700 7th Avenue

CITY, STATE & ZIP CODE Hesperia, CA 92345

SPACE ABOVE FOR RECORDER'S USE ONLY

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN AND STORMWATER BEST MANAGEMENT PRACTICES TRANSFER, ACCESS AND MAINTENANCE

Title of Document

Document exempt from recording fees pursuant to Cal. Gov. Code 6103 & 27383

THIS AREA FOR RECORDER'S USE ONLY

THIS COVER SHEET ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

Covenant and Agreement Regarding Water Quality Management Plan and Stormwater Best Management Practices Transfer, Access and Maintenance

OWNER NAME: Munem Maida

PROPERTY ADDRESS: 13302 Ranchero Road
Oakhills, CA 92344

APN: 3057-121-08

THIS AGREEMENT is made and entered into in

CITY OF HESPERIA, COUNTY OF SAN BERNARDINO , California, this _____ day of

_____ , by and between

Munem Maida , hereinafter

referred to as Owner, and the CITY OF HESPERIA, a political subdivision of the State of California, hereinafter referred to as "the City";

WHEREAS, the Owner owns real property ("Property") in the State of California, County of San Bernardino, located at [STREET ADDRESS] within the City of Hesperia, more commonly referred to as San Bernardino County Tax Assessor Parcel No. [APN Number] specifically described in Exhibit "A" and depicted in Exhibit "B", each of which is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of initial approval of the development project known as

APN: 3057-121-08 within the Property described herein, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff; and

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, dated _____, on file with the City and incorporated herein by this reference, hereinafter referred to as "WQMP", to minimize pollutants in stormwater and urban runoff and to minimize other adverse impacts of stormwater and urban runoff; and

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the City; and

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs.

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner shall comply with the WQMP.

2. All maintenance or replacement of any BMPs specified within the approved WQMP is the sole responsibility of the Owner in accordance with the terms of this Agreement.

3. Owner hereby provides the City's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the City, no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 5 below. The City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property. Denial of access to any premises or facility that contains WQMP features is a breach of this Agreement and may also be a violation of the Clean Water Act, the California Water Code, and/or the City's NPDES Permit Implementation regulations. If there is reasonable cause to believe that an illicit discharge or breach of this Agreement is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions. Owner recognizes that the City may perform routine and regular inspections, as well as emergency inspections, of the BMPs. Owner or Owner's successors or assigns shall pay City for all costs incurred by City in the inspection, sampling, testing of the BMPs within thirty (30) calendar days of City invoice.

4. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination, testing construction or reconstruction.

5. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) business days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense against the Property and/or to the Owner or Owner's successors or assigns, including administrative costs, attorney's fees and interest thereon at the maximum rate authorized by the City Code from the date of the notice of expense until paid in full. Owner or Owner's successors or assigns shall pay City within thirty (30) calendar days of City invoice.

6. The City may require the owner to post security in form and for a time period satisfactory to the City to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the surety (ies) to perform the obligations of this Agreement.

7. The City agrees, from time to time, within ten (10) business days after request of Owner, to execute and deliver to Owner, or Owner's designee, an estoppel certificate requested by Owner, stating that this Agreement is in full force and effect, and that Owner is not in default hereunder with regard to any maintenance or payment obligations (or specifying in detail the nature of Owner's default). Owner shall pay all costs and expenses incurred by the City in its investigation of whether to issue an estoppel certificate within thirty (30) calendar days after receipt of a City invoice and prior to the City's issuance of such certificate. Where the City cannot issue an estoppel certificate, Owner shall pay the City within thirty (30) calendar days of receipt of a City invoice.

8. Owner shall not change any BMPs identified in the WQMP without an amendment to this Agreement approved by authorized representatives of both the City and the Owner.

9. City and Owner shall comply with all applicable laws, ordinances, rules, regulations, court orders and government agency orders now or hereinafter in effect in carrying out the terms of this Agreement. If a provision of this Agreement is terminated or held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall remain in full effect.

10. In addition to any remedy available to City under this Agreement, if Owner violates any term of this Agreement and does not cure the violation within the time already provided in this Agreement, or, if not provided, within thirty (30) calendar days, or within such time authorized by the City if said cure reasonably requires more than the subject time, the City may bring an action at law or in equity in a court of competent jurisdiction to enforce compliance by the Owner with the terms of this Agreement. In such action, the City may recover any damages to which the City may be entitled for the violation, enjoin the violation by temporary or permanent injunction without the necessity of proving actual damages or the inadequacy of otherwise available legal remedies, or obtain other equitable relief, including, but not limited to, the restoration of the Property and/or the BMPs identified in the WQMP to the condition in which it/they existed prior to any such violation or injury.

11. This Agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

12. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to hold the City harmless and pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

13. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

14. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of

this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

15. Time is of the essence in the performance of this Agreement.

16. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

17. Owner agrees to indemnify, defend (with counsel reasonably approved by the City) and hold harmless the City and its authorized officers, employees, agents and volunteers from any and all claims, actions, losses, damages, and/or liability arising out of this Agreement from any cause whatsoever, including the acts, errors or omissions of any person and for any costs or expenses incurred by the City on account of any claim except where such indemnification is prohibited by law. This indemnification provision shall apply regardless of the existence or degree of fault of indemnitees. The Owner's indemnification obligation applies to the City's "active" as well as "passive" negligence but does not apply to the City's "sole negligence" or "willful misconduct" within the meaning of Civil Code Section 2782, or to any claims, actions, losses, damages, and/or liabilities, to the extent caused by the acts or omissions of any third party contractors undertaking any work (other than field inspections) or other maintenance on the Property on behalf of the City under this Agreement.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IF TO CITY:

City of Hesperia

9700 Seventh Avenue

Hesperia, CA 92345

IF TO OWNER:

Munem Maida

13302 Ranchero Road

Oakhills, CA 92344

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

OWNER:
Signature: _____

Name: _____

Title: _____

Date: _____

FOR: Maintenance Agreement, dated _____, for the project known as

APN: 3057-121-08

As described in the WQMP dated _____.

OWNER:

Signature: _____

Name: _____

Title: _____

Date: _____

NOTARIES ON FOLLOWING PAGE(S)

A notary acknowledgement for each signature is required for recordation.

ACCEPTED BY:

Director of Development Services or designee

Date: _____

Attachment: Notary Acknowledgement

ATTACHMENT 1

(Notary Acknowledgement)

ATTACHMENT 1, Page 2

(Notary Acknowledgement)

EXHIBIT A

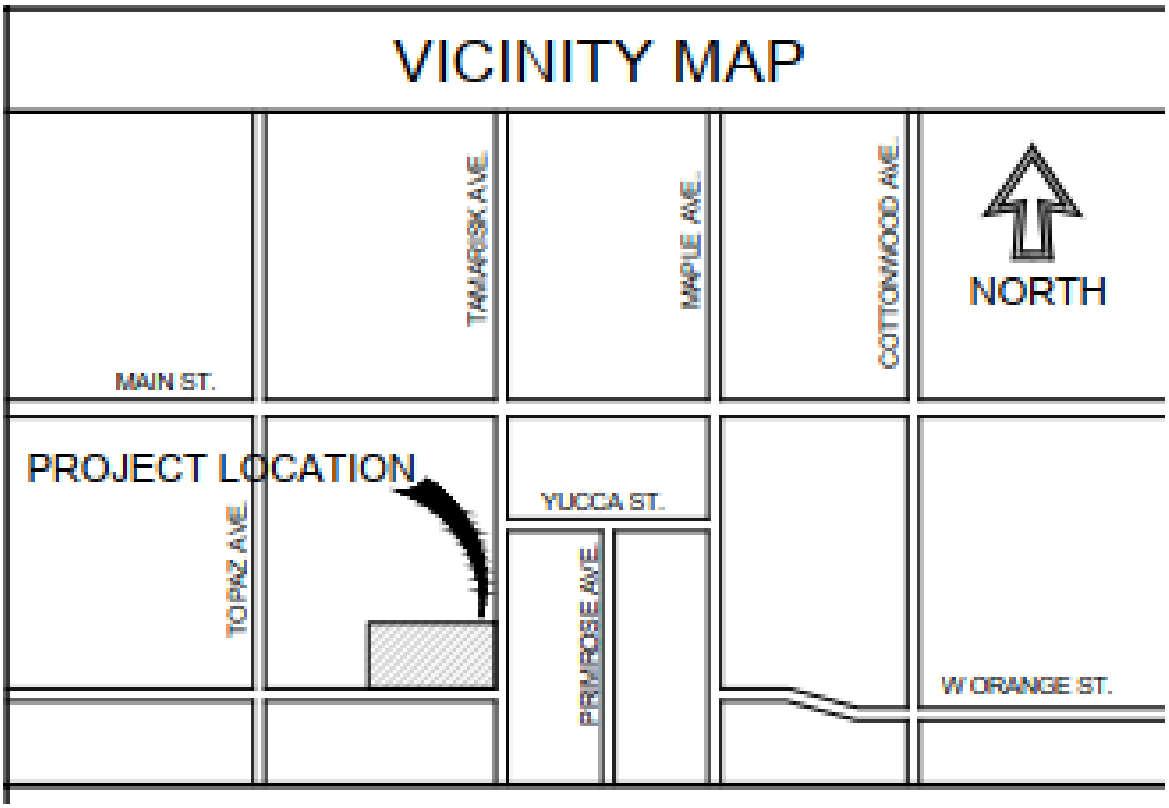
(Legal Description)

LEGAL DESCRIPTION:

THE N 1/2, SE 1/4, NW 1/4, NE 1/4, SECTION 24, T4N, R5W, S.B.M.

EXHIBIT B

(Map/illustration)



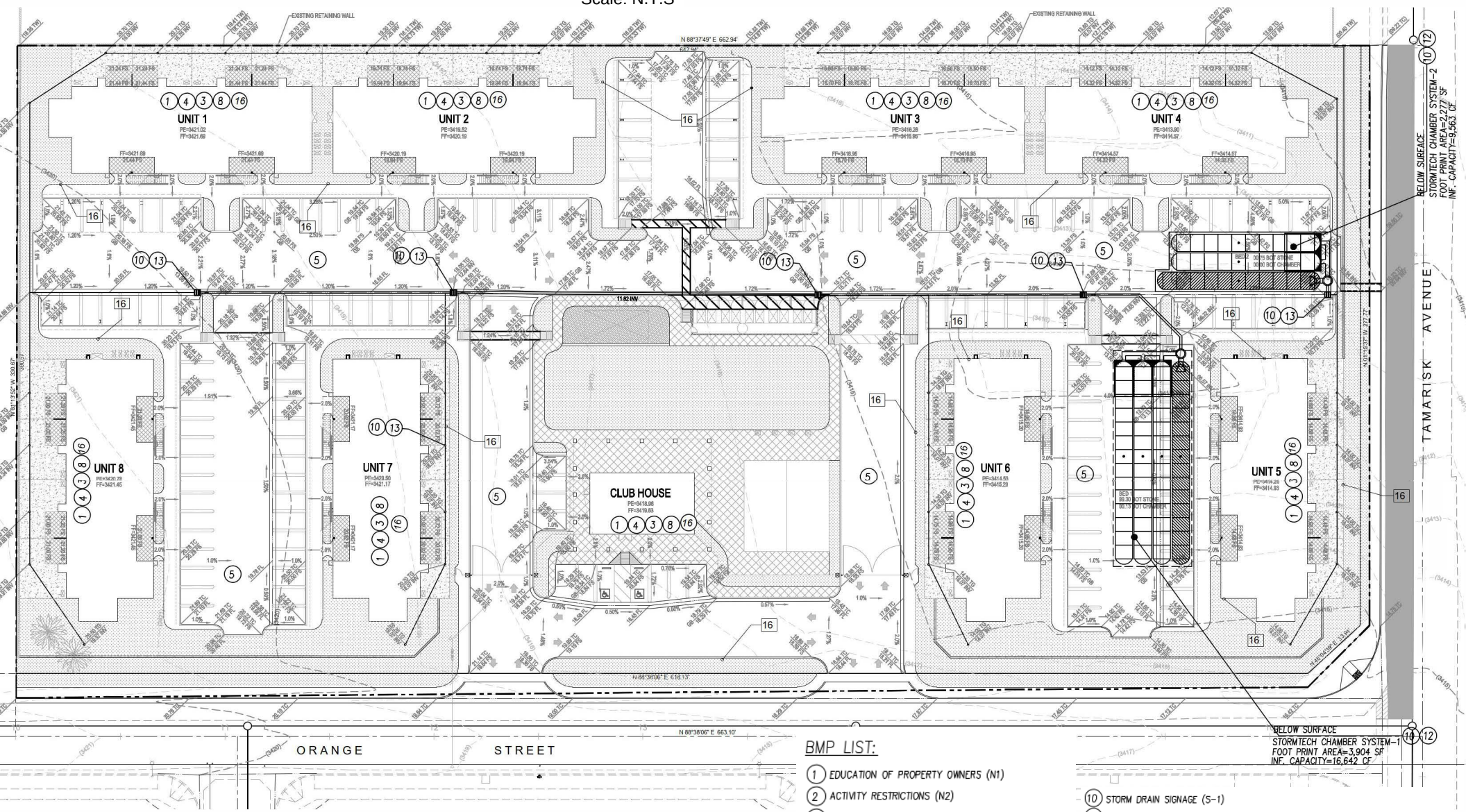
BMP STATISTICS:

DMAs	AREA (AC)	BMP	BMP CAPACITY (CF)	REQUIRED VOLUME (CF)	PROVIDED VOLUME (CF)
DMA-1	*4.90	STORMTECH CHAMBER-1	16,642	16,314	26,205
		STORMTECH CHAMBER-2	9,563		

TOTAL (BMP CAPACITY) = 26,205 CF
* GROSS SITE AREA

DCV ACHIEVED WITH PROPOSED BMPs: 161%

Scale: N.T.S



BMP LIST:

1. EDUCATION OF PROPERTY OWNERS (N1)
2. ACTIVITY RESTRICTIONS (N2)
3. SPILL CONTINGENCY (N7)
4. TRAINING/EDUCATION PROGRAM (N12)
5. PARKING LOT SWEEPING/VACUUMING (N15)
6. COMMON AREA CATCH BASIN INSPECTION (N14)
7. LANDSCAPE PLANNING (N3)
8. ROOF RUNOFF CONTROLS (SD-11)
9. EFFICIENT IRRIGATION (S-4)
10. STORM DRAIN SIGNAGE (S-1)
11. TRASH STORAGE AREAS (N11)
12. ADS STORMTECH MC-7200 STORMWATER INFILTRATION CHAMBER SYSTEM-1&2 (N4) (SIZE & CAPACITY PER PLAN)
13. DRAIN INLET/TRENCH DRAIN FILTER INSERT- ADS FLEXSTORM PURE INLET FILTER OR APPROVED EQUAL (N14)
14. RETENTION /INFILTRATION BASIN-1&2 (N11) (SIZE & CAPACITY PER PLAN)
15. SHALLOW DEPTH VEGETATED SWALE
16. *SITE DESIGN MEASURES-ROOFTOP AND IMPERVIOUS AREA DISCONNECTION.*

Prepared By:
ALLARD ENGINEERING
Civil Engineering - Land Surveying - Land Planning
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Fontana, California 92335
(909) 356-1815 Fax (909) 356-1795

Prepared For:
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CITY OF HESPERIA
CALIFORNIA

WQMP EXHIBIT
TAMARISK AVENUE APT. COMPLEX-2
APN :3057-121-08

Educational Material

Home Owner Education and Outreach Material

A. HHW Tearsheets
B. Paint Tip Cards
C. Pesticide Tip Cards
D. Fertilizer Tip Cards
E. Paint Shelftalkers
F. Pesticide Shelftalkers
G. Fertilizer Shelftalkers
H. "Too Toxic to Trash" Poster
I. Best Management Practices for Urban Horse Owners
J. Best Management Practices for Pet Owners
K. Tips for Pool Maintenance

Please see examples on the following pages.

A. HHW Tearsheets

Too Toxic to Trash

Take Your Household Hazardous Waste to a Collection Center Near You.

Examples of items collected:
pesticides - fertilizers - paints - cleaners - bleach - drain cleaner - furniture polish - deodorizers - aerosol - weed killers - antifreeze - pool chlorine - batteries - motor oil

- No Business Waste Accepted

HOUSEHOLD HAZARDOUS WASTE COLLECTION CENTER LOCATIONS:

APPLE VALLEY
22411 Highway 18
Hours: 1st & 3rd Saturday of each month, 10 a.m. to 2 p.m.

BARSTOW - City of Barstow Corporation Yard
900 South Avenue 'H'
Hours: Saturdays, 9 a.m. to 2 p.m.

HESPERIA - Hesperia Fire Station
17443 Lemon Street
Hours: Tuesdays & Thursdays, 9 a.m. to 1 p.m. and Saturdays, 9 a.m. to 3 p.m.

VICTORVILLE - Victorville Fire Department
East of Desert Knoll Drive on Loves Lane
Hours: Wednesdays & Sundays, 9 a.m. to 4 p.m.

For additional information call (800) CLEAN UP or visit www.cleanup.org

Muy Tóxico Para Tirar a La Basura

Deshágase de Desperdicios Tóxicos del Hogar de la Manera Correcta.

Ejemplos de artículos que son colectados:
pesticidas - fertilizantes - pinturas - limpiadores - cloro - productos de limpieza para drenajes - productos de aerosol enlatados - pulidores para muebles - desodorantes - productos para eliminar hierbas - anticongelantes - baterías de mercurio - aceite para motor

- No se aceptarán desperdicios tóxicos de negocios

CENTROS de RECOLECCIÓN de DESPERDICIOS TÓXICOS del HOGAR:

APPLE VALLEY
22411 Highway 18
Horario: 1° y 3° sábado del mes, de 10 a.m. a 2 p.m.

BARSTOW - City of Barstow Corporation Yard
900 South Avenue 'H'
Horario: sábados, de 9 a.m. a 2 p.m.

HESPERIA - Hesperia Fire Station
17443 Lemon Street
Horario: martes y jueves, de 9 a.m. a 1 p.m. y sábados, de 9 a.m. a 3 p.m.

VICTORVILLE - Victorville Fire Department
al este de Desert Knoll Drive sobre Loves Lane
Horario: miércoles y domingo, de 9 a.m. a 4 p.m.

Para mas información llame al (800) CLEAN UP o visite www.cleanup.org

B. Paint Tip Cards

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 Mojave. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica:

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 Mojave 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:

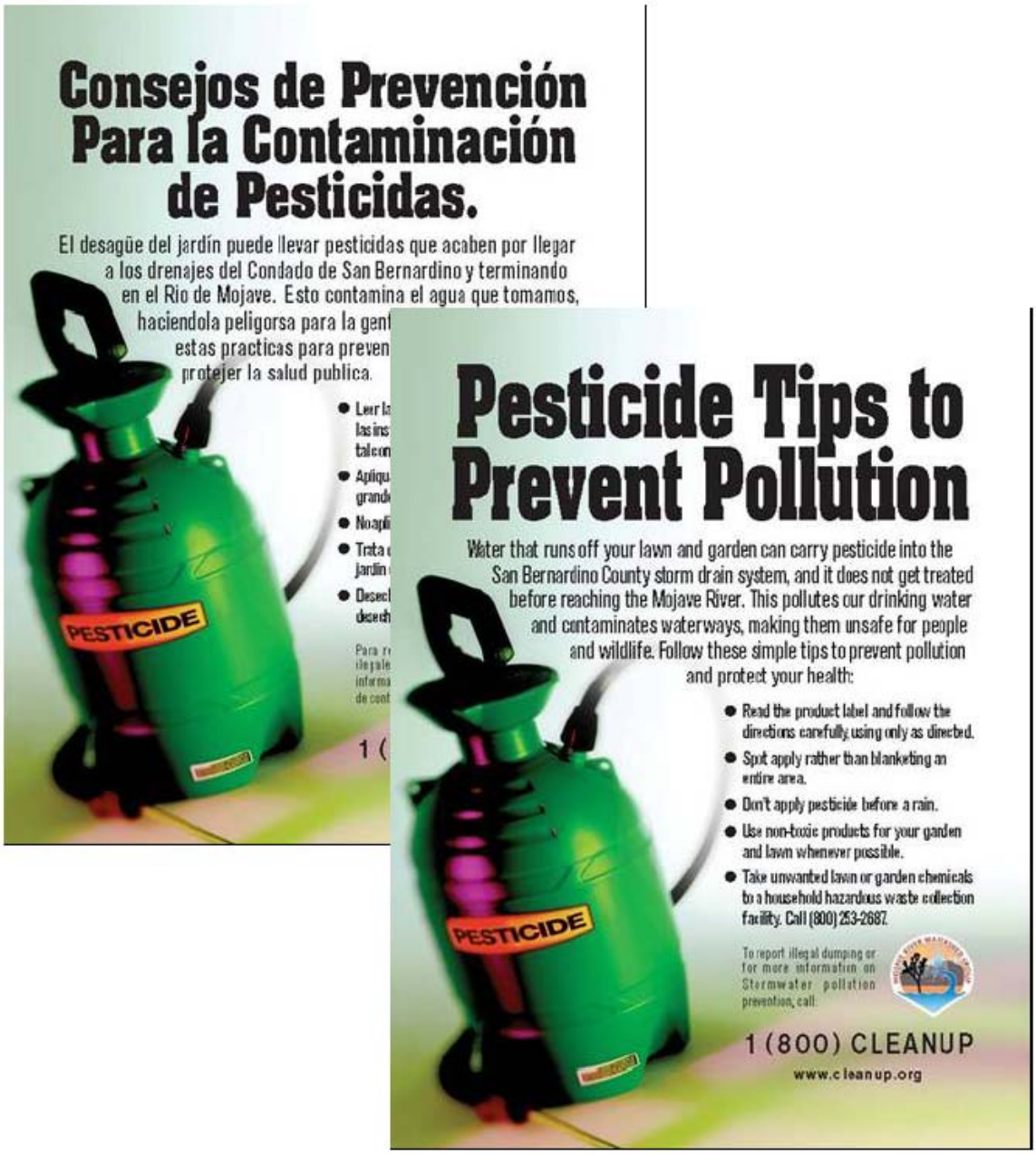
- Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."
- Don't clean brushes or rinse paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink and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

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

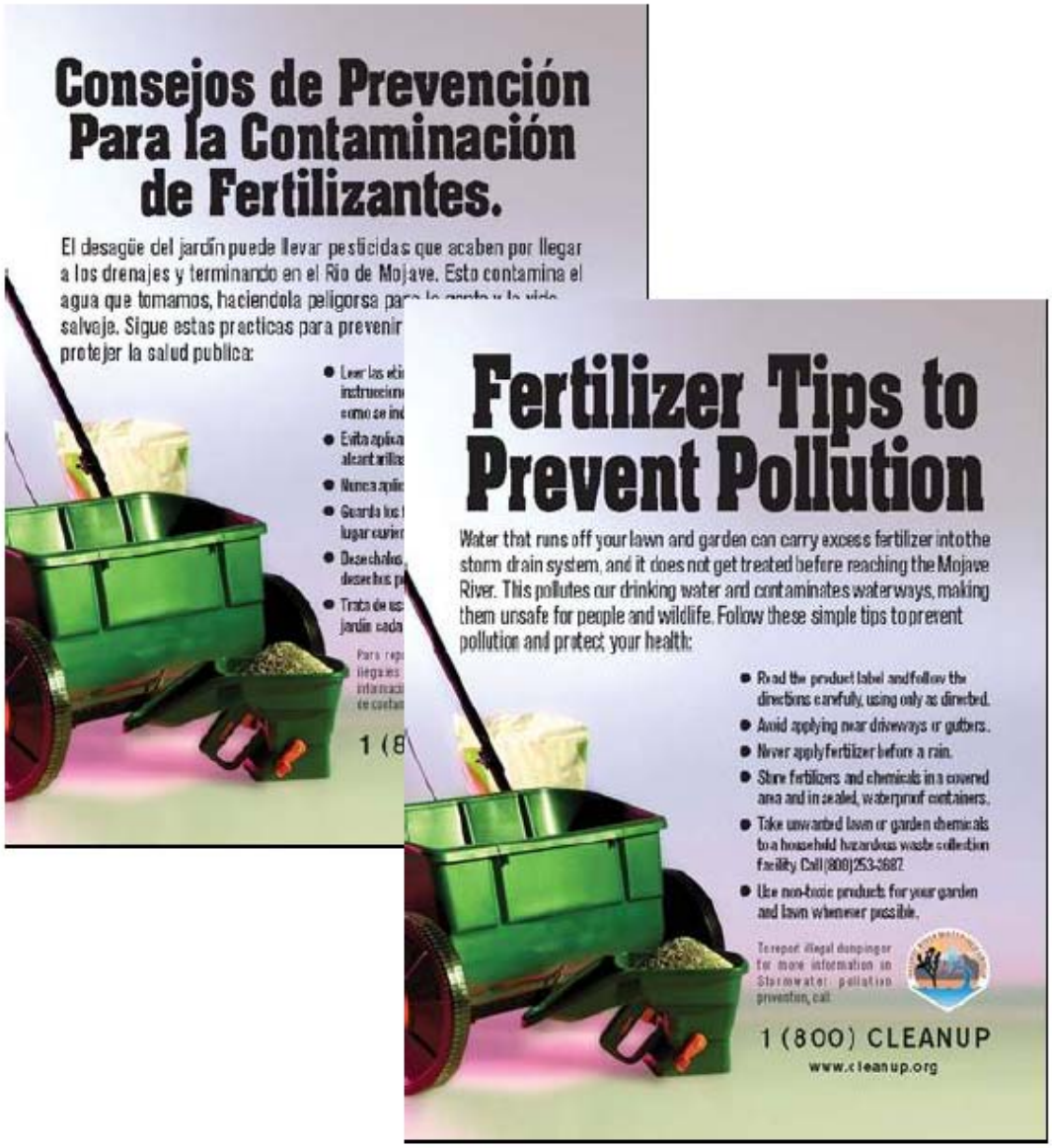
1 (800) CLEANUP

www.cleanup.org

C. Pesticide Tip Cards



D. Fertilizer Tip Cards



Consejos de Prevención Para la Contaminación de Fertilizantes.

El desagüe del jardín puede llevar pesticidas que acaben por llegar a los drenajes y terminando en el Río de Mojave. Esto contamina el agua que tomamos, haciendola peligorsa para
salvaje. Sigue estas practicas para prevenir
protejer la salud publica:

Fertilizer Tips to Prevent Pollution

Water that runs off your lawn and garden can carry excess fertilizer into the storm drain system, and it does not get treated before reaching the Mojave 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) 253-3687.
- Use non-toxic products for your garden and lawn whenever possible.

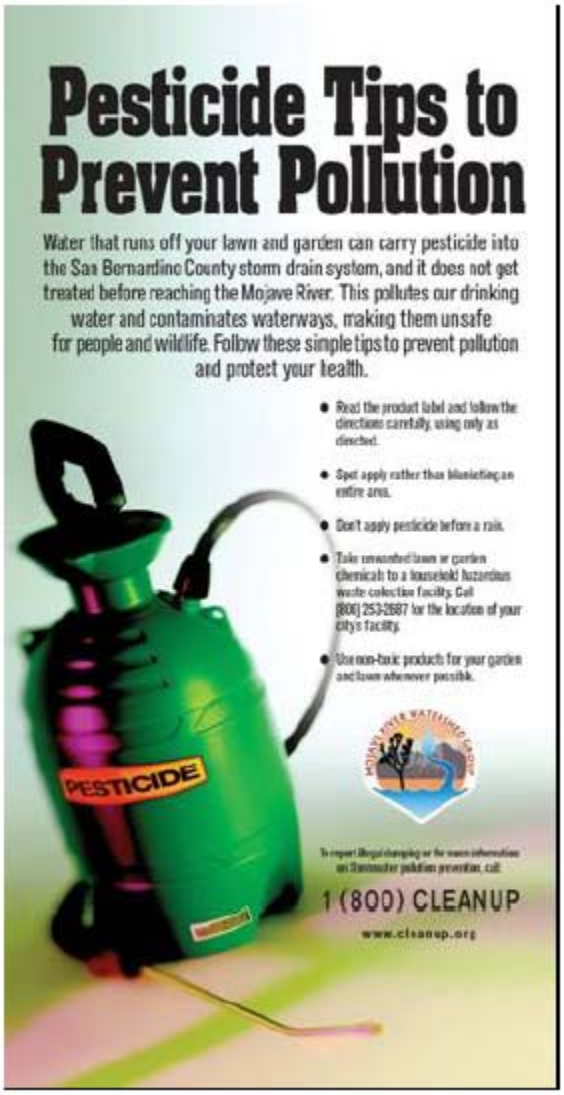
To report illegal dumping or for more information on Stormwater pollution prevention, call

1 (800) CLEANUP

www.cleanup.org

E. Paint Shelftalkers

F. Pesticide Shelftalkers



G. Fertilizers Shelftalkers

H. "Too Toxic To Trash" Poster

I. Best Management Practices for Urban Horse Owners

TO CONNECT TO THE STORM DRAIN:

It is illegal to connect to the storm drain without a permit. To obtain a storm drain connection permit, contact the Town of Apple Valley Engineering Department at (760) 240-7000 ext. 7353.

RECYCLING AND HAZARDOUS WASTE INFORMATION:

San Bernardino County Fire Department
Hazardous Materials Division
Phone: (909) 386-8401

For more information on storage/disposal of hazardous waste call:
Department of Toxic Substances Control (DTSC)
Duty Officer: (818) 551-2830 or log on to www.dtsc.ca.gov.

TO REPORT ILLEGAL DUMPING OR SPILLS:

San Bernardino County Stormwater Program
24-hour non-emergency Water Pollution Hotline
1 (800) CLEANUP

TO REPORT A CLOGGED STORM DRAIN INLET OR CATCH BASIN:

Public Works Department
7:30am to 5:30pm Monday - Friday
(760) 240-7000 ext. 7500
After hours call (760) 961-6001

HOUSEHOLD HAZARDOUS MATERIALS:

The Town of Apple Valley collects hazardous materials generated in the normal course of household operations - no business waste, no medical waste, or reactive waste will be accepted. The Collection Center is located at the Public Works Yard, at 22411 Highway 18, and is open the 1st and 3rd Saturdays of each month, excluding holiday weekends.

This brochure is one of a series of brochures describing storm drain protection measures.

Other brochures include:

FOOD SERVICE INDUSTRY

USED OIL AND HOUSEHOLD HAZARDOUS WASTE MANAGEMENT

LANDSCAPING, GARDENING & PEST CONTROL

TOWN
OF
APPLE VALLEY

A-V Inc. 1988

www.888CleanLA.com

For more information about storm drain protection or additional brochures, call the Town of Apple Valley at (760) 240-7000 or go to the web at www.applevalley.org.

Stormwater Pollution Prevention

Best Management Practices (BMPs)

for

Urban Horse Owners

Equestrian Centers

Boarding Stables

PROBLEMS

Storm Water Pollution - *It's Up To Us*

Animal waste contributes to stormwater pollution when it is improperly stored or left uncovered near small streams and storm drains. Animal waste contains nutrients-phosphorus and nitrogen- as well as bacteria. The nutrients fertilize the aquatic plants causing their proliferation and subsequent die-off, which depletes the oxygen in the water, killing aquatic life. The high bacteria levels in the water can cause gastro-intestinal disorders and other medical problems.

Sediment in runoff from pastures and livestock facilities harms aquatic life by clogging the gills of fish, blocking light transmission and increasing water temperatures.

SOLUTIONS

Facilities Design

- Site barns, corrals, and other high-use areas on the portion of property that drains away from the nearest creek or stream.
- Install gutters that will divert runoff away from livestock areas.
- Design diversion terraces which drain into areas with sufficient vegetation to filter the flow.
- Protect manure storage facilities from rainfall and surface runoff.

Pasture Management

- Confine animals in properly fenced areas except for exercise and grazing time.
- Corrals, stables, and barns should be located on higher ground when possible and surrounded by pasture to act as a natural filtration system.
- Utilize fencing to keep horses away from environmentally sensitive areas and protect stream banks from contamination.

- Use manure and soiled bedding sparingly to fertilize pastures and croplands.

Grazing Management

- Establish healthy and vigorous pastures.
- Subdivide grazing areas into three or more equal units of equal size.
- Rotate animals to clean pasture when grass is grazed down to 3-4 inches. Let pasture regrow 8-10 inches before allowing regrazing.
- Keep animals away from wet fields when possible.
- During heavy rainfall, consider indoor feeding, a practice which keeps more manure under roof and away from runoff.

Waste Collection and Storage

Collect soiled bedding and manure on a regular basis from stalls and paddocks and place in temporary or long-term storage units. Store in sturdy, insect resistant and seepage free units such as:

- Plastic garbage cans with lids
- Fly-tight wooden or concrete storage sheds
- Composters
- Pits or trenches lined with an impermeable layer

Use and Disposal

- Compost soiled bedding and manure for your own use.
- Give away composted material to local greenhouses, nurseries and botanical parks.
- Leave manure waste in approved containers for pick-up and composting.
- Fertilize pastures, cropland, and lawns with compost. **Do not** apply compost just before or during rainstorms.

Pesticide Alternatives

The "chemicals only" approach to pest control is only a temporary fix. *Integrated Pest Management* is a more common sense approach for a long-term solution. Plan your "IPM" strategy in this order:

A) Physical Controls
- Pheromone Traps
- Tarps
- Bug Zappers
- Fly-Tight Storage Sheds

B) Biological Controls – *Nature's Way*
Encourage the use of swallows, bats and other insect eating animals on your property. For more information call the Environmental Health Hotline at 1-888-700-9995.

C) Chemical Controls – *Your Last Resort*
Use these least-toxic products:
- Pyrethrin-based insecticides
- Dehydrating dusts (e.g. silica gel)
- Insecticidal soaps
- Horticultural oils

Pesticide Disposal

Rinse empty pesticide containers and treat the rinse water as you would the product. Empty containers may be recycled depending on their type or may be thrown in the trash.

Unused household hazardous waste may be disposed of at Los Angeles County RoundUps. Contact the Town of Apple Valley Engineering Department at (760) 240-7000 ext. 7353.

J. Best Management Practices for Pet Owners

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TOWN OF APPLE VALLEY

Inc. 1988

For more information about storm drain protection or additional brochures, call the Town of Apple Valley at (760) 240-7000 or go to the web at www.applevalley.org.

Storm Water Pollution Prevention

Best Management Practices (BMPs) For

Pet Waste Handling and Disposal

PROBLEMS

Storm Water Pollution - *It's Up To Us*

Pet waste contributes to stormwater pollution when it is not properly disposed of. During a rainfall, it can be washed into storm drains and flow, untreated, directly into the Mojave River. Pet waste contains nutrients such as phosphorus and nitrogen as well as bacteria. The nutrients fertilize the aquatic plants causing their proliferation and subsequent die-off, which depletes the oxygen in the water, killing aquatic life. The high bacteria levels in the water can cause gastrointestinal disorders and other medical problems for swimmers.

SOLUTIONS

The following controls referred to as "Best Management Practices" or BMPs will help ensure a cleaner Town and Mojave River.

Pick up after your pet

- When walking your dog, always carry a pooper scooper or plastic bag with you to pick up your pet's waste. It is a neighborhood nuisance that can wash into gutters and storm drains carrying dangerous diseases into our rivers.
- Properly dispose of pet waste by flushing it down the toilet or placing it in the trash.
- Picking up after your pet while out on a walk insures that waste will not wash into catch basins.
- Plastic grocery and vegetable bags work well. Place your hand in the bag, pick up the waste, then turn the bag inside out. Commercial "scoopers" can also be purchased to make proper disposal of pet waste even easier. Check pet stores and catalogs. Dogs can be trained to "take care of business" at the beginning of a walk so you can dispose of the waste right away.

- Remember, it is illegal to not pick up your dog's waste.

Maintain your automobile and dispose of used fluids properly

Pets can be poisoned if they ingest gas, oil or antifreeze that drips onto the pavement or is stored in open containers. Call the Household Hazardous Waste Hotline for information on proper disposal.

Cleaning up after pets at home

Pet owners have many different ways of cleaning up after their pets at home. Here are a few that are environmentally friendly:

- Smaller quantities of pet waste can be left to decompose slowly on permeable surfaces.
- Larger amounts should be scooped and placed in the trash. One method suggested for this is to place a plastic bag in a 5-gallon trash can with a lid. When you pick up dog droppings in your yard, put them in that trash can, then cover them with a sprinkling of powdered lime (available at building supply stores) and close the lid. Each time you clean up the yard and add droppings to the container, add more lime. When the container is full, tie the bag closed and put it in your regular trash container.
- A more innovative method, which not only disposes of pet waste but also creates fertilizer, is to install a disposal system, commercially available through pet owners' and gardening catalogs. These systems use bacterial and enzymatic cultures which reduce the waste to a liquid, which is then absorbed into the soil.

Washing pets

Wash pets indoors in a bathtub or sink using less toxic shampoos, or consider having your pet professionally groomed. Pet shampoos and soaps, even when biodegradable, can be toxic to humans.

Consider using less toxic alternatives such as oral or topical flea control products. If you do use flea control products such as shampoos, sprays or collars, please dispose of unwanted quantities properly. Call the Household Hazardous Waste Hotline for more information.

K. Tips for Pool Maintenance

Tips for Pool Maintenance

Swimming pools and spas must be maintained properly to guarantee that chemicals aren't allowed to enter the street. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

Many pools and spas are plumbed to allow the water to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.

Acceptable and Preferred Method of Disposal

When you cannot dispose of pool or spa water in the sanitary sewer, the release of dechlorinated swimming pool and spa water is allowed if all of these tips are followed:

- The residential chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.

How to Know if You're Following the Standards

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company or hardware store. Always make sure to follow the instructions that come with any products you use.

BMP Fact Sheets


SC-310

DC-780


SC-740


MC-3500

MC-4500

StormTech®

Detention • Retention • Water Quality

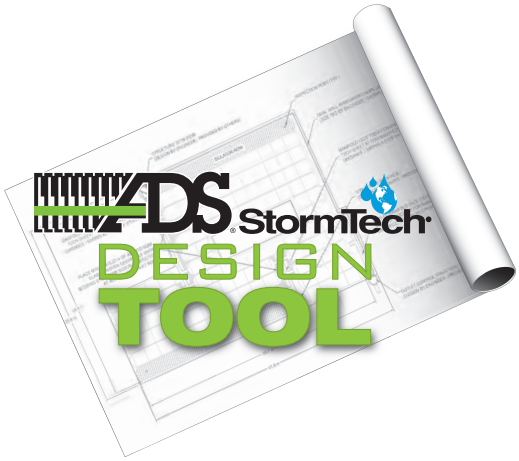
An ADS company

Product Catalog

This catalog is not intended to provide requirements for design or installation of StormTech chambers. Refer to the appropriate "StormTech Design Manual" and "StormTech Construction Guide" for design and installation specifications.

StormTech Subsurface Stormwater Management

Table of Contents



The ADS StormTech Design Tool will help designers, owners, and contractors design conceptual layouts and cost estimates.
Now available at **www.stormtech.com/designtool.html**

StormTech Subsurface Stormwater Management

StormTech has thousands of chamber systems in service throughout the world. All StormTech chambers are designed to meet the most stringent industry performance standards for superior structural integrity. The StormTech system is designed primarily to be used under parking lots, roadways and heavy earth loads saving valuable land and protecting water resources for commercial and municipal applications. In our continuing desire to answer designers' challenges, StormTech has expanded the family of products providing engineers, developers, regulators and contractors with additional site specific flexibility.

Advanced Structural Performance for Greater Long-Term Reliability

StormTech developed a state of the art chamber design through:

- Collaboration with world-renowned experts of buried drainage structures to develop and evaluate the structural testing program and product design
- Designing chambers to exceed American Association of State Highway and Transportation Officials (AASHTO) LRFD design specifications for HS-20 live loads and deep burial earth loads
- Subjecting the chambers to rigorous full scale testing, under severe loading conditions to verify the AASHTO safety factors for live load and deep burial applications
- Designing chambers to conform to the product requirements of ASTM F2418 and ASTM F2922 and design requirements of ASTM F2787 ensuring both the assurance of product quality and safe structural design

Our Chambers Provide...

- Large capacity that *fits very tight footprints* providing developers with more useable land for development.
- *A proven attenuation alternative* to cumbersome large diameter metal pipe or snap together plastic crates and unreliable multi-layer systems.
- Provides the *strength* of concrete vaults at a very competitive price.
- The robust *continuous true elliptical arch design* which effectively transfers loads to the surrounding backfill providing the long-term safety factors required by AASHTO. Offers developers a cost-effective underground system that will perform as designed for decades.
- *Designed in accordance with the AASHTO LRFD Bridge Design Specifications* providing engineers with a structural performance standard for live and long-term dead loads.
- *Polypropylene and polyethylene* resins tested using ASTM standards to ensure long and short-term structural properties.
- *Injection molded* for uniform wall thickness and repeatable quality.
- Third party *tested and patented Isolator Row* for less frequent maintenance, water quality and long-term performance.
- Incorporates *traditional manifold/header designs* using conventional hydraulic equations that can easily verify flow equalization and scour velocity.
- *Open chamber design* requiring only one chamber model to construct each row assuring ease of construction and no repeating end walls to obstruct access or flow.

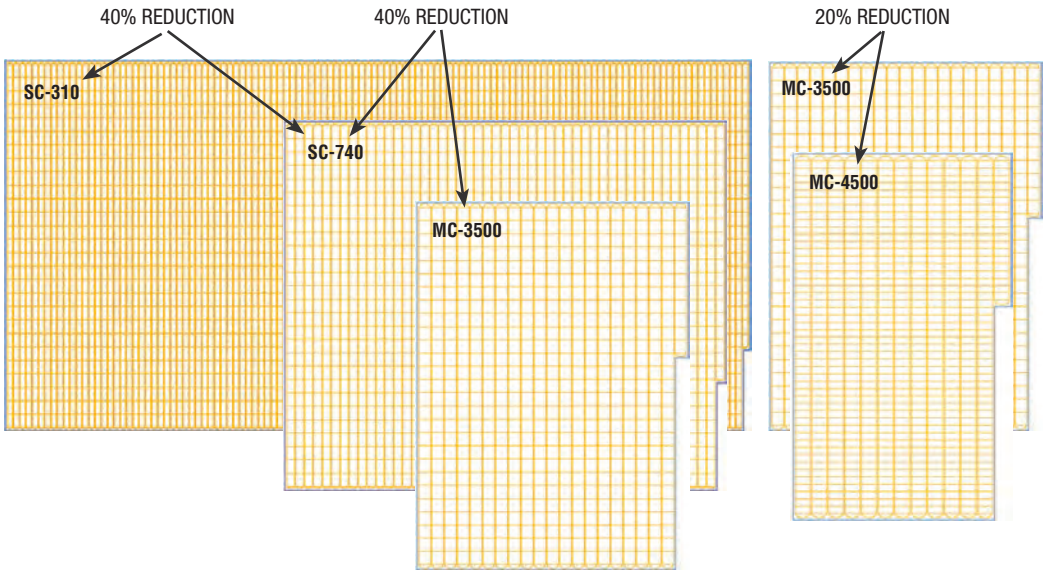
StormTech offers a variety of chamber sizes (SC-160LP, SC-310, SC-740, DC-780, MC-3500 and MC-4500) so the consulting design engineer can choose the chamber that is best suited for the site conditions and regulatory requirements. StormTech has thousands of chamber systems in service worldwide. We provide plan layout and cost estimate services at no charge for consulting engineers and developers.

StormTech Subsurface Stormwater Management

PRODUCT SPECIFICATIONS	MC-4500	MC-3500	DC-780	SC-740	SC-310	SC-160LP
Height, in. (mm)	60 (1524)	45 (1143)	30 (762)	30 (762)	16 (406)	12 (305)
Width, in. (mm)	100 (2540)	77 (1956)	51 (1295)	51 (1295)	34 (864)	25 (635)
Length, in. (mm)	52 (1321)	90 (2286)	90.7 (2300)	90.7 (2300)	90.7 (2300)	90.7 (2300)
Installed Length, in. (mm)	48.3 (1227)	86.0 (2184)	85.4 (2170)	85.4 (2170)	85.4 (2170)	85.4 (2170)
Bare Chamber Storage, cf (cm)	106.5 (3.01)	109.9 (3.11)	46.2 (1.30)	45.9 (1.30)	14.7 (0.42)	6.85 (0.19)
Stone above, in. (mm)	12 (305)	12 (305)	6 (152)	6 (152)	6 (152)	6 (152)
Minimum Stone below, in. (mm)	9 (229)	9 (229)	9 (229)	6 (152)	6 (152)	4 (100)
Row Spacing, in. (mm)	9 (229)	9 (229)	6 (152)	6 (152)	6 (152)	N/A
Minimum Installed Storage, cf (cm)	**162.6 (4.60)**	**178.9 (5.06)**	**78.4 (2.22)**	**74.9 (2.12)**	**31.0 (0.88)**	**15.0 (0.42)**
Storage Per Unit Area, cf/sf (cm/sm)	4.45 (1.35)	3.48 (1.06)	2.32 (0.70)	2.21 (0.67)	1.31 (0.39)	1.01 (0.61)

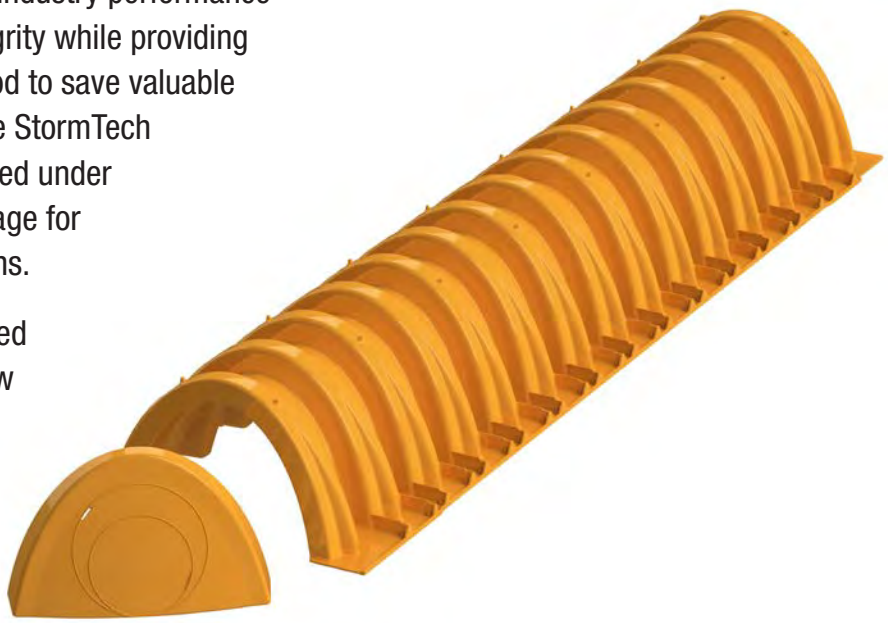
***NOTE**: Spec sheets for our RC-310 and RC-750, recycled chambers, are available upon request.*

Example: Footprint Comparison - 100,000 CF Project



StormTech SC-160LP Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



The SC-160LP chamber was developed for infiltration and detention in shallow cover applications

- Only 14” (350 mm) required from top of chamber to bottom of pavement
- Only 12” (300 mm) tall
- Installs toe to toe - no additional spacing between rows

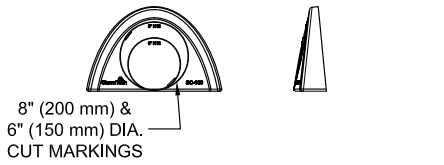
Shipping

132 chambers/pallet
144 end caps/pallet
12 pallets/truck

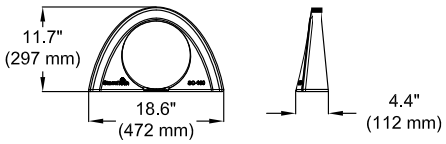
StormTech SC-160LP Chamber (not to scale)
Nominal Chamber Specifications

Size (L x W x H)	85.4” x 25.0” x 12.0” (2170 x 635 x 305 mm)
Chamber Storage	6.85 ft³ (0.19 m³)
Min. Installed Storage*	15.0 ft³ (0.42 m³)
Weight	24.0 lbs (10.9 kg)

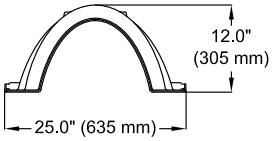
*Assumes 6” (150 mm) stone above, 4” (100mm) below and stone between chambers with 40% stone porosity.

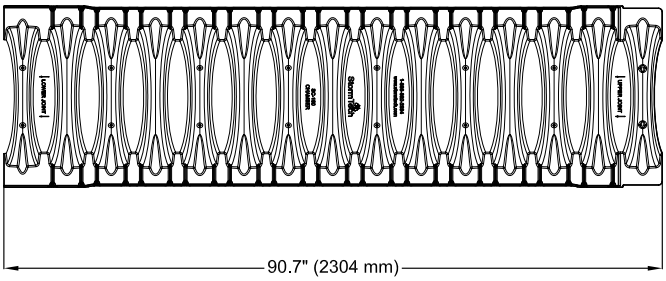


SC-160LP SOLID END CAP

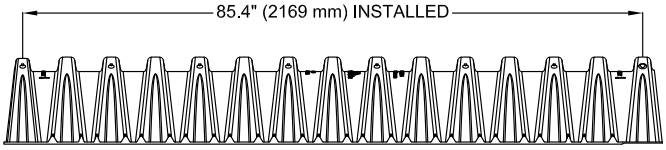


SC-160LP 8" OPEN END CAP





SC-160LP CHAMBER



StormTech SC-160LP Chamber

SC-160LP Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 4" (100 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
22 (559)	6.85 (0.194)	14.98 (0.424)
21 (533)	6.85 (0.194)	14.49 (0.410)
20 (508)	6.85 (0.194)	14.00 (0.396)
19 (483)	6.85 (0.194)	13.50 (0.382)
18 (457)	6.85 (0.194)	13.01 (0.368)
17 (432)	6.85 (0.194)	12.51 (0.354)
16 (406)	6.85 (0.194)	12.02 (0.340)
15 (381)	6.80 (0.193)	11.49 (0.325)
14 (356)	6.67 (0.189)	10.92 (0.309)
13 (330)	6.38 (0.181)	10.25 (0.290)
12 (305)	5.94 (0.168)	9.49 (0.269)
11 (279)	5.40 (0.153)	8.67 (0.246)
10 (254)	4.78 (0.135)	7.81 (0.221)
9 (229)	4.10 (0.116)	6.91 (0.196)
8 (203)	3.36 (0.095)	5.97 (0.169)
7 (178)	2.58 (0.073)	5.01 (0.142)
6 (152)	1.76 (0.050)	4.02 (0.114)
5 (127)	0.89 (0.025)	3.01 (0.085)
4(102)	0	1.98 (0.056)
3 (76)	0	1.48 (0.042)
2 (51)	0	0.99 (0.028)
1 (25)	0	0.49 (0.014)

Stone Cover

Stone Foundation

Note: Add 0.49 cu. ft. (0.014 m³) of storage for each additional inch (25 mm) of stone foundation.

Amount of Stone Per Chamber

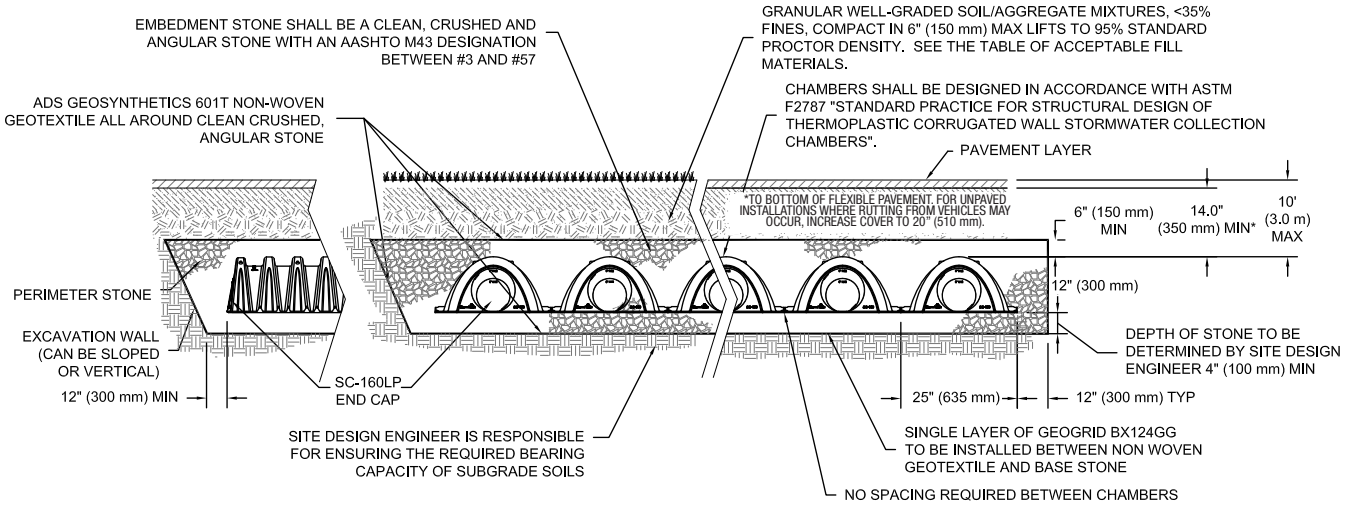
ENGLISH TONS (yds³)	Stone Foundation Depth		
	4"	6"	8"
StormTech SC-160LP	1.1 (0.8 yd³)	1.2 (0.9 yd³)	1.3 (0.9 yd³)
METRIC KILOGRAMS (m³)	**100 mm**	**150 mm**	**200 mm**
StormTech SC-160LP	952 (0.7 m³)	1074 (0.8 m³)	1197 (0.8 m³)

Note: Assumes 6" (150 mm) of stone above, and only embedment stone between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	4" (100 mm)	8" (200 mm)	12" (300 mm)
StormTech SC-160LP	1.4 (1.1)	1.6 (1.2)	1.8 (1.3)

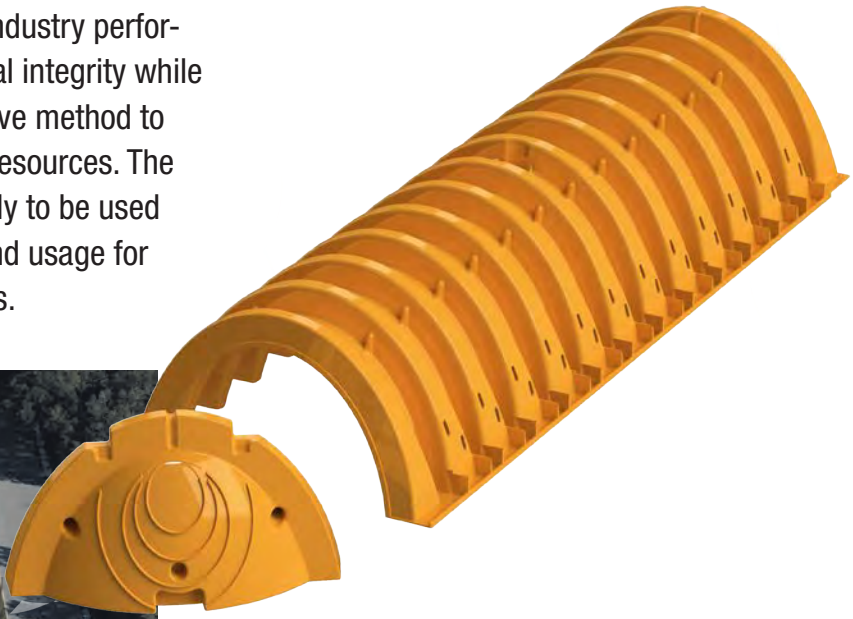
Note: Assumes no row separation and 14" (350 mm) of cover. The volume of excavation will vary as the depth of the cover increases.



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech SC-310 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech SC-310 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	85.4" x 34.0" x 16.0" (2170 x 864 x 406 mm)
Chamber Storage	14.7 ft³ (0.42 m³)
Min. Installed Storage*	31.0 ft³ (0.88 m³)
Weight	37.0 lbs (16.8 kg)

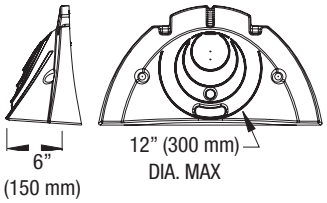
*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.

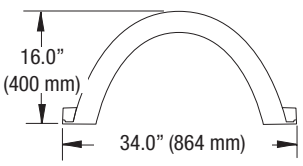
Shipping

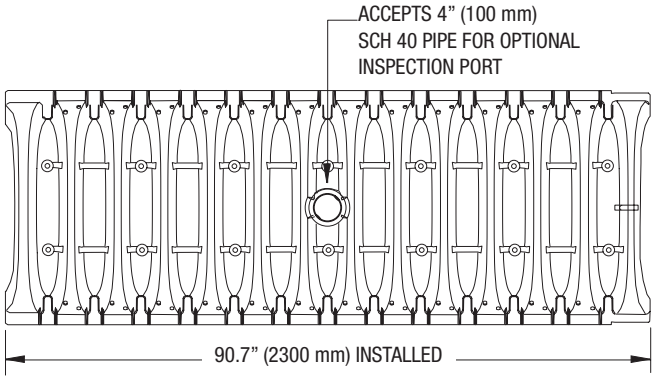
41 chambers/pallet

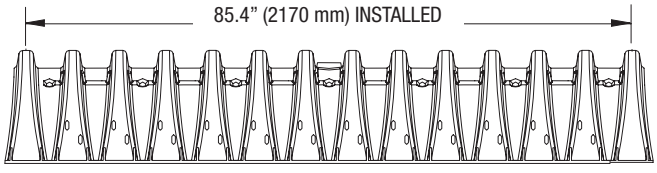
108 end caps/pallet

18 pallets/truck









StormTech SC-310 Chamber

SC-310 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	14.70 (0.416)	31.00 (0.878)
27 (686)	14.70 (0.416)	30.21 (0.855)
26 (680) Stone	14.70 (0.416)	29.42 (0.833)
25 (610) Cover	14.70 (0.416)	28.63 (0.811)
24 (609)	14.70 (0.416)	27.84 (0.788)
23 (584)	14.70 (0.416)	27.05 (0.766)
22 (559)	14.70 (0.416)	26.26 (0.748)
21 (533)	14.64 (0.415)	25.43 (0.720)
20 (508)	14.49 (0.410)	24.54 (0.695)
19 (483)	14.22 (0.403)	23.58 (0.668)
18 (457)	13.68 (0.387)	22.47 (0.636)
17 (432)	12.99 (0.368)	21.25 (0.602)
16 (406)	12.17 (0.345)	19.97 (0.566)
15 (381)	11.25 (0.319)	18.62 (0.528)
14 (356)	10.23 (0.290)	17.22 (0.488)
13 (330)	9.15 (0.260)	15.78 (0.447)
12 (305)	7.99 (0.227)	14.29 (0.425)
11 (279)	6.78 (0.192)	12.77 (0.362)
10 (254)	5.51 (0.156)	11.22 (0.318)
9 (229)	4.19 (0.119)	9.64 (0.278)
8 (203)	2.83 (0.081)	8.03 (0.227)
7 (178)	1.43 (0.041)	6.40 (0.181)
6 (152)	0	4.74 (0.134)
5 (127)	0	3.95 (0.112)
4(102) Stone Foundation	0	3.16 (0.090)
3 (76)	0	2.37 (0.067)
2 (51)	0	1.58 (0.046)
1 (25)	0	0.79 (0.022)

Note: Add 0.79 cu. ft. (0.022 m³) of storage for each additional inch. (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
StormTech SC-310	14.7 (0.4)	31.0 (0.9)	35.7 (1.0)	40.4 (1.1)

Note: Assumes 6" (150 mm) of stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

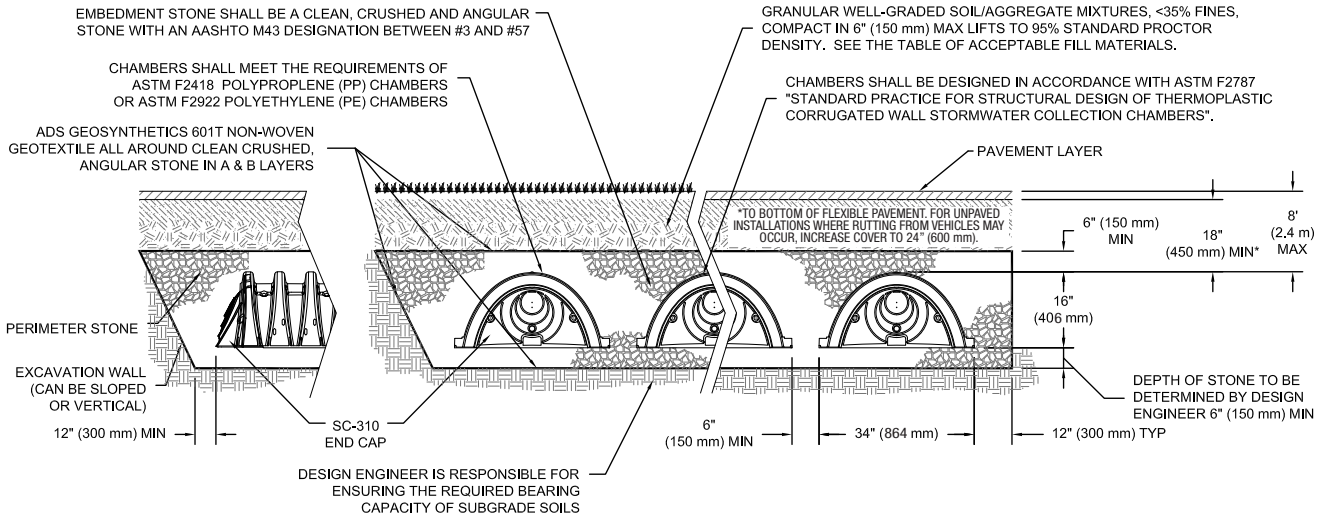
ENGLISH TONS (yds³)	Stone Foundation Depth		
	6"	12"	18"
StormTech SC-310	2.1 (1.5 yd³)	2.7 (1.9 yd³)	3.4 (2.4 yd³)
METRIC KILOGRAMS (m³)	**150 mm**	**300 mm**	**450 mm**
StormTech SC-310	1830 (1.1 m³)	2490 (1.5 m³)	2990 (1.8 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	12" (300 mm)	18" (450 mm)
StormTech SC-310	2.9 (2.2)	3.4 (2.6)	3.8 (2.9)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech SC-310-3 Chamber

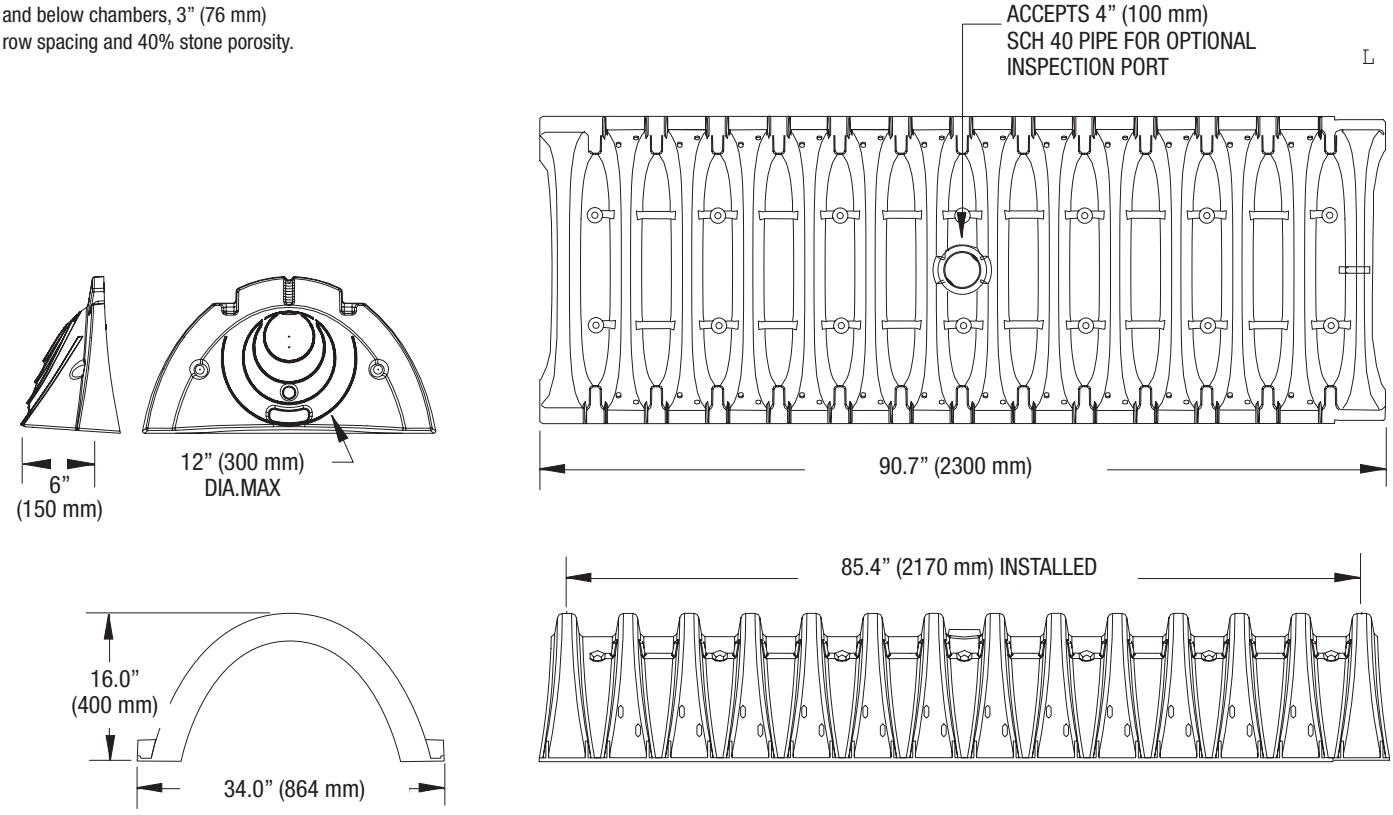
The proven strength and durability of the SC-310-3 Chamber allows for a design option for sites where limited cover, limited space, high water table and escalated aggregate cost are a factor. The SC-310-3 has a minimum cover requirement of 16” (400 mm) to bottom of pavement and reduces the spacing requirement between chambers by 50% to 3” (76 mm). This provides a reduced footprint overall and allows the designer to offer a traffic bearing application yet comply with water table separation regulations.

StormTech SC-310-3 Chamber (not to scale)

Nominal Chamber Specifications	
Size (L x W x H)	85.4” x 34.0” x 16.0” (2170 x 864 x 406 mm)
Chamber Storage	14.7ft³ (0.42 m³)
Min. Installed Storage*	29.3 ft³ (0.83 m³)
Weight	37.0 lbs (16.8 kg)

*Assumes 6” (150 mm) stone above and below chambers, 3” (76 mm) row spacing and 40% stone porosity.

Shipping
41 chambers/pallet
108 end caps/pallet
18 pallets/truck



StormTech SC-310-3 Chamber

SC-310-3 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)		Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)		14.70 (0.416)	29.34 (0.831)
27 (686)		14.70 (0.416)	28.60 (0.810)
26 (660)	Stone	14.70 (0.416)	27.87 (0.789)
25 (635)	Cover	14.70 (0.416)	27.14 (0.769)
24 (610)		14.70 (0.416)	26.41 (0.748)
23 (584)		14.70 (0.416)	25.68 (0.727)
22 (559)		14.70 (0.416)	24.95 (0.707)
21 (533)		14.64 (0.415)	24.18 (0.685)
20 (508)		14.49 (0.410)	23.36 (0.661)
19 (483)		14.22 (0.403)	22.47 (0.636)
18 (457)		13.68 (0.387)	21.41 (0.606)
17 (432)		12.99 (0.368)	20.25 (0.573)
16 (406)		12.17 (0.345)	19.03 (0.539)
15 (381)		11.25 (0.319)	17.74 (0.502)
14 (356)		10.23 (0.290)	16.40 (0.464)
13 (330)		9.15 (0.260)	15.01 (0.425)
12 (305)		7.99 (0.226)	13.59 (0.385)
11 (279)		6.78 (0.192)	12.13 (0.343)
10 (254)		5.51 (0.156)	10.63 (0.301)
9 (229)		4.19 (0.119)	9.11 (0.258)
8 (203)		2.83 (0.080)	7.56 (0.214)
7 (178)		1.43 (0.040)	5.98 (0.169)
6 (152)		0	4.39 (0.124)
5 (127)		0	3.66 (0.104)
4(102)	Stone Foundation	0	2.93 (0.083)
3 (76)		0	2.19 (0.062)
2 (51)		0	1.46 (0.041)
1 (25)		0	0.73 (0.021)

Note: Add 0.73 ft³ (0.021 m³) of storage for each additional inch (25 mm) of stone foundation.

Amount of Stone Per Chamber

ENGLISH TONS (yd³)	Stone Foundation Depth		
	6"	12"	18"
SC-310-3	1.9 (1.4)	2.5 (1.8)	3.1 (2.2)
METRIC KILOGRAMS (m³)	150 mm	300 mm	450 mm
SC-310-3	1724 (1.0)	2268 (1.3)	2812 (1.7)

Note: Assumes 6" (150 mm) of stone above chambers and 3" (76 mm) row spacing.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-310-3	14.7 (0.42)	29.3 (0.83)	33.7 (0.95)	38.1 (1.08)

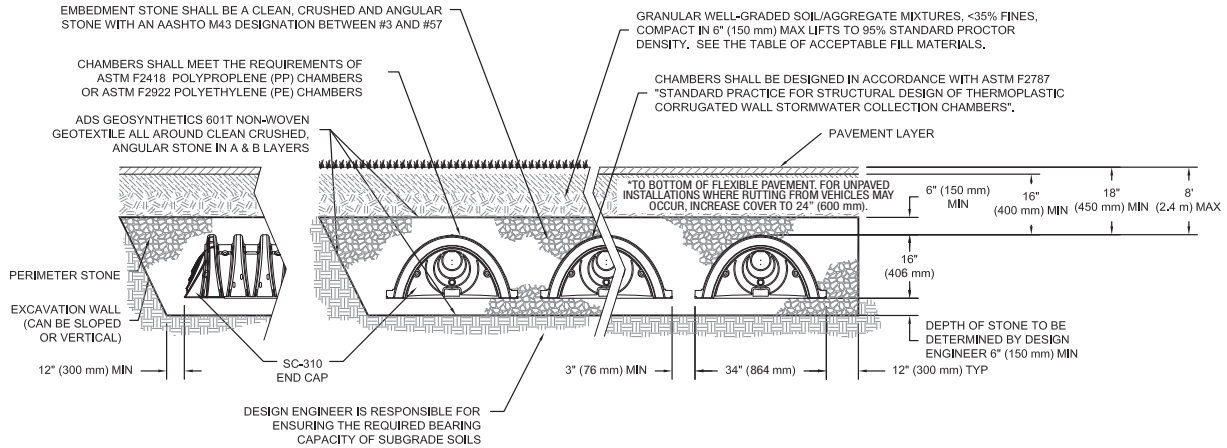
Note: Assumes 6" (150 mm) of stone above chambers, 3" (76 mm) row spacing and 40% stone porosity.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	12" (300 mm)	18" (450 mm)
SC-310-3	2.6 (2.0)	3.0 (2.0)	3.4 (2.6)

Note: Assumes 3" (76 mm) of row separation and 6" (150 mm) of stone above the chambers and 16" (400 mm) of cover. The volume of excavation will vary as depth of cover increases.

Typical Cross Section Detail



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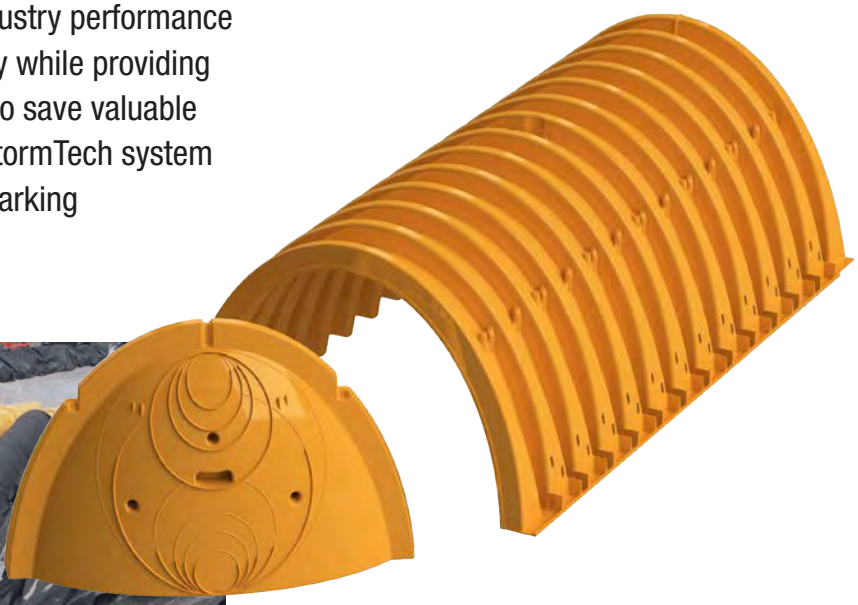
StormTech SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech SC-740 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	85.4" x 51.0" x 30.0" (2170 x 1295 x 762 mm)
Chamber Storage	45.9 ft³ (1.30 m³)
Min. Installed Storage*	74.9 ft³ (2.12 m³)
Weight	74.0 lbs (33.6 kg)

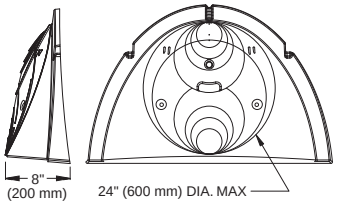
*Assumes 6" (150 mm) stone above, below and between chambers and 40% stone porosity.

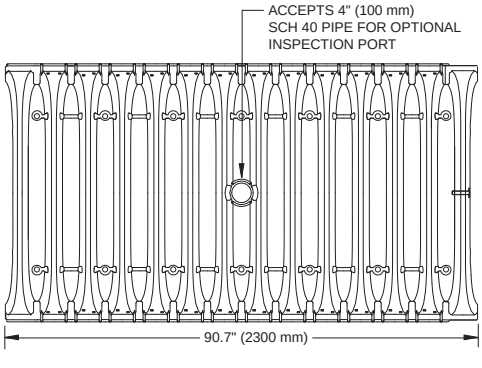
Shipping

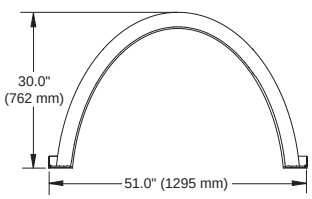
30 chambers/pallet

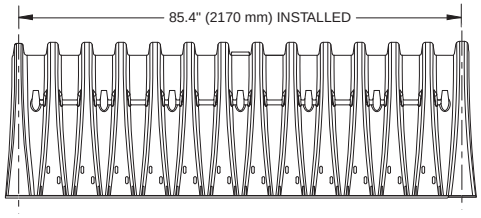
60 end caps/pallet

12 pallets/truck









StormTech SC-740 Chamber

SC-740 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)	45.90 (1.300)	74.90 (2.121)
41 (1041)	45.90 (1.300)	73.77 (2.089)
40 (1016)	Stone 45.90 (1.300)	72.64 (2.057)
39 (991)	Cover 45.90 (1.300)	71.52 (2.025)
38 (965)	45.90 (1.300)	70.39 (1.993)
37 (948)	45.90 (1.300)	69.26 (1.961)
36 (914)	45.90 (1.300)	68.14 (1.929)
35 (889)	45.85 (1.298)	66.98 (1.897)
34 (864)	45.69 (1.294)	65.75 (1.862)
33 (838)	45.41 (1.286)	64.46 (1.825)
32 (813)	44.81 (1.269)	62.97 (1.783)
31 (787)	44.01 (1.246)	61.36 (1.737)
30 (762)	43.06 (1.219)	59.66 (1.689)
29 (737)	41.98 (1.189)	57.89 (1.639)
28 (711)	40.80 (1.155)	56.05 (1.587)
27 (686)	39.54 (1.120)	54.17 (1.534)
26 (660)	38.18 (1.081)	52.23 (1.479)
25 (635)	36.74 (1.040)	50.23 (1.422)
24 (610)	35.22 (0.977)	48.19 (1.365)
23 (584)	33.64 (0.953)	46.11 (1.306)
22 (559)	31.99 (0.906)	44.00 (1.246)
21 (533)	30.29 (0.858)	41.85 (1.185)
20 (508)	28.54 (0.808)	39.67 (1.123)
19 (483)	26.74 (0.757)	37.47 (1.061)
18 (457)	24.89 (0.705)	35.23 (0.997)
17 (432)	23.00 (0.651)	32.96 (0.939)
16 (406)	21.06 (0.596)	30.68 (0.869)
15 (381)	19.09 (0.541)	28.36 (0.803)
14 (356)	17.08 (0.484)	26.03 (0.737)
13 (330)	15.04 (0.426)	23.68 (0.670)
12 (305)	12.97 (0.367)	21.31 (0.608)
11 (279)	10.87 (0.309)	18.92 (0.535)
10 (254)	8.74 (0.247)	16.51 (0.468)
9 (229)	6.58 (0.186)	14.09 (0.399)

SC-740 Cumulative Storage Volumes Per Chamber (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
8 (203)	4.41 (0.125)	11.66 (0.330)
7 (178)	2.21 (0.063)	9.21 (0.264)
6 (152)	0	6.76 (0.191)
5 (127)	0	5.63 (0.160)
4 (102)	Stone Foundation 0	4.51 (0.125)
3 (76)	0	3.38 (0.095)
2 (51)	0	2.25 (0.064)
1 (25)	0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m 3) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
StormTech SC-740	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) of stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

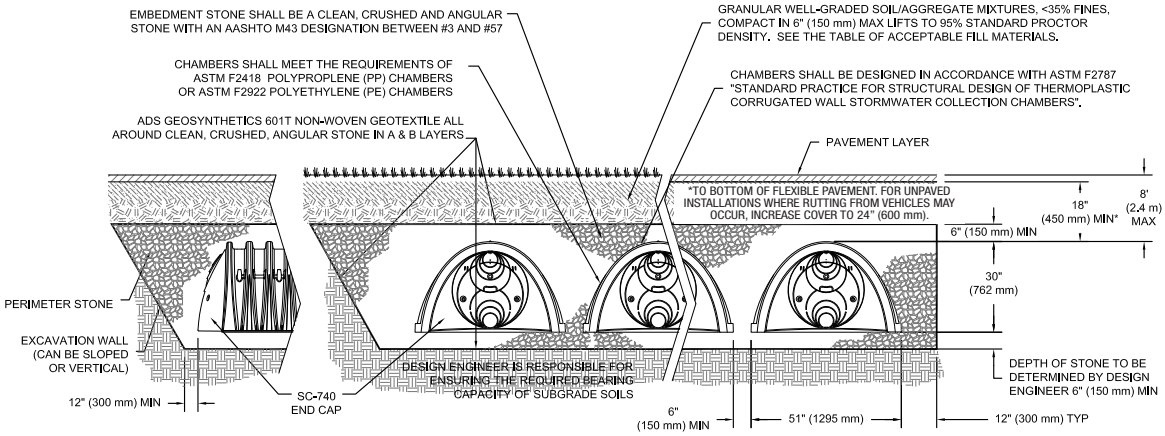
ENGLISH TONS (yd³)	Stone Foundation Depth		
	6"	12"	18"
StormTech SC-740	3.8 (2.8 yd³)	4.6 (3.3 yd³)	5.5 (3.9 yd³)
METRIC KILOGRAMS (M³)	**150 mm**	**300 mm**	**450 mm**
StormTech SC-740	3450 (2.1 m³)	4170 (2.5 m³)	4490 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6" (150 mm)	12" (300 mm)	18" (450 mm)
StormTech SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

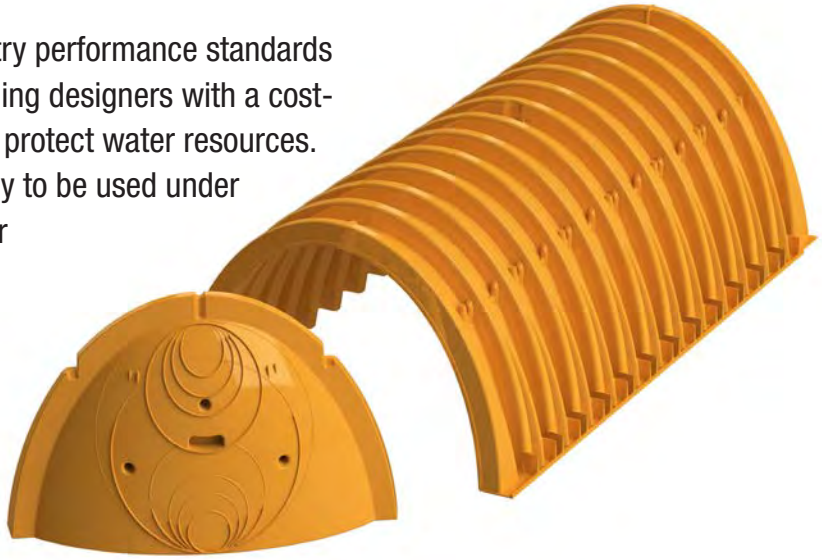
Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. Volume of excavation will vary as the depth cover increases.



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech DC-780 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



- 12’ Deep Cover applications.
- Designed in accordance with ASTM F 2787 and produced to meet the ASTM 2418 product standard.
- AASHTO safety factors provided for AASHTO Design Truck (H20) and deep cover conditions

StormTech DC-780 Chamber (not to scale)

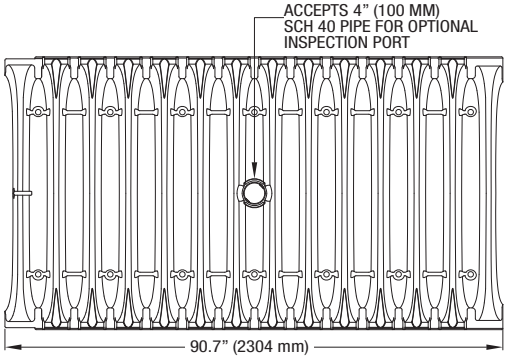
Nominal Chamber Specifications

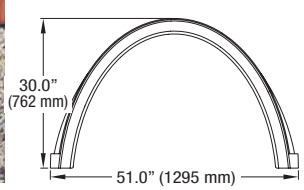
Size (L x W x H)	85.4” x 51.0” x 30.0” (2169 x 1295 x 762 mm)
Chamber Storage	46.2 ft³ (1.30 m³)
Min. Installed Storage*	78.4 ft³ (2.2 m³)

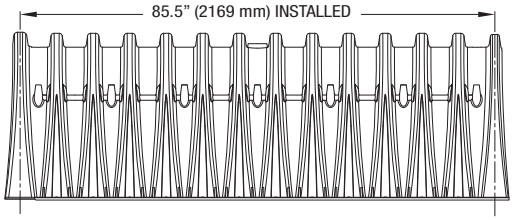
• Assumes 9” (230 mm) stone below, 6” (150 mm) stone above, 6” (150 mm) row spacing and 40% stone porosity.

Shipping

24 chambers/pallet
60 end caps/pallet
12 pallets/truck







StormTech DC-780 Chamber

DC-780 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 9" (230 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
45 (1143)	46.27 (1.310)	78.47 (2.222)
44 (1118)	46.27 (1.310)	77.34 (2.190)
43 (1092)	Stone 46.27 (1.310)	76.21 (2.158)
42 (1067)	Cover 46.27 (1.310)	75.09 (2.126)
41 (1041)	46.27 (1.310)	73.96 (2.094)
40 (1016)	46.27 (1.310)	72.83 (2.062)
39 (991)	46.27 (1.310)	71.71 (2.030)
38 (965)	46.21 (1.309)	70.54 (1.998)
37 (940)	46.04 (1.304)	69.32 (1.963)
36 (914)	45.76 (1.296)	68.02 (1.926)
35 (889)	45.15 (1.278)	66.53 (1.884)
34 (864)	44.34 (1.255)	64.91 (1.838)
33 (838)	43.38 (1.228)	63.21 (1.790)
32 (813)	42.29 (1.198)	61.43 (1.740)
31 (787)	41.11 (1.164)	59.59 (1.688)
30 (762)	39.83 (1.128)	57.70 (1.634)
29 (737)	38.47 (1.089)	55.76 (1.579)
28 (711)	37.01 (1.048)	53.76 (1.522)
27 (686)	35.49 (1.005)	51.72 (1.464)
26 (660)	33.90 (0.960)	49.63 (1.405)
25 (635)	32.24 (0.913)	47.52 (1.346)
24 (610)	30.54 (0.865)	45.36 (1.285)
23 (584)	28.77 (0.815)	43.18 (1.223)
22 (559)	26.96 (0.763)	40.97 (1.160)
21 (533)	25.10 (0.711)	38.72 (1.096)
20 (508)	23.19 (0.657)	36.45 (1.032)
19 (483)	21.25 (0.602)	34.16 (0.967)
18 (457)	19.26 (0.545)	31.84 (0.902)
17 (432)	17.24 (0.488)	29.50 (0.835)
16 (406)	15.19 (0.430)	27.14 (0.769)
15 (381)	13.10 (0.371)	24.76 (0.701)
14 (356)	10.98 (0.311)	22.36 (0.633)
13 (330)	8.83 (0.250)	19.95 (0.565)
12 (305)	6.66 (0.189)	17.52 (0.496)
11 (279)	4.46 (0.126)	15.07 (0.427)

DC-780 Cumulative Storage Volumes Per Chamber (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
10 (254)	2.24 (0.064)	12.61 (0.357)
9 (229)	0	10.14 (0.287)
8 (203)	0	9.01 (0.255)
7 (178)	0	7.89 (0.223)
6 (152)	0	6.76 (0.191)
5 (127)	Stone Foundation 0	5.63 (0.160)
4 (102)	0	4.51 (0.128)
3 (76)	0	3.38 (0.096)
2 (51)	0	2.25 (0.064)
1 (25)	0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Stone Foundation Depth in. (mm)		
		9 (230)	12 (300)	18 (450)
StormTech DC-780	46.2 (1.3)	78.4 (2.2)	81.8 (2.3)	88.6 (2.5)

Note: Assumes 40% porosity for the stone, the bare chamber volume, 6" (150 mm) stone above, and 6" (150 mm) row spacing.

Amount of Stone Per Chamber

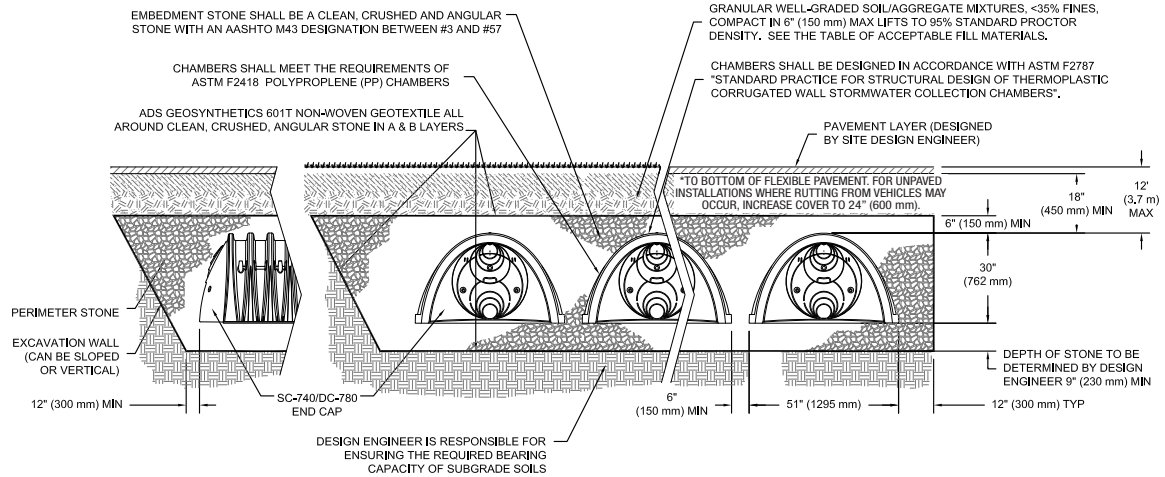
ENGLISH TONS (yds³)	Stone Foundation Depth		
	9"	12"	18"
StormTech DC-780	4.2 (3.0 yd³)	4.7 (3.3 yd³)	5.6 (3.9 yd³)
METRIC KILOGRAMS (m³)	**230 mm**	**300 mm**	**450 mm**
StormTech DC-780	3810 (2.3 m³)	4264 (2.5 m³)	5080 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	9" (230 mm)	12" (300 mm)	18" (450 mm)
StormTech DC-780	5.9 (4.5)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6" (150 mm) of separation between chamber rows and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases..



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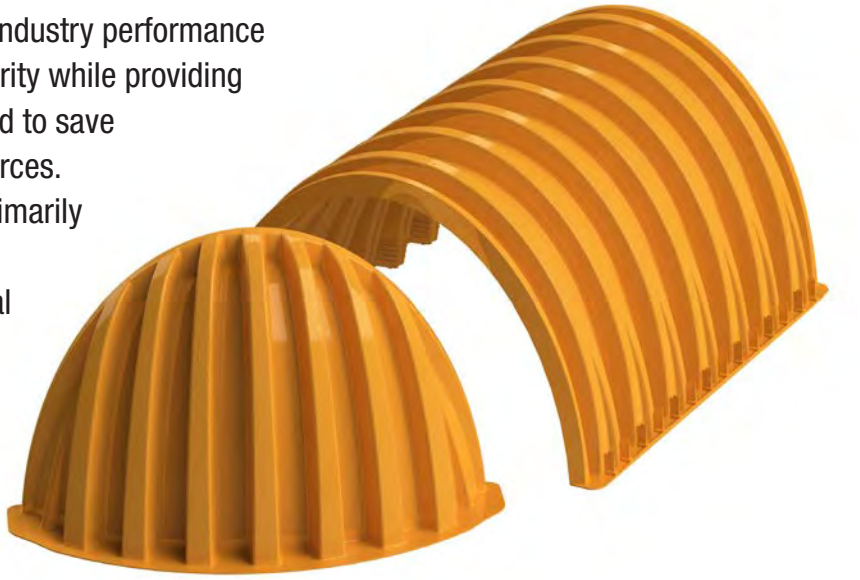
StormTech MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech MC-3500 Chamber (not to scale)
Nominal Chamber Specifications

Size (L x W x H)	90" (2286 mm) x 77" (1956 mm) x 45" (1143 mm)
Chamber Storage	109.9 ft³ (3.11 m³)
Min. Installed Storage*	178.9 ft³ (5.06 m³)
Weight	134 lbs (60.8 kg)

*This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

StormTech MC-3500 End Cap (not to scale)
Nominal End Cap Specifications

Size (L x W x H)	26.5" (673 mm) x 71" (1803 mm) x 45.1" (1145 mm)
End Cap Storage	14.9 ft³ (0.42 m³)
Min. Installed Storage*	46.0 ft³ (1.30 m³)
Weight	49 lbs (22.2 kg)

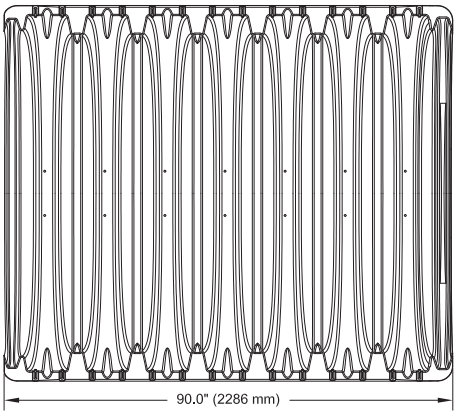
*This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

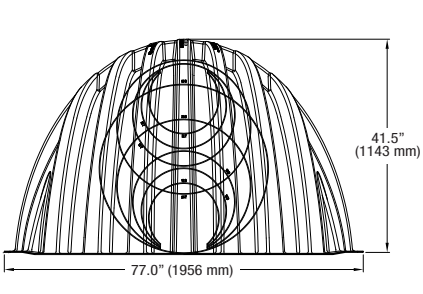
Shipping

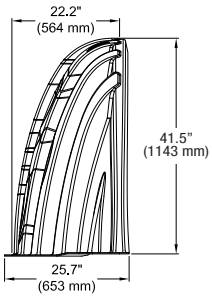
15 chambers/pallet

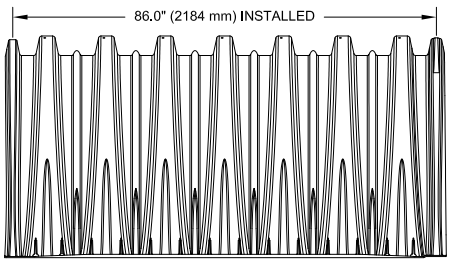
7 end caps/pallet

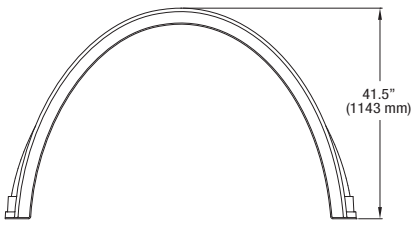
7 pallets/truck











StormTech MC-3500 Chamber

Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage ft³ (m³)	Chamber/End Cap and Stone Unit Volume — Stone Foundation Storage Depth in. (mm)			
		9 (230)	12 (300)	15 (375)	18 (450)
MC-3500 Chamber	109.9 (3.11)	178.9 (5.06)	184.0 (5.21)	189.2 (5.36)	194.3 (5.5)
MC-3500 End Cap	14.9 (0.42)	46.0 (1.33)	47.7 (1.35)	49.4 (1.40)	51.1 (1.45)

NOTE: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 6" (150 mm) stone perimeter.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-3500	9.1 (6.4 yd³)	9.7 (6.9 yd³)	10.4 (7.3 yd³)	11.1 (7.8 yd³)
End Cap	4.1 (2.9 yd³)	4.3 (3.0 yd³)	4.5 (3.2 yd³)	4.7 (3.3 yd³)
METRIC kg (m³)	230 mm	300 mm	375 mm	450 mm
MC-3500	8220 (4.9 m³)	8831 (5.3 m³)	9443 (5.6 m³)	10054 (6.0 m³)
End Cap	3699 (2.2 m³)	3900 (2.3 m³)	4100 (2.5 m³)	4301 (2.6 m³)

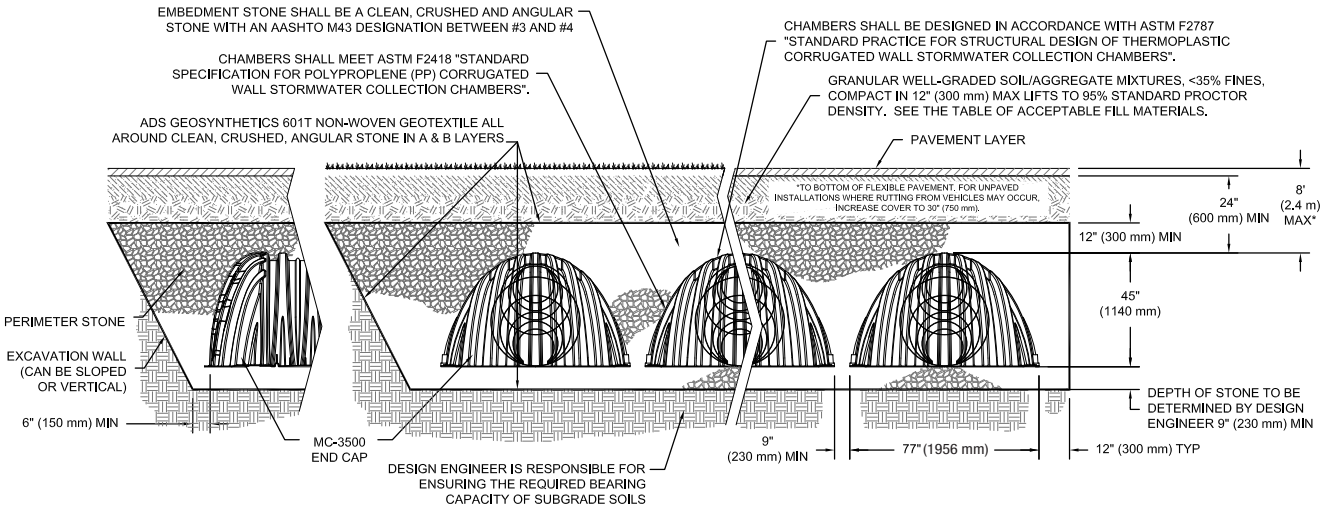
NOTE: Assumes 12" (300 mm) of stone above, and 9" (230 mm) row spacing, and 6" (150 mm) of perimeter stone in front of end caps.

Volume of Excavation Per Chamber/End Cap in yd³ (m³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)	13.8 (10.5)
End Cap	4.1 (3.1)	4.2 (3.2)	4.4 (3.3)	4.5 (3.5)

NOTE: Assumes 9" (230 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as the depth of cover increases.

General Cross Section



*FOR COVER DEPTHS GREATER THAN 9.0' (2.4 mm) PLEASE CONTACT STORMTECH

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StormTech MC-4500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

StormTech MC-4500 Chamber (not to scale)
Nominal Chamber Specifications

Size (L x W x H)	52" (1321 mm) x 100" (2540 mm) x 60" (1524 mm)
Chamber Storage	106.5 ft³ (3.01 m³)
Min. Installed Storage*	162.6 ft³ (4.60 m³)
Weight	120 lbs (54.4 kg)

* This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

StormTech MC-4500 End Cap (not to scale)
Nominal End Cap Specifications

Size (L x W x H)	35.1" (891 mm) x 90.2" (2291 mm) x 59.4" (1509 mm)
End Cap Storage	35.7 ft³ (1.01 m³)
Min. Installed Storage*	108.7 ft³ (3.08 m³)
Weight	120 lbs (54.4 kg)

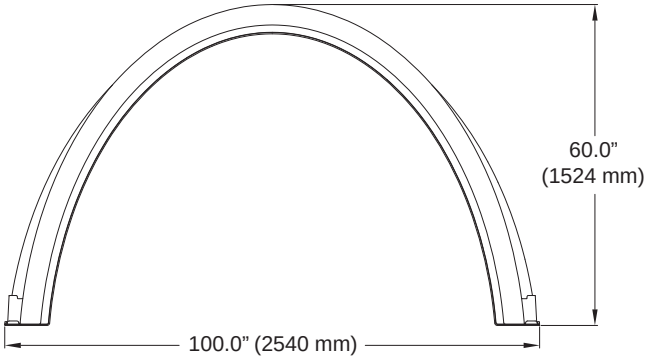
*This assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 12" (300 mm) of stone perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

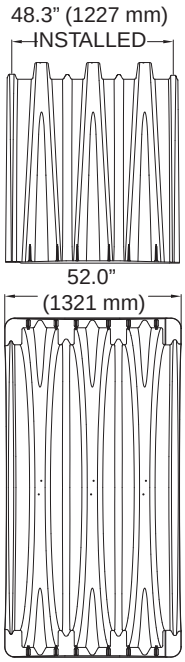
Shipping

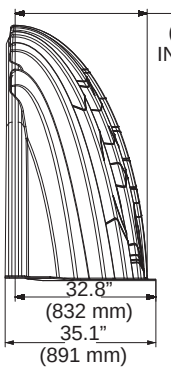
7 chambers/pallet

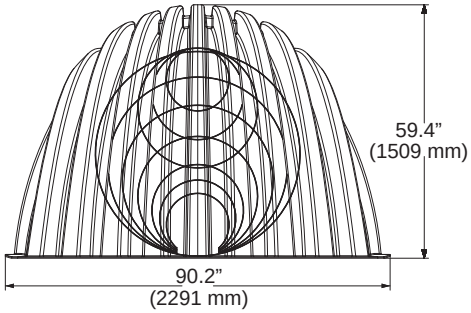
7 end caps/pallet

11 pallets/truck









StormTech MC-4500 Chamber

Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage ft³ (m³)	Chamber/End Cap and Stone Unit Volume — Stone Foundation Storage Depth in. (mm)			
		9 (230)	12 (300)	15 (375)	18 (450)
MC-4500 Chamber	106.5 (3.02)	162.6 (4.60)	166.3 (4.71)	169.9 (4.81)	173.6 (4.91)
MC-4500 End Cap	35.7 (1.0)	108.7 (3.08)	111.9 (3.17)	115.2 (3.26)	118.4 (3.35)

NOTE: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter.

Amount of Stone Per Chamber

ENGLISH tons (yd³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-4500	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
End Cap	9.6 (6.8)	10.0 (7.1)	10.4 (7.4)	10.9 (7.7)
METRIC kg (m³)	230 mm	300 mm	375 mm	450 mm
MC-4500	6681 (4.0)	7117 (4.2)	7552 (4.5)	7987 (4.7)
End Cap	8691 (5.2)	9075 (5.4)	9460 (5.6)	9845 (5.9)

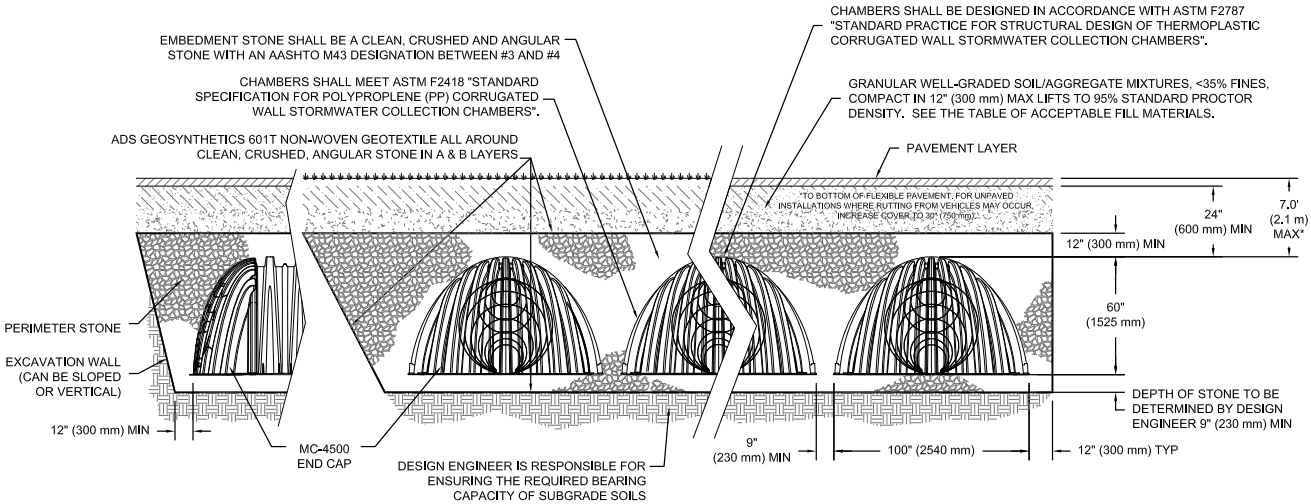
NOTE: Assumes 12" (300 mm) of stone above, 9" (230 mm) row spacing, and 12" (300 mm) of perimeter stone in front of end caps.

Volume of Excavation Per Chamber/End Cap in yd³ (m³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-3500	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
End Cap	9.3 (7.1)	9.6 (7.3)	9.9 (7.6)	10.2 (7.8)

NOTE: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of end caps, and 24" (600 mm) of cover. The volume of excavation will vary as the depth of cover increases.

General Cross Section



*FOR COVER DEPTHS GREATER THAN 7.0' (2.1 mm) PLEASE CONTACT STORMTECH

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StormTech Isolator Row

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

The Isolator Row is a row of StormTech chambers 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 stormwater 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 stormwater 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.

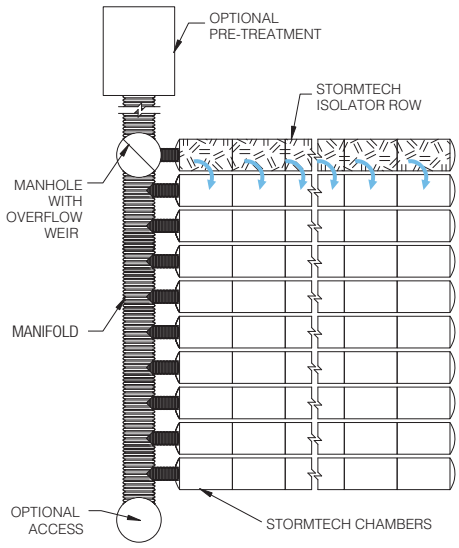
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for stormwater filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of 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 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 stormwater flow rates or volumes that exceed the capacity of the Isolator Row crest the weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating stormwater 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 and oil-water separators or can be innovative stormwater 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.

StormTech Isolator Row with Overflow Spillway
(not to scale)



StormTech Isolator Row

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.

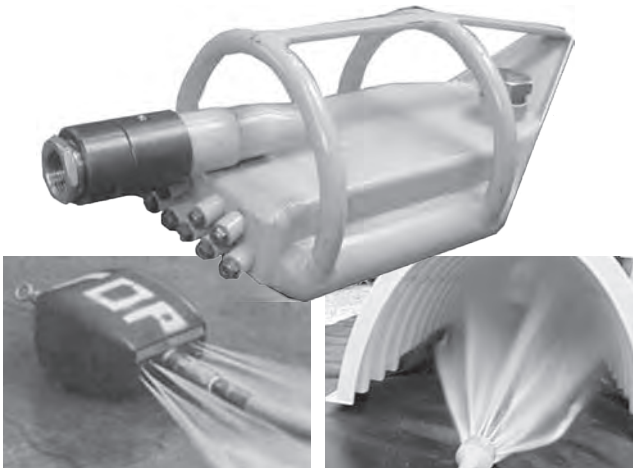
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

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.

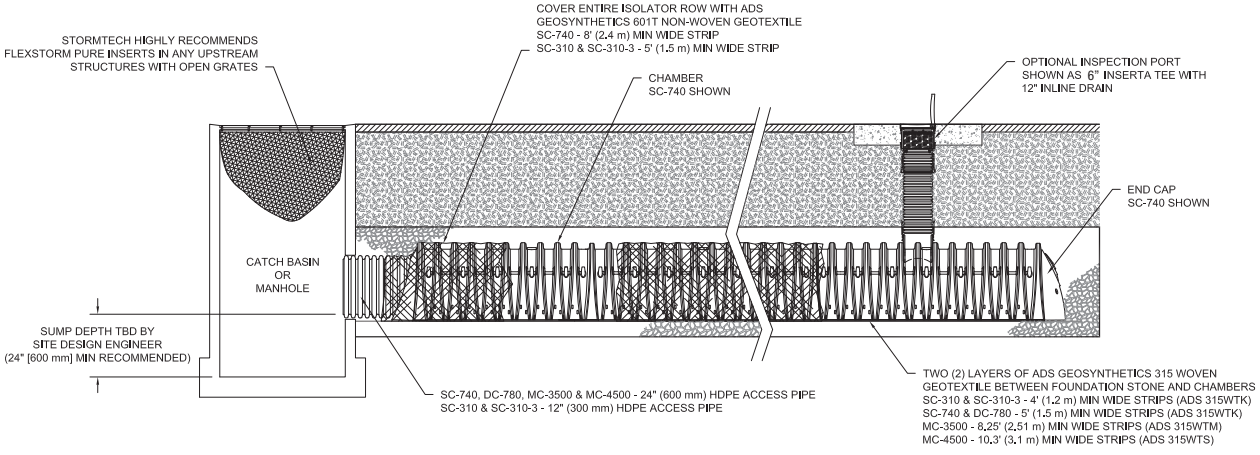
MAINTENANCE

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.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

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.**



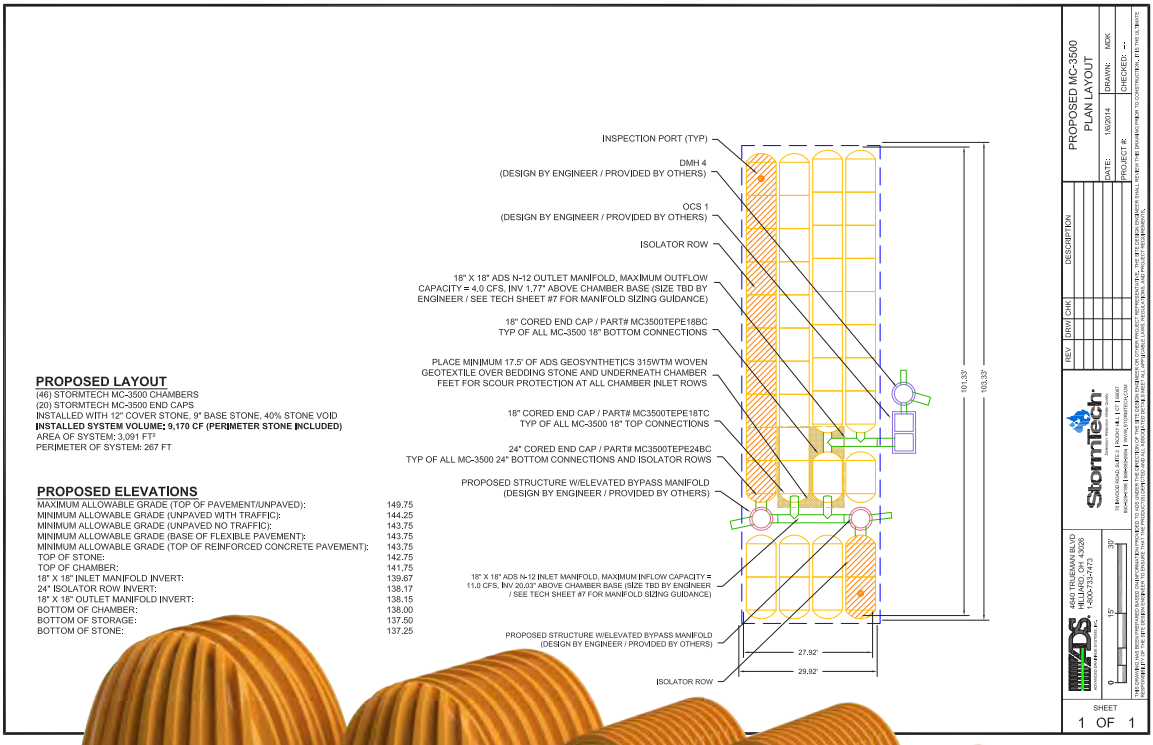
*NOTE: NON-WOVEN FABRIC IS ONLY REQUIRED OVER THE INLET PIPE CONNECTION INTO THE END CAP FOR DC-780, MC-3500 & MC-4500 CHAMBER MODELS AND IS NOT REQUIRED OVER THE ENTIRE ISOLATOR ROW.

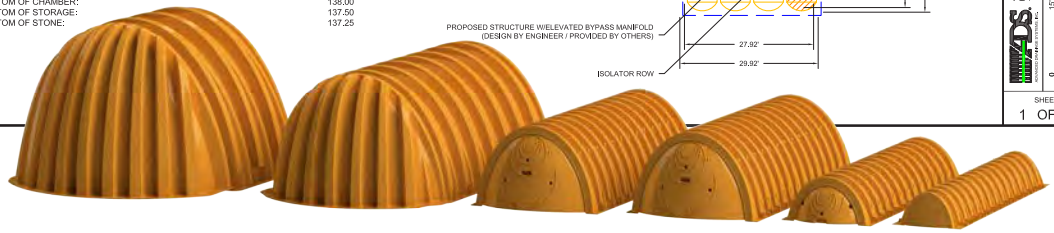
A Family of Products and Services

- MC-4500 Chambers and End Caps
- MC-3500 Chambers and End Caps
- SC-310 Chambers and End Caps
- SC-310-3 Chambers and End Caps
- DC-780 Chambers and End Caps
- SC-740 Chambers and End Caps
- SC-160LP Chambers and End Caps
- SC, DC and MC Fabricated End Caps
- Fabricated Manifold Fittings
- Patented Isolator™ Row for Maintenance and Water Quality
- Inserta Tee® Connections
- Nyloplast® Basins and Inline Drains
- Flexstorm® Inserts
- In-House System Layout Assistance
- On-Site Educational Seminars
- Worldwide Technical Sales Group
- Centralized Product Applications Department
- Research and Development Team
- Technical Literature, O&M Manuals and Detailed CAD drawings all downloadable via our Web Site
- StormTech Design Tool

StormTech provides state of the art products and services that meet or exceed industry performance standards and expectations. We offer designers,regulators, owners and contractors the highest quality products and services for stormwater management that "Saves Valuable Land and Protects Water Resources."

Please contact one of our inside Technical Service professionals or Engineered Product Managers (EPMs) to discuss your particular application. A wide variety of technical support material is available from our website at **www.stormtech.com**. For any questions, please call StormTech at **888-892-2694**.





MC-4500 MC-3500 DC-780 SC-740 SC-310 SC-160LP

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Detention • Retention • Water Quality
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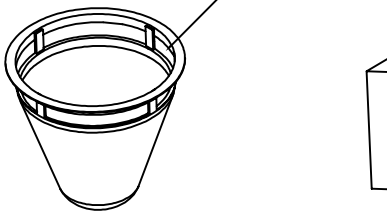
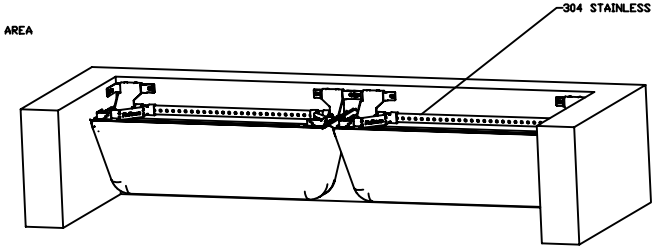
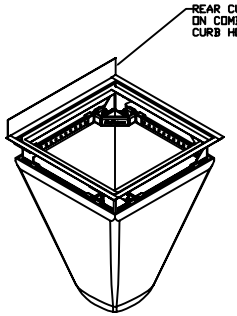
FLEXSTORM PURE FILTERS FOR PERMANENT INLET PROTECTION
PRODUCT SELECTION AND SPECIFICATION DRAWING



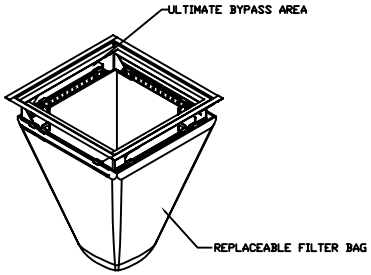
FLEXSTORM PURE INLET FILTERS
FOR ROUND OPENINGS



FLEXSTORM PURE WALL MOUNT INLET
FILTERS FOR OPEN THROAT GUTTERS



FLEXSTORM PURE INLET FILTERS
FOR COMBINATION INLETS



FLEXSTORM PURE INLET FILTERS
FOR RECTANGULAR OPENINGS
WITH GRATES

use this model

For Round Openings with Grates		Minimum Bypass Flow Rates (CFS)*
Drop Thru Opening Size Dia	Flexstorm Frame P/N	Based on Nominal Frame Size with minimum 2" Bypass flow gap
Small: 10.0" - 18.0"	62SHDR	1.6
Medium: 18.1" - 24.0"	62MHDR	2.7
Large: 24.1" - 36.0"	62LHDR	3.8

For Open Throat Curb Inlets - Mounted to Wall Beneath Curb Opening	
Curb Opening Size	Flexstorm Frame P/N
Up to 4' curb openings (1 Filter)	62HDWM1
Between 4' and 8' curb openings (2 Filters)	62HDWM2
Between 8' and 12' curb openings (3 Filters)	62HDWM3
Between 12' and 16' curb openings (4 Filters)	62HDWM4

For Rectangular/Square Openings with Grates			Minimum Bypass Flow Rates (CFS)*
Clear Drop Thru Opening Size *(not grate or seat size)*	Flexstorm Frame P/N	Combination P/N	Based on Nominal Frame Size with minimum 2" Bypass flow gap
Small: 12" x 12" up to 16" x 16" (or 64" max perimeter)	62SHD	62SHDCB	2.4
Medium: 18" x 18" up to 24" x 24" (or 96" max perimeter)	62MHD	62MHDCB	3.5
Large: 26" x 26" up to 30" x 30" (or 120" max perimeter)	62LHD	62LHDCB	5.0
XL: 32" x 32" up to 48" x 48" (or 192" max perimeter) typ 2 pc set	62XLHD	62XLHDCB	7.2

CREATE YOUR ADS FLEXSTORM PART NUMBER BY COMBINING FRAME P/N AND BAG P/N

1. IDENTIFY YOUR FLEXSTORM FRAME PART NUMBER FROM TABLES ABOVE
2. SELECT YOUR BAG PART NUMBER BASED ON APPLICATION NEEDS

FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX: Standard Woven Bag	FX	FX-S	200	40
FX+: Woven w/ MyCelx	FXP	FXP-S	200	40
FXO: Woven w/ Oil Boom	FXO	FXO-S	200	40
PC: Post Construction Bag	PC	PC-S	137	140
PC+: PC Bag w/ MyCelx	PCP	PCP-S	137	140
LL: Litter and Leaf Bag	LL	LL-S	High	3.5
IL: IDOT Non-Woven Bag	IL	IL-S	145	70

SPECIFICATIONS FOR STANDARD BAGS BY NOMINAL BAG / FRAME SIZE

Nominal Bag Size *Matched to Frame Size*	Solids Storage (CuFt)	Filtered Flow Rate at 50% Max (CFS) FX (Woven)	PC (Post Constr)	IL (NonWoven)	* PC Oil Retention (Oz)	**PC+ Oil Retention (Oz)	**FX+ Oil Retention (Oz)
Small	1.6	1.2	0.8	0.9	79	168	89
Medium	2.1	1.7	1.2	1.3	115	204	89
Large	3.8	2.7	1.8	1.9	173	262	89
XL	4.2	3.6	2.4	2.6	230	319	178
Filtration Efficiency		82%	NA	Large scale 3rd party testing per ASTM D 7351 using 7% concentration USDA Sandy Loam			
TSS (total suspended solids rem)		NA	99%	Large Scale testing at 90 GPM using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D.			
TPH (tot petroleum hydrocarbons)		NA	96%	Large Scale testing at 90 GPM with used motor oil at 243 mg/L measuring per EPA Method 1664A.			

* PC filter bag at 50% max adsorption capacity

** PC filter bag at 50% capacity and MyCelx skimmer at 100% capacity

3. CREATE YOUR FLEXSTORM INLET FILTER PART NUMBER

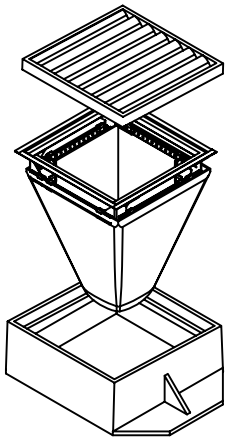
Frame P/N from Step 1. Filter Bag P/N from Step 2.

NOTES:

1. ALL FRAMING IS CONSTRUCTED OF 304 STAINLESS STEEL FOR 25 YEAR SERVICE LIFE RATING
2. TOTAL BYPASS CAPACITY: BYPASS CAPACITY WILL VARY WITH EACH SIZE DRAINAGE STRUCTURE. FLEXSTORM DESIGNS FRAMING BYPASS TO MEET OR EXCEED THE DESIGN FLOW OF THE PARTICULAR DRAINAGE STRUCTURE.
3. UPON ORDERING CONFIRMATION OF THE DOT CALLOUT, PRECAST OR CASTING MAKE AND MODEL, OR DETAILED DIMENSIONAL FORMS MUST BE PROVIDED TO CONFIGURE AND ASSEMBLE YOUR CUSTOMIZED FLEXSTORM INLET FILTER. PART NUMBER ALONE IS NOT SUFFICIENT.
4. FOR WRITTEN SPECIFICATIONS AND MAINTENANCE GUIDELINES VISIT WWW.INLETFILTERS.COM

INSTALLATION:

1. REMOVE GRATE
2. DROP FLEXSTORM INLET FILTER ONTO LOAD BEARING LIP OF CASTING OR CONCRETE STRUCTURE
3. REPLACE GRATE



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PURE

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BY INLET & PIPE PROTECTION, INC
A DIVISION OF ADS, INC.
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(630) 355-3477 FX
INFO@INLETFILTERS.COM

SIZE	DWG NO	REV
C	FLEXSTORM_PURE	A
SCALE		SHEET 1 OF 1

Retention/Irrigation TC-12

Description

Retention/irrigation refers to the capture of stormwater runoff in a holding pond and subsequent use of the captured volume for irrigation of landscape of natural pervious areas. This technology is very effective as a stormwater quality practice in that, for the captured water quality volume, it provides virtually no discharge to receiving waters and high stormwater constituent removal efficiencies. This technology mimics natural undeveloped watershed conditions wherein the vast majority of the rainfall volume during smaller rainfall events is infiltrated through the soil profile. Their main advantage over other infiltration technologies is the use of an irrigation system to spread the runoff over a larger area for infiltration. This allows them to be used in areas with low permeability soils.

Capture of stormwater can be accomplished in almost any kind of runoff storage facility, ranging from dry, concrete-lined ponds to those with vegetated basins and permanent pools. The pump and wet well should be automated with a rainfall sensor to provide irrigation only during periods when required infiltration rates can be realized. Generally, a spray irrigation system is required to provide an adequate flow rate for distributing the water quality volume (LCRA, 1998). Collection of roof runoff for subsequent use (rainwater harvesting) also qualifies as a retention/irrigation practice.

This technology is still in its infancy and there are no published reports on its effectiveness, cost, or operational requirements. The guidelines presented below should be considered tentative until additional data are available.

California Experience

This BMP has never been implemented in California, only in the Austin, Texas area. The use there is limited to watersheds where no increase in pollutant load is allowed because of the sensitive nature of the watersheds.

Advantages

- Pollutant removal effectiveness is high, accomplished primarily by: (1) sedimentation in the primary storage facility; (2) physical filtration of particulates through the soil profile; (3) dissolved constituents uptake in the vegetative root zone by the soil-resident microbial community.

Design Considerations

- Soil for Infiltration
- Area Required
- Slope
- Environmental Side-effects

Targeted Constituents

☑	Sediment	■
☑	Nutrients	■
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

Retention/Irrigation TC-12

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☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

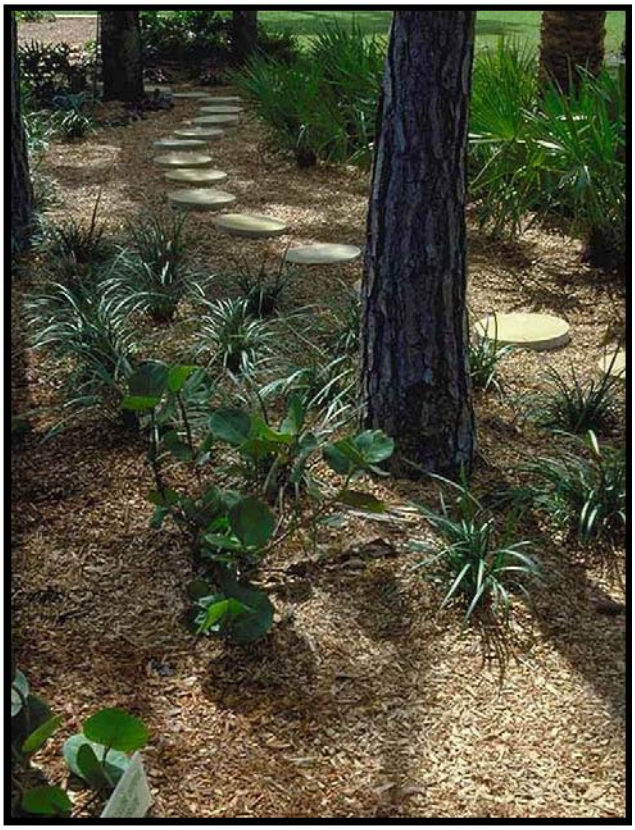
Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Site Design & Landscape Planning SD-10



Design Objectives

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

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

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

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

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

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

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

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

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

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

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

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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

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

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

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

Other Resources

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

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

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

Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

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

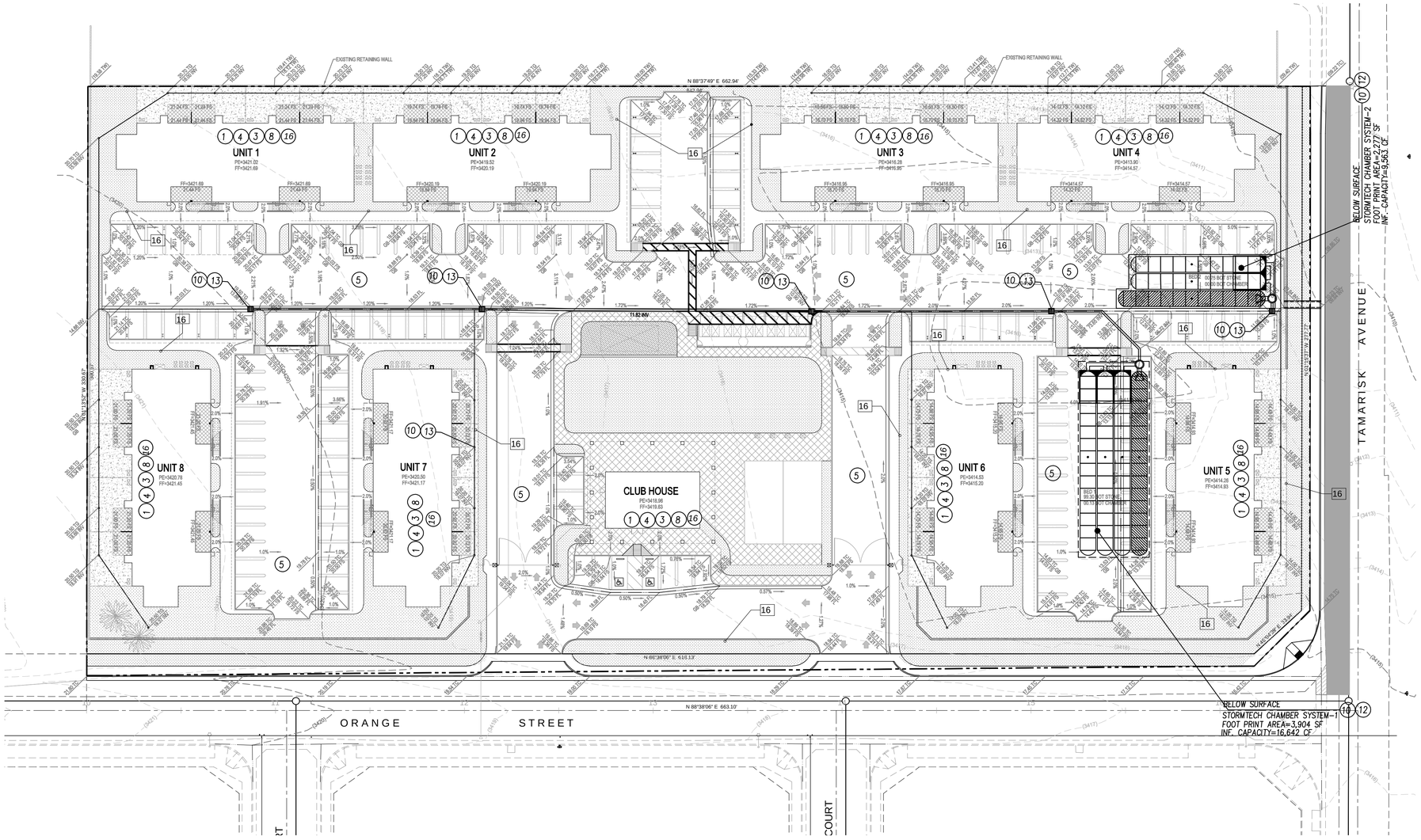
Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

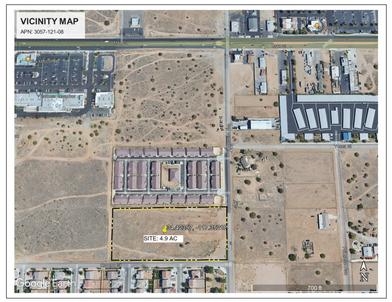
Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

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

Site Plan

(WQMP Exhibit)





VICINITY MAP
NTS

BMP LIST:

1. EDUCATION OF PROPERTY OWNERS (N1)
2. ACTIVITY RESTRICTIONS (N2)
3. SPILL CONTINGENCY (N7)
4. TRAINING/EDUCATION PROGRAM (N12)
5. PARKING LOT SWEEPING/VACUUMING (N15)
6. COMMON AREA CATCH BASIN INSPECTION (N14)
7. LANDSCAPE PLANNING (N3)
8. ROOF RUNOFF CONTROLS (SD-11)
9. EFFICIENT IRRIGATION (S-4)
10. STORM DRAIN SIGNAGE (S-1)
11. TRASH STORAGE AREAS (N11)
12. ADS STORMTECH MC-7200 STORMWATER INFILTRATION CHAMBER SYSTEM-1&2 (N4) (SIZE & CAPACITY PER PLAN)
13. DRAIN INLET/TRENCH DRAIN FILTER INSERT- ADS FLEXSTORM PURE INLET FILTER OR APPROVED EQUAL (N14)
14. RETENTION /INFILTRATION BASIN-1&2 (N11) (SIZE & CAPACITY PER PLAN)
15. SHALLOW DEPTH VEGETATED SWALE
16. *SITE DESIGN MEASURES-ROOFTOP AND IMPERVIOUS AREA DISCONNECTION.*

LATITUDE & LONGITUDE
34.42357° N, −117.35218° W

BMP STATISTICS:

DMAs	AREA (AC)	BMP	BMP CAPACITY (CF)	REQUIRED VOLUME (CF)	PROVIDED VOLUME (CF)
DMA-1	*4.90	STORMTECH CHAMBER-1	16,642	16,314	26,205
		STORMTECH CHAMBER-2	9,563		

TOTAL (BMP CAPACITY) = 26,205 CF
* GROSS SITE AREA

DCV ACHEIVED WITH PROPOSED BMPs: 161%

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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CITY OF HESPERIA CALIFORNIA

WQMP EXHIBIT
TAMARISK AVENUE APT. COMPLEX-2
APN :3057-121-08

PLOT DATE: May 05, 2023 camillo

Filename: I:\Steeno Design Studios\STEENO-TAMARISK APT, HESPERIA\Reports\WQMP\EXHIBIT\Exhibit-