MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

PHELAN COMMUNITY PARK

APN: 3066-251-14, 3066-261-08, 3066-261-10

Prepared for:

PHELAN PINON HILLSCOMMUNITY SERVICES DISTRICT

4176 Warbler Road

Phelan, CA 92371

Tel: 760-868-1212

Prepared by:

Red Brick Solution, LLC

331 South Rio Grande Street, #203

Salt Lake City, Utah 84101

801-224-5335

County of San Bernardino
LAND DEVELOPMENT

PRELIMINARY
APPROVAL

THE APPROVAL OF THIS REPORT SHALL NOT BE CONSTRUED TO BE A PERMIT FOR ANY DEVELOPMENT OR SITE IMPROVEMENT

By: Mariano Mosquera (I8267)
Date: 5/10/2023

This report has Preliminary Approval. Prior to Final Approval of the report, all outstanding comments and requirements shall be met.

mariano.mosquera@lus.sbcounty.gov
C: (909) 601-4671 O: (909) 387-4104

Public Works Comments are in RED with a BLUE outline.

Note: Corrections here shall be addressed prior to final approval.

For preliminary design the proposed basin of 0.61 AC-FT of total infiltration is considered a conservative enough design for entailment purposes by Land Use Services - Land Development. However, there are corrections that will need to be addressed prior to final approval, please also note that on final review additional corrections may be required.

Land Development Comments are shown in RED with a RED outline.

Submittal Date: OCTOBER 6, 2021

Revision No. and Date: Rev 1. -April 28 2022

Revision No. and Date: Rev 2.- March 7 2023

Revision No. and Date: Rev 3: April 24,2023

Revision No. and Date: Rev 4 May 26, 2023

Revision No. and Date: Insert No and Current Revision Date

Final Approval Date:_____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for Phelan Pinon Hills Community Services District by Red Brick Solution. The WQMP is intended to comply with the requirements of the County of San Bernardino 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):	PRAA-2021-00040	Grading Permit Number(s):	GRAD-2021-00235
Tract/Parcel Map Number(s):	APN 3066-251-18, & 3066-261-10	Building Permit Number(s):	NEWNR-2021- 00230
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 3066-251-18, & 3066-261-10

Owner's Signature			
Owner Name: Don Bartz			
Title	General Manager		
Company	Phelan Pinon Hills Community Services District		
Address	4176 Warbler Road, Phelan, CA 92371		
Email	dbartz@pphcsd.org		
Telephone #	760-868-1212		
Signature		Date	March 28, 2021

Preparer's Certification

Project Data			
Permit/Application Number(s):	PRAA-2021-00040	Grading Permit Number(s):	GRAD-2021-00235
Tract/Parcel Map Number(s):	APN 3066-251-18, & 3066-261-10	Building Permit Number(s):	NEWNR-2021- 00230
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 3066-251-18, & 3066-261-10

"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: David W. Larson		PE Stamp Below
Title	Principal	
Company	Red Brick Solution	
Address	331 South Rio Grande Street, #203, Salt Lake City, UT 84101	
Email	david@redbricksolution.com	
Telephone #	801-224-5335	
Signature		
Date		

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Forms

Project location	EXHIBIT A
Site boundary	EXHIBIT B
Land uses and land covers, as applicable	EXHIBIT C & D
Suitability/feasibility constraints	ATTACHED
Structural Source Control BMP locations	EXHIBIT C
Site Design Hydrologic Source Control BMP locations	SEE EROSION CONTROL PLANS ATTACHED
LID BMP details	ATTACHED
Drainage delineations and flow information	SEE GRADING PLANS ATTACHED
Drainage connections	SEE GRADING PLANS ATTACHED

Section I – Introduction

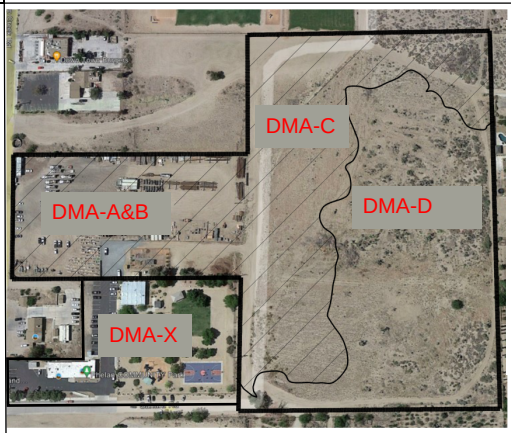
This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

verify acres add up to total, currently .4 acres short

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Phelan Community Park Phase 1				
Project Owner Contact Name:	Don Bartz - Phelan Pinon Hills Community Services District				
Mailing Address:	4176 Warbler Road, Phelan, CA 92371	E-mail Address:	dbartz@pphcsd.org	Telephone:	760-868-1212
Permit/Application Number(s):	PRAA-2021-00040 WQMP 2021-00153	Tract/Parcel Map Number(s):		APN 3066-251-18 & 3066-261-100	
Additional Information/ Comments:	The project site is a 22.72-acre development that currently is a 3.11-acre CSD site that will add a 14,034 sf Community Building and a 17, 284 sf Community Center Gymasium on a 5.03-acre site to the north, and develope a 14.6-acre park to the east. The new work will be constrructed in two (2) phases; Phase 1 (DMA-A) will be a 12.54 -acre project that will construct the 14,034 sf building on the 4.63-acre site and 7.51 -acres on the park site. Phase 2 (DMA-B) will construct the remaining 7.07-acre park site and the future 17,284 sf building on the 5.03-acre site. The project will be an overlaping two phased development that will have common drainage conveyances and infiltration basins. A hardscapes have been added to this current analysis.				
Description of Project:	Phase 1 (DMA-A) project will construct the 14,034 sf building and associated parking on the 5.03-acre site and grade 7.51 -acres on the park site as playfields and an retention / detention basin. Phase 1 consists of 167,925 SF of impermiable area and of 33,830 sf of Landscape area CN=87 and a 7.51 acre park site having a CN=50 . The Phase 1 and Phase 2 Park site will have 189,723sf impermiable hardscape, and 510012 sf landscaping with an average CN=50. An on-site basin is proposed at the northeast corner of the project and it is designed to mitigate the Delta Q and the phase 1 &2 infiltration requirement. Off-site flows are currently being diverted aound or away from the site via sheep creek road and Warbler Road and the existing natural channel south of Wabler Road . Warbler Road directs flows o the east property line to channel along the east property line.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy. WQMP 2018-00126, LD0058 LD00472			The Proposed site has existing WQMP conditions SW Existing Site (DMA-X) that drains to the proposed site. Provisions for this area are considered in this WQMP. See Hydrology Study regarding mitigation of the peak Q100 storm flows generated by both sites.		

state the basin will be constructed in phase 1

Verify impervious area of phase 1 and 2 build out. The exhibit shows differently.

please describe what will occur in phase 2 at full build out.

Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	`The 5.03-acre site is being utilized as a staging area for construction equipment and supplies as shown. No WQMP conditions are being employeed. Typical drainage is currently to the northeast corner of the overall 22.72 acre site (3.11+5.03+7.51+7.07=21.68)

what 5.03 acre area? is this the gymnasium part mentioned above. Please clarify.

for and during phase 1? Clarify.

what is the rest of the overall site

Section 2 Project Description

2.1 Project Information

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

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

2.1.1 Project Sizing Categorization

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

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

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):			
☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☒ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 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):	989,683	**3** Number of Dwelling Units:	N/A	**4** SIC Code:	7999 / 8641

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:

The property will be owned and operated by Pheland Pinon Hills Community Service Distict and they will be the responsible party. Currently the resonsible party will be Don Bartz the general manager representative (GMR)and property owner association representative (POAR).
Name: Don Bartz
Title: General Manager (GMR)
Phone: 760-868-1212
Address: 4176 Warbler Road Phelan, CA 9237
DBartz@pphcsd.org

2.3 Potential Stormwater Pollutants

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

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Trash, Human wastes and Petroleum Hydrocarbons
Nutrients - Phosphorous	E ☒	N ☐	Liquid Fertilizers
Nutrients - Nitrogen	E ☒	N ☐	Landscape fertilizers
Noxious Aquatic Plants	E ☒	N ☐	nuisance water
Sediment	E ☒	N ☐	Landscaping
Metals	E ☒	N ☐	Parking Area
Oil and Grease	E ☒	N ☐	Parking Area
Trash/Debris	E ☒	N ☐	Parking and Trash Containers
Pesticides / Herbicides	E ☒	N ☐	Landscaping
Organic Compounds	E ☒	N ☐	Landscaping
Other: Flouride	E ☒	N ☐	Mojave River
Other:	E ☐	N ☒	
Other:	E ☐	N ☒	

Section 3 Site and Watershed Description

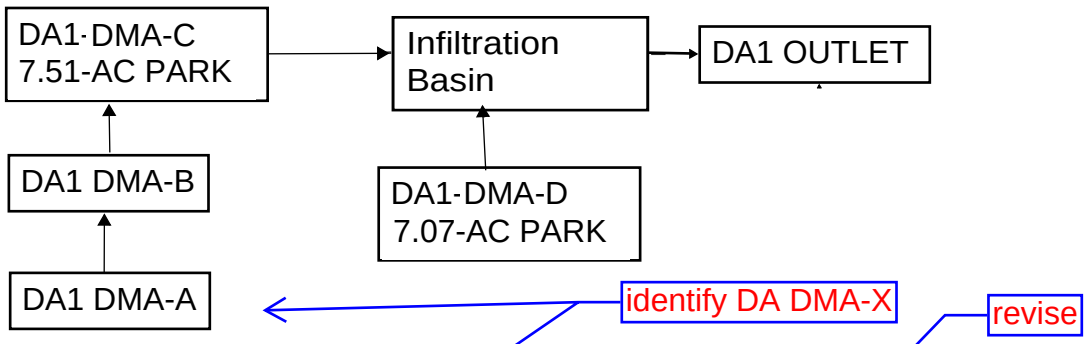
Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (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..423056 N	Longitude 117.571419 W	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Desert

2 Does the site have more than one drainage area (DA): Yes ☐ No ☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA A Flows to DA1 DMA B Flows to DA1 DMA C that confluences with DA1 DMA D Flows in a detention / retention basin before Outlet 1	5.03-acre Community Center and Parking Lot is collected on site into a storm drain system that is released on to the 7.51-acre easterly park site's play-field were it is conveyed northeasterly via graded channels graded to a slope varying from 10:1 slopes to 0.50% to the access road along the northerly property line where it is collected and conveyed down the concrete access road into the 1.67-ac ft. infiltration Basin that also receives an addition 7.07-acre future park site down a riprap lined drainage conveyance prior to outleting these flows to the northeast into their naural historic conveyance channel.

Exhibit shows 681.7k sf for DMA A. Verify DMA B. Final to resolve inconsistencies.

Final to do more detailed revision of the areas and update forms as necessary.

From 3-2 and 4.2-3 should match.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	546,242	307,969		
2 Existing site impervious area (ft^2)	0	0		
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II	II		
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	A	A		
5 Longest flowpath length (ft)	1862	1350		
6 Longest flowpath slope (ft/ft)	0.0305	0.0333		
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Open Brush poor`	Open Brush poor		
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***	Fair	Fair		

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*				
4 Hydrologic soil group *County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*				
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*				

Form 3-3 Watershed Description for Drainage Area	
Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Regional Board: 6V / Lahontan/Mojave River (below Lower Narrows)
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	N/A.
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	N/A
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

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	☒	☐	Owners shall walk-thru of the site where treatment BMPs are located and restrictions., and Within 2 days for new hires. Within 2 months, a signed acknowledgement of site policies and restrictions. Educational materials available from the San Bernardino Stormwater Program and can be downloaded at: http://www.sbcountystormwater.org/gov_out.html http:// www.mojaveriver.org/
N2	Activity Restrictions	☒	☐	Conditions, covenants and restrictions (CCRs) will be prepared by the developer restricting dumping waste down catch basins for the purpose of surface water quality protection . Pesticides shall be applied by a licensed appplicator.
N3	Landscape Management BMPs	☒	☐	CC&R's will be prepared limiting fertilizer and/or pesticide. usage. At a minimum, pesticides shall be placed by a licensed applicator./Owner/site operator(s) shall ensure landscaping/Groundskeeping Service providers do not blow or sweep debris, cutting, leaves, etc., into treatment BMPs and/or City maintained right of ways. All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowing and fertilizer materials off paved areas weekly and dispose of properly.
N4	BMP Maintenance	☒	☐	Property owner shall be responsible for the maintenance of all site BMP's. ~~The responsible person in charge, will hire an independent testing laboratory to test catch basins after each storm event to determine if any contamination has reached off-site areas.~~ The RPIC will also schedule cleaining and/or maintenance of all structural BMP facilities. When BMP replacement(s) is required, the Owner shall order and provide materials to assigned personnel/staff.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Project will obtain MDS reports on mateterials stored on site and review hazards prior to using said materials in a safety meeting
N6	Local Water Quality Ordinances	☐	☐	All local water quality ordinances shall be followed through implementation of WQMP.

remove laboratory testing

Form 4.1-1 Non-Structural Source Control BMPs				
N7	Spill Contingency Plan	☐	☒	No fueling or Hazardouse materials on-site
N8	Underground Storage Tank Compliance	☒	☐	Underground septic storage tank complance proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials

septic system shall be kept a minimum 50 feet from infiltration system.

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	
N10	Uniform Fire Code Implementation	☐	☒	No hazardous waste proposed
N11	Litter/Debris Control Program	☒	☐	Owner to ensure lids are secure, lidded, and consistent with County Ordinances on a daily basis. In addition, the owner will contract weekly with Landscaping/Groundskeeping services including perimeter fencing and wind-blown debris. The owner/POA will contract trash removal through local city services.
N12	Employee Training	☒	☐	Owner/POA training manual will be provided and training of staff and reidence will occure bi-annually and with new occupant.
N13	Housekeeping of Loading Docks	☐	☒	NO LOADING DOCKS PROPOSED
N14	Catch Basin Inspection Program	☒	☐	The Owner will clean in the late summer/early fall prior to the start of the rainy season at least 80% of drainage facilities inspected, and clean and maintain on annual basis 100% every two-year period using an outside agency.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	VACUUM sweep Streets and parking lots shall be swept at a minimum in late summer or early fall, prior to the start of the rainy season or equivalent, as required by the governing jurisdiction.
N16	Other Non-structural Measures for Public Agency Projects	☒	☐	As a parcially Federally funded site additional non-structural measures for public agency projects may be required and will be implemented such as 1) Protect Sensitive / Special Value Features 2)Reduce Parking Imperviousness HILLS AND ELEVATION CHANGES PROTECTED / GRAVEL PARKING AREAS
N17	Comply with all other applicable NPDES permits	☒	☐	The owner/POA will comply with the State General Construction Permit and develop a SWPPP.

Gravel was not stated in form 1-1. Please break down how much gavel will be utilized onsite in form 1-1

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 inlets and catch basins will be labeled with no less than 2" letters stating "No Dumping" and will maintain legibility of stencils and signs.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☒	☐	An outdoor concrete paved storage area will be provided with a permitted wall to reduce pollution introduction to the site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	The enclosure area will be paved with an impervious surface and provide solid roof or awning to prevent exposure to direct precipitation.
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)	☒	☐	All landscaped areas will be designed based on efficient irrigation systems such as timing and application methods and group plans with similar water requirements to minimize the runoff of excess irrigation water.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	All landscape pockets, fingers, setback areas, parkway strips, street medians shall be finish-graded at a min of 1-2 inches below top of curb or sidewalk for increased retention/infiltration of stormwater and irrigation water.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Storm Drain Channel Slope Protection will be concrete lining with velocity dissipation drop stuctures and rip-rap.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No dock proposed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays with proposed.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No carwashing proposed on site.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing proposed.

must be roofed

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment washing proposed.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling proposed.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillside landscaping proposed.
S14	Wash water control for food preparation areas	☐	☒	No outdoor food preparation is planned for this site. All food preparation will be indoors, wash water for food preparation areas will drain to sanitary sewer.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community car wash racks proposed.

4.1.2 Site Design BMPs

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

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

Describe site design and drainage plan including:

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

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

Form 4.1-3 Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Impervious areas consolidated on 4.63-acre site only 31.76% of phase1 site. Impervious area flows are directed to pervioius channels and playfields prior to entering basin at the northeast corner of the 20.68- acre site.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: All drainage channels and playfields are designed as pervious conveyances on the park site as flows travel to the infiltration basin.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Off-site flows will be directed to the eastern property line, then north to exit the site as historic native flows, and on-site predeveloped flows will be retained to preserve existing TCs and exit the site at historic conveyance points.
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: Developed flows on the center site will be directed to the neighbooring parks site into the infiltration Basin
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Desert area is unsuitable for the porous pavement.
Protect existing vegetation and sensitive areas: Yes ☒ No ☐ Explanation: joshua trees will be protected in a 186 radius zone along with desert tortoise fencing installed around disturbance areas
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: All proposed landscape areas will be vegetated and will use drought tolerant vegetation or xeroscape where possible
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Infiltration basin is outside the construction limits required for paving and building construction.

identify where possible and the different places of use on the exhibit. Provide legend.

Are they utilized? Call out all locations on the exhibit provide detail.

Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation rock lined channels will be constructed along toes of slopes to direct concentrated flows around the perimeter of playfields.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: landscape set back areas fronting sheep creek road, along the perimeter of the project, as well as future park areas shall be stake landscape areas to limit compaction.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: A retention/detention infiltration basin will be used as an alternative .
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: No stream beds are located in the project site.

revise to staking will occur in the landscape areas to minimize compaction, we are looking to stake all landscaping areas to minimize compaction.

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

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

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

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

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

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

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

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

4.2 Treatment BMPs

After implementation and design of both Source Control 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

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

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

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

Methods applied in the following forms include:

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

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

Final to do a more refined review of impervious surface area. And update the rest of the results as needed.

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

[1] Project area DA 1 (ft^2): 989,683	[2] Imperviousness after applying preventative site design practices (Imp%): 39.68%	[3] Runoff Coefficient (Rc): _0.2779 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.405 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.501

*P_6 = Item 4 * C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*

6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

7 Compute design capture volume, DCV (ft^3): 20,542

*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

Further down in the report it states that the DCV is 22k. Final to revise and fix any inconsistencies.

Form 4.2-2 Summary of Hydromod[illegible]nt (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** 2,959 *Form 4.2-3 Item 12*	**2** 21.45 *Form 4.2-4 Item 13*	**3** 4.77 *Form 4.2-5 Item 10*
Post-developed	**4** 21,316 *Form 4.2-3 Item 13*	**5** 15.52 *Form 4.2-4 Item 14*	**6** 14.23 *Form 4.2-5 Item 14*
Difference	**7** *18,356* *Item 4 – Item 1*	**8** *5.94* *Item 2 – Item 5*	**9** *9.46* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *620%* *Item 7 / Item 1*	**11** *28%* *Item 8 / Item 2*	**12** *198%* *Item 9 / Item 3*

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

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	O-BRUSH	O-BRUSH						
2a Hydrologic Soil Group (HSG)	A	A						
3a DMA Area, ft² *sum of areas of DMA should equal area of DA*	528,720	460963						
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	46	46						
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	COM	LANDSC	Park					
2b Hydrologic Soil Group (HSG)	A	A	A					
3b DMA Area, ft² *sum of areas of DMA should equal area of DA*	167,925	33,830	699065					
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	98	32	50					

Final to revise and verify these numbers. Areas shall match up between pre and post and between what is in the forms and shown in the plans and exhibits.

5 Pre-Developed area-weighted CN: 46	**7** Pre-developed soil storage capacity, S (in): 11.74 *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): 2.35 *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: 61	**8** Post-developed soil storage capacity, S (in): 6.32 *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): 1.26 *I_a = 0.2 * Item 8*

11 Precipitation for 10 yr, 24 hr storm (in): 3.27
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

weighted CN is 58

12 Pre-developed Volume (ft³): 2,959
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

revise

13 Post-developed Volume (ft³): 21,316
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet hydromodification requirement, (ft³): 17,290
*Vhydro = (Item 13 * 0.95) – Item 12*

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

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

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	1064	960			1196	953		
2 Change in elevation (ft)	31	38			26	37		
3 Slope (ft/ft), *S_o = Item 2 / Item 1*	0.029	.0385			0.0193	0.0385		
4 Land cover	poor	fair			COM	fair		
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	18	21			11	21		
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	786 24 FT S=0.031	390 8 s=.021			953 25 FT S=0.0262	402 8 ft s=0.020		
7 Cross-sectional area of channel (ft^2)	10	10			10	10		
8 Wetted perimeter of channel (ft)	30	30			30	30		
9 Manning's roughness of channel (n)	0.033	0.033			0.033	0.033		
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	3.79	3.11			3.51	3.06		
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	3.45	2.09			4.52	2.19		
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	21.45	23.09			15.52	23.19		

13 Pre-developed time of concentration (min): 21.45 *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): 15.52 *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet hydromodification requirement (min): 4.86 *$T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14*

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

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)*		0.87	0.84		1.45	0.84	
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		12.14	8.54		12.14	8.54	
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.9	.9		0.28	0.90	
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		0.56	.56		0.09	0.56	
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		0.504	0.504		.025	0.504	
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		4.77	3.24		14.23	3.24	
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*	0	0	*n/a*	0	0
	DMA B	0	*n/a*	0	0	*n/a*	0
	DMA C	0	0	*n/a*	0	0	*n/a*

8 Pre-developed Q_p at T_c for DMA A: 4.77 *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*

9 Pre-developed Q_p at T_c for DMA B: 3.24 *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*

10 Pre-developed Q_p at T_c for DMA C: 0.00 *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*

10 Peak runoff from pre-developed condition confluence analysis (cfs): 4.04 *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: 14.23 *Same as Item 8 for post-developed values*

12 Post-developed Q_p at T_c for DMA B: 3.24 *Same as Item 9 for post-developed values*

13 Post-developed Q_p at T_c for DMA C: 0 *Same as Item 10 for post-developed values*

14 Peak runoff from post-developed condition confluence analysis (cfs): 14. *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): 8.75 *$Q_{p\text{-}hydro}$ = (Item 14 * 0.95) – Item 10*

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:

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

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

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

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

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

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

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

4.3.1 Exceptions to Requirements for Bioretention Facilities

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

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ *Refer to Section 5.3.2.1 of the TGD for WQMP*
If Yes, Provide basis: (attach)
[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ *See Section 3.5 of the TGD for WQMP and WAP*
If Yes, Provide basis: (attach)
[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ *If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.* *If no, then proceed to Item 8 below.* [8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ *If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.* *If no, then proceed to Item 9, below.* [9] All answers to Item 1 through Item 6 are "No": *Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.* *Proceed to Form 4.3-2, Site Design BMPs.*

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that

either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 0 *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): 0 *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 Site Design BMPs (DA 1)

Form 4.3-2 cont. Site Design BMPs (DA 1)

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

4.3.3 Infiltration BMPs

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

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

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

4.3.3.1 Allowed Variations for Special Site Conditions

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

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

.

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	.5
		Predominant soil texture	0.25	1	.25
		Site soil variability	0.25	1	.25
		Depth to groundwater / impervious layer	0.25	1	.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	3	.75
		Level of pretreatment/ expected sediment loads	0.25	1	.25
		Redundancy	0.25	1	.25
		Compaction during construction	0.25	2	.5
		Design Safety Factor, $S_B = \Sigma p$			1.75
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					2.19
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					8.3 IN/HR
Design Infiltration Rate, in/hr, $K_{DESIGN} = ~~S_{TOT} \times K_M~~$ S_{TOT} / K_M					3.79 IN/HR
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

describe pretreatment.

describe redundancy as none can be see on exhibit.

verify and revise.

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

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): 22,543 *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 Basin	DA DMA BMP Type	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*	8.3		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.19		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	3.78		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	3.5	SEE EXHIBIT K RETENTION DEPTH	
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.5		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	1,730	SEE EXHIBIT K SF @ BOTTOM	
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		
10 Amended soil porosity	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		
12 Gravel porosity	0		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	7,690		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0		

16 Total Retention Volume from LID Infiltration BMPs: 7,690 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP 34% *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.

does not match see exhibit K comments.

incorrect value for formula, see comments on exhibit K and below.

$V_{ret} = P_{design} / 12 * SA_{inf} * (T_{drawdown} + T_{fill})$ =(3.78/12)*1730*(48+3)=27,865>22,543 REQUIRED

you can only have 48 hour draw down time at the peak infiltration retention height. ie 3.78*48/12=15.16 feet your basin only retains 3.5 feet so the draw down time in this equation would be 11.11 hours not 48 hours. However if you are just using this equation to figure out infiltration volume (not basin open space CF) drawdown will be 0 hours as this equation incorporates the volume of the basin through it's drawdown time. Revise calculations

4.3.4 Biotreatment BMP

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

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

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

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.* Nutrients, Noxious Aquatic Plants, Metals, Oil and Greese, Trash/Debris, Pesticide, Organic Compounds	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-5 and 4.3-6 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): 0.00 *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 1% *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): 0.00 *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☒ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

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

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

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

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

Form 4.3-7 Flow Based Biotreatment (DA 1)

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

4.3.5 Conformance Summary

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

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 22,543 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design BMP (ft^3): 0.00 *Copy Item18 in Form 4.3-2* revise

3 On-site retention with LID infiltration BMP (ft^3) 7,690 *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft^3): 0.00 *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): 0.00 *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. ☐

4.3.6 Hydromodification Control BMP

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

Form 4.3-9 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 17,290 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 57,.412 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): -40,121 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): 0.00

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☒
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒

4.4 Alternative Compliance Plan (if applicable)

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

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

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

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

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

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

Not a chamber system, revise language for basin

that at time of Project construction completion, the Maintenance Agreement must ompleted, 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
~~Under-ground~~ in-filtration Basin	Owner/GMR/POAR	Inspect debris chamber and remove any visible debris.	Bi-annually
SD-12 Efficient Irrigation	Owner/GMR/POAR	Owner shall inspect or hire landscape maintenance company to inspect irrigation systems and control systems to ensure they are operating efficiently in order to minimize water usage.	Monthly
SD-13 Storm Drain Signs	Owner/GMR/POAR	Owner shall inspect and maintain the legibility of all stencils, markings and signs.	Bi-annually
SD-32 Trash Enclosure	Owner/GMR/POAR	The owner shall inspect and maintain screens, covers, signs for legibility and all trash enclosures and bins for leakage and detioration of underline pavement.	Bi-monthly
BG-40 Landscape	Owner/GMR/POAR	allow leaf drop to become part of the mulch layer in tree shrub, and ground cover areas, keep lawn mower blades sharp, grass dash cycle,	Bi-monthly

inspection and O&M		collect lawn and garden clippings, perform soils analysis seasonally, apply chemical furnace wisers only as needed by a certified applicator, prune plants sparingly.	
BG-30 Food prep inspection and O&M	Owner/GMR/POAR	cleaning of equipment, grease handling and disposal, spills, surface cleaning, cooling and refrigeration equipment maintenance, landscaping and grounds maintenance, dumpster, loading area, parking lots, inspection of food preparation areas	daily
WM-4 spell kit inspectiona nd O&M	Owner/GMR/POAR	absorbent spill clean up materials and spill kit shall be available on site and used on small spills instead of hosing down or burying techniques. Spill kit materials should be disposed of after use	verify weekly that spill control cleanup materials are present
SS-9 RIPrap inspection and O&M	Owner/GMR/POAR	inspect ditches and berms for washouts, replace lost riprap, damaged lining or soil stabilizers as needed. Remove debris and sediment, and repair linings and embankments to ensure they function as intended	daily during extended rain events, post storm, and weekly year round
N14 CATCH BASIN INSERTS	Owner/GMR/POAR	Inspect for trash, debris and damage Clean and repair as needed	MONTHLY
Swell inspection and O&M		Inspect and remove any visible silts and debris.	Biannually
N15 vacuum sweeping	Owner/GMR/POAR	Inspect parking lots for debris and accumulation. Using dry cleaning methods parentheses (e.g., sweeping, vacuuming) to prevent the potential discharge of pollutants into the storm water conveyance system.	Annually (prior to October 1st)
Litter and debris inspection and clean out program	Owner/GMR/POAR	Pick up and dispose of properly as needed	daily during extended rain events, post storm, and weekly year round

swale?

who will maintain.

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

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

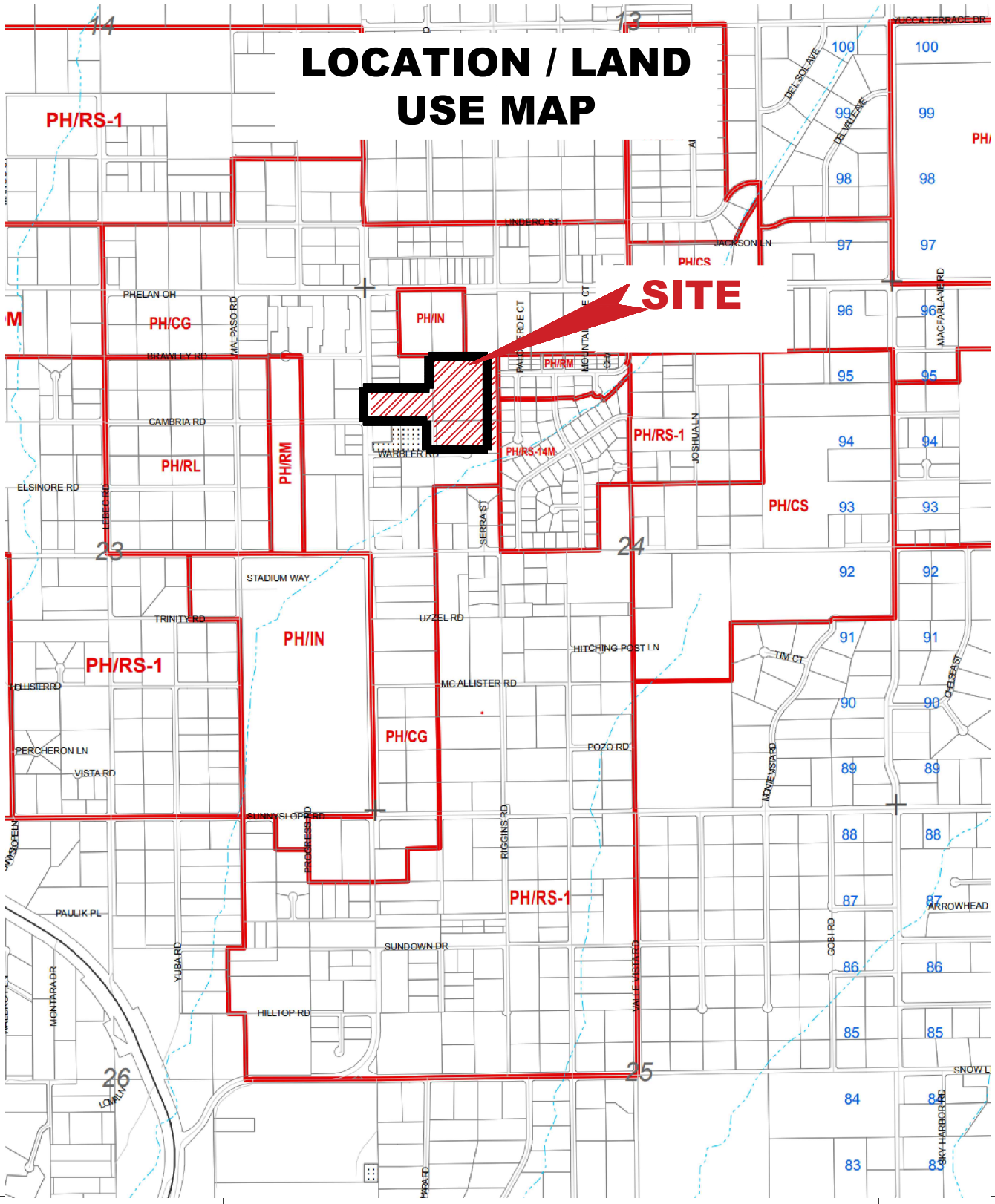
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (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

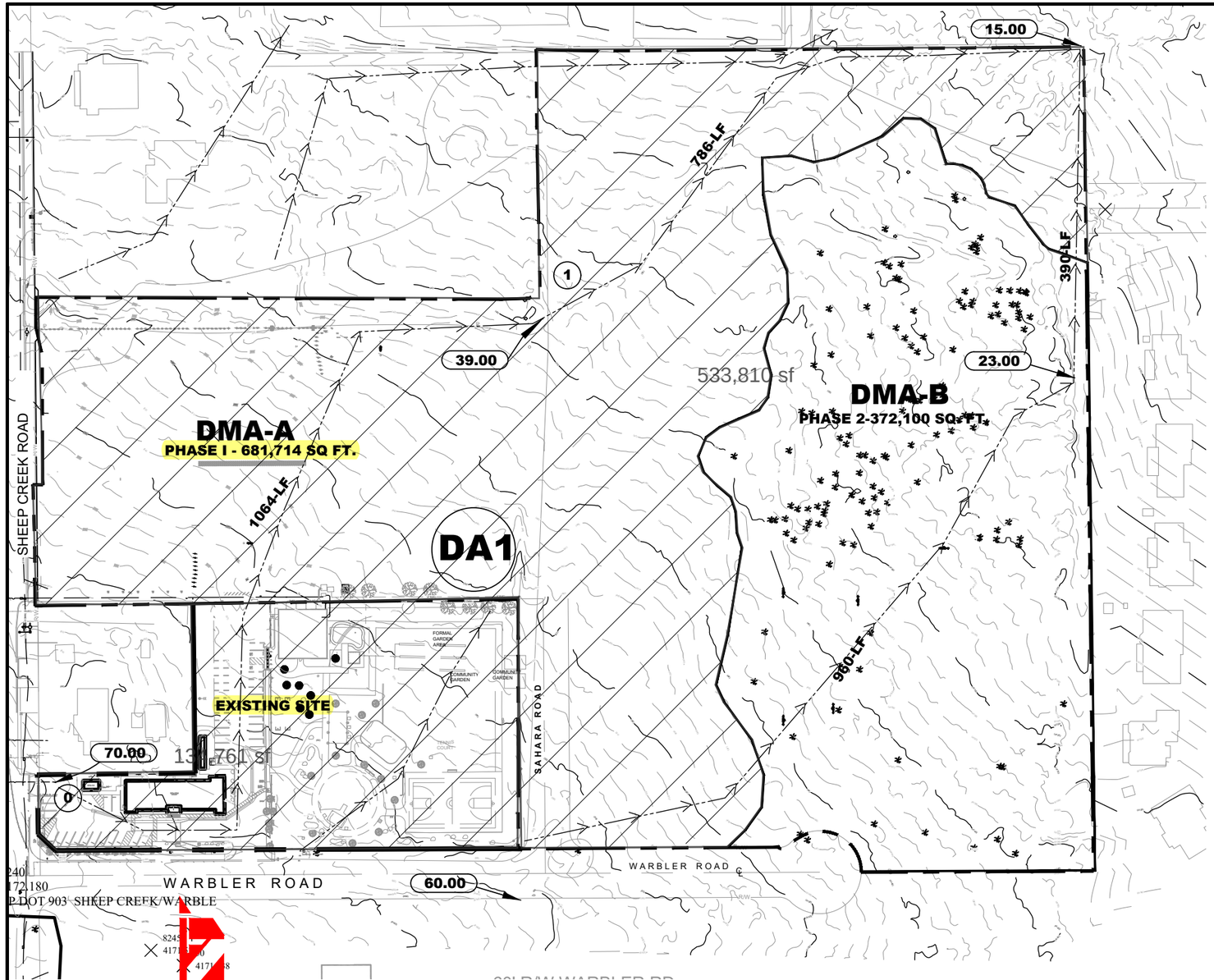


DATE:	03/15/2022
DRAWN BY:	DWL
CHECKED BY:	DWL
SCALE:	NTS

LOCATION

PPHCSD-COMMUNITY CENTER
PHELAN - SAN BERNARDINO, CA
COUNTY, CA
APN: 3066-261-08,10
3066-251-14

RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS



LEGEND:

DA1 — DRAINAGE AREA

DMA-A — DRAINAGE MANAGEMENT AREA - A

(##) — NODE #

XX.XX — SPOT ELEVATION

OVERALL WQMP BOUNDARY

SUBAREA BOUNDARY

SUBAREA FLOWLINE

EG	EXISTING GRADE
FG	FINISH GRADE
FS	FINISH SURFACE
FF	FINISH FLOOR
IE	INVERT ELEVATION

PHASE I - 681,714 SQ FT.

GRAPHIC SCALE

150' 0' 75' 150' 300'

(IN FEET)

1 inch = 150'ft.

WQMP

ON-SITE TRIBUTARY WATERSHED AREA

FOR:
PPHCSD

IN
PHELAND
SAN BERNARDINO COUNTY, CA

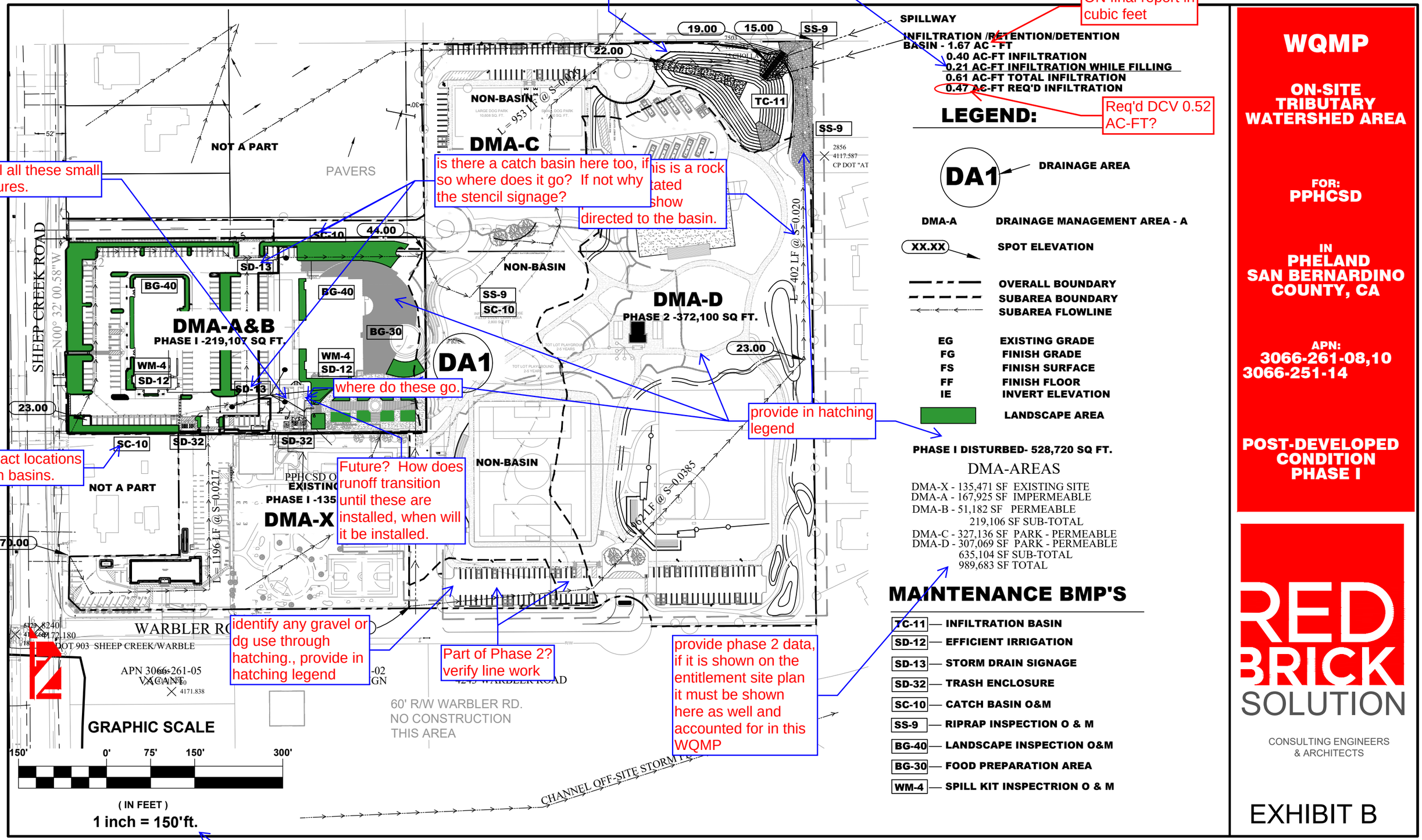
APN:
3066-261-08,10
3066-251-14

PRE-DEVELOPED CONDITION PHASE I

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT A



WQMP

ON-SITE TRIBUTARY WATERSHED AREA

FOR:
PPHCSD

IN
PHELAND
SAN BERNARDINO COUNTY, CA

APN:
3066-261-08,10
3066-251-14

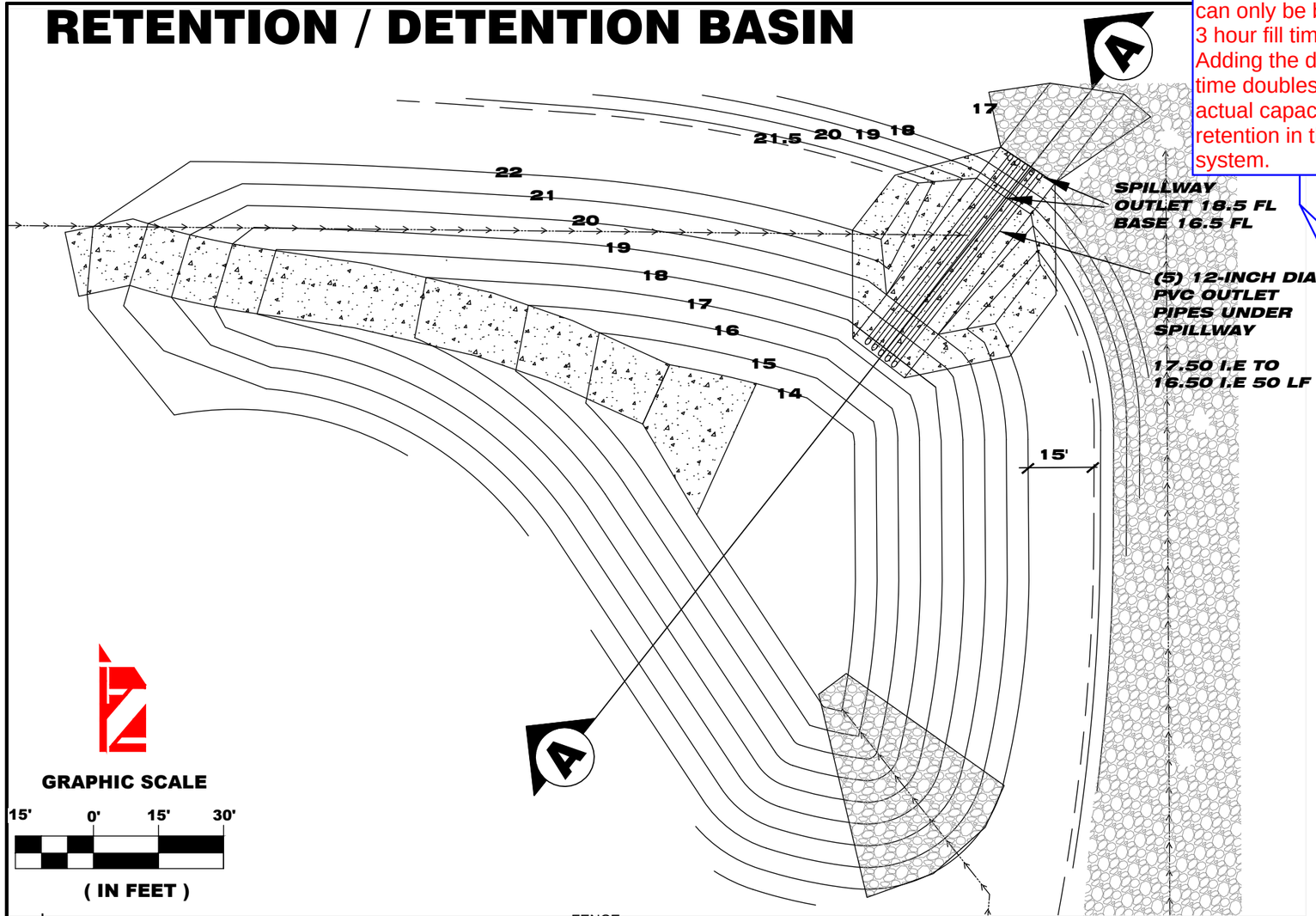
POST-DEVELOPED CONDITION PHASE I

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT B

RETENTION / DETENTION BASIN



infiltration capability can only be based on 3 hour fill time. Adding the drawdown time doubles the actual capacity of retention in the system.

infiltration is only consistant at the bottom but we can allow use of SQFT mid height of the retention portion of the basin, revise to 5379.171

BASIN DATA:

BOTTOM ELEV= 4114.0
RIM ELEV = 4122.0

100-YEAR STORM
WSE = 4120.00
DETENTION V=1.07 AC-FT
BOTTOM AREA=1,730 SF

REQ'D DCV =22,543 CF
= 0.52 AC-FT

DRAWDOWN TIME: 0.518
REQ'D < 48 HRS

INFILTRATION RATE =8.30 IN/HR
FS =2.19 =3.78 IN/HR

@ PEAK -VOLUME INFILTRATION
=16HRS*3.78IN/HR
*1730/43560/12=0.20AF

OUTLET ELEV = 4117.50
RETENTION V = 0.402 AC-FT

TOTAL INFILTRATION AFTER PEAK
=0.20+0.402=0.602>0.52 AC-FT 0.518

DEPTH = 4117.5-4114.0=3.5 FT
=3.5*12 = 42 IN 0.519 AC FT
DRAW DOWN TIME =42/3.78
=11.11HR<48

BASIN VOLUME/ FT ELEVATION

	FT/ELEV	Area SF	Area Ac.	Vol Ac/ft per ft	Acc. Vol Ac.-Ft
21.5	7.5	19698.31	0.452211	0.216254	1.669949
21	7	17981.79	0.412805	0.378924	1.453695
20	6	15030.08	0.345043	0.313908	1.074771
19	5	12317.55	0.282772	0.253706	0.760863
18	4	9785.288	0.224639	0.195384	0.507157
17.5	3.5	8510.934	0.195384	0.090378	0.402151
17	3	7236.58	0.166129	0.143142	0.311773
16	2	5233.984	0.120156	0.101456	0.168631
15	1	3604.855	0.082756	0.067175	0.067175
14	0	2247.407	0.051593		

Interpolation

0	1.75	3.5
2247.407	X	8510.934
	X=	5379.171

LOGY
GY
TE
TRIBUTARY
WATERSHED AREA

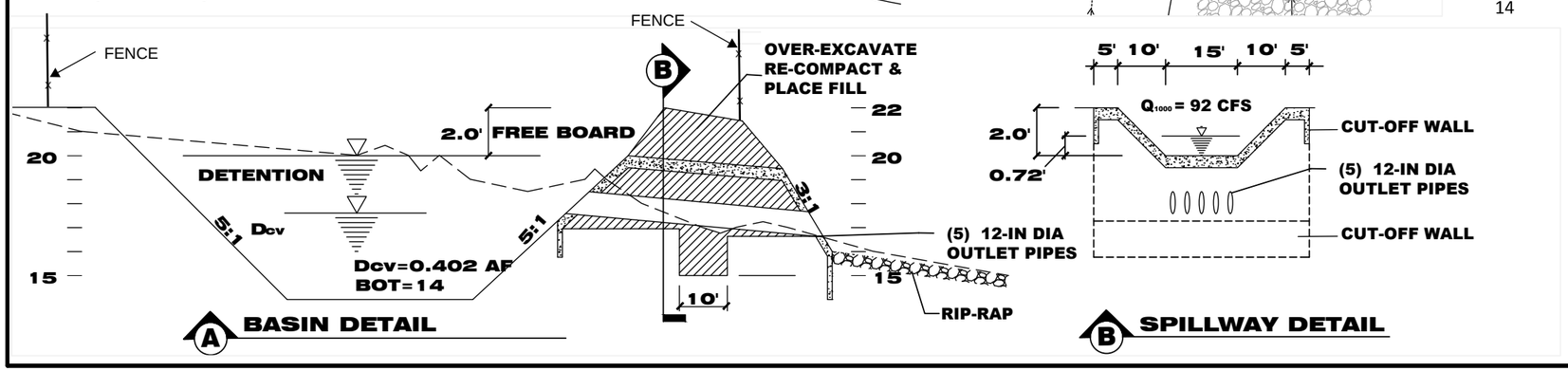
IN
PHELAND
SAN BERNARDINO
COUNTY, C

revise to 0.117

OAPN:
3066-261-08,10
3066-251-14

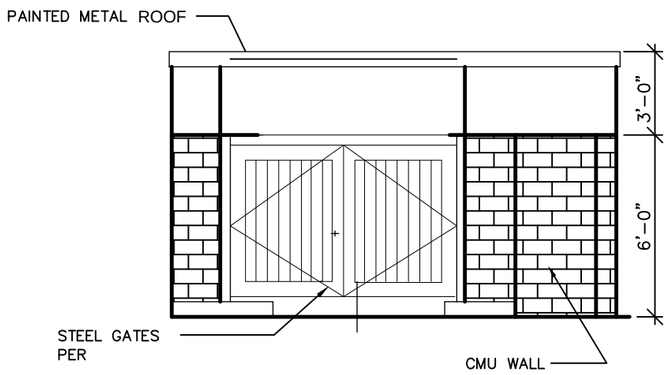
RETENTION/
DETENTION BASIN

GRAPHIC SCALE
15' 0' 15' 30'
(IN FEET)

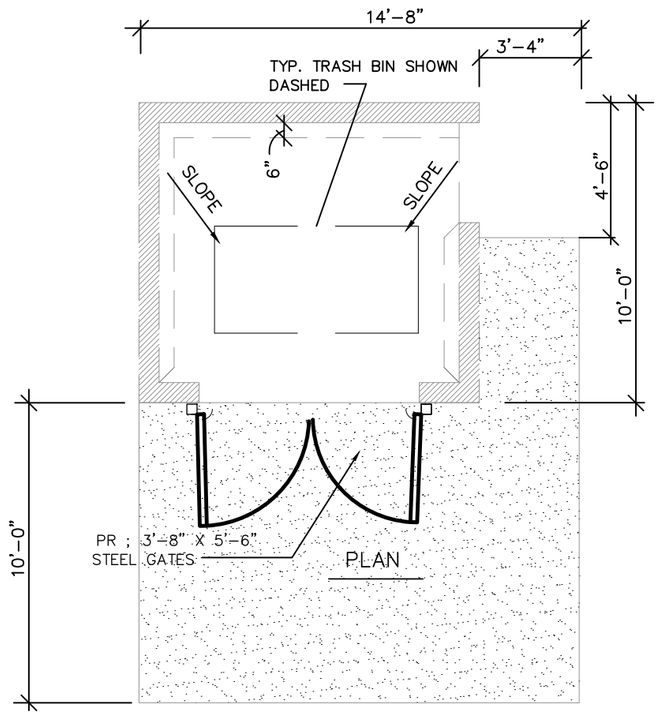


RED BRICK SOLUTION
CONSULTING ENGINEERS & ARCHITECTS

EXHIBIT K



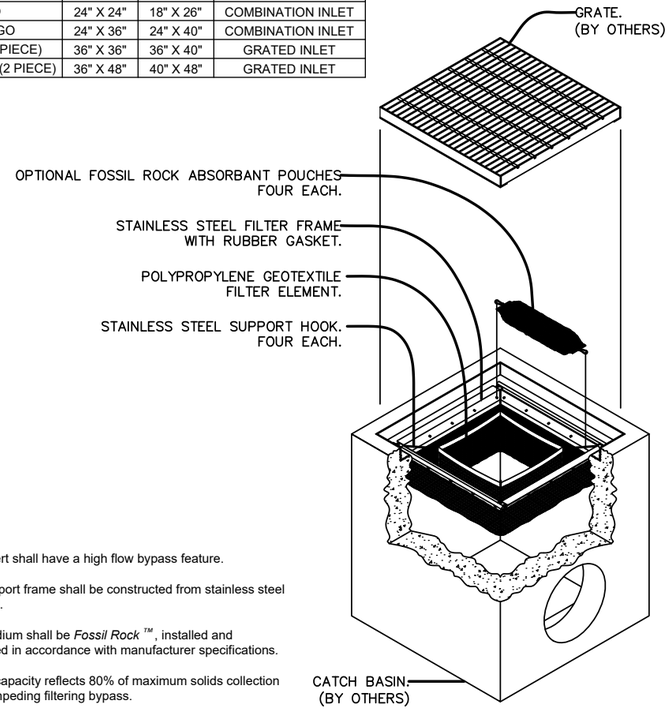
ELEVATION



1 **TRASH ENCLOSURE DETAIL**

SCALE 1"=5'

SPECIFIER CHART			
MODEL	INLET ID	GRATE OD	COMMENTS
FF-12D	12" X 12"	15" X 15"	GRATED INLET
FF-16D	16" X 16"	18" X 18"	GRATED INLET
FF-18D	18" X 18"	20" X 20"	GRATED INLET
FF-1836SD	18" X 36"	18" X 40"	GRATED INLET
FF-1836DGO	18" X 36"	18" X 40"	COMBINATION INLET
FF-24D	24" X 24"	26" X 26"	GRATED INLET
FF-2436SD	24" X 36"	24" X 40"	GRATED INLET
FF-24DGO	24" X 24"	18" X 26"	COMBINATION INLET
FF-2436DGO	24" X 36"	24" X 40"	COMBINATION INLET
FF-36D (2 PIECE)	36" X 36"	36" X 40"	GRATED INLET
FF-3648D (2 PIECE)	36" X 48"	40" X 48"	GRATED INLET

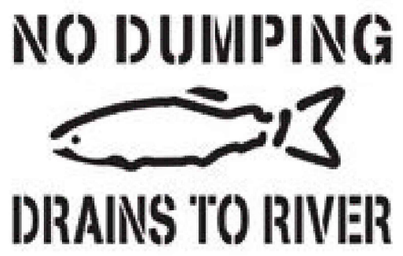


NOTES:

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

2 **SDM FILTER**

SCALE 1"=5'



3 **STENCIL DETAIL**

SCALE

WQMP

ON-SITE SOURCE CONTROLS

FOR:
PPHCSD

IN
PHELAND
SAN BERNARDINO COUNTY, CA

APN:
3066-261-08,10
3066-251-14

RED BRICK SOLUTION

CONSULTING ENGINEERS & ARCHITECTS

NOAA Atlas 14, Volume 6, Version 2
Location name: Phelan, California, USA*
Latitude: 34.4228°, Longitude: -117.5707°
Elevation: 4151.29 ft**
* source: ESRI Maps
** source: USGS

EXHIBIT D

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	**0.083** (0.069-0.101)	**0.118** (0.098-0.144)	**0.167** (0.138-0.205)	**0.209** (0.171-0.259)	**0.270** (0.214-0.345)	**0.320** (0.248-0.417)	**0.373** (0.282-0.498)	**0.430** (0.316-0.591)	**0.510** (0.360-0.732)	**0.576** (0.392-0.855)
10-min	**0.119** (0.099-0.145)	**0.170** (0.140-0.207)	**0.240** (0.198-0.294)	**0.300** (0.246-0.371)	**0.388** (0.307-0.495)	**0.459** (0.355-0.598)	**0.534** (0.404-0.714)	**0.616** (0.452-0.847)	**0.732** (0.515-1.05)	**0.826** (0.562-1.23)
15-min	**0.144** (0.120-0.176)	**0.205** (0.170-0.250)	**0.290** (0.239-0.355)	**0.363** (0.297-0.448)	**0.469** (0.371-0.598)	**0.555** (0.430-0.723)	**0.646** (0.488-0.864)	**0.745** (0.547-1.02)	**0.885** (0.623-1.27)	**0.998** (0.679-1.48)
30-min	**0.207** (0.172-0.252)	**0.294** (0.243-0.359)	**0.416** (0.343-0.509)	**0.521** (0.426-0.643)	**0.672** (0.532-0.858)	**0.796** (0.616-1.04)	**0.927** (0.701-1.24)	**1.07** (0.785-1.47)	**1.27** (0.894-1.82)	**1.43** (0.974-2.13)
60-min	**0.285** (0.236-0.348)	**0.405** (0.335-0.495)	**0.574** (0.473-0.702)	**0.718** (0.587-0.886)	**0.927** (0.733-1.18)	**1.10** (0.849-1.43)	**1.28** (0.966-1.71)	**1.47** (1.08-2.02)	**1.75** (1.23-2.51)	**1.97** (1.34-2.93)
2-hr	**0.420** (0.348-0.512)	**0.576** (0.476-0.703)	**0.791** (0.653-0.969)	**0.975** (0.798-1.20)	**1.24** (0.980-1.58)	**1.45** (1.13-1.89)	**1.68** (1.27-2.24)	**1.92** (1.41-2.64)	**2.26** (1.59-3.24)	**2.53** (1.72-3.75)
3-hr	**0.523** (0.433-0.637)	**0.707** (0.585-0.863)	**0.960** (0.792-1.18)	**1.18** (0.962-1.45)	**1.48** (1.17-1.89)	**1.73** (1.34-2.26)	**1.99** (1.51-2.66)	**2.27** (1.67-3.12)	**2.66** (1.88-3.82)	**2.97** (2.02-4.41)
6-hr	**0.750** (0.621-0.914)	**1.00** (0.832-1.23)	**1.35** (1.12-1.66)	**1.65** (1.35-2.03)	**2.06** (1.63-2.63)	**2.39** (1.86-3.12)	**2.74** (2.07-3.66)	**3.11** (2.29-4.28)	**3.63** (2.55-5.20)	**4.04** (2.75-5.99)
12-hr	**0.997** (0.826-1.22)	**1.38** (1.14-1.68)	**1.90** (1.56-2.32)	**2.32** (1.90-2.87)	**2.92** (2.31-3.73)	**3.39** (2.63-4.42)	**3.88** (2.93-5.19)	**4.39** (3.23-6.04)	**5.09** (3.59-7.30)	**5.65** (3.84-8.39)
24-hr	**1.30** (1.15-1.49)	**1.87** (1.66-2.16)	**2.64** (2.33-3.05)	**3.27** (2.86-3.81)	**4.14** (3.51-4.99)	**4.83** (4.01-5.94)	**5.53** (4.48-6.97)	**6.27** (4.94-8.12)	**7.29** (5.51-9.84)	**8.08** (5.90-11.3)
2-day	**1.53** (1.35-1.76)	**2.23** (1.97-2.57)	**3.17** (2.80-3.67)	**3.96** (3.47-4.61)	**5.05** (4.28-6.08)	**5.90** (4.90-7.26)	**6.79** (5.50-8.56)	**7.72** (6.08-10.0)	**9.01** (6.81-12.2)	**10.0** (7.32-14.0)
3-day	**1.65** (1.46-1.90)	**2.42** (2.14-2.79)	**3.47** (3.06-4.01)	**4.35** (3.81-5.06)	**5.56** (4.72-6.70)	**6.53** (5.42-8.03)	**7.53** (6.10-9.49)	**8.59** (6.77-11.1)	**10.1** (7.61-13.6)	**11.2** (8.21-15.7)
4-day	**1.75** (1.55-2.02)	**2.58** (2.29-2.98)	**3.72** (3.29-4.30)	**4.68** (4.10-5.45)	**6.02** (5.10-7.25)	**7.08** (5.88-8.71)	**8.20** (6.64-10.3)	**9.38** (7.39-12.1)	**11.0** (8.34-14.9)	**12.3** (9.02-17.2)
7-day	**1.93** (1.71-2.22)	**2.86** (2.53-3.30)	**4.17** (3.68-4.82)	**5.29** (4.63-6.16)	**6.88** (5.83-8.29)	**8.16** (6.77-10.0)	**9.51** (7.70-12.0)	**11.0** (8.63-14.2)	**13.0** (9.83-17.6)	**14.6** (10.7-20.5)
10-day	**1.99** (1.76-2.29)	**2.97** (2.63-3.42)	**4.36** (3.85-5.04)	**5.56** (4.87-6.48)	**7.30** (6.19-8.79)	**8.71** (7.23-10.7)	**10.2** (8.27-12.9)	**11.8** (9.32-15.3)	**14.1** (10.7-19.1)	**16.0** (11.7-22.4)
20-day	**2.30** (2.04-2.65)	**3.49** (3.09-4.02)	**5.21** (4.60-6.03)	**6.73** (5.90-7.85)	**8.99** (7.61-10.8)	**10.9** (9.01-13.3)	**12.9** (10.4-16.2)	**15.1** (11.9-19.5)	**18.2** (13.8-24.6)	**20.8** (15.2-29.1)
30-day	**2.67** (2.37-3.07)	**4.04** (3.58-4.66)	**6.07** (5.36-7.02)	**7.89** (6.90-9.19)	**10.6** (8.98-12.8)	**12.9** (10.7-15.8)	**15.3** (12.4-19.3)	**18.0** (14.2-23.3)	**21.9** (16.6-29.6)	**25.2** (18.4-35.2)
45-day	**3.15** (2.79-3.63)	**4.73** (4.19-5.46)	**7.09** (6.26-8.20)	**9.22** (8.07-10.7)	**12.4** (10.5-15.0)	**15.2** (12.6-18.7)	**18.2** (14.7-22.9)	**21.4** (16.9-27.7)	**26.2** (19.8-35.4)	**30.1** (22.0-42.1)
60-day	**3.51** (3.11-4.04)	**5.20** (4.60-5.99)	**7.75** (6.84-8.96)	**10.1** (8.82-11.7)	**13.6** (11.5-16.4)	**16.6** (13.8-20.4)	**19.9** (16.1-25.1)	**23.5** (18.5-30.4)	**28.8** (21.7-38.8)	**33.1** (24.2-46.3)

[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.

Back to Top

PF graphical

EXHIBIT E

United States Department of Agriculture

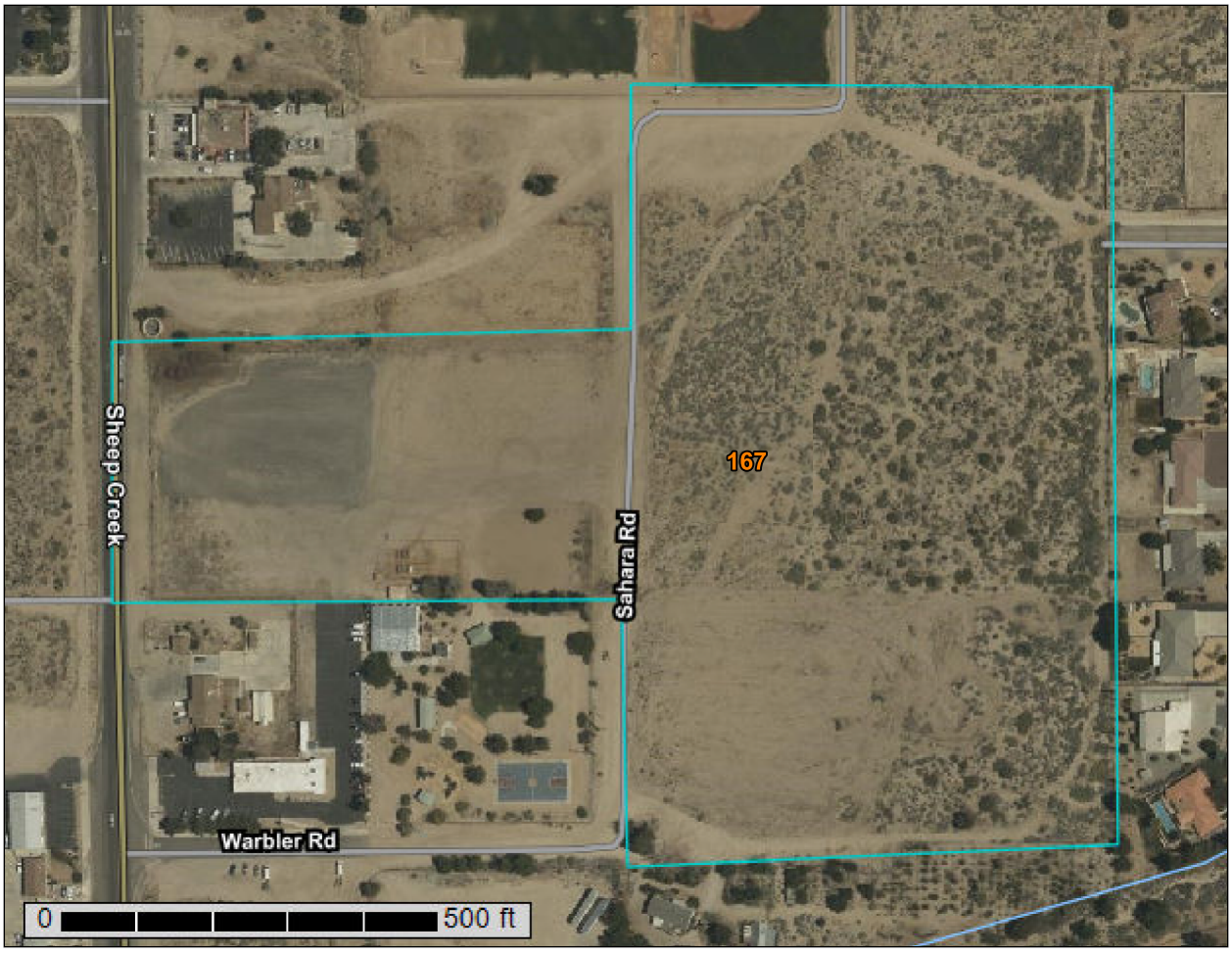
NRCS

Natural Resources Conservation Service

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

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
167	TUJUNGA SAND, COOL, 2 TO 9 PERCENT SLOPES	20.7	100.0%
Totals for Area of Interest		**20.7**	**100.0%**



October 19, 2020

San Bernardino County, California, Mojave River Area

167—TUJUNGA SAND, COOL, 2 TO 9 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkt9
Elevation: 2,700 to 4,300 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: Not prime farmland

Map Unit Composition

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

Description of Tujunga

Setting

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

Typical profile

H1 - 0 to 14 inches: sand
H2 - 14 to 60 inches: stratified gravelly sand to gravelly loamy sand

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Available water capacity: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R030XE006CA - COARSE LOAMY
Hydric soil rating: No

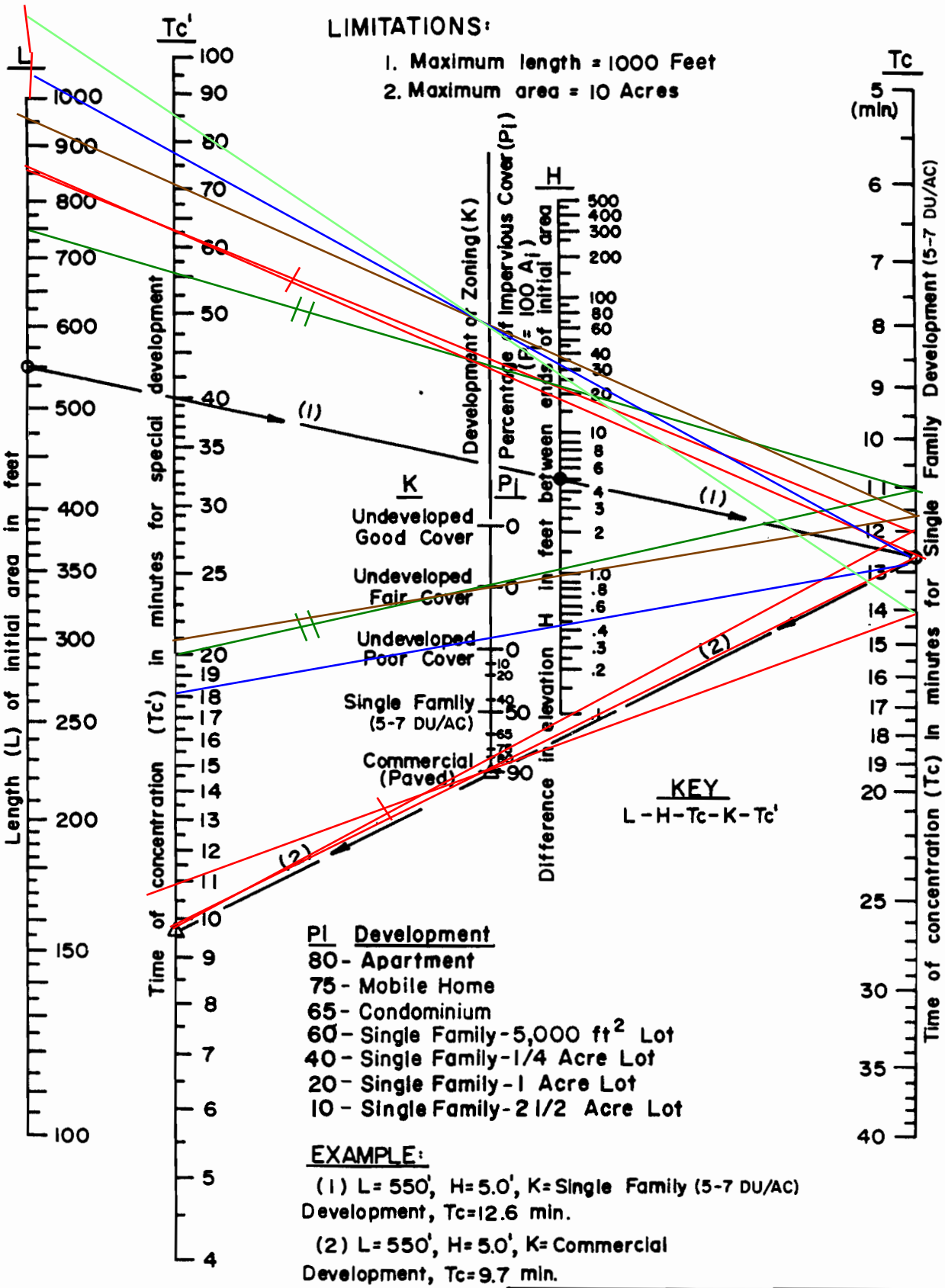
Minor Components

Soboba

Percent of map unit: 4 percent

Hanford

Percent of map unit: 4 percent



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

EXHIBIT G1

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79

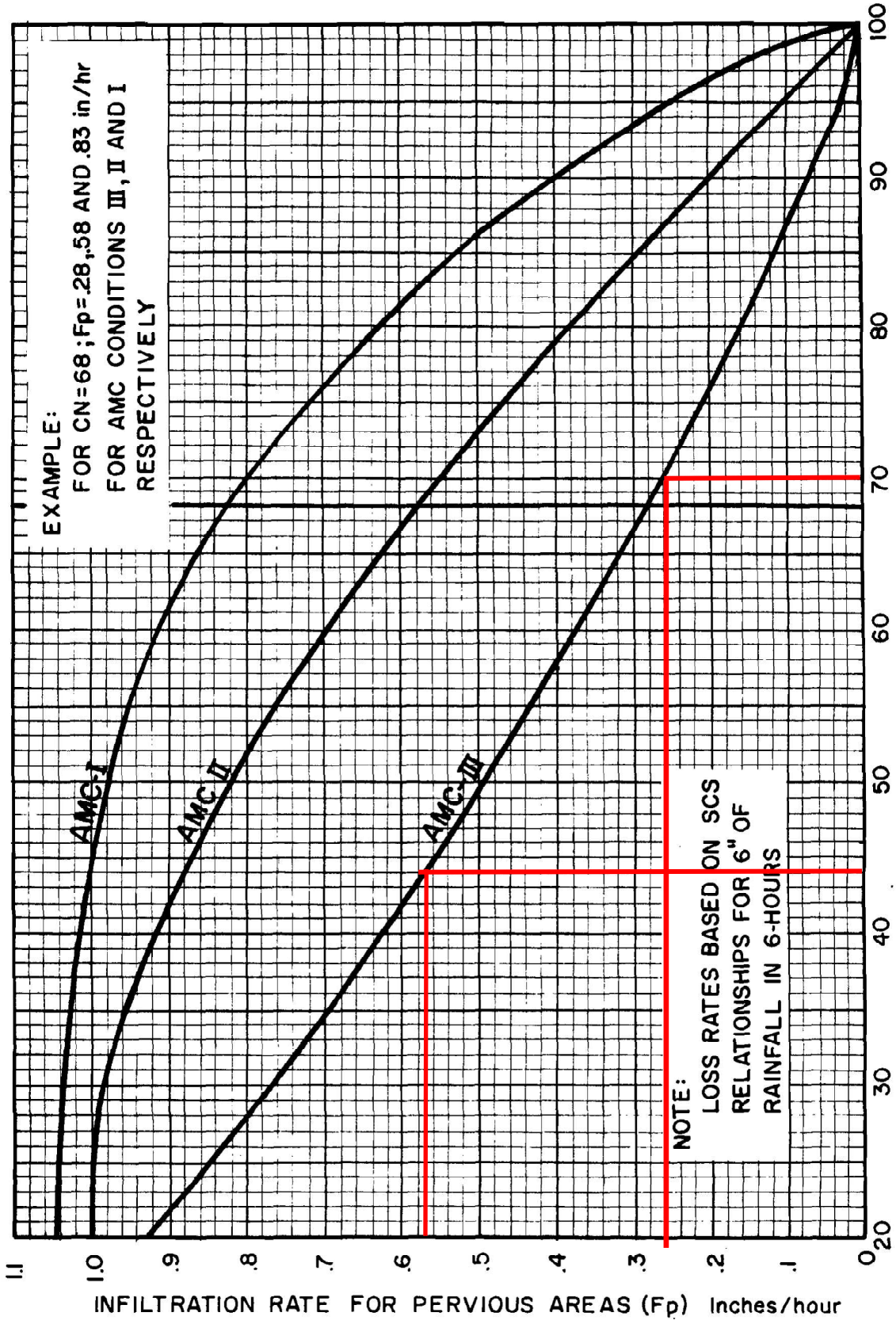
Impervious areas shall be assigned a CN of 98. It is noted that for ultimately developed conditions, the CN for urban landscaping (turf) is provided in Figure C-3.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

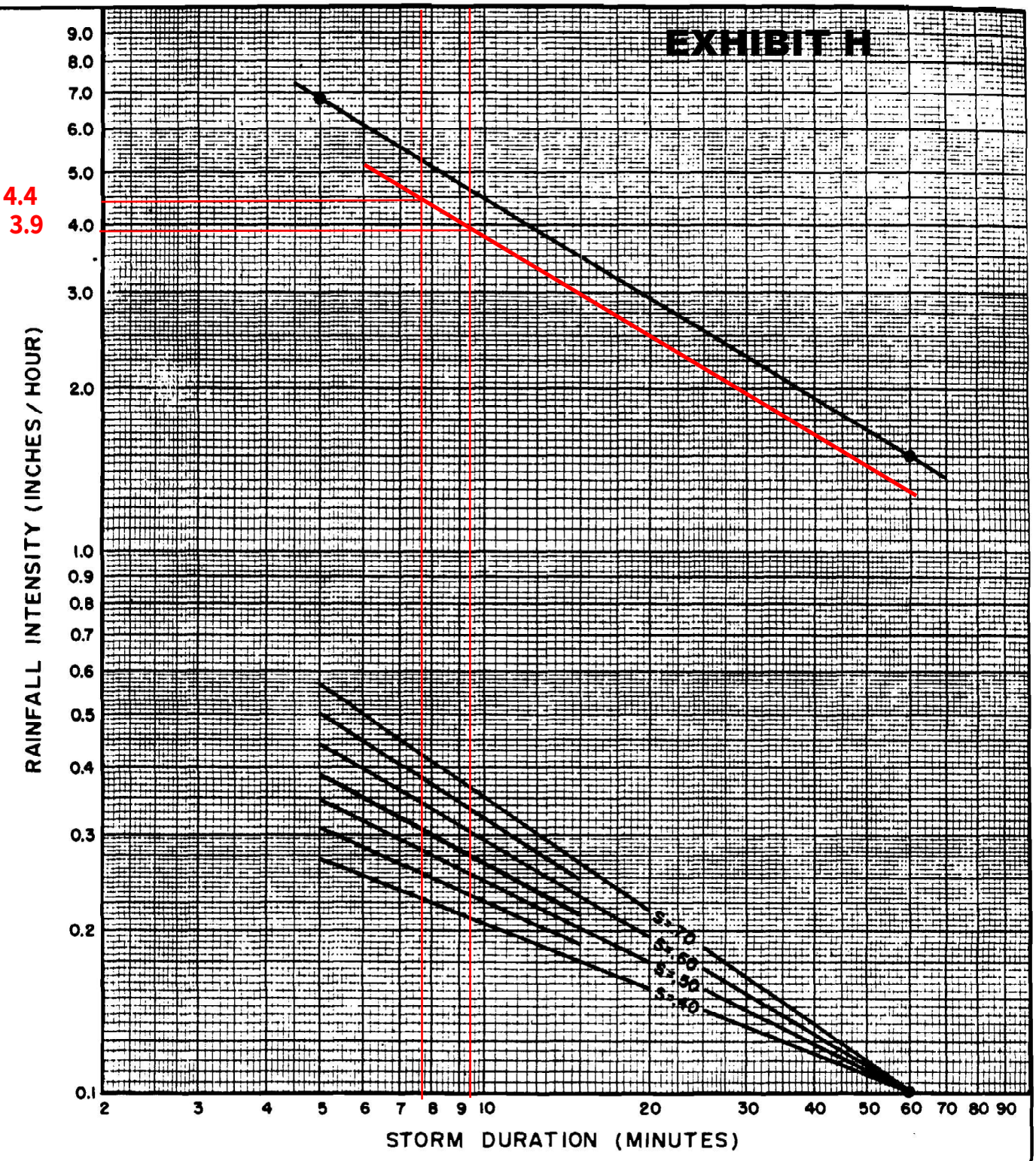


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS SCS CURVE NUMBERS

Figure C-6

EXHIBIT H



DESIGN STORM FREQUENCY = 10 YEARS

ONE HOUR POINT RAINFALL = 1.49 INCHES

LOG-LOG SLOPE = 0.60

PROJECT LOCATION = EXAMPLE PROBLEM

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

RECORDING REQUESTED BY:

AND WHEN RECORDED MAIL TO:

SPACE ABOVE THIS LINE FOR RECORDER'S USE

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

THIS PAGE 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: _____

PROPERTY ADDRESS: _____

_____

APN: _____

THIS AGREEMENT is made and entered into in

_____ ,California, this _____ day of

_____ , by and between

_____ , 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 City, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference; and

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

_____ 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 urban runoff and to minimize other adverse impacts of 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 BMPs proposed as part of the WQMP are 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 of Hesperia, 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 County's Pollutant Discharge Elimination System regulations, which on the effective date of this Agreement are found in County Code Sections 35.0101 et seq. 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's 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, attorneys 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's 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. The 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:

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

OWNER:

Company/Trust:_____

Signature: _____

Name: _____

Title: _____

Date: _____

FOR: Maintenance Agreement, dated

_____, for the

project known as

_____

(APN)_____,

As described in the WQMP dated -

_____.

OWNER:

Company/Trust:_____

Signature: _____

Name: _____

Title: _____

Date: _____

NOTARIES ON FOLLOWING PAGE

A notary acknowledgement is required for recordation.

ACCEPTED BY:

NILS BENTSEN, CITY MANAGER

Date: _____

Attachment: Notary Acknowledgement

ATTACHMENT 1
Notary Acknowledgement)

EXHIBIT A
(Legal Description)

BMP OPERATION & MAINTENANCE LOG
MARIANA ELEMENTARY SCHOOL

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed
SD-10 (Site Design & Landscape Planning)	
SD-12 (Efficient Irrigation)	
SD-13 (Storm Drain Signage)	
SD-32 (Trash Storage Areas)	
SD-34 (Outdoor Material Storage Areas)	
TC-11 (Infiltration Basin) Including pretreatment infiltration filter	

Note: annual cost to maintain the post construction BMPs shall be determined by the owner.

IT'S A STORMWATER POLLUTION REVOLUTION!

Keeping construction sites and the Mojave River Watershed clean!

Stormwater runoff from construction sites are major contributors to toxins entering the Mojave River - harming our natural wildlife and eventually making its way back to our faucets, hoses, drinking water and other waterways in the High Desert.

We need your help! Follow these simple steps when doing small or large-scale construction to prevent stormwater pollution and protect our community from toxins:

- Identify path for stormwater discharge
- Secure storm drain inlets with sandbags
- Protect slopes and channels
- Store materials off the ground on wooden pallets
- Never sweep or wash anything into a storm drain

Installing Storm Drain Inlet Protection 101

Prevent sediment from entering a storm drain by following the simple installation and maintenance steps outlined below. Use silt fence, rock-filled bags, or block and gravel.

Installation:
Install protection prior to starting activity; Protect all inlets that may receive discharge; Design protection to handle maximum volume of water expected.

Maintenance:
Inspect frequently; Remove trapped sediment; Replace or repair protection as needed; Sweep streets, sidewalks and other paved areas regularly.

To report illegal dumping or for more information on stormwater pollution prevention call 1 (800) 78 CRIME or visit our website at www.mojaveriver.org, Facebook at MojaveWatershed, Twitter @MojaveRiver, or Pinterest at Mojave Watershed.

Disposal Centers

Apple Valley
13450 Nomwaket Road

Hesperia Fire Station
17443 Lemon Street

Victorville Fire Department
East of Desert Knoll Drive
on Loves Lane

Barstow Corporation Yard
900 South Avenue H

San Bernardino County
2824 East W Street
San Bernardino, CA

Don't Get Turned Away!

For hours of operation, quantity limitations and other rules and regulations, call (800) 645-9228 or visit the MRWG website at www.mojaveriver.org before dropping off materials.

The Updated Model Water Efficient Landscape Ordinance

CALIFORNIA DEPARTMENT OF WATER RESOURCES

Landscapes are essential to the quality of life in California. They provide areas for recreation, enhance the environment, clean the air and water, prevent erosion, offer fire protection and replace ecosystems lost to development.

California's economic prosperity and environmental quality are dependant on an adequate supply of water for beneficial uses. In California, about half of the urban water used is for landscape irrigation. Ensuring **efficient landscapes** in new developments and reducing water waste in existing landscapes are the most cost-effective ways to stretch our limited water supplies and ensure that we continue to have sufficient water for California to prosper.

The Water Conservation in Landscaping Act of 2006 (Assembly Bill 1881, Laird) requires cities, counties, and charter cities and charter counties, to adopt landscape water conservation ordinances by January 1, 2010. Pursuant to this law, the Department of Water Resources (DWR) has prepared a Model Water Efficient Landscape Ordinance (Model Ordinance) for use by local agencies. The Model Ordinance was approved by the Office of Administrative Law on September 10, 2009. The Model Ordinance became effective on September 10.

All local agencies must adopt a water efficient landscape ordinance by **January 1, 2010**. The local agencies may adopt the state Model Ordinance, or craft an ordinance to fit local conditions. In addition, several local agencies may collaborate and craft a region-wide ordinance. In any case, the adopted ordinance must be as effective as the Model Ordinance in regard to water conservation.

For more information, please visit our web site at
http://www.water.ca.gov/wateruseefficiency/landscapeordinance/

DWR October 2009

Important points to consider...

Water purveyors have an important role.

The enabling statute was directed to local agencies that make land use decisions and approve land development. Active participation by water purveyors can make the implementation, enforcement and follow-up actions of an ordinance more effective.

Most new and rehabilitated landscapes are subject to a water efficient landscape ordinance. Public landscapes and private development projects including developer installed single family and multi-family residential landscapes with at least 2500 sq. ft. of landscape area are subject to the Model Ordinance .

Homeowner provided landscaping at single family and multi-family homes are subject to the Model Ordinance if the landscape area is at least 5000 sq. ft

Existing landscapes are also subject to the Model Ordinance.

Water waste is common in landscapes that are poorly designed or not well maintained. Water waste (from runoff, overspray, low head drainage, leaks and excessive amounts of applied irrigation water in landscapes is prohibited by Section 2, Article X of the California Constitution.

Any landscape installed prior to January 1, 2010, that is at least one acre in size may be subject to irrigation audits, irrigation surveys or water use analysis programs for evaluating irrigation system performance and adherence to the Maximum Applied Water Allowance as defined in the 1992 Model Ordinance with an Evapotranspiration Adjustment Factor (ETAF) of 0.8. Local agencies and water purveyors (designated by the local agency) may institute these or other programs to increase efficiency in existing landscapes.

All new landscapes will be assigned a water budget.

The water budget approach is a provision in the statute that ensures a landscape is allowed sufficient water. There are two water budgets in the Model Ordinance; the Maximum Applied Water Allowance (MAWA) and the Estimated Total Water Use (ETWU).

The MAWA, is the water budget used for compliance and is an annual water allowance based on landscape area, local evapotranspiration and ETAF of 0.7. The ETWU is an annual water use estimation for design purposes and is based on the water needs of the plants actually chosen for a given landscape. The ETWU may not exceed the MAWA.

Water efficient landscapes offer multiple benefits.

Water efficient landscapes will stretch our limited water supplies. Other benefits include reduced irrigation runoff, reduced pollution of waterways, less property damage, less green waste, increased drought resistance and a smaller carbon footprint.

The Department of Water Resources will offer technical assistance.

The Department plans to offer a series of workshops, publications and other assistance for successful adoption and implementation of the Model Ordinance or local water efficient landscape ordinances. Information regarding these resources may be found on the DWR website: **http://www.water.ca.gov/wateruseefficiency/landscapeordinance/**
Questions on the Model Ordinance may be sent by e-mail to DWR staff at: **mweo@water.ca.gov.**

R-3
AUTOMOBILE PARKING

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	
Bacteria	
Foaming Agents	
Metals	X
Hydrocarbons	X
Hazardous Materials	x
Pesticides and Herbicides	
Other	

Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before parking your car. Remember - The ocean starts at your front door.

Required Activities

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.
- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.
- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

Recommended Activities

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).
- Limit vehicle parking to covered areas.
- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

For additional information contact:
County of Orange, OC **Watershed**
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-5
DISPOSAL OF PET WASTES

Pet wastes left in the environment may introduce solids, bacteria, and nutrients to the storm drain. The type and quantity of waste will dictate the proper disposal method. Small quantities of waste are best disposed with regular trash or flushed down a toilet. Large quantities of wastes from herbivore animals may be composted for subsequent use or disposal to landfill.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	
Metals	
Hydrocarbons	
Hazardous Materials	
Pesticides and Herbicides	
Other	

Pick up after your pet! It's as easy as 1-2-3. 1) Bring a bag. 2) Clean it up. 3) Dispose of it properly (toilet or trash). The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before you dispose of any pet wastes. Remember - The ocean starts at your front door.

Required Activities

- All pet wastes must be picked up and properly disposed of. Pet waste should be disposed of in the regular trash, flushed down a toilet, or composted as type and quantities dictate.
- Properly dispose of unused flea control products (shampoo, sprays, or collars).
- Manure produced by livestock in uncovered areas should be removed at least daily for composting, or storage in water-tight container prior to disposal. Never hose down to stream or storm drain. Composting or storage areas should be configured and maintained so as not to allow contact with runoff. Compost may be donated to greenhouses, nurseries, and botanical parks. Topsoil companies and composting centers may also accept composted manure.
- Line waste pits or trenches with an impermeable layer, such as thick plastic sheeting.
- When possible, allow wash water to infiltrate into the ground, or collect in an area that is routed to the sanitary sewer.
- Confine livestock in fenced in areas except during exercise and grazing times. Restrict animal access to creeks and streams, preferably by fencing.

For additional information contact:
County of Orange, OC **Watershed**
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

- Install gutters that will divert roof runoff away from livestock areas.

Recommended Activities

- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.
- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.
- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.
- Maintain healthy and vigorous pastures with at least three inches of leafy material.
- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.
- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant form nearby creeks or storm drains.

For additional information contact:
County of Orange, OC **Watershed**
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-7
HOUSEHOLD HAZARDOUS WASTE

Household hazardous wastes (HHW) are defined as waste materials which are typically found in homes or similar sources, which exhibit characteristics such as: corrosivity, ignitability, reactivity, and/or toxicity, or are listed as hazardous materials by EPA.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	
Nutrients	
Bacteria	
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

List of most common HHW products:

- Drain openers
- Oven cleaners
- Wood and metal cleaners and polishes
- Automotive oil and fuel additives
- Grease and rust solvents
- Carburetor and fuel injection cleaners
- Starter fluids
- Batteries
- Paint Thinners
- Paint strippers and removers
- Adhesives
- Herbicides
- Pesticides
- Fungicides/wood preservatives

Many types of waste can be recycled, however options for each waste type are limited. Recycling is always preferable to disposal of unwanted materials. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should be disposed of at a properly permitted landfill.

Think before disposing of any household hazardous waste. Remember - The ocean starts at your front door.

RECYCLE USED OIL

Required Activities

- Dispose of HHW at a local collection facility. Call (714) 834-6752 for the household hazardous waste center closest to your area.
- Household hazardous materials must be stored indoors or under cover, and in closed and labeled containers.
- If safe, contain, clean up, and properly dispose all household hazardous waste spills. If an unsafe condition exists, call 911 to activate the proper response team.

Recommended Activities

- Use non-hazardous or less-hazardous products.
- Participate in HHW reuse and recycling. Call (714) 834-6752 for the participating household hazardous waste centers.

The California Integrated Waste Management Board has a Recycling Hotline (800) 553-2962, that provides information and recycling locations for used oil.

For additional information contact:
County of Orange, OC **Watershed**
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

R-8
WATER CONSERVATION

Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

The activities outlined in this fact sheet target the following pollutants:	
Sediment	x
Nutrients	x
Bacteria	x
Foaming Agents	x
Metals	x
Hydrocarbons	x
Hazardous Materials	x
Pesticides and Herbicides	x
Other	x

Hosing off outside areas to wash them down not only consumes large quantities of water, but also transports any pollutants, sediments, and waste to the storm drain system. The pollution prevention activities outlined in this fact sheets are used to prevent the discharge of pollutants to the storm drain system.

Think before using water. Remember - The ocean starts at your front door.

Required Activities

- Irrigation systems must be properly adjusted to reflect seasonal water needs.
- Do not hose off outside surfaces to clean, sweep with a broom instead.

Recommended Activities

- Fix any leaking faucets and eliminate unnecessary water sources.
- Use xeroscaping and drought tolerant landscaping to reduce the watering needs.
- Do not over watering lawns or gardens. Over watering wastes water and promotes diseases.
- Use a bucket to re-soak sponges/rags while washing automobiles and other items outdoors. Use hose only for rinsing.
- Wash automobiles at a commercial car wash employing water recycling.

For additional information contact:
County of Orange, OC **Watershed**
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com

FP-2

LANDSCAPE MAINTENANCE

The model procedures described below focus on minimizing the discharge of pesticides and fertilizers, landscape waste, trash, debris, and other pollutants to the storm drain system and receiving waters. Landscape maintenance practices may involve one or more of the following activities:

1. **Mowing, Trimming/Weeding, and Planting**
2. **Irrigation**
3. **Fertilizer and Pesticide Management**
4. **Managing Landscape Waste**
5. **Erosion Control**

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for landscape maintenance include:

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools. Refer to Appendix D, Fertilizer and Pesticide Management Guidance for further details.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) will preserve the landscapes water efficiency.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Mowing, Trimming/Weeding, and Planting

Mowing, Trimming/Weeding

✓ Whenever possible, use mechanical methods of vegetation removal rather than applying herbicides. Use hand weeding where practical.

- ✓ When conducting mechanical or manual weed control, avoid loosening the soil, which could erode into streams or storm drains.
- ✓ Use coarse textured mulches or geotextiles to suppress weed growth and reduce the use of herbicides.
- ✓ Do not blow or rake leaves, etc. into the street or place yard waste in gutters or on dirt shoulders. Sweep up any leaves, litter or residue in gutters or on street.
- ✓ Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this procedure sheet).
- ✓ Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

Planting

- ✓ Where feasible, retain and/or plant selected native vegetation whose features are determined to be beneficial. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting ornamental vegetation.
- ✓ When planting or replanting consider using low water use groundcovers.

OPTIONAL:

- Careful soil mixing and layering techniques using a topsoil mix or composted organic material can be used as an effective measure to reduce herbicide use and watering.

2. Irrigation

- ✓ Utilize water delivery rates that do not exceed the infiltration rate of the soil.
- ✓ Use timers appropriately or a drip system to prevent runoff and then only irrigate as much as is needed.
- ✓ Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- ✓ Where practical, use automatic timers to minimize runoff.
- ✓ Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- ✓ If re-claimed water is used for irrigation, ensure that there is no runoff from the landscaped area(s).
- ✓ If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.

3. Fertilizer and Pesticide Management

Usage

- ✓ Utilize a comprehensive management system that incorporates integrated pest management techniques.
- ✓ Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- ✓ Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution.
- ✓ Pesticide application must be under the supervision of a California qualified pesticide applicator.
- ✓ When applicable use the least toxic pesticides that will do the job. Avoid use of copper-based pesticides if possible.
- ✓ Do not mix or prepare pesticides or fertilizers for application near storm drains.
- ✓ Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- ✓ Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- ✓ Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- ✓ Periodically test soils for determining proper fertilizer use.
- ✓ Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- ✓ Inspect pesticide/fertilizer equipment and transportation vehicles daily.
- ✓ Refer to Appendix D for further guidance on Fertilizer and Pesticide management

OPTIONAL:

- Work fertilizers into the soil rather than dumping or broadcasting them onto the surface.
- Use beneficial insects where possible to control pests (green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seedhead weevils, and spiders prey on detrimental pest species).
- Use slow release fertilizers whenever possible to minimize leaching.

Scheduling

- ✓ Do not use pesticides if rain is expected within 24 hours.
- ✓ Apply pesticides only when wind speeds are low (less than 5 mph).

Disposal

- ✓ Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- ✓ Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- ✓ Dispose of empty pesticide containers according to the instructions on the container label.

4. Managing Landscape Waste

- ✓ Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

Also see Waste Handling and Disposal procedure sheet

- ✓ Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- ✓ Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.
- ✓ Inspection of drainage facilities should be conducted to detect illegal dumping of clippings/cuttings in or near these facilities. Materials found should be picked up and properly disposed of.
- ✓ Landscape wastes in and around storm drain inlets should be avoided by either using bagging equipment or by manually picking up the material.

5. Erosion Control

- ✓ Maintain vegetative cover on medians and embankments to prevent soil erosion. Apply mulch or leave clippings to serve as additional cover for soil stabilization and to reduce the velocity of storm water runoff.

Also see Waste Handling and Disposal procedure sheet

- ✓ Minimize the use of disking as a means of vegetation management because the practice may result in erodable barren soil.
- ✓ Confine excavated materials to pervious surfaces away from storm drain inlets, sidewalks, pavement, and ditches. Material must be covered if rain is expected.

LIMITATIONS:

Alternative pest/weed controls may not be available, suitable, or effective in every case.

FP-6

WATER AND SEWER UTILITY OPERATION AND MAINTENANCE

Although the operation and maintenance of public utilities are not considered themselves a chronic source of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Activities associated with the operation and maintenance of water and sewer utilities to prevent and handle such incidents include the following:

1. **Water Line Maintenance**
2. **Sanitary Sewer Maintenance**
3. **Spill/Leak/Overflow Control, Response, and Containment**

Cities that do not provide maintenance of water and sewer utilities should coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for water and sewer utility operation and maintenance include:

- Inspect potential non-storm water discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. Water Line Maintenance

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main breaks, sheared fire hydrants, equipment malfunction, and operator error.

Planned Discharges

✓ For planned discharges use one of the following options:

- Reuse water for dust suppression, irrigation, or construction compaction
- Discharge to the sanitary sewer system with approval
- Discharge to the storm drain system or to a creek using applicable pollution control measures listed below (this option is ONLY applicable to uncontaminated pumped ground water, water line flushing, fire hydrant testing and flushing, discharges from potable water sources other than water main breaks) and may require a permit from the Regional Water Quality Control Board.

✓ If water is discharged to a storm drain inlet (catch basin), control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain inlet protection options include:

- Silt fence – appropriate where the inlet drains a relatively flat area.
- Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
- Wooden weir and fabric – use at curb inlets where a compact installation is desired.

✓ Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

✓ Select appropriate pollution control measure(s) considering the receiving system (i.e. curb inlet, drop inlet, culvert, creek, etc.) and ensure that the control device(s) fit properly.

✓ General design considerations for inlet protection devices include the following:

- The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
- Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.

✓ The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made as needed.

OPTIONAL:

- Sediment removal may be enhanced by placing filter fabric, gravel bags, etc. at storm drain inlets.

Unplanned Discharges

✓ Stop the discharge as quickly as possible by turning off water source.

✓ Inspect flow path of the discharged water:

- Control erosion along the flow path.
- Identify areas that may produce significant sediment or gullies, use sandbags to redirect the flow.
- Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions

✓ If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path and ensure that no additional discharged water enters storm drain inlets.

2. Sanitary Sewer Maintenance

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by the Permittee. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

Sewer System Cleaning

- ✓ Sewer lines should be cleaned on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.
- ✓ Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified
- ✓ Cleaning activities may require removal of tree roots and other identified obstructions.

Preventative and Corrective Maintenance

- ✓ During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:
  - cracked/deteriorating pipes
  - leaking joints/seals at manhole
  - frequent line plugs
  - line generally flows at or near capacity
  - suspected infiltration or exfiltration
- ✓ Document suggestions and requests for repair and report the information to the appropriate manager or supervisor.
- ✓ Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.
- ✓ Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

3. Spill/Leak/Overflow Control, Response, and Containment

Control

Also see Drainage System procedures sheet

- ✓ Refer to countywide *Illicit Discharge Detection and Elimination Program.* Components of this program include:
  - Investigation/inspection and follow-up
  - Elimination of illicit discharges and connections
  - Enforcement of ordinances
  - Respond to sewage spills

- Facilitate public reporting of illicit discharges and connections. A citizen's hotline for reporting observed overflow conditions should be established to supplement the field screening efforts being conducted by the Principal Permittee.

Response and Containment

- ✓ Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.
- ✓ When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system to the maximum extent practicable by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.).
- ✓ If a spill reaches the storm drain notify County of Orange Health Care Agency through Control One at (714) 628-7208.
- ✓ Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- ✓ Record required information at the spill site.
- ✓ Perform field tests as necessary to determine the source of the spill.
- ✓ Develop additional notification procedures regarding spill reporting as needed.

LIMITATIONS:

Private property access rights needed to perform testing along storm drain right-of-ways. Requirements of municipal ordinance authority for suspected source verification testing necessary for guaranteed rights of entry.

REFERENCES:

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. Water Utility Pollution Prevention Plan.

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.

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 –

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.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

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

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

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.

Outdoor Material Storage Areas SD-34

Design Objectives

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

Description

Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach

Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications

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

Design Considerations

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design requirements

requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

Designing New Installations

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.
- The storage area should be paved and sufficiently impervious to contain leaks and spills.
- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.
- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

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.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

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.

BG-40 Landscape Maintenance

Photo Credit: Geoff Brosseau

Description

This category includes businesses that provide landscaping and landscape maintenance/gardening services.

Pollutant Sources

The following are sources of pollutants:

- Selecting plants or landscape design,
- Installing new landscaping,
- Maintaining landscapes,
- Using pesticides and fertilizers, and
- Using gas-powered equipment.

Pollutants can include:

- Nutrients (fertilizers, yard wastes),
- Pesticides,
- Heavy metals (copper, lead, and zinc),
- Hydrocarbons (fuels, oils and grease), and
- Sediments.

Approach

Minimize the potential for stormwater pollution and the need for resources/controls (water, pesticides, fertilizers) by creating and maintaining landscapes in a way that is compatible with the local soils, climate, and amount of rain and sun. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program.

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BG-40 Landscape Maintenance

Provide employee education materials in the first language of employees, as necessary.

Source Control BMPs

The best management practices are listed by activity or area.

Landscape Design	☐ Specify native, low maintenance, and insectary (attract beneficial insects) plants and landscape designs. ☐ Design zoned, water-efficient irrigation systems using technologies such drip irrigation, soaker hoses, or microspray systems. Landscape design should be consistent with the local Water Efficient Landscape Ordinance. See the following website for a list of local ordinances: ftp://ftp.water.ca.gov/Model-Water-Efficient-Landscape-Ordinance/Local-Ordinances/ ☐ Do not landscape riparian areas, except to remove non-native plants and replace them with native riparian landscaping. ☐ Replant with native species where possible when landscaping or building an ornamental pond. Do not assume something is native because you have seen it in your area. Contact the local nursery for information or visit the California Exotic Pest Plant Council website (www.caleppc.org).
Landscape Installation	☐ Protect stockpiles and landscaping materials from wind and rain by storing them under tarps or secured plastic sheeting. ☐ Schedule grading and excavation projects during dry weather. ☐ Divert runoff from exposed soils or lower its velocity by leveling and terracing. ☐ Use temporary check dams or ditches to divert runoff away from storm drains. ☐ Protect storm drains with sandbags or other sediment controls. ☐ Revegetation is an excellent form of erosion control for any site. Keep soils covered with vegetation or temporary cover material (mulch) to control erosion. ☐ Check plant roots before buying a plant. Do not buy plants with roots are that kinked or circling around the container. Do not buy plants with soft, rotten, or deformed root crowns. ☐ Do not pile soil around the plant any higher than the root crown.
Landscape Maintenance	Yard Waste ☐ Allow leaf drop to become part of the mulch layer in tree, shrub, and groundcover areas. ☐ Keep lawn mower blades sharp, and grasscycle.

- Grasscycle – leave grass clippings on the lawn when mowing. Once cut, grass clippings first dehydrate, and then decompose, quickly disappearing from view. Proper mowing is required for successful grasscycling. Cut grass when the surface is dry, and keep mower blades sharp. Follow the "1/3 Rule": mow the lawn often enough so that no more than 1/3 of the length of the grass blade is cut in any one mowing. Frequent mowing will produce short clippings that will not cover up the grass surface. The lawn may have to be cut every seven days when the lawn is growing fast but only every 7 to 14 days when the lawn is growing slowly.
- Do not leave clippings on pavement or sidewalks where they can wash off into the street, gutter, or storm drain.
- Collect lawn and garden clippings, pruning waste, and tree trimmings. Chip if necessary, and compost or take to the local municipal yard waste recycling/composting facility.
- In communities with curbside pick-up of yard waste, place clippings and pruning waste at the curb in approved bags or containers. No curbside pickup of yard waste is available for commercial properties.
- Do not blow or rake leaves or other yard waste into the street, or place yard waste in gutters or on dirt shoulders, unless it is being piled up for recycling (allowed by some municipalities). After pick-up, sweep up any leaves, litter, or residue in gutters or on street.

Fertilizing and Pruning

- Perform soil analysis seasonally to determine actual fertilization need and application rates.
- Fertilize garden areas with a mulch of leaves, bark, or composted manure and/or garden waste.
- Apply chemical fertilizer only as needed, when plants can best use it, and when the potential for it being carried away by runoff is low. Make sure the fertilizer spreader is calibrated.
- Prune plants sparingly, if at all. A healthy plant – one that is native to the area and growing under the right conditions – should not need pruning, except when it is not in the right location (where safety or liability is a concern).

Watering

- Use soil probes to determine soil moisture depth, overall moisture levels, and the need to adjust irrigation schedules.
- Check sprinklers regularly. Adjust as needed to minimize or eliminate overspray onto impervious surfaces. Replace broken sprinklers or lines.

Pest and Weed Control

- ☐ Obtain appropriate licenses for pest control and pesticides. Contact the Department of Pesticide Regulation for more information.
- ☐ Become trained in and offer customers less-toxic pest control or Integrated Pest Management (IPM).
- ☐ The label on a pesticide container is a legal document. Use a pesticide only as instructed on the label.
- ☐ Store pesticides, fertilizers, and other chemicals indoors or in a shed or storage cabinet.
- ☐ Use pesticides sparingly, according to instructions on the label. Rinse empty containers, and use rinsewater as product.
- ☐ Dispose of rinsed, empty containers in the trash. Dispose of unused pesticides as hazardous waste.
- ☐ To control weeds, use drip irrigation and mulch. Hand-pull weeds including roots or cut down to ground. Repeat cutting before they flower, grow new leaves, or go to seed. Use herbicides containing pelargonic acid or herbicidal soap as a last resort.

Handling Gasoline

- ☐ Use only containers approved by a nationally recognized testing lab, such as Underwriters Laboratories (UL). Keep the container tightly sealed. Containers should be fitted with a spout to allow pouring without spilling and to minimize the generation of vapors.
- ☐ Fill cautiously. Always use a funnel and/or spout to prevent spilling or splashing when fueling power mowers, blowers, and all other gas-powered equipment.
- ☐ Avoid spilling gasoline on the ground, especially near wells. If a spill occurs use kitty litter, saw dust, or an absorbent towel to soak up the spill, then dispose of it properly.
- ☐ Store carefully. Gasoline moves quickly through soil and into groundwater, therefore, store and use gasoline and fuel equipment as far away from your drinking water well as possible. Be certain to keep a closed cap on the gasoline container. Store at ground level, not on a shelf to minimize the danger of falling and spilling.
- ☐ Do not dispose of gasoline down the drain, into surface water, onto the ground, or in the trash. Contact the local municipality for directions on proper disposal of excess or old gasoline. Transport old gas in an approved gasoline container.

Working Near Waterbodies

- ☐ Do not dump lawn clippings, other yard waste, or soil along creek banks or in creeks.

	☐ Do not store stockpiles of materials (soil, mulch) along creek banks. These piles can erode over time into a creek. ☐ Do not spray pesticides or fertilizers by creeks. ☐ Do not over water near streams. The excess water may carry pesticides, fertilizers, sediments, and anything else in its path directly into the creek.

Treatment Control BMPs

Not applicable.

More Information

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BG-30 Food Service Facilities

Photo Credit: Geoff Brosseau

Description

This category includes:

- Restaurants
- Food truck commissaries
- Institutional cafeterias
- Grocery stores, bakeries, and delicatessens
- Any facility requiring a Health Department permit for food preparation

Pollutant Sources

The following are sources of pollutants:

- Cleaning of equipment
- Grease handling and disposal
- Spills
- Surface cleaning
- Cooling and refrigeration equipment maintenance
- Landscaping and grounds maintenance
- Dumpster and loading dock area
- Parking lots
- Illicit connections to storm drain system

Pollutants can include:

- Organic materials (food wastes)

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- Oil and grease
- Toxic chemicals in cleaning products, disinfectants, and pesticides

Approach

Minimize exposure of rain and runoff to outdoor cleaning and storage areas by using cover and containment. In and around these areas, use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program. Provide employee education materials in the first language of employees.

Source Control BMPs

The best management practices are listed by activity or area in the following table.

Dumpster and Loading Dock Areas	☐ Store and transfer all solid and liquid wastes, such as tallow, in watertight covered containers. ☐ Keep litter from accumulating around loading docks by providing trash receptacles and encouraging employees to use them. ☐ Bag and seal food waste before putting it in the dumpster. Do not place uncontained liquids, or leaking containers or garbage bags into a dumpster. ☐ Keep dumpster lids closed to keep out rainwater and to prevent trash from spilling out. ☐ If the dumpster regularly overflows, get a bigger one or arrange for more frequent collection. If the dumpster is shared with other tenants, speak with the property/lease manager about scheduling more frequent trash pickups or a larger dumpster. ☐ Don't hose out dumpsters. Apply absorbent over any fluids spilled in dumpster. Absorbent will usually be knocked out when the dumpster is emptied. ☐ Have the dumpster leasing company repair or replace leaky dumpsters and compactors, and have them clean out dirty dumpsters. ☐ Install a spill cleanup kit near the dumpster and loading dock areas. ☐ Post employee reminder signs such as "Keep lid closed" near tallow bins and dumpsters. ☐ Consider enclosing the dumpster in a roofed and bermed area to prevent exposure to rainwater, and draining the area to the sanitary sewer. Contact the local wastewater treatment plant or the county environmental health department for guidance. ☐ Keep dumpsters or the dumpster enclosure locked to prevent illegal dumping. ☐ For more information on cleaning dumpster areas see the Mobile Cleaning - Food Service Business-related business guide sheet in this series.

BG-30 Food Service Facilities

Equipment and Outdoor Cleaning	☐ Make sure all discharges from cooling equipment go to the sanitary sewer and not the street, gutter, or storm drain. ☐ Clean floor mats, filters, and garbage cans in a mop sink, floor drain, or proper outside area connected to the sanitary sewer with an oil and water separator. Don't wash them in a parking lot, alley, sidewalk, or street. ☐ Consider installing anti-slip floors when you remodel. ☐ Consider cleaning filters in the dishwasher. Contact the local wastewater treatment plant or the county environmental health department for guidance. ☐ Pour wash water into a janitorial or mop sink. Don't pour it out onto a parking lot, alley, sidewalk, or street. ☐ For outdoor cleaning, have employees or contractors follow the instructions in the following business guide sheet in this series: ✓ Mobile Cleaning - Food Service Business-related ✓ Mobile Cleaning – Surface cleaning ☐ For more information in general on cleaning floor mats, equipment, exhaust filters, and outdoor surfaces see the Mobile Cleaning - Food Service Business-related business guide sheet in this series.
Spill Cleanup	☐ Prepare a spill cleanup plan that includes: ✓ Procedures for different types of spills ✓ Schedule for initial and annual training of employees ✓ Cleanup kits in well-marked, accessible areas ✓ Designation of key employee who monitors cleanup ✓ Posting the plan in the work area ☐ If a spill occurs, immediately stop the spill at its source. ☐ Keep the spill from entering the street, gutter, or storm drain. ☐ Use dry methods for spill cleanup (sweeping, cat litter, etc.). Don't hose down spills. ☐ If wet cleaning (including high-temperature or high pressure washing) is required, dry clean first and then mop (or if it is absolutely necessary, wash) and collect the water. Dispose of water in sink or other indoor drain, not in the street, gutter, or storm drain. ☐ If a final rinse is necessary for health reasons, collect the rinsewater and dispose it to the sink or indoor floor drain. If outdoors, block the storm drain before applying water. Mop up or wet-vacuum water, and dispose it to a sink or indoor drain. ☐ Do not use bleach or disinfectants if there is a possibility that rinsewater could flow to a street, gutter, or storm drain.

	☐ For more information on cleaning outdoor surfaces see the Mobile Cleaning - Surface Cleaning business guide sheet in this series.
Recycling and Disposal	☐ Separate wastes. Keep your recyclable wastes in separate containers according to the type of material. They are easier to recycle if separated. ☐ Recycle the following materials: ✓ Food waste (non-greasy, non-animal food waste can be composted). Donate leftover, edible food whenever possible to local food banks. ✓ Paper and cardboard ✓ Container glass, aluminum, and tin ✓ Pallets and drums ☐ Dispose of toxic waste properly. Toxic waste includes used cleaners, and rags (soaked with solvents, floor cleaners, and detergents).
Grease Handling and Disposal	☐ Never pour oil, grease, or large quantities of oily liquids such as sauces or salad dressings or waste grease down a sink, floor drain, storm drain, or into a dumpster. ☐ Install screens and solid traps in sink and floor drains to catch larger solids. Clean these screens and traps frequently. ☐ Don't try to "dissolve" grease by adding hot water or emulsifying chemicals – it will only move the grease further down the building's sewer line and make it harder to remove later. ☐ Recycle grease and oil. Don't pour it into sinks, floor drains, or onto a parking lot or street. Look in the phone book for "Renderers" or call the local recycling or household hazardous waste information line. ☐ Use tallow bins or sealed containers with tamper-proof lids. Keep the exterior of the container clean. Check for leaks. Ask the recycler for a leak-free tallow bin and replace any leaky grease containers. If grease is stored outside, keep it under a roof, if possible. ☐ Do not contaminate the recyclable oils and grease in the tallow bin with the waste grease from the grease trap or grease interceptor. ☐ Inspect and clean all waste grease removal devices (grease trap or grease interceptor) often enough to keep them functioning properly and efficiently. ☐ For disposal of waste grease from the grease trap or grease interceptor, see "Grease Traps" or "Septic Tanks" in the phone book.

BG-30 Food Service Facilities

Land-scaping and Grounds Mainte-nance	☐ Never dispose of leftover pesticides in the gutter, street, or storm drain. Leftover pesticides must be either used up or disposed of as hazardous waste. ☐ Do not blow or rake leaves, grass, or garden clippings into the street, gutter, or storm drain. ☐ If pesticides are used, do not over apply or apply when rain is forecast. ☐ Do not use copper-based algaecides in pools or fountains. Control algae with chlorine or other alternatives to copper-based products.
Pest Control	Food Sources ☐ Keep the kitchen free of food scraps. ☐ Take out garbage each night in a closed container. ☐ Refrigerate all food or store in pest-proof containers each night. ☐ Keep ventilation system working properly to keep greasy residue off walls. Appliances ☐ Keep dishwasher area clean. Check the trap nightly. ☐ Where possible, elevate appliances at least 6 inches off the floor. ☐ Clean under appliances nightly. ☐ Steam clean or wash appliances weekly. ☐ Remember to clean under the counter, under the sink, and the refrigerator vent. Drains and Trash Cans ☐ Steam clean or scrub floor drains with a brush to help eliminate fruit flies. ☐ Keep dumpster area clean – inside and out. ☐ Wash garbage cans regularly. Supplies and Entry Points ☐ Check for pests before bringing supplies in to the kitchen. Roaches like corrugated boxes. ☐ Don't store boxes in the kitchen – take boxes away or store in a refrigerated area. ☐ Seal any gaps below doors. Reduce Habitat ☐ Inspect the entire establishment – inside and out. ☐ Suggest physical modifications that may help to eliminate pest behavior.

	☐ Suggest changes in food storage or cleanup practices to eliminate food sources for pests. ☐ Place boric acid powder in wall voids. ☐ Seal cracks and crevices. Monitor for Pests ☐ Use sticky traps to monitor how well the pest control program is working. Pests caught in the traps warn of a possible problem. ☐ When hiring a pest control service, look for a company that provides Integrated Pest Management (IPM) services. Use Baits First ☐ Use baits for controlling pests. Remove bait when pests are gone, or else the bait may attract more pests. ☐ Use chemicals only as a last resort. If absolutely necessary, choose less-toxic chemicals, and ask the pest service to provide label information. ☐ Apply pesticides only if necessary, not on a regular schedule. Follow label directions. Do not apply pesticides around floor drains, sinks, or food. Purchasing ☐ Use non-disposable products. Serve food on ceramic dishware rather than paper, plastic or Styrofoam, and use cloth napkins rather than paper ones. If you must use disposable products, use paper instead of Styrofoam. ☐ Buy the least toxic products available: ✓ Look for "non-toxic," "non-petroleum based," "free of ammonia, phosphates, dye, or perfume," or "readily biodegradable" on the label. Don't assume biodegradable products are safe. Biodegradable means the product will eventually break down, but it may harm the environment in the meantime. ✓ Avoid chlorinated compounds, petroleum distillates, phenols, formaldehyde, and caustic or acidic products. ✓ Use water-based products. ✓ Look for and purchase "recycled" and "recyclable" containers. By doing so, you help ensure a use for the recyclable materials that people collect and recycle.
Education and Training	☐ Employees can help prevent pollution when urban runoff training is included in employee orientations and reviews. ☐ Train all employees upon hiring and annually thereafter. ☐ Use a training log to document employee training.

	☐ Post information about or labels for BMPs where employees and customers can see them. ☐ Remember the facility is liable for the behavior of contractors. Be sure all contractors hired to clean inside or outside are aware of and implement these BMPs. ☐ Explain BMPs to other food businesses through your business associations or chambers of commerce.

Treatment Control BMPs

If treatment controls are installed at the facility, see Section 4 of this Handbook for information on inspecting and maintaining the BMPs.

For information on designing treatment controls, see Section 5 of the Development and Redevelopment Handbook.

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Drain Inserts MP-52

Description

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

California Experience

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

Advantages

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

Limitations

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

Design and Sizing Guidelines

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

Design Considerations

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

Targeted Constituents

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

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

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

Construction/Inspection Considerations

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

Performance

Few products have performance data collected under field conditions.

Siting Criteria

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

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

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

Cost

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

References and Sources of Additional Information

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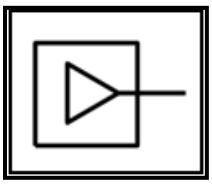
Outlet Protection/Velocity Dissipation Devices

SS-10



Standard Symbol

Definition and Purpose

These devices are placed at pipe outlets to prevent scour and reduce the velocity and/or energy of stormwater flows.

Appropriate Applications

These devices may be used at the following locations:

- Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels.
- Outlets located at the bottom of mild to steep slopes.
- Discharge outlets that carry continuous flows of water.
- Outlets subject to short, intense flows of water, such as flash floods.
- Points where lined conveyances discharge to unlined conveyances.

Limitations

Loose rock may have stones washed away during high flows.

Grouted rock slope protection may break up in areas of freeze and thaw.

If there is not adequate drainage, and water builds up behind grouted rock slope protection, it may cause the grouted rock slope protection to break up due to the resulting hydrostatic pressure.

Outlet protection may negatively impact the channel habitat.

Outlet Protection/Velocity Dissipation Devices

SS-10

Standards and Specifications

There are many types of energy dissipaters; a flared end section and rock slope protection is shown in the figure on the previous page. Please note that this is only one example and the RE may approve other types of devices proposed by the contractor.

Flared end sections must comply with Standard Specification 70-5.02.

Rock slope protection must comply with Standard Specification Section 72.

Install rock slope protection, grouted rock slope protection, or concrete apron at selected outlet. Rock slope protection aprons are best suited for temporary use during construction.

Carefully place rock slope protection to avoid damaging the filter fabric.

For proper operation of apron:

- Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, consider placing it in upper section of apron.
- If size of apron rock slope protection is large, consider protecting underlying filter fabric with a gravel blanket.

Outlets on slopes steeper than 10% should have additional protection.

Maintenance and Inspection

At a minimum, perform inspections weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

Minimize areas of standing water by removing sediment blockages and filling scour depressions. If persistent, it might be necessary to have licensed professional re-evaluate size and type of device implemented.

Inspect apron for displacement of the rock slope protection and/or damage to the underlying fabric. Repair fabric and replace rock slope protection that has washed away.

Inspect for scour beneath the rock slope protection and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

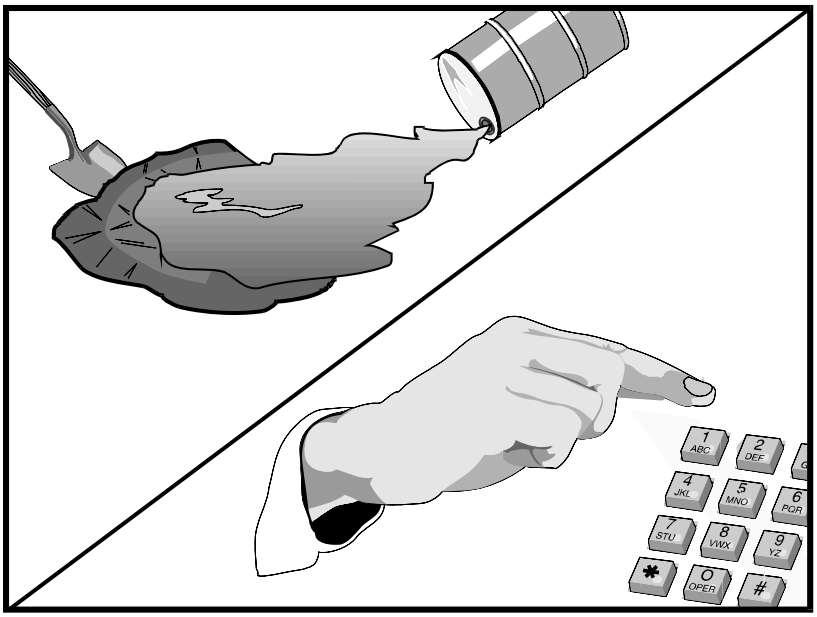
Outlet Protection/Velocity Dissipation Devices

SS-10

SWPPP or WPCP

Outlet Protection/Velocity Dissipation Devices must be discussed in Section 500.3.2 of SWPPP or Section 30.2 of the WPCP.

Spill Prevention and Control WM-4



Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

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

Potential Alternatives

None

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

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Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

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

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Infiltration Basin TC-11

Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Targeted Constituents

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

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins use the natural filtering ability of the soil to remove pollutants in stormwater runoff. Infiltration facilities store runoff until it gradually exfiltrates through the soil and eventually into the water table. This practice has high pollutant removal efficiency and can also help recharge groundwater, thus helping to maintain low flows in stream systems. Infiltration basins can be challenging to apply on many sites, however, because of soils requirements. In addition, some studies have shown relatively high failure rates compared with other management practices.

California Experience

Infiltration basins have a long history of use in California, especially in the Central Valley. Basins located in Fresno were among those initially evaluated in the National Urban Runoff Program and were found to be effective at reducing the volume of runoff, while posing little long-term threat to groundwater quality (EPA, 1983; Schroeder, 1995). Proper siting of these devices is crucial as underscored by the experience of Caltrans in siting two basins in Southern California. The basin with marginal separation from groundwater and soil permeability failed immediately and could never be rehabilitated.

Advantages

- Provides 100% reduction in the load discharged to surface waters.
- The principal benefit of infiltration basins is the approximation of pre-development hydrology during which a

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

significant portion of the average annual rainfall runoff is infiltrated and evaporated rather than flushed directly to creeks.

- If the water quality volume is adequately sized, infiltration basins can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

Limitations

- May not be appropriate for industrial sites or locations where spills may occur.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration basins once clogged.

Design and Sizing Guidelines

- Water quality volume determined by local requirements or sized so that 85% of the annual runoff volume is captured.
- Basin sized so that the entire water quality volume is infiltrated within 48 hours.
- Vegetation establishment on the basin floor may help reduce the clogging rate.

Construction/Inspection Considerations

- Before construction begins, stabilize the entire area draining to the facility. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction or remove the top 2 inches of soil after the site is stabililized. Stabilize the entire contributing drainage area, including the side slopes, before allowing any runoff to enter once construction is complete.
- Place excavated material such that it can not be washed back into the basin if a storm occurs during construction of the facility.
- Build the basin without driving heavy equipment over the infiltration surface. Any equipment driven on the surface should have extra-wide (“low pressure”) tires. Prior to any construction, rope off the infiltration area to stop entrance by unwanted equipment.
- After final grading, till the infiltration surface deeply.
- Use appropriate erosion control seed mix for the specific project and location.

Performance

As water migrates through porous soil and rock, pollutant attenuation mechanisms include precipitation, sorption, physical filtration, and bacterial degradation. If functioning properly, this approach is presumed to have high removal efficiencies for particulate pollutants and moderate removal of soluble pollutants. Actual pollutant removal in the subsurface would be expected to vary depending upon site-specific soil types. This technology eliminates discharge to surface waters except for the very largest storms; consequently, complete removal of all stormwater constituents can be assumed.

There remain some concerns about the potential for groundwater contamination despite the findings of the NURP and Nightingale (1975; 1987a,b,c; 1989). For instance, a report by Pitt et al. (1994) highlighted the potential for groundwater contamination from intentional and unintentional stormwater infiltration. That report recommends that infiltration facilities not be sited in areas where high concentrations are present or where there is a potential for spills of toxic material. Conversely, Schroeder (1995) reported that there was no evidence of groundwater impacts from an infiltration basin serving a large industrial catchment in Fresno, CA.

Siting Criteria

The key element in siting infiltration basins is identifying sites with appropriate soil and hydrogeologic properties, which is critical for long term performance. In one study conducted in Prince George's County, Maryland (Galli, 1992), all of the infiltration basins investigated clogged within 2 years. It is believed that these failures were for the most part due to allowing infiltration at sites with rates of less than 0.5 in/hr, basing siting on soil type rather than field infiltration tests, and poor construction practices that resulted in soil compaction of the basin invert.

A study of 23 infiltration basins in the Pacific Northwest showed better long-term performance in an area with highly permeable soils (Hilding, 1996). In this study, few of the infiltration basins had failed after 10 years. Consequently, the following guidelines for identifying appropriate soil and subsurface conditions should be rigorously adhered to.

- Determine soil type (consider RCS soil type ‘A, B or C’ only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30% clay or more than 40% of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.

- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.

- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15% should not be considered.

- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.

- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.

- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.

- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.

- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Additional Design Guidelines

(1) Basin Sizing - The required water quality volume is determined by local regulations or sufficient to capture 85% of the annual runoff.

(2) Provide pretreatment if sediment loading is a maintenance concern for the basin.

(3) Include energy dissipation in the inlet design for the basins. Avoid designs that include a permanent pool to reduce opportunity for standing water and associated vector problems.

(4) Basin invert area should be determined by the equation:

$$A = \frac{WQV}{kt}$$

where A = Basin invert area (m^2)

WQV = water quality volume (m^3)

k = 0.5 times the lowest field-measured hydraulic conductivity (m/hr)

t = drawdown time (48 hr)

(5) The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).

Maintenance

Regular maintenance is critical to the successful operation of infiltration basins. Recommended operation and maintenance guidelines include:

- Inspections and maintenance to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 72 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.
- Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time has been obtained.
- Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation.
- Remove accumulated trash and debris in the basin at the start and end of the wet season.
- Inspect for standing water at the end of the wet season.
- Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin.
- If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.
- To avoid reversing soil development, scarification or other disturbance should only be performed when there are actual signs of clogging, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a very light tractor.

Cost

Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. One study estimated the total construction cost at about $2 per ft (adjusted for inflation) of storage for a 0.25-acre basin (SWRPC, 1991). As with other BMPs, these published cost estimates may deviate greatly from what might be incurred at a specific site. For instance, Caltrans spent about $18/ft^3 for the two infiltration basins constructed in southern California, each of which had a water quality volume of about 0.34 ac.-ft. Much of the higher cost can be attributed to changes in the storm drain system necessary to route the runoff to the basin locations.

Infiltration basins typically consume about 2 to 3% of the site draining to them, which is relatively small. Additional space may be required for buffer, landscaping, access road, and fencing. Maintenance costs are estimated at 5 to 10% of construction costs.

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly maintained, infiltration basins have a high failure rate. Thus, it may be necessary to replace the basin with a different technology after a relatively short period of time.

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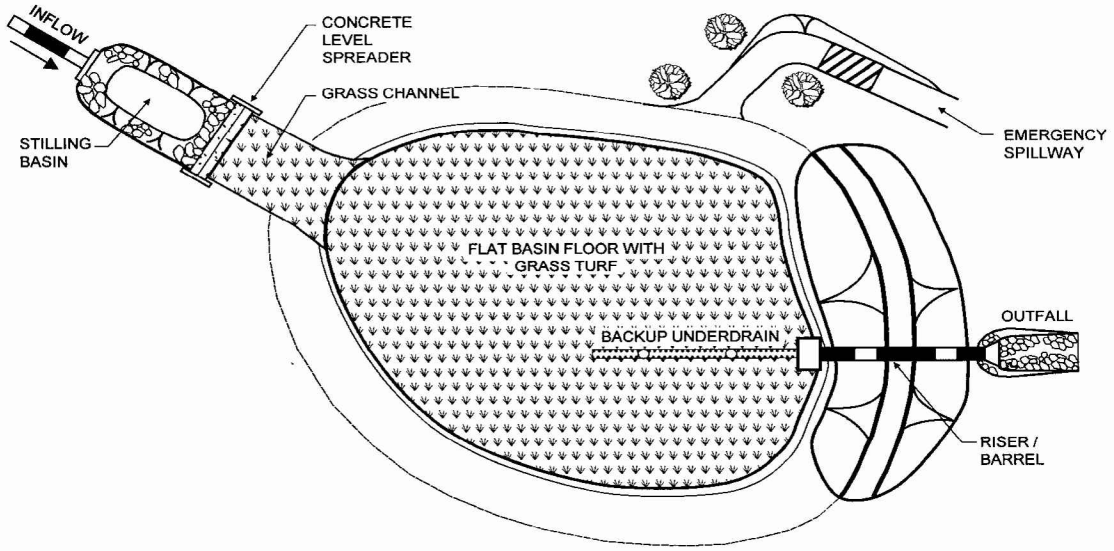
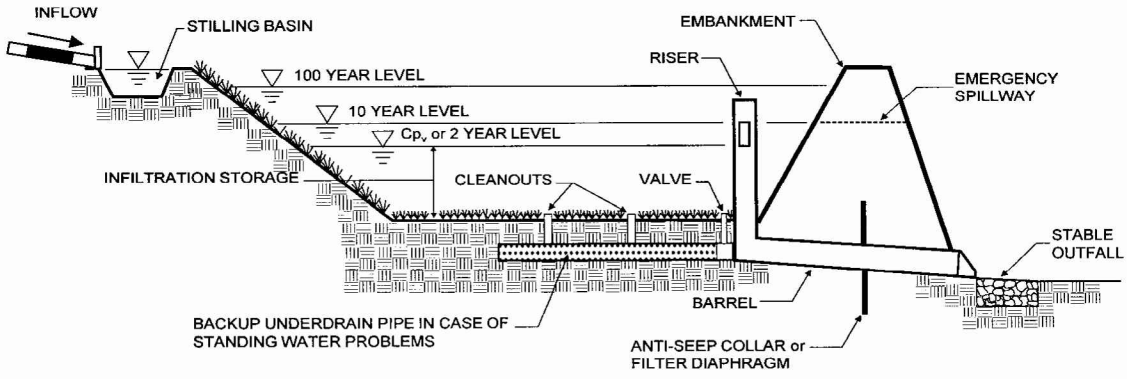


PLAN VIEW



PROFILE

Innovative stormwater management products

KRISTAR

FloGard®+PLUS

Catch Basin Insert Filter

FloGard®+PLUS Catch Basin Insert Filter

GENERAL FILTER CONFIGURATION

FloGard®+PLUS catch basin insert filter shall provide solids filtration through a filter screen or filter liner, and hydrocarbon capture shall be effected using a non-leaching absorbent material contained in a pouch or similar removable restraint. Hydrocarbon absorbent shall not be placed at an exposed location at the entry to the filter that would allow blinding by debris and sediment without provision for self-cleaning in operation.

Filter shall conform to the dimensions of the inlet in which it is applied, allow removal and replacement of all internal components, and allow complete inspection and cleaning in the field.

FLOW CAPACITY

Filter shall provide two internal high-flow bypass locations that in total exceed the inlet peak flow capacity. Filter shall provide filtered flow capacity in excess of the required "first flush" treatment flow. Unit shall not impede flow into or through the catch basin when properly sized and installed.

MATERIALS

Filter support frame shall be constructed of type 304 stainless steel. Filter screen, when used in place of filter liner, shall be type 304 or 316 stainless steel, with an apparent opening size of not less than 4 U.S. mesh. Filter liner, when used in place of filter screen, shall be woven polypropylene geotextile fabric liner with an apparent opening size (AOS) of not less than 40 U.S. mesh as determined by ASTM D 4751. Filter liner shall include a support basket of polypropylene geogrid with stainless steel cable reinforcement.

Filter frame shall be rated at a minimum 25-year service life. All other materials, with the exception of the hydrocarbon absorbent, shall have a rated service life in excess of 2 years.

FloGard®+PLUS TEST RESULTS SUMMARY

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

FEATURES

- Easy to install, inspect and maintain
- Can be retrofitted to existing drain catch basins – or used in new projects
- Economical and efficient
- Catches pollutants where they are easiest to catch (at the inlet)
- No standing water – minimizes vector, bacteria and odor problems
- Can be incorporated as part of a "Treatment Train"

BENEFITS

- Lower installation, inspection and maintenance costs
- Versatile installation applications
- Higher return on investment
- Allows for installation on small and confined sites
- Minimizes vector, bacteria and odor problems
- Allows user to target specific pollutants

Innovative stormwater management products

FloGard® +PLUS
Catch Basin Insert Filter

INSTALLATION AND MAINTENANCE
Filter shall be installed and maintained in accordance with manufacturer's general instructions and recommendations.

PERFORMANCE
Filter shall provide 80% removal of total suspended solids (TSS) from treated flow with a particle size distribution consistent with typical urban street deposited sediments. Filter shall capture at least 70% of oil and grease and 40% of total phosphorus (TP) associated with organic debris from treated flow. Unit shall provide for isolation of trapped pollutants, including debris, sediments, and floatable trash and hydrocarbons, from bypass flow such that re-suspension and loss of pollutants is minimized during peak flow events.

FloGard®+PLUS COMPETITIVE FEATURE COMPARISON

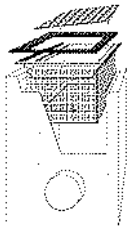
Evaluation of FloGard+PLUS Units (Based on flow-comparable units) (Scale 1-10, 10 being best)	**FloGard+PLUS**	**Other Insert Filter Types****
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity – Sludge and Oil	7	7
Service Life	10	3
Installation – Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	**10**	**2**

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

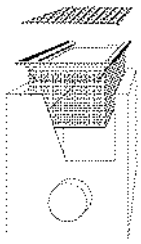
Long-Term Cost Comparison (Scale 1-10, 10 being lowest cost, higher number being best)	**FloGard+PLUS**	**Other Insert Filter Types**
Unit cost — initial ($/cfs treated)	10	4
Installation cost ($/cfs treated)	10	7
Adsorbent replacement (annual avg $/cfs treated)	10	2
Unit materials replacement (annual avg $/cfs treated)	10	10
Maintenance cost (annual avg $/cfs treated)	10	7
Total first yr ($/cfs treated)	10	5
Total Annual Avg ($/cfs treated, avg over 20 yrs)*	**10**	**5**

*assumes 3% annual inflation

Captured debris from FloGard+PLUS, Dana Point, CA



FloGard+PLUS Combination Inlet



FloGard+PLUS Flat Grate

FloGard+PLUS Round Gated Inlet

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Proposed Civic Center (Phase 1)
9535 Sheep Creek Road
Phelan, CA 92329
APN 3066-261-10, 3066-261-18 & 3066-251-14

Results of Two Infiltration Tests for a Proposed Infiltration Basin

For: Phelan Pinon Hills Community Services District
Prepared By: Merrell Johnson Geotechnical

April 19, 2023

George Cardenas
PPHCSD Engineering Manager
4176 Warbler Road
P.O. Box 294049
Phelan, CA 92329

Subject: Proposed Infiltration Basin | Proposed Civic Center (Phase 1) |9535 Sheep Creek Road, Phelan, CA | APN 3066-261-10, 3066-261-08, & 3066-251-14
M.J.G. Project No. 3103.007.500

Mr. Cardenas:

On April 17 and 18, 2023, Merrell Johnson Geotechnical's (MJG's) personnel performed two infiltration tests at the subject site. The infiltration rate of the soil was measured using the double-ring infiltrometer method, ASTM D3385-09.

The subject site's proposed development will include the construction of a Civic Center, future gymnasium, and associated site improvements. In conjunction with the new development, an infiltration basin will be constructed at the northeast corner of the neighboring future park site that bounds the east side of Civic Center site. The infiltration test was performed by MJG to provide the infiltration rate data needed to design the proposed infiltration basin. The infiltration test was performed within the limits of the proposed infiltration basin. The approximate locations of the project site, proposed development, infiltration basin, and infiltration test locations are shown on the attached Site Vicinity Map, Overall Site Plan, and Infiltration Basin Grading Plan (Sheet G-6), included with this report as Enclosures 1, 2, and 3 respectively. Enclosure 4 presents a photo of the infiltration test location.

SOIL CONDITIONS

The soil conditions encountered at the two infiltration test locations consisted of loose to medium dense silty sand with gravel (SM). The soil conditions are summarized in the following table.

Pit No.	Depth (inches)	Soil Description	Lab Test
P-1	0-7’	Brown silty sand with gravel (SM), loose to medium dense, dry	Sieve Analysis 5’-7’
P-2	0-7’	Brown silty sand with gravel (SM), loose to medium dense, dry	--

A bulk sample of the silty sand was obtained from P-1 between the depths of 5 to 7 feet. The sample was delivered to our laboratory for sieve analysis. The result of the sieve analysis is included with this report as Enclosure 5.

GROUNDWATER

A review of the California Department of Water Resources website indicates only three wells within a five-mile radius of the site. Two of the wells are listed as dry. The nearest water well that includes historic water depth data is located just south of Phelan Road, west of Coughlin Road about 4.7 miles northeast of the site. At this location the historic high groundwater level was recorded in 1917 at a depth of 869.5 feet below the ground surface. http://wdl.water.ca.gov/waterdatalibrary/

Based on our research of existing water well data in the vicinity of the project and our own exploratory borings drilled previously for the proposed 14-acre park site development, the depth to the historic high groundwater level is at least 100 feet below the project site’s existing ground surface.

INFILTRATION TESTS

Two test pits were excavated to a depth of approximately 7 feet below the existing ground surface within the limits of the proposed infiltration basin shown on the Infiltration Basin Grading Plan, Enclosure 3. The bottoms of the two 7-feet-deep test pits correspond to the planned infiltration basin bottom elevation of 4114. The soils exposed at the two test pit locations consisted of loose to medium dense silty sand with gravel (SM).

To prepare for the infiltration tests, MJC's personnel drove a 12-inch diameter by 20-inch-high inner-ring and 24-inch diameter by 20-inch-high outer-ring (annular space) into the ground 3 inches (7.6 cm) and 5 inches (12.7 cm), respectively. Both rings were carefully filled, using rubber splash guards, to a depth of 4 inches (10.16 cm) with tap water. Mariotte Tubes were used to maintain constant water levels of 4 inches (10.16 cm) and measure the flow readings during the testing. The volume of water used at intervals of 15 minutes was recorded for about five hours. Due to the relatively rapid infiltration rates measured, test intervals longer than 15 minutes were not possible using Mariotte Tubes. The volume measurements were converted into incremental infiltration rates. The infiltration test results indicated the silty sand with gravel (SM) soils encountered at the 4114 elevation in the two test pits exhibited the infiltration rates tabulated below. The infiltration test data is included with this report as Enclosure 4.

Test No.	Location	Infiltration Rate Inner Ring	Infiltration Rate Outer Ring
P-1	Proposed Infiltration Basin	8.4 in/hr. 21.3 cm/hr.	8.8 in/hr. 22.4cm/hr.
P-2	Proposed Infiltration Basin	8.3 in/hr. 21.1 cm/hr.	8.6 in/hr. 21.9 cm/hr.

The water pH was measured at 8.0; the ground temperature at a depth of 7 feet was 60 degrees F; the ambient air and testing water temperatures varied from 49 to 60 and 55 to 56 degrees F, respectively.

We appreciate this opportunity to be of service. Should you have any questions, please contact our office.

Sincerely,
Merrell Johnson Geotechnical

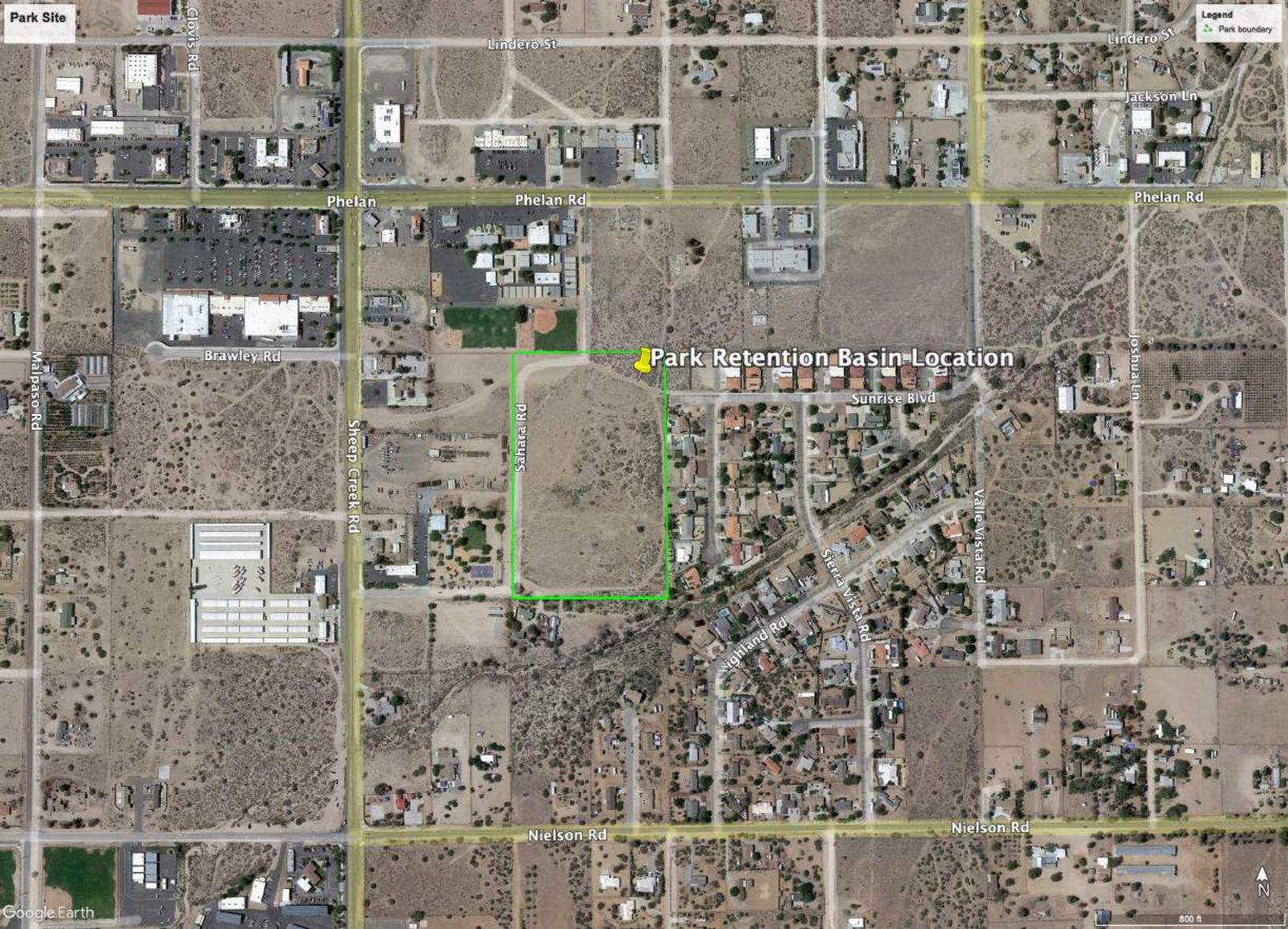
Brad Merrell, P.E.
President R.C.E. 49423

Enclosures: (1) Site Vicinity Map
(2) Overall Site Plan
(3) Infiltration Basin Grading Plan
(3) Photograph of Infiltration Test
(4) Infiltration Test Data
(5) Sieve Analysis Test Data

References:

A. Overall Site Plan (Page A-0.1), Steeno Design Studio, Inc., Job No. COM20-L01/01, May 2022.

B. Grading Plan (Sheet G-6), TRLS Engineering, Inc., Drawn Date 02/28/2023.


Park Site
Legend
Park boundary
Park Retention Basin Location
Clovis Rd
Lindero St
Lindero St
Jackson Ln
Phelan
Phelan Rd
Phelan Rd
Brawley Rd
Malpaso Rd
Sheep Creek Rd
Sahara Rd
Joshua Ln
Sunrise Blvd
Valle Vista Rd
Sierra Vista Rd
Highland Rd
Nielson Rd
Nielson Rd
N
Google Earth
800 ft

DRAWING FOR REFERENCE ONLY SEE CIVIL DRAWINGS FOR COMPLETE HYDROLOGY AND GRADING INFORMATION

PHASE I CIVIC CENTER BUILDING 14,034 SQ.FT.

PHASE II COMMUNITY CENTER/ GYMNASIUM 17,284 S.F.

RETENTION BASIN

APPROX. GRADING EXTENTS FOR 5 ACRE PROJECT

HATCH INDICATES PHASED 14 ACRE PARK SITE DEVELOPMENT PER SEPARATE SUBMITTAL

HATCH INDICATES PHASED 5 ACRE DEVELOPMENT PER THIS DRAWING SUBMITTAL

NORTH

SCALE = 1:40

0 20 40 80 120

OVERALL SITE PLAN
SCALE = 1:40

S:\2020 Aprojects\02 - Commercial\L - P\01 - PPHCSD_Phelan Pinon Hills Community Service District\01 - Civic Center (Former Admin Bldg)\A-0.1 Overall SitePlan_PPHCSD_Civic Center.dwg, 2/17/2023 2:48:44 PM, DWG To PDF.pc3

STEENO DESIGN STUDIO INC.
ARCHITECTURE ◆ DESIGN ◆ PLANNING
11774 HESPERIA ROAD, SUITE B ◆ HESPERIA, CA. 92345
PHONE (760) 244-5001 ◆ FAX (760) 244-1948
www.steenodesign.com

DATE FINISHED
MAY 2022

REVISIONS
1 DEV_CODE_02/14/22
2 BLDG_CODE_02/14/22
3 BLDG_CODE_08/08/22
4 ELECTRICAL_09/30/22
5 SEPTIC_10/27/22
6 ADDENDUM TO STRUCTURAL_01/24/2023

THESE PLANS SHALL COMPLY WITH THE 2019 CALIFORNIA BUILDING CODE WHICH ADOPTS THE 2019 CMC, 2019 CPC, 2019 CEC, 2019 CFC, 2019 CRC AND THE 2019 ENERGY STANDARDS

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LICENSED ARCHITECT THOMAS R. STEENO No. C26448 REN. 2/28/25 STATE OF CALIFORNIA

PROJECT: CIVIC CENTER BUILDING

PHELAN PIÑON HILLS C.S.D.

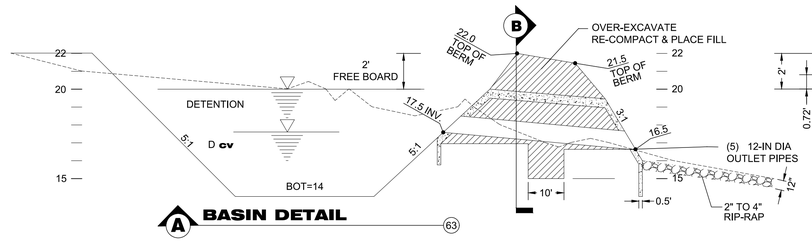
SITE ADDRESS:
A.P.N. 3066-261-10
9535 SHEEP CREEK ROAD
PHELAN, CA 92329

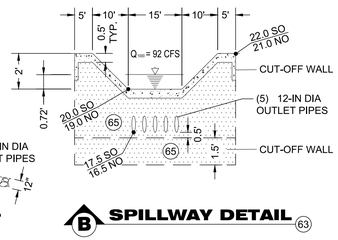
CONTACT:
DON BARTZ

JOB NO.
COM20-L01/01

SHEET NAME:
OVERALL SITE PLAN

PAGE
A-0.1





CONSTRUCTION NOTES

1. PHASE 1 GRADING LIMITS.
21. PROTECT EXISTING FENCE IN PLACE.
29. PROTECT EXISTING JOSHUA TREES IN PLACE.
32. INSTALL 6' HIGH CHAINLINK FENCE TO LIMITS SHOWN.
59. CONTRACTOR MUST MAINTAIN A 40 FOOT UNDISTURBED PERIMETER AROUND ALL JOSHUA TREES
60. INSTALL 12" THICK 2 SACK SLURRY SOIL CEMENT TO LIMITS SHOWN.
61. INSTALL 6' HIGH DECORATIVE WROUGHT IRON FENCE TO LIMITS SHOWN.
62. INSTALL 16' WIDE DOUBLE DECORATIVE WROUGHT IRON SWING GATE.
63. CONSTRUCT 6" THICK CONCRETE SPILLWAY W/S 12" DIAMETER CAST IRON PIPE (OUTLETS) PER DETAIL 'A' ON SHEET G-6
64. 2" TO 4" X 6" DEEP ROCK RIP RAP TO LIMITS SHOWN.
65. 6" X 6" 10/10 WWM WITH 15" MIN. LAP.

N

SCALE 1"=20'
CONTOUR INTERVAL=1FT.
10 0 10 20 40

APN: 3066-251-10

APN: 3066-281-05

APN: 3066-281-06

F.1 GS-4

G GS-5

C GS-2

P-2
RETENTION AREA
DA-A
BOTT. ELEV= 14.0
7,205 CU. FT.

P-1

Infiltration Test Locations

MATCH LINE
SEE SHEET G-5 FOR CONTINUATION

SECTION LINE

5:1 SLOPE

S=1%

28.0 ℄ HP
27.0 ℄
26.0 ℄
25.0 ℄
24.0 ℄
23.0 ℄ GB
24.0 ℄ GB
17.0 ℄ FG
18.0 ℄ FG
19.0 ℄ FG
20.0 ℄ FG
21.0 ℄ FG

JOSHUA TREES
JOSHUA TREE
R= 40'

R/W

- GRAD-2021-00235
- PRAA-2021-00040
- DRNSTY-2021-00054
- SIP-2021-00031
- NEWNR-2021-00230
- WQMP-2021-00153

DIGALERT
CALL BEFORE YOU DIG
1-800-422-4133
UNDERGROUND SERVICE ALERT
Call at least 2 working days prior to excavating

BENCHMARK:

U.S.G.S. BENCHMARK H 35, LOCATED 3.0 MI NORTH ALONG JOHNSON RD, FROM THE INTERSECTION OF PHELAN RD, 49 FT NORTHEAST OF THE CENTER OF THE INTERSECTION OF DUNCAN RD, 34 FT EAST OF THE CENTER LINE OF JOHNSON RD, 32.5 FT NORTH OF THE CENTER LINE DUNCAN RD, 6.6 FT WEST OF A FENCE, 6.3 FT NORTH OF A SECTION MARKER PIPE, 0.6 FT EAST OF A WITNESS POST, ABOUT 1 FT HIGHER THAN THE ROAD AND SET IN THE TOP OF A CONCRETE POST PROJECTING 0.4 FT ABOVE THE GROUND.
ELEV= 3616.50

NO.	REVISION	DATE	BY

REGISTERED PROFESSIONAL ENGINEER
Jerry L. Miles
No. C 42593
Civil
STATE OF CALIFORNIA

JERRY L. MILES R.C.E. 42593 - EXP. 3/31/24

PLANS PREPARED BY:
TRLS ENGINEERING Inc.
10770 I AVENUE, SUITE 108
Hesperia, CA 92345
Phone: (760) 948-4900

COUNTY OF SAN BERNARDINO
DEPARTMENT OF PUBLIC WORKS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
TER	TER		

RECOMMENDED/APPROVED BY:
LAND DEVELOPMENT ENGINEER — DATE
ASST. DIRECTOR OF PUBLIC WORKS — DATE
DIRECTOR OF PUBLIC WORKS — DATE

DRAWN BY: TRLS
DATE: 02/28/2023
DESIGNED BY: TER
DATE: -
APPROVED BY:
DATE:

PHELAN PINON HILLS COMMUNITY SERVICES DISTRICT

CIVIC CENTER DEVELOPMENT PHASE 1

9535 SHEEPCREEK RD. PHELAN, CA. 92329
(APN: 3066-261-10, 3066-261-08 & 3066-251-14)

GRADING PLAN

SCALE: AS SHOWN
SHEET 8 OF 25
SHEET G-6

Constants	Area (cm)	Depth of Liquid (cm)	Liquid No.	Containers Vol/Δh (cm^2/cm)
Inner Ring	707	10.16	1	69.6
Annular Space	2144	10.16	1	211.0

Project Identification: 3103.007.500
Test Location: P-1
Liquid Used: tap water **pH:** 8.0
Tested by: CDL **Liquid Level maintained using:**
Depth to water table: 600'+ **Penetration of rings—Inner:** 7.6 **Outer:** 12.7 **Date:** 04/17/2023

Trial No.		Time (hr:min)	Elapsed Time: Δ/total min)	Flow Readings: Inner Reading Reading (cm)	Flow Readings: Inner Reading Flow (cm^3)	Flow Readings: Annular Space Reading (cm)	Flow Readings: Annular Space Flow (cm^3)	Liquid Temp (ºC)	Incremental Infiltration Rate: Inner (cm/h)	Incremental Infiltration Rate: Annular (cm/h)	Ground Temperature = 14ºC at depth of 30 cm Remarks: Weather Conditions, etc.
1	S	0959	15	57.5	3,967.2	59.0	12,238.0	12.8	22.4	22.8	Clear. 13.9
	E	0914	15	0.5		1.0					
2	S	1024	15	58.0	2,958.0	57.5	12,048.1	12.8	16.7	22.4	14.5
	E	1039	30	15.5		0.4					
3	S	1053	15	57.9	3,803.6	58.0	12,132.5	12.8	21.5	22.6	15.3
	E	1108	45	3.25		0.5					
4	S	1131	15	58.0	3828.0	58.0	12,238.0	12.9	21.7	22.8	15.6
	E	1146	60	3.00		0.00					
5	S	1202	15	57.6	3772.3	56.2	11,858.2	12.9	21.3	22.1	15.6
	E	1217	75	3.4		0.0					
6	S	1244	15	57.4	3,751.4	58.1	12,153.6	12.9	21.2	22.6	15.6
	E	1259	90	3.5		0.5					
7	S	1313	15	58	3,484.5	58	12,216.9	12.9	19.7	22.8	15.6
	E	1328	105	7.5		0.1					
8	S	1345	15	57.8	3,821.0	58.5	12,259.1	12.9	21.6	22.9	15.7
	E	1400	120	2.9		0.4					
9	S	1407	15	57.5	3,751.4	58.0	12,005.9	12.9	21.2	22.4	15.7
	E	1422	135	3.6		1.1					
10	S	1428	15	57.9	3,765.4	58.0	12,005.9	12.9	21.3	22.4	15.7
	E	1443	150	3.8		1.1					

Constants	Area (cm)	Depth of Liquid (cm)	Liquid No.	Containers Vol/Δh (cm^2/cm)
Inner Ring	707	10.16	1	69.6
Annular Space	2144	10.16	1	211.0

Project Identification: 3103.007.500
Test Location: P-2
Liquid Used: tap water **pH:** 8.0
Tested by: CDL **Liquid Level maintained using:**
Depth to water table: 600'+ **Penetration of rings—Inner:** 7.6 **Outer:** 12.7 **Date:** 04/18/2023

Trial No.		Time (hr:min)	Elapsed Time: Δ/total min)	Flow Readings: Inner Reading Reading (cm)	Flow Readings: Inner Reading Flow (cm^3)	Flow Readings: Annular Space Reading (cm)	Flow Readings: Annular Space Flow (cm^3)	Liquid Temp (ºC)	Incremental Infiltration Rate: Inner (cm/h)	Incremental Infiltration Rate: Annular (cm/h)	Ground Temperature = 14ºC at depth of 30 cm Remarks: Weather Conditions, etc.
1	S	0841	15	57.2	3,702.7	57.2	11,900.4	12.9°	20.9	22.2	Clear, 9°
	E	0856	15	4.0		0.8					
2	S	0911	15	57.5	2,637.8	57.5	11,921.5	12.9°	14.9	22.2	9°
	E	0928	30	19.6		1.0					
3	S	0943	15	57.5	2,832.7	57.5	12,027	12.9°	16.0	22.4	9 °
	E	0958	45	16.8		0.5					
4	S	1020	15	57.5	2,589.1	57.5	11,942.6	12.9°	14.6	22.3	10°
	E	1035	60	20.3		0.9					
5	S	1045	15	57.5	2,992.8	57.5	11,921.5	12.9 °	16.9	22.2	10°
	E	1100	75	14.5		1.0					
6	S	1110	15	57.5	3,271.2	57.5	11,900.4	12.9°	18.5	22.2	10°
	E	1125	90	10.5		1.1					
7	S	1135	15	57.5	3,688.8	57.5	11,8116.0	12.9°	20.8	22.0	10°
	E	1150	105	4.5		1.5					
8	S	1159	15	57.5	3,744.5	57.5	11,445.2	13.0°	21.2	21.3	10°
	E	1214	120	3.7		2.0					
9	S	1225	15	57.5	3,681.8	57.5	11,445.2	13.0°	20.8	21.3	11°
	E	1240	135	4.6		2.0					
10	S	1255	15	57.5	3,737.5	57.5	11,731.6	13.0 °	21.1	21.9	11°
	E	1310	150	3.8		1.9					

Particle-Size Analysis of Soil

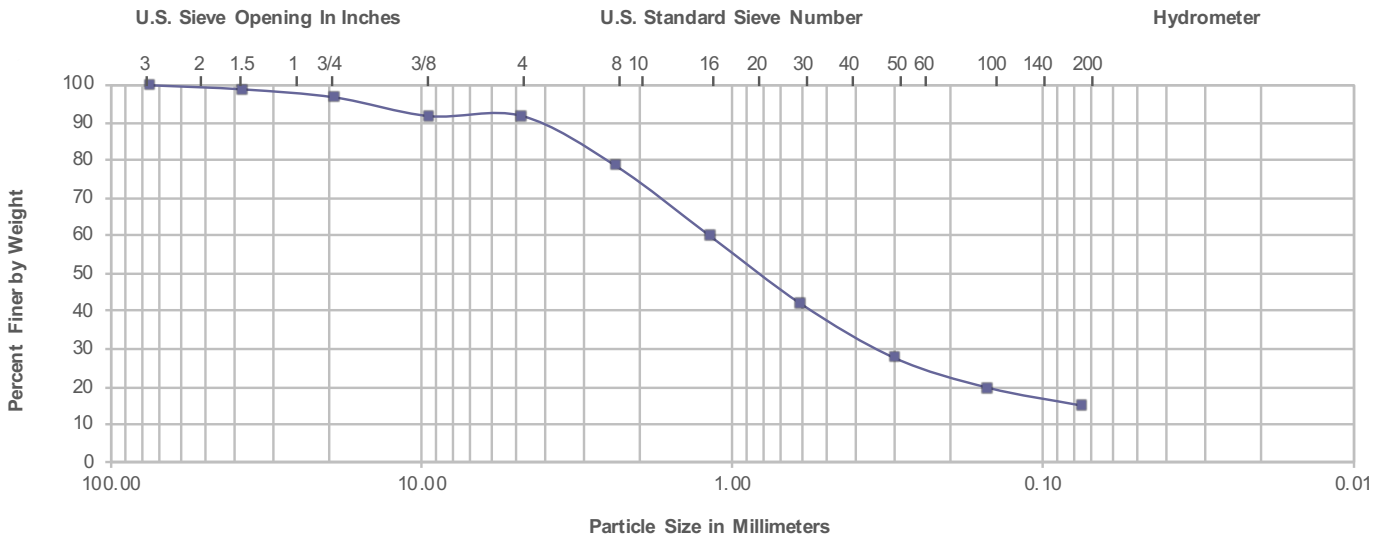
D422, D1140, D2487

Report Date:	04/19/23
Sheet:	1 of 1
Appendix:	
Permit No:	
Client Project No:	
Other:	
DSA File No:	
DSA Application No:	
DSA LEA No:	

Project Number:	3103.007.500
Project Title:	Civic Center (Phase 1)
Project Location:	9535 Sheep Creek Road, Phelan
Client:	Phelan Pinon Hills Community Services District

Sample ID: CDL23041901 **Gravel (%):** 8.2% **Sand (%):** 76.9% **Fines (%):** 15.0%

Classification, ASTM D2487:	(SM) Silty sand
Sample Origin:	P-1 at 5' to 7'
Laboratory Remarks:	



C_u	C_c	Moisture	D_{100}	D_{60}	D_{30}	D_{10}	LL	PL	PI	SG	FM	SE
NA	NA	1.4%	37.500	1.180	0.300	0.000	ND	ND	ND	ND	ND	ND

Method / Procudure Used:	D422, D1140
Size of Initial Dry Mass (g):	10602.5
Determination of Dry Mass:	D2216
Particles; Shape, Hardness:	ND
Dispersion Device/Period:	Manual/2 hr
Type & Amount of Agent:	Defloc. & 1.0
Laboratory Comments:	

The Material ☐ Was ☐ Was Not Sampled & tested in accordance with the reqs. of the DSA approved documents.
The Material Tested ☐ Met ☐ Did Not Meet The requirements of the DSA approved documents.

cc: Project Architect, Structural Engineer, Project Inspector, DSA Regional Office, School District

MerrellJohnson. engineering | surveying | testing | inspection

Merrell Engineering Company, Inc. | 22221 US Highway 18, Apple Valley, Ca. 92308 t)760.256.2068 f)760.256.0418 w)www.merrelljohnson.com