Water Quality Management Plan

For:

Agua Mansa Industrial Project

APN: 260-033-017

Prepared for:

Lansing Companies

12671 High Bluff Drive, Suite 150
San Diego, CA 92130

Att: James Kozak

(858) 523-0719

Prepared by:

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09/22/2004

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Rev # 2: 07/29/2015

Rev # 3: 12/4/2015

12/30/15

Approval Date:_____

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Land Development Division

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Lansing Companies by Allard Engineering. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Area wide Storm water Program requiring the preparation of a WQMP. 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 San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county 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):	TPM 19603 CASE # P2014-00411	Grading Permit Number(s):	
Tract/Parcel Map Number(s):	TPM 19603	Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0260-032-01,02,03,11,12,13,14 APN: 0260-040-01,17 APN: 0260-051-06 to 13

Owner's Signature			
Owner Name: James Kozak			
Title	Representative		
Company	REO Disposition, LLC		
Address	12671 High Bluff Drive, Suite 150, San Diego CA 92130		
Email	jimk@strategicland.net		
Telephone #	(858) 523-0719		
Signature		Date	12/15/2015

Project Data			
Permit/Application Number(s):	TPM 19603 CASE # P2014-00411	Grading Permit Number(s):	
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"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 Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Raymond Allard		PE Stamp Below
Title	Principal	
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Telephone #	909-356-1815	
Signature	Raymond J. Allard	
Date	12-15-15	

REGISTERED PROFESSIONAL ENGINEER
RAYMOND J. ALLARD
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CIVIL
STATE OF CALIFORNIA

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Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Agua Mansa Industrial Project				
Project Owner Contact Name:	James Kozak				
Mailing Address:	2671 High Bluff Drive, Suite 150 San Diego, CA 92130	E-mail Address:	jimk@strategicland.net	Telephone:	(858) 523 0719
Permit/Application Number(s):	CASE # P2014-00411	Tract/Parcel Map Number(s):	TPM 19603		
Additional Information/ Comments:					
Description of Project:	Agua Mansa Industrial Project is a 29.1 Ac, industrial project located at El Rivino Rd., City of Bloomington, County of San Bernardino, California. The site lies north of El Rivino road between Agua Mansa Avenue and Hall Avenue. The proposed condition will propose new buildings, paking spaces, circulation and paved areas and landscaping/undeveloped areas. The buildings consist of 14,500 sq-ft office space, 500,392 sq-ft of warehouse space, a total of 693 parking spaces, (553 regular parking spaces, 15 Handicap parking spaces and 179 trailer parking spaces), 296,689 sqft of landscaping/undeveloped areas and 322,459 sq-ft circulation and paved areas. The site lies within a 6000 acre watershed with boundaries comprising of 10 Freeway to the north, Santa Ana River to the south, Riverside Avenue on the east and Cedar Avenue on the west. Residential, commercial and scpecially Industrial developments are established within the watershed. The natural terrain slopes to the south at a slope of approximately 2%. A soils report and percolation test (double ring) has been completed for the site and no preexisting onsite contamination has been identified.				

	A mix of infiltration/detention basins,and Infiltration trenches will be the primary BMP utilized to clean water prior exiting the Site into and existing 90" storm drain pipe that runs parallel to the northern property line and direct the flows toward the Reach 4 of the Santa Ana River, which is the receiving waters. The project will consist of 5 drainages areas: DA1 with 2.40 Ac will collect entire area of building B including the ofiices buildings, the warehouse building, the paking area and landscaped areas. All drainage will flow into Infiltration trench # 1, then the overflow will be directed to infiltration/detention # 2, and then to the outlet pipe. DA2 with 10.89 Ac will collect the the storm drain runoff from the a portion of the roof of building A, its paking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration/detention # 1, and then to the outlet pipe. DA3 with 9.63 Ac will collect the storm drain runoff from the a portion of the roof of building A, its paking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration/detention # 2, and then to the outlet pipe. DA4 with 5.61 Ac will collect the storm drain runoff from the a portion of the roof of building A, its paking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration trench # 4, and then to the outlet pipe. DA5 with 2.44 Ac will collect the paking area of the easterly portion of the site and it will flow into Infiltration trench # 5a and 5b. and then to the outlet pipe.

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein. The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more
☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements.*

2 Project Area (ft2):	1,349,384 sf	3 Number of Dwelling Units:	N/A	4 SIC Code:	4225

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

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

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 of WQMP stormwater facilities:
Lansing Companies will be responsible to build the site and the maintenance of the post-developed BMP.

2.3 Potential Stormwater Pollutants

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

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Santa Ana River reach 4 is impaired for pathogens
Phosphorous	E ☒	N ☐	
Nitrogen	E ☒	N ☐	
Sediment	E ☒	N ☐	
Metals	E ☒	N ☐	Santa Ana River reach 4 is impaired for heavy metals
Oil and Grease	E ☒	N ☐	
Trash/Debris	E ☒	N ☐	
Pesticides / Herbicides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	
Other: Nutrients	E ☒	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits			
[1] Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
[2] Total Credit % 0 *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)	N/A		

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed 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.***

Form 3-1 Site Location and Hydrologic Features

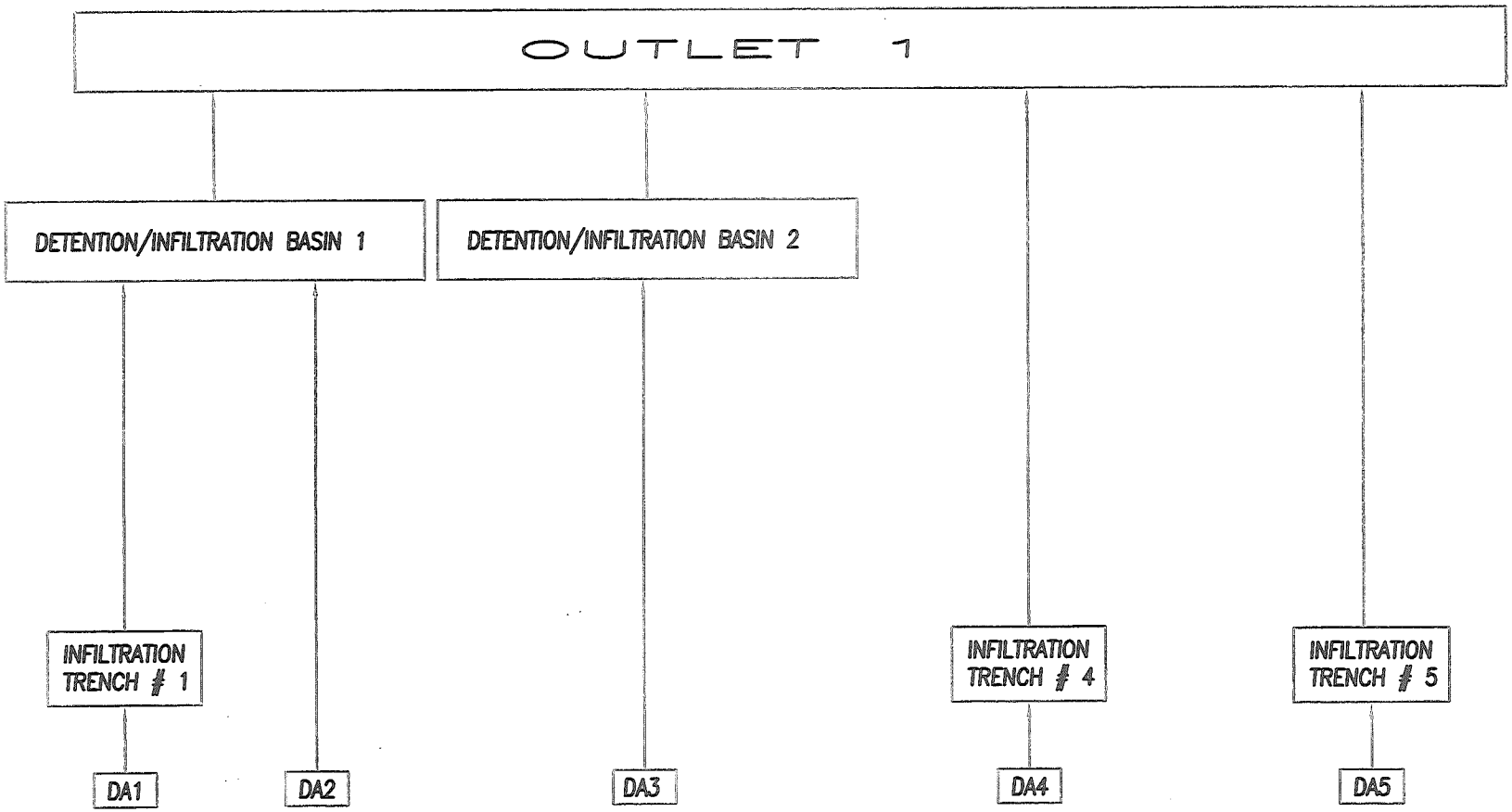
Site coordinates *take GPS measurement at approximate center of site*	Latitude 34° 02' 09.56" N	Longitude -117° 22' 33.08"W	Thomas Bros Map page PAGE 647 GRID G 2

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

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*

See conceptual schematic on next page.

Conveyance	
DA1 to Outlet 1	DA1 with 2.40 Ac will flow into Infiltration trench # 1, then the overflow will be directed to infiltration/detention # 1, and then to the outlet pipe.
DA2 to Outlet 1	DA2 with 10.89 Ac will collect the the storm drain runoff from the portion of the roof of building A, its parking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration/detention # 1, and then to the outlet pipe.
DA3 to outlet 1	DA3 with 9.63 Ac will collect the storm drain runoff from a portion of the roof of building A, its parking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration/detention # 2, and then to the outlet pipe.
DA4 to Outlet 1	DA4 with 5.61 Ac will collect the storm drain runoff from a portion of the roof of building A, its parking, landscape/undeveloped and circulation areas. All drainage will flow into the infiltration trench # 4, and then to the outlet pipe.
DA5 to Outlet 1	DA5 with 2.44 Ac will collect the parking area of the easterly portion of the site and it will flow into Infiltration trench # 5a and 5b, and then to the outlet pipe.


OUTLET 1
DETENTION/INFILTRATION BASIN 1
DETENTION/INFILTRATION BASIN 2
INFILTRATION TRENCH # 1
INFILTRATION TRENCH # 4
INFILTRATION TRENCH # 5
DA1
DA2
DA3
DA4
DA5

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1, 2, 3 & 4				
For Drainage Area sub-watershed DMA, provide the following characteristics	DA1	DA2	DA3	DA4
1 DMA drainage area (ft²)	104,533	473,313	419,532	244,520
2 Existing site impervious area (ft²)	0	0	0	0
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II	II	II	II
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	B	B	A	B
5 Longest flowpath length (ft)	458	1090	702	226
6 Longest flowpath slope (ft/ft)	0.0087	0.0037	0.006	0.09300
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	**Grass poor cover**	**Grass poor cover**	**Grass poor cover**	**Grass poor cover**
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*	Undeveloped poor cover	Undeveloped poor cover	Undeveloped poor cover	Undeveloped poor cover

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 5				
For Drainage Area 1 AND Area 2, provide the following characteristics	DA5			
1 DMA drainage area (ft^2)	106,486			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	B			
5 Longest flowpath length (ft)	1,055			
6 Longest flowpath slope (ft/ft)	0.0284			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Grass poor cover			
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*	Undeveloped poor cover			

Form 3-3 Watershed Description for Drainage Area	
Receiving waters *Refer to Watershed Mapping Tool -* *http://sbcounty.permitrack.com/WAP* *See 'Drainage Facilities" link at this website*	Flows from the site will run into the existing 90" storm drain pipe then into Santa Ana River Reach 4
Applicable TMDLs *Refer to Local Implementation Plan*	Santa Ana River Reach 4: Pathogens Santa Ana River Reach 3: Pathogens "Bacterial Indicator TMLDs for Middle Santa Ana River Watershed Waterbodies Nitrate : Santa Ana River Reach 3 Heavy metals, Nitrate TMDL Prado Flood Control basin Pathogens "Bacterial Indicator TMLDs for Middle Santa Ana River Watershed Waterbodies Santa Ana River Reach 2 NONE Santa Ana River Reach 1 NONE Tidal Prism, Santa Ana River NONE
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Expected pollutants of concern include pathogens, metals, Nutrients, organic compounds, pesticides, trash and debris, oxygen demanding compounds and oil and grease. There is no evidence to suggest that any other pollutants will be produced from the project site other than these. 303(d) listed impairment Santa Ana River Reach 4: Pathogens Santa Ana River Reach 3: Pathogens, Metals(copper & lead) Prado Flood Control Basin: Pathogens and Nutrients Santa Ana River Reach 2: Pathogens Santa Ana River Reach 1 and Tidal prism Santa Ana River : NONE
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	NONE
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No The site if slightly outside of the HCOC exempt area. The project is proposing a detention basin therefore developed peak flows will be below the 90% of

	the existing flows. See hydrology Report.
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

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.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Practical education materials will be provided to property owners and industrial site staff covering various water quality issues that will need to be addressed on their specific site. These materials will include general practices that contribute to the protection of storm water quality and BMP's that eliminate or reduce pollution during property improvements. The developer/owner will provide educational materials attached to this report on Section 6.4 supporting documention and BMP Educational materials. The Property Owners shall be responsible to dissiminate the educational material to Occupants and key industrial site staff 30 days prior to building opening to public.
N2	Activity Restrictions	☒	☐	Restrictions may be developed by property owner, industrial site staff, or other mechanisms. Such restriction will include but not limited to Pesticide applications will be performed by an applicator certified by the California Department of Pesticide Regulation. Vehicle washing will be prohibited.
N3	Landscape Management BMPs	☒	☐	Landscape maintenance activities include vegetation removal, herbicide and insecticide application, fertilizer application, watering and other gardening and lawn care practices. Also a large portion of the runoff will be routed through the two proposed infiltration/detention basins, and landscape areas. Provide by the owner and/or building operator.
N4	BMP Maintenance	☒	☐	See section 5, Table 5.1 for details on BMP maintenance
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous materials will be found on site.
N6	Local Water Quality Ordinances	☐	☒	No fuel dispenses areas on the site.

Form 4.1-1 Non-Structural Source Control BMPs				
N7	Spill Contingency Plan	☒	☐	The spill contingency plan shall be provided in accordance with Section 6.95 of the California Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	The building is planned to connect to public sewer, no underground storage on the site.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous materials in the site.

Form 4.1-1 Non-Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☐	☒	The project will not store toxic and highly toxic compressed gases therefore no Uniform Fire Code Implementation is necessary.
N11	Litter/Debris Control Program	☒	☐	Promote efficient and safe housekeeping practices (CASQA BMP HANDBOOK SC-60) (storage, use and clean up) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Please also see BMP fact sheets SC-11 and SC-34. Provide by the owner and/or building operator.
N12	Employee Training	☒	☐	Members of the industrial site staff will have training regarding the location and maintenance of the BMP. Educations materials are provided in the present reports. Owners will be responsibles to provide said materials to all the Industrial site Personnel when they start working at the site and from there once a year.
N13	Housekeeping of Loading Docks	☒	☐	Members of the industrial site staff will have to follow all the procedures indicated on SD-31 Maintenance of Bays & Loading Docks. Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered

				infiltration system, or an equally effective alternative. Pre-treatment may also be required.
N14	Catch Basin Inspection Program	☒	☐	Catch basins will be inspected and cleaned as needed a minimum of once every three months during the dry season and a minimum of once every two months during the rainy season.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Parking lot and onsite streets sweeping and vacuuming will be done by industrial site staff or by a specialized street sweeping company contracted by owner on a regular frequency based on usage and field observation of waste accumulation, using a vacuum assisted sweeper. As minimum all paved areas shall be swept before the rainy season starts.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public agency project.
N17	Comply with all other applicable NPDES permits	☒	☐	General construction permit, grading plan permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Signs stating "drains to the ocean"will be placed above storm drain inlets to warn the public of prohibitions against waste disposal. See BMP fact sheet SD-13. Owners will be reposible of mainenance.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No material storages areas in the project
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	All trash container areas shall meet the following requirements: Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash also provide solid roof or awning to prevent exposure to direct precipitation. The proposed trash enclosure is designed as to avoid run-on from any adjoining areas and is walled, and paved to to mitigate spills, screened and is being designed with a roof/awning to minimize 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 irrigation systems and landscape design, water conservation, smart controllers and source control will be shown on the landscape plan. The planned source controls will include at minimum landscape area's with specific water requirements and include design with efficient flow reducers and shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads, the plan will be designed using the latest County water conservation resolutions and landscape guidelines. Also drought tolerant plants are being planned and shall be installed to match native vegatation for San Bernardino County climate.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	New landscaped areas will be constructed at a minimum of 1 inch below existing paved areas

S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	No slopes and channels inside the project. Provide riprap at outlets points as well as inlets.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	Members of the industrial site staff will have to follow all the procedures indicated on SD-31 Maintenance of Bays & Loading Docks.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No carwash areas
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing

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)	☐	☒	There will not be outdoor equipment/accessory washing and steam cleaning activities on the site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No Hill side Landscaping
S14	Wash water control for food preparation areas	☐	☒	No food preparation areas indoor or outdoor are proposed.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No carwash

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. 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 Preventative LID 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: Approximatelly 36% of the project are landscaped/undeveloped areas. All the impervious areas will driain into landscaped areas or into infiltration trenches or infiltration basins.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Runoff from impervious surfaces will be conveyed through landscaped areas so that infiltration is maximized.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☒ Explanation: The overall existing tributary drainage pattern will be different than the existing tributary pattern. On the existing conditions the drainage sheet flows from El Rivino Rd. to the northerly property line and through two drain inlets into an existing 90" storm drain pipe. The developed condition shows 5 drainages areas that will convey the flows through 2 infiltration basins and 5 infiltration trenches including a pipe system that will carry all the flows into the existing 90" pipe.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Impervious areas will drain into landscaped areas.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: There are no environmentally sensitive portions onsite. All existing vegetation will be replaced for new proposed landscaped plan to adequate the project to the new standards of more drought tolerant vegetation.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: As much disturbed areas as possible will be revegetated, see landscape areas on WQMP exhibit.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: No compaction will be performed within the area where infiltration trenchs and detention basin are proposed, please see notes on WQMP exhibit.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation The majority of the runoff will be on the surface. DA1, DA4 and DA5 will carry the runoff into their respectives infiltration trenches. DA2 and DA3, will run runoff from impervious surfaces through vegetated areas to finally pipe the flows into the infiltration basins.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: No compaction will be performed within the area where landscape areas are proposed, please see notes on WQMP exhibit. Also said areas will be staked off during construction

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the 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 of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

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

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
1 Project area DA 1 (ft²): 104,533	2 Imperviousness after applying preventative site design practices (Imp%): 76.8%	3 Runoff Coefficient (Rc): 0.56 *$R_c = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.698 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.0337 *P_6 = Item 4 * C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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 (ft³): 9,954 *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*		

Target Capture Volume

Watershed DA 1

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

Imperviousness(i)= **0.768**

Total Acreage(A) = **2.40**

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

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

C_{bmp} = 0.56

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

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

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

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.698** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 1.0337 inches

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

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

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

P_0 = C x a x P6

Po(inches) = 1.1425

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

$V_0 = (P_0 * A)/12$

V_0 = 0.23 acre-feet
V_0 = 9,954 CF

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 2 (ft^2): 474,313	2 Imperviousness after applying preventative site design practices (Imp%): 79.2%	3 Runoff Coefficient (Rc): 0.59 *$R_c = 0.858(Imp\%)^{3} - 0.78(Imp\%)^{2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.698 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.0337 *P_6 = Item 4 * C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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): 47,327 *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*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 3)

1 Project area DA 3 (ft^2): 419,532	2 Imperviousness after applying preventative site design practices (Imp%): 75.5%	3 Runoff Coefficient (Rc): 0.55 *$R_c = 0.858(Imp\%)^{3} - 0.78(Imp\%)^{2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.698 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.0337 *P_6 = Item 4 * C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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): 38,944 *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*		

Target Capture Volume

Watershed DA 2

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

Imperviousness(i)= **0.792**

Total Acreage(A) = **10.89**

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

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

C_{bmp} = 0.59

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

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

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

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.698** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 1.0337 inches

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

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

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

P_0 = C x a x P6

Po(inches) = 1.1972

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

$V_0 = (P_0 * A)/12$

V_0 = 1.09 acre-feet
V_0 = 47,327 CF

Target Capture Volume

Watershed DA 3

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

Imperviousness(i)= **0.755**

Total Acreage(A) = **9.63**

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

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

C_{bmp} = 0.55

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

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

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

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.698** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 1.0337 inches

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

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

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

P_0 = C x a x P6

Po(inches) = 1.1141

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

$V_0 = (P_0 * A)/12$

V_0 = 0.89 acre-feet
V_0 = 38,944 CF

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 4)

1 Project area DA 4 (ft^2): 244,520	2 Imperviousness after applying preventative site design practices (Imp%): 91.6%	3 Runoff Coefficient (Rc): 0.75 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.698 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.0337 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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): 31,712 *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*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 5)

1 Project area DA 5 (ft^2): 106,486	2 Imperviousness after applying preventative site design practices (Imp%): 52.4%	3 Runoff Coefficient (Rc): 0.35 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.698 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.0337 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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): 6,378 *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*		

Target Capture Volume

Watershed DA 4

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

Imperviousness(i)= **0.916**

Total Acreage(A) = **5.71**

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

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

C_{bmp} = 0.75

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

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

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

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.698** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 1.0337 inches

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

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

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

P_0 = C x a x P6

Po(inches) = 1.5300

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

$V_0 = (P_0 * A)/12$

V_0 = 0.73 acre-feet

V_0 = 31,712 CF

Target Capture Volume

Watershed DA 5

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

Imperviousness(i)= **0.524**

Total Acreage(A) = **2.44**

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

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

C_{bmp} = 0.35

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

Valley	1.481
Mountain	1.909
Desert	1.237

Regression coefficient for this project is: 1.481

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

2 yr 1 Hr Rainfall Depth per NOAA Atlas 14= **0.698** inches

P_6 = 2 yr 1 hr Rainfall x Regression coefficient

P_6 = 1.0337 inches

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

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

a = 1.963

6) Calculate the Maximized Detention Volume, P_0

P_0 = C x a x P6

Po(inches) = 0.7201

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

$V_0 = (P_0 * A)/12$

V_0 = 0.15 acre-feet
V_0 = 6,378 CF

Form 4.2-2 Summary of HCOC Assessment (DA 1, DA2, DA3, DA4 & DA5)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr 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)

If "No," then proceed to Section 4.3 Project Conformance Analysis

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

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1, 2, 3, 4 & 5)

Weighted Curve Number Determination for: Pre-developed DA								
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA			DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

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

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

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

13 Post-developed Volume (ft^3):
*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 HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1, 2, 3, 4 & 5)

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*			
	DA 1	DMA B	DMA C	DMA D	DA 1	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o = *Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} = *(1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t = *Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c = *Item 5 + Item 11*								

13 Pre-developed time of concentration (min):

14 Post-developed time of concentration (min):

15 Additional time of concentration needed to meet HCOC requirement (min):

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1, 2, 3, 4 & 5)

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 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (ft^2) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = 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)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = 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: *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: *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): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	12 Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	13 Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*

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

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

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the 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 MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

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 5.3.2.1 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 Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use 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 HSC 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 LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment.**

Form 4.3-1 Infiltration BMP Feasibility (DA1, DA2, DA3, DA4 & DA5)

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 eight 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, Harvest and Use BMP. If no, then proceed to Item 9 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, Hydrologic Source Control 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, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC 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 HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC 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 HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1, 2, 3, 4, & 5)

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*	DA1, 2, 3, 4, 5 BMP Type Infiltration Basin	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 ft^3 $V_{retention}$ *=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)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (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 ft^3 $V_{retention}$ *=Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1, 2, 3, 4 & 5)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA1, 2, 3, 4, 5 BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) *$V_{retention}$ = Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): 0 ft^3 *$V_{retention}$ =Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 20-2. If no, proceed to Item 24*	DA1, 2, 3, 4, 5 BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): 0 ft^3 *$V_{retention}$ = Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrels/cisterns: Yes ☐ No ☒ *If yes, complete Items 27-28; If no, proceed to Item 29*	DA1, 2, 3, 4, 5 BMP Type Infiltration Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) *$V_{retention}$ = Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): 0 ft^3 *$V_{retention}$ =Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 ft^3 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 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 D 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 5.5.1 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).

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		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25		
		Level of pretreatment/ expected sediment loads	0.25		
		Redundancy	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	4.38
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	12.7 in/hr
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$	2.9 in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

NO INFILTRATION RATE AT THIS AREA.

THE WORST ONE OF THE SITE WILL BE USED

K_{DESIGN} = 2.9 in/hr.

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

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	1.0	0.25
		Predominant soil texture	0.25	3.0	0.75
		Site soil variability	0.25	2.0	0.50
		Depth to groundwater / impervious layer	0.25	1.0	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Tributary area size	0.25	3.0	0.75
		Level of pretreatment/ expected sediment loads	0.25	3.0	0.75
		Redundancy	0.25	3.0	0.75
		Compaction during construction	0.25	1.0	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.5
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					4.38
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					12.7 in/hr
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$					2.9 in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

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

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	1.0	0.25
		Predominant soil texture	0.25	3.0	0.75
		Site soil variability	0.25	2.0	0.50
		Depth to groundwater / impervious layer	0.25	1.0	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Tributary area size	0.25	2.0	0.50
		Level of pretreatment/ expected sediment loads	0.25	3.0	0.75
		Redundancy	0.25	3.0	0.75
		Compaction during construction	0.25	1.0	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.25

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	3.94
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	16.9 in/hr
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$	4.3 in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

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, 2 & 3)

1 Remaining LID DCV not met by site design HSC BMP (ft^3):	*9,954 ft3*	*47,327* ft^3	*38,944 ft3*
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*	DA1 BMP Type Infiltration Trench	DA2 BMP Type Infiltration Basin	DA3 BMP Type Infiltration basin
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	12.7 in/hr	12.7 in/hr	16.9 in/hr
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	4.38	4.38	3.94
4 Design percolation rate (in/hr) P_{design} = *Item 2 / Item 3*	2.9 in/hr	2.9 in/hr	4.3 in/hr
5 Ponded water drawdown time (hr) Copy Item 6 in Form 4.2-1	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	11.6'	11.6'	17.2'
7 Ponding Depth (ft) d_{BMP} = *Minimum of (1/12*Item 4*Item 5) or Item 6*	1.0'	3.17'	1.83'
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*	3290	15,221	21,780
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0'	0'	0'
10 Amended soil porosity	0.0	0.0	0.0
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	4.0'	0'	0'
12 Gravel porosity	0.35	0.35	0.35
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3 hrs	0	0
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))]*	10,281	48,251	39,857
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0	0	0
16 Total Retention Volume from LID Infiltration BMPs:	10,117	48,251	39,857
17 Fraction of DCV achieved with infiltration BMP:	103.3%	101.9%	102.3%

18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and 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.

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		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25		
		Level of pretreatment/ expected sediment loads	0.25		
		Redundancy	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	4.38
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	12.7 in/hr
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$	2.9 in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

NO INFILTRATION RATE AT THIS AREA
THE LOWEST K DESIGN FOR THE SITE WILL BE USED.

K DESIGN = 2.9 in/hr

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

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	1.0	0.25
		Predominant soil texture	0.25	3.0	0.75
		Site soil variability	0.25	2.0	0.50
		Depth to groundwater / impervious layer	0.25	1.0	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Tributary area size	0.25	2.0	0.5
		Level of pretreatment/ expected sediment loads	0.25	3.0	0.75
		Redundancy	0.25	3.0	0.75
		Compaction during construction	0.25	1.0	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.25
Combined Safety Factor, $S_{TOT} = S_A \times S_B$					3.94
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)					11.9 in/hr.
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} \times K_M$					3.0 in/hr.

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

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 4, 5-1 & 5-2)

1 Remaining LID DCV not met by site design HSC BMP (ft^3):	31,712 ft^3	6,378 ft^3	
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*	DA4 BMP Type Infiltration Trench	DA5-1 BMP Type Infiltration Trench	DA5-2 BMP Type Infiltration Trench
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	12.7 in/hr	11.9 in/hr	11.9 in/hr
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	4.38	2.94	3.94
4 Design percolation rate (in/hr) P_{design} = *Item 2 / Item 3*	2.9 in/hr	3.0 in/hr	3.0 in/hr
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	11.6'	12.1'	12.1'
7 Ponding Depth (ft) d_{BMP} = *Minimum of (1/12*Item 4*Item 5) or Item 6*	1.0'	1.0'	1.0'
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*	10,334	1,546	660
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0'	0'	0'
10 Amended soil porosity	0.0	0.0	0.0
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	4.0'	3.5'	3.5'
12 Gravel porosity	0.35	0.35	0.35
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3 hrs	3 hrs	3 hrs
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))]*	4,483	1,852	1,852
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0	0	0
16 Total Retention Volume from LID Infiltration BMPs:	31,712	4,607	1,967
17 Fraction of DCV achieved with infiltration BMP:	100.2%	100.3%	

18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and 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.

			INFILTRATION BASIN CALCULATION					
			DA1	DA2	DA3	DA4	DA5-1	DA5-2
2	Infiltration rate	in/hr		12.7	16.9			
3	Safety factor			4.38	3.94			
4	Design infiltration rate	in/hr		2.9	4.3			
5	Drawn time	hrs		48	48			
6	Maximum depth	feet		11.6	17.16			
7	Ponding depth	feet		3.17	1.83			
8	Surface Area	sqft		15,221	21,780			
9	Amended depth	feet		0	0			
10	Porosity of amended soil	%		0	0			
11	Gravel depth	feet		0	0			
12	Gravel porosity	%		0.35	0.35			
13	Duration of storm	hrs		0	0			
14	Above ground detention	cf		48,251	39,857			
16	Target volume	cf		47,327	38,944			

			INFILTRATION TRENCH CALCULATION					
			DA1	DA2	DA3	DA4	DA5-1	DA5-2
2	Infiltration rate	in/hr	12.7			12.7	11.9	11.9
3	Safety factor		4.38			4.38	3.94	3.94
4	Design infiltration rate	in/hr	2.90			2.90	3.02	3.02
5	Drawn time	hrs	48			48	48	48
6	Maximum depth	feet	11.6			11.6	12.1	12.1
7	Ponding depth	feet	1			1	1	1
8	Surface Area	sqft	3,290			10,334	1,546	660
9	Amended depth	feet	0			0	0	0
10	Porosity of amended soil	%	0			0	0	0
11	Gravel depth	feet	4			4	3.5	3.5
12	Gravel porosity	%	0.35			0.35	0.35	0.35
13	Duration of storm	hrs	3			3	3	3
14	Above ground detention	cf	10,281			32,293	4,607	1,967
								6,574
16	Target volume	cf	9,954			31,712		6,378

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1, 2, 3, 4 & 5)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0 ft^3

V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			

9 Total Retention Volume (ft^3) from Harvest and Use BMP 0 ft^3 *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☐ No ☐

If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. 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 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1, 2, 3, 4 & 5)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 ft^3 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.* Pathogens, Phosphorous, Nitrogen, Sediment, Metals, Oil and Grease, Trash/Debris, Pesticides/Herbicides, Organic Compounds, and Nutrients.	
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 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ 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 ft^3 *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 ft^3 *Item 1 – Item 3*	5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0% *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): 0 *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 4.3-6 Volume Based Biotreatment (DA 1, 2, 3, 4 & 5) 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: 0 ft^3 *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1, 2, 3, 4 & 5) 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 : 0 ft^3 *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1, 2, 3, 4 & 5)			
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 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, 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 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): *9,954* ft^3 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): *0* ft^3 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): *10,281* ft^3 *copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *0* ft^3 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): *0* ft^3 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *0* ft^3 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ NO
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ NO
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 2)

1 Total LID DCV for the Project DA-1 (ft^3): 47,327 ft^3 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): *0* ft^3 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): *48,251* ft^3 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *0* ft^3 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): *0* ft^3 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *0* ft^3 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ NO
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ NO
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 3)

1 Total LID DCV for the Project DA-1 (ft^3): 38,944 ft^3 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): *0* ft^3 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): *39,857* ft^3 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *0* ft^3 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): *0* ft^3 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *0* ft^3 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ NO
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ NO
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 4)

1 Total LID DCV for the Project DA-1 (ft^3): 31,712 ft^3 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): *0* ft^3 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): *32,293* ft^3 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *0* ft^3 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): *0* ft^3 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *0* ft^3 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ NO
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ NO
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 5)

1 Total LID DCV for the Project DA-1 (ft^3): 6,378 ft^3 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): *0* ft^3

3 On-site retention with LID infiltration BMP (ft^3): 4,607 + 1,967 = 6,574 ft^3 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): *0* ft^3 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): *0* ft^3 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *0* ft^3 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐ NO
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐ No
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control DA1, DA2, DA3, DA4 & DA5	
1 Volume reduction needed for HCOC performance criteria (ft^3): 0 ft^3 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	2 On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): *Sum of Form 4.3-9 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 HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): *Item 1 – Item 2*	4 Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*
5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*	
6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐ *If yes, HCOC 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 or off-site retention BMP ☐ *BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)* • 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 ☐ • Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐	
7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐ *If yes, HCOC 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 or off-site retention BMPs ☐ *BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)* • Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, 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 compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP 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 may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration basins and infiltration trench	Lansing Companies	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. Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin. If erosion is occurring within the basin, re-vegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established	2 times a year at the beginning and end of the rainy season (October to March)
Education of Property Owners, industrial site staff, on Stormwater BMPs	Lansing Companies	Practical education materials will be provided to property owners and industrial site staff covering various water quality issues that will need to be addressed on their specific site. These materials will include general good house keeping practices that contribute to the protection of storm water quality and BMP's that eliminate or reduce pollution during property improvements.	Once a year
Activity Restrictions	County of San Bernardino and/or building operator	Restrictions may be developed by County of San Bernardino and/or buiding operator in order to protect surface water quatity. An example will be do not allow car wash inside the project or to storage hazardous materials outside the buildings	Ongoing by Code Enforcement

Landscape maintenance	Lansing Companies	Landscape planning is implemented to reduce groundwater and storm water contamination. This will be accomplished through an infiltration basin, and landscape areas.	Monthly
BMP maintenance	Lansing Companies	See details hereon	Ongoing with every schedule
Spill contingency plan	Lansing Companies	The spill contingency plan shall be provided in accordance with Section 6.95 of the California Health and Safety Code.	Revise once a year
Litter debris control program	Lansing Companies	Litter debris control programmay be developed by Lansing Companies or by the site Opertor	Revise once a year
Employee training	Lansing Companies	Employee training should be developed by Lansing Companies or by the site Opertor	Revise once a year
Catch basin inspection program	Lansing Companies	Catch basins will be inspected a minimum of once every three months during the dry season and a minimum of once every two months during the rainy season.	As stated
Provide storm drain system stencilling and signage	Lansing Companies	Signs will be placed above storm drain inlets to warn the public of prohibitions against waste disposal	Once a year or according to Manufacturer Manuals
Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Lansing Companies	Rain sensors will be incorporated into the onsite sprinkler system so that no unnecessary watering of landscaped areas occurs after storm events.	Once a year

Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	Lansing Companies	New landscaped areas will be constructed at a minimum of 1 inch below existing paved areas	Twice a year

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 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

CHJ Consultants
1355 E. Cooley Drive, Suite C, Colton, CA 92324 ◆ Phone (909) 824-7311 ◆ Fax (909) 503-1136
15345 Anacapa Road, Suite D, Victorville, CA 92392 ◆ Phone (760) 243-0506 ◆ Fax (760) 243-1225
77-564A Country Club Drive, Suite 122, Palm Desert, CA 92211 ◆ Phone (760) 772-8234 ◆ Fax (909) 503-1136

May 20, 2015

Allard Engineering
16866 Seville Avenue
Fontana, California 92335
Attention: Mr. Bobby Allard

Job No. 15228-2

Subject: Percolation Investigation
Agua Mansa Industrial Park
East of Del Mesa Road and Halbrook Lane
Bloomington, California

Dear Mr. Allard:

As requested, percolation testing was performed for the subject project. We anticipate that the percolation rates obtained from the testing and the infiltration rates derived from the percolation testing may be used for the project's water quality management plan (WQMP). This report presents the test data and summarizes the scope of testing.

The site location is shown on Enclosure "A-1", and the locations of the percolation tests are shown on Enclosure "A-2". The drilling and pre-soaking of the test locations occurred on May 14, 2015, and the percolation testing was performed on May 15, 2015. The test holes were pre-soaked 24 hours prior to testing.

The percolation tests were performed in general accordance with the deep percolation test method provided in the Technical Guidance Document for Water Quality Management Plans prepared by the San Bernardino County Stormwater Program (2011). In order to prevent caving of the test holes, a

2-inch perforated PVC pipe was placed inside each test hole and 3/4-inch gravel was placed in the annular space between the PVC pipe and the sides of the holes.

Per the test method, if two consecutive measurements show that 6 inches of water seep away in less than 25 minutes, the location is considered "sandy" and the test should be run for an additional hour with measurements taken every 10 minutes. If less than 6 inches of water seep away, the location is considered "non-sandy" and measurements are taken every 30 minutes for a total testing time of six hours. Test locations were considered "sandy" for the purposes of the percolation testing. The final measurements taken were used to calculate the percolation and infiltration rates provided.

Exploratory Boring No. 2 was advanced an additional 10 feet in order to provide the soil profile beneath the bottom of the basin and to confirm the required vertical distance from the bottom of the basin to the groundwater table. The test hole was then backfilled with the soils cuttings and compacted to the anticipated depth of the bottom of the basin.

Based on review of the groundwater levels and exploratory boring logs, we anticipate that a minimum of 10 feet of separation between the bottom of the infiltration surface and the historical high groundwater table will be maintained.

It should be noted that the percolation rate is related to, but not equal to, the infiltration rate. The infiltration rate is a measure of the speed at which water progresses downward into the soil, while the percolation rate includes both downward and horizontal speeds. The infiltration rate should be considered for use in detention basin or permeable pavement design, and percolation rates should be considered for dry well design.

Continuous logs of the subsurface conditions, as encountered within the borings, were recorded at the time of drilling by a staff geologist from this firm. The boring logs for the percolation tests are presented in Enclosure "B".

soils. A safety factor should be determined with consideration to other factors in the storm water retention system design, particularly storm water volume estimates and the safety factors associated with those design components.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions that appear different from those described herein be encountered in the field by the client or any firm performing services for the client or the client's assign, this firm should be contacted immediately in order that we might evaluate their effect.

The information presented in this report is not intended or represented to be suitable for reuse on extensions or modifications of this project, or for use on any other project.

CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.

Respectfully submitted,

CHJ CONSULTANTS

Maihan Noorzay, R.C.E. 77901
Project Engineer

LICENSED PROFESSIONAL ENGINEER
MAIHAN NOORZAY
No. 77901
Exp. 06-30-2017
CIVIL
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REGISTERED PROFESSIONAL ENGINEER
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GEOTECHNICAL
STATE OF CALIFORNIA
5-21-15

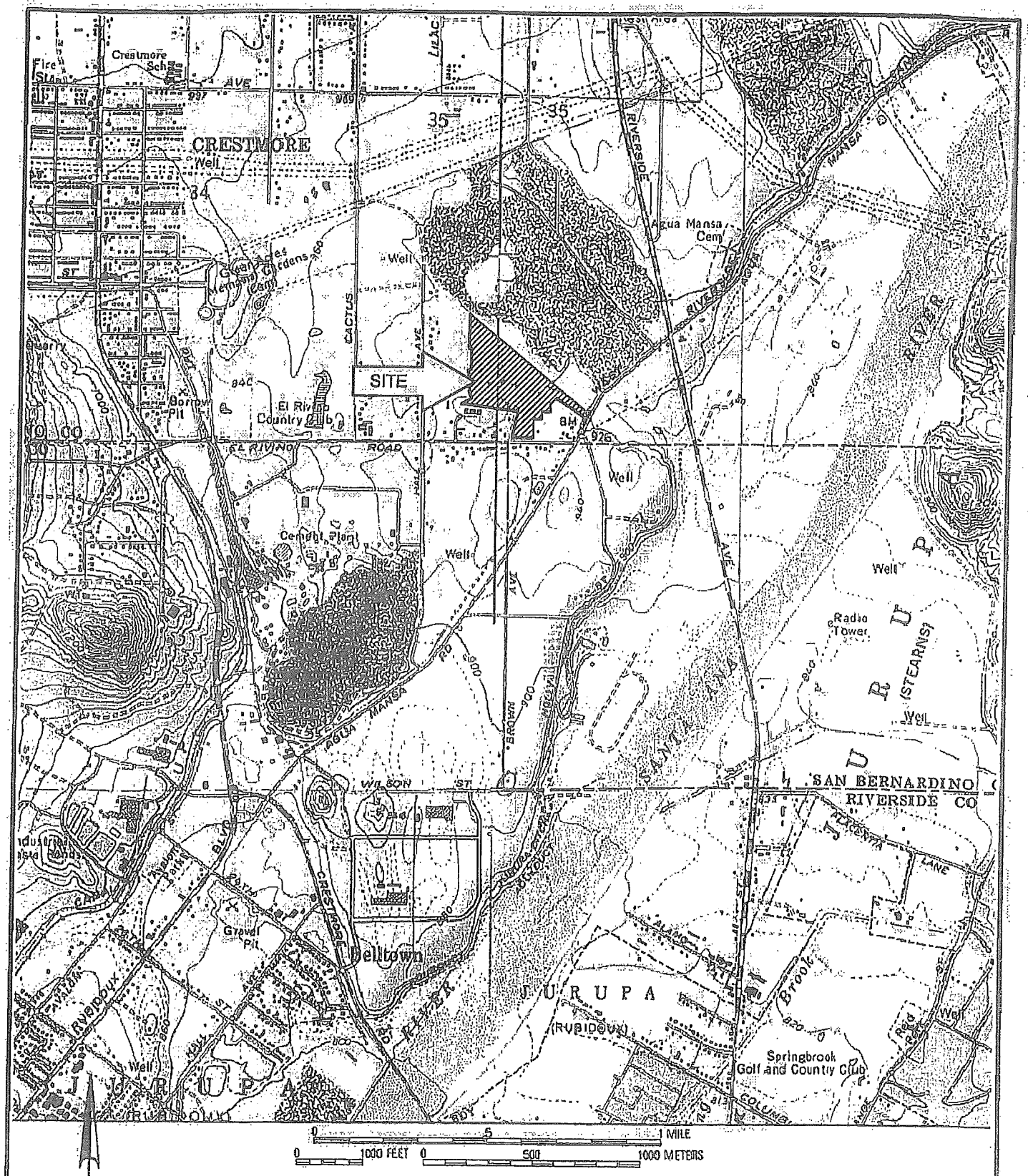
Robert J. Johnson, P.E.
President

MN/JFC/RJJ:lb

Enclosures:

	"A-1"	- Index Map
	"A-2"	- Site Plan
	"B-1" - "B-3"	- Exploratory Boring Logs
	"C-1" - "C-3"	- Particle Size Distribution
	"D-1" - "D-3"	- Percolation Test Data

Distribution: Allard Engineering (2 + email)



INDEX MAP

FOR: ALLARD ENGINEERING	PERCOLATION INVESTIGATION AGUA MANSA INDUSTRIAL PARK EAST OF DEL MESA ROAD AND HALBROOK LANE BLOOMINGTON, CALIFORNIA	ENCLOSURE "A-1"
DATE: MAY 2015		JOB NUMBER 15228-2

CHJ Consultants

EXPLORATORY BORING NO. P-3

Date Drilled: 5/14/15

Client: Allard Engineering

Equipment: CME 55 Truck Rig

Driving Weight / Drop: N/A

Surface Elevation (Ft.): N/A

Logged by: GA

DEPTH (ft)	GRAPHIC LOG	VISUAL CLASSIFICATION	REMARKS	SAMPLES DRIVE	SAMPLES BULK	VISUAL CLASSIFICATION GRADATION (%) FINES	SAND	GRAVEL	LAB TESTS
		(ML) Sandy Silt, fine, reddish brown	Fill						
5									
		(ML) Sandy Silt, fine, light greenish gray	Native						
10									
15									
20					▩	63	37	0	SA
		END OF BORING							
		NO REFUSAL, NO BEDROCK NO GROUNDWATER MODERATE CAVING, FILL TO 6'							
25									
30									

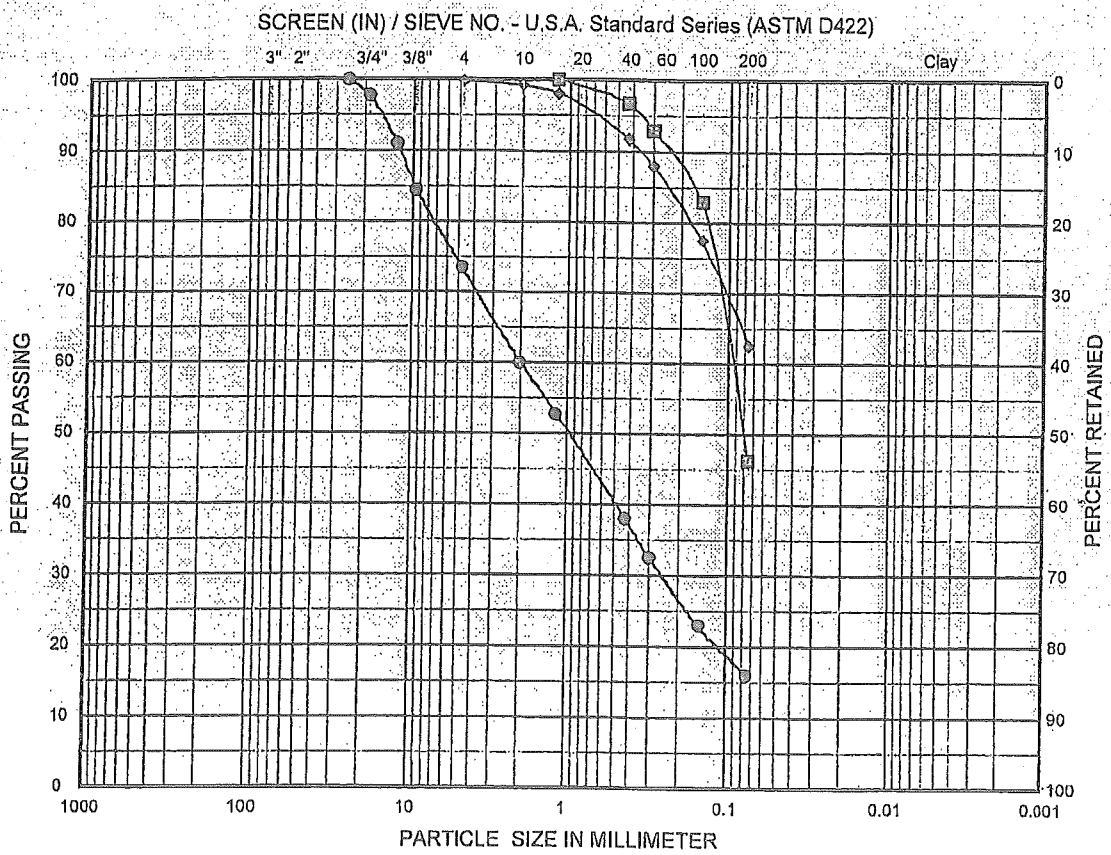
BORING FOR PERCOLATION - 35 FT./PAGE - 15228-2.GPJ - CHJ.GDT - 5/19/15

CHJ

AGUA MANSA INDUSTRIAL PARK
BLOOMINGTON, CALIFORNIA

Job No. 15228-2

Enclosure B-3



Cobbles & Boulders	Gravel		Sand			Silt	Clay
	Coarse	Fine	Coarse	Medium	Fine		

	Boring No.	Depth	Gravel	Sand	Fines	Clay	D_{10}	D_{30}	D_{50}	D_{60}	C_u	C_c
●	1	15	26.6	57.3	16.1		0.0407	0.253	0.963	1.993	49.0	0.8
	(SM) Silty sand with gravel, fine to coarse											
■	2	19		53.8	46.2				0.079	0.091		
	(SM) Silty sand, fine											
◆	3	19	0.1	37.3	62.5					0.067		
	(ML) Sandy Silt, fine											

PARTICLE SIZE DISTRIBUTION (ASTM D422)					
Project:	Agua Mansa Industrial Park				
Location:	Bloomington, California				
Job Number:	15228-2	Engineer:	MNoorzay	Enclosure:	C-1

N:\Projects\Geotechnical\2015\15228-2 Albert, Agua Mansa Industrial Park\Lab\Suite_15228-2.gpj

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Prepared at 5/18/2015 11:39:32 AM

Enclosure "D-2"
Job No.: 15228-2

PERCOLATION TEST DATA

BORING NUMBER: P-2
LOT No: N/A
TRACT No: N/A

CLIENT: Allard Engineering
PROJECT: Agua Mansa Industrial Park

DATE OF DRILLING: May 14, 2015
DATE OF TESTING: May 15, 2015
DRILLED BY: GA
TESTED BY: GA

DEPTH BEFORE (ft.): 20.0
DEPTH AFTER (ft.): 20.0
PVC PIPE DIA. (in.): 2.0
PERC HOLE DIA. (in.): 8.0
% VOID (Rock Backfill): 0.53

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate Q (gal/sq.ft/day)	Infiltration rate (based on Porchet Method) (in/hr)
25	25	2	11.9	9.9	20.0	20.0	29.9	10.0
25	50	2	11.6	9.6	20.0	20.0	28.9	9.6
10	60	2	7.9	5.9	20.0	20.0	38.9	13.0
10	70	2	7.8	5.8	20.0	20.0	38.2	12.7
10	80	2	7.8	5.8	20.0	20.0	38.2	12.7
10	90	2	7.9	5.9	20.0	20.0	38.9	13.0
10	100	2	8.0	6.0	20.0	20.0	39.7	13.2
10	110	2	7.8	5.8	20.0	20.0	38.2	12.7

Enclosure "D-3"
Job No.: 15228-2

PERCOLATION TEST DATA

BORING NUMBER: P-3
LOT No: N/A
TRACT No: N/A

CLIENT: Allard Engineering
PROJECT: Agua Mansa Industrial Park

DATE OF DRILLING: May 14, 2015
DATE OF TESTING: May 15, 2015
DRILLED BY: GA
TESTED BY: GA

DEPTH BEFORE (ft.): 20.0
DEPTH AFTER (ft.): 20.0
PVC PIPE DIA. (in.): 2.0
PERC HOLE DIA. (in.): 8.0
% VOID (Rock Backfill): 0.53

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate Q (gal/sq.ft/day)	Infiltration rate (based on Porchet Method) (in/hr)
25	25	1.8	10.1	8.3	20.0	20.0	23.3	7.8
25	50	0.9	10.1	9.2	20.0	20.0	25.2	8.4
10	60	1.8	8.0	6.2	20.0	20.0	40.7	13.6
10	70	2.0	7.9	5.9	20.0	20.0	38.5	12.8
10	80	2.0	7.4	5.4	20.0	20.0	35.1	11.7
10	90	2.0	7.6	5.6	20.0	20.0	36.6	12.2
10	100	2.0	7.4	5.4	20.0	20.0	34.7	11.6
10	110	2.0	7.5	5.5	20.0	20.0	35.8	11.9

TABLE OF CONTENTS

1. INTRODUCTION

2. NON-STORMWATER DISCHARGE

3 SPILL PREVENTS CONTROL & CLEANUP

4 OUTDOOR STORAGE OF RAW MATERIALS

5 OUTDOOR EQUIPMENT OPERATION

6 OUTDOOR LOADING/UNLOADING

7 WASTE HANDLING & DISPOSAL

8 BUILDING & GROUNDS MAINTENANCE

9 PARKING/STORAGE AREA MAINTENANCE

10 METHOD TO PREVENT STORM WATER POLLUTION

1) INTRODUCTION

This section include copies of the educational materials that will be used in implementing the project specific Water Quality Management Plan.

2. NON-STORMWATER DISCHARGES

2.1 Description

Non-storm water discharges are those flows that do not consist entirely of storm water. Some non-storm water discharges do not include pollutants and may be discharged to the storm drain. These include u neon laminated groundwater and natural springs. There are also some non-storm water discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-storm water discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system.. These discharges can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-storm water discharges to the storm water drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

2.2 Approach

Initially the industry must make an assessment of non-storm water discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-storm water discharges.
Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented.
Encourage litter control.
Develop clear protocols and lines of communication for effectively prohibiting non storm water discharges, especially those that are not classified as hazardous. These axe often not responded to as effectively as they need to be stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as Dump No Waste Drains to Stream stenciled or demarcate next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
Isolate problem areas and plug illicit discharges points.
Inventory and inspect each discharges point during dry weather.
During dry weather the storm water collection system is filled with smoke and then traced to sources.The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the storm water system.

3. SPILL PREVENTION, CONTROL & CLEANUP

3.1 Description

Many activities (that occur at an industrial or commercial site) have the potential to cause accidental *or* illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of storm water pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the storm water drainage system, and train personnel to prevent and control future spills.

3.2 Approach

Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

Recycle, reclaim or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

Place drip pans or absorbent materials beneath al mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.

Checks tanks daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

Label all containers according to their contents.

3.3 Spill Control and Cleanup Activities

Follow the Spill Prevention Control Countermeasure Plan.
Clean up leaks and spills immediately.
Place a stockpile of spill cleanup materials where it will be readily accessible.
Never hose down or bury dry material spills. Sweep up the material and dispose of Properly.
Chemical cleanups of material can be achieved with the use of adsorbents, gels, and forms.
Use adsorbent materials on small spills rather than hosing down the spill.
Remove the adsorbent materials promptly and dispose of properly.
For larger spills, a private spill cleanup company or Hazmat team may be necessary.

3.4 Reporting

Reporting spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
Federal regulations require that any 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)
Report spills to local agencies, such as the fire department; they can assist in cleanup.
Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
Maintenance is critical to preventing leaks and spills. Conduct routing inspections.
Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of storm water and the runoff of spills.

3.5 Training

Educate employees about spill prevention and cleanup.
The employee should have the tools and knowledge to immediately begin cleaning up as pill should one occurs. Employees should be familiar with the spill Prevention Control and Countermeasure Plan.
Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control Countermeasure Plan and the plan should be readily available.
Train employees to recognize and report illegal dumping incidents.
For the purposes of developing a spill prevention and response program to meet the storm water regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheet in this handbook, for specific activities.

4. OUTDOOR EQUIPMENT OPERATIONS

4.1 Description

Outside process equipment operations and maintenance can contaminate storm water runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operation that can lead to contamination of storm water runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

4.2 Approach

Perform the activity during dry periods.
Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.
Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
Minimize contact of storm water with outside process equipment operations through berming and drainage routing. If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
Keep your Spill Prevention Control and Countermeasure Plan up-to-date. Place a stockpile of spill cleanup materials where it will be readily accessible.
Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

4.3 Training

Train employees to perform the activity during dry periods only or substituting benign materials for more toxic ones.
Train employee and contractors in proper techniques for spill containment and cleanup. Employees should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

4.4 Prevention

Keep Spill Prevention Control and Counter measure Plan up-to-date.
Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
Place a stockpile of spill cleanup materials where it will be readily accessible.

5. OUTDOOR LOADING / UNLOADING

5.1 Description

The loading/unloading of materials usually lakes place outside on docks or terminals; therefore materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by storm water runoff or when the area is cleaned. Additionally, rainfall may wash pollutant from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to storm water from outdoor loading/unloading of materials.

5.2 Approach

Reduce potential for pollution discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Keep accurate maintenance logs to evaluate materials removed and improvements made.
Parks tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
Limit exposure of material to rainfall whenever possible.
Prevent storm water run-on.
Check equipment regularly for leaks
Develop an operations plan that describes procedures for loading and/or unloading.
Conduct loading and unloading in dry weather if possible.
Cover designated loading/unloading areas to reduce exposure of materials to rain
Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
Load/unload only at designated loading areas.
Pave loading areas with concrete instead of asphalt.
Avoid placing storm drains in the area.
Keep your Spill Prevention Control and Countermeasure Plan up-to-date
Store and maintain appropriate spill cleanup materials in a location. that is readily accessible and known to all and ensure that employees are familiar with the site spill control plan and proper spill cleanup procedures.
Have an emergency spill cleanup plan readily available
Use drip pans or comparable devices when transferring oils, solvents, and paints.

5.3 Inspection

Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
Look for dust or fumes during loading or unloading operations.

5.4 Training

Train employees and contractors on proper spill containment and cleanup.
Have employees trained in spill containment and cleanup present during loading/unloading.
Train employees in proper handling techniques during liquid transfers to avoid spills
Make sure forklift operators are properly trained on loading and unloading procedures.

6.2 Inspection

Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
Check waste management areas for leaking containers or spills.
Repair leasing equipment including valves, lines, seals, or pumps promptly.

6.3 Training

Train staff in pollution prevention measures and proper disposal methods.
Train employees and contractors in proper spill containment and cleanup.
The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
Train employees and subcontractors in proper hazardous waste management

6.4 Prevention

Keep Spill Prevention Control and Countermeasure Plan up-to-date.
Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills.
Collect all spilled liquids and properly dispose of them.
Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.

7. OUTDOOR STORAGE OF RAW MATERIALS

7.1 Description

Raw materials, by-products, finished products, containers, and material storage areas exposed to rain and/or runoff can pollute storm water. Storm water can become contaminated when materials wash off or dissolve into water or are added to runoff by spills and leaks. Improper storage of these materials can result in accidental spills and the release of materials. To prevent or reduce the discharge of pollutants to storm water from material delivery and storage, pollution prevention and source control measures must be implemented, such as minimizing the storage of hazardous materials on-site$_3$ enclosing or covering materials, storing materials in a designated area, installing secondary containment, conducting regular inspections, preventing storm water run-on and runoff, and training employees and subcontractors.

7.2 Approach

Emphasize employee education for successful BMP implementation.
Keep an accurate, up-to-date inventory of the materials delivered and stored on-site.
Keep chemicals in their original containers and keep them well labeled.
Keep outdoor storage containers in good condition.
Minimize storm water run-on by enclosing the area or building a berm around it.
Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use. Curbing should be placed along the perimeter of the area to prevent the run-on of uncontaminated storm water from adjacent areas as well as runoff of storm water from the stockpile areas.

7.3 **Inspection**

Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible.
Check berms, curbing, containment for repair and patching.

7.2 **Training**

Train employees well in proper material storage.
Train employees and contractors in proper techniques for spill containment and cleanup.

7.3 **Prevention**

Keep Spill Prevention Control and Countermeasure Plan up-to-date. Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers near the storage area where it will be ready accessible.
Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.

8. BUILDING & GROUNDS MAINTENANCE

8.1 **Description**

Storm water runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to storm water from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the storm water collection system.

8.2 **Approach**

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Switch to non-toxic chemicals for maintenance when possible.

Choose cleaning agents that can be recycled.
Encourage proper lawn management and landscaping, including use of native vegetation.
Encourage use of Integrated Pest Management techniques for pest control.
Encourage proper onsite recycling of yard trimmings.
Recycle residual paints, solvents, lumber, and other material as much as possible.
If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filer fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
If pressured washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement

8.3 **Landscaping Activities**

Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage system. Use mulch or other erosion control measures on exposed soils.

8.4 **Building Repair, Remodeling and Construction**

Do not dump any toxic substance or liquid waste on *the* paveme.nl, the ground, or toward a storm drain.

Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.

Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit$_s$ wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days.

Store toxic material under cover during precipitation events and when not in use. A Cover would include tarps or other temporary cover material.

8.5 **Inspection**

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.

8.6 **Training**

Educate and train employees on pesticide use and in pesticide application techniques to
prevent pollution.

Train employees and contractors in proper techniques for spill containment and cleanup Be sure the frequency of training takes into account the complexity of the operations and
the nature of the staff.

8.7 **Prevention**

Keep Spill Prevention Control and Countermeasure Plan up-to-date.

Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers near the storage area where it wall be readily accessible.

Have employees trained in spill containment and cleanup present during the, loading/unloading of dangerous wastes, liquid chemicals, or other materials. Clean up spills immediately.

9. PARKING / STORAGE AREA MAINTENANCE

9.1 Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through storm water runoff or non-storm water discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMP s and training employees.

9.2 Approach

The goal of this program is to ensure storm water pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Encourage alternative designs and maintenance strategies for impervious parking lots.

Keep accurate maintenance logs to evaluate BMP implementation.

Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.

Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

9.3 Controlling Litter, Surf ace Cleaning, and Repair

Post No Littering signs and enforce anti-litter laws.

Provide an adequate number of litter receptacles.

Routinely sweep, shovel, and dispose of litter in the trash.

Use dry cleaning methods to prevent the discharge of pollutants into the storm water conveyance system if possible.

Sweep all parking lots at least once before the onset of the wet season.

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting storm water runoff.

Use only as much water as necessary for dust control, to avoid runoff.

Catch drips from paving equipment that is not in use with pans or absorbent material place under the machines. Dispose of collected material and absorbents property.

9.4 Inspection

Have designated personnel conduct inspections of parking facilities and storm water conveyance systems associated with parking facilities on a regular basis.

9.5 Training

Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.

Train employees and contractors in proper techniques for spill containment and cleanup.

9.6 Prevention

Keep Spill Prevention Control Countermeasure Plan up-to-date.

Place stockpile of spill cleanup materials where it will be readily accessible or at a central location.

Clean up fluid spills immediately with absorbent rags or material. *JBS* Dispose or spilled material and absorbents properly.

10. METHOD TO PREVENT STORM WATER POLLUTION

Who is responsible for Storm Water Pollution Prevention?

10.1 In one sentence

Each individual working in the company is a responsible party. Of course there is one employee in charge of the program, but without your co-operation his/her job will be very difficult. We should keep our eyes open watching for any possible source of pollutants and either eliminate it or at least if you can't report the situation immediately to the management.

What is our company's propose to prevent storm water pollution?

(a) Facility Design

The site storm water run off is mainly directed to under ground filtration chambers. This means mat the storm water run off is going to the under ground reservoirs. To Reduce the under ground water pollution the storm water run off is going first to a "Filtration System" with high efficiency to capture the majority of sediments, oil and grease, suspended solid and will treat some of the dissolved solids and nutrients. Any equipment in the world has a limit in capacity. If we over load the filtration system with pollutants, the result are some of the pollutants will escape the system and go to the Filtration Chambers. We have to do what we agreed on; otherwise the "Filtration System" will be overwhelmed. It is not only some pollutants will escape the Filter but also it will be clogged with debris.

In the Original design of the facility there are two major Best Management Measures used:

(1) Filtration System (Show the slide of the filter drawing/picture)

(2) Filtration Chambers. (Show the drawing/picture of the filtration chamber)

Offer brief explanation of how these two BMP's function.

In the Water Quality Management Plan you can find the maintenance procedures and schedule for these two measures.

(b) Operation and Maintenance

Through the implementation of the Water Quality Management the company is taking all possible precautions to prevent the storm water run off pollution. Actually the training we have today is part of this plan.

Periodical inspection and maintenance of at the BMP's are required.
Copy of the "WQMP" is available for you to review.

[At this time the trainer will pick up a copy of the plan and show it to the trainees. Also the trainer shall highlight the main sections of the plan]

Once the trainer completes that he/she will guide the trainees through the facility to show them where are the "Filtration System" inlet and the location of the "Filtration Chambers". Then the trainer shall guide the group to show the landscape areas around the parameter of the site and how the sprinkler system is designed and controlled.

Then back to the class room to complete the training.

GOVERNMENT ORGANIZATIONS INVOLVED IN THE WQMP AND REGULATIONS:

Storm water pollution prevention started with Federal Regulations "Clean Water Act". States and Counties established detailed regulations in implementing the federal program. The program in the State of California is managed by The State Water Quality Control Board. Riverside County and City of Perris are responsible for enforcing the program and monitoring the compliance of all Commercial and Industrial Facilities in their jurisdiction.

The regulations allow the local authorities to impose penalties on violators. These penalties range from warning to fines and imprisonment depending on the kind of violation. Repeated violations or ignoring the required corrective actions can escalate the level of penalty even if it is a minor violation.

It is for every employee benefit to avoid any kind of violation. Penalties can threaten the continuation of the business operation. The bottom line is, when prevent storm water pollution we are:

(1) Protect our health and our children health
(2) Protect our job in Western Way Recycling

Let's make Pollution Prevention Part of our Daily Life

Class Room Training

The class room training shall cover the following:

1. What is the definition of storm water?
2. Where the storm water goes?
3. Why we are concerned about preventing the storm water pollution?
4. What are the substances that may pollute the storm water in general and what are the specific site potential pollutants?
5. How we can prevent those pollutants from reaching the storm water?
6. Who is responsible for storm water pollution prevention?
7. What our company (Western Way Recycling, Inc.) did and doing to prevent the storm water pollution?
8. The government organization responsible for the storm water pollution prevention program.

The Trainer: A qualified company employee or outside qualified consultant

Class room environment and tools:
Shall be comfortable setting using overhead projector. Preferred to have pictures of the existing on site BMPs (The retention area, filtration system and Infiltration Chambers Maximum number of trainees per class is 10 employees.

Method of approach:
Dynamic interaction based on addressing questions to the trainees. It is very important t& tie the training to the trainee's real life daily practice. At the end of the class the trainer should give sufficient time for the trainees to ask questions and generate suggestions from the trainees. Any suggestion regardless if it may look not valid shall be considered for discussion and positive criticism by the group.
The final list of employee's suggestions shall be presented to the company management for consideration. This is the best way to get the employees to participate in the implementation of the program.

Class room training shall be on annual base. The training material shall be revised to include:

- Employees suggestions from the previous training
- Update in permit conditions
- Any new regulations
- Any change in the operations

1. What is the Storm Water?

It is in common term the Rain Water. The natural cycle of water on earth start from the evaporated water mainly off the world large water bodies (Oceans, Seas, and Lakes). The water vapor forms the clouds which under certain weather conditions fall on the ground water drops or snow.

2. Where the Storm Water Goes?

The Storm Water (Rain) is the life blood for all human beings, animals and plants. Looking at the world map there are large areas just plain desert Good example is the desert areas in California. If God forbid- we suffer drought for extended period of time-say 7 to 8 years- our whole state will turn gradually to be desert. Considerable amount of rain water penetrate the surface soil and ends up in the under ground naturally created reservoirs which we call aquifers. These aquifers are the source of water feeding the water wells. The Inland empire and San Gabriel Valley area depending on the under ground water for the majority of these areas residential, commercial and industrial water supply needs. The rest of the rainwater which fall on the paved street, buildings, parking lots or any other impervious surfaces are collected by a huge piping net work and flood control channels and directed to the ocean. In addition there is always runoff quantity of rain water the soil can not absorb -especially in times of heavy rain- also goes to the storm water piping and flood control channels. If you look carefully under the streets curbs you can see large openings which are the inlet to the flood control system.

3. Why we are concerned about preventing the Storm Water Pollution?

Considering what we discussed before, the rain water will end up either in the ocean or in the under ground water reservoirs. The ocean is the world of magnificent marine life supplied us with all kinds of seafood Also it is where we go with our children to enjoy swimming and playing. Any pollutants may end up in the bodies of the seafood we eat. In case of high pollution the ocean beaches will be dangerous for the adults and children. The under ground water is what we are using in our homes for drinking, cooking, cleaning and other purposes.
In very short answer, WE PREVENT THE RAIN WATER POLLUTION BECAUSE WE ARE PROTECTING OUR SELF.

4. Pollutants

Pollutants are any substance which can represent threat to human life, marine life and plants. They range from mild pollutants to extremely dangerous and toxic pollutants. No doubt that the modern civilization created hundreds of chemicals that were not in nature before or were not exposed to use. Examples are: Oil and Grease, mercury compounds, solvents, pesticides, chemical fertilizers, specific metals and metal compounds etc. In the attached publication by Federal EPA # 833-B-03-002 you can see how different pollutants can affect the marine life. These pollutants include: Debris, Sediments, Excess Nutrients, Bacteria and Household Hazardous In our operation here we receive tons of empty cans, glass bottles and printed paper. The rain water can wash down the recyclable materials which potentially carry several pollutants. These pollutants can end up either to storm water drainage system then to the ocean or in the underground water.

5. How can we prevent the pollutants from mixing with the storm water?

a) Housekeeping; we can not stress enough the importance of housekeeping. Clean yard and well organized storage of material is the first pollution prevention measure.
b) Containment of any spilled liquids. In case some of the containers may have left over fluids, the operator should not allow the spill to spread all over the place. Use absorbents to contain the spill. DO NOT WASH ANY SPILL BY HOSING IT DOWN THE STORM WATER DRAIN.
c) No car wash or truck wash on site
d) No oil change or any car repair shall be performed on site.
e) Customers and employees shall use the available trash cans and not to litter the trash any where.
f) It is forbidden to intentionally dispose of any fluids to the storm water drain specially waste oil, cleaners, soap, alcohol beverage, pesticides, weed Wing chemicals, acids and alkaline .
g) Watch for any excess plant and lawn watering. The excessive watering and cause run-off to the storm water drain. Most probably the run off will carry with it sediments, soil fertilizers and pesticide (If it was in the soil)
h) Now the trainer can ask the attendees to suggest more measures

6. Who is Responsible for Storm Water Pollution Prevention?

In one sentence: Each individual working in the company is a responsible party.
Of course there is one employee in charge of the program, but without your co-operation his / her job will be very difficult. We should keep our eyes open watching for any possible source of pollutants and either eliminate it or at least if you can 7 report the situation immediately to the management.

7. What is our company (Western Way Recycling) is doing to prevent storm water pollution?

(a) Facility Design
The site storm water run off is mainly directed to under ground filtration chambers. This means that the storm water run off is going to the under ground water reservoirs. To reduce the under ground water pollution the storm water run off is going first to a
violation. Repeated violations or ignoring the required corrective actions can escalate the level of penalty even if it is a minor violation.

It is for every employee benefit to avoid any kind of violation. Penalties can threaten the continuation of the business operation. The bottom line is, when prevent storm water pollution we are:

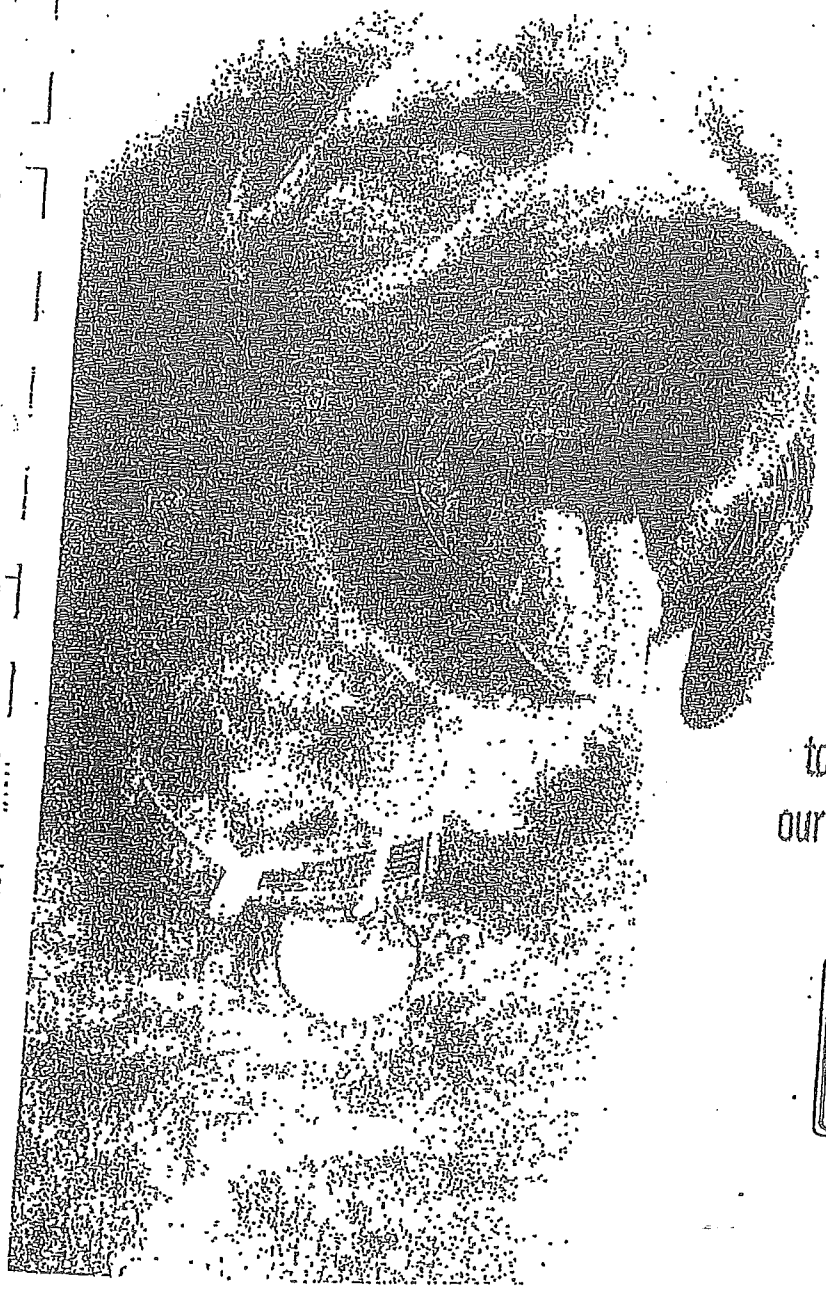
1) Protect our health and our children health
2) Protect our job in Western Way Recycling

3) Protect our health and our children health
4) Protect our job in

Let make Pollution Prevention Part of our Daily

Questions and Answers

Pick up after your pooch to curb pollution.



Maybe you weren't aware, but dog waste left on the ground gets into storm drains, polluting rivers, lakes and beaches.

The bacteria and risk of disease threatens the health of our kids and communities. Wherever you live in San Bernardino County, this pollution is a problem. The answer? Pick up after your dog, to help prevent pollution and protect our health. It's in your hands.

CITY OF FONTANA

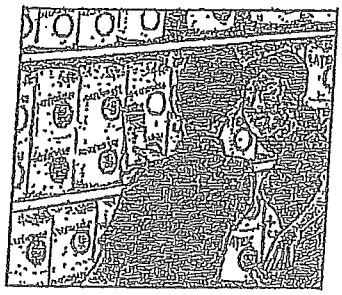
Printed on recycled paper

Pollution Prevention

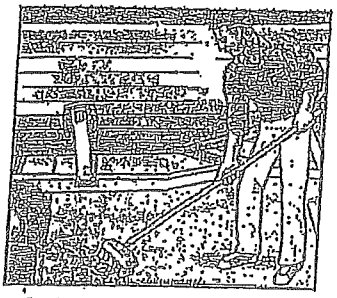
STORMWATER

PAINTING

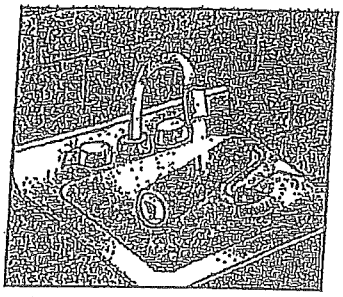
Paints, solvents, adhesives and other toxic chemicals used in painting often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife.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



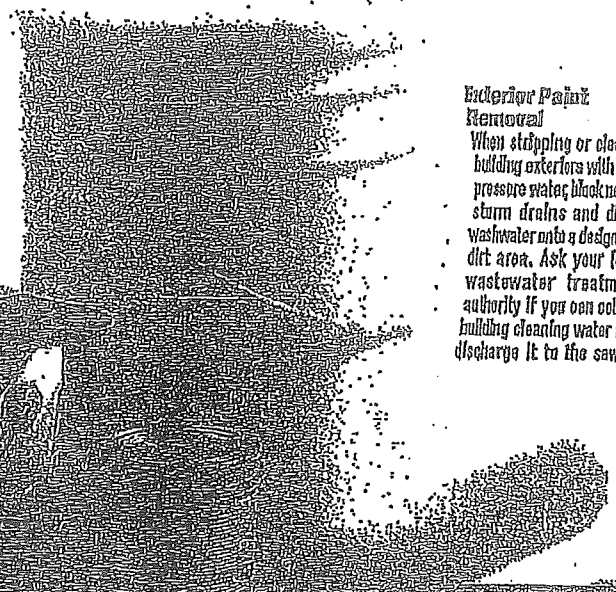
Water-Based Paints
Use water-based paints whenever possible. They are less toxic than oil-based paints and easier to clean up. Look for products labeled "latex" or "cleans with water."



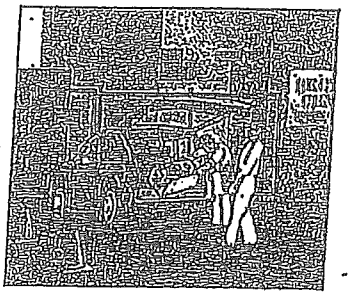
Paint Removal
Sweep up paint stripping residue, chips and dust instead of hosing into the street and dispose of them safely at a household hazardous waste collection facility. Call (800) CLEANUP for the facility in your area.



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



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



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

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

1-(800) CLEANUP

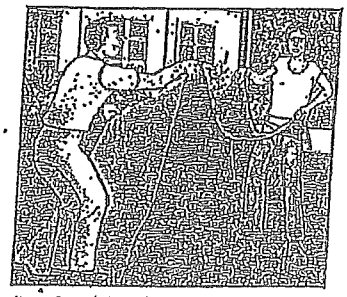
www.1800cleanup.org

CITY OF FONTANA

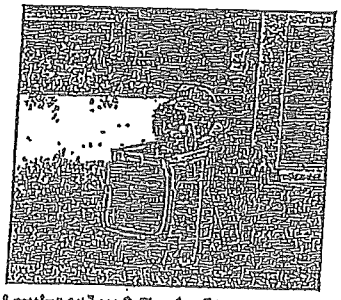
Stormwater Pollution Prevention

HOME REPAIR & REMODELING

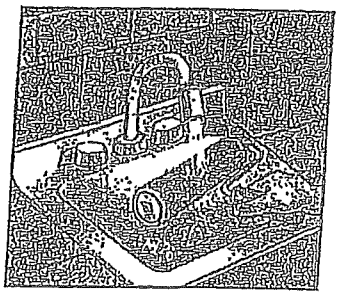
Paints, solvents, adhesives and other toxic substances used in home repair and remodeling often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe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



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



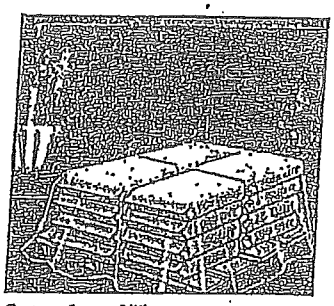
Landscaping & Gardening
Avoid applying fertilizers or pesticide near curbs and driveways, and store covered, protected from rain, wind and runoff. Try using organic or non-toxic alternatives. Reduce runoff and lower your water bill by using drip irrigation, soaker hoses or micro-spray systems. Recycle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



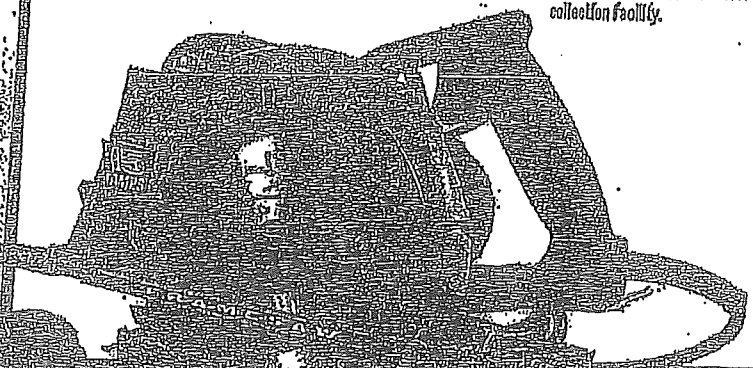
Painting Cleanup
Avoid cleaning brushes or rinsing paint containers in the street, gutter or near a storm drain. Clean water-based paints in the sink. Clean oil-based paints with thinner, which you can filter and reuse. Recycle leftover paint at a household hazardous waste collection facility, save it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

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

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



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



For more information or to report illegal dumping, call your city pollution prevention hotline:

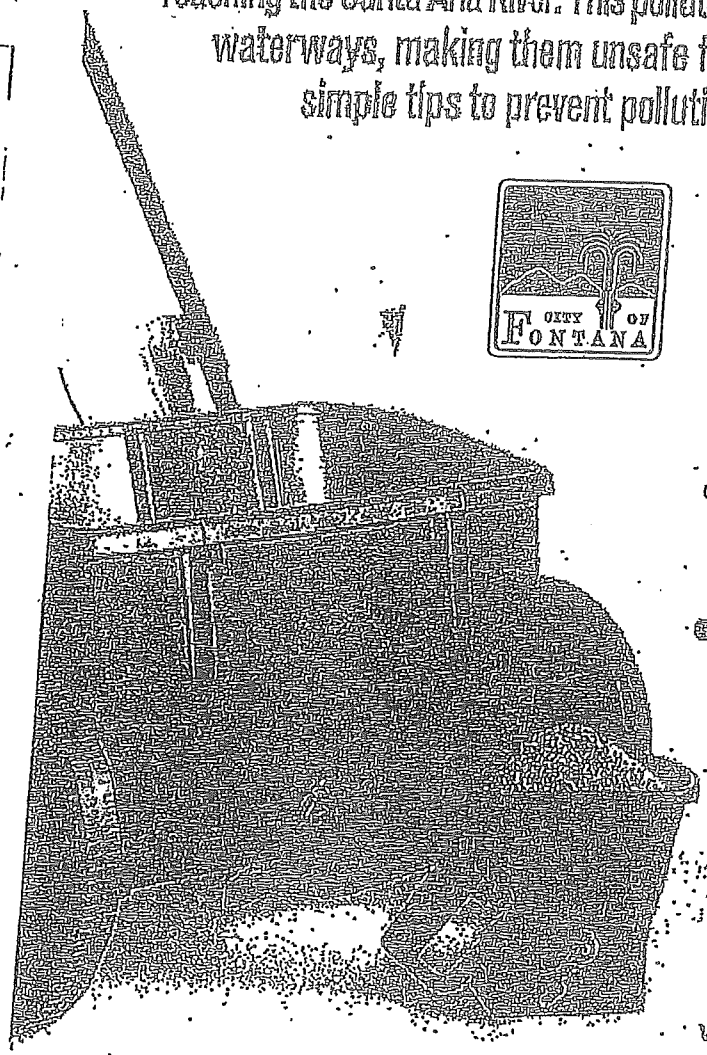
1-1-1 (800) CLEANUP

www.1800cleanup.org

CITY OF FONTANA

Fertilizer Tips to Prevent Pollution

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



CITY OF FONTANA

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

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

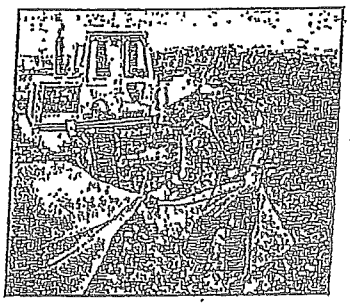
1 (800) CLEANUP

www.1800cleanup.org

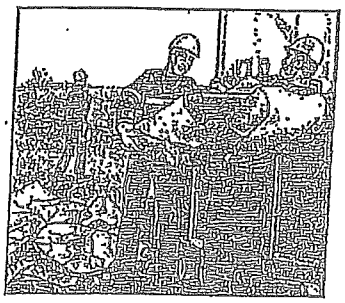
Pollution Prevention STORMWATER

FRESH CONCRETE & MORTAR APPLICATION

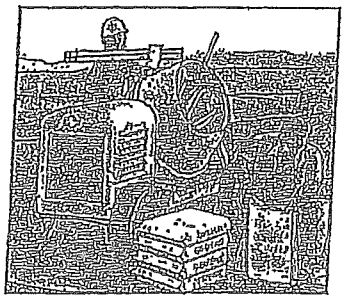
Cement wash, sediment, vehicle fluids, dust and hazardous debris from construction sites often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for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



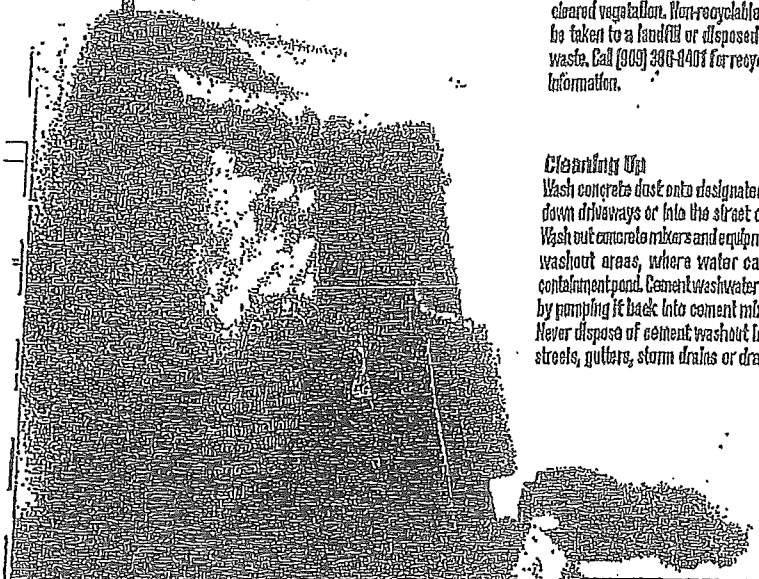
Storing Materials
Keep construction materials and debris away from the street, gutter and storm drains. Secure open bags of cement and cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.



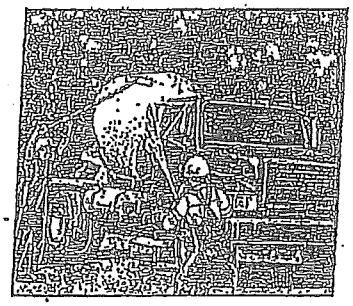
Ordering Materials & Recycling Waste
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation.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



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



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



To report illegal dumping or report information on stormwater pollution call

1-(800)-CLEANUP

www.1800cleanup.org

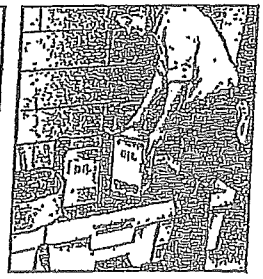
CITY OF FONTANA

Stormwater Pollution Prevention

AUTO MAINTENANCE

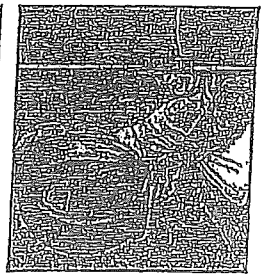
Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a shop sink, parking lot, driveway or street.

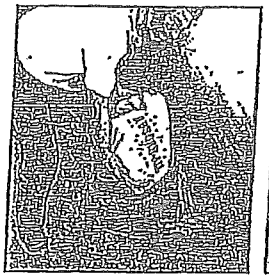


Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Metal Grinding and Polishing
Keep a bin under your lathe or grinder to capture metal filings. Send uncontaminated filings to a scrap metal recycler for reclamation. Store metal filings in a covered container or indoors.

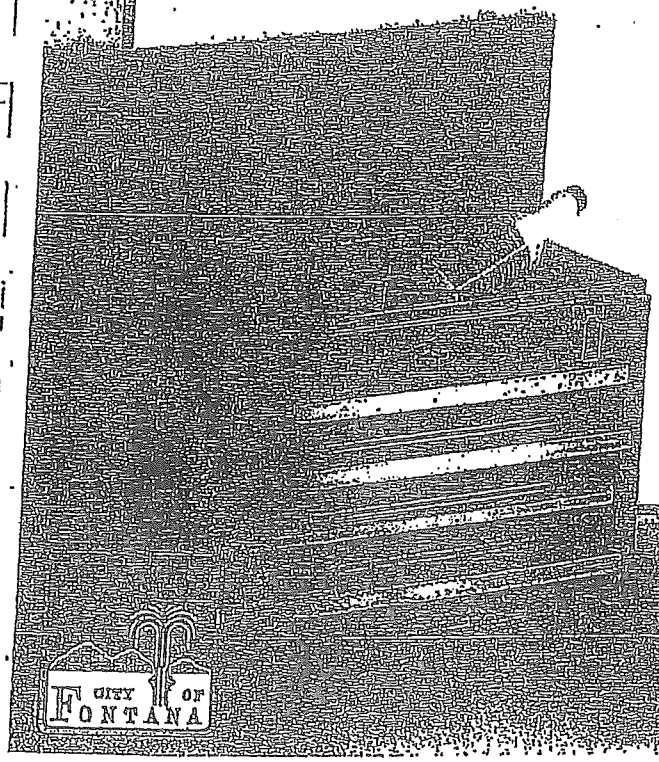


Preventing Leaks and Spills
Place drip pans underneath to capture fluids. Use absorbent cleaning agents instead of water to clean work areas.



Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). Follow your hazardous materials response plan, as filed with your local fire department or other hazardous materials authority. Be sure that all employees are aware of the plan and are capable of implementing each phase. To report serious toxic spills, call 911.

Proper Disposal of Hazardous Waste
Recycle used motor oil and oil filters, anti-freeze and other hazardous automotive fluids, batteries, tires and metal filings collected from grinding or polishing auto parts. Contact a licensed hazardous waste hauler. For more recycling information, call (909) 388-8401.



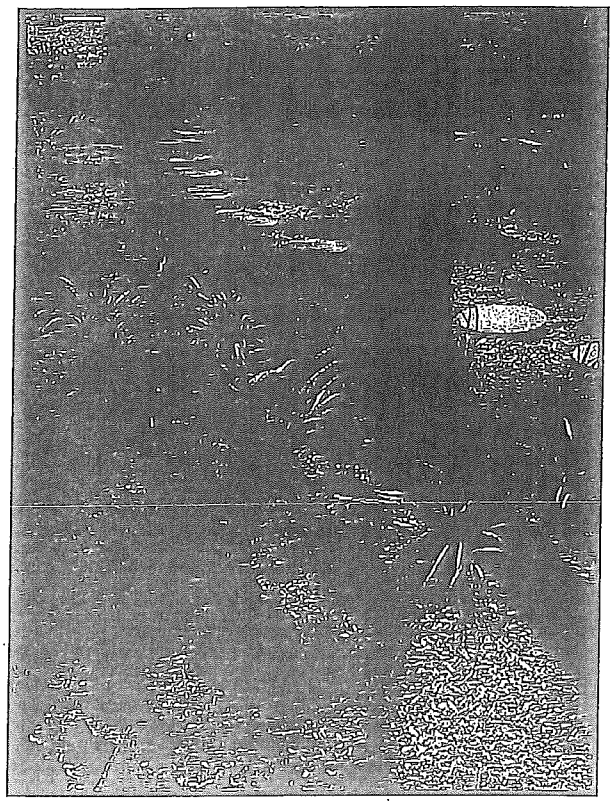
To report illegal dumping or for more information on stormwater pollution prevention, call:

1 (800) CLEANUP

www.1800cleanup.org

City of Fontana

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.

Designing New Installations

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

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

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

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

Conserve Natural Areas during Landscape Planning

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

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

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

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

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

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

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

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

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

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

Protection of Slopes and Channels during Landscape Design

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

Redeveloping Existing Installations

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

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

Other Resources

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

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

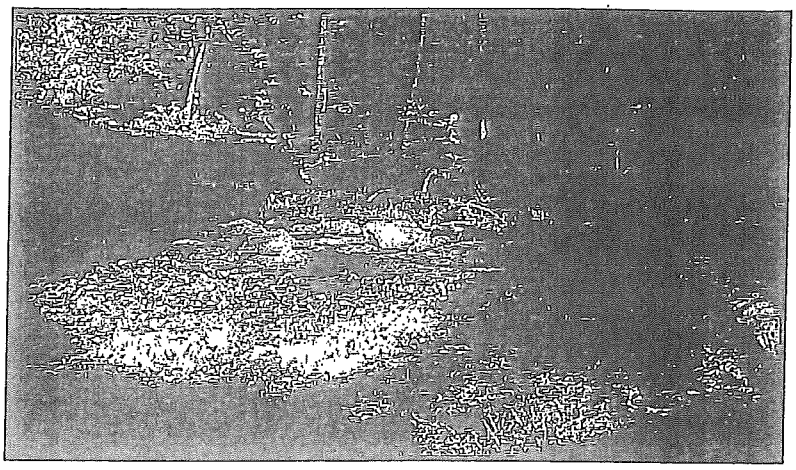
Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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

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

Roof Runoff Controls

SD-11



Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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

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

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

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

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

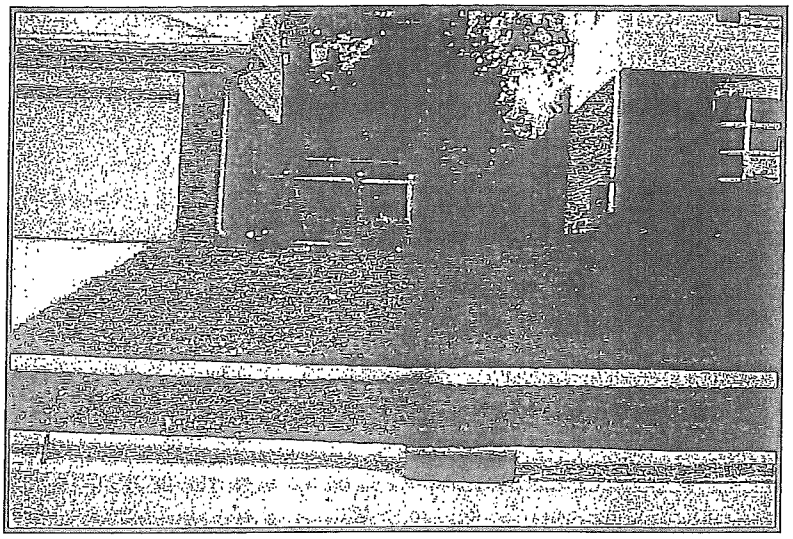
Other Resources

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

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

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

Efficient Irrigation SD-12



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

- 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.

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

Supplemental Information

Examples

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

Other Resources

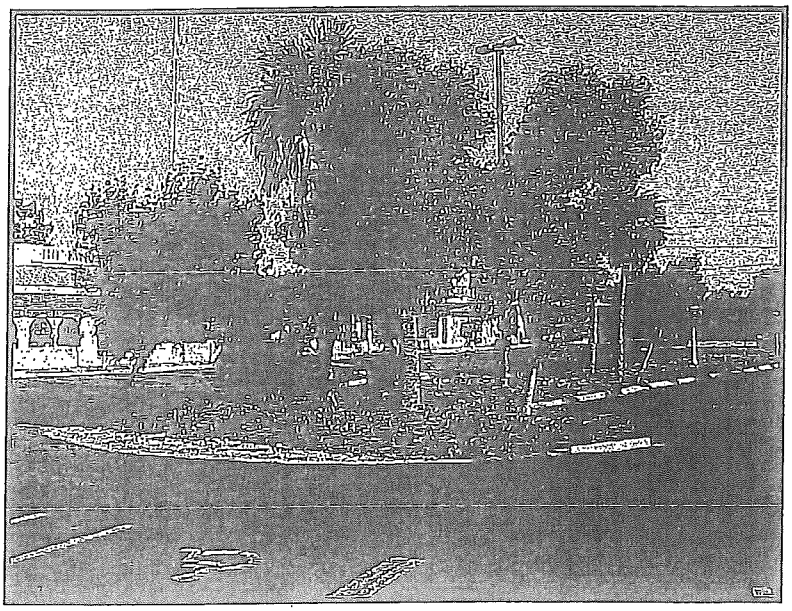
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

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

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

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

Parking/Storage Area Maintenance SC-43



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

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

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

Surface cleaning

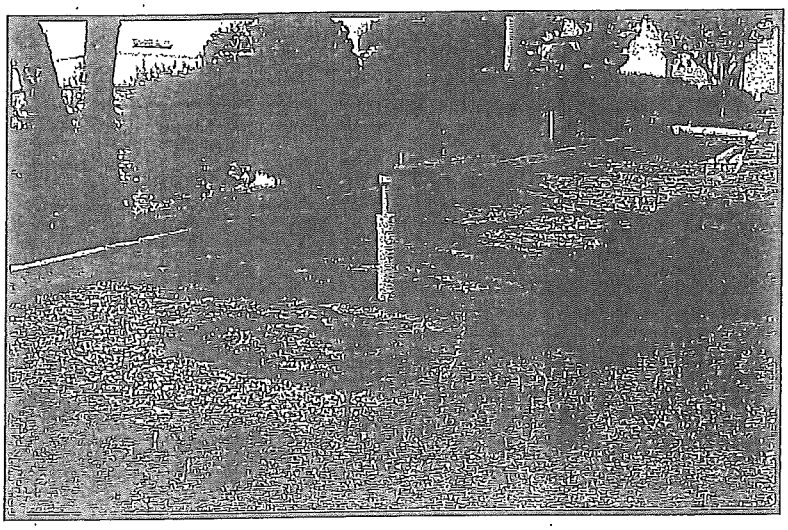
- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

Surface Repair

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

Infiltration Trench

TC-10



Maintenance Concerns, Objectives, and Goals

- Accumulation of Metals
- Clogged Soil Outlet Structures
- Vegetation/Landscape Maintenance

General Description

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

Targeted Constituents

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

Legend *(Removal Effectiveness)*

○ Low ■ High

△ Medium

Inspection/Maintenance Considerations

Frequency of clogging is dependant on effectiveness of pretreatment, such as vegetated buffer strips, at removing sediments. See appropriate maintenance factsheets for associated pretreatment. If the trench clogs, it may be necessary to remove and replace all or part of the filter fabric and possibly the coarse aggregate. Clogged infiltration trenches with surface standing water can become a nuisance due to mosquito breeding. Maintenance efforts associated with infiltration trenches should include frequent inspections to ensure that water infiltrates into the subsurface completely at a recommended infiltration rate of 72 hours or less to prevent creating mosquito and other vector habitats. Most of the maintenance should be concentrated on the pretreatment practices, such as buffer strips and swales upstream of the trench to ensure that sediment does not reach the infiltration trench. Regular inspection should determine if the sediment removal structures require routine maintenance. Infiltration trenches should not be put into operation until the upstream tributary area is stabilized.

▫ Inspect after every major storm for the first few months to ensure proper functioning. Drain times should be observed to confirm that designed drain times has been achieved.	After construction
▫ Inspect facility for signs of wetness or damage to structures, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, standing water, and material buildup. ▫ Check for standing water or, if available, check observation wells following 3 days of dry weather to ensure proper drain time. ▫ Inspect pretreatment devices and diversion structures for damage, sediment buildup, and structural damage.	Semi-annual and after extreme events
▫ Trenches with filter fabric should be inspected for sediment deposits by removing a small section of the top layer. If inspection indicates that the trench is partially or completely clogged, it should be restored to its design condition.	Annual
▫ Repair undercut and eroded areas at inflow and outflow structures. ▫ Remove sediment, debris, and oil/grease from pretreatment devices and overflow structures.	Standard maintenance (as needed)
▫ Remove trash, debris, grass clippings, trees, and other large vegetation from the trench perimeter and dispose of properly. ▫ Mow and trim vegetation to prevent establishment of woody vegetation, and for aesthetic and vector reasons.	Semi-annual, more often as needed
▫ Clean out sediment traps, forebays, inlet/outlet structures, overflow spillway, and trenches if necessary. ▫ Remove grass clippings, leaves, and accumulated sediment from the surface of the trench. Replace first layer of aggregate and filter fabric if clogging appears only to be at the surface. ▫ Clean trench when loss of infiltrative capacity is observed. If drawdown time is observed to have increased significantly over the design drawdown time, removal of sediment may be necessary. This is an expensive maintenance activity and the need for it can be minimized through prevention of upstream erosion.	Annual
▫ If bypass capability is available, it may be possible to regain the infiltration rate in the short term by providing an extended dry period. ▫ Seed or sod to restore ground cover.	5-year maintenance
▫ Total rehabilitation of the trench should be conducted to maintain storage capacity within 2/3 of the design treatment volume and 72-hour exfiltration rate limit. ▫ Trench walls should be excavated to expose clean soil. ▫ All of the stone aggregate and filter fabric or media must be removed. Accumulated sediment should be stripped from the trench bottom. At this point the bottom may be scarified or tilled to help induce infiltration. New fabric and clean stone aggregate should be refilled.	Upon failure

Additional Information

Infiltration practices have historically had a high rate of failure compared to other stormwater management practices. One study conducted in Prince George's County, Maryland (Galli, 1992), revealed that less than half of the infiltration trenches investigated (of about 50) were still functioning properly, and less than one-third still functioned properly after 5 years. Many of these practices, however, did not incorporate advanced pretreatment. By carefully selecting the location and improving the design features of infiltration practices, their performance should improve.

It is absolutely critical that settleable particles and floatable organic materials be removed from runoff water before it enters the infiltration trench. The trench will clog and become nonfunctional if excessive particulate matter is allowed to enter the trench.

Cold climate considerations – see http://www.cwp.org/cold-climates.htm

References

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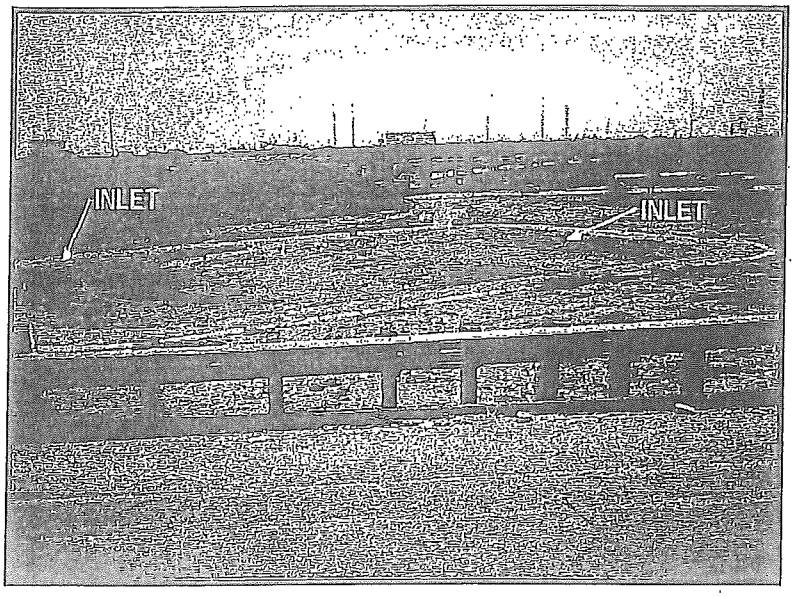
Infiltration Basin

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

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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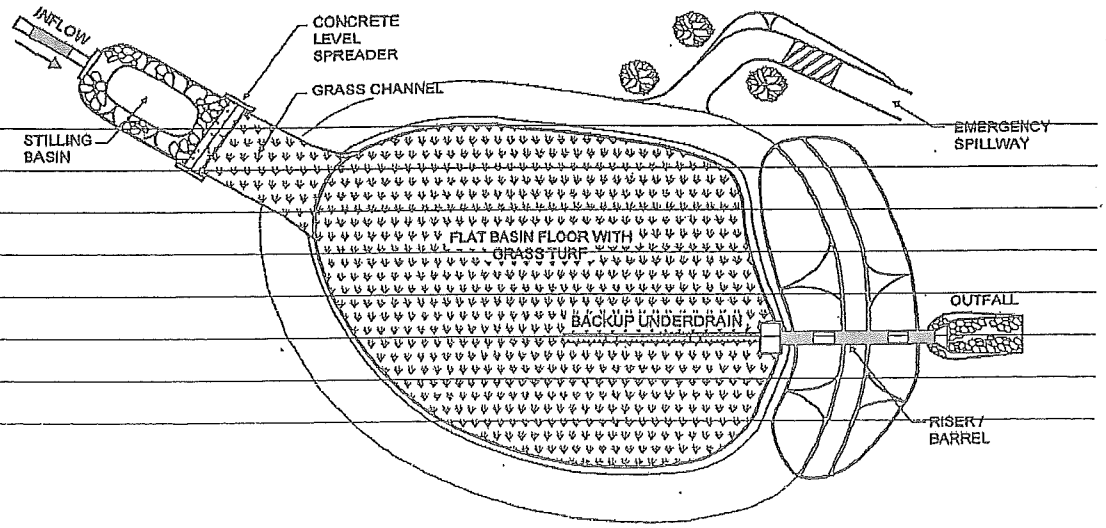
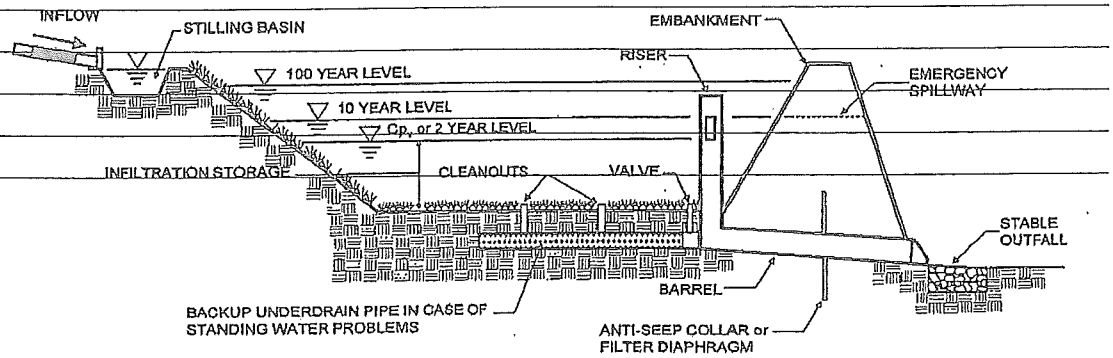
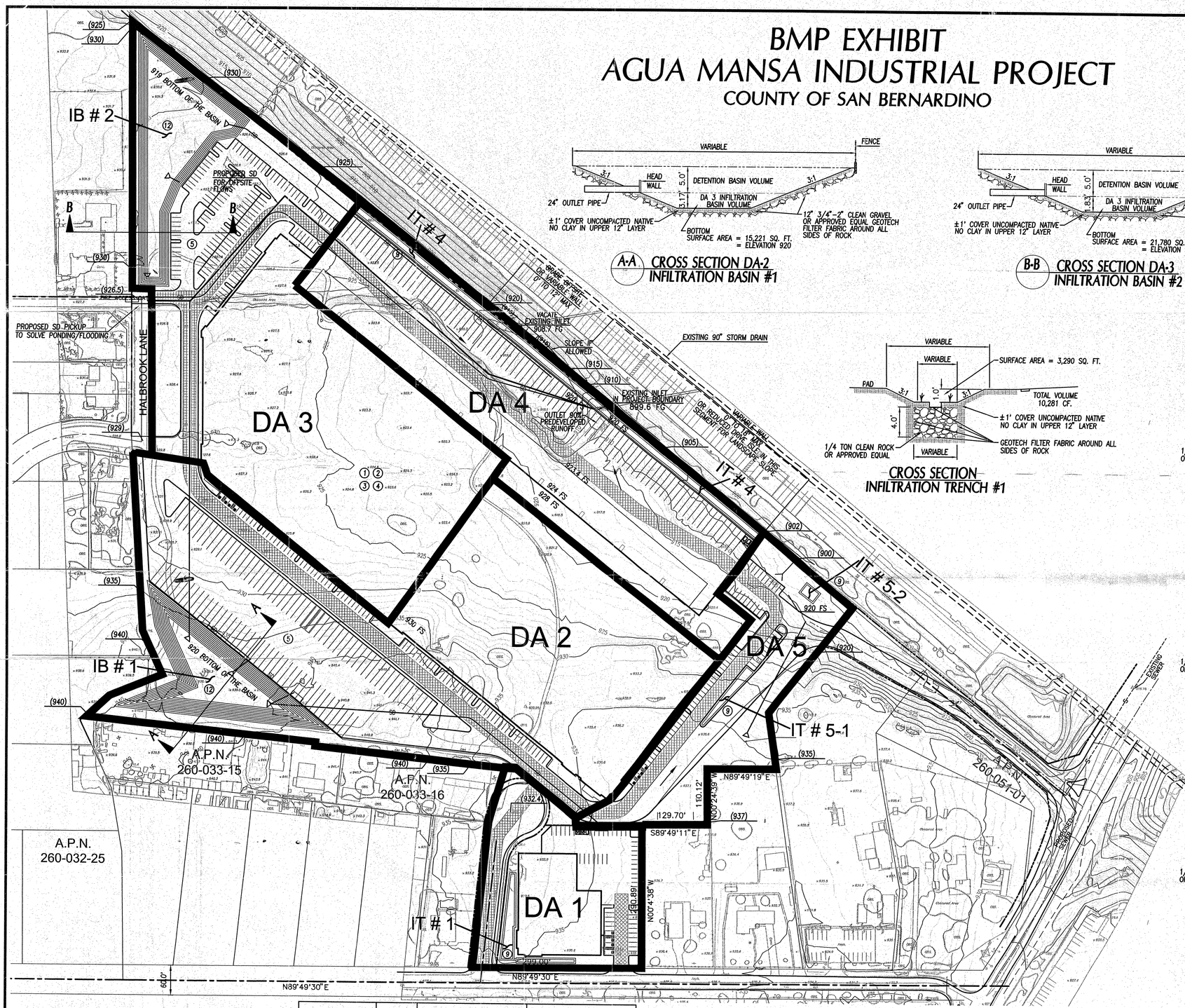


PLAN VIEW

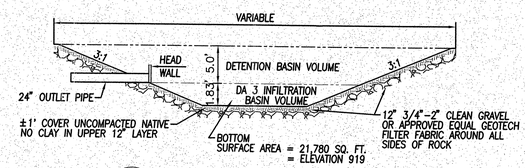


PROFILE

BMP EXHIBIT
AGUA MANSA INDUSTRIAL PROJECT
COUNTY OF SAN BERNARDINO



A-A CROSS SECTION DA-2
INFILTRATION BASIN #1



B-B CROSS SECTION DA-3
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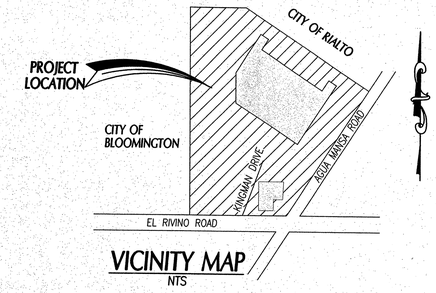
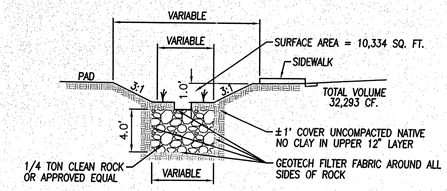


VICINITY MAP
NTS

CROSS SECTION
INFILTRATION TRENCH #1



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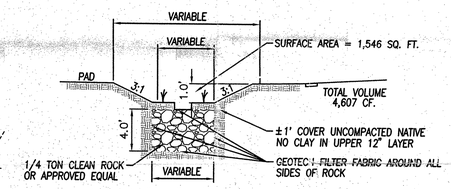

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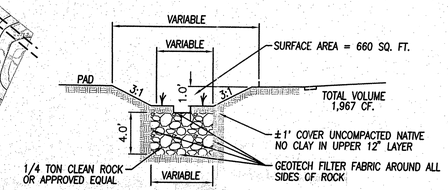
INFILTRATION TRENCH #5-1



CROSS SECTION
INFILTRATION TRENCH #5-2

NOTE:
DO NOT COMPACT AREAS WHERE INFILTRATION TRENCHES WILL BE LOCATED

BMP LIST

1. EDUCATION OF PROPERTY OWNERS
2. ACTIVITY RESTRICTIONS
3. SPILL CONTINGENCY
4. TRAINING/EDUCATION PROGRAM
5. STREET SWEEPING
6. EFFICIENT IRRIGATION (SD-12)
7. STORM DRAIN SIGNAGE (SD-13)
8. INLET TRASH RACKS
9. INFILTRATION TRENCH (TC-10)
10. VELOCITY DISSIPATION DEVICES (EC-10)
11. CATCH BASIN STENCILLING AND SIGNAGE
12. INFILTRATION BASIN (TC-11)

ASSESSOR'S PARCEL NO'S.
APN:

ACREAGE:
__ ACRES

LEGEND:

- BMP TRIBUTARY DRIANAGE BOUNDARY
- DA # — DRAINAGE AREA #
- IT # — INFILTRATION TRENCH #
- IB # — INFILTRATION BASIN #
- FLOW DIRECTION

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 INCH = 100 FT.

INFILTRATION BASIN	AREA	VOLUME REQUIRED	VOLUME PROVIDED
	Ac	CU-FT	CU-FT
DA-1	2.40	9,954	10,281
DA-2	10.89	47,327	48,251
DA-3	9.63	38,944	39,857
DA-4	5.61	31,712	32,293
DA-5	2.44	6,378	6,574

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COUNTY OF SAN BERNARDINO
WATER QUALITY MANAGEMENT PLAN

Drawn By: HMG	BMP EXHIBIT	Scale: 1"=100'
Designed By: BKA		Date: August, 2015
Checked By: RJA		Dwg. No. 1/1

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