

Preliminary

Water Quality Management Plan

For:

Sri Sai Ram Mandir

APN # 1016-331-05-0000, 1016-331-06-0000

CUP # P2018000549

Prepared for:

Sri Jayaram Foundation Inc

3759 E Foothill Blvd, #714

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Attn: Arunasri Reddy

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Submittal Date: December 14, 2018

Revision Date: April 19, 2019, Sept 10, 2019, April 22, 2020

Approval Date: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Sri Jayaram Foundation Inc by Alex Torres, PE. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Areawide Stormwater 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):	CUP# P201800549	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN # 1016-331-05-0000, 1016-331-06-0000
Owner's Signature			
Owner Name: Arunasri Reddy			
Title	President		
Company	Sri Jayaram Foundation Inc		
Address	3579 E Foothill Blvd, #714, Pasadena CA 91107		
Email	jayabidda@yahoo.com		
Telephone #	951-544-5832		
Signature		Date	4-15-2020

Preparer's Certification

Project Data			
Permit/Application Number(s):	CUP# P201800549	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN # 1016-331-05-0000, 1016-331-06-0000

"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: Alex Torres PE		<p>PE Stamp Below</p> 
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Signature		
Date	04-22-2020	

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Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name		Sri Sai Ram Mandir			
Project Owner Contact Name:		Arunasri Reddy			
Mailing Address:	3579 E Foothill Blvd, #714, Pasadena CA 91107	E-mail Address:	jayabidda@yahoo.com	Telephone:	951-544-5832
Permit/Application Number(s):		CUP# P201800549	Tract/Parcel Map Number(s):	APN # 1016-331-05-0000, 1016-331-06-0000	
Additional Information/ Comments:		TBD			
Description of Project:		<p>Project site area is approximately 4.83 acres of undeveloped land that is currently vacant. The site is bounded by Walnut Avenue and Railroad tracks on the north, single family residential homes on the south and west, and Roswell Avenue on the east. There are no known easements on the site. The cover of the land consists of natural grass. The local topography generally slopes in the southeasterly direction at approximately 0.5% to 1%.</p> <p>The proposed project is to construct a two story, 32,400 square feet place of worship and a three story, 4,500 square foot caretaker building, parking stalls, drive aisles, and landscaping. The project will consist of one (1) Drainage Area referred to as DA 1. Please refer to the WQMP site plan provided in the Appendix for the breakdown of pervious and impervious areas of the site.</p> <p>Drainage Area (DA 1) consists of 4.83 acres total. DA 1 runoff will be collected by proposed gutters and catch basin inlets and piped directly to the underground retention basin located near the east/northeast corner of the site. The underground basin will include Stormtech MC-3500 arch pipes to retain the runoff and infiltrate into the subsurface soils. The proposed basin will provide a total volume of 10,564 cubic feet which exceeds the DA 1's Design Capture Volume (DCV) of 10,417 cubic feet. The treated volume will infiltrate into the subsurface soils under 48-hours.</p>			

Water Quality Management Plan (WQMP)

<p>Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.</p>	<p>N/A</p>
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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):					
<input type="checkbox"/> Significant re-development involving the addition or replacement of 5,000 ft ² or more of impervious surface on an already developed site	<input checked="" type="checkbox"/> New development involving the creation of 10,000 ft ² or more of impervious surface collectively over entire site	<input type="checkbox"/> Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	<input type="checkbox"/> Restaurants (with SIC code 5812) where the land area of development is 5,000 ft ² or more		
<input type="checkbox"/> Hillside developments of 5,000 ft ² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	<input type="checkbox"/> Developments of 2,500 ft ² 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.	<input checked="" type="checkbox"/> Parking lots of 5,000 ft ² or more exposed to storm water	<input type="checkbox"/> Retail gasoline outlets that are either 5,000 ft ² or more, or have a projected average daily traffic of 100 or more vehicles per day		
<input type="checkbox"/> Non-Priority / Non-Category Project <i>May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements.</i>					
2 Project Area (ft ²):	210,586	3 Number of Dwelling Units:	N/A	4 SIC Code:	8661
5 Is Project going to be phased? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.</i>					
6 Does Project include roads? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)</i>					

2.2 Property Ownership/Management

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

Form 2.2-1 Property Ownership/Management

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

Sri Jayaram Foundation Inc will be responsible to maintain the proposed BMPs. Operation and Maintenance Plan and Maintenance Mechanism and Educational materials for those personnel maintaining the proposed BMPs within this Project-Specific WQMP will be included as part of Final Project Specific WQMP.

Contact Name: Arunasri Reddy

Address: Sri Jayaram Foundation Inc., 3759 E Foothill Bouelvard, #714, Pasadena CA 91107

Ph: 951-544-5832

Email: jayabidda@yahoo.com

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 <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Including petroleum hydrocarbons, Bacterial indicators are routinely detected in pavement runoff.
Nutrients - Phosphorous	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site
Nutrients - Nitrogen	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site
Noxious Aquatic Plants	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site
Sediment	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when solid materials are eroded from land surfaces.
Metals	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Metals are routinely detected in pavement runoff.
Oil and Grease	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Hydrocarbons are routinely detected in pavement runoff. CDS unit will provide screening for hydrocarbons.
Trash/Debris	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site. CDS unit will provide screening for trash and debris
Pesticides / Herbicides	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site
Organic Compounds	E <input checked="" type="checkbox"/>	N <input type="checkbox"/>	Expected pollutant when landscaping exists on-site. Including petroleum hydrocarbons and solvents.
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	
Other:	E <input type="checkbox"/>	N <input type="checkbox"/>	

2.4 Water Quality Credits

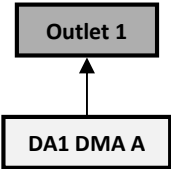
A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing 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: <i>Select all that apply</i>			
<input type="checkbox"/> Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects <input type="checkbox"/> Vertical density [20%] <input type="checkbox"/> 7 units/ acre [5%]	<input type="checkbox"/> 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%]	<input type="checkbox"/> Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
<input type="checkbox"/> Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	<input type="checkbox"/> Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	<input type="checkbox"/> 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%]	<input type="checkbox"/> 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)			

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 34.02458	Longitude -117.72108	Thomas Bros Map page
1 San Bernardino County climatic region: <input checked="" type="checkbox"/> Valley <input type="checkbox"/> Mountain			
2 Does the site have more than one drainage area (DA): Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>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</i>			
			
Example only – modify for project specific WQMP using additional form			
Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA		
DA1 DMA C flows to DA1 DMA A	Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property		
DA1 DMA A to Outlet 1	Drainage Area (DA 1) consists of 4.83 acres total. DA 1 runoff will be collected by gutters, catch basin inlets, and piped directly to the proposed underground retention basin located near the east/northeast corner of the site. The underground basin will include Stormtech MC-3500 arch pipes to retain the runoff and infiltrate into the subsurface soils. The proposed basin will provide a total volume of 10,564 cubic feet which exceeds the DA 1's Design Capture Volume (DCV) of 10,417 cubic feet. The treated volume will infiltrate into the subsurface soils under 48-hours.		
DA1 DMA B to Outlet 1			
DA2 to Outlet 2			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft ²)	210,586			
2 Existing site impervious area (ft ²)	0			
3 Antecedent moisture condition <i>For desert areas, use</i> http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf	III			
4 Hydrologic soil group <i>Refer to Watershed Mapping Tool –</i> http://permittrack.sbcounty.gov/wap/	B			
5 Longest flowpath length (ft)	800			
6 Longest flowpath slope (ft/ft)	0.005			
7 Current land cover type(s) <i>Select from Fig C-3 of Hydrology Manual</i>	Barren			
8 Pre-developed pervious area condition: <i>Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating</i>	Poor			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft ²)				
2 Existing site impervious area (ft ²)				
3 Antecedent moisture condition <i>For desert areas, use</i> http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf				
4 Hydrologic soil group <i>Refer to Watershed Mapping Tool –</i> http://permittrack.sbcounty.gov/wap/				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) <i>Select from Fig C-3 of Hydrology Manual</i>				
8 Pre-developed pervious area condition: <i>Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating</i>				

Form 3-3 Watershed Description for Drainage Area	
<p>Receiving waters</p> <p><i>Refer to Watershed Mapping Tool -</i></p> <p>http://permittrack.sbcounty.gov/wap/</p> <p><i>See "Drainage Facilities" link at this website</i></p>	<p>Yorba-Chino Storm Drain</p> <p>Chino Creek Reach 1B</p> <p>Chino Creek Reach 1A</p> <p>Santa Ana River Reach 3</p> <p>Prado Dam</p> <p>Santa Ana River Reach 2</p> <p>Santa Ana River Reach 1</p> <p>Pacific Ocean</p>
<p>Applicable TMDLs</p> <p><i>Refer to Local Implementation Plan</i></p>	<p>Yorba-Chino Storm Drain: None</p> <p>Chino Creek Reach 1B: Pathogens</p> <p>Chino Creek Reach 1A: Pathogens</p> <p>Santa Ana River Reach 3: Pathogens</p> <p>Prado Dam: Pathogens</p> <p>Santa Ana River, Reach 2: None</p> <p>Santa Ana River, Reach 1: None</p> <p>Pacific Ocean: None</p>
<p>303(d) listed impairments</p> <p><i>Refer to Local Implementation Plan and Watershed Mapping Tool -</i></p> <p>http://permittrack.sbcounty.gov/wap/ and State Water Resources Control Board website -</p> <p>http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml</p>	<p>Yorba-Chino Storm Drain: None</p> <p>Chino Creek Reach 1B: Chemical Oxygen Demand (COD), Nutrients, Pathogens</p> <p>Chino Creek Reach 1A: Nutrients, Pathogens</p> <p>Santa Ana River, Reach 3: Copper, Lead, Pathogens</p> <p>Prado Dam: None</p> <p>Santa Ana River, Reach 2: Indicator Bacteria</p> <p>Santa Ana River, Reach 1: None</p> <p>Pacific Ocean: None</p>
<p>Environmentally Sensitive Areas (ESA)</p> <p><i>Refer to Watershed Mapping Tool -</i></p> <p>http://permittrack.sbcounty.gov/wap/</p>	<p>No ESA near site</p>
<p>Unlined Downstream Water Bodies</p> <p><i>Refer to Watershed Mapping Tool -</i></p> <p>http://permittrack.sbcounty.gov/wap/</p>	<p>N/A</p>
<p>Hydrologic Conditions of Concern</p>	<p><input checked="" type="checkbox"/> 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</p> <p><input type="checkbox"/> No (<i>The project runoff infiltrates and does not affect the downstream water bodies</i>)</p>
<p>Watershed-based BMP included in a RWQCB approved WAP</p>	<p><input type="checkbox"/> Yes Attach verification of regional BMP evaluation criteria in WAP</p> <ul style="list-style-type: none"> • 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 <p><input checked="" type="checkbox"/> No</p>

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Property owner will familiarize him/herself with the educational materials in Attachment "E" and the contents of the WQMP. The owner shall familiarize himself with the pamphlets/requirements from City/State discussing business operations and inspections, etc. and owner shall furnish copies of this document to all future tenants or lease agreements or CC&Rs. The owner shall utilize the Stormwater and Water Quality BMP educational materials contained in this Appendix E of this report and shall provide to the property owners, Tenants, and Occupants annually or more frequently as needed.
N2	Activity Restrictions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No outdoor work areas, processing, storage or wash area. Pesticide applications should be done by licensed contractor.
N3	Landscape Management BMPs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Irrigation must be consistent with County's Water Conservation Ordinance. Fertilizer and pesticide usage will be consistent with County Management Guidelines for Use of Fertilizers and Pesticides. The owner shall contract with a qualified landscape contractor or ensure regular inspection and maintenance of landscape and irrigation systems. Landscape and garden maintenance BMP is provided for reference.
N4	BMP Maintenance	<input checked="" type="checkbox"/>	<input type="checkbox"/>	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative. The owners shall inspect and maintain all BMPs implemented for the project site. Maintenance for BMPs is described in the BMP Factsheets as provided in report for reference.
N5	Title 22 CCR Compliance (How development will comply)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hazardous wastes onsite.
N6	Local Water Quality Ordinances	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The report complies with applicable local water quality ordinances. The owner shall comply with all implementation and maintenance requirements contained in this report.
N7	Spill Contingency Plan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Owner/tenant will have a spill contingency plan based on individual site needs. BMP SC-11 is included in the report for reference for cleanup of spills and leaks.

Form 4.1-1 Non-Structural Source Control BMPs				
N8	Underground Storage Tank Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No USTs onsite.
N9	Hazardous Materials Disclosure Compliance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No hazardous materials onsite.

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	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency.
N11	Litter/Debris Control Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Contract with their landscape maintenance firm to provide this service during regularly schedule maintenance. The owner shall cover all trash dumpsters. A program shall be implemented to pick up litter and sweep and clean the trash enclosure on a daily basis. The owner shall contract with a refuse company to have the dumpsters emptied on a weekly basis at a minimum. Follow Litter Control procedures for site. SC-60 BMP is provided in the report.
N12	Employee Training	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The owner will ensure that tenants are also familiar with onsite BMPs and necessary maintenance required of the tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and new hires within 2 months.
N13	Housekeeping of Loading Docks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No loading docks proposed on site.

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N14	Catch Basin Inspection Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Monthly inspection by property owner's designee. Vacuum when sediment or trash becomes 2-inches deep and dispose of properly. Replace as necessary.
N15	Vacuum Sweeping of Private Streets and Parking Lots	<input checked="" type="checkbox"/>	<input type="checkbox"/>	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowing and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and driveways will be vacuum swept monthly by sweeping contractor.
N16	Other Non-structural Measures for Public Agency Projects	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not a public agency project.
N17	Comply with all other applicable NPDES permits	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will comply with Construction General Permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	"No Dumping – Drains to River" stencils will be applied. Legibility of stencil will be maintained on a yearly basis.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No outdoor material storage areas onsite.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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. Provide solid roof or awning to prevent direct contact with rainfall.
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)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Irrigation systems shall include reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines. Timers will be used to avoid over watering and watering cycles and duration shall be adjusted seasonally by the landscape maintenance contractor. The landscaping areas will be grouped with plants that have similar water requirements. Native or drought tolerant species shall also be used where appropriate to reduce excess irrigation runoff and promote surface filtration.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Landscaped areas will be suppressed to increase retention of stormwater/irrigation water and promote infiltration.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no slopes or channels will require energy dissipation.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No dock areas present on the site.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no maintenance bay is being proposed.

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S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no vehicle wash being proposed.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no outdoor processing being proposed.
Form 4.1-2 Structural Source Control BMPs				
Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no equipment wash are being proposed.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no fueling being proposed.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no hillside landscaping is being proposed.
S14	Wash water control for food preparation areas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Staff will be trained in spill prevention, cleanup , recycling and disposal and grease handling and disposal. Food preparation areas shall have wash areas connected to sanitary sewer.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not applicable, no community car wash is being proposed.

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
<p>Site Design Practices</p> <p><i>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</i></p>
<p>Minimize impervious areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: Included as much pervious areas as possible throughout the site. Pervious areas cover more than required 40% of the site pervious allowance.</p>
<p>Maximize natural infiltration capacity: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: An underground infiltration basin with uncompacted soil underneath it is being proposed. Besides that, project incorporates permeable pavement and also landscaping areas proposed would maximize infiltration.</p>
<p>Preserve existing drainage patterns and time of concentration: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: Existing drainage patterns were preserved. The site generally drains northwest to southeast in the existing conditions and this pattern was preserved in proposed condition of the project.</p>
<p>Disconnect impervious areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: Permeable pavers are proposed to disconnect some impervious areas on the site.</p>
<p>Protect existing vegetation and sensitive areas: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p>Explanation: The existing site contains little to no vegetation to protect. However, landscaping will be planted around the borders of the site.</p>
<p>Re-vegetate disturbed areas: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p>Explanation: There is little vegetation in existing condition, but proposed landscape areas will be vegetated with plants.</p>
<p>Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: Undisturbed earth will be required under infiltration basin. Grading plans with construction notes will be provided to make sure unnecessary compaction do not occur</p>
<p>Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p>Explanation: The site does not utilize vegetated drainage swales. There is not enough space available for a vegetated swale but the runoff does drain to gutters and inlets and ultimately to an underground basin that will treat pollutants.</p>
<p>Stake off areas that will be used for landscaping to minimize compaction during construction: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Explanation: Efforts will be made to reduce compaction in landscape areas</p>

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 P₆ 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 (ft ²): 210,586	2 Imperviousness after applying preventative site design practices (Imp%): 60.2%	3 Runoff Coefficient (Rc): 0.410 $R_c = 0.858(\text{Imp}\%)^{0.3} - 0.78(\text{Imp}\%)^{0.2} + 0.774(\text{Imp}\%) + 0.04$
4 Determine 1-hour rainfall depth for a 2-year return period P _{2yr-1hr} (in): 0.498 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P ₆ , Mean 6-hr Precipitation (inches): 0.737 $P_6 = \text{Item 4} * C_1$, 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 <input type="checkbox"/> 48-hrs <input checked="" type="checkbox"/>
7 Compute design capture volume, DCV (ft ³): 10,417 $DCV = 1/12 * [\text{Item 1} * \text{Item 3} * \text{Item 5} * C_2]$, where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2		

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

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

Go to: <http://permittrack.sbcounty.gov/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 25,376 <i>Form 4.2-3 Item 12</i>	² 20.3 <i>Form 4.2-4 Item 13</i>	³ 6.76 <i>Form 4.2-5 Item 10</i>
Post-developed	⁴ 2702 <i>Form 4.2-3 Item 13</i>	⁵ 6.49 <i>Form 4.2-4 Item 14</i>	⁶ 10.95 <i>Form 4.2-5 Item 14</i>
Difference	⁷ -22,673 <i>Item 4 – Item 1</i>	⁸ 13.81 <i>Item 2 – Item 5</i>	⁹ 4.19 <i>Item 6 – Item 3</i>
Difference (as % of pre-developed)	¹⁰ -89% <i>Item 7 / Item 1</i>	¹¹ 68% <i>Item 8 / Item 2</i>	¹² 61.9% <i>Item 9 / Item 3</i>

DCV 10,417 cubic feet will govern the design of the underground infiltration basin proposed for the site.

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

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H								
1a Land Cover type	Bare soil															
2a Hydrologic Soil Group (HSG)	B															
3a DMA Area, ft ² <i>sum of areas of DMA should equal area of DA</i>	210,586															
4a Curve Number (CN) <i>use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP</i>	86															
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H								
1b Land Cover type	Commercial															
2b Hydrologic Soil Group (HSG)	B															
3b DMA Area, ft ² <i>sum of areas of DMA should equal area of DA</i>	210,586															
4b Curve Number (CN) <i>use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP</i>	56															
5 Pre-Developed area-weighted CN: 86	7 Pre-developed soil storage capacity, S (in): 1.63 $S = (1000 / \text{Item 5}) - 10$					9 Initial abstraction, I _a (in): 0.33 $I_a = 0.2 * \text{Item 7}$										
6 Post-Developed area-weighted CN: 56	8 Post-developed soil storage capacity, S (in): 7.86 $S = (1000 / \text{Item 6}) - 10$					10 Initial abstraction, I _a (in): 1.57 $I_a = 0.2 * \text{Item 8}$										
11 Precipitation for 2 yr, 24 hr storm (in): 2.75 Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html																
12 Pre-developed Volume (ft ³): 25,376 $V_{pre} = (1 / 12) * (\text{Item sum of Item 3}) * [(\text{Item 11} - \text{Item 9})^2 / ((\text{Item 11} - \text{Item 9} + \text{Item 7}))]$																
13 Post-developed Volume (ft ³): 2,702 $V_{pre} = (1 / 12) * (\text{Item sum of Item 3}) * [(\text{Item 11} - \text{Item 10})^2 / ((\text{Item 11} - \text{Item 10} + \text{Item 8}))]$																
14 Volume Reduction needed to meet HCOC Requirement, (ft ³): -22,808 $V_{HCOC} = (\text{Item 13} * 0.95) - \text{Item 12}$																

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

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

Variables	Pre-developed DA1 <i>Use additional forms if there are more than 4 DMA</i>				Post-developed DA1 <i>Use additional forms if there are more than 4 DMA</i>			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) <i>Use Form 3-2 Item 5 for pre-developed condition</i>	766				183			
2 Change in elevation (ft)	5.2				4.3			
3 Slope (ft/ft), $S_o = \text{Item 2} / \text{Item 1}$	0.0068				0.0235			
4 Land cover	Barren Land				Commercial			
5 Initial DMA Time of Concentration (min) <i>Appendix C-1 of the TGD for WQMP</i>	20.3				5.17			
6 Length of conveyance from DMA outlet to project site outlet (ft) <i>May be zero if DMA outlet is at project site outlet</i>	0				891			
7 Cross-sectional area of channel (ft ²)	n/a				3.53			
8 Wetted perimeter of channel (ft)	n/a				7.71			
9 Manning's roughness of channel (n)	n/a				0.012			
10 Channel flow velocity (ft/sec) $V_{fps} = (1.49 / \text{Item 9}) * (\text{Item 7}/\text{Item 8})^{0.67} * (\text{Item 3})^{0.5}$	n/a				11.28			
11 Travel time to outlet (min) $T_t = \text{Item 6} / (\text{Item 10} * 60)$	n/a				1.31			
12 Total time of concentration (min) $T_c = \text{Item 5} + \text{Item 11}$	20.3				6.49			
13 Pre-developed time of concentration (min): 20.3 <i>Minimum of Item 12 pre-developed DMA</i>								
14 Post-developed time of concentration (min): 6.49 <i>Minimum of Item 12 post-developed DMA</i>								
15 Additional time of concentration needed to meet HCOC requirement (min): 12.79 $T_{C-HCOC} = (\text{Item 13} * 0.95) - \text{Item 14}$								

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

Compute peak runoff for pre- and post-developed conditions

Variables	Pre-developed DA to Project Outlet (Use additional forms if more than 3 DMA)			Post-developed DA to Project Outlet (Use additional forms if more than 3 DMA)							
	DMA A	DMA B	DMA C	DMA A	DMA B	DMA C					
1 Rainfall Intensity for storm duration equal to time of concentration $I_{peak} = 10^{(LOG \text{ Form 4.2-1 Item 4} - 0.6 LOG \text{ Form 4.2-4 Item 5} / 60)}$	2.9			2.9							
2 Drainage Area of each DMA (Acres) <i>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)</i>	4.83			4.83							
3 Ratio of pervious area to total area <i>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)</i>	1			0.40							
4 Pervious area infiltration rate (in/hr) <i>Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP</i>	0.5			0.96							
5 Maximum loss rate (in/hr) $F_m = \text{Item 3} * \text{Item 4}$ <i>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)</i>	0.5			0.38							
6 Peak Flow from DMA (cfs) $Q_p = \text{Item 2} * 0.9 * (\text{Item 1} - \text{Item 5})$	6.76			10.95							
7 Time of concentration adjustment factor for other DMA to site discharge point <i>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)</i>	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: 6.76 $Q_p = \text{Item 6}_{DMAA} + [\text{Item 6}_{DMAB} * (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAB}) / (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAB}) * \text{Item 7}_{DMAA/2}] + [\text{Item 6}_{DMAC} * (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAC}) / (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAC}) * \text{Item 7}_{DMAA/3}]$	9 Pre-developed Q_p at T_c for DMA B: $Q_p = \text{Item 6}_{DMAB} + [\text{Item 6}_{DMAA} * (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAA}) / (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAA}) * \text{Item 7}_{DMAB/1}] + [\text{Item 6}_{DMAC} * (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAC}) / (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAC}) * \text{Item 7}_{DMAB/3}]$		10 Pre-developed Q_p at T_c for DMA C: $Q_p = \text{Item 6}_{DMAC} + [\text{Item 6}_{DMAA} * (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAA}) / (\text{Item 1}_{DMAA} - \text{Item 5}_{DMAA}) * \text{Item 7}_{DMAC/1}] + [\text{Item 6}_{DMAB} * (\text{Item 1}_{DMAC} - \text{Item 5}_{DMAB}) / (\text{Item 1}_{DMAB} - \text{Item 5}_{DMAB}) * \text{Item 7}_{DMAC/2}]$								
10 Peak runoff from pre-developed condition confluence analysis (cfs): 6.76 Maximum of Item 8, 9, and 10 (including additional forms as needed)											
11 Post-developed Q_p at T_c for DMA A: 10.95 <i>Same as Item 8 for post-developed values</i>	12 Post-developed Q_p at T_c for DMA B: <i>Same as Item 9 for post-developed values</i>		13 Post-developed Q_p at T_c for DMA C: <i>Same as Item 10 for post-developed values</i>								
14 Peak runoff from post-developed condition confluence analysis (cfs): 10.95 Maximum of Item 11, 12, and 13 (including additional forms as needed)											
15 Peak runoff reduction needed to meet HCOC Requirement (cfs): 3.6 $Q_{p-HCOC} = (\text{Item 14} * 0.95) - \text{Item 10}$											

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 (DA 1)

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

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

Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

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

Yes ☐ No ☒

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

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than 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 8 below.

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

Yes ☐ No ☒

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, 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)			
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 <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, complete Items 2-5; If no, proceed to Item 6	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Total impervious area draining to pervious area (ft ²)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft ³) $V = \text{Item 2} * \text{Item 3} * (0.5/12)$, assuming retention of 0.5 inches of runoff			
5 Sum of retention volume achieved from impervious area dispersion (ft ³):		$V_{\text{retention}} = \text{Sum of Item 4 for all BMPs}$	
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 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) $V_{\text{retention}} = (\text{Item 7} * \text{Item 8}) + (\text{Item 9} * \text{Item 10} * \text{Item 11})$			
13 Runoff volume retention from on-lot infiltration (ft ³):		$V_{\text{retention}} = \text{Sum of Item 12 for all BMPs}$	

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

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 15-20. If no, proceed to Item 21</i>	DA DMA BMP Type	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) <i>Use local values, typical ~ 0.1</i>			
17 Daily ET demand (ft ³ /day) <i>Item 15 * (Item 16 / 12)</i>			
18 Drawdown time (hrs) <i>Copy Item 6 in Form 4.2-1</i>			
19 Retention Volume (ft ³) <i>V_{retention} = Item 17 * (Item 18 / 24)</i>			
20 Runoff volume retention from evapotranspiration BMPs (ft ³): <i>V_{retention} = Sum of Item 19 for all BMPs</i>			
21 Implementation of Street Trees: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 22-25. If no, proceed to Item 26</i>	DA DMA BMP Type	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) <i>V_{retention} = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches</i>			
25 Runoff volume retention from street tree BMPs (ft ³): <i>V_{retention} = Sum of Item 24 for all BMPs</i>			
26 Implementation of residential rain barrel/cisterns: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, complete Items 27-29; If no, proceed to Item 30</i>	DA DMA BMP Type	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) <i>V_{retention} = Item 27 * 3</i>			
29 Runoff volume retention from residential rain barrels/Cisterns (ft ³): <i>V_{retention} = Sum of Item 28 for all BMPs</i>			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: <i>Sum of Items 5, 13, 20, 25 and 29</i>			

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).

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

1 Remaining LID DCV not met by site design HSC BMP (ft ³): 10,417 $V_{unmet} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 30}$			
BMP Type Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs	DA 1 DMA 1 BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Infiltration rate of underlying soils (in/hr) See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods	1.54		
3 Infiltration safety factor See TGD Section 5.4.2 and Appendix D	2		
4 Design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$	0.77		
5 Ponded water drawdown time (hr) Copy Item 6 in Form 4.2-1	48		
6 Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details	n/a		
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$	3		
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	3,402		
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	n/a		
10 Amended soil porosity	n/a		
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	1.5		
12 Gravel porosity	0.40		
13 Duration of storm as basin is filling (hrs) Typical ~ 3hrs	3 hrs		
14 Above Ground Retention Volume (ft ³) $V_{retention} = \text{Item 8} * [\text{Item 7} + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
15 Underground Retention Volume (ft ³) Volume determined using manufacturer's specifications and calculations	10,564		
16 Total Retention Volume from LID Infiltration BMPs: 10,564 (Sum of Items 14 and 15 for all infiltration BMP included in plan)			
17 Fraction of DCV achieved with infiltration BMP: 101% $\text{Retention\%} = \text{Item 16} / \text{Form 4.2-1 Item 7}$			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.			

4.3.3 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)			
1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft ³): 0 <i>V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 - Form 4.3-3 Item 16</i>			
BMP Type(s) <i>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</i>	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft ³) <i>Volume of cistern</i>			
4 Landscaped area planned for use of harvested stormwater (ft ²)			
5 Average wet season daily irrigation demand (in/day) <i>Use local values, typical ~ 0.1 in/day</i>			
6 Daily water demand (ft ³ /day) <i>Item 4 * (Item 5 / 12)</i>			
7 Drawdown time (hrs) <i>Copy Item 6 from Form 4.2-1</i>			
8 Retention Volume (ft ³) <i>V_{retention} = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))</i>			
9 Total Retention Volume (ft ³) from Harvest and Use BMP <i>Sum of Item 8 for all harvest and use BMP included in plan</i>			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes <input type="checkbox"/> No <input type="checkbox"/> <i>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.</i>			

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)			
1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft ³): 0 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.	
2 Biotreatment BMP Selected <i>(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)</i>	Volume-based biotreatment <i>Use Forms 4.3-6 and 4.3-7 to compute treated volume</i>		Flow-based biotreatment <i>Use Form 4.3-8 to compute treated volume</i>
	<input type="checkbox"/> Bioretention with underdrain <input type="checkbox"/> Planter box with underdrain <input type="checkbox"/> Constructed wetlands <input type="checkbox"/> Wet extended detention <input type="checkbox"/> Dry extended detention		<input type="checkbox"/> Vegetated swale <input type="checkbox"/> Vegetated filter strip <input type="checkbox"/> Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (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): Item 1 – Item 3		5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % Item 4 / Item 1
6 Flow-based biotreatment BMP capacity provided (cfs): Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)			
7 Metrics for MEP determination: <ul style="list-style-type: none"> • 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: <input type="checkbox"/> 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) – 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 <i>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</i>			
2 Amended soil infiltration rate <i>Typical ~ 5.0</i>			
3 Amended soil infiltration safety factor <i>Typical ~ 2.0</i>			
4 Amended soil design percolation rate (in/hr) $P_{design} = \text{Item 2} / \text{Item 3}$			
5 Ponded water drawdown time (hr) <i>Copy Item 6 from Form 4.2-1</i>			
6 Maximum ponding depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
7 Ponding Depth (ft) $d_{BMP} = \text{Minimum of } (1/12 * \text{Item 4} * \text{Item 5}) \text{ or Item 6}$			
8 Amended soil surface area (ft ²)			
9 Amended soil depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
10 Amended soil porosity, n			
11 Gravel depth (ft) <i>see Table 5-6 of the TGD for WQMP for reference to BMP design details</i>			
12 Gravel porosity, n			
13 Duration of storm as basin is filling (hrs) <i>Typical ~ 3hrs</i>			
14 Biotreated Volume (ft ³) $V_{biotreated} = \text{Item 8} * [(\text{Item 7}/2) + (\text{Item 9} * \text{Item 10}) + (\text{Item 11} * \text{Item 12}) + (\text{Item 13} * (\text{Item 4} / 12))]$			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: <i>Sum of Item 14 for all volume-based BMPs included in this form</i>			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type <i>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.</i>	DA DMA BMP Type		DA DMA BMP Type <i>(Use additional forms for more BMPs)</i>	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin <i>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</i>				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft ²) $A_{bottom} = \text{Item 2} * \text{Item 3}$				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft ²) $A_{surface} = (\text{Item 2} + (2 * \text{Item 5} * \text{Item 6})) * (\text{Item 3} + (2 * \text{Item 5} * \text{Item 6}))$				
8 Storage volume (ft ³) <i>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</i> $V = \text{Item 6} / 3 * [\text{Item 4} + \text{Item 7} + (\text{Item 4} * \text{Item 7})^{0.5}]$				
9 Drawdown Time (hrs) <i>Copy Item 6 from Form 2.1</i>				
10 Outflow rate (cfs) $Q_{BMP} = (\text{Item 8}_{forebay} + \text{Item 8}_{basin}) / (\text{Item 9} * 3600)$				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft ³) $V_{biotreated} = (\text{Item 8}_{forebay} + \text{Item 8}_{basin}) + (\text{Item 10} * \text{Item 11} * 3600)$				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : <i>(Sum of Item 12 for all BMP included in plan)</i>				

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

4.3.5 Conformance Summary

Complete Form 4.3-9 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): 10,417 <i>Copy Item 7 in Form 4.2-1</i>
2	On-site retention with site design hydrologic source control LID BMP (ft ³): <i>Copy Item 30 in Form 4.3-2</i>
3	On-site retention with LID infiltration BMP (ft ³): 10,564 <i>Copy Item 16 in Form 4.3-3</i>
4	On-site retention with LID harvest and use BMP (ft ³): <i>Copy Item 9 in Form 4.3-4</i>
5	On-site biotreatment with volume based biotreatment BMP (ft ³): <i>Copy Item 3 in Form 4.3-5</i>
6	Flow capacity provided by flow based biotreatment BMP (cfs): <i>Copy Item 6 in Form 4.3-5</i>
7	<p>LID BMP performance criteria are achieved if answer to any of the following is "Yes":</p> <ul style="list-style-type: none"> Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> <i>If yes, sum of Items 2, 3, and 4 is greater than Item 1</i> 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 <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>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</i> 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 <input type="checkbox"/> No <input checked="" type="checkbox"/> <i>If yes, Form 4.3-1 Items 7 and 8 were both checked yes</i>
8	<p>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:</p> <ul style="list-style-type: none"> Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: <input type="checkbox"/> <i>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, $V_{alt} = (Item\ 1 - Item\ 2 - Item\ 3 - Item\ 4 - Item\ 5) * (100 - Form\ 2.4-1\ Item\ 2)\%$</i> 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: <input type="checkbox"/> <i>Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed</i>

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 BMPs (DA 1)	
1 Volume reduction needed for HCOC performance criteria (ft ³): n/a <i>(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1</i>	2 On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft ³): <i>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</i>
3 Remaining volume for HCOC volume capture (ft ³): <i>Item 1 – Item 2</i>	4 Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft ³): <i>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)</i>
5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification <input type="checkbox"/> <i>Attach in-stream control BMP selection and evaluation to this WQMP</i>	
6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes <input type="checkbox"/> No <input type="checkbox"/> <i>If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:</i> <ul style="list-style-type: none"> Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP <input type="checkbox"/> <i>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)</i> 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 <input type="checkbox"/> 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 <input type="checkbox"/> 	
7 Form 4.2-2 Item 12 less than or equal to 5%: Yes <input type="checkbox"/> No <input type="checkbox"/> <i>If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:</i> <ul style="list-style-type: none"> Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs <input type="checkbox"/> <i>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)</i> 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 <input type="checkbox"/> 	

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
Underground Infiltration Chambers	Owner	The isolator row shall be inspected semi-annually (October 1st and February 1st) and maintained upon sediment reaching 3-inches in depth. The isolator row shall be inspected and maintained by a qualified technician and he/she will properly dispose of all wastes. A manhole is installed in order to inspect and maintain the isolator row. It is installed per OSHA codes to ensure operator and inspector safety.	Semi-annually (October 1st and February 1st) through maintenance service contract with the vendor or equally qualified contractor.
Drain Inserts	Owner	Visually inspect for defects and illegal dumping. Notify proper authorities if illegal dumping has occurred. Using an industrial vacuum, the collected materials shall be removed from the filter basket and disposed of properly. Inspect biosorb hydrocarbon booms and replace as necessary.	Annually or right before a major storm event when debris is clearly visible.
N1 - Education	Owner	The Owner shall utilize the Stormwater and Water Quality BMP educational materials contained in this report for training program and provide to tenant with lease/operation agreement	Annually or as needed
N2 – Activity Restriction	Owner	Owner shall be performed tenant/site inspections as required to determine if tenant is complying with CCR or lease agreement. City to inspect site as needed for compliance	Bi-annually
N3 – Landscape Management	Owner	Maintain landscape weekly or as needed to comply with local City Ordinances	Weekly or as needed

Water Quality Management Plan (WQMP)

N4 – BMP Maintenance	Owner	Inspect site and review records to make sure non-structural and structural BMPs are properly maintained as schedule. Provide records to City if requested.	Monthly or as needed

The source control BMPs are listed in Form 4-1.1, 4-1.2 of the report and included in the appendix. Maintenance requirements are included in those fact sheets.

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

Attachment A: Educational Material

For Information:

LOCAL SEWERING AGENCIES IN RIVERSIDE COUNTY:

City of Beaumont	(909) 769-8520
Belair Homeowners Association	(909) 277-1414
City of Banning	(909) 922-3130
City of Blythe	(760) 922-6161
City of Coachella	(760) 391-5008
Coachella Valley Water District	(760) 398-2651
City of Corona	(909) 736-2259
Desert Center, CSA #51	(760) 227-3203
Eastern Municipal Water District	(909) 928-3777
Elsinore Valley MWD	(909) 674-3146
Farm Mutual Water Company	(909) 244-4198
Idyllwild Water District	(909) 659-2143
Jurupa Community Services Dist.	(909) 685-7434
Lake Hemet MWD	(909) 658-3241
Lee Lake Water District	(909) 277-1414
March Air Force Base	(909) 656-7000
Mission Springs Water District	(760) 329-6448
City of Palm Springs	(760) 323-8242
Rancho Caballero	(909) 780-9272
Rancho California Water Dist.	(909) 676-4101
Ripley, CSA #62	(760) 922-4909
Rubidoux Community Services Dist.	(909) 684-7580
City of Riverside	(909) 782-5341
Silent Valley Club, Inc	(909) 849-4501
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(909) 780-4170

SPILL RESPONSE AGENCY:

HAZ-MAT: (909) 358-5055

HAZARDOUS WASTE DISPOSAL: (909) 358-5055

TO REPORT ILLEGAL DUMPING OR A CLOGGED

STORM DRAIN: 1-800-506-2555



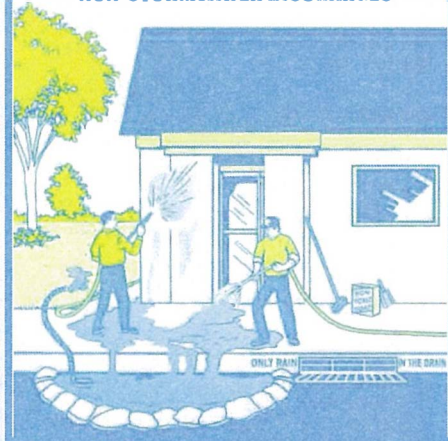
**Storm Water
Clean Water**
PROTECTION PROGRAM

Riverside County gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure

StormWater Pollution

What you should know for...

OUTDOOR CLEANING ACTIVITIES NON-STORMWATER DISCHARGES



GUIDELINES for disposal of washwater from:

- ✓ Sidewalk, plaza or parking lot cleaning
- ✓ Vehicle washing or detailing
- ✓ Building exterior cleaning
- ✓ Waterproofing
- ✓ Equipment cleaning or degreasing

Do you know . . . where the water should go?



Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to prevent flooding by carrying excess rainwater away from streets. . . it's not designed to be a waste disposal system. Since the storm drain system does not provide for water treatment, it often serves the unintended function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

Soaps, degreasers, automotive fluids, litter, and a host of other materials washed off buildings, sidewalks, plazas, parking areas, vehicles, and equipment can all pollute our waterways.

Non-stormwater discharges such as washwater generated from outdoor cleaning projects often transport harmful pollutants into storm drains and our local waterways. Polluted runoff contaminates local waterways and poses a threat to groundwater resources.

The Cities and County of Riverside StormWater/CleanWater Protection Program

Since preventing pollution is much easier, and less costly than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses of pollution prevention activities such as those described in this pamphlet.

The Cities and County of Riverside have adopted ordinances for stormwater management and discharge control. In accordance with state and federal law, these local stormwater ordinances **prohibit** the discharge of wastes into the storm drain system or local surface waters. This includes non-stormwater discharges containing oil, grease, detergents, degreasers, trash, or other waste materials.



PLEASE NOTE: The discharge of pollutants into the street, gutters, storm drain system, or waterways - without a Regional Water Quality Control Board permit or waiver - is **strictly prohibited** by local ordinances and state and federal law.

Help Protect Our Waterways!

Use These Guidelines For Outdoor Cleaning Activities and Washwater Disposal

Do . . . Dispose of **small amounts** of washwater from cleaning **building exteriors, sidewalks, or plazas** onto landscaped or unpaved surfaces provided you have the owner's permission and the discharge will not cause flooding or nuisance problems, or flow into a storm drain.

Do NOT . . . Discharge **large amounts** of these types of washwater onto landscaped areas or soil where water may run to a street or storm drain. Wastewater from exterior cleaning may be pumped to a sewer line with specific permission from the local sewerage agency.

Do . . . Check with your local sewerage agency's policies and requirements concerning waste water disposal. **Water from many outdoor cleaning activities** may be acceptable for disposal to the sewer system. See the list on the back of this flyer for phone numbers of the sewerage agencies in your area.

Do NOT . . . Pour **hazardous wastes** or toxic materials into the storm drain or sewer system . . . properly dispose of it instead. When in doubt, contact the local sewerage agency! The agency will tell you what types of liquid wastes can be accepted.

Do . . . Understand that **water (without soap)** used to remove dust from clean vehicles may be discharged to a street or storm drain. **Washwater from sidewalk, plaza, and building surface cleaning** may go into a street or storm drain if **ALL** of the following conditions are met:

- 1) The surface being washed is free of residual oil stains, debris and similar pollutants by using dry cleanup methods (sweeping, and cleaning any oil or chemical spills with rags or other absorbent materials before using water).
- 2) Washing is done with water only - no soap or other cleaning materials.
- 3) You have not used the water to remove paint from surfaces during cleaning.

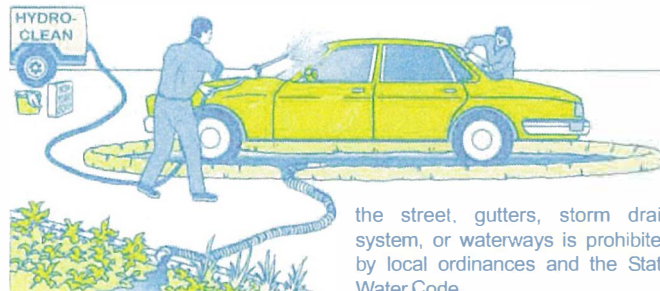
Do NOT . . . Dispose of water containing **soap or any other type of cleaning agent** into a storm drain or water body. This is a direct violation of state and/or local regulations. Because **wastewater from cleaning parking areas or roadways** normally contains metallic brake pad dust, oil and other automotive fluids, it should never be discharged to a street, gutter, or storm drain.

Do . . . Understand that **mobile auto detailers** should divert washwater to landscaped or dirt areas. Note: Be aware that soapy washwater may adversely affect landscaping; consult with the property owner. Residual washwater may remain on paved surfaces to evaporate; sweep up any remaining residue. If there is sufficient water volume to reach the storm drain, collect the runoff and obtain permission to pump it into the sanitary sewer. Follow local sewerage agency's requirements for disposal.

Do NOT . . . Dispose of left over cleaning agents into the gutter, storm drain or sanitary sewer.

Regarding Cleaning Agents:

If you must use soap, use biodegradable/phosphate free cleaners. Avoid use of petroleum based cleaning products. Although the use of nontoxic cleaning products is strongly encouraged, **do** understand that these products can still degrade water quality and, therefore, the discharge of these products into



the street, gutters, storm drain system, or waterways is prohibited by local ordinances and the State Water Code.

Note: When cleaning surfaces with a high pressure washer or steam cleaning methods, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning, as compared to the use of a low pressure hose, can remove additional materials that can contaminate local waterways.

OTHER TIPS TO HELP PROTECT OUR WATER . . .

SCREENING WASH WATER

A thorough dry cleanup before washing (without soap) surfaces such as building exteriors and decks without loose paint, sidewalks, or plaza areas, *should be sufficient to protect storm drains*. However if any debris (solids) could enter storm drains or remain in the gutter or street after cleaning, washwater should first pass through a "20 mesh" or finer screen to catch the solid material, which should then be disposed of in the trash.

DRAIN INLET PROTECTION/CONTAINING & COLLECTING WASH WATER

- Sandbags can be used to create a barrier around storm drain inlets.
- Plugs or rubber mats can be used to temporarily seal storm drain openings.
- You can also use vacuum booms, containment pads, or temporary berms to keep wash water away from the street, gutter, or storm drain.

EQUIPMENT AND SUPPLIES

Special materials such as absorbents, storm drain plugs and seals, small sump pumps, and vacuum booms are available from many vendors. For more information check catalogs such as New Pig (800-468-4647), Lab Safety Supply (800-356-0783), C&H (800-558-9966), and W.W. Grainger (800-994-9174); or call the Cleaning Equipment Trade Association (800-441-0111) or the Power Washers of North America (800-393-PWNA).

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your
Regional Water Quality Control Board (RWQCB)

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501 3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

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PROTECTION PROGRAM

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DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?



Many industrial facilities
and manufacturing operations
must obtain coverage under the
Industrial Activities Storm Water
General Permit

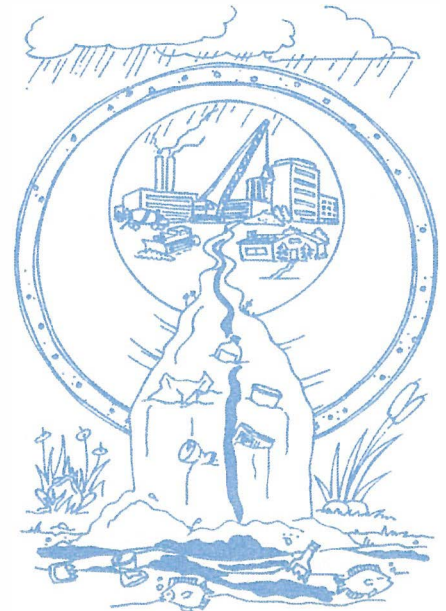
**FIND OUT
IF YOUR FACILITY
MUST OBTAIN A PERMIT**

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system **does not provide** for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."



National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are general descriptions of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

→ Facilities such as cement manufacturing, feedlots, fertilizer manufacturing, petroleum refining, phosphate manufacturing, steam electric power generation, coal mining, mineral mining and processing, ore mining and dressing, and asphalt emulsion;

→ Facilities classified as lumber and wood products (except wood kitchen cabinets), pulp, paper, and paperboard mills, chemical producers (except some pharmaceutical and biological products), petroleum and coal products, leather production and products, stone, clay and glass products, primary metal industries, fabricated structural metal, ship and boat building and repairing,

→ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations,

→ Hazardous waste treatment, storage, or disposal facilities,

→ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill,

→ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards,

→ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

→ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district,

→ Sewage treatment facilities,

→ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.
2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.
3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.
4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

A Non-Storm Water Discharge is... any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing, potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage, landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.

A BMP is . . . a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g., settling basins, oil/water separators, etc.).



WARNING: There are significant penalties for non-compliance: a minimum fine of \$5,000 for failing to obtain permit coverage, and, up to \$10,000 per day, per violation plus \$10 per gallon of discharge in excess of 1,000 gallons.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee (\$250 or \$500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.



A Citizen's Guide to Understanding Stormwater



EPA 833-B-03-002
January 2003
United States Environmental Protection Agency

Revised Edition (2003) of the 1997 edition of the publication. The text is the same as the 1997 edition. The cover has been changed to reflect the current design.

After the Storm

For more information contact:
www.epa.gov/nps
or visit
www.epa.gov/nps/stormwater



What is stormwater runoff?



Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?



Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- ◆ Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- ◆ Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- ◆ Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- ◆ Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- ◆ Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

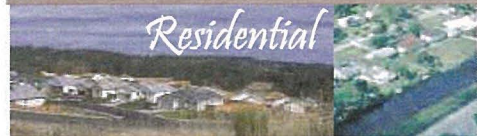


- ◆ Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.



Stormwater Pollution Solutions

Residential



Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.



- ◆ Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- ◆ Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- ◆ Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- ◆ Cover piles of dirt or mulch being used in landscaping projects.

Septic systems

- Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.
- ◆ Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
 - ◆ Don't dispose of household hazardous waste in sinks or toilets.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- ◆ Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- ◆ Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for



rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.



Commercial

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- ◆ Sweep up litter and debris from parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.
- ◆ Cover grease storage and dumpsters and keep them clean to avoid leaks.
- ◆ Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- ◆ Divert stormwater away from disturbed or exposed areas of the construction site.
- ◆ Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- ◆ Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



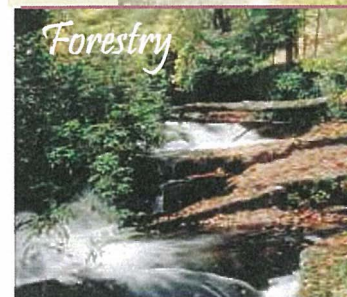
Construction



Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- ◆ Keep livestock away from streambanks and provide them a water source away from waterbodies.
- ◆ Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- ◆ Vegetate riparian areas along waterways.
- ◆ Rotate animal grazing to prevent soil erosion in fields.
- ◆ Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- ◆ Conduct preharvest planning to prevent erosion and lower costs.
- ◆ Use logging methods and equipment that minimize soil disturbance.
- ◆ Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- ◆ Construct stream crossings so that they minimize erosion and physical changes to streams.
- ◆ Expedite revegetation of cleared areas.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- ◆ Clean up spills immediately and properly dispose of cleanup materials.
- ◆ Provide cover over fueling stations and design or retrofit facilities for spill containment.
- ◆ Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- ◆ Install and maintain oil/water separators.

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WARNING: There are significant penalties for non-compliance: a minimum fine of \$5,000 for failing to obtain permit coverage, and, up to \$10,000 per day, per violation plus \$10 per gallon of discharge in excess of 1,000 gallons.

Stormwater Pollution Found in Your Area!

This is not a citation.

This is to inform you that our staff found the following pollutants in the storm sewer system in your area. This storm sewer system leads directly to

- ☐ Motor oil
- ☐ Oil filters
- ☐ Antifreeze/
transmission fluid
- ☐ Paint
- ☐ Solvent/degreaser
- ☐ Cooking grease
- ☐ Detergent
- ☐ Home improvement waste (concrete,
mortar)
- ☐ Pet waste
- ☐ Yard waste (leaves, grass, mulch)
- ☐ Excessive dirt and
gravel
- ☐ Trash
- ☐ Construction debris
- ☐ Pesticides and
fertilizers
- ☐ Other



**For more information or to report
an illegal discharge of
pollutants, please call:**



www.epa.gov/npdes/stormwater

EPA 833-F-03-002
April 2003



Stormwater runoff is precipitation from rain or snowmelt that flows over the ground. As it flows, it can pick up debris, chemicals, dirt, and other pollutants and deposit them into a storm sewer system or waterbody.

Anything that enters a storm sewer system is discharged *untreated* into the waterbodies we use for swimming, fishing, and providing drinking water.

Remember: Only Rain Down the Drain

To keep the stormwater leaving your home or workplace clean, follow these simple guidelines:

- ◆ Use pesticides and fertilizers sparingly.
- ◆ Repair auto leaks.
- ◆ Dispose of household hazardous waste, used auto fluids (antifreeze, oil, etc.), and batteries at designated collection or recycling locations.
- ◆ Clean up after your pet.
- ◆ Use a commercial car wash or wash your car on a lawn or other unpaved surface.
- ◆ Sweep up yard debris rather than hosing down areas. Compost or recycle yard waste when possible.
- ◆ Clean paint brushes in a sink, not outdoors. Properly dispose of excess paints through a household hazardous waste collection program.
- ◆ Sweep up and properly dispose of construction debris like concrete and mortar.





EPA

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Clean Water

State Revolving Fund

ACTIVITY UPDATE

Innovative use of Clean Water State Revolving Funds for Nonpoint Source Pollution

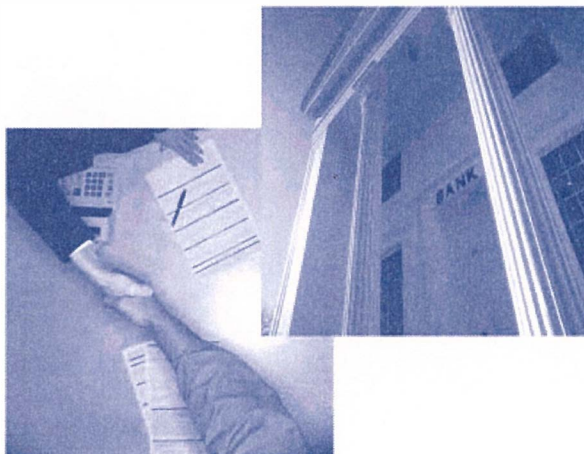
*States are
successfully
using linked
deposit and
pass-through
loans to fund
important
nonpoint source
pollution
remediation
projects*

Many states are successfully using the USEPA's Office of Water, Clean Water State Revolving Fund (CWSRF) loan program to fund important nonpoint source pollution remediation projects. Nonpoint source pollution is widely viewed as one of the most serious threats to our nation's water quality. State and local governments, local watershed and agricultural organizations, and many others are working to devise solutions that address nonpoint source pollution. The CWSRF program provides very attractive low-interest loans that spread project costs over a repayment period of up to 20 years. Today, CWSRF programs are funding projects that address agriculture runoff, leaking on-site septic systems, and urban nonpoint source pollution, including stormwater runoff and brownfield contamination.

During the initial operating phase of CWSRF programs, states designed loan

options and implemented administrative procedures that would best serve municipal wastewater system projects. However, when considering how the CWSRF program could be used to address nonpoint source pollution, a number of states recognized that they would need to go beyond the typical municipal borrower and provide loan assistance to farmers, homeowners, and nonprofit organizations. States also recognized that providing loans to small private borrowers could be challenging. The loans would fund a variety of small projects, there would be more of them to service and manage, and there would be a greater risk of loan defaults.

States have taken different approaches to addressing these challenges. In some states, the CWSRF program has called upon internal expertise and the expertise of other state personnel to help manage loans to private borrowers. Other states have used creative lending approaches that pass loan risks and loan servicing responsibilities to financial institutions, local governments, or other state agencies. These lending methods include linked deposit loan programs with local financial institutions and pass-through loan programs with local government or state agencies. This activity update will highlight these loan structures with three case studies of successful state programs.



What is a linked deposit loan?

Under a linked deposit loan approach, a state works with local private lending institutions to provide assistance for nonpoint source pollution control. The state agrees to accept a reduced rate of return on an investment (e.g., a certificate of deposit) and the lending institution agrees to provide a loan to a borrower at a similarly reduced interest rate. For example, if the typical earnings rate for a certificate of deposit (CD) is five percent, a state might agree to purchase a CD that earns two percent interest, and in exchange, the lending institution agrees to provide a loan to a borrower at an interest rate that is three percentage points lower than the market rate for the borrower. In this program, the CWSRF investment (deposit) is linked to a low-interest loan,

thereby earning the description "linked deposit loan."

Linked deposit loan programs provide benefits for CWSRF programs, local financial institutions, and borrowers. The linked-deposit approach benefits CWSRF programs because they support high priority nonpoint source projects and because they place risk and management responsibilities with local financial institutions. Financial institutions earn profits from the linked deposit agreements and add an additional service for their customers. Borrowers find linked deposit programs to be economical and comfortable; they save money with low-interest loans, and they are comfortable working with local financial institutions.

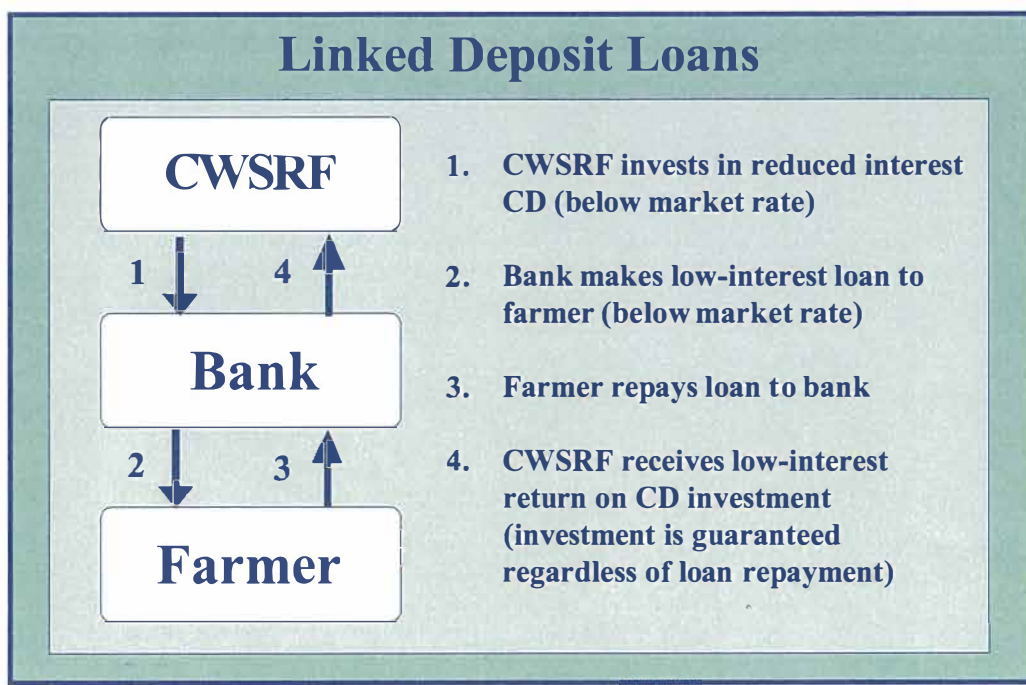


Figure 1. Linked deposit program flow chart

What is a pass-through loan?

In a pass-through loan, a CWSRF program makes a loan to another state or local government agency and that agency then lends the funds to private borrowers to address nonpoint source pollution. The town, county, or state agency reviews the project and the finances of each borrower. CWSRF loan funds are "passed-through" another government agency to private borrowers.

Pass-through loan programs benefit CWSRF programs, pass-through partners (towns, counties, and state agencies), and borrowers. These programs benefit CWSRF programs because they support

high-priority nonpoint source projects and because they place risk and management responsibilities with program partners. Towns, counties, and state agencies benefit from pass-through programs because CWSRF funds support their nonpoint source priorities. Pass-through loans can offer two potential benefits to borrowers. First, pass-through loans are not provided by private lenders and, as a result, are likely to have lower interest rates. Second, local government agencies may have greater flexibility to provide loans to borrowers with relatively weak credit conditions if the borrower's nonpoint source project is a high priority for the state or local government agency.

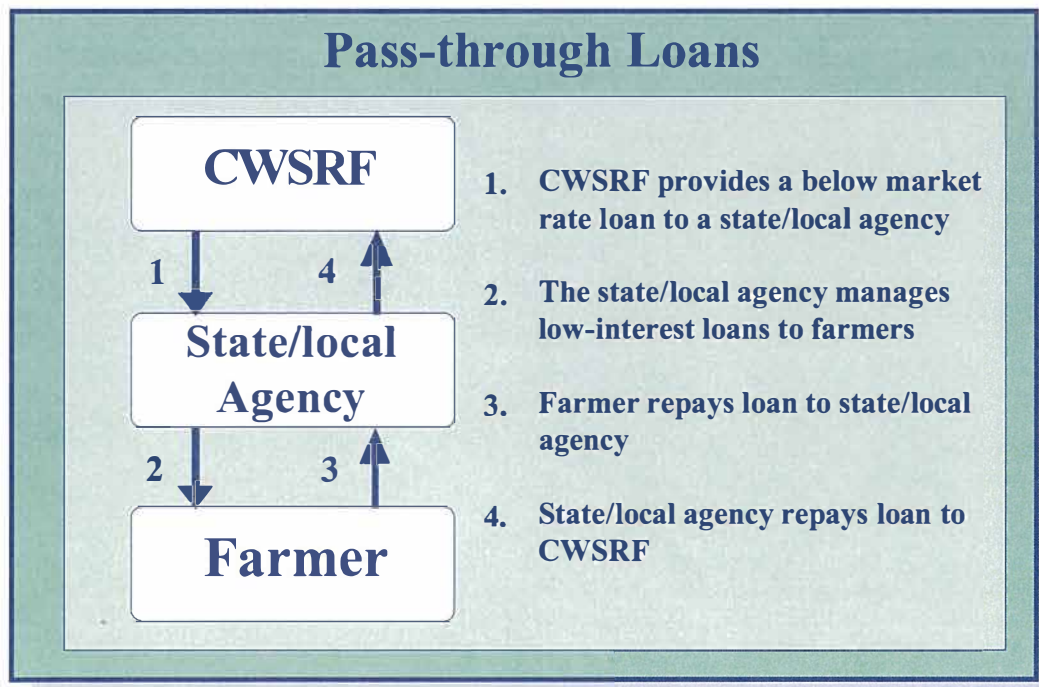


Figure 2. Pass-through program flow chart

Who has benefited from these programs and what have they funded?

CWSRF linked deposit and pass-through loan programs have supported borrowers implementing a variety of nonpoint source projects:

- Homeowners have implemented stormwater runoff best management practices and repaired or replaced failing on-site septic systems.
- Homeowner associations have addressed failing stormwater management facilities.
- Farmers have addressed agricultural runoff with a wide variety of agricultural best management practices including the construction of manure storage facilities, the restoration of filter strips and grassed waterways, and the use of conservation tillage equipment.



Ohio Case Study — Linked Deposit Loan Program

Ohio has used a linked-deposit loan program since 1993 to fund projects that support county watershed management plans. This program has funded more than 300 projects, including the repair of onsite wastewater treatment systems and the implementation of best management practices for agriculture, forestry, stormwater, and land development. The CWSRF program developed this program with the help of county soil and water conservation districts and local banks.

The CWSRF program implements its linked deposit loan program one county at a time. Each county's program is developed with two concurrent steps: the county soil and water conservation district develops a watershed management plan, and the CWSRF program and local financial institutions enter into agreements describing requirements and procedures for linked deposit loans.

Watershed management plans describe a watershed, identify sources of pollution, suggest actions that would address those pollution sources, prioritize water quality problems, identify sources of funding, and establish an implementation schedule. The county soil and water district's draft plan is reviewed by Ohio EPA and by a formal public review process. If Ohio EPA approves a plan after this review, the CWSRF program and the soil and water conservation district sign a memorandum of understanding that describes how these two entities will coordinate their implementation of the management plan.



At the same time that a watershed management plan is developed and reviewed, soil and conservation districts contact local banks to identify institutions that would like to participate in a linked deposit program. Interested banks enter into agreements with the CWSRF program that describe requirements and procedures for linked deposit loans.

Any borrower with a project that helps to implement a watershed management plan is eligible for a linked deposit loan. Participating banks review borrowers' credit using their own credit standards. If a bank approves a linked deposit loan, the CWSRF program purchases a CD of equal value from the bank. The CWSRF program accepts a CD interest rate that is five percentage points lower than the rate of a U.S. Treasury Note or Bond with the same term. The borrower's loan interest

rate is also reduced by five percentage points. The bank makes semiannual payments of principal and interest to repay the CWSRF for its investment in the CD, and it makes these payments even if the borrower defaults on the linked deposit loan.

Massachusetts Case Study — Lending through Local Government

Since 1995, Massachusetts' Community Septic Management Program has used pass-through loans with local municipalities to fund the repair and replacement of failing septic systems. The program has funded more than 3,000 projects across the state. The CWSRF has developed this program with the cooperation of local municipalities.

Communities that participate in Massachusetts' Community Septic Management Program can borrow hundreds of thousands of dollars from the CWSRF program, but communities must first develop a septic management plan and procedures for a local betterment loan program (the community uses betterment assessments to secure the loans). Massachusetts provides grants of up to \$20,000 to municipalities to support these planning activities and the administration of the program.

Massachusetts law defines a betterment assessment as a charge imposed on real property that receives a benefit from a public improvement. Municipalities have traditionally imposed betterments to pay for improvements such as roads, sidewalks and sewer lines. In the Community Septic Management Program, however, betterment agreements allow individuals to receive community support (a betterment loan) for septic system improvements, and the agreements allow communities to ensure that the loans are repaid as part of a property tax bill. The community can place a municipal lien on property if a homeowner defaults on a betterment loan.

Septic management plans identify and prioritize areas with septic systems that require monitoring, maintaining, and upgrading. As part of the planning process, communities develop maintenance schedules for septic systems, and they develop databases that track the inspection, maintenance, and upgrade of these systems. The Massachusetts Department of Environmental Protection reviews all community septic management plans.

Before a community can receive a CWSRF loan from the state, however, it also develops the framework for a local betterment loan program. Communities create administrative structures to manage the programs, devise a method for selecting priority projects, and work with their tax assessors to ensure that homeowners will repay their betterment loans as part of their local tax assessments.

Communities that develop septic management plans and procedures for a local betterment loan program receive loans from the CWSRF program for 20 years at zero percent interest. Communities

typically borrow \$200,000 from this program. Homeowners typically receive twenty-year loans from communities at two to five percent interest. Communities can use interest accrued on betterment loans to support the administrative costs of the loan programs. Communities must begin to repay the CWSRF within one year after they have finished dispersing the proceeds of each CWSRF loan.

Missouri Case Study — Lending through State Agencies

Missouri's Nonpoint Source Animal Waste Treatment Facility Loan Program is a pass-through loan program that uses a state agency as a loan intermediary. Since 1995, the Missouri Agriculture and Small Business Development Authority (MASBDA) has borrowed \$5 million from the CWSRF program, and MASBDA has used these funds to support the construction of 88 animal waste treatment systems for livestock and poultry producers. The agricultural operation of each borrower in this loan program produces fewer than 1,000 animal units -- concentrated animal feeding operations are ineligible.

Missouri's Nonpoint Source Animal Waste Treatment Facility Loan Program does not require a regional planning effort similar to the soil and water conservation plans required in Ohio' linked deposit program or the septic management plans required in Massachusetts' pass-through loan program. Engineers with Missouri's CWSRF program review each project application to ensure that CWSRF-financed structures and equipment support the goals of the program.



Missouri's CWSRF program provides 10-year loans to MASBDA that have a 1.8 percent interest rate. Individual agricultural producers access these resources by submitting applications to MASBDA. MASBDA reviews the financial component of each application, assessing cash flows and establishing security requirements. Borrowers must provide a dedicated source of repayment and a first or second deed of trust on their property. Agricultural producers typically receive 10-year loans from MASBDA that have interest rates from 5.3-5.8 percent. However, MASBDA does not offer construction financing for animal waste treatment systems. Typically, agricultural producers use loans from the Nonpoint Source Animal Waste Treatment Facility Loan Program to pay off construction loans from a private lender. MASBDA uses the repayments from agricultural producers to repay its loan from the CWSRF.

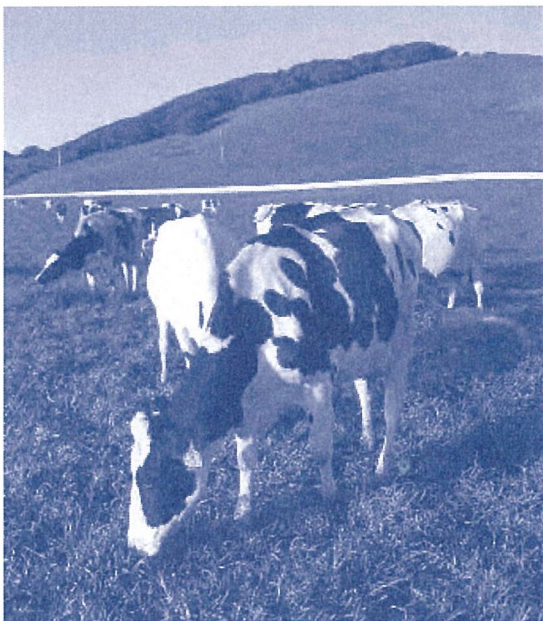
Case Study Contact Information

More information on the programs outlined in this update can be found on the state program web sites or by contacting the programs themselves.

Ohio Environmental Protection Agency
Div. of Environmental & Financial Assistance
Contact: Bob Monsarrat
Phone: 614-644-3655
Web site:
www.epa.state.oh.us/defa/linkdepo.html

Massachusetts Department of Environmental Protection
Massachusetts' Community Septic Management Program
Contact: Joseph McNealy
Phone: 617-556-1068
Web site: www.state.ma.us/dep/brp

Missouri Department of Agriculture
Animal Waste Facility Loan Program
Contact: Steve Townley
Phone: 573-751-1397
Web site: www.mda.state.mo.us/a2c.htm



*For more information about the Clean Water Revolving Fund, or for a program representative in your State,
please contact:*

Clean Water State Revolving Fund Branch
U.S. Environmental Protection Agency
1201 Constitution Avenue, NW (Mailcode 4204M)
Washington, DC 20004
Phone: (202) 564-0752 **Fax:** (202) 501-2403
Internet: <http://www.epa.gov/owm>



Clean Water



Everybody's
Business



10 Things You Can Do to Prevent Stormwater Runoff Pollution

- Use fertilizers sparingly and sweep up driveways, sidewalks, and roads
- Never dump anything down storm drains
- Vegetate bare spots in your yard
- Compost your yard waste
- Avoid pesticides; learn about Integrated Pest Management (IPM)
- Direct downspouts away from paved surfaces
- Take your car to the car wash instead of washing it in the driveway
- Check car for leaks, and recycle motor oil
- Pick up after your pet
- Have your septic tank pumped and system inspected regularly



For more information, visit
www.epa.gov/nps or
www.epa.gov/npdes/stormwater

Protecting Water Quality from **URBAN RUNOFF**

Clean Water Is Everybody's Business

In urban and suburban areas, much of the land surface is covered by buildings and pavement, which do not allow rain and snowmelt to soak into the ground. Instead, most developed areas rely on storm drains to carry large amounts of runoff from roofs and paved areas to nearby waterways. The stormwater runoff carries pollutants such as oil, dirt, chemicals, and lawn fertilizers directly to streams and rivers, where they seriously harm water quality. To protect surface water quality and groundwater resources, development should be designed and built to minimize increases in runoff.

How Urbanized Areas Affect Water Quality

Increased Runoff

The porous and varied terrain of natural landscapes like forests, wetlands, and grasslands traps rainwater and snowmelt and allows them to filter slowly into the ground. In contrast, impervious (nonporous) surfaces like roads, parking lots, and rooftops prevent rain and snowmelt from infiltrating, or soaking, into the ground. Most of the rainfall

The most recent National Water Quality Inventory reports that runoff from urbanized areas is the leading source of water quality impairments to surveyed estuaries and the third-largest source of impairments to surveyed lakes.

Did you know that because of impervious surfaces like pavement and rooftops, a typical city block generates more than 5 times more runoff than a woodland area of the same size?

and snowmelt remains above the surface, where it runs off rapidly in unnaturally large amounts.

Storm sewer systems concentrate runoff into smooth, straight conduits. This runoff gathers speed and erosional power as it travels underground. When this runoff leaves the storm drains and empties into a stream, its excessive volume and power blast out streambanks, damaging streamside vegetation and wiping out aquatic habitat. These increased storm flows carry sediment loads from construction sites and other denuded surfaces and eroded streambanks. They often carry higher water temperatures from streets, roof tops, and parking lots, which are harmful to the health and reproduction of aquatic life.

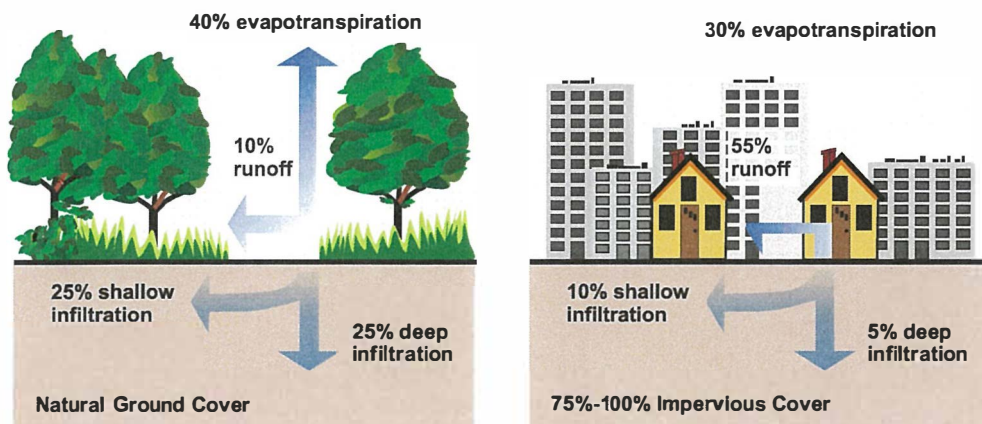
The loss of infiltration from urbanization may also cause profound groundwater changes. Although urbanization leads to great increases in flooding during and immediately after wet weather, in many instances it results in lower stream flows during dry weather. Many native fish and other aquatic life cannot survive when these conditions prevail.

Increased Pollutant Loads

Urbanization increases the variety and amount of pollutants carried into streams, rivers, and lakes. The pollutants include:

- Sediment
- Oil, grease, and toxic chemicals from motor vehicles
- Pesticides and nutrients from lawns and gardens
- Viruses, bacteria, and nutrients from pet waste and failing septic systems
- Road salts
- Heavy metals from roof shingles, motor vehicles, and other sources
- Thermal pollution from dark impervious surfaces such as streets and rooftops

These pollutants can harm fish and wildlife populations, kill native vegetation, foul drinking water supplies, and make recreational areas unsafe and unpleasant.



Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.

Managing Urban Runoff

What Homeowners Can Do

To decrease polluted runoff from paved surfaces, households can develop alternatives to areas traditionally covered by impervious surfaces. Porous pavement materials are available for driveways and sidewalks, and native vegetation and mulch can replace high maintenance grass lawns. Homeowners can use fertilizers sparingly and sweep driveways, sidewalks, and roads instead of using a hose. Instead of disposing of yard waste, they can use the materials to start a compost pile. And homeowners can learn to use Integrated Pest Management (IPM) to reduce dependence on harmful pesticides.

In addition, households can prevent polluted runoff by picking up after pets and using, storing, and disposing of chemicals properly. Drivers should check their cars for leaks and recycle their motor oil and antifreeze when these fluids are changed. Drivers can also avoid impacts from car wash runoff (e.g., detergents, grime, etc.) by using car wash facilities that do not generate runoff. Households served by septic systems should have them professionally inspected

and pumped every 3 to 5 years. They should also practice water conservation measures to extend the life of their septic systems.

Controlling Impacts from New Development

Developers and city planners should attempt to control the volume of runoff from new development by using low impact development, structural controls, and pollution prevention strategies. Low impact development includes measures that conserve natural areas (particularly sensitive hydrologic areas like riparian buffers and infiltrable soils); reduce development impacts; and reduce site runoff rates by maximizing surface roughness, infiltration opportunities, and flow paths.

Controlling Impacts from Existing Development

Controlling runoff from existing urban areas is often more costly than controlling runoff from new developments. Economic efficiencies are often realized through approaches that target "hot spots" of runoff pollution or have multiple benefits, such as high-efficiency street sweeping (which addresses aesthetics, road safety,

and water quality). Urban planners and others responsible for managing urban and suburban areas can first identify and implement pollution prevention strategies and examine source control opportunities. They should seek out priority pollutant reduction opportunities, then protect natural areas that help control runoff, and finally begin ecological restoration and retrofit activities to clean up degraded water bodies. Local governments are encouraged to take lead roles in public education efforts through public signage, storm drain marking, pollution prevention outreach campaigns, and partnerships with citizen groups and businesses. Citizens can help prioritize the clean-up strategies, volunteer to become involved in restoration efforts, and mark storm drains with approved "don't dump" messages.



Related Publications

Turn Your Home into a Stormwater Pollution Solution!

www.epa.gov/nps

This web site links to an EPA homeowner's guide to healthy habits for clean water that provides tips for better vehicle and garage care, lawn and garden techniques, home improvement, pet care, and more.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas

www.epa.gov/owow/nps/urbanmm

This technical guidance and reference document is useful to local, state, and tribal managers in implementing management programs for polluted runoff. Contains information on the best available, economically achievable means of reducing pollution of surface waters and groundwater from urban areas.

Onsite Wastewater Treatment System Resources

www.epa.gov/owm/onsite

This web site contains the latest brochures and other resources from EPA for managing onsite wastewater treatment systems (OWTS) such as conventional septic systems and alternative decentralized systems. These resources provide basic information to help individual homeowners, as well as detailed, up-to-date technical guidance of interest to local and state health departments.

Low Impact Development Center

www.lowimpactdevelopment.org

This center provides information on protecting the environment and water resources through integrated site design techniques that are intended to replicate preexisting hydrologic site conditions.

Stormwater Manager's Resource Center (SMRC)

www.stormwatercenter.net

Created and maintained by the Center for Watershed Protection, this resource center is designed specifically for stormwater practitioners, local government officials, and others that need technical assistance on stormwater management issues.

Strategies: Community Responses to Runoff Pollution

www.nrdc.org/water/pollution/storm/stoinx.asp

The Natural Resources Defense Council developed this interactive web document to explore some of the most effective strategies that communities are using around the nation to control urban runoff pollution. The document is also available in print form and as an interactive CD-ROM.

For More Information

U.S. Environmental Protection Agency
Nonpoint Source Control Branch (4503T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

www.epa.gov/nps

Stormwater Management

A Guide for Auto Recycler Owners and Operators



Stormwater Protection Starts With You

The facility operator's attitude toward stormwater management can make all the difference. It's your responsibility to communicate to your employees that stormwater management is a priority. Make sure your employees understand why stormwater management is important, both to your business and to the environment. Start by having them review the enclosed video and fact sheet.

Protecting stormwater can benefit your business in several important ways:

- **Professionalism and pride in your business** – Both workers and customers appreciate a clean and responsible facility.
- **It's the law** – Not complying with stormwater rules can put your business in jeopardy. Regulators and environmental groups across the country are increasingly targeting auto dismantlers for stormwater violations.
- **Environmental protection** – We all want clean streams, rivers, lakes, bays, and oceans for our families and for our future. Your business can protect the environment by following some straightforward and commonsense practices.

Protect
the environment
to protect
your business

The following practices describe options that your facility can implement to help address its stormwater issues. Although following all of the practices described below may help improve performance with regard to stormwater management, it does not guarantee that your facility will be in compliance with all applicable stormwater rules. Check with your state regulatory agency or EPA for more information.

The Stormwater Permit

All vehicle dismantling facilities in the United States (except those in a combined sewer service area or facilities that do not discharge stormwater from their property) are required by the Clean Water Act to obtain a stormwater permit either from the U.S. Environmental Protection Agency or from an appropriate state agency. You must first file a Notice of Intent (NOI) with the appropriate state agency. You must also prepare a Storm Water Pollution Prevention Plan (SWPPP) to describe how you will address your facility's stormwater issues.

The practices below are organized by facility area or activity. Links and contact information to obtain additional information about stormwater and other environmental issues related to auto dismantling are listed at the end of this document.

Stormwater Management

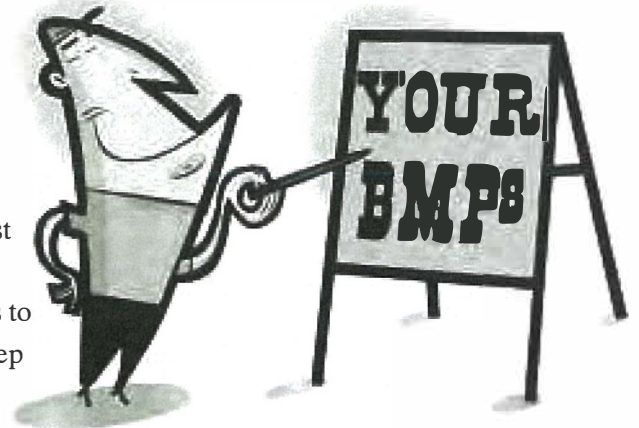
A Guide for Auto Recycler Owners and Operators

What are Best Management Practices (BMPs)?

The term “BMP” is used to describe management practices that many different industries use to address a range of environmental issues. We’ll use BMP to describe the practices that you can implement to address your auto dismantling facility’s stormwater issues.

> Training

Employee training is critical! Train appropriate employees on relevant stormwater management procedures, especially during the wet season and prior to rain or snow events. All employees must be trained upon their initial hire and at least once per year thereafter. Be sure to document employee training. Also, place signs around activity areas as reminders to your workers; for example, “No fluids in the drain” or “Sweep up loose absorbent daily.” Make up your own signs that make sense for your operation.



> Incoming Vehicles

Inspect all incoming vehicles for leaking fluids and unwanted materials as they enter your facility.

Promptly contain leaks with drip pans or absorbent materials.

> Fluid Removal

Establish a procedure for processing vehicles and stick to it. First, before any vehicle is placed in the yard for long-term storage or crushed, and before fluid-containing parts are dismantled, drain the following fluids from the vehicle in the order that best fits your operation:

- Fuel
- Motor oil
- Transmission fluid
- Brake fluid
- Antifreeze
- Freon

Draining these fluids before placing the vehicle in the yard reduces 1) the possibility of spills when parts are removed later, and 2) time and cost to your business of cleaning up leaks and spills.



> Fluid Draining and Vehicle Dismantling Area

Ideally, these activities should be conducted in the same area, which should be covered with a roof. Your fluid draining and vehicle dismantling areas have more potential to contaminate stormwater than any other areas of your facility. Properly covering this area can eliminate contact with rainfall and is a great way to get a big bang for your buck in preventing stormwater pollution. Rain or snow can carry harmful materials like oil or gasoline into the soil and nearby streams, rivers, and lakes. Roofs not only keep out rain and snow, but also make the work area more comfortable for your workers.

Stormwater Management

A Guide for Auto Recycler Owners and Operators

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If you don't currently dismantle fluid-containing parts and drain fluids under cover, you don't necessarily have to put up an entirely new and expensive building. One low-cost roofing option available is the "VersaTube" offered by Tuff Shed. (See <http://www.tuffshed.com/versatube.htm> or call (800) BUY-TUFF for more information.)

Another option includes building your own temporary cover using low-cost materials. Plans and materials for such temporary roofs can be obtained from vendors like South Bay Canopy (408) 998-8280.

You should also have a concrete pad in the draining and dismantling area, and you should drain all vehicles on this surface. Draining over concrete makes spills and leaks easier to clean up and minimizes the chance of environmental harm. Use appropriate fluid removal and handling equipment, such as suction systems, drain racks, and funnels for the containers.



Prevent stormwater pollution by minimizing the exposure of dismantling and fluid removal activities to stormwater. In addition to overhead cover, possible options include installing intercept trenches, berming the perimeter of the area, or using channels, swales, or grade breaks to divert the flow of stormwater around these areas.

> Fluid Storage

Storing fluids properly helps cut down on the amount of contaminants that end up in stormwater. When you remove fluids, transfer them to the

proper container. Confine fluid storage to designated areas that are covered

and have adequate secondary containment. Keep drums containing fluids away from storm drains; consider storing fluids near the location where fluids are drained. Maintain good integrity of all storage containers. Do not leave open drain pans that contain fluids around the shop.

You are responsible for ensuring that your fluids are handled by an authorized processor, transporter, and treatment/disposal facility.

> Spill Cleanup

Clean up spills promptly and thoroughly. Keep appropriately sized and stocked "spill kits" available in the areas where you conduct the following activities:

- Dismantling and fluid removal
- Fueling
- Fluid storage
- Equipment maintenance
- Battery and parts storage

For smaller spills, use shop rags and oil dry. Used absorbents should be placed in a designated container for proper disposal.

What should be in your spill kit?

- Absorbent socks or booms
- Disposal bags or other containers
- Absorbent pillows and pads
- Safety goggles
- Oil dry
- Plastic gloves
- Broom and shovel

- **Never use vehicle fluids for dust control!**
- **Don't mix your used oil with solvents, brake cleaner, or antifreeze.**
This creates a hazardous waste, which can't be recycled and is very expensive to get rid of.
- **Don't pour fluids into your septic system, sanitary sewer, dry well, on the ground, or in the trash.**

Stormwater Management

A Guide for Auto Recycler Owners and Operators

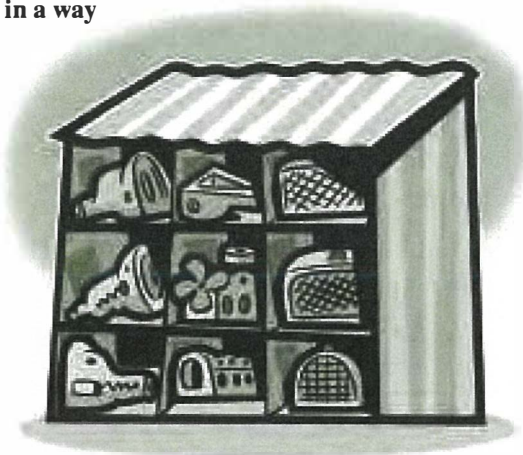
> Parts Storage

Store engines, transmissions, and other oily parts (resale, core, or scrap) in a way that avoids exposure to rain or snowfall. This can include:

- 1) Storing parts indoors
- 2) Storing parts under a permanent roof on impervious surface
- 3) Storing parts in weather-proof, leak-proof, covered containers
- 4) Placing parts in vehicle bodies
- 5) Providing temporary cover (like tarps) for these parts as an interim measure

Lead acid battery components are toxic and corrosive and can contaminate the soil and water if handled improperly. Store batteries inside a building or outside in covered, non-leaking containers. Separate batteries from other wastes like paper, rags, garbage and flammable or hazardous chemicals. Monitor your battery storage area for leaks or deterioration, and take quick action to address any spills or leaks. Lime can be used to neutralize spilled battery acid. *Never pour battery acid on the ground or into a storm drain!*

Radiators removed from vehicles should be stored under a roof, tarp, or other cover, and raised up off the ground such that there is no contact with rainfall and surface drainage.



> Crushing

Never crush a vehicle without draining all the fluids and removing gas tanks, tires, and batteries. Capture and properly dispose of residual fluids released during crushing. You're responsible for ensuring fluids are captured and don't run off your property, even if you use a contractor to crush your vehicles.

> Vehicle Storage

If engines or fluid-containing parts remain in the vehicle when it is placed in the yard, place a hood or other cover, such as a well-secured tarp, over the vehicle engine. Use drip pans under stored vehicles with leaks.

Don't place vehicles on the ground where there is a heavy stormwater flow or close to a storm drain.

After vehicles are moved, scrape up dirt or gravel that was stained from leaks and drips. Manage the contaminated material in accordance with applicable regulations.

- **Never wash spills into storm drains!**
- **Sweep up absorbent material and properly dispose at least daily.**

Stormwater Management

A Guide for Auto Recycler Owners and Operators

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> Equipment Maintenance

Schedule and perform periodic inspections of equipment. Regular maintenance of equipment such as forklifts reduces risk of breakdown and fluid release. Check for leaks and spills and for malfunctioning, worn, or corroded parts. Equipment maintenance should be done indoors or, where practical, on an impervious surface. If maintenance can't be done under cover, take adequate spill control and/or cleanup measures.

> Fueling

Pave refueling areas with concrete to prevent contamination of the soil and to enable cleanup. Don't leave vehicles unattended while fueling.

> Housekeeping

Sweep and clean paved surfaces daily to reduce sediment and contaminant buildup. Routine housekeeping is important. Catchments, inlets, oil-water separators, oil booms, waddles, tarps, and other pollutant-collecting materials need to be maintained regularly or they can become ineffective. Clean out drain inlets periodically, especially before the wet season, during the wet season, and after the wet season ends.

> Erosion Control

Tackle TSS! You may have heard of TSS or total suspended solids – in other words, dirt. Controlling the amount of dirt that runs off your property is important because metals and other harmful pollutants can attach themselves to the dirt particles and end up flowing off the property with stormwater. Eroded soil can also smother aquatic life.

Implement appropriate vegetative, structural, or stabilization

measures such as basins, sediment traps, geotextiles, buffer strips, or filter berms in areas without much vegetation where soil erosion is evident.

> Non-Stormwater Discharges

Wash water from equipment, work areas, or shop floors cannot come into contact or mix with rainfall or surface drainage, or drain offsite. Vehicle and hand wash water is OK to be discharged to the sanitary sewer where allowed (be sure to check with your local sanitary sewer district). Most states prohibit all non-stormwater discharges from your property, including, but not limited to, discharges of wash water, rinse water and spilled fluids. If you are permitted to use sewers, make sure your drain is connected to the sanitary sewer. If this is not possible in your area, the wash water must be managed on-site. Management options include recycling, re-use, or off-site disposal. If you let the water soak into the ground (**infiltration**), take appropriate steps to prevent groundwater contamination and infestation by mosquitoes or other pests. For additional information consult your local regulatory agency.



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- Residues from dried wash water cannot come into contact with rainfall or surface drainage.
- **Know where your drains go. Plug any floor drains that would let a spill run into septic systems or storm drains.** Automotive fluids and solvents can contaminate drinking water if they end up in drains that discharge to soil.
- Following washing, collect and clean up any accumulated sediments, oil deposits, debris, and paint particles.
- Do not steam clean or pressure wash parts without proper wash water management.
- Do not hose down the shop floor if water will run into a storm drain or off the property.

> Stormwater Filter Systems

Inexpensive filter systems or absorbents can provide an extra level of defense against stormwater pollution.

Examples include: absorbent socks or booms, silt fences, straw bales, rock filters, and inlet filters.

Regular maintenance of these products is essential – if they're not maintained, they won't work. Further, these measures are not a substitute for good stormwater management practices.

> Inspection

Inspect your site regularly to ensure all appropriate BMPs are being implemented. Increase inspections during periods of rainy weather. Based on permit or management needs, maintain a record of visual inspections.

Inspect oil containers, fresh water systems, irrigation lines, fueling areas, and other piping systems for leaks. If evidence of leaks is found, promptly repair or replace damaged parts to prevent polluted runoff and non-stormwater discharges.

> Customer Education

Inform customers who remove parts to do so properly and to appropriately dispose of fluids. For example, make fluid receptacles readily available, post signs that require the use of drip pans for parts removal, and prohibit waste generating activities like vehicle maintenance in parking lots.

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Mercury Switches

Mercury switches are an important issue. Many older vehicles contain mercury, which is highly toxic and can cause learning disabilities and mental retardation in newborn children. When vehicles are crushed and mercury remains inside, it can get onto the ground and into waterways. Also, mercury can be released into the air and water bodies after scrapped vehicles go to the shredder.

What to do about mercury

Mercury switches are commonly found under vehicle hoods and trunks and less frequently in automatic braking systems (ABS). These switches can easily be removed to prevent contamination of the environment and human health problems.

Some states require mercury switches to be removed before vehicles are crushed. Some auto dismantlers remove the switches even if they are not required to do so. If you choose to address this important environmental issue and remove mercury switches before your vehicles are crushed, store the switches in a leak-proof, clearly marked, closed container. Also take care to ensure that the switches do not break during handling or storage. A licensed metals recycler that reclaims mercury can dispose of the switches. Contact your state environmental agency for more information.

Information on removing mercury from vehicles is available online at:

epa.gov/glnpo/bnsdocs/hgsbook/auto.pdf

epa.gov/region5/air/mercury/autoswitch.htm

switchout.ca

You
>> **CAN** <<
Make a Difference!

Auto recyclers do their part to conserve natural resources by recycling valuable materials. Build on this good work and protect the environment from polluted runoff by implementing the BMPs described in this fact sheet. Make sure that your employees understand that stormwater management is important and are trained to implement your BMPs.

Remember,
stormwater protection
starts with **YOU!**

"It's critical for owners to set an example and be actively involved in implementing BMPs."

— Brian Werth, Select Auto & Truck Recyclers

Stormwater Management

A Guide for Auto Recycler Owners and Operators

Where to find more information

Check out the following sources for additional information on BMPs for auto recyclers:

Manuals

- An Environmental Compliance Workbook for Automotive Recyclers, Florida DEP
www.dep.state.fl.us/central/home/ps/asyc/fl_gyb.pdf
- Environmental Compliance Guide for Motor Vehicle Salvage Yards, OH Small Bus. Assistance Office
www.epa.state.oh.us/other/sbao/salvageguide.pdf
- Vehicle Recycling Manual: A Guide for Vehicle Recyclers, Washington State Department of Ecology
www.ecy.wa.gov/pubs/97433.pdf
- Automotive Recyclers Guide to a Cleaner Environment, New York DEC
www.dec.state.ny.us/website/reg8/press/autorec/autorec0.pdf
- Certified Auto Recycler (CAR) Guidance Manual, Automotive Recyclers Association
www.autorecyc.org (Available to members only)

Other Sources

- The National Compliance Assistance Clearinghouse is your guide to compliance information on the Internet. It provides quick access to compliance tools and contacts from EPA and other compliance assistance providers. The clearinghouse has an entire section devoted to the auto salvage industry.
cfpub.epa.gov/clearinghouse
- A list of state and local environmental contacts can be found on the internet at:
www.epa.gov/epapages/statelocal/envrolst.htm
- The EPA Small Business Ombudsman can help you understand environmental regulations, or refer you to local contacts. Their toll-free small business hotline provides regulatory and technical assistance information: (800) 368-5888

Vendors

Call for catalogs or more information

Low-Cost Roofs:

Tuff Shed (800)BUY-TUFF
South Bay Canopy (408) 998-8280

Fluid Removal and Storage Equipment:

Hy-Tec Environmental (800) 336-4499
Spill Cleanup Direct (800) 356-0783

Spill Kits and Absorbent Materials:

Stormtech (888) 549-5374
New Pig (800) 468-4647

Note: Sustainable Conservation and U.S. EPA do not endorse any of these products.

This list is not complete: other vendors may provide similar or identical products and services.

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La Protección de la Precipitación Pluvial Comienza Con Usted

La actitud del operador de la compañía hacia la supervisión de la precipitación pluvial puede hacer la diferencia. Es su responsabilidad comunicar a sus empleados que la supervisión de la precipitación pluvial es una prioridad. Asegúrese que sus empleados entiendan por qué es importante la supervisión de la precipitación pluvial tanto para su negocio como para el medio ambiente. Comience mostrándoles el video y hoja informativa que aquí se adjuntan.

Proteger la precipitación pluvial puede beneficiar a su negocio de varias maneras importantes:

- **Profesionalismo y orgullo en su negocio** - Tanto los trabajadores como sus clientes aprecian una compañía limpia y responsable.
- **Es la ley** - El no cumplir con las normas de precipitación pluvial puede poner su negocio en juego. Los grupos reguladores y ambientalistas en todo el país están enfocándose cada vez más en las dismanteladoras de autos por violaciones en cuanto a la precipitación pluvial.
- **Protección ambiental** - Todos queremos arroyos, ríos, lagos, bahías, y océanos limpios para nuestras familias y nuestro futuro. Su compañía puede proteger el medio ambiente siguiendo algunas prácticas directas y de sentido común.



Proteja
el medio ambiente
para proteger a
su negocio

Las siguientes prácticas describen opciones que su compañía puede aplicar para ayudarse a administrar lo relativo a la precipitación pluvial. Aunque el seguir todas las prácticas descritas abajo puede ayudar a mejorar el desempeño respecto a la supervisión de la precipitación pluvial, ello no garantiza que su compañía estará en cumplimiento con todas las normas aplicables de la precipitación pluvial. Comuníquese con una agencia reguladora del estado o la EPA si desea más información.

El Permiso de precipitación pluvial

Todas las instalaciones dismanteladoras de vehículos en los Estados Unidos (excepto aquellas en una área de servicio de desagüe combinado o instalaciones que no desechen precipitación pluvial de su propiedad) están obligadas por la Ley de Agua Limpia (Clean Water Act) a obtener un permiso de precipitación pluvial, ya sea de la Agencia de Protección del Medio Ambiente de los EE.UU. o de una agencia estatal correspondiente. Usted primero debe archivar un Aviso de Intención (Notice of Intent, o N.O.I.) ante la agencia estatal correspondiente. También debe preparar un Plan de Prevención de Contaminación de la precipitación pluvial (SWPPP) para describir cómo es que su compañía administrará lo referente a la precipitación pluvial.

Las siguientes prácticas están organizadas por área o actividad de la compañía. Para referencias y contactos para obtener información adicional acerca de la precipitación pluvial y otros asuntos ambientales relacionados la dismantelación de vehículos, vea el final de este documento.

¿Cuáles son las prácticas de mejor manejo (BMPs)?

El término “BMP” es utilizado para describir prácticas de manejo que muchas diferentes industrias usan para dirigir un gran número de asuntos ambientales. Nosotros utilizaremos BMP para describir las prácticas que usted puede aplicar para administrar lo referente a la precipitación pluvial en su dismanteladora de autos.

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detienen la lluvia y la nieve, sino que también hacen el área de trabajo más cómoda para sus trabajadores.

Si usted no desmantela actualmente partes que contengan fluidos y extrae fluidos debajo de un techo, usted no necesariamente tiene que construir un edificio nuevo y costoso. Una opción disponible es el techo de bajo costo “Versa Tube” ofrecido por Tuff Shed. (Vea <http://www.tuffshed.com/versatube.htm> o llame (800) BUY TUFF para más información.) Otra opción incluye construir su propio techo temporal utilizando materiales de bajo costo. Puede obtener planos y materiales de dichos techos temporales de vendedores como South Bay Canopy (408) 998-8280.

Usted también debe tener una plataforma de concreto en el área de extracción y desmantelamiento, y debe drenar todos los vehículos sobre la superficie. El drenar sobre concreto hace que los derrames y fugas sean más fáciles de limpiar y minimiza la posibilidad de daño ambiental. Utilice equipo apropiado para la extracción y manejo de fluidos, tales como sistemas de succión, racas de drenaje y embudos para contenedores.



Prevenga la contaminación de la precipitación pluvial minimizando la exposición de las actividades de desmantelamiento y de extracción de fluidos a la precipitación pluvial. Además de un techo, otras opciones posibles incluyen instalar zanjas interceptoras, bordear el perímetro del área, o utilizar canales, o cortes para desviar el flujo de la precipitación pluvial fuera del alcance de estas áreas.

> Almacenamiento de fluidos

El almacenar los fluidos apropiadamente ayuda a reducir la cantidad de contaminantes que terminan en la precipitación pluvial. Cuando extraiga fluidos, colóquelos en el contenedor apropiado. Destine el almacenamiento de fluidos a áreas designadas que estén cubiertas y que tengan un adecuado contenimiento secundario. Mantenga los barriles que contengan fluidos alejados de los drenajes de agua; considere almacenar los fluidos cerca del área donde los fluidos son extraídos. Mantenga en buenas condiciones todos los contenedores de almacenamiento. No deje charolas abiertas que contengan fluidos alrededor del taller.

Usted es responsable de asegurarse que sus fluidos sean manejados por procesadores, transportistas, y compañías de tratamiento/desechos autorizados.

> Limpieza de derrames

Limpie los derrames rápida y completamente. Guarde kits para derrames, del tamaño apropiado, en todas las áreas donde realice las siguientes actividades:

- Desmantelamiento y extracción de fluidos
- Abastecimiento de combustible
- Almacenamiento de fluidos
- Mantenimiento de equipo
- Almacenamiento de baterías y partes

Para derrames menores utilice trapos y “oil dry”. Los materiales absorbentes usados deberán colocarse en un contenedor designado para su desecho.

¿Qué debería haber en su kit para derrames?

- Tubos (“socks”) absorbentes
- Lentes de seguridad
- Cojines y almohadas absorbentes
- Guantes de plástico
- “Oil dry”
- Bolsas para desecho y otros contenedores
- Escoba y pala

- **iNunca utilice fluidos de vehículo para controlar el polvo!**
- **No mezcle su aceite usado con solventes, limpiador de frenos, ni anticongelante.** Esto crea un desperdicio peligroso el cual no puede ser reciclado y es muy costoso deshacerse de él.
- **No vierta fluidos dentro del sistema séptico, el drenaje sanitario, los pozos, en la tierra, ni en la basura.**

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> Mantenimiento del equipo

Programa y realice inspecciones periódicas del equipo. El mantenimiento regular del equipo, tal como los montacargas, reduce el riesgo de que se descomponga y que tire fluidos. Revise por posibles fugas y derrames, el mal funcionamiento, desgaste, o partes corroídas. El mantenimiento del equipo debe hacerse en un lugar cerrado o, cuando sea práctico, en una superficie impenetrable. Si el mantenimiento no puede hacerse bajo techo, tome medidas adecuadas de control de derrames y/o limpieza.

> Abastecimiento de combustible

Pavimente las áreas de abastecimiento de combustible con concreto para prevenir la contaminación del suelo y facilitar la limpieza. No deje los vehículos sin atender mientras se estén cargando de combustible.

> Mantenimiento

Barra y limpie las superficies pavimentadas diariamente para reducir la sedimentación y acumulación de contaminantes.

El mantenimiento como rutina es importante. Recipientes, zanjas, separadores de agua/aceite, repelentes de aceite, lonas, y demas materiales para retener contaminantes deben recibir mantenimiento regular o pueden llegar a ser ineficaces. Limpie las zanjas de drenaje periódicamente, antes, durante y después de la temporada de lluvias.

> Control de la erosión

¡Elimine los TSS! Quizás haya oído hablar de los TSS o sólidos totalmente suspendidos: en otras palabras, la tierra. Controlar la cantidad de tierra que se escurre fuera de su propiedad es importante porque los metales y otros contaminantes dañinos pueden adherirse a las partículas de tierra y terminar escurriéndose fuera de la propiedad hacia la precipitación pluvial. El suelo erosionado puede también extinguir la vida acuática.



Tome medidas adecuadas en cuanto a la vegetación, estructuración o estabilización, tales como desagües, retenedores de sedimentación, geotextiles, o bordos de filtración en áreas sin mucha vegetación, donde la erosión del suelo es evidente.

> Los escurrimientos que no provienen de la precipitación pluvial

El agua para lavar equipo, áreas de trabajo, o pisos del taller no puede entrar en contacto o mezclarse con la lluvia o el drenaje superficial ni el drenaje común. El agua para lavarse las manos o lavar vehículos puede descargarse en el drenaje sanitario donde sea permitido (asegúrese de contactar a su distrito local de drenaje sanitario). La mayoría de los estados prohíben los escurrimientos de su propiedad que no provengan de la precipitación pluvial, incluyendo, pero sin limitarse a, los escurrimientos de agua para lavar, para enjuagar y de fluidos derramados. Si usted tiene permiso para usar drenajes, asegúrese que su drenaje esté conectado al drenaje sanitario. Si esto no es posible en su área, el agua para lavar debe ser manejada dentro de su propiedad. Las opciones de manejo incluyen el reciclaje, el reuso o su desecho fuera de la propiedad. Si usted deja que el agua se acumule en la tierra (filtración), tome los pasos adecuados para prevenir contaminación en la tierra o que se infeste con mosquitos u otras plagas. Para información adicional consulte su agencia reguladora local.

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- Los residuos secos del agua para lavar no pueden entrar en contacto con la lluvia o drenaje de la superficie.

- **Usted debe saber hacia dónde están dirigidos sus drenajes. Tape cualquier drenaje en el suelo que pudiera dejar escurrir un derrame hacia un sistema séptico o drenaje de agua.**

Los fluidos y solventes de los automóviles pueden contaminar el agua potable si caen en drenajes que se descargan sobre el suelo.

- Después de lavar, recoja y limpie cualquier sedimentación acumulada, depósitos de aceite, chatarra, y partículas de pintura.
- No lave partes a vapor o a presión sin el manejo apropiado del agua para lavar.
- No lave el piso del taller con manguera si el agua va a escurrir hacia el drenaje o fuera de la propiedad.

> Sistemas de filtración de la precipitación pluvial

Los sistemas de filtración no costosos o absorbentes pueden ofrecer un nivel de defensa adicional contra la contaminación de la precipitación pluvial. Algunos ejemplos incluyen: tubos absorbentes, cercos, pacas de paja, filtros de roca, y zanjas para filtrar. El mantenimiento regular de estos productos es esencial: si no reciben mantenimiento, no van a funcionar. Además, estas medidas no sustituyen a las prácticas del buen manejo de la precipitación pluvial.

> Inspección

Inspeccione sus instalaciones con regularidad para asegurarse que se estén aplicando todas las BMPs correctas.

Aumente las inspecciones durante los periodos de clima lluvioso. Basándose en el permiso o necesidades de supervisión, mantenga un registro de las inspecciones visuales. Inspeccione los contenedores de aceite, los sistemas de agua fresca, las líneas de irrigación, las áreas de abastecimiento de combustible, y demás sistemas de tuberías por posibles fugas. Si existe evidencia de alguna fuga, repárela rápidamente o reemplace las partes dañadas para prevenir escurrimientos contaminados y descargas de agua que no provengan de la precipitación pluvial.

> Educación de los clientes

Notifique a sus clientes que sustraen partes que lo hagan correctamente y que desechen los fluidos debidamente. Por ejemplo, coloque recipientes para fluidos a disposición de los clientes, coloque letreros que requieran el uso de charolas para quitar partes, y prohíba actividades que generen desperdicios, como el dar mantenimiento a vehículos en el estacionamiento.

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Switches de mercurio

Los switches o interruptores de mercurio son un aspecto importante. Muchos vehículos viejos contienen mercurio, el cual es altamente tóxico y puede causar discapacidades del aprendizaje y el retardo mental en niños recién nacidos. Cuando los vehículos son compactados y el mercurio se mantiene adentro, éste puede caer en el suelo y en las corrientes de agua. El mercurio también puede esparcirse en el aire y en los mantos acuíferos después de que los vehículos compactados van a la cortadora.

Qué hacer acerca del mercurio

Los switches de mercurio se hayan normalmente debajo de los cofres y cajuelas de los vehículos y menos frecuentemente en sistemas de frenado automático (ABS). Estos switches se pueden extraer antes de compactar los vehículos. Algunas dismanteladoras de autos quitan los switches aunque no se les requiera. Si usted decidiera participar en este importante aspecto ambiental y removiera los switches de mercurio antes de compactar sus vehículos, debe almacenar los switches en un contenedor cerrado claramente marcado y a prueba de fugas. También asegúrese de que los switches no se quiebren cuando se manejen o almacenen. Una recicladora de metales con licencia que recolecte mercurio puede desechar los switches. Contacte a su agencia ambiental del estado si desea más información.

Puede obtener información acerca de como remover el mercurio de los vehículos por el internet en:

epa.gov/glnpo/bnsdocs/hgsbook/auto.pdf

epa.gov/region5/air/mercury/autoswitch.htm
switchout.ca

**iUsted
>> PUEDE <<
Hacer la Diferencia!**

Las recicladoras de autos hacen su labor para conservar los recursos naturales al reciclar materiales valiosos. Coopere en esta buena labor y proteja al medio ambiente de los escurrimientos contaminados, aplicando las BMPs descritas en este documento. Asegúrese que sus empleados entiendan que el manejo de la precipitación pluvial es importante y que se les capacite para aplicar las BMPs.

**Recuerde, ¡la protección de la precipitación pluvial
Comienza con USTED!**

"Es fundamental para los propietarios poner el ejemplo y participar activamente en la aplicación de las BMPs."

— Brian Werth, Select Auto & Truck Recyclers

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Dónde puede encontrar más información

Consulte las siguientes fuentes si desea más información acerca de las BMPs para recicladoras de autos:

Manuales

- An Environmental Compliance Workbook for Automotive Recyclers, Florida DEP
www.dep.state.fl.us/central/home/ps/asyca/fl_gyb.pdf
- Environmental Compliance Guide for Motor Vehicle Salvage Yards, OH Small Bus. Assistance Office
www.epa.state.oh.us/other/sbao/salvageguide.pdf
- Vehicle Recycling Manual: A Guide for Vehicle Recyclers, Washington State Department of Ecology
www.ecy.wa.gov/pubs/97433.pdf
- Automotive Recyclers Guide to a Cleaner Environment, New York DEC
www.dec.state.ny.us/website/reg8/press/autorec/autorec0.pdf
- Certified Auto Recycler (CAR) Guidance Manual, Automotive Recyclers Association
www.autorecyc.org (Disponible para miembros solamente)

Otras fuentes

- La National Compliance Assistance Clearinghouse es su guía sobre cómo obtener información acerca de los requerimientos por el internet. Ésta le proporciona al rápido acceso a las herramientas requeridas y los contactos de la EPA y de otros proveedores de asistencia en cuanto a los requerimientos. Dicha agencia tiene una sección entera dedicada a la industria del salvamento de autos. <http://cfpub.epa.gov/clearinghouse>
- Puede hallar una lista de contactos ambientalistas del estado y locales por el internet en:
epa.gov/epapages/statelocal/envrolst.htm
- El EPA Small Business Ombudsman le puede ayudar a comprender las regulaciones ambientales, o proporcionarle contactos locales. La línea libre de cobro para pequeños empresarios provee información sobre asistencia regulatoria y técnica: (800) 368 5888.

Información sobre vendedores

Techos de bajo costo:

Tuff Shed (800) BUY-TUFF
South Bay Canopy (408) 998-8280

Extracción de fluidos y equipo de almacenamiento:

Hy-Tec Environmental (800) 336-4499
Spill Cleanup Direct (800) 356-0783

Kits para derrames y materiales absorbentes:

Stormtech (888) 549-5374
New Pig (800) 468-4647

Nota: Sustainable Conservation y U.S. EPA no endosa ninguno de estos productos.

Esta lista no esta completa: otros vendedores pueden proveer productos y servicios similares o idénticos.

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FACT SHEET

Cleaning Up Polluted Runoff with the Clean Water State Revolving Fund

What's In It For You?

The Clean Water State Revolving Fund (CWSRF) program has become a major source of funding to address polluted runoff. To date, 30 of the 51 CWSRF programs have provided funding for nonpoint source and estuary protection projects. Today annual funding to address polluted runoff exceeds \$200 million. CWSRF loans are issued at below market rates (zero percent to less than market), offering borrowers significant savings over the life of the loan.

History

In creating the CWSRF program, Congress ensured that it would be able to fund most types of water quality projects, including nonpoint source, wetlands, estuary, and other types of watershed projects, as well as more traditional municipal wastewater treatment systems. The CWSRF program provisions in the Clean Water Act give no more preference to one category or type of project than any other.



Capacity of the CWSRF

The 51 CWSRF programs work like banks (each state and Puerto Rico has one). Federal and state contributions are used to capitalize or set-up the programs. These assets are used to make low-interest loans for important water quality projects. Repaid funds are then recycled to fund other important water quality projects.

The CWSRF programs have in excess of \$42 billion in assets and average funding for the past three years exceeds \$4 billion annually. The funding of polluted runoff projects with the CWSRF is gaining momentum. Since 1989, the CWSRF program has funded 3,400 projects, investing more than \$1.6 billion in polluted runoff projects.

Who May Qualify?

Included in a long list of eligible loan recipients are communities, citizens groups, businesses, farmers, homeowners, watershed groups, and nonprofit organizations. Since the program is managed largely by the states, project eligibility may vary according to the priorities within each state. Contact your state's CWSRF program for details.

Polluted Runoff and the CWSRF

The CWSRF can fund virtually any type or category of polluted runoff that is included in a state approved nonpoint source (NPS) management plan.

Polluted runoff occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into surface or ground

water. For instance, polluted runoff from agricultural sources is the leading contributor to water quality impairments in rivers, degrading over 60% of impaired river miles.



Terraces, conservation tillage and conservation buffers save soil and improve water quality

Here are a few actual project examples from states that demonstrate what the CWSRF can do:

- **California** - Stormwater management facilities, including sediment basins and constructed wetlands. Purchasing easements for wetland protection
- **Delaware** - Animal waste management facilities, including manure storage facilities and dead chicken composters
- **Massachusetts** - Septic system improvements and replacement
- **Minnesota** - Agricultural best management practices (BMPs) to prevent and reduce runoff. Purchasing conservation tillage equipment and implementing soil erosion controls
- **New York** - Purchasing land and easements for source water protection projects
- **Washington** - Rehabilitation of streambanks, riparian corridors and buffers

- **Wisconsin** - Water protection and improvement projects on brownfield redevelopment sites
- **Wyoming** - Removal of leaking underground storage tanks and remediation of contaminated ground water and soil



State of the art lagoon animal waste management system

These are just a sample of the projects that have been funded. Contact your state or visit the CWSRF web site for more examples and information (www.epa.gov/owm/cwfinance/index.htm)

Benefits of Loans

First, Funds are Available. CWSRF loans can usually be obtained much faster than grants and each year over \$200 million is spent on nonpoint source projects.

Second, No Cash Up-Front. Most grant programs require significant cost shares (as much as 40 percent or more). A CWSRF loan can cover 100 percent of project costs with no cash up-front.

Third, Significant Cost Savings. CWSRF loans provide significant cost savings over the life of the loan. The total cost of a zero percent CWSRF loan will be approximately 50 percent less than the same project financed by a commercial loan at 7.5 percent.

Fourth, Loans can Complement other Funding Sources. It may be possible to combine a CWSRF loan with grant dollars from other sources. Check with your state.

Sources of Repayment

Many users of the CWSRF program have demonstrated a high level of creativity in developing sources of repayments. The source of repayment need not come from the project itself. Some possible sources include:

- Fees paid by property owner or homeowner
- Fees paid by a developer
- Dedicated portion of local, county, or state taxes or fees
- Recreational fees (fishing license, park entrance fees)
- Stormwater management fees
- Wastewater user charges
- Donations or dues made to nonprofit groups
- Business revenues



Making Funding Accessible - Ohio Examples

The state of Ohio employs several innovative funding methods to ensure a variety of watershed projects receive funding. Two unique funding methods used in Ohio are the Linked-Deposit Loan Program and the Watershed Resource Restoration Sponsorship Program (WRRSP). In both examples the state shows creativity by taking existing institutional arrangements and modifying them to achieve the state's goals and meet the needs of loan recipients.

Linked Deposit Lending Program

In Ohio's linked-deposit program, the state makes arrangements with local banks to provide loans for agricultural BMPs and on-site wastewater treatment projects. Under a linked-deposit arrangement the state agrees to buy a bank's investment (CD) and receive a lower than market rate of return on the investment. The bank agrees to provide reduced interest rate loans for eligible projects. The linked-deposit loan interest rate reflects the difference between the state's reduced rate of return on the investment and the market rate of return.

The linked-deposit approach benefits CWSRF programs because they support high priority nonpoint source projects and because they place risk and management responsibilities with local financial institutions. Financial institutions earn profits from the linked deposit agreements and add an additional service for their customers. Borrowers find linked deposit programs to be economical and comfortable; they save money with low-interest loans, and they are comfortable working with local financial institutions.

For more information on linked-deposit loans see EPA's Activity Update *"Innovative Use of Clean Water State Revolving Funds for Nonpoint Source Pollution"* (EPA 832-F-02-004) found on the CWSRF web site.

Watershed Resource Restoration Sponsorship Program (WRRSP)

The WRRSP offers communities very low interest rates on loans for wastewater treatment plant improvements if the communities also sponsor projects that protect or restore water resources. The end payment for the wastewater treatment plant project is the same because of the lower interest rate and the simultaneous funding for the restoration project by the wastewater treatment plant. The benefit of this program is water restoration projects that normally would not receive funding are completed with the help of the wastewater treatment plants.

To date, the WRRSP program has supported projects that have acquired wetlands and riparian lands, acquired conservation easements, restored habitat, and removed dams.

Over the past two years under the WRRSP, communities in Ohio have used \$24 million of CWSRF loan funds to protect and restore 1850 acres of riparian lands and wetlands and 38 miles of Ohio's stream corridors.

For more information on Ohio's WRRSP see EPA's Activity Update ***"Ohio's Restoration Sponsor Program Integrates Point Source and Nonpoint Source Projects"*** (EPA 832-F-02-001) found on the CWSRF web site.

Challenges Ahead

With increasing emphasis on watershed-based program management and implementation of Total Maximum Daily Loads (TMDLs) in impaired water bodies, it will be even more important to take advantage of the tremendous buying power of the CWSRF program.

How to Get More From the CWSRF

- Share information on polluted runoff priorities with CWSRF managers
- Work to enhance CWSRF programs to include funding of polluted runoff projects
- Become involved in the annual CWSRF planning and priority setting process
- Help market the program and encourage loan applications

The water quality community needs to work together to increase understanding of polluted runoff issues and facilitate the use of the powerful resources of the CWSRF to address these significant problems. EPA has been encouraging the states to open their CWSRFs to the widest variety of water quality projects and to use their CWSRFs to fund the highest priority projects in targeted watersheds. Those interested in cleaning up polluted runoff must seek out their CWSRF programs, gain an understanding of how their state program works, and participate in the annual process that determines which projects are funded.

For more information about the Clean Water Revolving Fund, or for a program representative in your State, please contact:

Clean Water State Revolving Fund Branch
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (Mailcode 4204M)
Washington, DC 20460
Phone: (202) 564-0752 **Fax:** (202) 501-2403
Internet: www.epa.gov/owm/cwfinance/index.htm





What is WaterSense?

WaterSense is a voluntary public-private partnership program sponsored by the U.S. Environmental Protection Agency. Its mission is to protect the future of our nation's water supply by promoting and enhancing the market for water-efficient products and services.

www.epa.gov/watersense



5


Simple Ways to Save Water



United States Environmental Protection Agency
(4204M)

EPA-832-F-06-007
May 2006

www.epa.gov/watersense

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Saving water is simple and smart.

1 Be smart when irrigating your lawn or landscape.

- Water the lawn or garden during the coolest part of the day. Early morning is best.
- Water plants according to their water needs; you'll have healthier plants and a lower water bill.
- Set sprinklers to water lawns and gardens only—not the street or sidewalk.
- Use soaker hoses or trickle irrigation systems for trees and shrubs.

2 Use your appliances wisely.

- Wash only full loads or set small loads to the appropriate water level.
- Scrape rather than rinse dishes before loading them into the dishwasher.
- Replace old clothes washers with ENERGY STAR qualified appliances that use less water.

3 Don't flush your money down the drain/Toilets.

- A leaky toilet can waste 200 gallons of water per day. Check your toilet for leaks by adding food coloring to the tank. If the toilet is leaking, color will appear in the bowl within 15 minutes. Look for worn out, corroded or bent parts in the leaky toilet. Most replacement parts are inexpensive, readily available and easily installed. (Flush as soon as test is done, since food coloring may stain the tank.)
- When replacing your toilet, look for high-efficiency models that use less than 1.3 gallons per flush.

4 Conserve around the house.

- Keep drinking water in the refrigerator instead of letting the faucet run until cool. A running tap can use about 2 gallons of water per minute.

- Try not to leave the tap running while you brush your teeth or shave.

- Don't pour water down the drain if you can use it for other projects such as watering a plant or cleaning.

5 Stop those leaks.

- Verify that your home is leak-free. Many homes have hidden water leaks that can waste more than 10 percent, costing both you and the environment. Read your water meter before and after a two-hour period where no water is being used. If the meter does not read exactly the same, you probably have a leak.
- Repair dripping faucets and showers. If your faucet is dripping at the rate of one drop per second, you can expect to waste 2,700 gallons per year. This waste will add to the cost of water and sewer utilities or strain your septic system.

As stormwater flows over driveways, lawns, and sidewalks, it picks up debris, chemicals, dirt, and other pollutants. Stormwater can flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water. Polluted runoff is the nation's greatest threat to clean water.



By practicing healthy household habits, homeowners can keep common pollutants like pesticides, pet waste, grass clippings, and automotive fluids off the ground and out of stormwater. Adopt these healthy household habits and help protect lakes, streams, rivers, wetlands, and coastal waters. Remember to share the habits with your neighbors!

Healthy Household Habits for Clean Water

Vehicle and Garage

- Use a commercial car wash or wash your car on a lawn or other unpaved surface to **minimize** the amount of dirty, soapy water flowing into the storm drain and eventually into your local waterbody.



- Check your car, boat, motorcycle, and other machinery and equipment for leaks and spills. Make repairs as soon as possible. Clean up spilled fluids with an absorbent material like kitty litter or sand, and don't rinse the spills into a nearby storm drain. Remember to properly dispose of the absorbent material.
- Recycle used oil and other automotive fluids at participating service stations. Don't dump these chemicals down the storm drain or dispose of them in your trash.

Lawn and Garden

- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Avoid application if the forecast calls for rain; otherwise, chemicals will be washed into your local stream.
- Select native plants and grasses that are drought- and pest-resistant. Native plants require less water, fertilizer, and pesticides.
- Sweep up yard debris, rather than hosing down areas. Compost or recycle yard waste when possible.
- Don't overwater your lawn. Water during the cool times of the day, and don't let water run off into the storm drain.
- Cover piles of dirt and mulch being used in landscaping projects to prevent these pollutants from blowing or washing off your yard and into local waterbodies. Vegetate bare spots in your yard to prevent soil erosion.

Home Repair and Improvement

- Before beginning an outdoor project, locate the nearest storm drains and protect them from debris and other materials.
- Sweep up and properly dispose of construction debris such as concrete and mortar.
- Use hazardous substances like paints, solvents, and cleaners in the **smallest amounts possible**, and follow the directions on the label. Clean up spills immediately, and dispose of the waste safely. Store substances properly to avoid leaks and spills.
- Purchase and use nontoxic, biodegradable, recycled, and recyclable products whenever possible.
- Clean paint brushes in a sink, not outdoors. Filter and reuse paint thinner when using oil-based paints. Properly dispose of excess paints through a household hazardous waste collection program, or donate unused paint to local organizations.
- Reduce the amount of paved area and increase the amount of vegetated area in your yard. Use native plants in your landscaping to reduce the need for watering during dry periods. Consider directing downspouts away from paved surfaces onto lawns and other measures to increase infiltration and reduce polluted runoff.



Pet Care

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Swimming Pool and Spa

- Drain your swimming pool only when a test kit does not detect chlorine levels.
- Whenever possible, drain your pool or spa into the sanitary sewer system.
- Properly store pool and spa chemicals to prevent leaks and spills, preferably in a covered area to avoid exposure to stormwater.

Septic System Use and Maintenance

- Have your septic system inspected by a professional at least every 3 years, and have the septic tank pumped as necessary (usually every 3 to 5 years).
- Care for the septic system drainfield by not driving or parking vehicles on it. Plant only grass over and near the drainfield to avoid damage from roots.
- Flush responsibly. Flushing household chemicals like paint, pesticides, oil, and antifreeze can destroy the biological treatment taking place in the system. Other items, such as diapers, paper towels, and cat litter, can clog the septic system and potentially damage components.

Storm drains connect to waterbodies!

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or
www.epa.gov/nps

Remember: Only rain down the drain!



Make your home The **SOLUTION TO STORMWATER POLLUTION!**

*A homeowner's guide to healthy
habits for clean water*



Take the Stormwater Runoff Challenge

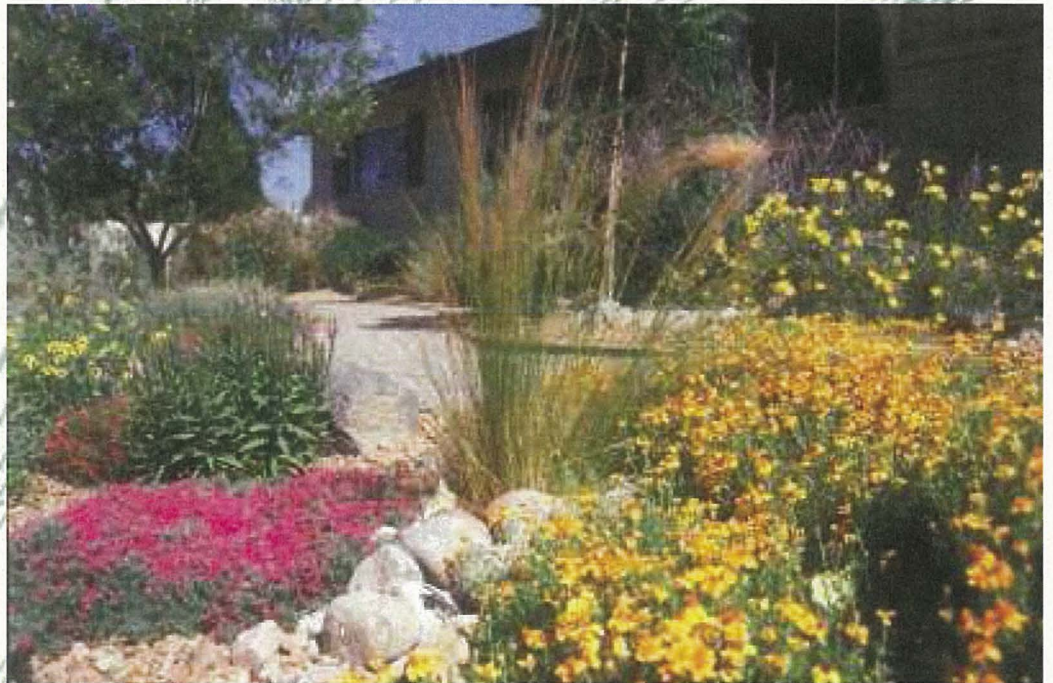


For more information, please visit EPA's
Polluted Runoff web site at www.epa.gov/nps

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Water-Efficient Landscaping:



Preventing
Pollution &
Using Resources
Wisely

A Message from the Administrator



Christine Todd Whitman

I believe water is the biggest environmental issue we face in the 21st Century in terms of both quality and quantity. In the 30 years since its passage, the Clean Water Act has dramatically increased the number of waterways that are once again safe for fishing and swimming. Despite this great progress in reducing water pollution, many of the nation's waters still do not meet water quality goals. I challenge you to join with me to finish the business of restoring and protecting our nation's waters for present and future generations.

United States Environmental Protection Agency
Office of Water (4204M)
EPA832-F-02-002
September 2002
www.epa.gov/owm/water-efficiency/index.htm



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What is Water-efficient Landscaping?

Water, many agree, is our most precious natural resource; without it, life ceases. Yet judging by our water use and consumption practices, many of us in the United States seem to take it for granted. A typical household uses approximately 260 gallons of water per day. "Water conscious" individuals often install high-efficiency shower heads and toilets and wash only full loads of clothes and dishes to reduce consumption. But in the summer, the amount of water used outdoors by a household can exceed the amount used for all other purposes in the entire year. This is especially true in hot, dry climates.

Gardening and lawn care account for the majority of this seasonal increase, but other outdoor activities, such as washing cars and filling swimming pools, also contribute. According to the U.S. Geological Survey, of the 26 billion gallons of water consumed daily in the United States¹, approximately 7.8 billion gallons, or 30 percent², is devoted to outdoor uses. The majority of this is used for landscaping. In fact, it is estimated that the typical suburban lawn consumes 10,000 gallons of water above and beyond rainwater each year (Vickers, p 140).

Many mistakenly believe that stunning gardens and beautiful lawns are only possible through extensive watering, fertilization, and pesticide application. As this booklet will demonstrate, eye-catching gardens and landscapes that save water, prevent pollution, and

protect the environment are, in fact, easily achieved by employing water-efficient landscaping. Water-efficient landscaping produces attractive landscapes because it utilizes designs and plants suited to local conditions.

This booklet describes the benefits of water-efficient landscaping. It includes several examples of successful projects and programs, as well as contacts, references, and a short bibliography. For specific information about how to best apply water-efficient landscaping principles to your geographical area, consult with your county



Xeriscape garden at Denver Water

extension service and local garden and nursery centers. Local governments and water utilities also possess a wealth of information and suggestions for using water more efficiently in all aspects of your life, including landscaping.

¹ W.B. Solley, R.R. Pierce, and H.A. Perlman. 1998. *Estimated Use of Water in the United States in 1995* (USGS Circular 1200). USGS. Reston, VA. p.27.

² Amy Vickers. 2001. *Handbook of Water Use and Conservation*. WaterPlow Press. Amherst, MA. p. 140.



Xeriscaped front yard in Colorado Springs

Many terms and schools of thought have been used to describe approaches to water-efficient landscaping. Some examples include “water-wise,” “water-smart,” “low-water,” and “natural landscaping.” While each of these terms varies in philosophy and approach, they are all based on the same principles and are commonly used interchangeably. One of the first conceptual approaches developed to formalize these principles is known as “Xeriscape³ landscaping.” Xeriscape landscaping is defined as “quality landscaping that conserves water and protects the environment.” The word “Xeriscape” was coined and copyrighted by

Denver Water Department in 1981 to help make water conserving landscaping an easily recognized concept. The word is a combination of the Greek word “xeros,” which means “dry,” and “landscape.”

The seven principles upon which Xeriscape landscaping is based are:

- Proper planning and design
- Soil analysis and improvement
- Appropriate plant selection
- Practical turf areas
- Efficient irrigation
- Use of mulches
- Appropriate maintenance

The eight fundamentals of water-wise landscaping, below, illustrate the similarities in the underlying concepts and principles of Xeriscape landscaping and other water-efficient approaches.

- Group plants according to their water needs.
- Use native and low-water-use plants.
- Limit turf areas to those needed for practical uses.
- Use efficient irrigation systems.
- Schedule irrigation wisely.
- Make sure soil is healthy.
- Remember to mulch.
- Provide regular maintenance.

In short, plan and maintain your landscape with these principles of water efficiency in mind and it will continue to conserve water and be attractive.

³ Denver Water welcomes the use of the term Xeriscape in books, articles, and speeches promoting water conserving landscape. EPA is using this term with permission from Denver Water. For permission to use “Xeriscape” in your publications, call Denver Water at 303 628-6330.

Why Use Water-efficient Landscaping?

Proper landscaping techniques not only create beautiful landscapes, but also benefit the environment and save water. In addition, attractive, water-efficient, low-maintenance landscapes can increase home values.

Water-efficient landscaping offers many economic and environmental benefits, including:

- Lower water bills from reduced water use.
- Conservation of natural resources and preservation of habitat for plants and wildlife such as fish and waterfowl.
- Decreased energy use (and air pollution associated with its generation) because less pumping and treatment of water is required.
- Reduced home or office heating and cooling costs through the careful placement of trees and plants.
- Reduced runoff of stormwater and irrigation water that carries top soils, fertilizers, and pesticides into lakes, rivers, and streams.
- Fewer yard trimmings to be managed or landfilled.
- Reduced landscaping labor and maintenance costs.
- Extended life for water resources infrastructure (e.g., reservoirs, treatment plants, groundwater aquifers), thus reduced taxpayer costs.



Meadow Sage (Salvia pratensis) is the background for New Mexico Evening Primrose (Oenothera berlandieri 'siskiyou')

How is Water-efficient Landscaping Applied?

Landscaping that conserves water and protects the environment is not limited to arid landscapes with only rocks and cacti.

Through careful planning, landscapes can be designed to be both pleasing to the senses and kind to the environment. One simple approach to achieving this is applying and adopting the basic principles of water-efficient landscaping to suit your climatic region. The seven principles of Xeriscape landscaping are used below to describe these basic concepts in greater detail.

Proper planning and design

Developing a landscape plan is the first and most important step in creating a water-efficient landscape. Your plan

should take into account the regional and micro-climatic conditions of the site, existing vegetation, topography, intended uses of the property, and most importantly, the grouping of plants by their water needs. Also consider the plants' sun or shade requirements and preferred soil conditions. A well-thought-out landscape plan can serve as your roadmap in creating beautiful,

water-efficient landscapes and allow you to continually improve your landscape over time.

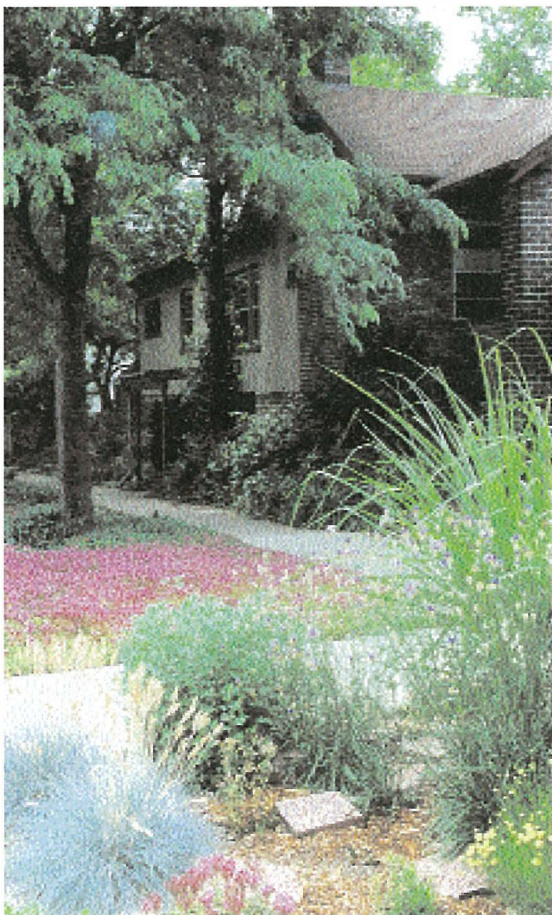
Soil analysis and improvements

Because soils vary from site to site, test your soil before beginning your landscape improvements. Your county extension service can analyze the pH levels; nutrient levels (e.g., nitrogen, phosphorus, potassium); and the sand, silt, clay, and organic matter content of your soil. It can also suggest ways to improve your soil's ability to support plants and retain water (e.g., through aeration or the addition of soil amendments or fertilizers).

Appropriate plant selection

Your landscape design should take into account your local climate as well as soil conditions. Focus on preserving as many existing trees and shrubs as possible because established plants usually require less water and maintenance. Choose plants native to your region. Native plants, once established, require very little to no additional water beyond normal rainfall. Also, because they are adapted to local soils and climatic conditions, native plants commonly do not require the addition of fertilizers and are more resistant to pests and disease.

When selecting plants, avoid those labeled "hard to establish," "susceptible to disease," or "needs frequent attention," as these types of plants frequently require large amounts of supplemental water, fertilizers, and pesticides. Be careful when selecting non-indigenous species as some of them may become invasive. An invasive plant might be a water guzzler and will surely choke out native species. Your state or county extension service or local nursery can help you select appropriate plants for your area.



Dragon's Blood Sedum
(*Sedum spurium*) under
Honeylocust Trees (*Gleditsia*
triacanthos)

The key to successful planting and transplanting is getting the roots to grow into the surrounding soil as quickly as possible. Knowing when and where to plant is crucial to speeding the establishment of new plants. The best time to plant will vary from species to species. Some plants will thrive when planted in a dormant or inactive state. Others succeed when planted during the season when root generation is highest and sufficient moisture is available to support new growth (generally, spring is the best season, but check plant tags or consult with your local nursery for specific species).

Practical turf areas

How and where turf is placed in the landscape can significantly reduce the amount of irrigation water needed to support the landscape. Lawns require a large amount of supplemental water and generally greater maintenance than other vegetation. Use turf where it aesthetically highlights the house or buildings and where it has practical function, such as in play or recreation areas. Grouping turf areas can increase watering efficiency and significantly reduce evaporative and runoff losses. Select a type of grass that can withstand drought periods and become dormant during hot, dry seasons. Reducing or eliminating turf areas altogether further reduces water use.

Efficient irrigation

Efficient irrigation is a very important part of using water efficiently outdoors, and applies in any landscape—whether Xeriscape or conventional. For this reason, an entire section of this booklet addresses efficient irrigation; it can be found on page 6.

Use of mulches

Mulches aid in greater retention of water by minimizing evaporation, reducing weed growth, moderating soil temperatures, and preventing erosion. Organic mulches also improve the condition of your soil as they decompose. Mulches are typically composed of wood bark chips, wood grindings, pine straws, nut shells, small



Wine Cup (Callirhoe involucrata) and Sunset Hyssop (Agastache rupestris) in the Denver Water Xeriscape Garden

gravel, or shredded landscape clippings. Avoid using rock mulches in sunny areas or around non-arid climate plants, as they radiate large amounts of heat and promote water loss that can lead to scorching. Too much mulch can restrict water flow to plant roots and should be avoided.

Appropriate maintenance

Water and fertilize plants only as needed. Too much water promotes weak growth and increases pruning and mowing requirements. Like any landscape, a water-efficient yard will require regular pruning, weeding, fertilization, pest control, and irrigation. As your water-efficient landscape matures, however, it will require less maintenance and less water. Cutting turf grass only when it reaches two to three inches promotes deeper root growth and a more drought-resistant lawn. As a rule of thumb, mow your turf grass before it requires more than one inch to be removed. The proper cutting height varies, however, with the type of grass, so you should contact your county extension service or local nursery to find out the ideal cutting height for your lawn. Avoid shearing plants or giving them high nitrogen fertilizers during dry periods because these practices encourage water-demanding new growth.

Water-efficient Landscape Irrigation Methods

With common watering practices, a large portion of the water applied to lawns and gardens is not absorbed by the plants. It is lost through evaporation, runoff, or being pushed beyond the root zone because it is applied too quickly or in excess of the plants' needs. The goal of efficient irrigation is to reduce these losses by applying only as much water as is needed to keep your plants healthy. This goal is applicable whether you have a Xeriscape or a conventional landscape.

To promote the strong root growth that supports a plant during drought, water deeply and only when the plant needs water. For clay soils, watering less deeply and more often is recommended. Irrigating with consideration to soil

type, the condition of your plants, the season, and weather conditions—rather than on a fixed schedule—significantly increases your watering efficiency. Grouping plants according to similar water needs also makes watering easier and more efficient.

Irrigating lawns, gardens, and landscapes can be accomplished either manually or with an automatic irrigation system. Manual watering with a hand-held hose tends to be the most water-efficient method. According to the AWWA Research Foundation's outdoor end use study, households that manually water with a hose typically use 33 percent less water outdoors than the average household. The study also showed that households with in-ground sprinkler systems used 35 percent more water, those with automatic timers used 47 percent more water, and those with drip irrigation systems used 16 percent more water than households without these types of systems. These results show that in-ground sprinkler and drip irrigation systems must be operated properly to be water-efficient.

You can use a hand-held hose or a sprinkler for manual irrigation. To reduce water losses from evaporation and wind, avoid sprinklers that produce a fine mist or spray high into the air. Soaker hoses can also be very efficient and effective when used properly. Use a hand-held soil moisture probe to determine when irrigation is needed.

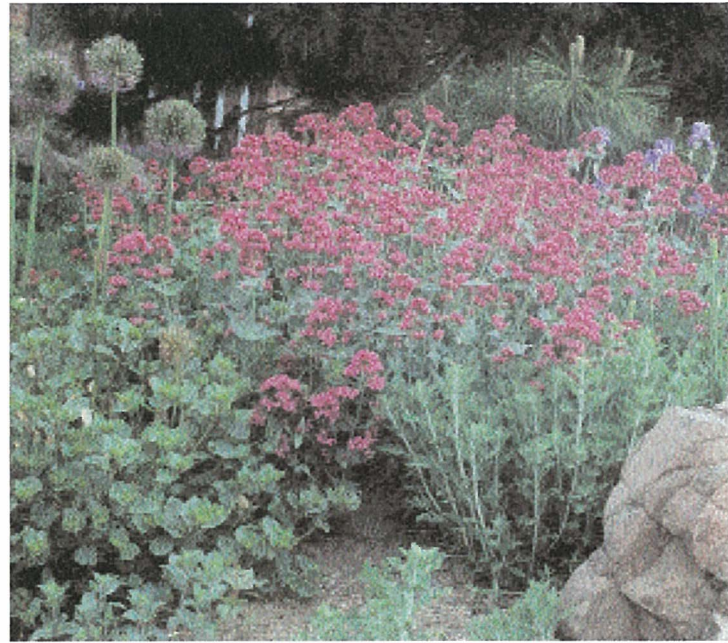
To make automatic irrigation systems more efficient, install system controllers such as rain sensors that prevent sprinkler systems from turning on during and immediately after rainfall, or soil moisture sensors that activate sprinklers only when soil moisture levels drop below pre-programmed levels. You can also use a weather-



Purple Fountain Grass (Pennisetum setaceum "Rubrum") and Marigolds (Calendula officinalis) in planter bed

driven programming system. Drip-type irrigation systems are considered the most efficient of the automated irrigation methods because they deliver water directly to the plants' roots. It is also important to revise your watering schedule as the seasons change. Over-watering is most common during the fall when summer irrigation schedules have not been adjusted to the cooler temperatures.

To further reduce your water consumption, consider using alternative sources of irrigation water, such as gray water, reclaimed water, and collected rainwater. According to the AWWA Research Foundation, homes with access to alternative sources of irrigation reduce their water bills by as much as 25 percent.⁴ Graywater is untreated household waste water from bathroom sinks, showers, bathtubs, and clothes washing machines. Graywater systems pipe this used water to a storage tank for later outdoor watering use. State and local graywater laws and policies vary, so you should investigate what qualifies as gray water and if any limitations or restrictions apply. Reclaimed water is waste water that has been treated to levels suitable for nonpotable uses. Check with local water officials to determine if it is available in your area. Collected rainwater is rainwater collected in cisterns, barrels, or storage tanks. Commercial rooftop collection systems are available, but simply diverting your downspout into a covered

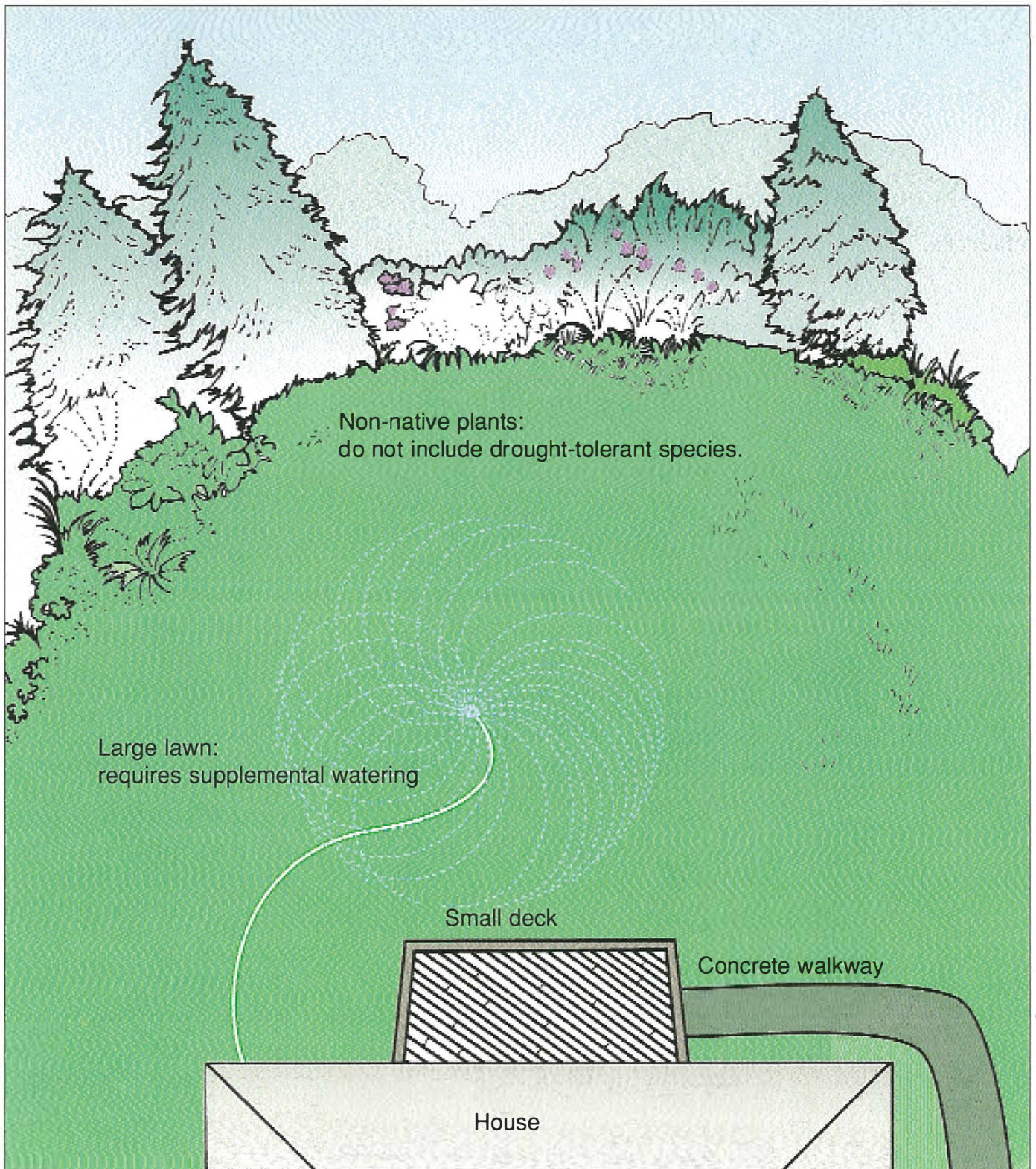


Red Valerian (Centranthus ruber)

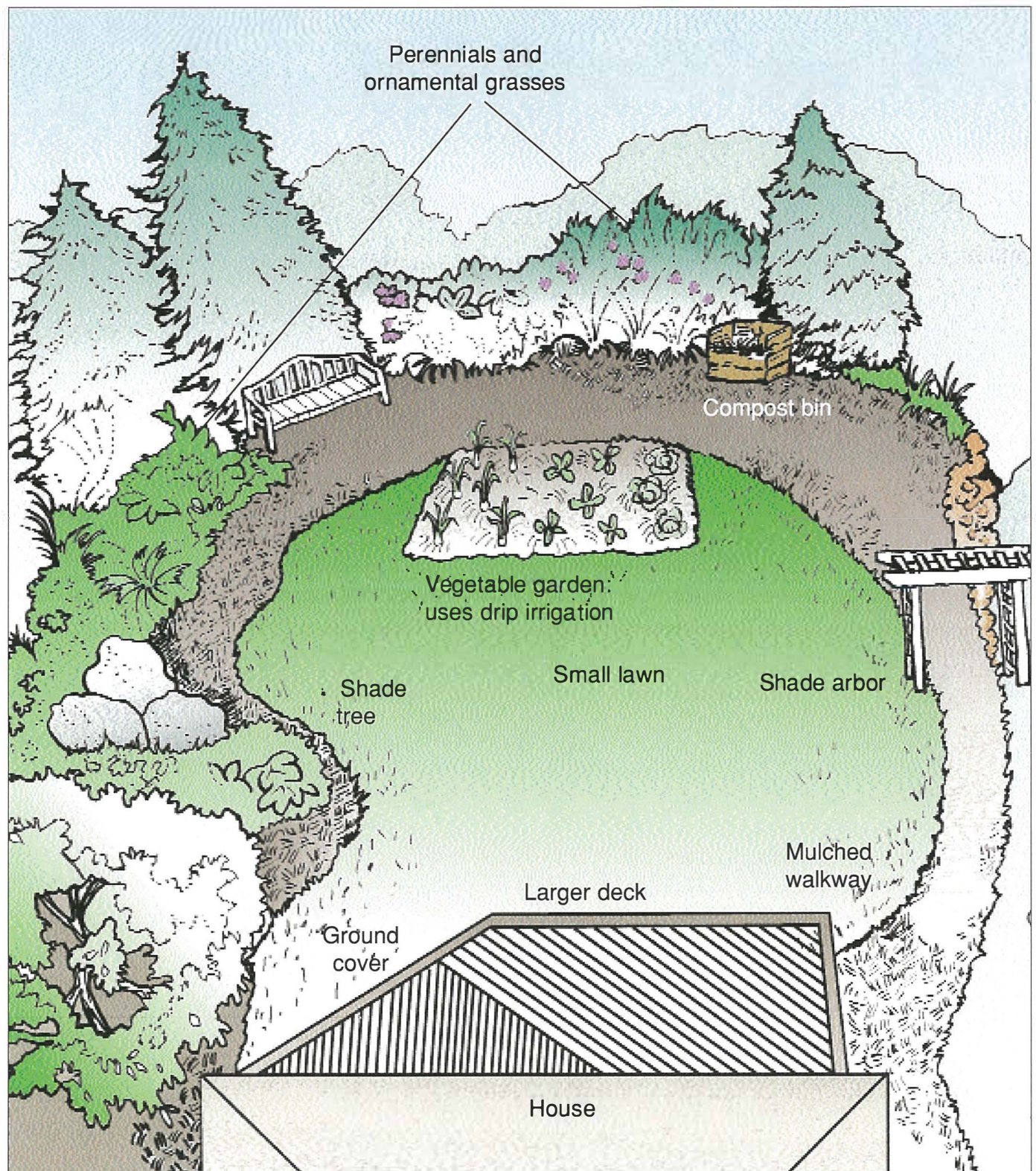
barrel is an easy, low-cost approach. When collecting rainwater, cover all collection vessels to prevent animals and children from entering and to prevent mosquito breeding. Some states might have laws which do not allow collection of rainwater, so be sure to check with your state's water resource agency before implementing a rainwater collection system.

⁴ AWWA Research Foundation. 1999. *Residential End Uses of Water*. <www.waterwisecr.org>

Non-xeriscaping



Xeriscaping



Examples of Successful Water-efficient Landscaping Projects

Water-efficient landscaping techniques can be used by individuals, companies, state, tribal, and local governments, and businesses to physically enhance their properties, reduce long-term maintenance costs, and create environmentally conscious landscapes. The following examples illustrate how water-efficient landscapes can be used in various situations.



Oriental Poppies (Papaver orientale)

Homeowner–public/private partnership

- The South Florida Water Management District, the Florida Nurserymen and Growers Association, the Florida Irrigation Society, and local businesses worked together to produce a television video called “Plant It Smart with Xeriscape.” The video shows how a typical Florida residential yard can be retrofitted with Xeriscape landscaping to save energy, time,

and money. The showcase yard (selected from 70 applicants) had a history of heavy water use—more than 90,000 gallons per month. After the retrofit, the yard’s aesthetic value was enhanced; plus it now uses 75 percent less water and relies on yard trimmings for mulch and compost.

- The Southwest Florida Water Management District (SWFWMD), the City of St. Petersburg, and Pinellas County, Florida, produced a video called “Xeriscape It!” It shows a landscape being installed using the seven Xeriscape principles. The SWFWMD also funded several Xeriscape demonstration sites and maintains a Xeriscape demonstration garden at its Brooksville, Florida, headquarters. The garden features a variety of native and non-native plants and is available for public viewing, along with a landscape plant identification guide.
- Residents of Glendale, Arizona, can receive a \$100 cash rebate for installing or converting more than half of their landscapable area to non-grass vegetation. The Glendale Water Conservation Office conducts an inspection of the converted lawn to ensure compliance with rebate requirements and then issues a rebate check to the homeowner. The purpose of the Landscape Rebate Program is to permanently reduce the amount of water used to irrigate grass throughout Glendale.

State government

- Although perceived as a water-rich state, Florida became the first to enact a statewide Xeriscape law. Florida’s legislature recognized that its growing population and vulnerable environment necessitated legal safeguards for its water resources. The Xeriscape law requires Florida’s Departments of Management Ser-

vices and Transportation to use Xeriscape landscaping on all new public properties and to develop a 5-year program to phase in Xeriscape on properties constructed before July 1992. All local governments must also consider requiring the use of Xeriscape and offering incentives to install Xeriscaping.

- Texas also developed legislation requiring Xeriscape landscaping on new construction projects on state property beginning on or after January 1994. Additional legislation, enacted in 1995, requires the Department of Transportation to use Xeriscape practices in the construction and maintenance of roadside parks. All municipalities may consider enacting ordinances requiring Xeriscape to conserve water.

City government

In Las Vegas, Nevada, homeowners can receive up to \$1,000 for converting their lawn to Xeriscape, while commercial landowners can receive up to a \$50,000 credit on their water bill. The city and several other surrounding communities hope these eye-catching figures will help Las Vegas meet its goal of saving 25 percent of the water it would otherwise have used by the year 2010; to date, it has saved 17 percent. Local officials plan to reach the target with the assistance of incentive programs encouraging Xeriscape, a city ordinance limiting turf to no more than 50 percent of new landscapes, grassroots information programs, and a landscape awards program specifically for Xeriscaped properties. Preliminary results of a five-year study show that residents who converted a portion of their lawns to Xeriscape reduced total water consumption by an average of 33 percent. The xeric vegetation required less than a quarter of the water typically used and one-third the maintenance (both in labor and expenditures) compared to traditional turf.



Yellow Ice Plant (Delosperma nubigenum) close-up

Developers

Howard Hughes Properties (HHP), a developer and manager of more than 25,000 acres of residential, commercial, and office development property, has enthusiastically used drought tolerant landscaping on all of its properties since 1990. Most of the company's properties are located in Las Vegas, one of the country's fastest growing metropolitan areas. To conserve resources, the city and county have implemented regulations requiring developers to employ certain Xeriscape principles in new projects. Specifically, a limited percentage of grass can be used on projects, and it must be kept away from streets. As the area's first large-scale developer to recognize the need and value in incorporating drought tolerant landscaping in parks, streetscapes, and open spaces, HHP uses native and desert-adaptive plants that survive and thrive in the Las Vegas climate with minimal to moderate amounts of water.

Drip system irrigation controllers are linked to weather stations that monitor the evapotranspiration rate. This allows HHP to determine the correct amount of water to be applied to plants at any given time. HHP tests the irrigation systems regularly and adds appropriate soil amendments to promote healthy plant growth. The maintenance program also includes pest management, the use of mulching mowers, and the use of rock mulch top dressing on all non-turf planting areas. These measures combine to ensure a beautiful, healthy, and responsible landscape.

Public/private partnerships

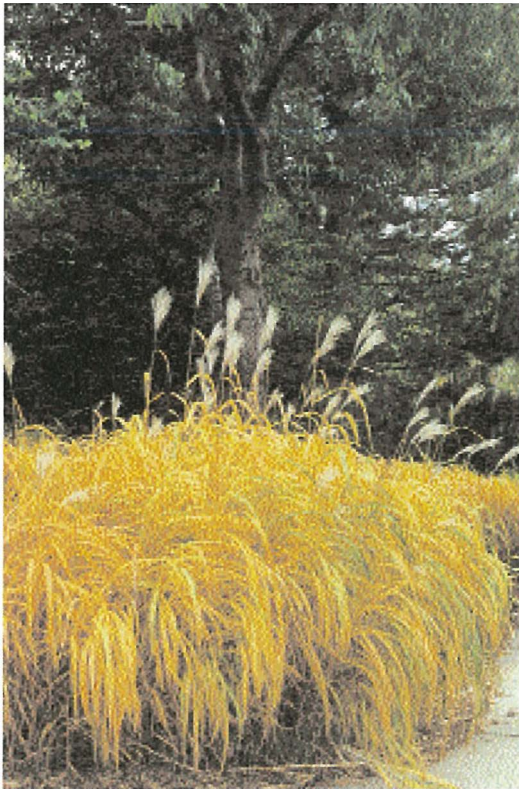
Even the most water-conscious homeowners in Southern California are over-watering by 50 to

70 gallons per day. The excess water washes away fertilizers and pesticides, which pollute natural waterways. The quantity of water wasted (and the dollars that pay for it) are even more substantial for large-scale commercial properties and developments.

An innovative partnership in Orange County links landscape water management, green mate-

rial management, and non-point source pollution prevention goals into one program—the Landscape Performance Certification Program. This program emphasizes efficient landscape irrigation and features a “landscape irrigation budget” based on a property’s landscape area, type, and the daily weather. The Municipal Water District monitors actual water use through a system of 12,000 dedicated water meters installed by participating landscape managers.

Participants, including landscapers, property managers, and homeowner associations, can compare the actual cost of water used on their property with the calculated budget. Those staying within budget are awarded certification, a proven marketing tool. This new voluntary program is implemented by the Municipal Water District with input from the California Landscape Contractors’ Association, the Orange County Integrated Management Department, the Metropolitan Water District of Southern California, and local nurseries and has the support of 32 retailing water suppliers. The program is already credited with increasing the use of arid-climate shrubs and landscaping to accommodate drip irrigation, and has resulted in cost savings to water customers.



Miscanthus sinensis
(Miscanthus grass, also called
Maiden grass) variety with
leaves turning yellow for fall.



For More Information

The following list of organizations can provide more information on water-efficient landscaping. This is not meant to be an exhaustive list, rather it is intended to help you locate local information sources and possible technical assistance.

Water Management Districts or Utilities

Your local water management district often can provide information on water conservation, including water efficient landscaping practices. Your city, town, or county water management district can be found in the Blue Pages section of your local phone book or through your city, town, or county's Web site if it has one. If you do not know your city, town, or county's Web site, check for a link on your state's Web site. URLs for state Web sites typically follow this format: <www.state.(two letter state abbreviation).us>.

State/County Extension Services

Your state or county extension service is also an excellent source of information. Many extension services provide free publications and advice on home landscaping issues including tips on plant selection and soil improvement. Some also offer a soil analysis service for a nominal fee. Your county extension service can be found in the Blue Pages section of your local phone book under the county government section or through your county's Web site if it has one. The U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (www.reeusda.gov/statepartners/usa.htm) provides an online directory of land-grant universities which can help you locate your state extension service. Government Guide (www.governmentguide.com) is yet another online resource that might prove helpful in locating state or local agencies.

Organizations

The following is a partial list of organizations located across the United States that provide helpful information on water-efficient landscaping.

American Water Works Association (AWWA)

6666 West Quincy Avenue
Denver, CO 80235

Telephone: 303 794-7711

and

1401 New York Avenue, NW, Suite 640
Washington, DC 20005

Telephone: 202 628-8303

Web: <www.awwa.org>

Arizona Municipal Water Users Association (AMWUA)

Web: <www.amwua.org/program-xeriscape.htm>

BASIN

City of Boulder Environmental Affairs
P.O. Box 791

Boulder, CO 80306

Phone: 303 441-1964

E-mail: basin@bcn.boulder.co.us

Web: <bcn.boulder.co.us/basin/local/seven.html>

Denver Water

1600 West 12th Avenue

Denver, CO 80204

Phone: 303 628-6000

Fax: 303 628-6199

TDDY: 303 534-4116

Office of Water Conservation hotline:

303 628-6343

E-mail: jane.earle@denverwater.org

Web: <www.water.denver.co.gov/conservation/conservframe.html>

New Mexico Water Conservation Program/Water Conservation Clearinghouse

P. O. Box 25102

Santa Fe, NM 87504

Phone: 800 WATER-NM

E-mail: watermm@ose.state.nm.us

Fax: 505 827-3813

Web: <www.ose.state.nm.us/water-info/conservation/index.html>

Project WET - Water Education for Teachers

201 Culbertson Hall

Montana State University

Bozeman, MT 59717

Phone: 406 994-5392

Web: <www.montana.edu/wwwwet>

Rocky Mountain Institute

1739 Snowmass Creek Road

Snowmass, CO 81654-9199

Phone: 970 927-3851

Web: <www.rmi.org>



Turkish Speedwell (Veronica liwanensis) in background and tulips in foreground.

Southern Nevada Water Authority
1001 S. Valley View Boulevard, Mailstop #440
Las Vegas, NV 89153
Phone: 702 258-3930
Web: <www.snwa.com>

Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604-6899
Phone: 352 796-7211 or 800 423-1476 (Florida only)
Web: <www.swfwmd.state.fl.us/watercon/xeris/swfxeris.html>

Sustainable Sources Green Building Program: Sustainable Building Source Book
E-mail: info@greenbuilder.com
Web: <www.greenbuilder.com/sourcebook/xeriscape.html>

Water Conservation Garden – San Diego County
12122 Cuyamaca College Drive West
El Cajon, CA 92019
Phone: 619 660-0614
Fax: 619 660-1687

E-mail: info@thegarden.org
Web: <www.thegarden.org/garden/xeriscape/index.html> and <www.sdcwa.org/manage/conservation-xeriscape.phtml>\

WaterWiser: The Water Efficiency Clearing House
(Operated by AWWA in cooperation with the U.S. Bureau of Reclamation)
6666 West Quincy Avenue
Denver, CO 80235
Phone: 800 559-9855
Fax: 303 794-6303
E-mail: bewiser@waterwiser.org
Web: <www.waterwiser.org>

Xeriscape Colorado!, Inc.
P.O. Box 40202
Denver, CO 80204-0202
Web: <www.xeriscape.org>

Resources

The following is a partial list of publications on resource efficient landscaping. For even more information, particularly on plants suited to your locale, consult your local library, county extension service, nursery, garden clubs, or water utility.

Ball, Ken and American Water Works Association Water Conservation Committee. *Xeriscape Programs for Water Utilities*. Denver: American Water Works Association, 1990.

Bennett, Jennifer. *Dry-Land Gardening: A Xeriscaping Guide for Dry-Summer, Cold-Winter Climates*. Buffalo: Firefly, 1998.

Bennett, Richard E. and Michael S. Hazinski. *Water-Efficient Landscape Guidelines*. Denver: American Water Works Association, 1993.

Brenzel, Kathleen N., ed. *Western Garden Book*, 2001 Edition. Menlo Park: Sunset Publishing Corporation, 2001.

City of Aurora, Colorado Utilities Department. *Landscaping for Water Conservation: Xeriscape!* Aurora: Colorado Utilities Department, 1989.

Johnson, Eric and Scott Millard. *The Low-Water Flower Gardener: 270 Unthirsty Plants for Color, Including Perennials, Ground Covers, Grasses & Shrubs*. Tucson: Ironwood Press, 1993.

Knopf, James M. *The Xeriscape Flower Gardener*. Boulder: Johnson Books, 1991.

Knopf, James M., ed. *Waterwise Landscaping with Trees, Shrubs, and Vines: A Xeriscape Guide for the Rocky Mountain Region, California, and the Desert Southwest*. Boulder: Chamisa Books, 1999.

Knox, Kim, ed. *Landscaping for Water Conservation: Xeriscape*. Denver: City of Aurora and Denver Water, 1989.

Nellis, David W. *Seashore Plants of South Florida and the Caribbean: A Guide to Identification and Propagation of Xeriscape Plants*. Sarasota: Pineapple Press, Inc., 1994.

Perry, Bob. *Landscape Plants for Western Regions: An Illustrated Guide to Plants for Water Conservation*. Claremont: Land Design Publishing, 1992.

Phillips, Judith. *Natural by Design: Beauty and Balance in Southwest Gardens*. Santa Fe: Museum of New Mexico Press, 1995.

- Phillips, Judith. *Plants for Natural Gardens: Southwestern Native & Adaptive Trees, Shrubs, Wildflowers & Grasses*. Santa Fe: Museum of New Mexico Press, 1995.
- Robinette, Gary O. *Water Conservation in Landscape Design and Maintenance*. New York: Nostrand Reinhold, 1984.
- Rumary, Mark. *The Dry Garden*. New York: Sterling Publishing Co., Inc., 1995.
- Springer, Lauren. *The Undaunted Garden: Planting for Weather-Resilient Beauty*. Golden: Fulcrum Publishing, 1994.
- Springer, Lauren. *Waterwise Gardening*. New York: Prentice Hall Gardening, 1994.
- Stephens, Tom, Doug Welsh, and Connie Ellefson. *Xeriscape Gardening, Water Conservation for the American Landscape*. New York: Macmillan Publishing, 1992.
- Sunset Books, eds. *Waterwise Gardening: Beautiful Gardens with Less Water*. Menlo Park: Lane Publishing Company, 1989.
- Vickers, Amy. *Handbook of Water Use and Conservation*. Amherst, MA: WaterPlow Press, 2001.
- Weinstein, Gayle. *Xeriscape Handbook : A How-To Guide to Natural, Resource-Wise Gardening*. Golden: Fulcrum Publishing, 1998.
- Williams, Sara. *Creating the Prairie Xeriscape*. Saskatchewan: University Extension Press, 1997.
- Winger, David, ed. *Xeriscape Plant Guide: 100 Water-Wise Plants for Gardens and Landscapes*. Golden: Fulcrum Publishing, 1998.
- Winger, David, ed. *Xeriscape Color Guide*. Golden: Fulcrum Publishing, 1998.
- Winger, David, ed. *Evidence of Care: The Xeriscape Maintenance Journal*, 2002, Vol. 1, Colorado WaterWise Council, 2001.

Acknowledgments

Technical advice provided by Alice Darilek, Elizabeth Gardener, and David Winger.

Cover photograph from Tom Brahl Photography.

Interior photographs have been provided courtesy of Denver Water and David Winger.

Illustrations by Linda Cook.

For copies of this publication contact:

EPA Water Resources Center (RC-4100)

U.S. Environmental Protection Agency

Ariel Rios Building, 1200 Pennsylvania Avenue, NW.

Washington, DC 20460

For more information regarding water efficiency, please contact:

Water Efficiency Program (4204M)

U.S. Environmental Protection Agency

Ariel Rios Building, 1200 Pennsylvania Avenue, NW.

Washington, DC 20460

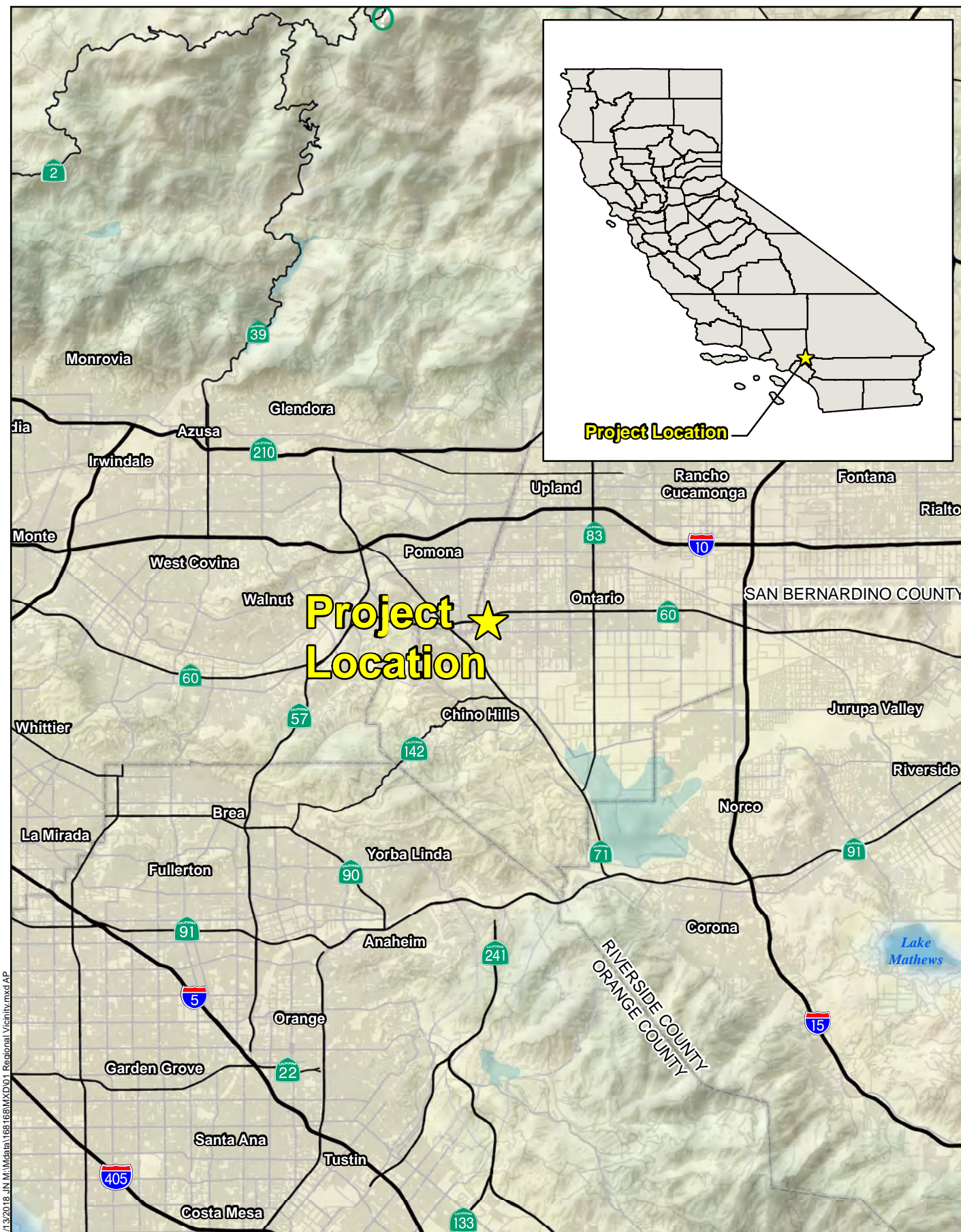
<www.epa.gov/OWM/water-efficiency/index.htm>



United States
Environmental Protection Agency (4204M)
Washington, DC 20460

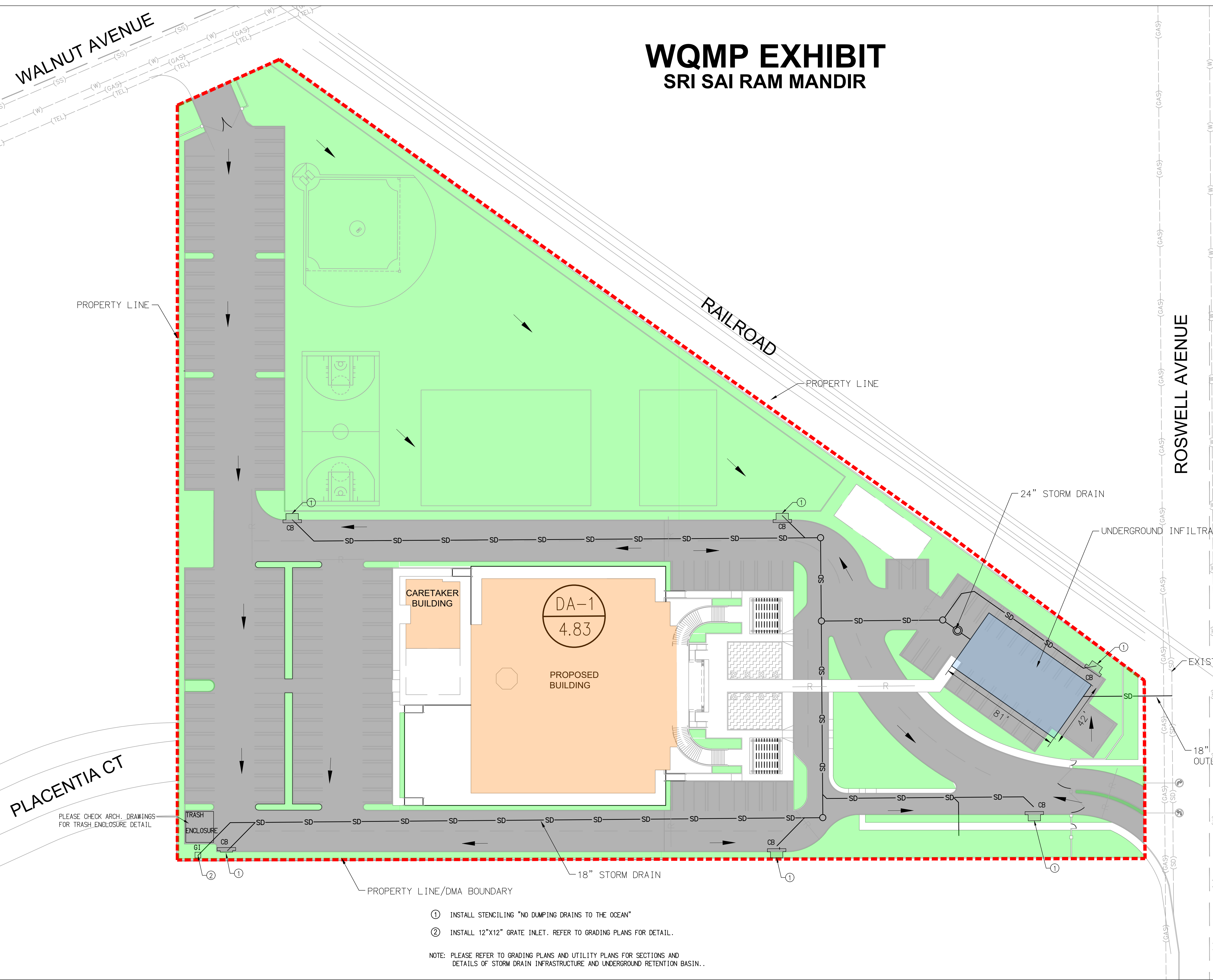
Official Business
Penalty for Private Use \$300

Attachment B: WQMP Exhibit & Vicinity Map



SRI SAI RAM MANDIR PROJECT
BIOLOGICAL RESOURCES MEMORANDUM

Regional Vicinity



WQMP EXHIBIT
SRI SAI RAM MANDIR

DESIGN CAPTURE VOLUME:
V (REQUIRED) = 10,417 CU. FT.
UNDERGROUND INFILTRATION BASIN:
V (PROVIDED) = 10,564 CU. FT.

LEGEND:

- DA-X

X.XX

WATERSHED DESIGNATION

DRAINAGE AREA NUMBER

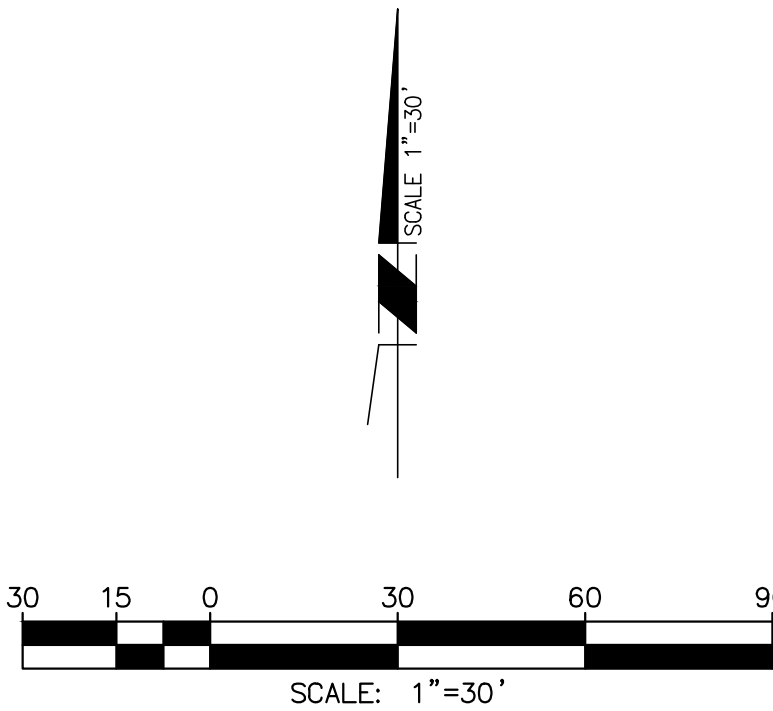
DRAINAGE AREA, AC
- DMA BOUNDARY
- UNDERGROUND INFILTRATION BASIN - 3402 SQ. FT. (INCLUDED IN ASPHALT PAVEMENT SQ. FT.)
- LANDSCAPE - 83,922 SQ. FT.
- BUILDING ROOF - 33,510 SQ. FT.
- CONCRETE PAVEMENT - 8,141 SQ. FT.
- ASPHALT PAVEMENT - 85,013 SQ. FT.
- CATCH BASIN
- SD

STORM DRAIN
- DRAINAGE FLOW ARROW
- R

RIDGE LINE

- ① INSTALL STENCILING "NO DUMPING DRAINS TO THE OCEAN"
- ② INSTALL 12"x12" GRATE INLET. REFER TO GRADING PLANS FOR DETAIL.

NOTE: PLEASE REFER TO GRADING PLANS AND UTILITY PLANS FOR SECTIONS AND DETAILS OF STORM DRAIN INFRASTRUCTURE AND UNDERGROUND RETENTION BASIN..



COUNTY OF SAN BERNARDINO	SHEET NO.
SRI SAI RAM MANDIR	
WQMP SITE PLAN	SHEET <u>1</u> OF <u>1</u>

Project Information:

Project Name: Sri Sai Ram Mandir
Location: Chino CA
Date: 4/14/2020
Engineer: PK
StormTech RPM:

MC-3500 Site Calculator

System Requirements

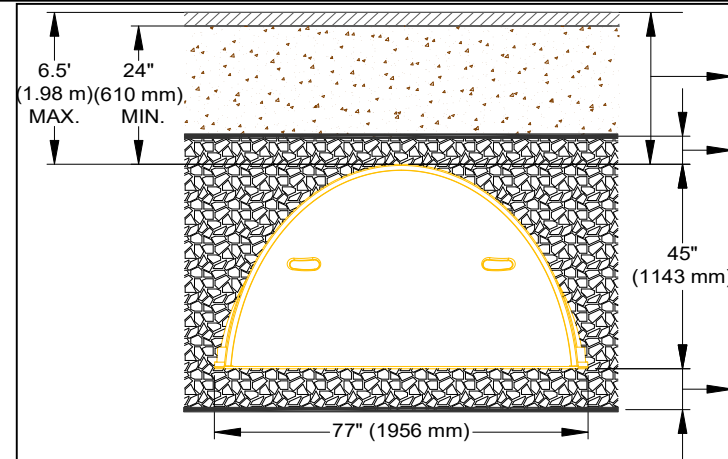
Units	Imperial	
Required Storage Volume	10417	CF
Stone Porosity (Industry Standard = 40%)	40	%
Stone Above Chambers (12 inch min.)	12	inches
Stone Foundation Depth (9 inch min.)	9	inches
Average Cover over Chambers (24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?	WIDTH	
Limiting WIDTH or LENGTH dimension	16	feet
Storage Volume per Chamber	178.9	CF
Storage Volume per End Cap	46.9	CF

System Sizing

Number of Chambers Required	58	each
Number of End Caps Required	4	each
Bed Size (including perimeter stone)	3,313	square feet
Stone Required (including perimeter stone)	609	tons
Volume of Excavation	798	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	1218	square yards
Length of Isolator Row	212.6	feet
Non-woven Isolator Row Fabric (20% Safety Factor)	369	square yards
Woven Isolator Row Fabric (20% Safety Factor)	468	square yards
Installed Storage Volume	10,564	cubic feet

Controlled by Width (Rows)

Maximum Width =	16	feet
2 rows of 29 chambers		
Maximum Length =	212.6	feet
Maximum Width =	15.6	feet



*This represents the estimated material and site work costs (US dollars) for the project. Materials excluded from this estimate are conveyance pipe, pavement design, etc. It is always advisable to seek detailed construction costs from local installers. Please contact STORMTECH at 888-892-2694 for additional cost information.

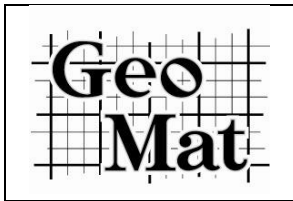
SRI SAI RAM MANDIR
WQMP BMP SIZING -SAN BERNARDINO COUNTY METHOD

DRAW-DOWN TIME

BASIN	Total Dead Storage Volume	Percolation Rate **	Infiltration Safety Factor	Design Percolation Rate (P_{design})	Total Area	Total Percolation	Draw- Down Time
-	(ft ³)	(in/hr)	-	(in/hr)	(sf)	(CFS)	(hr)
DMA - A	10417	1.54	2	0.77	3402	0.061	47.72

* Based on percolation test by City and County Soils Report, percolation rate is 1.54 in/hr
Drawdown time is 47.72 hours which is less than 48 hours to prevent vector issues.

Attachment C: Geotechnical Investigation



GeoMat Testing Laboratories, Inc.

Soil Engineering, Environmental Engineering, Materials Testing, Geology

April 1, 2020

Project No. 20105-01

TO: Sri Jayaram Foundation, Inc.
6549 Pimlico Place
Eastvale, California 92880

SUBJECT: Soil Infiltration Report Update, APN 1016-331-05-0000, 4.83 Acres, 12594 Roswell Avenue, City of Chino, County of San Bernardino, California

REFERENCE: City and County Engineering and Testing, Inc. "Basic Infiltration Testing Report, Proposed Sri Sai Mandir Center, Approximately 4.83 Acres, 12594 Roswell Avenue, City of Chino, County of San Bernardino, California." Project No. J&P2018044.DRI.RPT, Report Dated August 22, 2018.

As requested, we have updated the above referenced soil infiltration report. The purpose of the update is to transfer, to the new provided plan, the previously reported information by City and County Engineering. City and County Engineering is no longer in business.

For easy reference, the previously prepared report by City and County Engineering is attached. There are no changes in the findings, conclusion and recommendation of the previous report except for the following:

1. New site plan which supersede the previous site plan. The new plan depicts the exploratory boreholes and soil infiltration tests previously conducted by City and County Engineering.
2. New Project Description and usage provided by project representative.

New Project Description

The proposed development is located on a 4.83 acre site at 12594 Roswell Avenue, Chino, CA in the unincorporated area of San Bernardino County. The site is bordered by Roswell Avenue at the East and Walnut Ave at the North. The proposed project is to construct about 32,400 square foot multipurpose building to serve as both a place of worship as well as a facility for various community events & activities. The proposed development also includes about 4,500 square feet of caretaker quarter.

Usage of Proposed Building:

The first level is designed to serve as the main 270- seat congregation area for the purpose of worship and prayer. There will also be a kitchen facility for cooking and a dining hall located adjacent to the main congregation hall at the first floor, as well as classrooms for the youth,

multipurpose meeting rooms, administrative offices and prayer/meditation rooms. A detailed site plan is attached with this document.

The second level will house a prayer hall where devotees can view the idols and perform rituals. There will also be three classrooms for youth to learn about music, dance, yoga, education, etc.

The facility will also be designed to offer spaces for community events and activities. Both the larger hall or the smaller multipurpose rooms and classrooms will function individually for community services such as health fairs, counseling sessions, job search assistance, environmental awareness campaigns, community pantry, food drive, etc.

If you should have any questions regarding this report, please do not hesitate to call our office. We appreciate this opportunity to be of service.

Submitted for GeoMat Testing Laboratories, Inc.



Haytham Nabils, GE 2375
Project Engineer, Exp. 12/31/2020



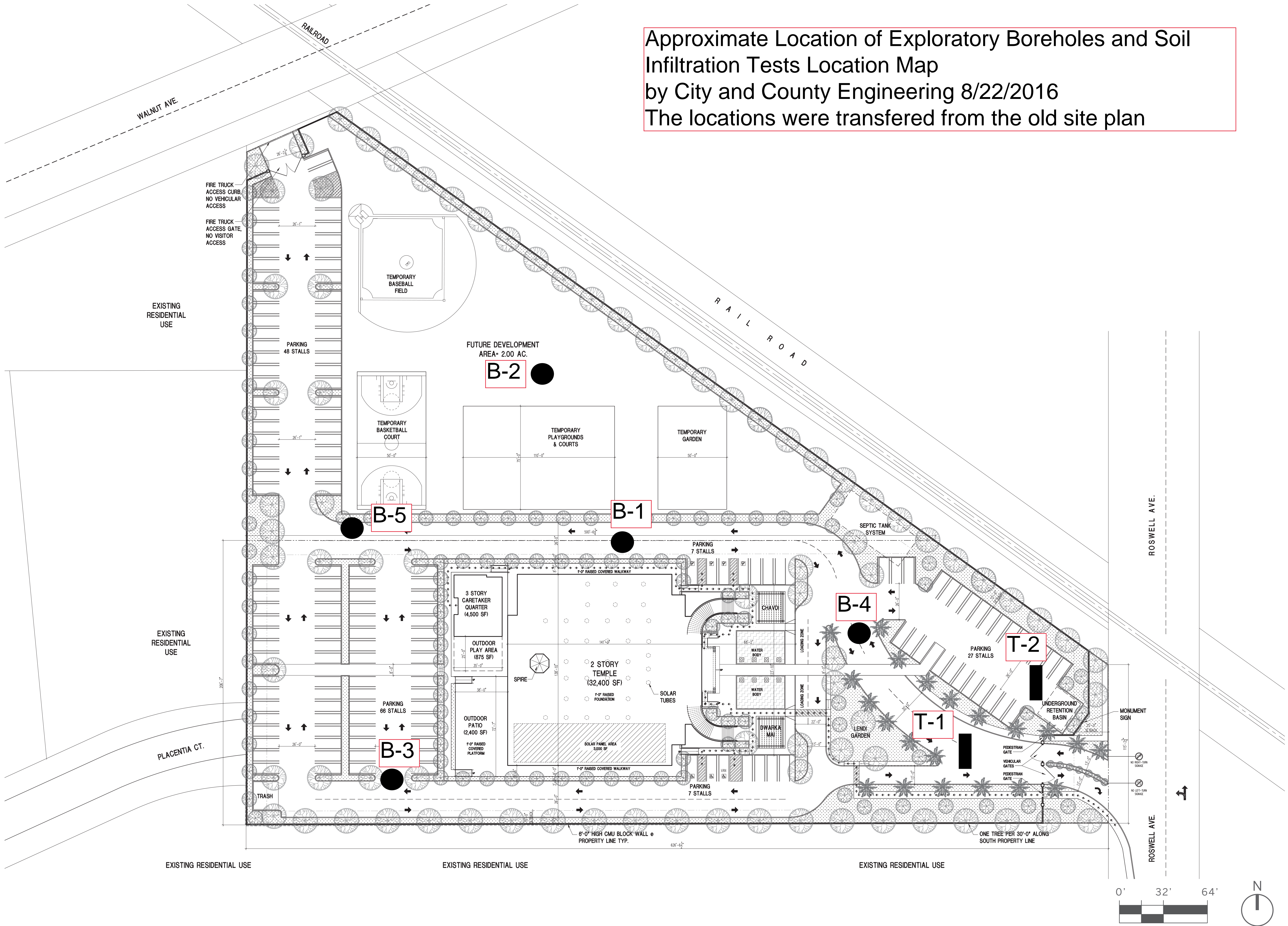
Art Martinez
Staff Engineer



Distribution: (1) Addressee

Attachments:

Plate 1	Site Plan
Appendix A	Soil Infiltration Report by City and County Engineering and Testing



Approximate Location of Exploratory Boreholes and Soil Infiltration Tests Location Map
by City and County Engineering 8/22/2016
The locations were transfered from the old site plan

Revisions:

01	Conceptual Drawings	11.20.2019
02	Conceptual Drawings v2	11.26.2019
03	Conceptual Drawings v3	12.03.2019
04	Conceptual Drawings v4	12.05.2019
05	Conceptual Drawings v5	12.15.2019
06	Conceptual Drawings v6	12.24.2019
07	Conceptual Drawings v7	01.20.2020
08	Conceptual Drawings v8	03.16.2020

Stamp:

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All Rights Reserved.

This Drawing is the property of **sda** and is not to be reproduced in whole or in part. It is to be used for the project and site specifically identified herein and is not to be used on any other project. This Drawing is to be returned upon the written request of **sda**

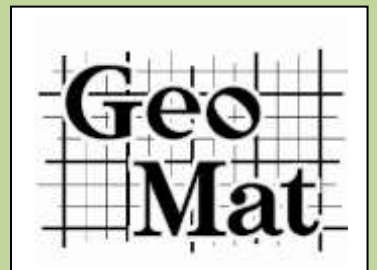
Drawing Data:

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Issue Date	03.16.2020
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Drawn By	KM
Sheet	22" x 34"

If sheet is less than size indicated above, this is a reduced print. Reduce scale accordingly.

Site Plan

Appendix A



**CITY & COUNTY ENGINEERING
AND TESTING, INC.**

2324 S. Vineyard Ave., Suite B, Ontario, CA 91761-7764, (909)-930-5868

**BASIC INFILTRATION TESTING REPORT, PROPOSED SRI SAI MANDIR CENTER,
APPROXIMATELY 4.83 ACRES, 12594 ROSWELL AVENUE,
CITY OF CHINO, COUNTY OF SAN BERNARDINO, CALIFORNIA,**

APN: 1016- 331- 05-0000

**August 22, 2018
Job #J&P2018044 DRI.RPT**

**Prepared For:
SRI SAI RAM MANDIR
12594 Roswell Avenue
CHINO, CA 91710**

**Prepared By:
CITY & COUNTY ENGINEERING AND TESTING INC.
2324 S. Vineyard Ave. Suite B
Ontario, CA 91761-7764
(909)-930-5868**

CITY & COUNTY ENGINEERING AND TESTING, INC.

2324 s. Vineyard Ave., Suite B, Ontario, CA 91761-7764

August 22, 2018

Job #J&P2018044 DRI.RPT

**SRI SAI RAM MANDIR
12594 Roswell Avenue
CHINO, CA 91710**

Attention: Mrs. Arunasri Reddy. Project Manager
**Subject: BASIC INFILTRATION TESTING REPORT, IN GENERAL ACCORDANCE
WITH ASTM 3385-03 TEST METHOD PROPOSED SRI SAI RAM MANDIR,
APPROXIMATELY 4.83 ACRES, 12594 ROSWELL AVENUE, CITY OF
CHINO, COUNTY OF SAN BERNARDINO, CALIFORNIA,**

APN: 1016-331-050-0000

Reference: Your Work Authorization and Contract dated August 03, 2018

Introduction

This report provides a summary of the geotechnical engineering services conducted to support evaluation of the feasibility of infiltration at the subject site. The purpose of our services was to complete two (2) in-situ infiltration tests utilizing the double-ring infiltrometer to evaluate the feasibility of infiltration for disposal of stormwater runoff following the falling head method.

Project Description

We understand that an infiltration trench/swale will be utilized to capture storm runoff for on-site disposal for the proposed Sri Sai Ram Mandir Center

Scope of Services

City and County Engineering and Testing was retained to provide geotechnical engineering services to support the project. Our scope of work consisted of the following specific tasks:

- 1) Complete two (2) infiltration tests at the site utilizing the double ring infiltrometer. The tests were completed in general accordance with the falling head method.
- 2) Complete data analysis.

3) Preparation of this report summarizing our findings, conclusions, and recommendations. The report includes:

- Site plan showing the location of infiltration tests and exploratory trench.
- Summary of log of conditions observed at the testing locations.
- Discussion of the results of insitu infiltration testing.
- A discussion of the surficial soil and anticipated groundwater conditions at the site.
- Evaluation of the feasibility of infiltration.
- Recommendations for in-situ infiltration rate.

Existing Site Conditions

The site is located in the southwesterly San Bernardino County. The property consists of the irregular-shaped parcel of 4.83 acre is located at 12594 Roswell Avenue within the City of Chino, California. Based on our site reconnaissance, the site is vacant, now. Southeast of the site was previously developed with a single family home and detached garage, which was later used for Armstrong nursery. Most of the site was used for nursery use. The, structure along with garage, plants and goods were since have been removed from the site leaving a stockpile of crushed rock in the southeast corner. The site is bounded to its north and northeast, south, east and west by chain link fence, partly block wall and wood fence. Rail road tract bordered to its north and northeast. There are few residential and industrial structures located around the subject site. No drainage course is located within the site or close by. The site has general slope towards south and southeast.

Groundwater

Groundwater study is not within the scope of this work. However, no groundwater was encountered in the exploratory trenches to 15 feet depth.

Based on the California Department of Water Resources and local water company's website; the depth of groundwater at the site is more than 50 feet.

Please note that the potential for rain or irrigation water locally seeping through from adjacent elevated areas and showing up near grades cannot be precluded. Our experience indicates that surface or near-surface groundwater conditions can develop in areas where groundwater conditions did not exist prior to site development, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation. Fluctuations in perched and static water elevations are likely to occur in the future due to variations in precipitation, temperature, consumptive uses, and other factors including urbanization and development. However; it is not likely to be less than 100 feet.

Subsurface Soils

The subsoil encountered in our exploratory borings and Infiltration trench during the exploration consists of **young alluvium**, brown to olive gray, fine silty sand (SM), silt lenses, poorly graded with grass-vegetation, house hold trash and debris to about 5-feet below the existing ground, slightly moist to moist, and very loose. The underlying soils below 5-feet to about 10-feet were found to be olive gray, fine silty sand (SM) and sandy silt (ML), slightly moist to moist and loose to firm. The sub soils between 10-feet to the end of our borings to a maximum depth of 40-feet were olive gray, fine sandy silt (ML) and fine silty sand (SM), poorly graded, moist and medium dense. Generally, the sub soils are very loose in the upper 5-feet and medium dense below 5-8 feet.

Based on the laboratory test results, the subsurface soils in foundation zone consist of mostly fine poorly graded silty fine sand (SM), possess relatively low cohesive properties, are highly susceptible to hydro consolidation and low in expansion potential.

Groundwater or hard bedrock strata were not encountered in any of our exploratory borings/trenches to a maximum depth of 40.0 feet below the existing ground. Information, based on the local water district, the depth of groundwater in the vicinity of the site should be 50-feet or more.

Test Method and Findings

Two infiltration tests were conducted at 5.0 and 8 feet below ground surface, in native soil. Based on the results of this study, infiltration of stormwater at the site is feasible. The following summarizes the result of the infiltration feasibility study and the recommended field infiltration rate for use in design.

Trench excavation for infiltration testing was conducted utilizing a track mounted DEEREJBE- 310 extended hoe backhoe on August 11, 2018. The bottom of the test trenches were cut level to the desired infiltration depth of 5.0 and 8 feet below the ground surface. The soil profile is described in the form of Exploratory Trench Logs, see Appendix B.

Infiltrometer Device

The double-ring infiltrometer test method consists of driving two open cylinders, one inside the other, into the ground and then partially filling the rings with water to a fixed point. The water is added at the constant mark at every time interval. The volume of water added each time interval is equal to the measure of the volume of liquid that infiltrates into the soil. The volume of water infiltrated during the time intervals can be converted into an infiltration velocity (in^3/hr). The incremental infiltration velocity within the inner test cylinder is equivalent to the infiltration rate (in/hr).

Infiltration Test Result

Based on the (minimum) test result, water infiltration rate stabilized at **1.5 *inch per hour* or 3.81 cm/hr.** for the tests that were conducted 5.0 and 8 feet below ground surface, see Appendix C. This result is raw test result.

Factors of Safety

Based on **Worksheet "H" in the Technical Guidance Document** for Water Quality Management Plans prepared for The County of San Bernardino Area wide Storm water Program dated June 07, 2016, the minimum safety factor for this suitability assessment is 1. The design engineer should complete Worksheet "H" to determine the Total Safety Factor for the BMP. Minimum safety factor should not be less than 2, but may be higher at the discretion of the design engineer and acceptance of the plan reviewer.

Conclusions/Recommendations

- In our opinion, water infiltration at the site is feasible. Filter fabric should be used whenever aggregates are placed against native soils.
- Infiltration water should not be allowed to saturate pavement and concrete structures sub grade soils.
- The planned infiltration system should extend vertically into native soil. The designer should review the attached geotechnical log for soil classification.
- Please note that soils in infiltration areas should not be subject to compaction during construction.
- The proposed system by the civil engineer should be constructed and maintained in accordance with manufacturer guidelines.

An important consideration for infiltration facilities is that, during construction, great care must be taken not to reduce the infiltrative capacity of the soil in the facility through compaction by heavy equipment or by using the infiltration area as a sediment trap.

Infiltration facilities should be constructed late in the site development after soils (that might erode and clog the units) have been stabilized, or should be protected (by flagging) until site work is completed.

Infiltration facilities should be sited with the following guidelines:

INFILTRATION FACILITY SETBACKS	
Setback From	Distance
Property Lines and Public Right of Way	5 feet
Foundations	15 feet or within a 1:1 plane drawn up from

	the bottom of foundation
Slopes	H/2, 5 feet minimum (H: is slope height)
Private drinking water wells	100 feet

Ferrous metal pipes should be protected from potential corrosion by bituminous coating, etc. We recommend that all utility pipes be nonmetallic and/or corrosion resistant. Recommendations should be verified by soluble sulfate and corrosion testing of soil samples obtained from specific locations during construction.

If applicable, four to six inch diameter with locking caps observation well(s) extending vertically into the system's bottom is suggested as an observation point. Observation well(s) should be checked regularly and after large storm events. Once performance stabilizes, frequency of monitoring may be reduced.

City & County Soil Engineering should observe the basin excavation. Additional laboratory testing including but not limited to grain size analysis, sand equivalent, sulfate content, etc should be conducted during construction.

Use of this Report

This report was prepared for the exclusive use of the owner and their consultants for specific applications to the proposed site. The use by others, or for the purposes other than intended, is at the user's sole risk.

The findings, conclusions, and recommendations presented herein are based on our understanding of the project and on subsurface conditions observed during our site work. Within the limitations of scope, schedule, and budget, the conclusions and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering principals and practices in the area at the time the report was prepared. We make no other warranty either expressed or implied.

We appreciate this opportunity to provide geotechnical services on this project and look forward to assisting the Project Team as the design progresses. Please call our office if you have any questions or comments regarding the information contained in this report, or if we may be of further services

Submitted for
City and County Engineering and Testing Inc.



Zen Bhatia, RCE #36150, License Expired on 6/30/2020

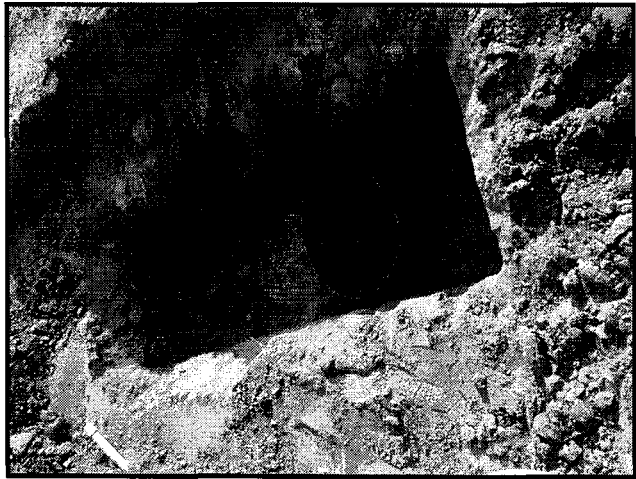
Distribution: [3] Addressee

Attachments:	Plate 1	Site Photos
	Plate 2	Index Map
	Plate 3	Topographic Map
	Plate-4	Aerial Map
	Plate 5	Infiltration Test Location Map
	Appendix A	Percolation Data/Graphs

SITE PHOTOGRAPHS



VIEW- EAST TO WEST



VIEW- DOUBLE RING INFILT. TEST



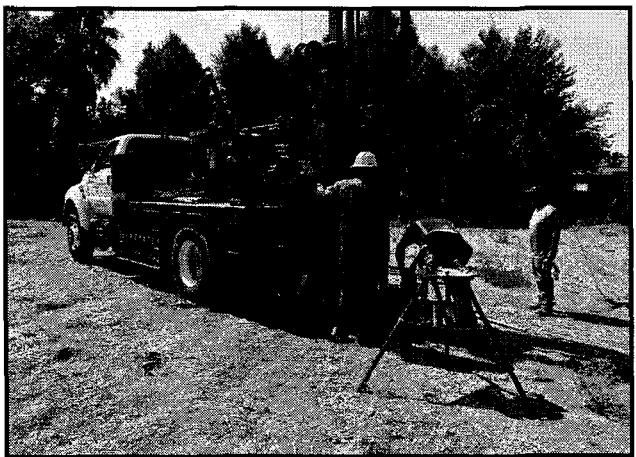
VIEW- NW TO SE



VIEW -SE TO NW



VIEW- SOUTH TO NORTH

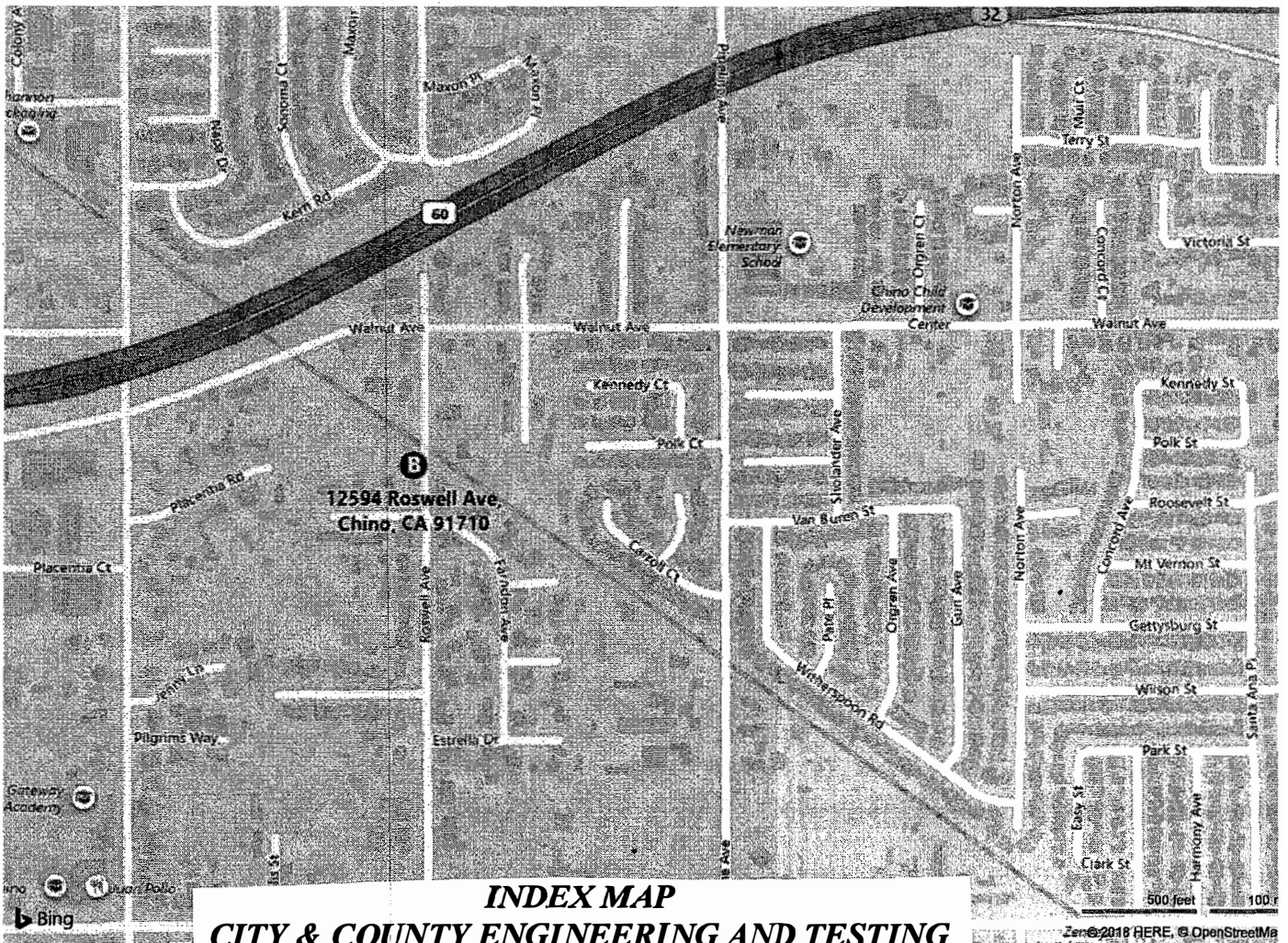
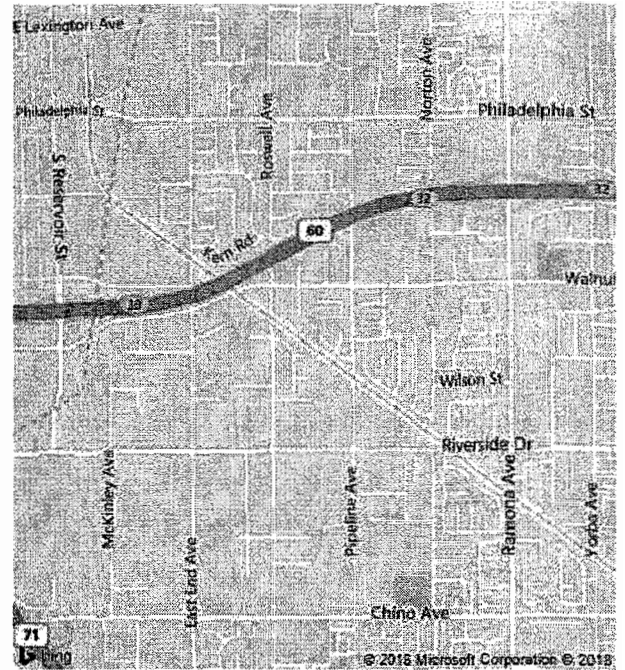


VIEW- WEST TO EAST



Notes

SRI SAI RAM TEMPLE
JOB #J&P2018037P1
August 7, 2018
INDEX MAP
Plate 2

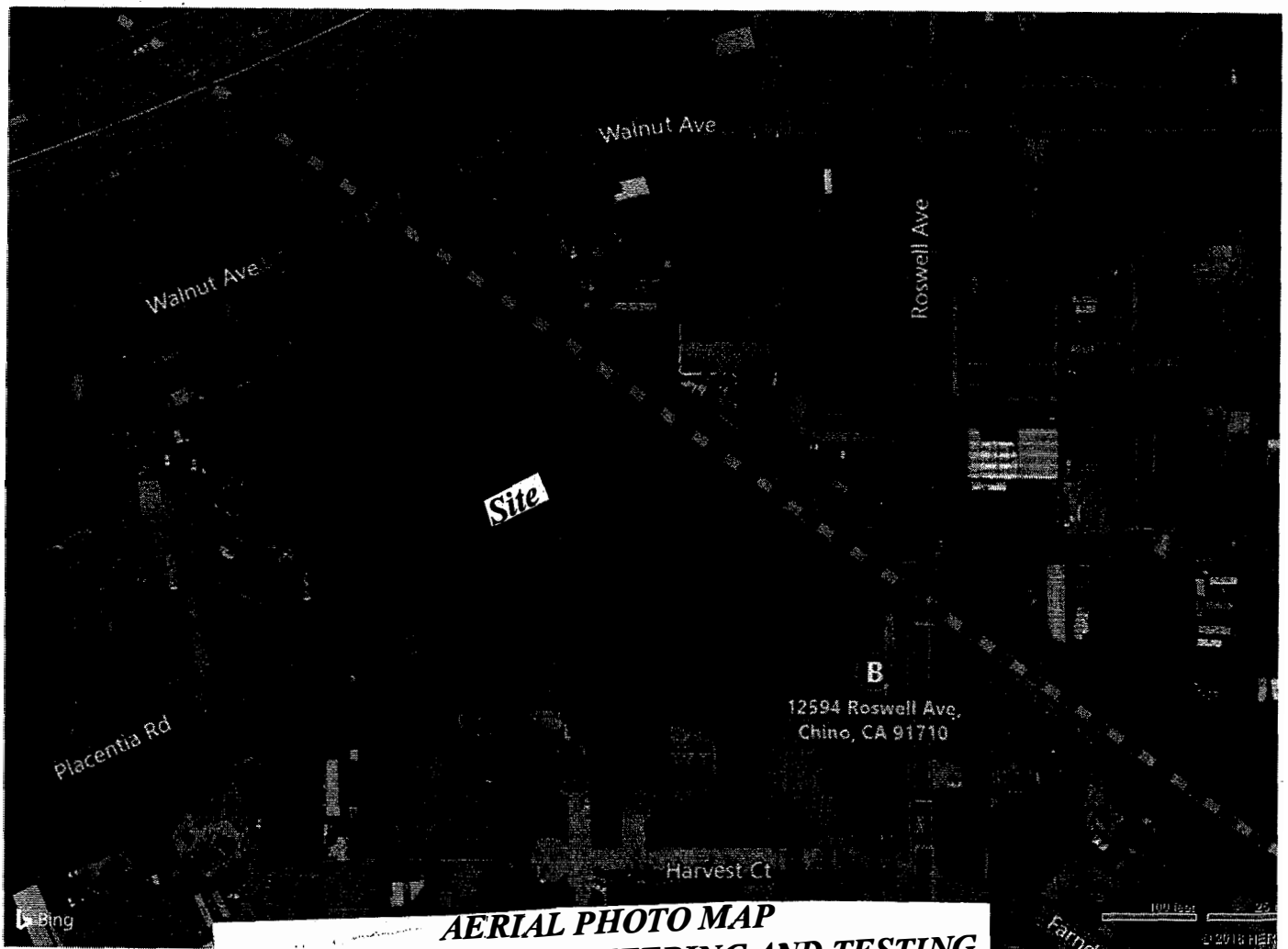
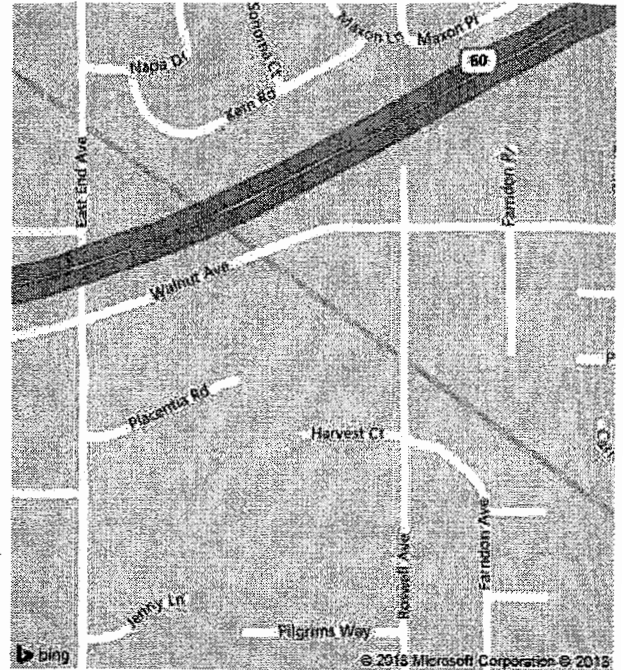


INDEX MAP
CITY & COUNTY ENGINEERING AND TESTING
JOB # J&P2018037P1.RPT/August 21, 2018
Plate-2

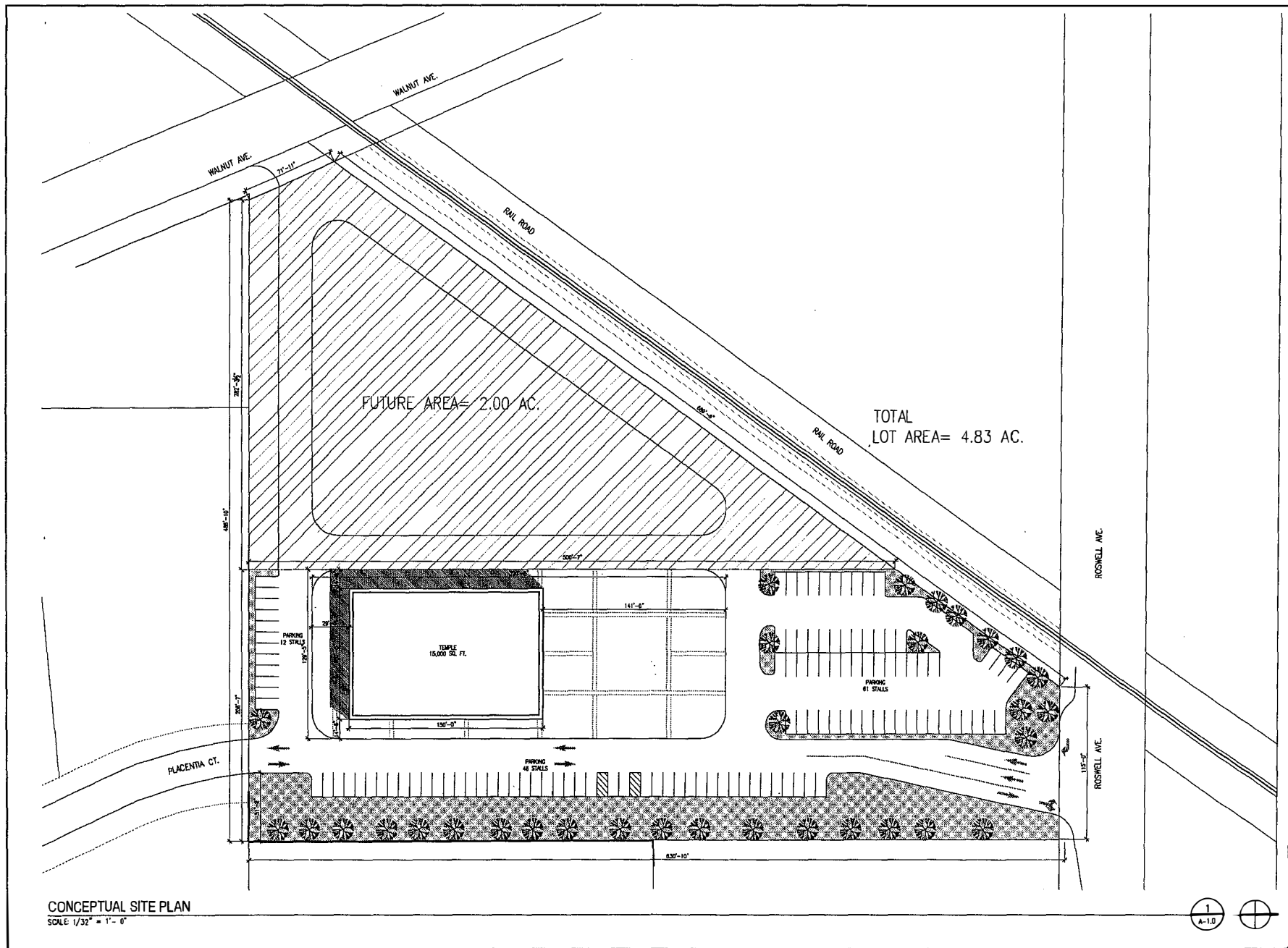


Notes


SRI SAI RAM TEMPLE
 JOB #J&P2018037P1
 August 7, 2018
 AERIAL MAP
 Plate 3



AERIAL PHOTO MAP
CITY & COUNTY ENGINEERING AND TESTING
JOB # J&P2018037P1.RPT/AUGUST 21, 2018
Plate-4



CONCEPTUAL SITE PLAN
SCALE: 1/32" = 1' - 0"

APPROVAL STAMP:	
 BRAHMBHATT ARCHITECTS	
PROJECT: SHRI SAI RAMMANDIR CONCEPTUAL DESIGN	
CLIENT:	
DATE: 8/16/2018	
GRAPH: AM	CHECKED: SB
SCALE: AS NOTED	PROJECT NO.:
TITLE: CONCEPTUAL SITE PLAN	
SHEET:	A-1.0

TOPOGRAPHIC SURVEY
12594 ROSWELL AVE
CHINO, CA 91710

12594 ROSWELL AVE
CHINO, CA 91710

SCAF 1"=30'

BENCHMARKS

REVISED 14-1

THE REMAINS IS LOCATED AT 0.3 MI. E ALONG ENCLD AVE. FROM S
RAMP 99 TO WALTON ST. ON WELL IN BRICKWALL, 2 FT. S OF CURB AT N
END S. INTER. 40 FT. S IN CONCRETE.

8129 701 643 92 57

BASIS OF BEARINGS

THIS SURVEY WAS BASED ON THE COVERLIFE RECORDS OF
GERRARD AND BOND H. GUYTON'S E. AT BUREAU ON THE TRACT
IN TWIN COUNTY ON SAN JOSE MOUNTAIN STATE OF CALIFORNIA

VICINTY.MAP

LEGAL DESCRIPTION

THAT PORTION OF LOT 35, SECTION 4, TOWNSHIP 2 NORTH, RANGE 8 WEST, SOUTHERN PLAINS MERIDIAN, ACCORDING TO MAP OF WASHINGTON OF PART OF SOUTHERN PLAINS MERIDIAN, IN THE COUNTY OF SPAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP EXTENDED TO BOOK 4, PAGE 13 OF MAPS IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO, LIES

EXCEPT WHERE SHOWN THAT POWER BELONGS TO THE STATE OF CALIFORNIA
RECORDED AS FOLLOWS:





















[illegible]

ALSO CARRYING TRAFFIC IN OPPOSITE ONE-WAY STREET IN AND TO THE
HILL AND PUMPED PLANT LOCATED ON THE WEST 8 FEET OF THE EAST 170.48
FEET OF THE NORTH 30.0 FEET OF THE NORTH 90.00 FEET STREET.

ABBREVIATIONS

LEGEND

40 ASSOCIATE NAME
 41 FURNISHING CODE
 42 FURNISHING NAME
 43 FURNISHING PRICE
 44 CODE OF SALE
 45 NAME OF SALE
 46 DATE OF SALE
 47 CODE OF SALE
 48 CODE OF SALE
 49 CODE OF SALE
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 97 CODE OF SALE
 98 CODE OF SALE
 99 CODE OF SALE
 100 CODE OF SALE

 DIRECT LINE (1)
 PROPERTY CONTIGUOUS (2)
 CURB AND GUTTER
 ON BUILDING FOOTING
 EXPOSED CENTER LINE
 AC PAVED
 GRADE WALL
 OVERBANK
 TREE (1) TRUNK OVER 4"
 PLANTED
 RAIL ROAD
 WSP
 CLP
 FH
 WM
 FP
 VOL. HLM
 ROLLER
 CRTV. RD
 CONC. WALL

CONCLUSIONS

EXHIBIT

1

Abstract

1
2

1

1

Abstract

1

1515

1

1

19181

T

BA
SC
JD

REFERENCES

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APPENDIX A
PERCOLATION TEST DATA/GRAPH

CITY & COUNTY SOIL ENGINEERING AND TESTING

SRI SAI RAM		TEMPLE		Constants-	Ring Data		Liquid Container—
Location: 12594 ROSWELL AVE, CHINO, County of San Bernardino, California				Job #J&P 2018044 DRI	Area, A _r (in ²)	Depth of Liquid (in)	Vol. V _r (in ³ in) #
				Inner Ring: 12" D	113	18"	1-78.54
Test By:	HM/GL	USCS class	SP/GP	Annular Space: 24" D	339	18"	2-176.7
Water Table	Dept Penetration of Rings into Soil (in.):			Inner:		Outer: 89 F	
Date Test:	Tape water used:		80F	pH:	Ground Temp (°F): 83 f		at Depth: 12" / 78 F
Liquid Level Maintained by using:			(Flow valve) Float Valve) Marriotte Tube (X) Other : Manually_				
Additional Comments::			Soil Description/Pit Location/Project Detail/Weather				
Date Tested: 08/11/18			Gray, fine silty sand, silt (SM-ML)				

"Flow. $Q_f = A_H \times V_r^{**}$ " Infiltration $I = (Q_f / A_r) / A_t$

Test; Riverside County-Law Impact Development BMP Design Handbook

SRI SAI RAO TEMPLE				Constants-		Ring Data		Liquid Container—
Location: 12594 ROSWELL AVE, CHINO, County of San Bernardino, California				Job #J&P 2018044 DRI		Area, A _r (in ²)	Depth of Liquid (in)	Vol. V _r (in ³ /in) #
				Inner Ring 12" D		113	18"	1-78.54
Test By:	HM/GL	USCS class	SP/GP	Annular Space 24" D		339	18"	2-176.7
Water Table Dept		Penetration of Rings into Soil (in.):				Inner:	Outer: 89 F	
Date Test:	Tape water used:		80F	pH:	Ground Temp (°F): 83 f		at Depth: 12" / 78 F	
Liquid Level Maintained by using:			(Flow valve <input type="checkbox"/> Float Valve <input type="checkbox"/> Mariotte Tube <input checked="" type="checkbox"/> Other : Manually__					
Additional Comments:			Soil Description/Pit Location/Project Detail/Weather					
Date Tested: 08/11/18			Gray, fine silty sand, silt (SM-ML)					

[illegible]

Table 1 - Test Data Form for Double Ring Infiltrometer
Test; *Riverside County - Low Impact Development BMP Design Handbook*

Test; Riverside County - Low Impact Development BMP Design Handbook

CITY COUNTY SOIL ENGINEERING AND TESTING

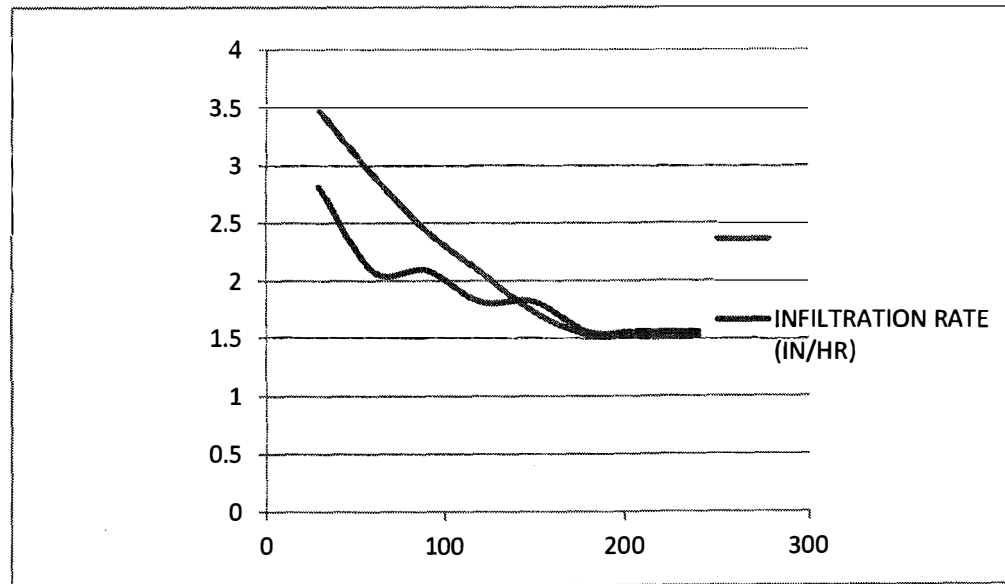
Job #J12018044P1-DRI

INFILTRATION CURVE (P-1)

ELAPSED TIME (MIN) INFILTRATION RATE (IN/HR)

30	3.47	2.81
60	2.91	2.08
90	2.43	2.09
120	2.08	1.82
150	1.73	1.82
180	1.53	1.56
210	1.53	1.56
240	1.53	1.56

Site: 12594 ROSWELL AVE., CHINO, CA 91710



CITY COUNTY SOIL ENGINEERING AND TESTING

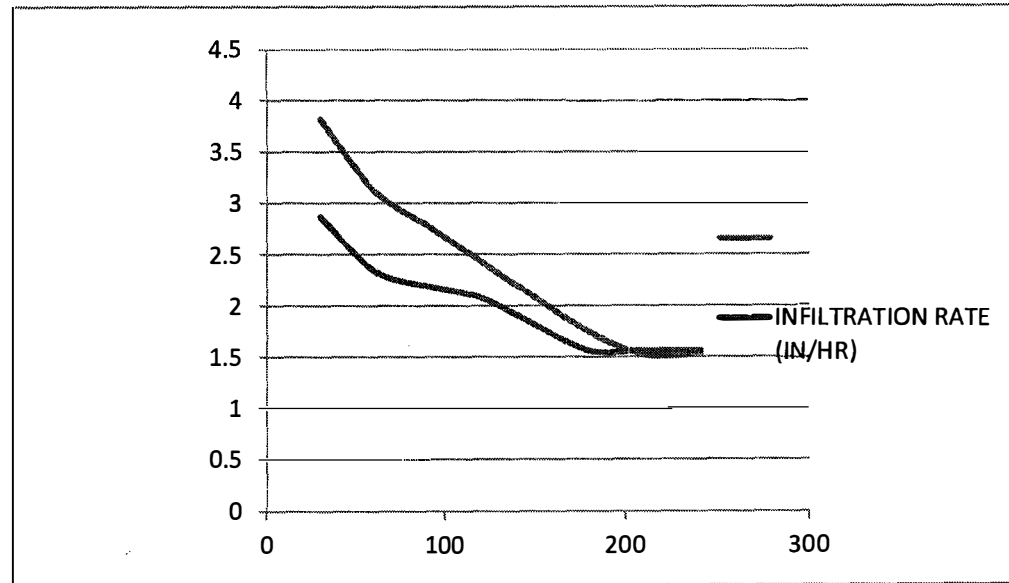
Job #J12018044P1-DRI

INFILTRATION CURVE (P-2)

ELAPSED TIME (MIN) INFILTRATION RATE (IN/HR)

30	3.82	2.87
60	3.12	2.34
90	2.78	2.19
120	2.43	2.08
150	2.08	1.81
180	1.74	1.56
210	1.52	1.56
240	1.52	1.56

Site: 12594 ROSWELL AVE., CHINO, CA 91710



Major division	Group symbols	Typical names	Classification criteria
Coarse-grained soils more than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	GW Well graded gravels and gravel sand mixtures, little or no fines	$C_u = D_{60}/D_{10}$ greater than 4 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		GP Poorly graded gravels and gravel sand mixtures, little or no fines	Not meeting both criteria for GW
		GM Silty gravels, gravel sand silt mixtures	Atterberg limits plot below A- line or plasticity index less than 4
		GC Clayey gravels, gravel sand-clay mixtures	Atterberg limits plot above A- line and plasticity index greater than 7
	Gravel with fines	SW Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60}/D_{10}$ greater than 6 $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		SP Poorly graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW
	Sands more than 50% of coarse fraction passes No. 4 sieve	SM Silty sands, sand silt mixtures	Atterberg limits plot below A- line of plasticity index less than 4
		SC Clayey sands, sand-clay mixtures	Atterberg limits plot above A- line and plasticity index greater than 7

Classification on basis of percentage of fines

GW, GP, SW, SP

Less than 5% pass No. 200 sieve

More than 12% pass No. 200 sieve

5% to 12% pass No. 200 sieve

GM, GC, SM, SC
Borderline classification
requiring use of dual symbol

For soils with more
than 50% passing No.
200 sieve, classify on
Casagrande chart
and highly organic
soil is PT (peat)

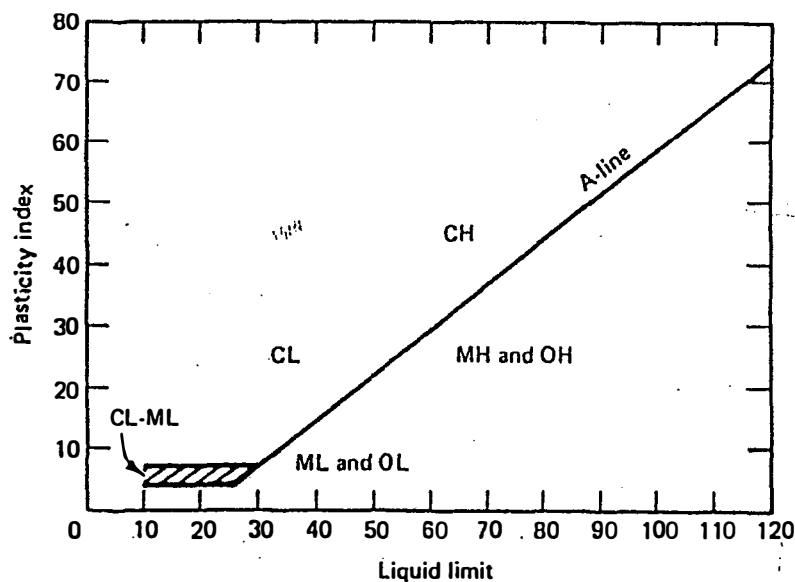


Figure 3-9 Unified classification tabular chart. (Courtesy A. Casagrande, *Classification and Identification of Soils*, Trans. ASCE 113, 1948.)

BORING LOG NO. B-1 (P-1)

Job # J&P2018037P1			08/12/18	Client: SRI SAI RAM MANDIR		
Hole Diameter: 8"			Elev. G.L.	Location:12594 ROSWELL AVE., CHINO, CA		
Sampling Method		Drive Wt. 140#		CME-45		Logged By: ZB
Drop: 30"				Drilling Co: GEOMAT DRILLING, RIVERSIDE, CA		
Dry Density (pcf)	Depth (ft)	# of Blows (ft)	Moist. (%)	Sample Type	Soil Class	Earth Materials Description Top Soil: Dense grass-vegetation-12"
					SM	Dark gray, fine silty sand, grass, vegetation, roots s. moist
						very loose
99.1		38	12.0	■ ●	SM	Brown, fine silty sand, poorly graded, v. moist, med. loose
						dense, 27% passing #200 sieve
	5					
116.4		37	1.7	■ ●	SM	Olive gray, fine silty sand, poorly graded, s. moist, med.
						dense,
	10					
		8		◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
	15					
		22		◆	SM	Olive gray, fine silty sand, poorly graded, moist, medium
						dense
	20					
		19		◆	ML	Olive gray, fine sandy clayey silt, moist, very tiff
	25					
		15	8.0	◆	SM	Olive gray, fine silty sand, poorly graded, moist, medium
						dense , 38% passing #200 sieve
	30					



Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

City & County

**Soil Engineering
And Testing**

BORING LOG NO. B-2

Job # J&P2018037P1

08/12/18

Client: SRI SAI RAM MANDIR

Hole Diameter: 8"

Elev. G.L.

Location: 12594 ROSWELL AVE., CHINO, CA

Sampling Method

Drive Wt. 140#

CME-45

Logged By: ZB

Drop: 30"

Drilling Co: GEOMAT DRILLING, RIVERSIDE, CA

Dry
Density
(pcf)Depth
(ft)# of
Blows
(ft)Moist.
(%)Sample
TypeSoil
ClassEarth Materials Description
Top Soil: Dense grass-vegetation-12"

SM

Dark gray, fine silty sand, grass, vegetation, roots s. moist
very loose

46

■ ●

SM

Light brown, fine to coarse silty sand, few gravel, s. moist,
medium dense, 27% passing #200 sieve

5

104.0

17

7.7

■ ●

SM

Light brown, fine silty sand, moist, med. dense
27% passing #200 sieve

10

9

◆

ML

Olive gray, fine sandy clayey silt, moist, stiff

15

13

◆

ML

Olive gray, fine sandy clayey silt, moist, stiff

20

20

◆

ML

Olive gray, fine sandy clayey silt, moist, very stiff

25

End of Boring @ 25 feet Depth

No Groundwater Encountered

Boring Backfilled



Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

City & County

Soil Engineering
And Testing

BORING LOG NO. B-3

Job # J&P2018037P1			08/12/18	Client: SRI SAI RAM MANDIR		
Hole Diameter: 8"			Elev. G.L.	Location:12594 ROSWELL AVE., CHINO, CA		
Sampling Method		Drive Wt. 140#		CME-45		Logged By: ZB
Drop: 30"				Drilling Co: GEOMAT DRILLING, RIVERSIDE, CA		
Dry Density (pcf)	Depth (ft)	# of Blows (ft)	Moist. (%)	Sample Type	Soil Class	Earth Materials Description Top Soil: Dense grass-vegetation-12"
					SM	Dark gray, fine silty sand, grass, vegetation, roots s. moist
						very loose
	5	31		■ ●	SM	Brown, fine silty sand, poorly graded, v. moist, med.
						dense, 27% <i>passing #200 sieve</i>
	10	14		■ ●	ML	Olive gray, fine sandy clayey silt, moist, stiff
	15	9		◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
	20	13		◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
						dense
	25	14		◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
	30	17		◆	ML	Olive gray, fine sandy clayey silt, moist, very stiff



Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

City & County

**Soil Engineering
And Testing**

BORING LOG NO. B-3 (Continuous from 30')

[illegible]

BORING LOG NO. B-4

Job # J&P2018037P1			08/12/18	Client: SRI SAI RAM MANDIR		
Hole Diameter: 8"			Elev. G.L.	Location:12594 ROSWELL AVE., CHINO, CA		
Sampling Method		Drive Wt. 140#		CME-45		Logged By: ZB
Drop: 30"				Drilling Co: GEOMAT DRILLING, RIVERSIDE, CA		
Dry Density (pcf)	Depth (ft)	# of Blows (ft)	Moist. (%)	Sample Type	Soil Class	Earth Materials Description Top Soil: Dense grass-vegetation-12"
					SM	Dark gray, fine silty sand, grass, vegetation, roots s. moist
						very loose
		28		■ ●	SM	Lt. brown, fine silty sand, poorly graded, s. moist, med.
	5					dense,
98.4		33	4.4	■ ●	SM	Olive gray, fine silty sand, poorly graded, s. moist, med.
	10					<i>dense, 23% passing #200 sieve</i>
		13	17.8	◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
	15					<i>57% passing #200 sieve</i>
		21		◆	SM	Olive gray, fine silty sand, poorly graded, moist, medium
	20					dense
		24	7.3	◆	SM	Olive gray, fine silty sand, poorly graded, moist, medium
	25					Dense, <i>33% passing #200 sieve</i>
						<i>End of Boring @ 25 feet Depth</i>
						<i>No Groundwater Encountered</i>
						<i>Boring Backfilled</i>



Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

City & County

**Soil Engineering
And Testing**

BORING LOG NO. B-5 (P-2)

Job # J&P2018037P1		08/12/18		Client: SRI SAI RAM MANDIR		
Hole Diameter: 8"		Elev. G.L.		Location:12594 ROSWELL AVE., CHINO, CA		
Sampling Method		Drive Wt. 140#		CME-45		Logged By: ZB
Drop: 30"				Drilling Co: GEOMAT DRILLING, RIVERSIDE, CA		
Dry Density (pcf)	Depth (ft)	# of Blows (ft)	Moist. (%)	Sample Type	Soil Class	Earth Materials Description Top Soil: Dense grass-vegetation-12"
					SM	Dark gray, fine silty sand, grass, vegetation, roots s. moist
						very loose
	5	21		■ ●	SM	Brown, fine silty sand, poorly graded, v. moist,
						medium dense, 27% <i>passing</i> #200 sieve
91.6	10	14	16.8	■ ●	ML	Olive gray, fine sandy clayey silt, moist, stiff
101.0	15	21	16.0	■ ●	SM	Olive gray, fine silty sand, poorly graded, moist, medium
						dense
	20	9		◆	ML	Olive gray, fine sandy clayey silt, moist, stiff
	25	21		◆	SM	Olive gray, fine silty sand, poorly graded, moist, medium
						dense
	30	29		◆	SM	Olive gray, fine silty sand, poorly graded, moist, dense



Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

City & County

**Soil Engineering
And Testing**

BORING LOG NO. B-1 (continuous from 30')

[illegible]

Undisturbed Ring Sample
Bulk Sample
Standard Penetration Test

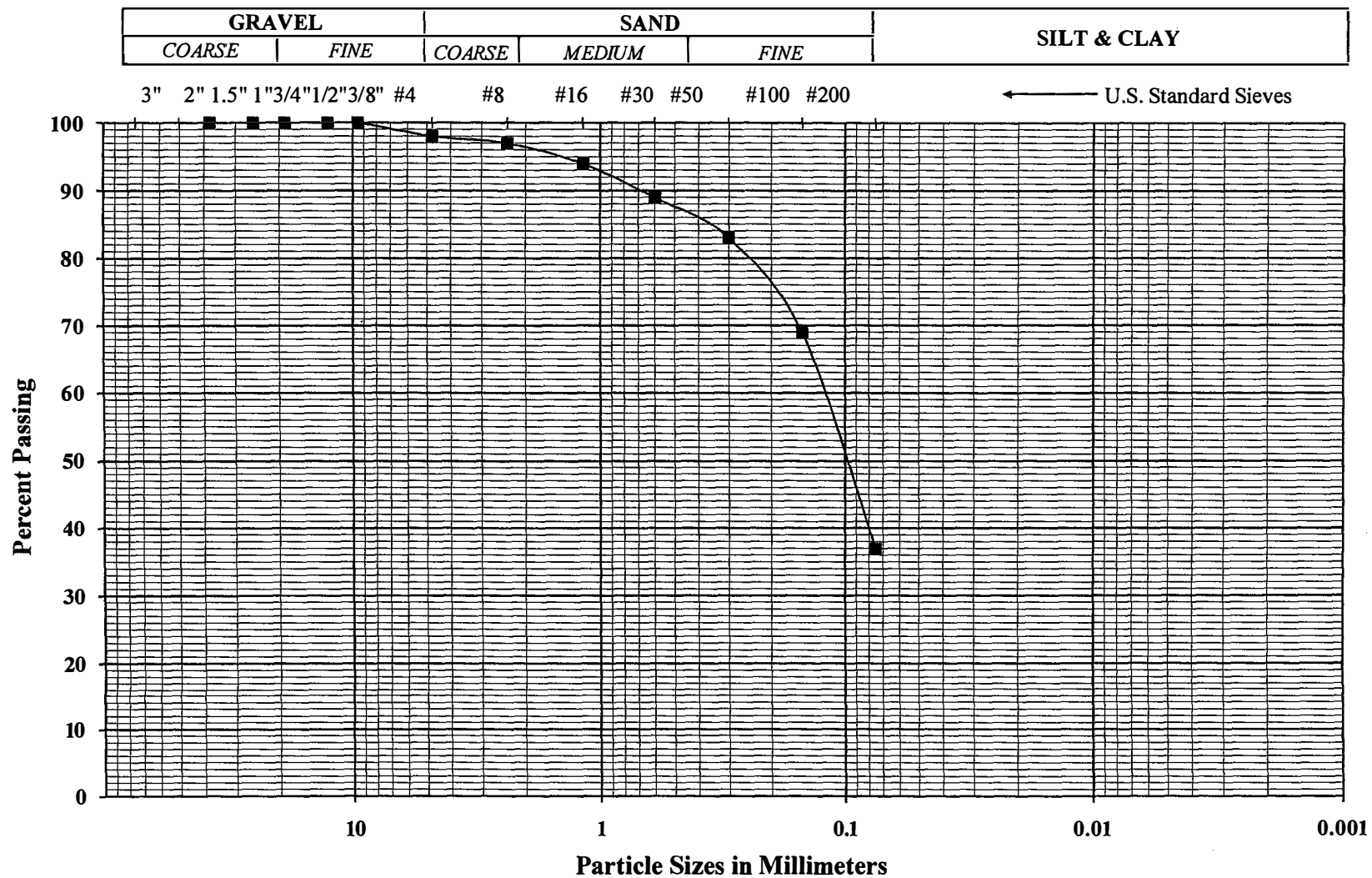
City & County

Soil Engineering And Testing

[illegible]

City & County

Soil Engineering And Testing



Sample Identification: T-1 @ -5'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Olive gray, fine silty sand (SM)

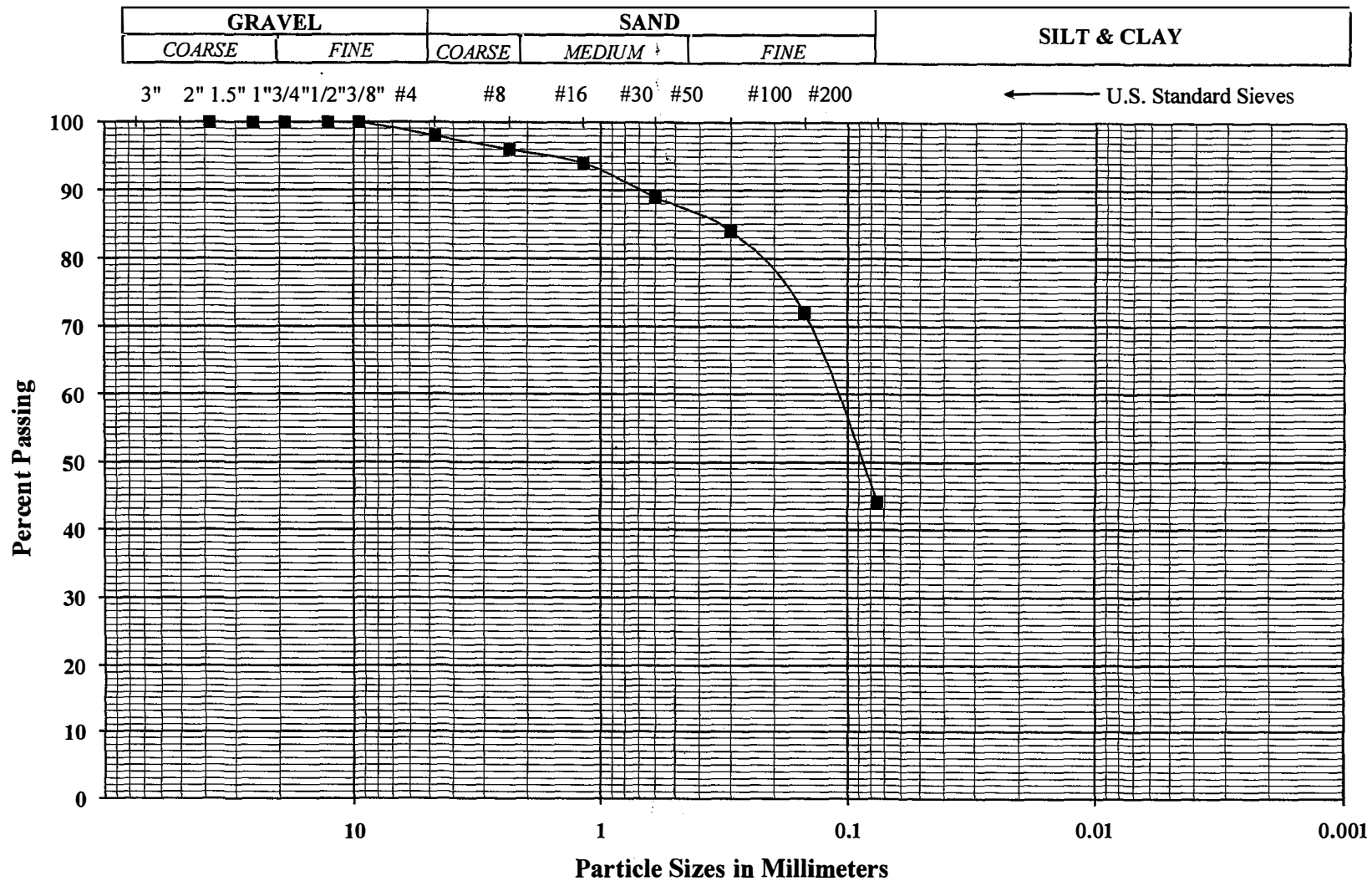
4.90%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: T-2 @ -8'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Olive gray, fine silty sand (SM)

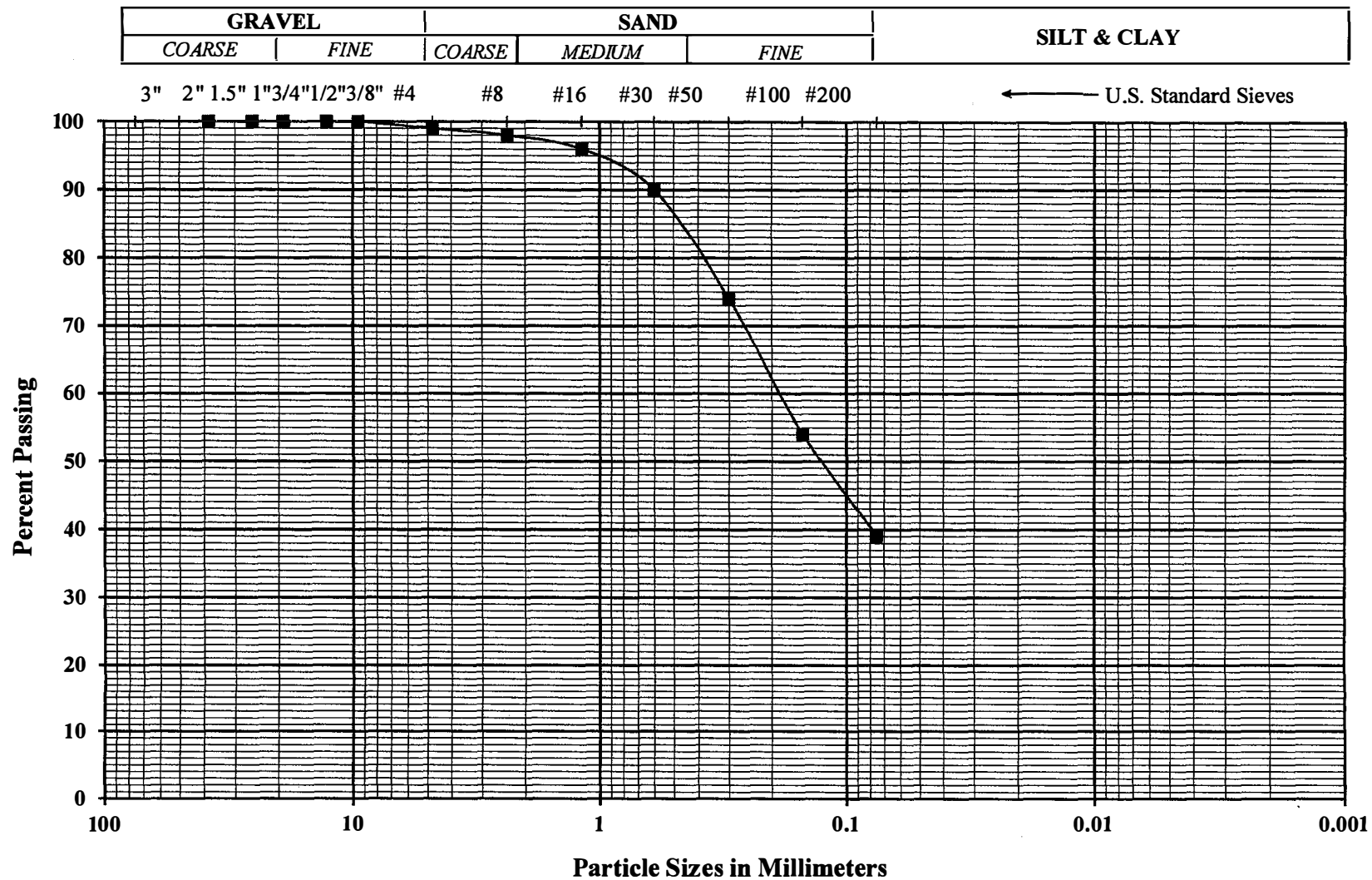
5.20%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-1 (P-1) @ -28'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Olive gray, fine silty sand (SM)

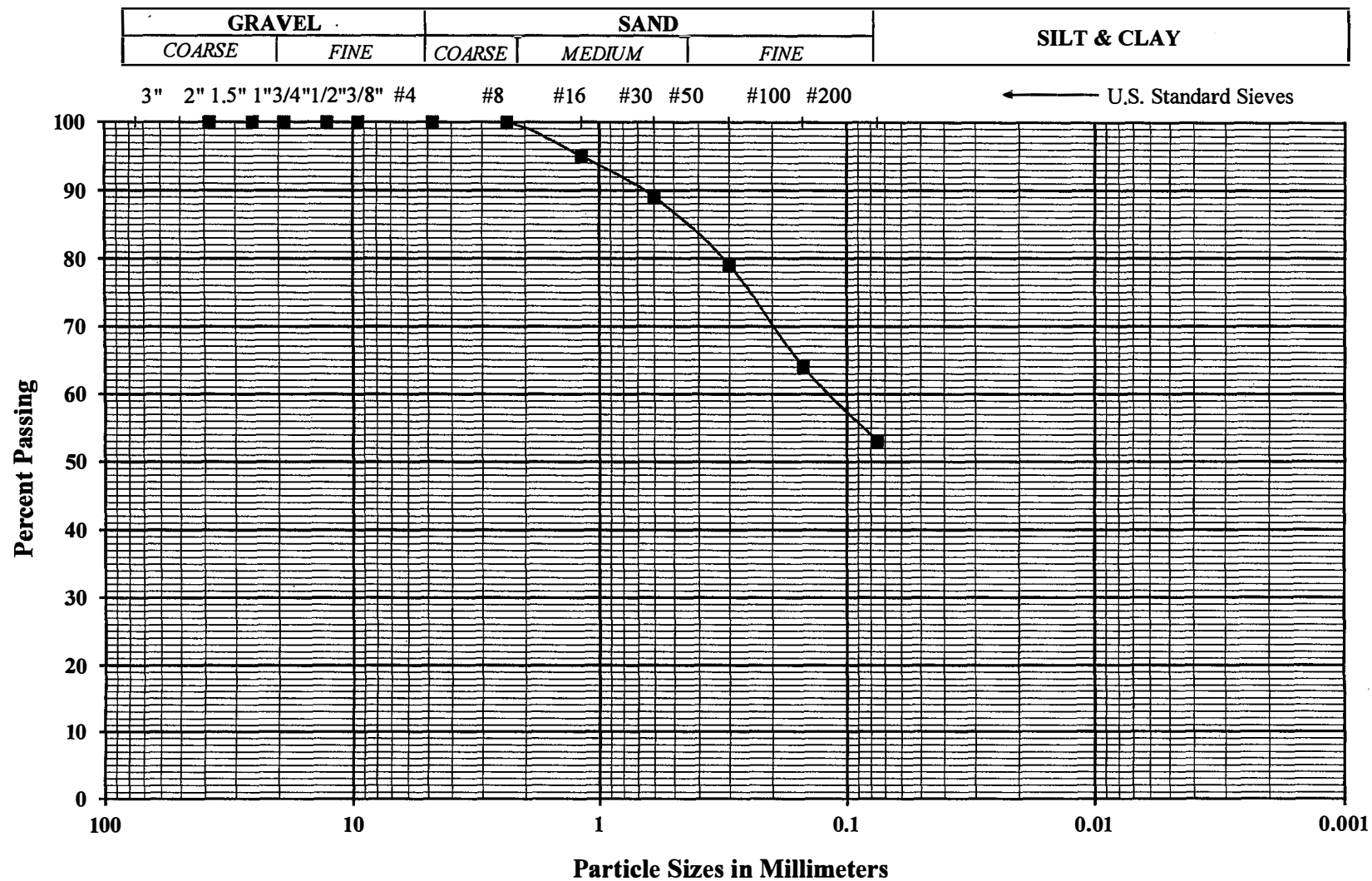
8.00%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-1 (P-1) @ -33'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Brown, fine sandy clayey silt (ML)

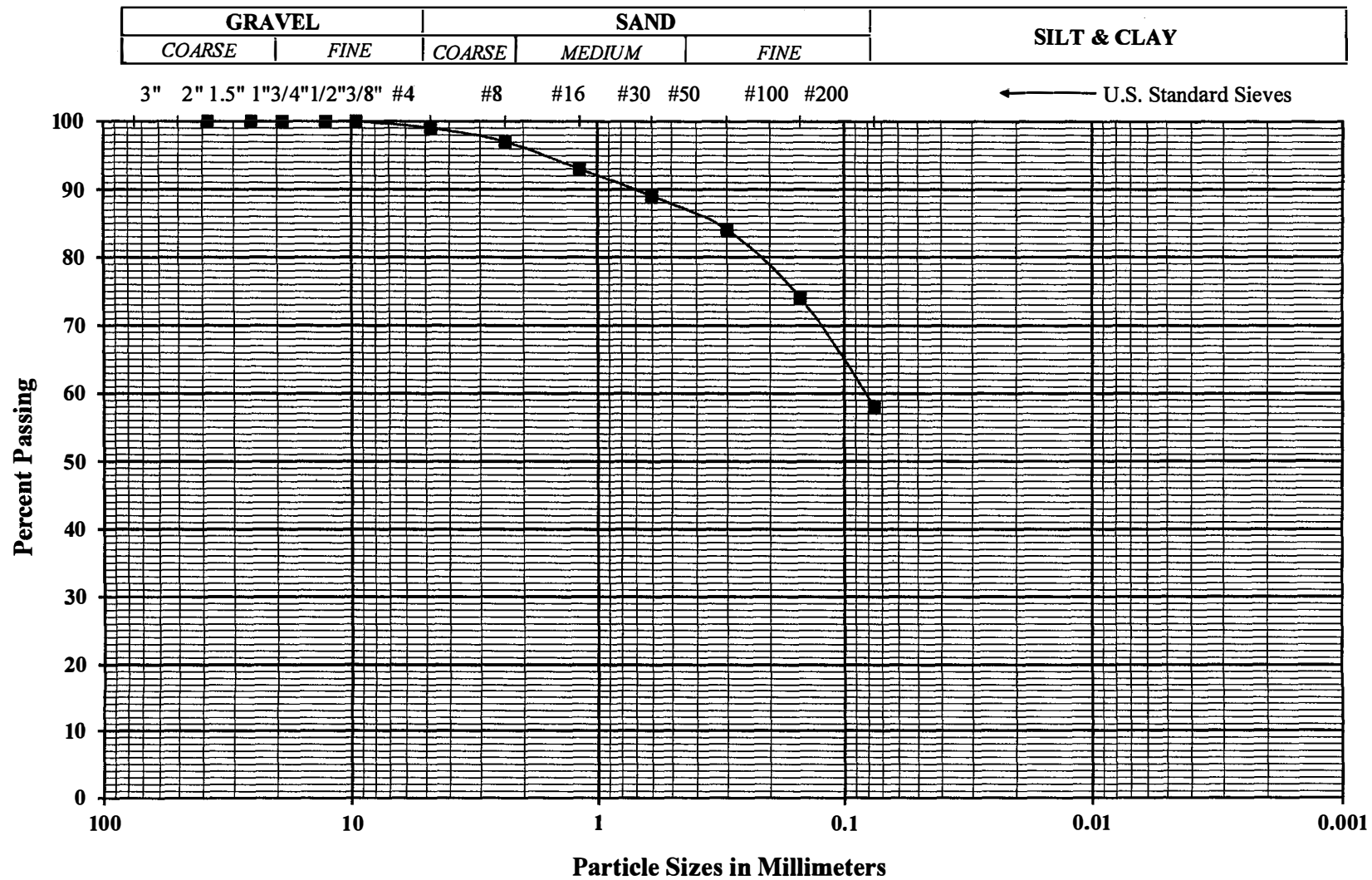
15.70%

City & County
Soil Engineering
And Testing

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-1 (P-1) @ -38'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Brown, fine sandy clayey silt (ML)

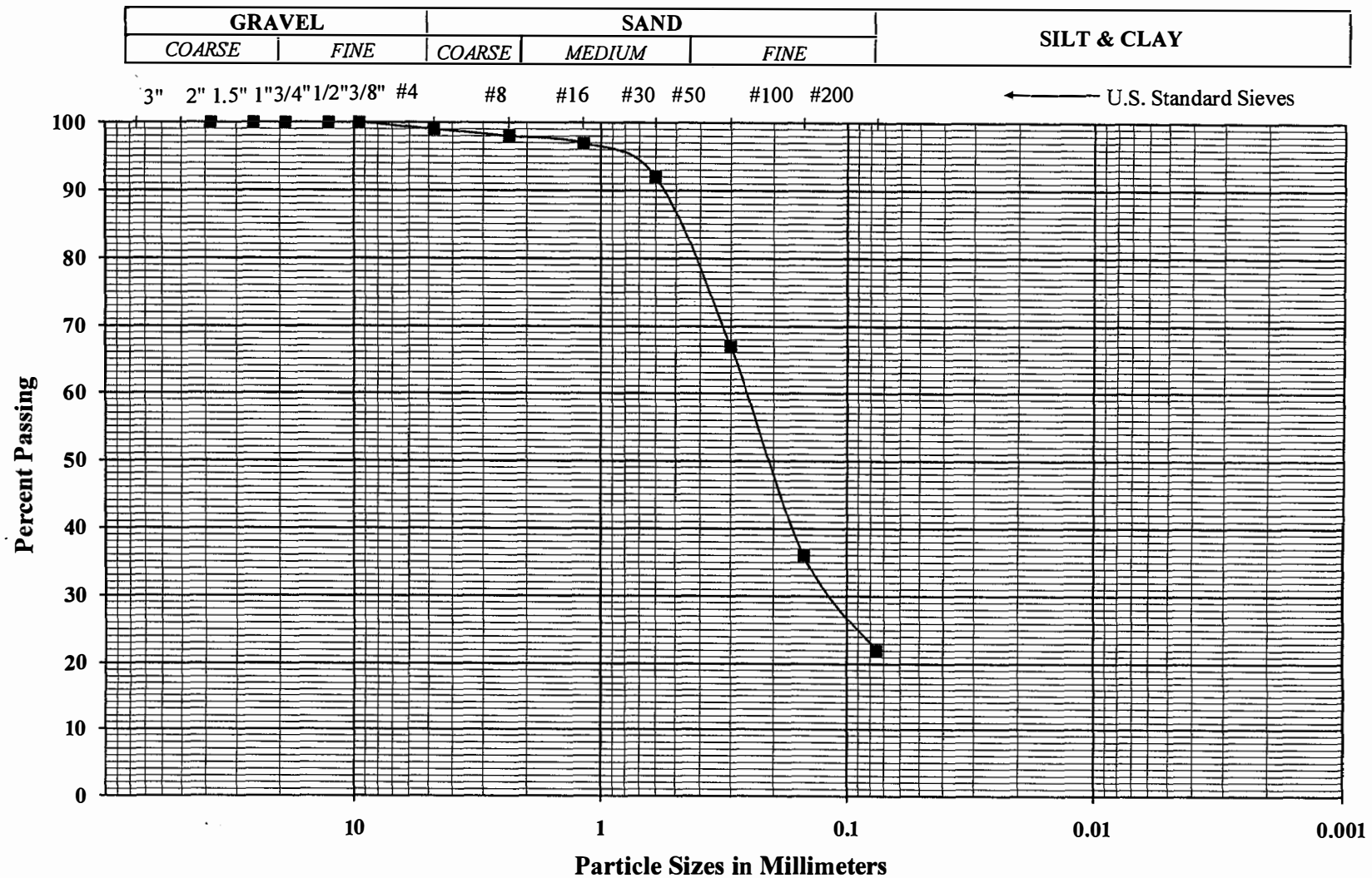
20.00%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-4 @ -9'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Olive gray, fine silty sand (SM)

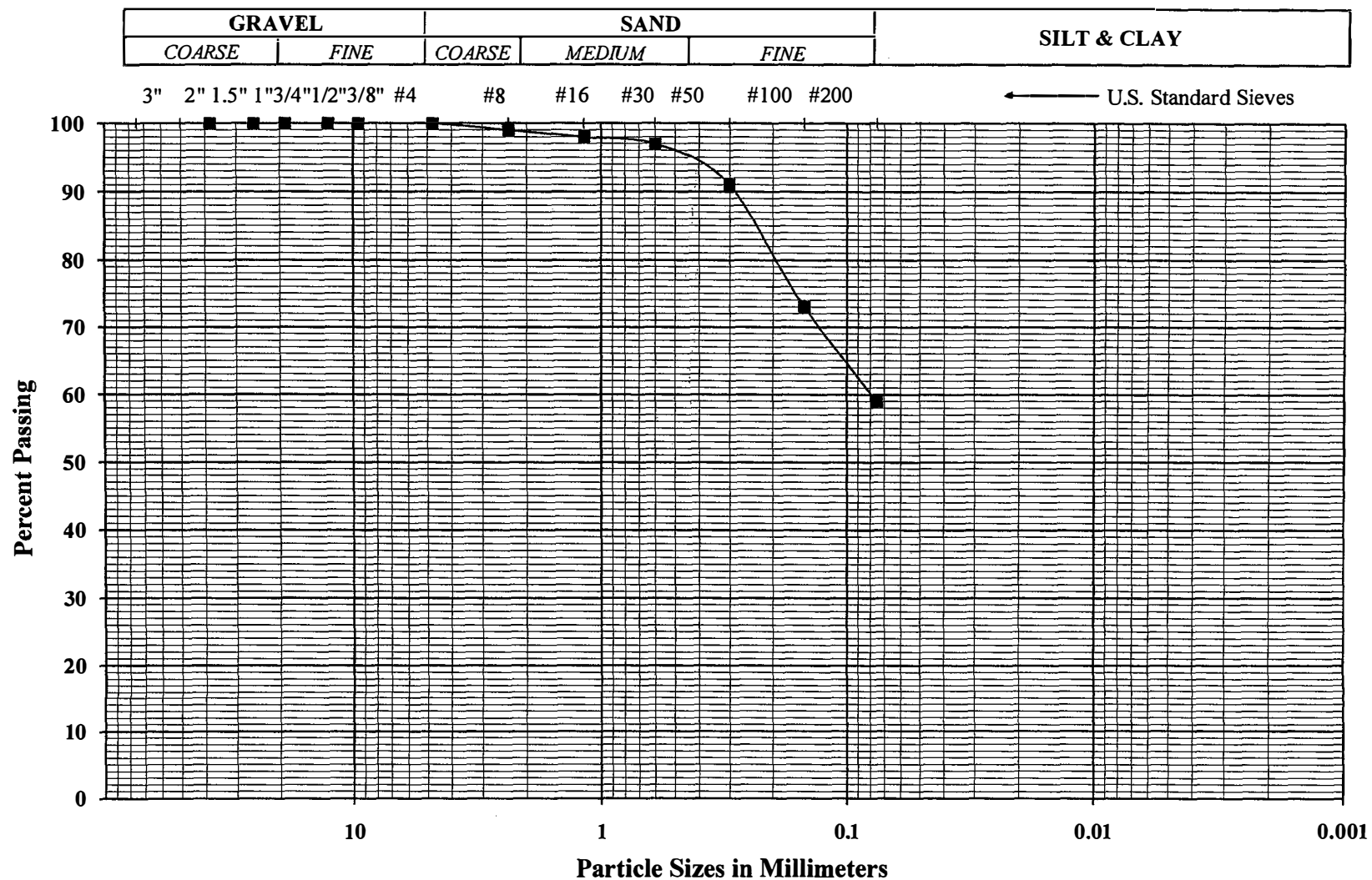
4.40%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-4 @ -14'

Soil Type: Olive gray, fine sandy silt (ML)

Location: 12954 ROISWELL AVE., CHINO, CA

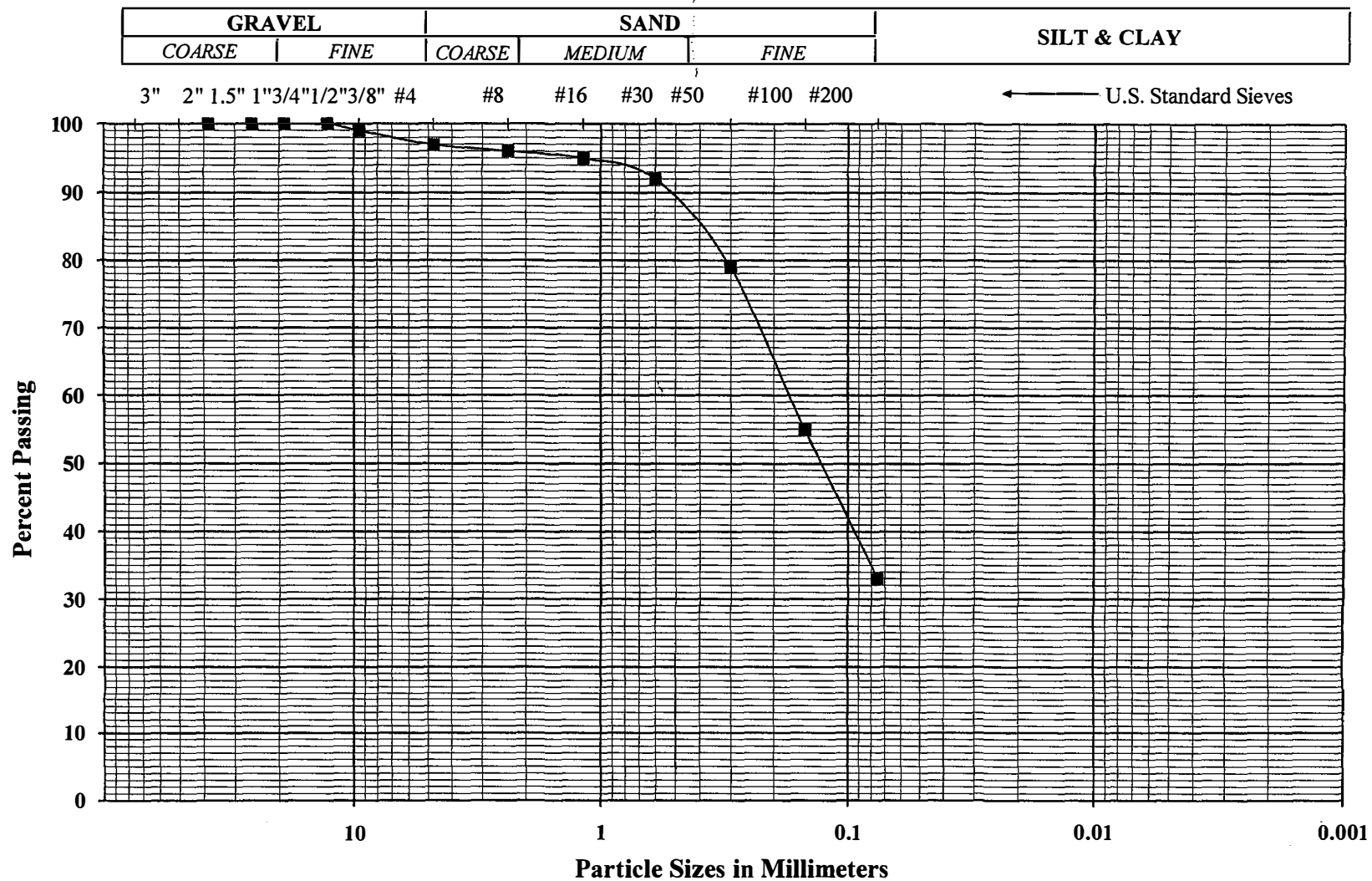
17.80%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1



Sample Identification: B-4 @ -24'

Location: 12954 ROISWELL AVE., CHINO, CA

Soil Type: Olive gray, fine silty sand (SM)

7.30%

**City & County
Soil Engineering
And Testing**

GRAIN SIZE DISTRIBUTION CURVE

SRI SAI RAM MANDIR

PROJECT No.
J&P2018037P1

Soil Resistivity, Soluble Sulfate, Soluble Chloride, pH

Project Name:
Project No.:
Sample ID:
Soil Classification:

Sample Collected:
Collected By:
Sample Tested:
Tested by:

Specimen No.	1	2	3	4
Soil Box Constant (cm)	1.00	1.00	1.00	
Water Added (ml)	15.0	5.0	5.0	
Moisture (%)	11.5	15.4	19.2	
Meter Dial Reading	11.0	4.5	8.3	
Multiliter Setting (ohm)	1K	1K	1K	
Resistance (ohm)	11000	4500	8300	

Minimum Resistivity (ohm-cm)	4500
Temperature (°C)	18.2
$R_{min\ 15.5} = [R_{min} - T(24.5 - T)] / 40$	4803.75

Water increment: 100-150 ml for large box and 5-15 ml for small box

Resistivity = Resistance X Soil Box Constant

Large Soil Box Constant = 6.67 cm

Small Soil Box Constant = 1.00 cm

Rmin 15.5 Corrected Minimum Resistivity to

Standard Ground Temperature of 15.5°C

Soil Corrosiveness Resistivity (ohm-cm)

Very Severely Corrosive 0 - 900

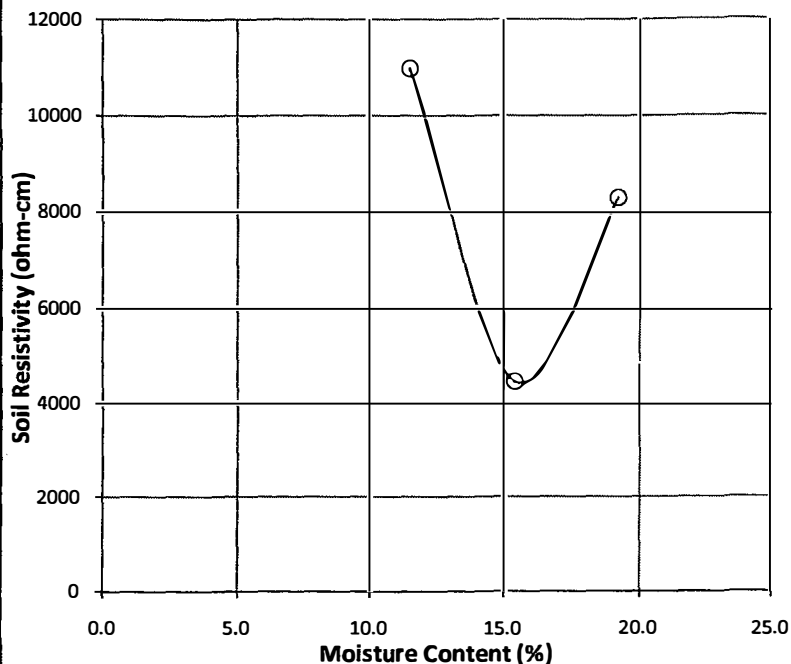
Severely Corrosive 900 - 2,300

Moderately Corrosive 2,300 - 5,000

Mildly Corrosive 5,000 - 10,000

Very Mildly Corrosive 10,000 - 100,000

Reference: ASTM STP 1013 Titled "Effects of Soil Characteristics on Corrosion" (February, 1989).



Mixing Ratio	Dilution Factor	Sulfate Reading (ppm)	Sulfate Content		Chloride Reading (ppm)	Chloride Content		pH
			ppm	%		ppm	%	
3	1	125	375	0.0375	1	5	0.0005	6.75
Average					Average			

ACI 318-05 Table 4.3.1 Requirements for Concrete Exposed to Sulfate-Containing Solutions

Sulfate Exposure	Water-Soluble Sulfate (SO ₄) in Soil, % by Mass	Sulfate (SO ₄) in Water, ppm	Cement Type	Maximum w/cm by Mass	Minimum Design Compressive Strength f_c , Mpa (psi)
Negligible	< 0.10	< 150	No Special Type	--	--
Moderate (See Water)	0.10 to 0.20	150 to 1500	II IP(MS), IS(MS), P(MS), I(PM)(MS), I(SM)(MS)	0.5	28 (4000)
Severe	0.20 to 2.00	1,500 to 10,000	V	0.45	31 (4500)
Very Severe	> 2.00	> 10,000	V + pozz	0.45	31 (4500)

Caltrans classifies a site as corrosive to structural concrete as an area where soil and/or water contains > 500 ppm chloride, > 2000 ppm sulfate, or has a pH < 5.5. A minimum resistivity of less than 1000 ohm-cm indicates the potential for corrosive environment requiring testing for the above criteria.

The 2007 CBC Section 1904A references ACI 318 for material selection and mix design for reinforced concrete dependant on the onsite corrosion potential, soluble sulfate content, and soluble chloride content in soil.

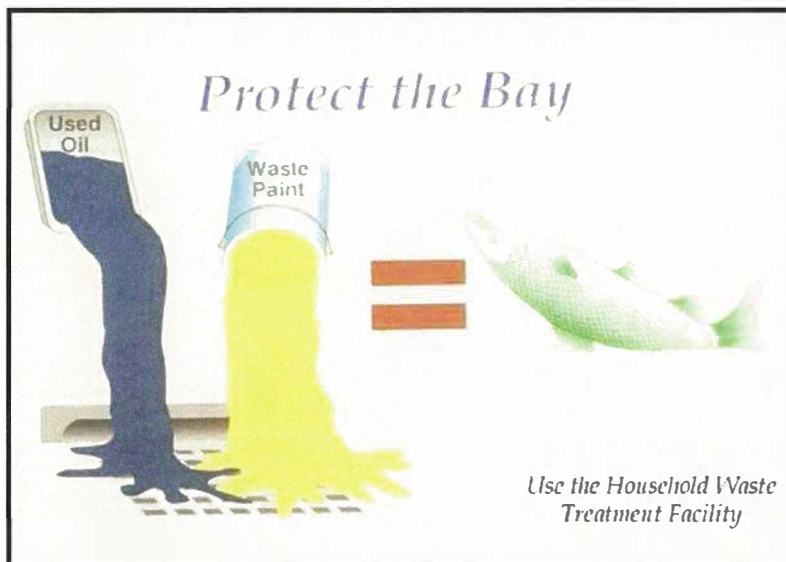
Comments: Sec. 4.3 of ACI 318 (2005) Soil environment is detrimental to concrete if it has soluble sulfate > 1000 ppm and/or pH < 5.5. Soil environment is corrosive to reinforcement and steel pipes if chloride ion > 500 ppm or pH < 4.0.

The information in this form is not intended for corrosion engineering design. If corrosion is critical, a corrosion specialist should be contacted to provide further recommendations.

Attachment D: Maintenance Agreement for BMP to the WQMP

To be provided in the Final WQMP Report.

Attachment E: BMP Factsheets



Objectives

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

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater 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-stormwater 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 (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) 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-stormwater discharges to the stormwater 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.

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

Targeted Constituents

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



Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols***Recommended Complaint Investigation Equipment***

- Field Screening Analysis
 - pH paper or meter
 - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
 - Sample jars
 - Sample collection pole
 - A tool to remove access hole covers
- Laboratory Analysis
 - Sample cooler
 - Ice
 - Sample jars and labels
 - Chain of custody forms
- Documentation
 - Camera
 - Notebook
 - Pens
 - Notice of Violation forms
 - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are 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 demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of “as-built” piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the “as-built” piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater 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 stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- 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.

Once a site has been cleaned:

- Post “No Dumping” signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
 - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a “non-stormwater” discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State’s General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility’s SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

California’s Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Storm Water Managers Resource Center <http://www.stormwatercenter.net/>

Spill Prevention, Control & Cleanup SC-11



Photo Credit: Geoff Brosseau

Objectives

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

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 stormwater 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 stormwater drainage system, and train personnel to prevent and control future spills.

Approach

Pollution Prevention

- 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.
- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

Targeted Constituents

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



SC-11 Spill Prevention, Control & Cleanup

- Description of the facility, owner and address, activities and chemicals present
 - Facility map
 - Notification and evacuation procedures
 - Cleanup instructions
 - Identification of responsible departments
 - Identify key spill response personnel
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- 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.
- If consistent illegal dumping is observed at the facility:
 - Post “No Dumping” signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
 - Landscaping and beautification efforts may also discourage illegal dumping.
 - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.
- 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.
- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.
- Routine maintenance:
 - Place drip pans or absorbent materials beneath all 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.
 - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site’s spill control plan and/or proper spill cleanup procedures.
 - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

Spill Prevention, Control & Cleanup SC-11

- Check tanks (and any containment sumps) 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 (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- 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 foams. 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.

Reporting

- Report 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 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:
 - Types and quantities (in some cases) of wastes
 - Patterns in time of occurrence (time of day/night, month, or year)

SC-11 Spill Prevention, Control & Cleanup

- Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

Training

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
 - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
 - 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 and Countermeasure Plan and the plan should be readily available.
- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Spill Prevention, Control & Cleanup SC-11

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

SC-11 Spill Prevention, Control & Cleanup

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

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- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

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- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
 - Cover fueling area if possible.
 - Use a perimeter drain or slope pavement inward with drainage to a sump.
 - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage “topping-off” of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

Spill Prevention, Control & Cleanup SC-11

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Stormwater Managers Resource Center <http://www.stormwatercenter.net/>

CALIFORNIA ENVIRONMENTAL REPORTING SYSTEM (CERS)
CONSOLIDATED EMERGENCY RESPONSE / CONTINGENCY PLAN
Prior to completing this Plan, please refer to the INSTRUCTIONS FOR COMPLETING A CONSOLIDATED CONTINGENCY PLAN

A. FACILITY IDENTIFICATION AND OPERATIONS OVERVIEW

FACILITY ID #	CERS ID	DATE OF PLAN PREPARATION/REVISION
BUSINESS NAME (Same as Facility Name or DBA - Doing Business As)		
BUSINESS SITE ADDRESS		
BUSINESS SITE CITY	104.	ZIP CODE
TYPE OF BUSINESS (e.g., Painting Contractor)		INCIDENTAL OPERATIONS (e.g., Fleet Maintenance)
THIS PLAN COVERS CHEMICAL SPILLS, FIRES, AND EARTHQUAKES INVOLVING: (Check all that apply)		
<input checked="" type="checkbox"/> 1. HAZARDOUS MATERIALS; <input type="checkbox"/> 2. HAZARDOUS WASTES		

B. INTERNAL RESPONSE

INTERNAL FACILITY EMERGENCY RESPONSE WILL OCCUR VIA: (Check all that apply)	B1.
<input type="checkbox"/> 1. CALLING PUBLIC EMERGENCY RESPONDERS (i.e., 9-1-1) <input type="checkbox"/> 2. CALLING HAZARDOUS WASTE CONTRACTOR <input type="checkbox"/> 3. ACTIVATING IN-HOUSE EMERGENCY RESPONSE TEAM	

C. EMERGENCY COMMUNICATIONS, PHONE NUMBERS AND NOTIFICATIONS

Whenever there is an imminent or actual emergency situation such as an explosion, fire, or release, the Emergency Coordinator (or his/her designee when the Emergency Coordinator is on call) shall:

1. Activate internal facility alarms or communications systems, where applicable, to notify all facility personnel.
2. Notify appropriate local authorities (i.e., call 9-1-1).
3. Notify the California Emergency Management Agency at (800) 852-7550.

Before facility operations are resumed in areas of the facility affected by the incident, the emergency coordinator shall notify the California Department of Toxic Substances Control (DTSC), the local Unified Program Agency (UPA), and the local fire department's hazardous materials program that the facility is in compliance with requirements to:

1. Provide for proper storage and disposal of recovered waste, contaminated soil or surface water, or any other material that results from an explosion, fire, or release at the facility; and
2. Ensure that no material that is incompatible with the released material is transferred, stored, or disposed of in areas of the facility affected by the incident until cleanup procedures are completed.

INTERNAL FACILITY EMERGENCY COMMUNICATIONS OR ALARM NOTIFICATION WILL OCCUR VIA: (Check all that apply)	C1.
<input type="checkbox"/> 1. VERBAL WARNINGS; <input type="checkbox"/> 2. PUBLIC ADDRESS OR INTERCOM SYSTEM; <input type="checkbox"/> 3. TELEPHONE; <input type="checkbox"/> 4. PAGERS; <input type="checkbox"/> 5. ALARM SYSTEM; <input type="checkbox"/> 6. PORTABLE RADIO	
NOTIFICATIONS TO NEIGHBORING FACILITIES THAT MAY BE AFFECTED BY AN OFF-SITE RELEASE WILL OCCUR BY: (Check all that apply)	C2.
<input type="checkbox"/> 1. VERBAL WARNINGS; <input type="checkbox"/> 2. PUBLIC ADDRESS OR INTERCOM SYSTEM; <input type="checkbox"/> 3. TELEPHONE; <input type="checkbox"/> 4. PAGERS; <input type="checkbox"/> 5. ALARM SYSTEM; <input type="checkbox"/> 6. PORTABLE RADIO	
EMERGENCY RESPONSE PHONE NUMBERS:	
AMBULANCE, FIRE, POLICE AND CHP	9-1-1
CALIFORNIA EMERGENCY MANAGEMENT AGENCY (CAL/EMA)	(800) 852-7550
NATIONAL RESPONSE CENTER (NRC)	(800) 424-8802
POISON CONTROL CENTER	(800) 222-1222
LOCAL UNIFIED PROGRAM AGENCY (UPA/CUPA)	
OTHER (Specify):	
NEAREST MEDICAL FACILITY / HOSPITAL NAME:	
AGENCY NOTIFICATION PHONE NUMBERS:	
CALIFORNIA DEPT. OF TOXIC SUBSTANCES CONTROL (DTSC)	(916) 255-3545
REGIONAL WATER QUALITY CONTROL BOARD	
U.S. ENVIRONMENTAL PROTECTION AGENCY (US EPA)	(800) 300-2193
CALIFORNIA DEPT OF FISH AND GAME (DFG)	(916) 358-2900
U.S. COAST GUARD	(202) 267-2180
CAL/OSHA	(916) 263-2800
STATE FIRE MARSHAL	(916) 445-8200
OTHER (Specify):	
OTHER (Specify):	

D. EMERGENCY CONTAINMENT AND CLEANUP PROCEDURES

SPILL PREVENTION, CONTAINMENT, AND CLEANUP PROCEDURES: (Check all boxes that apply to indicate your procedures for containing spills, releases, fires or explosions; and, preventing and mitigating associated harm to persons, property, and the environment.)

- ☐ 1. MONITOR FOR LEAKS, RUPTURES, PRESSURE BUILD-UP, ETC.;
- ☐ 2. PROVIDE STRUCTURAL PHYSICAL BARRIERS (e.g., Portable spill containment walls);
- ☐ 3. PROVIDE ABSORBENT PHYSICAL BARRIERS (e.g., Pads, pigs, pillows);
- ☐ 4. COVER OR BLOCK FLOOR AND/OR STORM DRAINS;
- ☐ 5. BUILT-IN BERM IN WORK / STORAGE AREA;
- ☐ 6. AUTOMATIC FIRE SUPPRESSION SYSTEM;
- ☐ 7. ELIMINATE SOURCES OF IGNITION FOR FLAMMABLE HAZARDS (e.g. Flammable liquids, Propane);
- ☐ 8. STOP PROCESSES AND/OR OPERATIONS;
- ☐ 9. AUTOMATIC / ELECTRONIC EQUIPMENT SHUT-OFF SYSTEM;
- ☐ 10. SHUT-OFF WATER, GAS, ELECTRICAL UTILITIES AS APPROPRIATE;
- ☐ 11. CALL 9-1-1 FOR PUBLIC EMERGENCY RESPONDER ASSISTANCE / MEDICAL AID;
- ☐ 12. NOTIFY AND EVACUATE PERSONS IN ALL THREATENED AREAS;
- ☐ 13. ACCOUNT FOR EVACUATED PERSONS IMMEDIATELY AFTER EVACUATION CALL;
- ☐ 14. PROVIDE PROTECTIVE EQUIPMENT FOR ON-SITE RESPONSE TEAM;
- ☐ 15. REMOVE OR ISOLATE CONTAINERS / AREA AS APPROPRIATE;
- ☐ 16. HIRE LICENSED HAZARDOUS WASTE CONTRACTOR;
- ☐ 17. USE ABSORBENT MATERIAL FOR SPILLS WITH SUBSEQUENT PROPER LABELING, STORAGE, AND HAZARDOUS WASTE DISPOSAL AS APPROPRIATE;
- ☐ 18. SUCTION USING SHOP VACUUM WITH SUBSEQUENT PROPER LABELING, STORAGE, AND HAZARDOUS WASTE DISPOSAL AS APPROPRIATE;
- ☐ 19. WASH / DECONTAMINATE EQUIPMENT W/ CONTAINMENT and DISPOSAL OF EFFLUENT / RINSATE AS HAZARDOUS WASTE;
- ☐ 20. PROVIDE SAFE TEMPORARY STORAGE OF EMERGENCY-GENERATED WASTES;
- ☐ 21. OTHER (Specify):

D1.

D2.

E. FACILITY EVACUATION

THE FOLLOWING ALARM SIGNAL(S) WILL BE USED TO BEGIN EVACUATION OF THE FACILITY (CHECK ALL THAT APPLY):

E1.

- ☐ 1. BELLS;
- ☐ 2. HORNS/SIRENS;
- ☐ 3. VERBAL (I.E., SHOUTING);
- ☐ 4. OTHER (Specify):

E2.

THE FOLLOWING LOCATION(S) IS/ARE EVACUEE EMERGENCY ASSEMBLY AREA(S) (i.e., Front parking lot, specific street corner, etc.)

E3.

Note: The Emergency Coordinator must account for all on site employees and/or site visitors after evacuation.

☐ EVACUATION ROUTE MAP(S) POSTED AS REQUIRED

E4.

Note: The map(s) must show primary and alternate evacuation routes, emergency exits, and primary and alternate staging areas, and must be prominently posted throughout the facility in locations where it will be visible to employees and visitors.

F. ARRANGEMENTS FOR EMERGENCY SERVICES

Explanation of Requirement: Advance arrangements with local fire and police departments, hospitals, and/or emergency services contractors should be made as appropriate for your facility. You may determine that such arrangements are not necessary.

ADVANCE ARRANGEMENTS FOR LOCAL EMERGENCY SERVICES (Check one of the following)

F1.

- ☐ 1. HAVE BEEN DETERMINED NOT NECESSARY; or
- ☐ 2. THE FOLLOWING ARRANGEMENTS HAVE BEEN MADE (Specify):

F2.

G. EMERGENCY EQUIPMENT

Check all boxes that apply to list emergency response equipment available at the facility and identify the location(s) where the equipment is kept and the equipment's capability, if applicable. [e.g., ☒ CHEMICAL PROTECTIVE GLOVES | Spill response kit | One time use, Oil & solvent resistant only.]

TYPE	EQUIPMENT AVAILABLE ^{G1.}	LOCATION	CAPABILITY (If applicable)
Safety and First Aid	1. <input type="checkbox"/> CHEMICAL PROTECTIVE SUITS, APRONS, OR VESTS	G2.	G3.
	2. <input type="checkbox"/> CHEMICAL PROTECTIVE GLOVES	G4.	G5.
	3. <input type="checkbox"/> CHEMICAL PROTECTIVE BOOTS	G6.	G7.
	4. <input type="checkbox"/> SAFETY GLASSES / GOGGLES / SHIELDS	G8.	G9.
	5. <input type="checkbox"/> HARD HATS	G10.	G11.
	6. <input type="checkbox"/> CARTRIDGE RESPIRATORS	G12.	G13.
	7. <input type="checkbox"/> SELF-CONTAINED BREATHING APPARATUS (SCBA)	G14.	G15.
	8. <input type="checkbox"/> FIRST AID KITS / STATIONS	G16.	G17.
	9. <input type="checkbox"/> PLUMBED EYEWASH FOUNTAIN / SHOWER	G18.	G19.
	10. <input type="checkbox"/> PORTABLE EYEWASH KITS	G20.	G21.
	11. <input type="checkbox"/> OTHER	G22.	G23.
	12. <input type="checkbox"/> OTHER	G24.	G25.
Fire Fighting	13. <input type="checkbox"/> PORTABLE FIRE EXTINGUISHERS	G26.	G27.
	14. <input type="checkbox"/> FIXED FIRE SYSTEMS / SPRINKLERS / FIRE HOSES	G28.	G29.
	15. <input type="checkbox"/> FIRE ALARM BOXES OR STATIONS	G30.	G31.
	16. <input type="checkbox"/> OTHER	G32.	G33.
Spill Control and Clean-Up	17. <input type="checkbox"/> ALL-IN-ONE SPILL KIT	G34.	G35.
	18. <input type="checkbox"/> ABSORBENT MATERIAL	G36.	G37.
	19. <input type="checkbox"/> CONTAINER FOR USED ABSORBENT	G38.	G39.
	20. <input type="checkbox"/> BERMING / DIKING EQUIPMENT	G40.	G41.
	21. <input type="checkbox"/> BROOM	G42.	G43.
	22. <input type="checkbox"/> SHOVEL	G44.	G45.
	23. <input type="checkbox"/> SHOP VAC	G46.	G47.
	24. <input type="checkbox"/> EXHAUST HOOD	G48.	G49.
	25. <input type="checkbox"/> EMERGENCY SUMP / HOLDING TANK	G50.	G51.
	26. <input type="checkbox"/> CHEMICAL NEUTRALIZERS	G52.	G53.
	27. <input type="checkbox"/> GAS CYLINDER LEAK REPAIR KIT	G54.	G55.
	28. <input type="checkbox"/> SPILL OVERPACK DRUMS	G56.	G57.
	29. <input type="checkbox"/> OTHER	G58.	G59.
Communications and Alarm Systems	30. <input type="checkbox"/> TELEPHONES (Includes cellular)	G60.	G61.
	31. <input type="checkbox"/> INTERCOM / PA SYSTEM	G62.	G63.
	32. <input type="checkbox"/> PORTABLE RADIOS	G64.	G65.
	33. <input type="checkbox"/> AUTOMATIC ALARM CHEMICAL MONITORING EQUIPMENT	G66.	G67.
Other	34. <input type="checkbox"/> OTHER	G68.	G69.
	35. <input type="checkbox"/> OTHER	G70.	G71.

H. EARTHQUAKE VULNERABILITY

Identify areas of the facility that are vulnerable to hazardous materials releases / spills due to earthquake-related motion. These areas require immediate isolation and inspection.

VULNERABLE AREAS: (Check all that apply)	LOCATIONS (e.g., shop, outdoor shed, forensic lab)
<input type="checkbox"/> 1. HAZARDOUS MATERIALS / WASTE STORAGE AREA	H12.
<input type="checkbox"/> 2. PROCESS LINES / PIPING	H13.
<input type="checkbox"/> 3. LABORATORY	H14.
<input type="checkbox"/> 4. WASTE TREATMENT AREA	H15.

Identify mechanical systems vulnerable to releases / spills due to earthquake-related motion. These systems require immediate isolation and inspection.

VULNERABLE SYSTEMS: (Check all that apply)	LOCATIONS
<input type="checkbox"/> 1. SHELVES, CABINETS AND RACKS	H17.
<input type="checkbox"/> 2. TANKS (EMERGENCY SHUTOFF)	H18.
<input type="checkbox"/> 3. PORTABLE GAS CYLINDERS	H19.
<input type="checkbox"/> 4. EMERGENCY SHUTOFF AND/OR UTILITY VALVES	H110.
<input type="checkbox"/> 5. SPRINKLER SYSTEMS	H111.
<input type="checkbox"/> 6. STATIONARY PRESSURIZED CONTAINERS (e.g., Propane dispensing tank)	H112.

I. EMPLOYEE TRAINING

Explanation of Requirement: Employee training is required for all employees handling hazardous materials and hazardous wastes in day-to-day or clean-up operations including volunteers and/or contractors. Training must be:

- Provided within 6 months for new hires;
- Amended as necessary prior to change in process or work assignment;
- Given upon modification to the Emergency Response / Contingency Plan, and updated/refreshed annually for all employees.

Required content includes all of the following:

- | | |
|---|--|
| <ul style="list-style-type: none"> • Material Safety Data Sheets; • Hazard communication related to health and safety; • Methods for safe handling of hazardous substances; • Fire hazards of materials / processes; • Conditions likely to worsen emergencies; • Coordination of emergency response; • Notification procedures; • Applicable laws and regulations; | <ul style="list-style-type: none"> • Communication and alarm systems; • Personal protective equipment; • Use of emergency response equipment (e.g. Fire extinguishers, respirators, etc.); • Decontamination procedures; • Evacuation procedures; • Control and containment procedures; • UST monitoring system equipment and procedures (if applicable). |
|---|--|

INDICATE HOW EMPLOYEE TRAINING PROGRAM IS ADMINISTERED (Check all that apply)

- | | | | |
|--|-------------------------------------|---|-----|
| <input type="checkbox"/> 1. FORMAL CLASSROOM; | <input type="checkbox"/> 2. VIDEOS; | <input type="checkbox"/> 3. SAFETY / TAILGATE MEETINGS; | H1. |
| <input type="checkbox"/> 4. STUDY GUIDES / MANUALS (Specify): _____ | | | H2. |
| <input type="checkbox"/> 5. OTHER (Specify): _____ | | | H3. |
| <input type="checkbox"/> 6. NOT APPLICABLE BECAUSE FACILITY HAS NO EMPLOYEES | | | |

Large Quantity Generator (LQG) Training Records: Large quantity hazardous waste generators (i.e., who generate more than 270 gallons/1,000 kilograms of hazardous waste per month) must retain written documentation of employee hazardous waste management training sessions which includes:

- A written outline/agenda of the type and amount of both introductory and continuing training that will be given to persons filling each job position having responsibility for the management of hazardous waste (e.g., labeling, manifesting, compliance with accumulation time limits, etc.).
- The name, job title, and date of training for each hazardous waste management training session given to an employee filling such a job position; and
- A written job description for each of the above job positions that describes job duties and the skills, education, or other qualifications required of personnel assigned to the position.
- Current employee training records must be retained until closure of the facility.
- Former employee training records must be retained at least three years after termination of employment.

J. LIST OF ATTACHMENTS

(Check one of the following)

- | | |
|--|-----|
| <input type="checkbox"/> 1. NO ATTACHMENTS ARE REQUIRED; <i>or</i> | J1. |
| <input type="checkbox"/> 2. THE FOLLOWING DOCUMENTS ARE ATTACHED: | J2. |

K. SIGNATURE / CERTIFICATION

Certification: Based on my inquiry of those individuals responsible for obtaining the information, I certify under penalty of law that I have personally examined and am familiar with the information submitted and believe the information is true, accurate, and complete, and that a copy is available on site.

SIGNATURE OF OWNER/OPERATOR	DATE SIGNED
K2.	K1.
NAME OF SIGNER (print)	TITLE OF SIGNER
K2.	K3.

Building & Grounds Maintenance SC-41



Objectives

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

Description

Stormwater 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 stormwater 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 stormwater collection system.

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.

Pollution Prevention

- 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.

Targeted Constituents

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



SC-41 Building & Grounds Maintenance

- 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.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- 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 filter 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 you are pressure 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.

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 systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, 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 ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

Building & Grounds Maintenance SC-41

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

SC-41 Building & Grounds Maintenance

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

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.

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.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). <http://www.basmaa.org/>

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). <http://www.basmaa.org/>

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Storm Water Managers Resource Center <http://www.stormwatercenter.net/>

Parking/Storage Area Maintenance SC-43



Objectives

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

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 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 BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater 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.

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.

Targeted Constituents

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



SC-43 Parking/Storage Area Maintenance

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 quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

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, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- 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.
- Follow the procedures below if water is used to clean surfaces:
 - Block the storm drain or contain runoff.
 - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
 - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
 - Clean oily spots with absorbent materials.
 - Use a screen or filter fabric over inlet, then wash surfaces.

Parking/Storage Area Maintenance SC-43

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

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

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

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.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a 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.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). <http://www.basmaa.org/>

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Storm Water Managers Resource Center <http://www.stormwatercenter.net/>



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
 - Immediate repair of any deterioration threatening structural integrity.
 - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
 - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

Targeted Constituents

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



- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Stream or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
 - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.
- 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 next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
 - Illegal dumping hot spots
 - Types and quantities (in some cases) of wastes
 - Patterns in time of occurrence (time of day/night, month, or year)
 - Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
 - Responsible parties
- Post “No Dumping” signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
 - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).
- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using “dry” methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements***Costs***

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:
 - Purchase and installation of signs.
 - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.
 - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.
 - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents “plug flow” discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

SC-44 Drainage System Maintenance

References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Clark County Storm Water Pollution Control Manual
<http://www.co.clark.wa.us/pubworks/bmpman.pdf>

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program <http://www.scvurppp.org>

The Storm Water Managers Resource Center <http://www.stormwatercenter.net>

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

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.



SD-10 Site Design & Landscape Planning

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

Site Design & Landscape Planning SD-10

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.

SD-10 Site Design & Landscape Planning

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.



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 $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

Other Resources

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

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

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



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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



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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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



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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

WORKSHEET “H”

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Tributary area size	0.25	1	0.25
		Level of pretreatment/ expected sediment loads	0.25	3	0.75
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{TOT} = S_A \times S_B$				2.00	
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)				1.54 in/hr	
Design Infiltration Rate, in/hr, $K_{DESIGN} = S_{TOT} / K_M$				0.77 in/hr	
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					
See Geotechnical Report attached as Appendix C to this report.					

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