Preliminary Water Quality Management Plan (P-WQMP)

For:

Cajon Boulevard
San Bernardino, CA 92407

APNs: 0262-041-09, -13, -18, -20

Prepared for:
Alere Property Group, LLC
100 Bayview Circle, Suite 310
Newport Beach, CA 92660
Phone: (949) 509-5000
Contact: Daniel Webb

Prepared by:
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14349 Firestone Boulevard
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Contact: Vicky Li (vicky@thieneseng.com)
Job No. 3560

Approval Date: _____
Implementation Date: _____

1st Submittal: October 30, 2017
2nd Submittal: _____
3rd Submittal: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for ***Alere Property Group, LLC*** by ***Thienes Engineering, Inc***. 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 the 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 fund) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		**Grading Permit Number(s):**	
Tract/Parcel Map Number(s):		**Building Permit Number(s):**	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):		APNs: 0262-041-09, -13, -18, -20	

Owner's Signature		
Owner Name: Daniel Webb		
Title	Vice President	
Company	Alere Property Group, LLC	
Address	100 Bayview Circle, Suite 310, Newport Beach, CA 92660	
Email	dwebb@alerellc.com	
Telephone #	(949) 509-5000	
Signature	**Date**	

Preparer's Certification

Project Data			
Permit/Application Number(s):		**Grading Permit Number(s):**	
Tract/Parcel Map Number(s):		**Building Permit Number(s):**	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):		APNs: 0262-041-09, -13, -18, -20	

"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: Reinhard Stenzel		**PE Stamp Below**
Title	Director of Engineering	
Company	Thienes Engineering, Inc	
Address	14349 Firestone Boulevard, La Mirada, CA 90638	
Email	reinhard@thieneseng.com	
Telephone #	(714) 521-4811	
Signature		

Contents

Section 1 Discretionary Permit(s) 1-1
Section 2 Project Description 2-1
2.1 Project Information 2-1
2.2 Property Ownership/Management 2-2
2.3 Potential Stormwater Pollutants 2-2
2.4 Water Quality Credits 2-3
Section 3 Site and Watershed Description 3-1
Section 4 Best Management Practices (BMP) 4-1
4.1 Source Control BMP 4-1
4.1.1 Pollution Prevention 4-1
4.1.2 Preventive LID Site Design Practices 4-6
4.2 Project Performance Criteria 4-7
4.3 Project Conformance Analysis 4-13
4.3.1 Site Design Hydrologic Source Control BMP 4-15
4.3.2 Infiltration BMPs 4-17
4.3.3 Harvest and Use BMP 4-19
4.3.4 Biotreatment BMP 4-20
4.3.5 Conformance Summary 4-24
4.3.6 Hydromodification Control BMP 4-25
4.4 Alternative Compliance Plan (if applicable) 4-26
Section 5 Inspection and Maintenance Responsibility for Post Construction BMP 5-1
Section 6 WQMP Attachments 6-1
6.1 Site Plan and Drainage Plan 6-1
6.2 Electronic Data Submittal 6-1
6.3 Post Construction 6-1
6.4 Other Supporting Documentation 6-1

Forms

Form 1-1 Project Information 1-1
Form 2.1-1 Description of Proposed Project 2-1
Form 2.2-1 Property Ownership/Management 2-2
Form 2.3-1 Pollutants of Concern 2-2
Form 2.4-1 Water Quality Credits 2-3
Form 3-1 Site Location and Hydrologic Features 3-1
Form 3-2 Existing Hydrologic Characteristics for Drainage Area (DA) 3-2
Form 3-3 Watershed Description 3-3
Form 4.1-1 Non-Structural Source Control BMPs 4-2
Form 4.1-2 Structural Source Control BMPs 4-4
Form 4.1-3 Preventive LID Site Design Practices Checklist 4-6
Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume 4-7
Form 4.2-2 Summary of HCOC Assessment 4-9
Form 4.2-3 HCOC Assessment for Runoff Volume 4-10
Form 4.2-4 HCOC Assessment for Time of Concentration 4-11
Form 4.2-5 HCOC Assessment for Peak Runoff 4-12
Form 4.3-1 Infiltration BMP Feasibility 4-14
Form 4.3-2 Site Design Hydrologic Source Control BMPs 4-16
Form 4.3-3 Infiltration LID BMP (including underground BMPs) 4-18
Form 4.3-4 Harvest and Use BMPs 4-19
Form 4.3-5 Selection and Evaluation of Biotreatment BMP 4-20
Form 4.3-6 Volume Based Biotreatment – Bioretention and Planter Boxes with Underdrains 4-21
Form 4.3-7 Volume Based Biotreatment – Constructed Wetlands and Extended Detention 4-22
Form 4.3-8 Flow Based Biotreatment 4-23
Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate 4-24
Form 4.3-10 Hydromodification Control BMPs 4-25
Form 5-1 BMP Inspection and Maintenance 5-1

Attachments

Attachment A: Existing Condition Site Photos
Attachment B: BMP Design Calculations & Supporting Documentation
Attachment C: WQMP Site Map
Attachment D: WQMP and Stormwater BMP Transfer, Access and Maintenance Agreement
Attachment E: Educational Materials
Attachment F: Infiltration Report
Attachment G: Hydrologic Conditions of Concern

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Cajon Boulevard				
Project Owner Contact Name:	Daniel Webb				
Mailing Address:	100 Bayview Circle, Suite 310 Newport Beach, CA 92660	**E-mail Address:**	dwebb@alerellc.com	**Telephone:**	(949) 509-5000
Permit/Application Number(s):			**Tract/Parcel Map Number(s):**		
Additional Information/ Comments:	n/a				
Description of Project:	The project site encompasses approximately 19.95 acres. Proposed improvements to the site include one warehouse type building with an area of approximately 321,800 square feet. Truck docks are located along the north side of the building. Vehicle parking is to the east and west sides of the building. An underground infiltration facility is located in the truck yard and the easterly side of the building. The remainder of the site will be reserved for landscape. DA 1 DMA A: Runoff from the westerly parking lot, north truck yard, and north half of the building will drain into a series of grate inlets located along the easterly property line. A storm drain will convey this to the underground infiltration facility (CMP #1). DA 1 DMA B: Runoff from the easterly vehicle parking will drain into catch basins; and the southern half of the building will directly connect to the proposed storm drain along the southerly property line. The two will converge at the southeasterly corner where low flows will be diverted towards a second underground infiltration facility (CMP #2). DA 2: Approximately 0.65 acres of self-treating areas (entirely landscaped) along the southerly property line will sheet flow offsite onto Cajon Boulevard.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	n/a				

Section 2 Project Description

2.1 Project Information

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

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

Form 2.1-1 Description of Proposed Project					
[1] Development Category (Select all that apply):					
☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532-7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more		
☐ 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	☐ 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.	☒ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ 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		
☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements.*					
[2] Project Area (ft^2):	869,022 (19.95 acres)*	**[3] Number of Dwelling Units:**	n/a	**[4] SIC Code:**	4225
[5] Is Project going to be phased? ☐Yes ☒No *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*					
[6] Does Project include roads? ☐Yes ☒No *If yes, ensure that applicable requirements for road projects are addressed (see Appendix A of TGD for WQMP)*					

*Includes approximately 0.65 acres of self-treating areas (entirely landscaped) along the southerly property line sheet flows offsite onto Cajon Boulevard.

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:
Alere Property Group, LLC 100 Bayview Circle, Suite 310 Newport Beach, CA 92660 Phone: (949) 509-5000 Contact: Daniel Webb No infrastructure will be transferred to a public agency after project completion. A property owner's association (POA) will not be formed for long-term maintenance of project stormwater facilities.

2.3 Potential Stormwater Pollutants

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

Form 2.3-1 Pollutants of Concern

Pollutant	**Please check: E = Expected, N = Not Expected**		**Additional Information and Comments**
Pathogens (Bacterial / Virus)	E ☒	N ☐	Receiving Water impairments shown in Form 3-3. Including petroleum hydrocarbons. Bacterial indicators are routinely detected in pavement runoff.
Nutrients - Phosphorous	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Nutrients - Nitrogen	E ☒	N ☐	Receiving Water impairments shown in Form 3-3. Expected pollutant if landscaping exists on-site.
Noxious Aquatic Plants	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Sediment	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Metals	E ☒	N ☐	Receiving Water impairments shown in Form 3-3.
Oil and Grease	E ☒	N ☐	Expected to be a concern in stormwater runoff.
Trash / Debris	E ☒	N ☐	Expected to be a concern in stormwater runoff.
Pesticides / Herbicides	E ☒	N ☐	Expected to be a concern in stormwater runoff.
Organic Compounds	E ☒	N ☐	Expected pollutant if landscaping exists on-site. Including petroleum hydrocarbons and solvents.
Other:			

2.4 Water Quality Credits

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

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

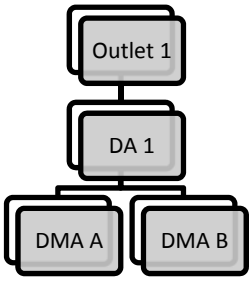
The proposed project will ***not*** utilize any water quality credits.

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. Complete form 3.2 for each DA on the project site.

Form 3-1 Site Location and Hydrologic Features

Site coordinates *Take GPS measurement at approximate center of site*	**Latitude:** 34.200433	**Longitude:** -117.37910	**Thomas Bros Map page:** Page 545
[1] **San Bernardino County climatic region:** ☒Valley ☐Mountain ☐Desert			
[2] **Does the site have more than one drainage area (DA):** ☐Yes ☒No *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached.*			



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA.
DA 1 DMA A flows to Outlet 1	Runoff from the westerly parking lot, north truck yard, and north half of the building will drain into a series of grate inlets located along the easterly property line. A storm drain will convey this to the underground infiltration facility (CMP #1).
DA 1 DMA B flows to Outlet 1	Runoff from the easterly vehicle parking will drain into catch basins; and the southern half of the building will directly connect to the proposed storm drain along the southerly property line. The two will converge at the southeasterly corner where low flows will be diverted towards a second underground infiltration facility (CMP #2).

Form 3-2 Existing Hydrologic Characteristics for Drainage Area (DA)

For each drainage area's sub-watershed DMA, provide the following characteristics	**Hydrology Nodes (100-101)**	**Hydrology Nodes (200-201)**	**n/a**	**n/a**
[1] **DMA drainage area (ft^2)**	359,370 (8.25 acres)	509,652 (11.7 acres)	n/a	n/a
[2] **Existing site impervious area (ft^2)**	0	0	n/a	n/a
[3] **Antecedent moisture condition** *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC II	AMC II	n/a	n/a
[4] **Hydrologic soil group** *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	HSG A	HSG A	n/a	n/a
[5] **Longest flowpath length (ft)**	875	1,000	n/a	n/a
[6] **Longest flowpath slope (ft/ft)**	0.021	0.022	n/a	n/a
[7] **Current land cover type(s)** *Select from Fig C-3 of Hydrology Manual*	Barren	Barren	n/a	n/a
[8] **Pre-developed pervious area condition:** *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* *See Attachment A for photos of site to support rating*	Poor	Poor	n/a	n/a

Form 3-3 Watershed Description	
Receiving Waters *Refer to Watershed Mapping Tool -* *http://sbcounty.permitrack.com/WAP* *See 'Drainage Facilities" link at this website*	Lytle Creek Channel Santa Ana River, Reach 5 Santa Ana River, Reach 4 Santa Ana River, Reach 3 Prado Dam Santa Ana River, Reach 2 Santa Ana River, Reach 1 Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	Lytle Creek Channel: None Santa Ana River, Reach 5: None Santa Ana River, Reach 4: None Santa Ana River, Reach 3: Pathogens, Nitrate Prado Dam: Pathogens Santa Ana River, Reach 2: None Santa Ana River, Reach 1: None Pacific Ocean: None
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP* *and State Water Resources Control Board website –* *http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Lytle Creek Channel: Pathogens Santa Ana River, Reach 5: None Santa Ana River, Reach 4: Pathogens Santa Ana River, Reach 3: Copper, Lead, Pathogens Prado Dam: None Santa Ana River, Reach 2: Indicator Bacteria Santa Ana River, Reach 1: None Pacific Ocean: None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	n/a
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Santa Ana River
Hydrologic Conditions of Concern	☒ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☐ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

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

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

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	X		Property owner will familiarize him/herself with the educational materials in Attachment "E" and the contents of the WQMP.
N2	Activity Restrictions	X		No outdoor work areas, processing, storage or wash area.
N3	Landscape Management BMPs	X		Irrigation must be consistent with the local agency's Water Conservation Ordinance. Fertilizer and pesticide usage will be consistent with local agency's Management Guidelines for Use of Fertilizers and Pesticides.
N4	BMP Maintenance	X		BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative.
N5	Title 22 CCR Compliance (How development will comply)		X	No hazardous wastes onsite.
N6	Local Water Quality Ordinances	X		Owner/tenant will be in compliance with Local Water Quality Ordinances.
N7	Spill Contingency Plan	X		Owner/tenant will have a spill contingency plan, a separate document, based on specific site needs.
N8	Underground Storage Tank Compliance		X	No USTs onsite.
N9	Hazardous Materials Disclosure Compliance		X	No hazardous materials onsite.
N10	Uniform Fire Code Implementation	X		Owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency.
N11	Litter/Debris Control Program	X		Contract with their landscape maintenance firm to provide this service during regularly schedule maintenance.
N12	Employee Training	X		The owner will ensure that tenants are also familiar with onsite BMPs and necessary maintenance required of the tenants. 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	X		Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No direct discharges into the storm drain system. Area shall be inspected weekly for proper containment and practices with spills cleaned up immediately and disposed of properly.
N14	Catch Basin Inspection Program	X		Monthly inspection by property owner's designee. Vacuum basins when sediment or trash becomes 2-inches deep and dispose of properly.
N15	Vacuum Sweeping of Private Streets and Parking Lots	X		All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be swept monthly by sweeping contractor.

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	
N16	Other Non-structural Measures for Public Agency Projects		X	Not a public agency project.
N17	Comply with all other applicable NDPES permits	X		Will comply with Construction General Permit and Industrial General Permit (may apply for No Exposure Certification/NEC).

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	X		"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)		X	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)	X		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)	X		Irrigation systems shall include 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	X		Landscaped areas will be depressed in order 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)		X	No onsite slopes or channels to protect.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)		X	Finished goods being loaded and unloaded at the docks do not have the potential to contribute to stormwater pollution. No direct connections will be made to a MS4.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)		X	No maintenance bays onsite.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)		X	No vehicle wash areas onsite.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)		X	No outdoor processing areas onsite.

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)		X	No equipment wash areas onsite.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)		X	No fueling areas onsite.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)		X	No hillsides onsite.
S14	Wash water control for food preparation areas		X	No food preparation onsite.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)		X	No community cars wash racks onsite.

4.1.2 Preventive 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 Preventive LID Site Design Practices Checklist	
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets.*	
Minimize impervious areas: ☐Yes ☒No	The project will utilize infiltration facilities to collect runoff from impervious areas.
Maximize natural infiltration capacity: ☒Yes ☐No	The infiltration facilities will maximize natural infiltration.
Preserve existing drainage patterns and time of concentration: ☒Yes ☐No	Post-development drainage patterns will mimic pre-development conditions. Stormwater will be retained in infiltration facilities to assist in maintaining the time of concentration compared to existing condition.
Disconnect impervious areas: ☒Yes ☐No	The infiltration facilities will disconnect impervious areas before discharging offsite.
Protect existing vegetation and sensitive areas: ☐Yes ☒No	Not applicable, there are no existing vegetation onsite (see Attachment A for recent site photos).
Re-vegetate disturbed areas: ☐Yes ☒No	Not applicable, development consists of a light industrial facility. Most of the disturbed areas will be paved; however, all disturbed areas will be collected by the infiltration facilities for treatment.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: ☒Yes ☐No	Heavy construction vehicles will be prohibited from unnecessary soil compaction at infiltration facility locations.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: ☐Yes ☒No	Underground piping and imperviously lined swales are located in traffic areas and could not be substituted with a vegetated swale.
Stake off areas that will be used for landscaping to minimize compaction during construction : ☒Yes ☐No	Landscaped areas will be staked to minimize unnecessary compaction during construction.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the 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		
[1] **Project area (ft^2):** 644,688 DA 1 DMA A (14.80 ac)*	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in):** 0.826 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
[5] **Compute P6, Mean 6-hr Precipitation (inches):** 1.223 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1* *(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft^3):** 104,087 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
[1] **Project area (ft^2):** 196,020 DA 1 DMA B (4.50 ac)*	[2] **Imperviousness after applying preventative site design practices (Imp%):** 95%	[3] **Runoff Coefficient (R_c):** 0.807 $R_C = 0.858(Imp\%)^3 - 0.78(Imp\%)^2 + 0.774(Imp\%) + 0.04$
[4] **Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in):** 0.826 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		

[5] **Compute P6, Mean 6-hr Precipitation (inches):** 1.223 *P6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1* *(Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*	
[6] **Drawdown Rate** *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒
[7] **Compute design capture volume, DCV (ft^3):** 31,648 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*	

*Does not include approximately 0.65 acres of self-treating areas (entirely landscaped) along the southerly property line that sheet flows offsite onto Cajon Boulevard.

Form 4.2-2 Summary of HCOC Assessment

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

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

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

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

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	[1] 152,249 *Form 4.2-3 Item 12*	[2] TBD *Form 4.2-4 Item 13*	[3] TBD *Form 4.2-5 Item 10*
Post-developed	[4] 260,617 *Form 4.2-3 Item 13*	[5] TBD *Form 4.2-4 Item 14*	[6] TBD *Form 4.2-5 Item 14*
Difference	[7] 108,368 *Item 4 – Item 1*	[8] TBD *Item 5 – Item 2*	[9] TBD *Item 6 – Item 3*
Difference (as % of pre-developed)	[10] 71% *Item 7 / Item 1*	[11] TBD *Item 8 / Item 2*	[12] TBD *Item 9 / Item 3*

To meet HCOC requirements, a mitigation volume must be achieved by using LID and/or hydromodification mitigation BMPs. The mitigation volume is approximately 95,337 cu-ft (0.95 * 260,617 – 152,249). The total volume being retained by the underground systems is 136,640 cu-ft which is greater than the mitigation volume needed. As a result, the mitigation volume has been contained by the proposed BMPs. Since the mitigation volume has been met, it is physically impossible for the project to avoid increasing the time of concentration and reducing peak runoff by more than five percent of pre-development conditions (see Section 5.6.1 of the Technical Guidance Document for more information).

Form 4.2-3 HCOC Assessment for Runoff Volume

Compute weighted curve number for pre and post developed conditions	Pre-developed DA *Add more columns if more than 4 DMA*				Post-developed DA *Add more columns if more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
[1] **Land Cover type**								
[2] **Hydrologic Soil Group (HSG)**								
[3] **DMA Area, ft^2** *sum of areas of DMA should equal area of DA*								
[4] **Curve Number (CN)** *Use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
	[5] **Pre-Developed area-weighted CN:**				[6] **Post-Developed area-weighted CN:**			
	[7] **Pre-developed soil storage capacity, S (in):** *S = (1000 / Item 5) - 10*				[8] **Post-developed soil storage capacity, S (in):** *S = (1000 / Item 6) - 10*			
	[9] **Initial abstraction, I_a (in):** *I_a = 0.2 * Item 7*				[10] **Initial abstraction, I_a (in):** *I_a = 0.2 * Item 8*			
[11] **Precipitation for 2 yr, 24 hr storm (in):** *Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*								
[12] **Pre-developed Volume (ft^3):** *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*								
[13] **Post-developed Volume (ft^3):** *V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*								
[14] **Volume Reduction needed to meet HCOC Requirement, (ft^3):** *V_{HCOC} = (Item 13 * 0.95) – Item 12*								

Form 4.2-4 HCOC Assessment for Time of Concentration

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 DA *Add more columns if more than 4 DMA*				Post-developed DA *Add more columns if more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
[1] **Length of flowpath (ft)** *Use Form 3-2 Item 5 for pre-developed condition*								
[2] **Change in elevation (ft)**								
[3] **Slope (ft/ft), So = Item 2 / Item 1**								
[4] **Land cover**								
[5] **Initial DMA Time of Concentration (min)** *Appendix C-1 of the TGD for WQMP*								
[6] **Length of conveyance from DMA outlet to project site outlet (ft)** *May be zero if DMA outlet is at project site outlet*								
[7] **Cross-sectional area of channel (ft2)**								
[8] **Wetted perimeter of channel (ft)**								
[9] **Manning's roughness of channel (n)**								
[10] **Channel flow velocity (ft/sec)** V_{fps} = (1.49 /Item 9) * (Item 7/Item 8)$^{0.67}$ * (Item 3)$^{0.5}$								
[11] **Travel time to outlet (min)** T_t = Item 6 / (Item 10 * 60)								
[12] **Total time of concentration (min)** T_c = Item 5 + Item 11								
[13] **Pre-developed time of concentration (min):** *Minimum of Item 12 pre-developed DMA*								
[14] **Post-developed time of concentration (min):** *Minimum of Item 12 post-developed DMA*								
[15] **Additional time of concentration needed to meet HCOC requirement (min):** $T_{C\text{-}HCOC}$ = (Item 14 * 0.95) – Item 13								

Form 4.2-5 HCOC Assessment for Peak Runoff

Compute peak runoff for pre and post developed conditions

Variables		Pre-developed DA *Add more columns if more than 3 DMA*			Post-developed DA *Add more columns if more than 3 DMA*		
		DMA A	**DMA B**	**DMA C**	**DMA A**	**DMA B**	**DMA C**
[1] Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
[2] Drainage Area of each DMA (ft2) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
[3] Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
[4] Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
[5] Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted Fm from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
[6] Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
[7] Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	**DMA A**	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

[8] Pre-developed Q_p at T_c for DMA A:	**[9] Pre-developed Q_p at T_c for DMA B:**	**[10] Pre-developed Q_p at T_c for DMA C:**
*Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} – Item 5_{DMAB}) / (Item 1_{DMAB} - Item 5_{DMAB}) * Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC}) / (Item 1_{DMAC} - Item 5_{DMAC}) * Item $7_{DMAA/3}$]*	*Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} – Item 5_{DMAA}) / (Item 1_{DMAA} - Item 5_{DMAA}) * Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC}) / (Item 1_{DMAC} - Item 5_{DMAC}) * Item $7_{DMAB/3}$]*	*Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} – Item 5_{DMAA}) / (Item 1_{DMAA} - Item 5_{DMAA}) * Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB}) / (Item 1_{DMAB} - Item 5_{DMAB}) * Item $7_{DMAC/2}$]*

11 Peak runoff from pre-developed condition confluence analysis (cfs):
Maximum of Item 8, 9, and 10

12 Post-developed Q_p at T_c for DMA A:	***13 Post-developed Q_p at T_c for DMA B:***	***14 Post-developed Q_p at T_c for DMA C:***
Same as Item 8 for post-developed values	*Same as Item 9 for post-developed values*	*Same as Item 10 for post-developed values*

15 Peak runoff from post-developed condition confluence analysis (cfs):
Maximum of Item 12, 13, and 14

16 Peak runoff reduction needed to meet HCOC Requirement (cfs):
*$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 11*

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

[1] Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP): ☐Yes ☒No *If yes, complete Items 2-5; If no, proceed to Item 6*			
Variables *Aggregate impervious area dispersion with equal ratios of pervious to impervious;*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[2] Total impervious area draining to pervious area			
[3] Ratio of pervious area receiving runoff to impervious area			
[4] Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
[5] Sum of retention volume achieved from impervious area dispersion (ft^3): 0 *$V_{retention}$ = Sum of Item 4 for all BMPs*			
[6] Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): ☐Yes ☒No *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[7] Ponding surface area (ft^2)			
[8] Ponding depth (ft)			
[9] Surface area of amended soil/gravel (ft^2)			
[10] Average depth of amended soil/gravel (ft)			
[11] Average porosity of amended soil/gravel			
[12] Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
[13] Runoff volume retention from on-lot infiltration (ft^3): 0 *$V_{retention}$ = Sum of Item 12 for all BMPs*			
[14] Implementation of evapotranspiration BMP (green, brown, or blue roofs): ☐Yes ☒No *If yes, complete Items 15-20. If no, proceed to Item 21*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[15] Rooftop area planned for ET BMP (ft^2)			
[16] Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
[17] Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
[18] Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
[19] Retention Volume (ft^3) *$V_{retention}$ = Item 17 * (Item 18 / 24)*			
[20] Runoff volume retention from evapotranspiration BMPs (ft^3): 0 *V = Sum of Item 19 for all BMPs*			
[21] Implementation of Street Trees: ☐Yes ☒No *If yes, complete Items 20-2. If no, proceed to Item 26*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[22] Number of Street Trees			
[23] Average canopy cover over impervious area (ft^2)			
[24] Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
[25] Runoff volume retention from street tree BMPs (ft^3): 0 *$V_{retention}$ = Sum of Item 24 for all BMPs*			
[26] Implementation of residential rain barrels/cisterns: ☐Yes ☒No *If yes, complete Items 27-28; If no, proceed to Item 30*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[27] Number of rain barrels/cisterns			
[28] Runoff volume retention from rain barrels/cisterns (ft^3) *$V_{retention}$ = Item 27 * 3*			
[29] Runoff volume retention from residential rain barrels/Cisterns (ft^3): 0 *$V_{retention}$ =Sum of Item 28 for all BMPs*			
[30] Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

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

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

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

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

[1] **Remaining LID DCV not met by site design HSC BMP (ft^3):** 135,735 *V = Form 4.2-1 Item 7 - 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)*	**DMA A Underground CMP #1**	**DMA B Underground CMP #1**	**n/a**	**n/a**
[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*	87.0	87.0	n/a	n/a
[3] **Infiltration safety factor** *See TGD Section 5.4.2 and Appendix D*	2.25	2.25	n/a	n/a
[4] **Design percolation rate (in/hr)** *P_{design} = Item 2 / Item 3*	38.6	38.6	n/a	n/a
[5] **Ponded water drawdown time (hr)** *Copy Item 6 in Form 4.2-1*	48	48	n/a	n/a
[6] **Maximum ponding depth (ft)** *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	8.4 (100.8 inches)	8.4 (100.8 inches)	n/a	n/a
[7] **Ponding Depth (ft)** *d_{BMP} = Minimum of (1/12 * Item 4 * Item 5) or Item 6*	8.4 (100.8 inches)	8.4 (100.8 inches)	n/a	n/a
[8] **Infiltrating surface area, SA (ft^2)** *The lesser of the area needed for BMP infiltration of full DCV or minimum space requirements from Table 5-7 of the TGD for WQMP*	16,380	4,988	n/a	n/a
[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	n/a	n/a	n/a
[10] **Amended soil porosity**	n/a	n/a	n/a	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*	0.5	0.5	n/a	n/a
[12] **Gravel porosity**	0.40	0.40	n/a	n/a
[13] **Duration of storm as basin is filling (hrs)** *Typical ~ 3hrs*	3	3	n/a	n/a
[14] **Above Ground Retention Volume (ft^3)** *$V_{retention}$ = Item 8 * [Item7 + (Item 9 retention * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a	n/a
[15] **Underground Retention Volume (ft^3)** *Volume determined using manufacturer's specifications and calculations*	104,659	31,981	n/a	n/a
[16] **Total Retention Volume from LID Infiltration BMPs (ft^3):** 136,640 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*				
[17] **Fraction of DCV achieved with infiltration BMP:** 100% *Retention% = Item 16 / Form 4.2-1 Item 7*				
[18] **Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs?** ☒Yes ☐No *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*				

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			
[1] **Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3):** V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP)*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[2] **Describe cistern or runoff detention facility**			
[3] **Storage volume for proposed detention type (ft^3)** *Volume of cistern*			
[4] **Landscaped area planned for use of harvested stormwater (ft^2)**			
[5] **Average wet season daily irrigation demand (in/day)** *Use local values, typical ~ 0.1 in/day*			
[6] **Daily water demand (ft^3/day)** *Item 4 * (Item 5 / 12)*			
[7] **Drawdown time (hrs)** *Copy Item 6 from Form 4.2-1*			
[8] **Retention Volume (ft^3)** *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			
[9] **Total Retention Volume (ft^3) from Harvest and Use BMP:** *Sum of Item 8 for all harvest and use BMP included in plan*			
[10] **Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs?** ☐Yes ☐No *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

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

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. 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		
[1] **Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3):** 2,960 *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:** Pathogens, Nitrogen, and Metals *Copy from Form 2.3-1*	
[2] **Biotreatment BMP Selected** *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	**Volume-based biotreatment** *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	**Flow-based biotreatment** *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☒ Proprietary biotreatment
[3] **Volume biotreated in volume based biotreatment BMP (ft^3):** n/a *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):** 2,960 *Item 1 – Item 3*	[5] **Remaining fraction of LID DCV for sizing flow based biotreatment BMP:** 100% *Item 4 / Item 1*
[6] **Flow-based biotreatment BMP capacity provided (cfs):** 0.10 cfs (DMA D) + 0.08 cfs (DMA E) = 0.18 cfs *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
[7] **Metrics for MEP determination:** ☐ **Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development:** *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment – Bioretention and Planter Boxes with Underdrains			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP)*	**BMP Type and DA**	**BMP Type and DA**	**BMP Type and DA**
[1] **Pollutants addressed with BMP** *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
[2] **Amended soil infiltration rate** *Typical ~ 5.0 in/hr*			
[3] **Amended soil infiltration safety factor** *Typical ~ 2.0*			
[4] **Amended soil design percolation rate (in/hr)** P_{design} *= Item 2 / Item 3*			
[5] **Ponded water drawdown time (hr)** *Copy Item 6 from Form 4.2-1*			
[6] **Maximum ponding depth (ft)** *See Table 5-6 of the TGD for WQMP for reference to BMP design details*			
[7] **Ponding Depth (ft)** d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
[8] **Amended soil surface area (ft^2)**			
[9] **Amended soil depth (ft)** *See Table 5-6 of the TGD for WQMP for reference to BMP design details*			
[10] **Amended soil porosity, *n***			
[11] **Gravel depth (ft)** *See Table 5-6 of the TGD for WQMP for reference to BMP design details*			
[12] **Gravel porosity, *n***			
[13] **Duration of storm as basin is filling (hrs)** *Typical ~ 3hrs*			
[14] **Biotreated Volume (ft^3)** $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
[15] **Total biotreated volume from bioretention and/or planter box with underdrains BMP:** *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	**BMP Type and DA**		**BMP Type and DA**		**BMP Type and DA**	
	Forebay	**Basin**	**Forebay**	**Basin**	**Forebay**	**Basin**
[1] **Pollutants addressed with BMP forebay and basin** *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*						
[2] **Bottom width (ft)**						
[3] **Bottom length (ft)**						
[4] **Bottom area (ft^2)** A_{bottom} = *Item 2 * Item 3*						
[5] **Side slope (ft/ft)**						
[6] **Depth of storage (ft)**						
[7] **Water surface area (ft2)** $A_{surface}$ = *(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*						
[8] **Storage volume (ft3)** *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details V =Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)$^{0.5}$]*						
[9] **Drawdown Time (hrs)** *Copy Item 6 from Form 2.1*						
[10] **Outflow rate (cfs)** Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*						
[11] **Duration of design storm event (hrs)**						
[12] **Biotreated Volume (ft^3)** $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*						
[13] **Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention:** *(Sum of Item 12 for all BMP included in plan)*						

Form 4.3-8 Flow Based Biotreatment		
Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	**BMP Type and DA**	**BMP Type and DA**
[1] **Pollutants addressed with BMP** *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*	n/a	n/a
[2] **Flow depth for water quality treatment (ft)** *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a
[3] **Bed slope (ft/ft)** *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a
[4] **Manning's roughness coefficient**	n/a	n/a
[5] **Bottom width (ft)** *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item $2^{1.67}$ * Item $3^{0.5}$)*	n/a	n/a
[6] **Side Slope (ft/ft)** *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a
[7] **Cross sectional area (ft^2)** *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*	n/a	n/a
[8] **Water quality flow velocity (ft/sec)** *V = Form 4.3-5 Item 6 / Item 7*	n/a	n/a
[9] **Hydraulic residence time (min)** *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a
[10] **Length of flow based BMP (ft)** *L = Item 8 * Item 9 * 60*	n/a	n/a
[11] **Water surface area at water quality flow depth (ft2)** *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*	n/a	n/a

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
[1] **Total LID DCV for the Project (ft^3):** 135,735 *Copy Item 7 in Form 4.2-1*
[2] **On-site retention with site design hydrologic source control LID BMP (ft^3):** 0 *Copy Item 30 in Form 4.3-2*
[3] **On-site retention with LID infiltration BMP (ft^3):** 136,640 *Copy Item 16 in Form 4.3-3*
[4] **On-site retention with LID harvest and use BMP (ft^3):** 0 *Copy Item 9 in Form 4.3-4*
[5] **On-site biotreatment with volume based biotreatment BMP (ft^3):** 0 *Copy Item 3 in Form 4.3-5*
[6] **Flow capacity provided by flow based biotreatment BMP (cfs):** 0 *Copy Item 6 in Form 4.3-5*
[7] **LID BMP performance criteria are achieved if answer to any of the following is "Yes":** • **Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP:** ☒Yes ☐No *If yes, sum of Items 2, 3, and 4 is greater than Item 1* • **Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV:** ☐Yes ☒No *If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized* • **On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV:** ☐Yes ☒No *If yes, Form 4.3-1 Items 7 and 8 were both checked yes*
[8] **If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:** ☐ **Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture.** *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance,* V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%* ☐ **An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility.** *Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed*

4.3.6 Hydromodification Control BMP

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

Form 4.3-10 Hydromodification Control BMPs	
[1] **Volume reduction needed for HCOC performance criteria (ft^3): 95,337** *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	[2] **On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): 136,640** *Sum of Form 4.3-9 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
[3] **Remaining volume for HCOC volume capture (ft^3): 0** *Item 1 – Item 2*	[4] **Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): 0** *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*
[5] **If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification** ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*	
[6] **Is Form 4.2-2 Item 11 less than or equal to 5%:** ☐Yes ☒No *If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:* ☒ **Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP.** *BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)* ☐ **Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities.** ☐ **Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California.**	
[7] **Form 4.2-2 Item 12 less than or equal to 5%:** ☐Yes ☒No *If yes, HCOC performance criteria are achieved. If no, select one or more mitigation options below:* ☒ **Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs.** *BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)* ☐ **Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California.**	

To meet HCOC requirements, a mitigation volume must be achieved by using LID and/or hydromodification mitigation BMPs. The mitigation volume is approximately 95,337 cu-ft (0.95 * 260,617 – 152,249). The total volume being retained by the underground systems is 136,640 cu-ft which is greater than the mitigation volume needed. As a result, the mitigation volume has been contained by the proposed BMPs. Since the mitigation volume has been met, it is physically impossible for the project to avoid <u>increasing</u> the time of concentration and <u>reducing</u> peak runoff by more than five percent of pre-development conditions (see Section 5.6.1 of the Technical Guidance Document for more information).

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

BMP	Responsible Party(ies)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
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 boom and replace as necessary.	Annually
Underground Retention Facility	Owner	The manholes shall be inspected semi-annually (October 1st and February 1st) and maintained upon sediment reaching 3-inches in depth. The rows shall be inspected and maintained by a qualified technician and he/she will properly dispose of all wastes. Manholes are installed in order to inspect and maintain the system. 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.

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

See Attachment C for WQMP Site Map.

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 (consult the LIP), 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 (Attachment D).

6.4 Other Supporting Documentation

- Existing Site Photos (Attachment A)
- BMP Design Calculations & Supporting Documentation (Attachment B)
- Maintenance Agreement (Attachment D)
- BMP Educational Materials (Attachment E)
- Infiltration Report (Attachment F)
- Hydrologic Conditions of Concern (Attachment G)

Attachment A
Existing Condition Site Photos

Attachment B
BMP Design Calculations & Supporting Documentation

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

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Probable Maximum Precipitation
Documents

Miscellaneous
Publications
Storm Analysis
Record Precipitation

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Inquiries
List-server

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

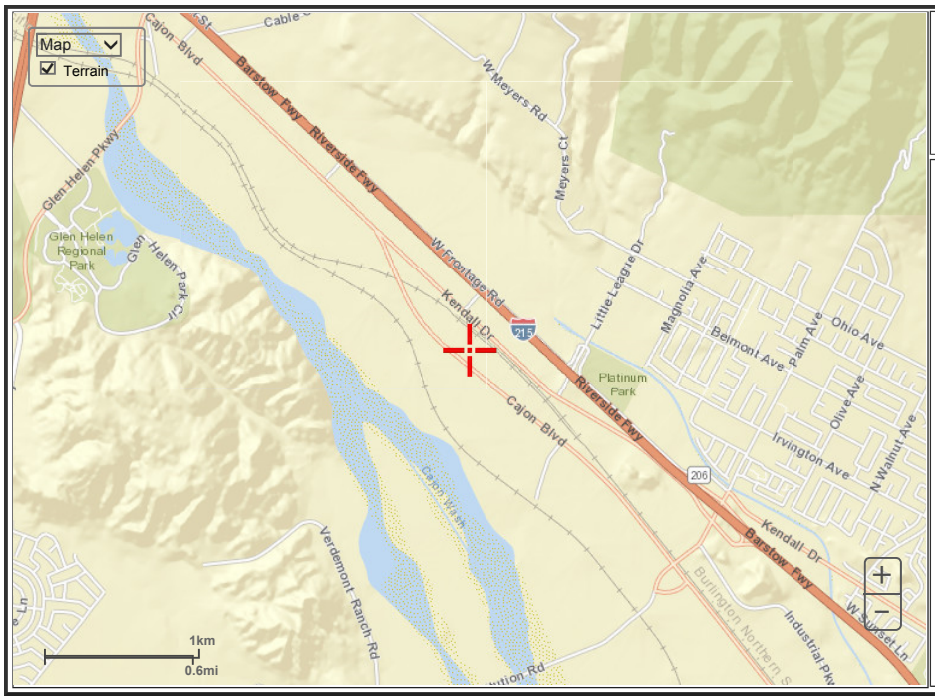
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 34.200433 Longitude: -117.37910 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: San Bernardino, California, USA*
Latitude: 34.2004°
Longitude: -117.3791°
Elevation: 1824.45 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years) 1	2	5	10	25	50	100	200	500	1000
5-min	**0.153** (0.127–0.186)	**0.211** (0.175–0.256)	**0.285** (0.236–0.348)	**0.346** (0.284–0.425)	**0.427** (0.339–0.544)	**0.490** (0.380–0.637)	**0.554** (0.420–0.739)	**0.620** (0.456–0.851)	**0.711** (0.502–1.02)	**0.782** (0.533–1.16)
10-min	**0.219** (0.182–0.266)	**0.302** (0.251–0.367)	**0.409** (0.338–0.499)	**0.495** (0.407–0.610)	**0.612** (0.486–0.780)	**0.702** (0.545–0.914)	**0.794** (0.601–1.06)	**0.889** (0.654–1.22)	**1.02** (0.719–1.46)	**1.12** (0.764–1.66)
15-min	**0.265** (0.220–0.322)	**0.365** (0.303–0.444)	**0.495** (0.409–0.604)	**0.599** (0.492–0.737)	**0.741** (0.587–0.943)	**0.849** (0.659–1.11)	**0.960** (0.727–1.28)	**1.08** (0.791–1.48)	**1.23** (0.869–1.77)	**1.36** (0.924–2.01)
30-min	**0.395** (0.329–0.481)	**0.545** (0.452–0.663)	**0.738** (0.611–0.901)	**0.894** (0.734–1.10)	**1.11** (0.877–1.41)	**1.27** (0.984–1.65)	**1.43** (1.09–1.91)	**1.61** (1.18–2.20)	**1.84** (1.30–2.64)	**2.02** (1.38–3.00)
60-min	**0.600** (0.498–0.729)	**0.826** (0.686–1.01)	**1.12** (0.927–1.37)	**1.36** (1.11–1.67)	**1.68** (1.33–2.13)	**1.92** (1.49–2.50)	**2.17** (1.65–2.90)	**2.43** (1.79–3.34)	**2.79** (1.97–4.00)	**3.07** (2.09–4.55)
2-hr	**0.913** (0.758–1.11)	**1.21** (1.00–1.47)	**1.59** (1.31–1.94)	**1.90** (1.56–2.33)	**2.31** (1.83–2.94)	**2.63** (2.04–3.42)	**2.96** (2.24–3.94)	**3.29** (2.42–4.52)	**3.75** (2.64–5.37)	**4.10** (2.80–6.09)
3-hr	**1.16** (0.967–1.41)	**1.52** (1.26–1.84)	**1.97** (1.63–2.40)	**2.34** (1.92–2.88)	**2.83** (2.25–3.61)	**3.21** (2.49–4.18)	**3.60** (2.72–4.80)	**3.99** (2.94–5.48)	**4.53** (3.20–6.49)	**4.95** (3.37–7.35)
6-hr	**1.73** (1.44–2.10)	**2.22** (1.84–2.70)	**2.85** (2.36–3.48)	**3.36** (2.76–4.14)	**4.05** (3.21–5.16)	**4.57** (3.55–5.95)	**5.10** (3.86–6.80)	**5.64** (4.15–7.74)	**6.37** (4.49–9.12)	**6.93** (4.72–10.3)
12-hr	**2.33**	**3.01**	**3.89**	**4.58**	**5.51**	**6.21**	**6.91**	**7.63**	**8.57**	**9.30**

	(1.94–2.84)	(2.50–3.67)	(3.22–4.74)	(3.76–5.64)	(4.37–7.02)	(4.82–8.08)	(5.24–9.22)	(5.61–10.5)	(6.05–12.3)	(6.33–13.8)
24-hr	**3.17** (2.81–3.65)	**4.17** (3.69–4.81)	**5.44** (4.80–6.29)	**6.46** (5.65–7.53)	**7.80** (6.61–9.40)	**8.82** (7.31–10.8)	**9.82** (7.96–12.4)	**10.8** (8.54–14.0)	**12.2** (9.23–16.5)	**13.2** (9.67–18.5)
2-day	**3.90** (3.45–4.49)	**5.24** (4.64–6.04)	**6.98** (6.16–8.07)	**8.38** (7.33–9.77)	**10.3** (8.70–12.4)	**11.7** (9.72–14.4)	**13.2** (10.7–16.6)	**14.7** (11.6–19.0)	**16.7** (12.6–22.5)	**18.3** (13.4–25.5)
3-day	**4.17** (3.70–4.81)	**5.70** (5.04–6.58)	**7.71** (6.81–8.92)	**9.36** (8.20–10.9)	**11.6** (9.84–14.0)	**13.4** (11.1–16.5)	**15.2** (12.3–19.1)	**17.0** (13.4–22.1)	**19.6** (14.8–26.5)	**21.7** (15.8–30.2)
4-day	**4.45** (3.94–5.12)	**6.15** (5.44–7.10)	**8.41** (7.42–9.72)	**10.3** (8.99–12.0)	**12.8** (10.9–15.5)	**14.9** (12.3–18.3)	**16.9** (13.7–21.3)	**19.1** (15.1–24.8)	**22.2** (16.8–29.9)	**24.6** (18.0–34.3)
7-day	**5.02** (4.45–5.78)	**7.07** (6.25–8.15)	**9.80** (8.64–11.3)	**12.1** (10.6–14.1)	**15.2** (12.9–18.3)	**17.7** (14.7–21.8)	**20.3** (16.4–25.5)	**23.0** (18.1–29.8)	**26.8** (20.2–36.1)	**29.8** (21.8–41.6)
10-day	**5.41** (4.79–6.23)	**7.69** (6.80–8.87)	**10.8** (9.49–12.4)	**13.3** (11.6–15.5)	**16.9** (14.3–20.3)	**19.7** (16.3–24.2)	**22.6** (18.3–28.5)	**25.7** (20.3–33.3)	**30.1** (22.8–40.6)	**33.6** (24.5–46.8)
20-day	**6.52** (5.78–7.51)	**9.40** (8.32–10.8)	**13.3** (11.7–15.4)	**16.6** (14.5–19.4)	**21.3** (18.0–25.7)	**25.0** (20.8–30.8)	**29.0** (23.5–36.5)	**33.2** (26.2–43.0)	**39.1** (29.6–52.8)	**43.9** (32.1–61.3)
30-day	**7.65** (6.78–8.81)	**11.0** (9.75–12.7)	**15.6** (13.8–18.1)	**19.6** (17.1–22.8)	**25.2** (21.4–30.4)	**29.8** (24.7–36.6)	**34.6** (28.0–43.6)	**39.8** (31.3–51.5)	**47.2** (35.7–63.6)	**53.2** (38.9–74.2)
45-day	**9.24** (8.18–10.6)	**13.2** (11.6–15.2)	**18.6** (16.4–21.5)	**23.3** (20.4–27.2)	**30.1** (25.5–36.2)	**35.6** (29.5–43.7)	**41.5** (33.6–52.2)	**47.9** (37.7–62.0)	**57.1** (43.2–77.0)	**64.7** (47.3–90.2)
60-day	**10.8** (9.61–12.5)	**15.2** (13.5–17.6)	**21.3** (18.8–24.7)	**26.7** (23.3–31.1)	**34.4** (29.1–41.4)	**40.7** (33.8–50.1)	**47.5** (38.5–59.9)	**55.0** (43.3–71.2)	**65.8** (49.7–88.7)	**74.8** (54.7–104)

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

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

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

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Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
(Entire Site)

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		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, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/expected sediment loads	0.25	2	0.50
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.25

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.25
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	87
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	38.6

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

A site specific infiltration test was conducted at the project site to support a measured rate of 87 in/hr. The design rate is 38.6 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

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

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(imp)^3 – 0.78(imp)^2 + 0.774(imp) + 0.04$
P6 = (0.826)(1.4807) = 1.223 inches
P0 = (1.963)(C_{BMP})(1.223)
DCV = (P0 * Area) / 12

DMA A – UNDERGROUND INFILTRATION CMP

Region		Valley	
Drainage Area (acres)		14.80	acres
Drainage Area (sq-ft)		**644,688**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.826	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**1.223**	
Drawdown Rate (a)		1.963	
DCV		**104,087**	cu-ft
DCV		**2.390**	acre-ft

Design infiltration rate = 38.6 in/hr
d_{max} = 1,852.8 inches = Design infiltration rate x 48 hours = 38.6 in/hr x 48 hrs
d_{BMP} = 100.8 inches = [(6 inches + 6 inches) x 0.40] + 96 inches
$d_{max} > d_{BMP}$

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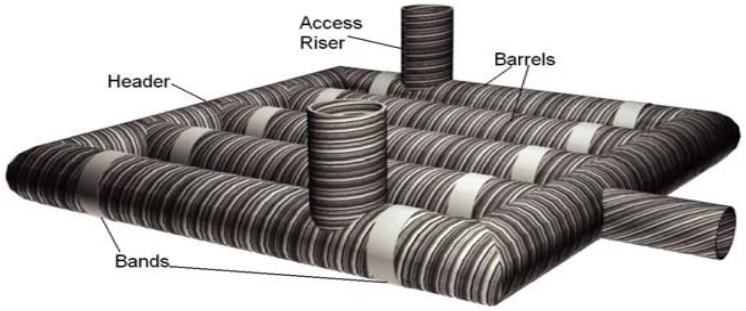
CONTECH® CMP DETENTION SYSTEMS

CONTECH® CONSTRUCTION PRODUCTS INC.

For design assistance, drawings, and pricing send completed worksheet to:
dyods@contech-cpi.com

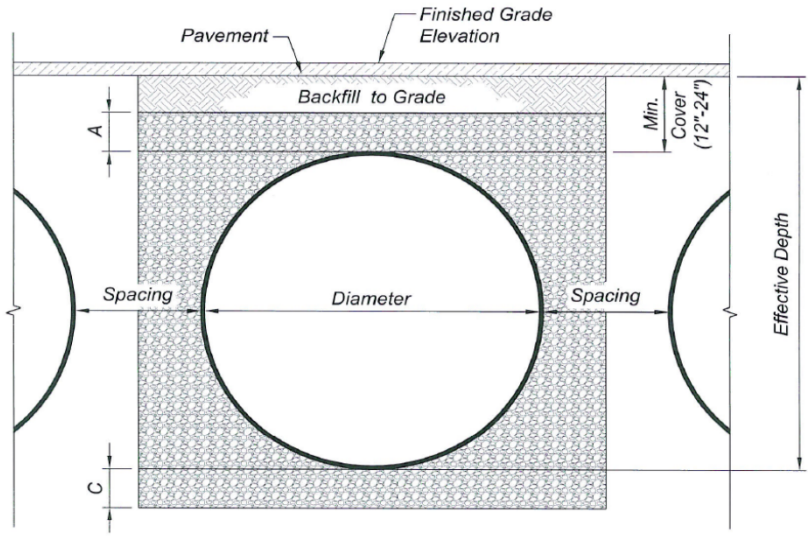


Project Summary

Date:	10/30/2017	
Project Name:	Cajon Blvd. (DMA A)	
City / County:	San Bernardino	
State:	California	
Designed By:	Luis Prado	
Company:	Thienes Engineering, Inc.	**Enter Information in Blue Cells**
Telephone:	(714) 521-4811	

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	104,087	
Limiting Width (ft):	75.00	
Invert Depth Below Asphalt (ft):	9.00	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft^2 Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	1	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	



System Sizing

Pipe Storage:	76,152	cf	
Porous Stone Storage:	28,507	cf	
Total Storage Provided:	104,659	cf	100.5% Of Required Storage
Number of Barrels:	6	barrels	
Length per Barrel:	242.0	ft	
Length Per Header:	63.0	ft	
Rectangular Footprint (W x L):	65. ft x 252. ft		

CONTECH Materials

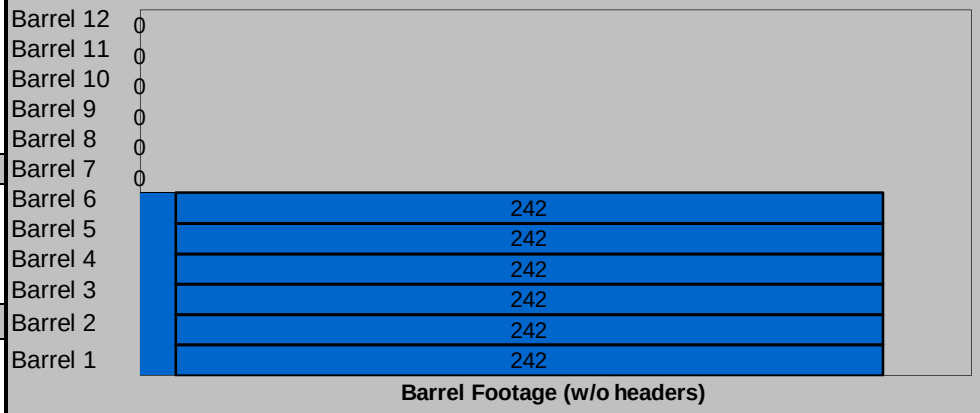
Total CMP Footage:	1,515	ft
Approximate Total Pieces:	69	pcs
Approximate Coupling Bands:	68	bands
Approximate Truckloads:	35	trucks

Construction Quantities**

Total Excavation:	5460	cy
Porous Stone Backfill For Storage:	2640	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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DMA B – UNDERGROUND INFILTRATION CMP

Region		Valley	
Drainage Area (acres)		4.50	acres
Drainage Area (sq-ft)		**196,020**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.826	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**1.223**	
Drawdown Rate (a)		1.963	
DCV		**31,648**	cu-ft
DCV		**0.727**	acre-ft

Design infiltration rate = 38.6 in/hr

d_{max} = 1,852.8 inches = Design infiltration rate x 48 hours = 38.6 in/hr x 48 hrs

d_{BMP} = 100.8 inches = [(6 inches + 6 inches) x 0.40] + 96 inches

$d_{max} > d_{BMP}$

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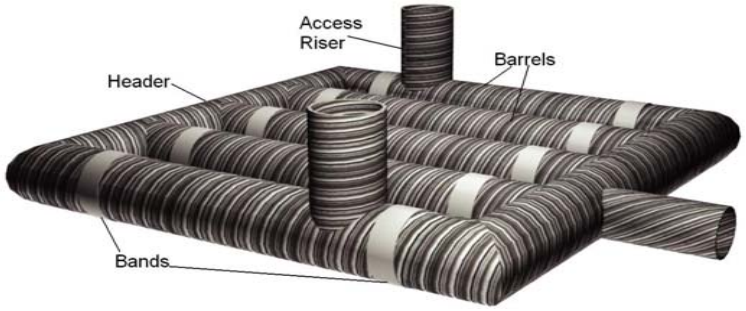
For design assistance, drawings,
and pricing send completed worksheet to:
dyods@contech-cpi.com

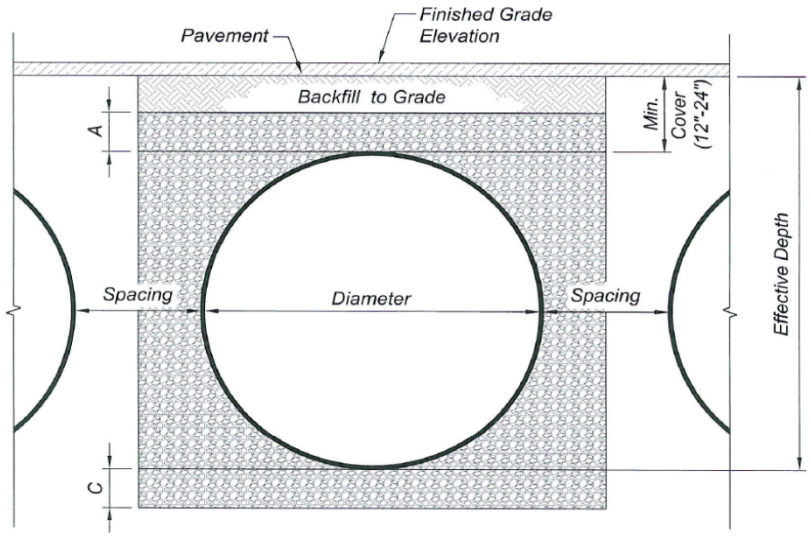


Project Summary

Date:	10/30/2017	
Project Name:	Cajon Blvd. (DMA B)	
City / County:	San Bernardino	
State:	California	
Designed By:	Luis Prado	
Company:	Thienes Engineering, Inc.	**Enter Information in Blue Cells**
Telephone:	(714) 521-4811	

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	31,648	
Limiting Width (ft):	45.00	
Invert Depth Below Asphalt (ft):	9.00	
Solid or Perforated Pipe:	Perforated	
Shape Or Diameter (in):	96	50.27 ft^2 Pipe Area
Number Of Headers:	1	
Spacing between Barrels (ft):	3.00	
Stone Width Around Perimeter of System (ft):	1	
Depth A: Porous Stone Above Pipe (in):	6	
Depth C: Porous Stone Below Pipe (in):	6	
Stone Porosity (0 to 40%):	40	



System Sizing

Pipe Storage:	23,373	cf	
Porous Stone Storage:	8,607	cf	
Total Storage Provided:	31,981	cf	101.1% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	106.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	43. ft x 116. ft		

CONTECH Materials

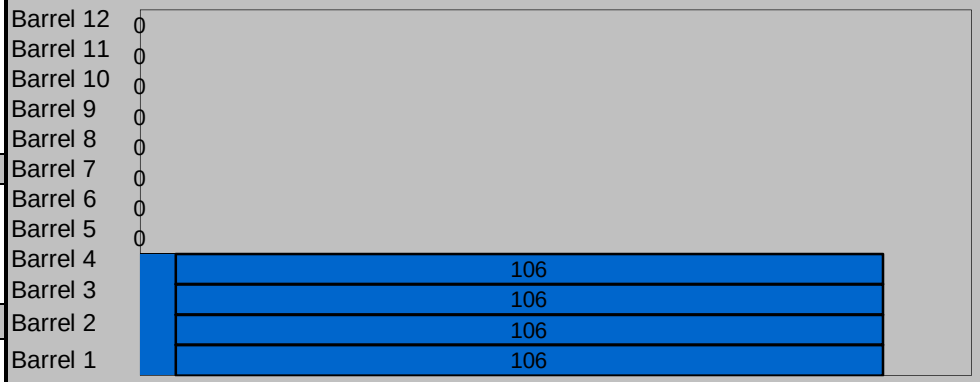
Total CMP Footage:	465	ft
Approximate Total Pieces:	22	pcs
Approximate Coupling Bands:	21	bands
Approximate Truckloads:	11	trucks

Construction Quantities**

Total Excavation:	1663	cy
Porous Stone Backfill For Storage:	797	cy stone
Backfill to Grade Excluding Stone:	0	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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Attachment C
WQMP Site Map

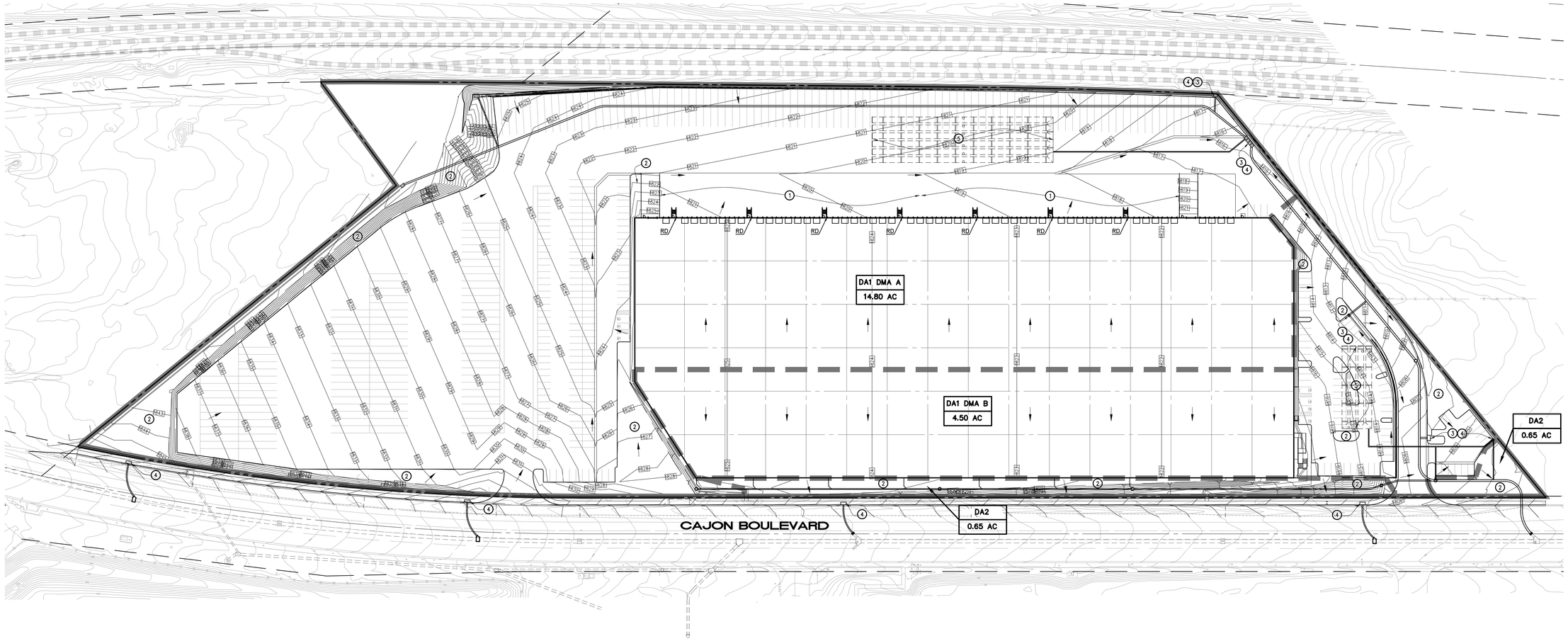
Last Update: 10/26/17
O:\3500-3599\3560\3560VicMap.dwg

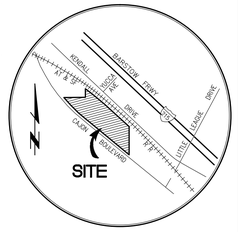
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

"VICINITY MAP"

FOR

CAJON BOULEVARD





VICINITY MAP
N.T.S.

LEGEND

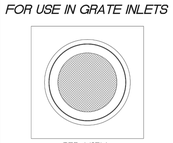
1. ABOVEGROUND LOADING DOCK
2. LANDSCAPE
3. DRAIN INSERT(S)
4. STORM DRAIN SYSTEM SIGNS "NO DUMPING–DRAINS TO RIVER"
5. CONTECH PERFORATED 96" CMP RETENTION SYSTEM
6. NOT USED
7. TRASH ENCLOSURES

NOTES:

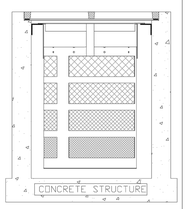
BOUNDARY
HYDROLOGIC BOUNDARY
FLOW DIRECTION

BIO CLEAN SCREENING FILTER

FOR USE IN GRATE INLETS

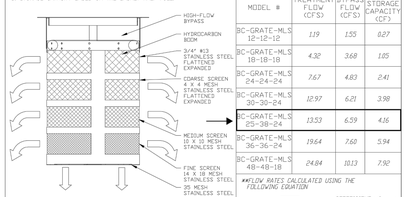


TOP VIEW



CONCRETE STRUCTURE

NOTES:
1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT.
3. FILTER PERFORMANCE BASED ON MANUFACTURERS SPECIFICATIONS.
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BYPASS IS FACILITATED VIA OVERFLOW.
6. DONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.



FLOW SCHEMATIC

MODEL #	TREATMENT FLOW (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BC-GRATE-MLS 12-12-12	1.19	1.55	0.27
BC-GRATE-MLS 18-18-18	4.32	3.68	1.05
BC-GRATE-MLS 24-24-24	7.67	4.83	2.41
BC-GRATE-MLS 30-30-24	12.97	6.21	3.98
BC-GRATE-MLS 33-38-24	13.53	6.59	4.16
BC-GRATE-MLS 36-36-24	19.64	7.60	5.94
BC-GRATE-MLS 48-48-18	24.84	10.13	7.92

**FLOW RATES CALCULATED USING THE FOLLOWING EQUATION

$Q = SCK_{cg}A_g\sqrt{2g_{gh}}$ C_d = COEFFICIENT of DISCHARGE = .62

DRAWING: BIO CLEAN GRATE INLET FILTER DETAILS
TYPICAL MODEL DETAIL — MULTI-LEVEL SCREENING
WARRANTY: 5 YEAR MANUFACTURERS
PROJECT:
BIO CLEAN ENVIRONMENTAL SERVICES, INC.
598 VIA EL CENTRO, OCEANSIDE CA 92058
PHONE: 760-433-7640 FAX: 760-433-3176
DATE: 10/12/17 SCALE: 0" = 12" REVISING: DATE:
DRAFTER: W.C.F. UNITS = INCHES REVISING: DATE:

Bio Clean
A Forterra Company

PAGE 1

BIO CLEAN SCREENING FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

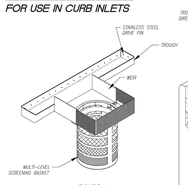


FIGURE 1: DETAIL OF PARTS

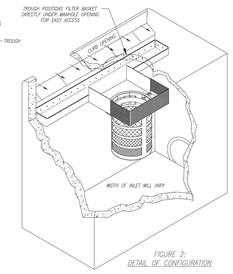


FIGURE 2: DETAIL OF CONFIGURATION

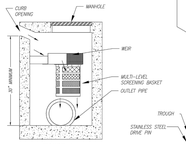


FIGURE 4: DETAIL OF PROFILE

FIGURE 3: DETAIL OF MOUNTING

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BC-CURB-30	2.85	2.21
BC-CURB-24	2.85	1.77
BC-CURB-18	2.85	1.33
BC-CURB-12	2.85	0.88

*SEE PAGE 3 FOR EXPLANATION OF FLOW RATES

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS
MULTI-LEVEL SCREENING
TREATMENT FLOW RATE: 2.85 cfs
MODEL #: BC-CURB-MLS
WARRANTY: 5 YEAR MANUFACTURERS
PROJECT:
BIO CLEAN ENVIRONMENTAL SERVICES, INC.
598 VIA EL CENTRO, OCEANSIDE CA 92058
PHONE: 760-433-7640 FAX: 760-433-3176
DATE: 10/12/2017 SCALE: NTS REVISING: DATE:
DRAFTER: W.C.F. UNITS = INCHES REVISING: DATE:

NOTES:
1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO INSERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, UV, COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH ADJUSTABLE STAINLESS STEEL BRACKETS.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM.
7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY ACCESS AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 3' TO 30'.
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0.
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING WHEN THE BASKET IS HALF FULL AND THE BASKET WILL FILL.
12. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

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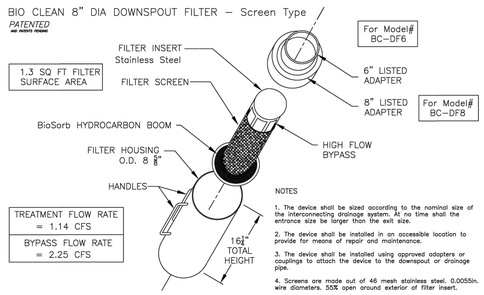
A Forterra Company

PAGE 1

BIO CLEAN 8" DIA DOWNSPOUT FILTER – Screen Type

PATENTED
AND PATENTS PENDING



NOTES

1. The device shall be sized according to the nominal size of the interconnecting drainage system. At no time shall the entrance size be larger than the exit size.

2. The device shall be installed in an accessible location to provide for means of repair and maintenance.

3. The device shall be installed using approved adapters or couplings to attach the device to the downspout or drainage pipe.

4. Screens are made out of 46 mesh stainless steel, 0.0055in. wire diameters. 55% open around exterior of filter insert.

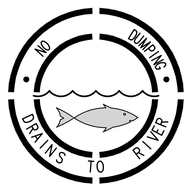
Bio Clean
A Forterra Company

BIO CLEAN ENVIRONMENTAL
PO BOX 868, OCEANSIDE, CA
P 760.433.7640 F 760.433.3179

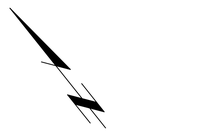
8" DOWNSPOUT FILTER SCREEN TYPE
MODEL NO. BC-DF6, BC-DF8

DATE: 8/30/2012 SCALE: NTS
DRAFTER: T.H.N. UNITS =INCHES

PROJECT:
DRAWING #:
FILE NAME:
REVISION: LM 8/30/2012
REVISING:
DATE:



SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS



0 30 60 120 180
SCALE: 1"=60'

Last Update:10/30/17
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COUNTY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

WQMP SITE MAP

CAJON BLVD.

PREPARED FOR:
ALERE PROPERTY GROUP, LLC.
100 BAYVIEW CIRCLE, SUITE 310
NEWPORT BEACH, CA 92660
PHONE: (949) 509-5000
FAX: (949) 509-5001

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by
Date
Checked by
Date
Designed by
Date
Checked by
Date

Approved by Date
Public Works Director R.C.E.
Sheet 1 of 1 Sheets

3560/1 OF 1 SHEETS

Attachment D
WQMP and Stormwater BMP Transfer, Access and Maintenance Agreement

RECORDING REQUESTED BY:
County of San Bernardino
Department of Public Works

AND WHEN RECORDED MAIL TO:
County of San Bernardino
Department of Public Works
825 E. Third Street, Room 117
San Bernardino, CA 92415-0835

SPACE ABOVE THIS LINE FOR RECORDER'S USE

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

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

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

OWNER NAME: Alere Property Group, LLC

PROPERTY ADDRESS: Cajon Boulevard

San Bernardino, CA 92407

APN: 0262-041-09, -13, -18, -20

THIS AGREEMENT is made and entered into in

_____ ,California, this _____ day of

_____ , by and between

Alere Property Group, LLC , hereinafter

referred to as Owner, and the COUNTY OF SAN BERNARDINO, a political subdivision of the State of California, hereinafter referred to as "the County";

WHEREAS, the Owner owns real property ("Property") in the County of San Bernardino, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference; and

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

Cajon Boulevard within the Property described herein, the County required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff; and

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

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

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

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

1. Owner shall comply with the WQMP

2. All maintenance or replacement of BMPs proposed as part of the WQMP are the sole responsibility of the Owner in accordance with the terms of this Agreement.

3. Owner hereby provides the County's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the County Director of Public Works, no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 5 below. The County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property. Denial of access to any premises or facility that contains WQMP features is a breach of this Agreement and may also be a violation of the County's Pollutant Discharge Elimination System regulations, which on the effective date of this Agreement are found in County Code Sections 35.0101 et seq. If there is reasonable cause to believe that an illicit discharge or breach of this Agreement is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions. Owner recognizes that the County may perform routine and regular inspections, as well as emergency inspections, of the BMPs. Owner or Owner's successors or assigns shall pay County for all costs incurred by County in the inspection, sampling, testing of the BMPs within thirty (30) calendar days of County invoice.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IF TO COUNTY :

Director of Public Works

825 E. Third Street, Room 117

San Bernardino, CA 92415-0835

IF TO OWNER:

Alere Property Group, LLC

100 Bayview Circle, Suite 310

Newport Beach, CA 92660

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

OWNER:

Signature: _____

Name: Daniel Webb

Title: Vice President

Date: _____

FOR: Maintenance Agreement, dated _____, for the project known as Cajon Boulevard _____ (APN)_____, As described in the WQMP dated _____.

OWNER:

Signature: _____

Name: _____

Title: _____

Date: _____

NOTARIES ON FOLLOWING PAGE

A notary acknowledgement is required for recordation.

ACCEPTED BY:

_____

GERRY NEWCOMBE, Director of Public Works

Date: _____

Attachment: Notary Acknowledgement

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }
County of _____ }

On _____ before me, _____,
(here insert name and title of the officer)

personally appeared _____

_____

_____,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____

(Seal)

EXHIBIT A
(Legal Description)

EXHIBIT B
(Map/illustration)

Attachment E
Educational Materials

Regulatory information

The Federal Water Pollution Control Act prohibits the discharge of any pollutant to navigable waters from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. The 1987 passage of the Water Quality Act established NPDES permit requirements for discharges of storm water. The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

Industrial facilities and construction sites are regulated by the Regional Water Quality Control Board and State Water Resources Control Board, through general storm water permits. Most industrial, manufacturing or transportation businesses that store materials, products or equipment outdoors, or conduct vehicle washing or process operations outdoors are required to obtain coverage under the State Water Resources Control Board's General Industrial Activities Stormwater Permit. For more information about this permit, visit www.swrcb.ca.gov/stormwtr/industrial.html or contact your local storm water coordinator.

If your business conducts construction activities, including clearing, grading, stockpiling or excavation that results in soil disturbances of at least one acre, you are subject to the State Water Resources Control Board's General Construction Activities Stormwater Permit. To find out more about this storm water permit for construction, visit: www.swrcb.ca.gov/stormwtr/construction.html.

Cities and counties are regulated through permits issued by the Regional Boards. Since 1990, operators of large storm drain systems such as San Bernardino County's have been required to:

- Develop a storm water management program designed to prevent harmful pollutants from being dumped or washed by storm water runoff, into the storm water system, then discharged into local water bodies; and
- Obtain a National Pollutant Discharge Elimination System (NPDES) permit.

The NPDES permit programs in California are administered by the State Water Resources Control Board and by nine regional boards that issue NPDES permits and enforce regulations within their respective region.

San Bernardino County lies within the jurisdiction of the Santa Ana Region. This regional board issues a permit to the San Bernardino County Permittees, which includes the County of San Bernardino, San Bernardino County Flood Control District and incorporated cities of San Bernardino County. Since the program's inception, the County of San Bernardino has served as the principal permittee.

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

Documents & reports:

The following documents describe the regulations and programs for water quality in San Bernardino County. You can review the latest Basin Plan, National Pollutant Discharge Elimination System (NPDES) Permit and Drainage Area Management Plan (DAMP).

- **Basin Plans:** The document for each region of the State Water Quality Board's jurisdiction, including Santa Ana, is the Water Quality Control Plan, commonly referred to as the Basin Plan. It is the foundation for the regulatory programs of each regional board. The Basin Plan documents the beneficial uses of the region's ground and surface waters, existing water quality conditions, problems, and goals, and actions by the regional board and others that are necessary to achieve and maintain water quality standards.

▶Water Control Plan for the Santa Ana River Basin

- **Municipal National Pollutant Discharge Elimination System (NPDES) Permits:** The permits of each region outline additional steps for a storm water management program and specify requirements to help protect the beneficial uses of the receiving waters. They require permittees to develop and implement Best Management Practices (BMPs) to control/reduce the discharge of pollutants to waters of the United States to the maximum extent practicable (MEP).

  ▶Santa Ana Regional Water Quality Control Board Municipal NPDES Permit Order No. R8-2002-0012

- **Report of Waste Discharge:** The Report of Waste Discharge (ROWD) describes the San Bernardino Stormwater Program, implemented by the County and cities to comply with their jointly held stormwater permit. It is the principle policy and guidance document for the NPDES Stormwater Program.

  ▶Report of Waste Discharge 2000

- **San Bernardino County Storm Water Program Annual Status Report:** The Annual Status Report is a requirement of the NPDES permit for submittal to the Regional Boards and United States Environmental Protection Agency. The report presents an analysis and assessment of permit compliance activities.

▶Annual report - will be posted soon

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

Commercial landscape maintenance:

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

- **Recycle Yard Waste:** Recycle leaves, grass clippings and other yard waste. Do not blow, sweep, rake or hose yard waste into the street. Let your customers know about grass cycling --the natural recycling of grass by leaving clippings on the lawn when mowing instead of using a grass catcher. Grass clippings will quickly decompose, returning valuable nutrients to the soil. You can get more information at www.ciwmb.ca.gov/Organics.
- **Use Fertilizers, Herbicides & Pesticides Safely:** Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural, non-toxic alternatives to traditional garden chemicals. If you must use chemical fertilizers, herbicides, or pesticides spot apply rather than blanketing entire areas, avoid applying near curbs and driveways and never apply before a rain.
- **Recycle Hazardous Waste:** Pesticides, fertilizers, herbicides and motor oil contaminate landfills and should be disposed of through a Hazardous Waste Facility. For information on proper disposal, call (909) 386-8401.
- **Use Water Wisely:** Conserve water and prevent runoff by controlling the amount of water and direction of sprinklers. Sprinklers should be on long enough to allow water to soak into the ground but not so long as to cause runoff. Periodically inspect, fix leaks and realign sprinkler heads.

- **Planting:** Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.
- **Prevent Erosion:** Erosion washes sediments, debris and toxic runoff into the storm drain system, polluting waterways. Prevent erosion and sediment runoff by using ground cover, berms and vegetation down-slope to capture runoff. Avoid excavation or grading during wet weather.

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

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

SAN BERNARDINO COUNTY
STORMWATER POLLUTION PREVENTION

Construction & development:

Soil, cement wash, asphalt, oil and other hazardous debris from construction sites often make their way into the San Bernardino County storm drain system, and flow untreated into local waterways. Follow these best management practices to prevent pollution, protect public health and avoid fines or legal action.

- **Store Materials Safely:** Keep construction materials and debris away from the street, gutter and storm drains. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.
- **Preventing Erosion:** Avoid excavation or grading during wet weather. Plant temporary vegetation or add hydro mulch on slopes where construction is not immediately planned, and permanent vegetation once excavation and grading are complete. Construct diversion dikes to channel runoff to a detention basin and around the construction site. Use gravel approaches where truck traffic is frequent to reduce soil compaction and limit the tracking of sediment into the streets. For more information on erosion control, call (909) 799-7407.

- **Cleaning & Preventing Spills:** Use a drip pan and funnel when draining or pouring fluids. Sweep up dry spills, instead of hosing. Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. To report serious spills, call 911.
- **Maintaining Vehicles & Equipment:** Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutter and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks, and prevent leaks from stored vehicles by draining gas, hydraulic oil, transmission, and brake and radiator fluids.
- **Ordering Materials & Recycling Waste:** Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Dispose of hazardous materials through a hazardous waste hauler or other means in accordance with the construction permit. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.
- **Concrete and mortar application:** Never dispose of cement washout into driveways, streets, gutters or drainage ditches. Wash concrete mixers and equipment only in specified washout areas, where the water flows into lined containment ponds. Cement wash water can be recycled by pumping it back into cement mixers for reuse.

For more information about how you can prevent stormwater pollution:

www.sbcountystormwater.org

General industrial & manufacturing businesses:

If you own, manage or help operate a business, especially an industrial or manufacturing company, you can help reduce storm water pollution. From environmentally friendly cleaning and maintenance activities, to recycling hazardous waste materials, businesses can do a lot to prevent storm water pollution.

- Review your cleaning and maintenance activities to look for ways to reduce runoff into the storm drain system, especially in outdoor areas like parking lots, loading docks and maintenance yards. Keep trash enclosure swept and trash bin lids closed.
- Train employees to wash vehicles and equipment indoors in a wash rack that is connected to the sanitary sewer or off-site at a commercial wash facility. Train janitorial staff to dispose of floor cleaning water in the sewer and not into the parking lot. Make sure that cooling towers, boilers, compressors, water softeners and other process equipment are connected to the sanitary sewer and do not discharge wastewater into the parking lot.
- If you use hazardous materials in your everyday business, like ink and solvents for commercial printing, or polishes and chemicals for car detailing or manufacturing after-market accessories, do not put these hazardous materials in the trash or pour them into the gutter. Take them to be recycled safely. Store chemicals, wastes, raw materials and contaminated equipment indoors or in a covered, spill contained area, to prevent exposure of these materials to storm water. For information on proper hazardous waste disposal, call (909)386-8401.
- Take advantage of less-toxic alternatives to dangerous chemicals. From detergents to drain openers, there are a lot of ways to get the same or better result without having to rely toxic substances.
- Looking for raw materials? San Bernardino County Materials Exchange Program, or SBCoMax is a partnership between the County and the California Integrated Waste Management Board, for businesses to provide used but usable materials to those interested in obtaining them. The program helps divert used materials from landfills, saves resources and can save you money.

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PERMIT# 000

San Bernardino County Stormwater Program
825 East Third Street · Room 127
San Bernardino, CA 94215-0835

STORMWATER

Pollution Prevention

LANDSCAPE MAINTENANCE

Pollution Prevention STORMWATER

Stormwater Management Practices for Commercial Landscape Maintenance

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

Recycle Yard Waste

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

Use Fertilizers, Herbicides and Pesticides Safely

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

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

Recycle Hazardous Waste

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

Use Water Wisely

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

Prevent Erosion

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

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

Store Materials Safely

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

San Bernardino County STORMWATER PROGRAM

To report illegal dumping call

(877) WASTE18

or visit our website:

sbcountystormwater.org

STORMWATER Pollution Prevention

FRESH CONCRETE & MORTAR APPLICATION

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

Storing Materials

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

Ordering Materials & Recycling Waste

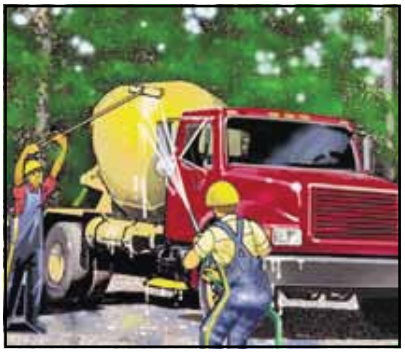
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. When breaking up paving, recycle the pieces at a crushing company. You can also recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should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

During Construction

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

Cleaning Up

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



To report illegal dumping call

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

APLICANDO CONCRETO FRESCO

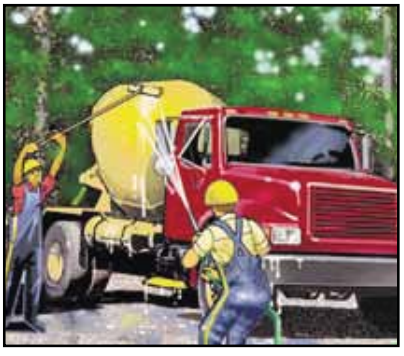
Cemento, grava, asfalto y liquidos de auto, tierra y residuos peligrosos de lugares de concreto fresco por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

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

Ordenando Materiales & Reciclando
Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales recicables cuando sea posible. Cuando estes rompiendo el pavimento, recicla los pedasos en la compañia demolidora. Se puede reciclar el aspfalto, concreto, madera y la vegetacion. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. llama al (909) 386-8401 para más información.

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

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



Para reportar actividades ilegales llamar al:

(877) WASTE18
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

CONSTRUCTION

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

Store Materials Safely

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

Ordering Materials & Recycling Waste

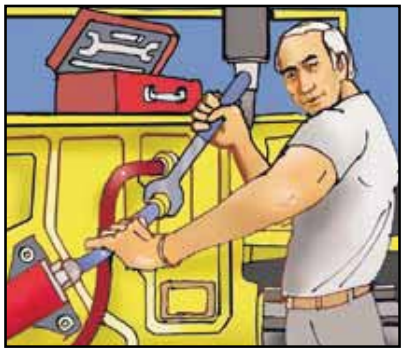
Reduce waste by ordering only the amounts of materials needed for the job. Use recycled or recyclable materials whenever possible. You can recycle broken asphalt, concrete, wood, and cleared vegetation. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling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

Cleaning & Preventing Spills

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

Preventing Erosion

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



Maintaining Vehicles & Equipment

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

To report illegal dumping call

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

CONSTRUCCIÓN

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

Almacenando Materiales Cuidadosamente

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

Ordenando Materiales & Reciclando Desechos

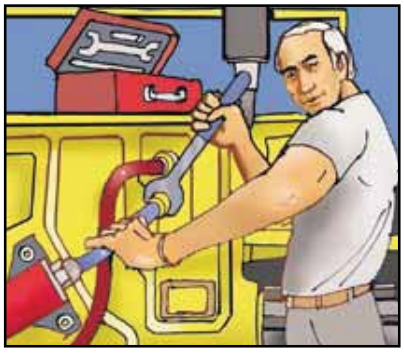
Reduce la cantidad al ordenar el material, solo ordena lo necesario. Usa materiales que se puedan reciclar cuando sea posible. Se puede reciclar el aspfalto, concreto, madera y la vegetacion. Materiales no reciclados se deven llevar a lugares de desechos peligrosos. Para mas información llama al (909)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

Limpiando & Previniendo Derrames

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

Previniendo Erosiones

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



Mantenimiento de Vehiculos & Herramientas

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

Para reportar actividades ilegales llamar al:

(877) WASTE18

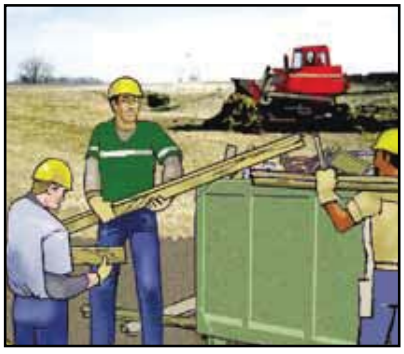
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

EXCAVATION AND GRADING

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



Recycling Waste

Recycle broken asphalt, concrete, wood, and cleared vegetation whenever possible. Non-recyclable materials should be taken to a landfill or disposed of as hazardous waste. For recycling and disposal information, call (909) 386-8401.

Maintaining Vehicles & Equipment

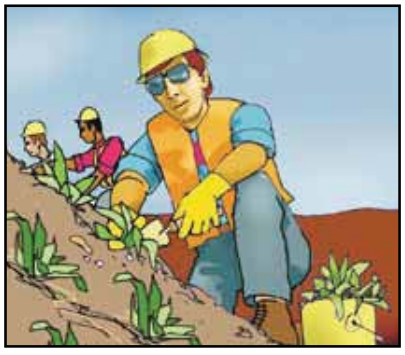
Maintain and refuel vehicles and equipment at a single location on-site, away from the street, gutters and storm drains. Perform major equipment repairs and washings off-site. Inspect vehicles and equipment frequently for leaks. Use gravel approaches where truck traffic is heavy to reduce soil compaction and limit the tracking of sediment into the street.

Cleaning & Preventing Spills

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

Storing Materials

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



Preventing Erosion

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

To report illegal dumping call

(877) WASTE18

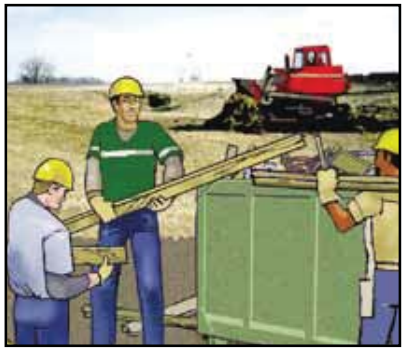
sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

EXCAVACIONES

Sedimento, cemento, asfalto y liquidos de auto, tierra y residuos peligrosos de lugares de construcción acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.



Reciclando Desechos

Recicla el aspfalto, concreto, madera y la vegetacion cuando sea posible. Materiales no reciclados se deverian llevar a lugares de desechos peligrosos. Para màs informacion llama al (909) 386-8401.

Manteniendo Vehiculos & Herramientas

Has el mantenimiento y carga de vehiculos en el mismo lugar, lejos de la calle, las alcantarillas y los drenajes. Inspecciona los vehiculos y el equipo de cualquier goteadura. Usa grava donde mayormente se consentra el trafico de camiones para y reducir el sedimento en las calles.

Limpiando & Previniendo Derrames

Usa siempre un enbudo al vaciar liquidos. Barre los derrames en ves de lavarlos con la manguera. Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin. Preveen goteaduras de autos que no se usan vasiandoles la gasolina, aceite de transmision, frenos y liquidos del radiador. Para reportar derrames llama al 911.

Almacenando Materiales

Manten materiales de construccion y residuos lejos de las calles, coladeras y desagües. Manten tapados los bultos de arena, grava y erramientas para excavar cuviertos con algun plastico para protejerlos de la lluvia, el aire y el desagüe.

Previniendo Erosiones

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

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

STORMWATER Pollution Prevention

ROADWORK AND PAVING

Asphalt, saw-cut slurry and excavated materials from road paving, surfacing and pavement removal often make their way into the San Bernardino County storm drain system and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Preventing Erosion
Schedule excavation and grading work during dry weather. Develop and implement erosion and sediment control plans for excavated embankments. Cover exposed stockpiles of soil, sand or gravel and excavated material with plastic sheeting, protected from rain, wind and runoff.

During Construction
Cover catch basins and maintenance holes when applying seal coat, slurry seal or fog seal. Use check dams, ditches or berms around excavations, and avoid over applying water for dust control. Never wash excess materials from exposed aggregate or concrete into the street, gutter or a storm drain.

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

Asphalt & Concrete Removal
Barricade storm drain openings during saw-cutting, and recycle broken up pavement at a crushing company. For recycling information, call (909) 386-8401.

Cleaning & Preventing Spills
Be ready for spills by preparing and using spill containment and cleanup kits that include safety equipment and dry cleanup materials such as kitty litter or sawdust. Sweep up dry spills, instead of hosing. Prevent spills from paver machines by using drip pans, or by placing absorbent materials like cloths or rags under the machines when not in use. To report serious spills, call 911.

To report illegal dumping call

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación del Desagüe

TRABAJO DE CARRETERAS & PAVIMENTO

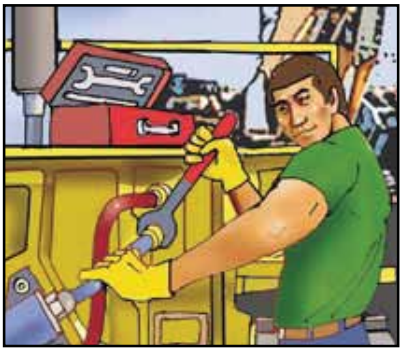
Asfalto, mezcla y materiales de excavaciones del pavimento acaban por llegar a los drenajes del Condado de San Bernardino y terminando en el Rio de Santa Ana. Esto contamina el agua que tomamos, haciendola peligorsa para la gente y la vida salvaje. Sigue estas practicas para prevenir la contaminación y protejer la salud publica.

Previniendo Erosiones

Planea las excavaciones trabajo de jardineria durante el clima seco. Desarrolla e implementa planes de embancamientos de control de sedimento y excavaciones. Cubre montones de tierra, grava y otros materiales con un plastico para protejerlos de la llvia, aire y desagüe.

Durante Construcción

Cubre los lavados y da mantenimiento a los hoyos al aplicar selladura o mezcla. Revisa las areas de excavaciones, y evita pasarte de agua para preveenir polvadura. Nunca laves los materiales llenos de concreto en la calle, drenajes o en el desagüe.



Mantenimiento de Vehiculos & Herramientas

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

Removiendo Asfalto & Concreto

Bloquea alrededor de los drenajes cuando estes usando las maquinas de sierra, tambien recicla todo el pavimento roto en la compañia demolidora. Para más información llama al (909) 386-8401.

Limpiando & Previniendo Derrames

Mantente siempre preparado para cualquier derrame, usa siempre las herramientas de seguridad al igual que materiales como, tierra para desechos de gato o aserrin Barre los derrames en ves de lavarlos con la manguera. Previene los derrames de las maquinas usando enbudos o colocanto garras para absorver cualquier liquido. Para reportar derrames llama al 911.

Para reportar actividades ilegales llamar al:

(877) WASTE18

sbcountystormwater.org

San Bernardino County STORMWATER PROGRAM

Stormwater Pollution Prevention

Important Phone Numbers

San Bernardino County Flood Control
(909) 387-8112

County of San Bernardino
(909) 387-8109

City of Big Bear Lake
(909) 866-5831

City of Chino (909) 591-9850

City of Chino Hills (909) 364-2722

City of Colton (909) 370-6128

City of Fontana (909) 350-6772

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

City of Highland (909) 864-8732 x 230

City of Loma Linda (909) 799-4405

City of Montclair (909) 625-9470

City of Ontario (909) 395-2025

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

City of Redlands (909) 798-7655

City of Rialto (909) 421-4921

City of San Bernardino (909) 384-5154

City of Upland (909) 931-4370

City of Yucaipa (909) 797-2489 x 243

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

STORMWATER Pollution Prevention

INDUSTRIAL AND COMMERCIAL FACILITIES

Pollution Prevention

STORMWATER

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

Prohibited Discharges

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

Outdoor Storage

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

Outdoor Processes

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

Spills and Clean Ups

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

Industrial and Commercial Facilities

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

Training

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

Permitting

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

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

1 (800) CLEANUP

or visit our websites at:

www.sbcounty.gov/stormwater

www.1800cleanup.org

San Bernardino County STORMWATER PROGRAM

Prevención de Contaminación
AL SISTEMA DE DRENAJE

Números de Teléfono Importantes

San Bernardino County Flood Control
(909) 387-8112

County of San Bernardino
(909) 387-8109

City of Big Bear Lake
(909) 866-5831

City of Chino (909) 591-9850

City of Chino Hills (909) 364-2722

City of Colton (909) 370-6128

City of Fontana (909) 350-6772

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

City of Highland (909) 864-8732 x 230

City of Loma Linda (909) 799-4405

City of Montclair (909) 625-9470

City of Ontario (909) 395-2025

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

City of Redlands (909) 798-7655

City of Rialto (909) 421-4921

City of San Bernardino (909) 384-5154

City of Upland (909) 931-4370

City of Yucaipa (909) 797-2489 x 243

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

Prevención de Contaminación
AL SISTEMA DE DRENAJE

INSTALACIONES INDUSTRIALES Y COMERCIALES

Prevención de Contaminación
AL SISTEMA DE DRENAJE

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

Desagües Prohibidos

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

Almacenamiento al Aire Libre

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

Procesos al Aire Libre

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

Derrames y Limpieza

- Limpie los derrames inmediatamente, utilice métodos de limpieza en seco como son el uso de materiales absorbentes y elimine estos materiales de la manera adecuada.
  - Siempre tenga a la mano un estuche para derrames cerca de las puertas de los muelles de carga de sustancias químicas, en las áreas de mantenimiento de vehículos y en las áreas de combustible.
  - Siga su Plan de Emergencia Comercial, como lo registró con el Departamento de Bomberos del Condado marcando al (909) 386-8401.
  - Reporte todos los desagües prohibidos y cualquier punto no implementado de las BMPs a su coordinador local de Aguas Pluviales llamando al (800) CLEANUP o como se indica en el enlace www.sbcounty.gov/stormwater.
  - Reporte cualquier derrame peligroso al (800) 33 TOXIC y al equipo Hazmat de su departamento local de bomberos marcando al 911.

Instalaciones Industriales y Comerciales

Capacitación

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

Autoridad Competente

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

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

1 (800) CLEANUP

o visite nuestro sitio:

www.sbcounty.gov/stormwater

www.1800cleanup.org

San Bernardino County STORMWATER PROGRAM

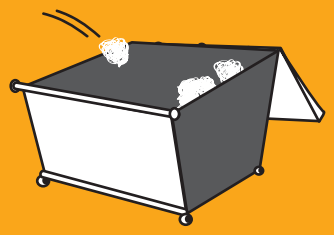
COMMERCIAL TRASH ENCLOSURES

FOLLOW THESE **REQUIREMENTS** TO **KEEP OUR WATERWAYS CLEAN**

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility. **These materials are NOT meant to go into our local lakes and rivers.**

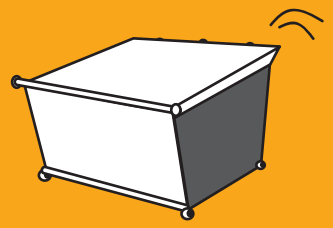
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

PUT TRASH INSIDE



Place trash inside the bin (preferably in sealed bags)

CLOSE THE LID



Prevent rain from entering the bin in order to avoid leakage of polluted water runoff

KEEP TOXICS OUT

- Paint
- Grease, fats and used oils
- Batteries, electronics and fluorescent lights

SOME ADDITIONAL GUIDELINES, INCLUDE

✓ **SWEEP FREQUENTLY**
Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

✓ **FIX LEAKS**
Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

✓ **CONSTRUCT ROOF**
Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!

San Bernardino County STORMWATER PROGRAM

To report illegal dumping **(877-WASTE18)** or
to find a household hazardous waste facility (800-OILY CAT): **sbcountystormwater.org**
To dispose of hazardous waste call the San Bernardino County Fire Dept. - CUPA Program **(909) 386-8401**

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa

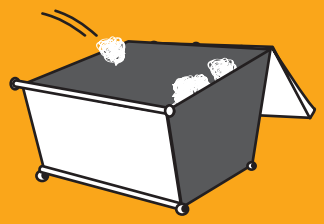
CONTENEDORES COMERCIALES PARA LA BASURA

SIGA ESTOS **PASOS** PARA MANTENER **LIMPIAS NUESTRAS VÍAS FLUVIALES**

Los contenedores de basura, tales como aquellos que se encuentran en las unidades comerciales y departamentos, generalmente contienen materiales que están destinados a los rellenos sanitarios o en algún establecimiento de reciclaje.
Estos materiales NO deben ser vertidos en nuestros lagos y ríos locales.

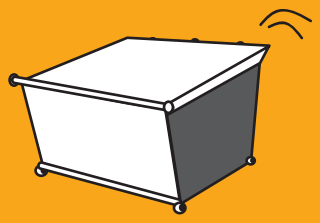
SIGA ESTOS PASOS PARA PROTEGER LA CALIDAD DEL AGUA

COLOQUE LA BASURA ADENTRO



Coloque la basura adentro del contenedor (preferentemente en bolsas selladas)

CIERRE LA TAPA



Evite que la lluvia ingrese al contenedor para evitar un escape de escorrentía contaminada

MANTENGA LOS PRODUCTOS TÓXICOS AFUERA

- Pintura
- Lubricante, grasas y aceites usados
- Baterías, componentes electrónicos y luces fluorescentes

ALGUNAS GUÍAS ADICIONALES, LAS CUALES INCLUYEN

✓ BARRER CON FRECUENCIA

Barra con frecuencia las áreas de los recintos para la basura, en lugar de lavarlas con una manguera, para evitar que el agua contaminada se vierta en las calles y los desagües de lluvia.

✓ REPARE LAS GOTERAS

Ocúpese inmediatamente de las goteras en los contenedores de basura. Use los métodos de limpieza en seco e infórmele a su recolector de basura para que reciba un reemplazo.

✓ CONSTRUYA UN TECHO

Construya un techo de cubierta sólida sobre la estructura actual del recinto para la basura a fin de evitar que el agua de lluvia entre en contacto con los desechos y la basura. Consulte con su Ciudad/Condado para conocer los Códigos de Construcción.

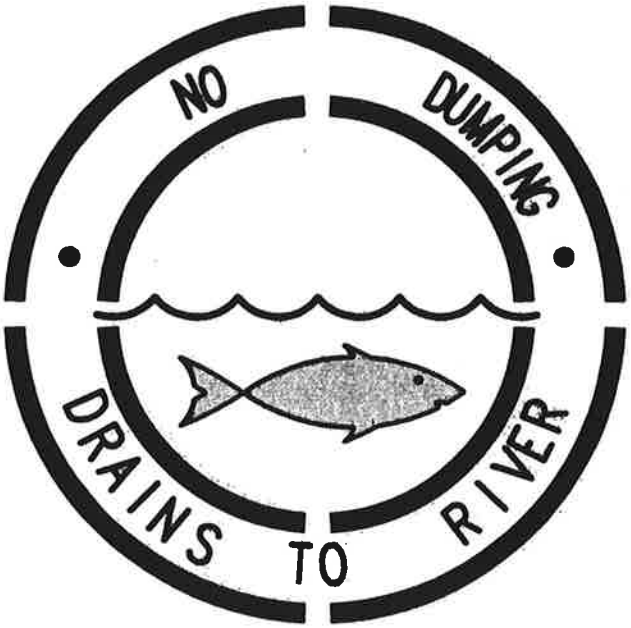
En el Condado de San Bernardino, los desechos de alimentos y jardines, los productos químicos y otros restos que se vierten en los desagües de aguas pluviales y que terminan en nuestras vías fluviales sin tratamiento alguno provocan la contaminación de estas aguas. Usted puede ser parte de la solución si mantiene un recinto para la basura que no contamine el agua.

¡MUCHAS GRACIAS POR AYUDAR A MANTENER EL CONDADO DE SB LIMPIO Y SIN CONTAMINACIÓN!

San Bernardino County STORMWATER PROGRAM

Para informar acerca del vertedero ilegal, llame a **(877-WASTE18)**, o para encontrar un establecimiento donde arrojar los residuos peligrosos del hogar, llame a **(800-OILY CAT)**: **sbcountystormwater.org**
Para deshacerse de los residuos peligrosos llame al Condado de San Bernardino Departamento de Bomberos - programa CUPA **(909) 386-8401**

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernardino • San Bernardino County • San Bernardino County Flood Control District • Upland • Yucaipa



SAMPLE STENCIL TO BE USED NEAR
GRATE AND CURB OPENING INLETS
SYMBOL TO BE 24" IN DIAMETER

Thienes Engineering
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

SAMPLE CATCH BASIN STENCIL
PER BMP SD-13

Infiltration Basin TC-11

Design Considerations

- Soil for Infiltration
- Slope
- Aesthetics

Targeted Constituents

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

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

Description

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

California Experience

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

Advantages

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

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

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

Limitations

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

Design and Sizing Guidelines

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

Construction/Inspection Considerations

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

Performance

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

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

Siting Criteria

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

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

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

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

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

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

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

Secondary Screening Based on Site Geotechnical Investigation

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

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

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

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

Additional Design Guidelines

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

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

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

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

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

where A = Basin invert area (m^2)

WQV = water quality volume (m^3)

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

t = drawdown time (48 hr)

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

Maintenance

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

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

Cost

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

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

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

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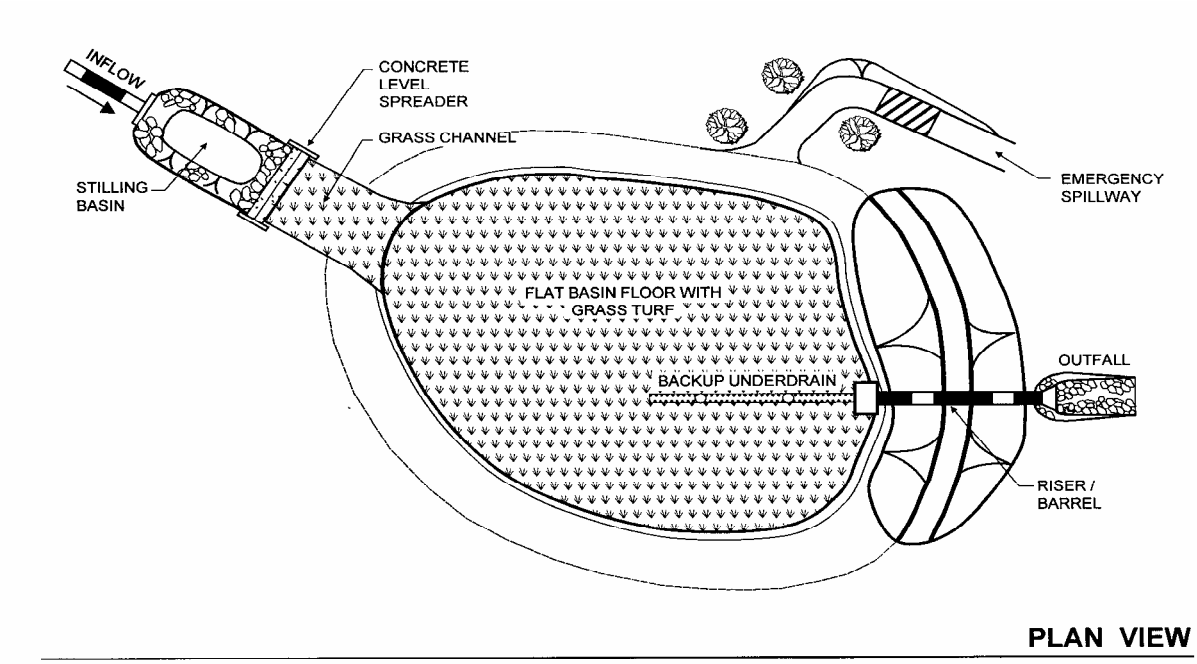
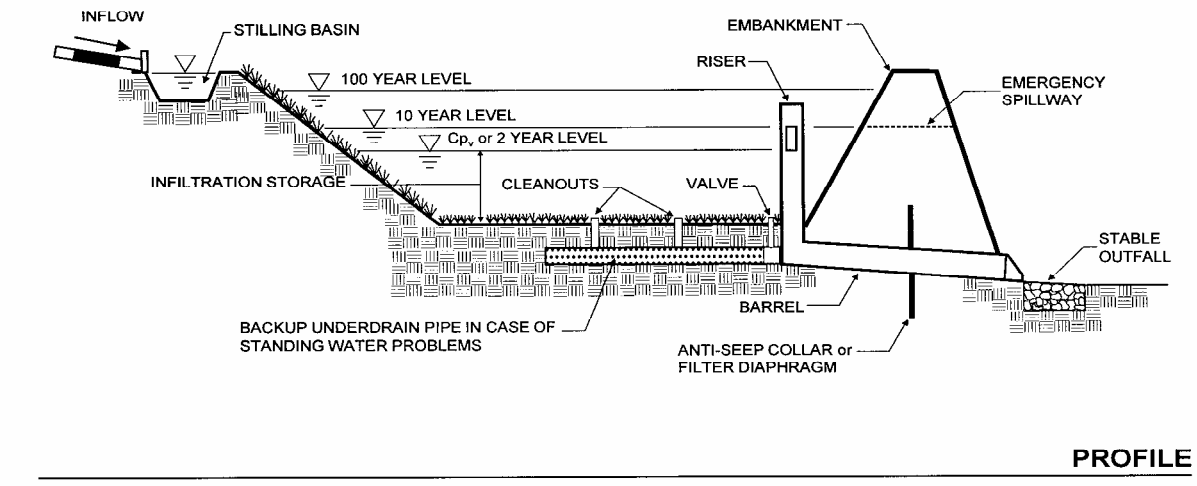


PLAN VIEW



PROFILE

CONTECH®
ENGINEERED SOLUTIONS

Contech® CMP Detention & Infiltration Maintenance Guide

CONTECH®
CMP DETENTION SYSTEMS

Maintenance

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Inspection & Maintenance Log Sample Template

_____" Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**
12/01/10	2"	None	Removed Sediment	B. Johnson	Installed
03/01/11	1"	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/11	0"	None	None		
09/01/11	0"	Heavy	Removed Trash	S. Riley	
12/01/11	1"	None	Removed Sediment	S. Riley	
04/01/12	0"	None	None	S. Riley	
04/15/01	2	Some	Removed Sediment and Trash	ACE Environmental Services	

SAMPLE

CONTECH®
CMP DETENTION SYSTEMS

Support

Drawings and specifications are available at www.ContechES.com.

Site-specific support is available from our engineers.

CONTECH®
ENGINEERED SOLUTIONS
800.338.1122
www.ContechES.com

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Drain Inserts MP-52

Description

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

California Experience

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

Advantages

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

Limitations

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

Design and Sizing Guidelines

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

Design Considerations

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

Targeted Constituents

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

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

Construction/Inspection Considerations

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

Performance

Few products have performance data collected under field conditions.

Siting Criteria

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

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

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

Cost

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

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BIO CLEAN SCREENING FILTER WITH TROUGH SYSTEM

FOR USE IN CURB INLETS

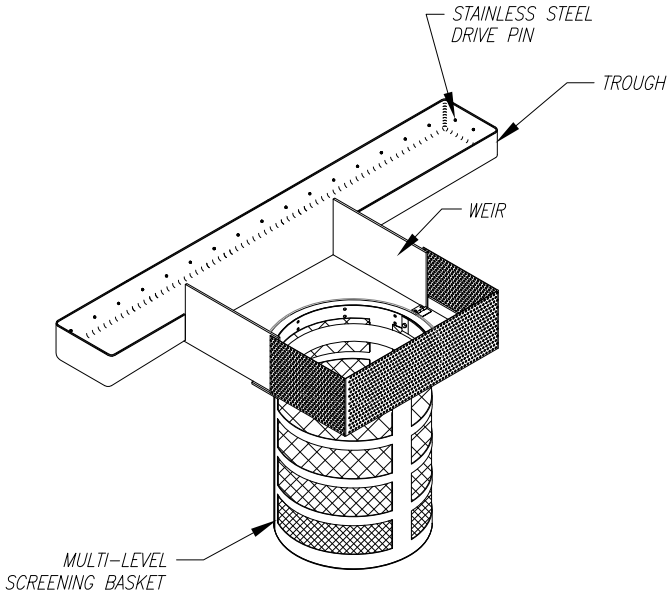


FIGURE 1:
DETAIL OF PARTS

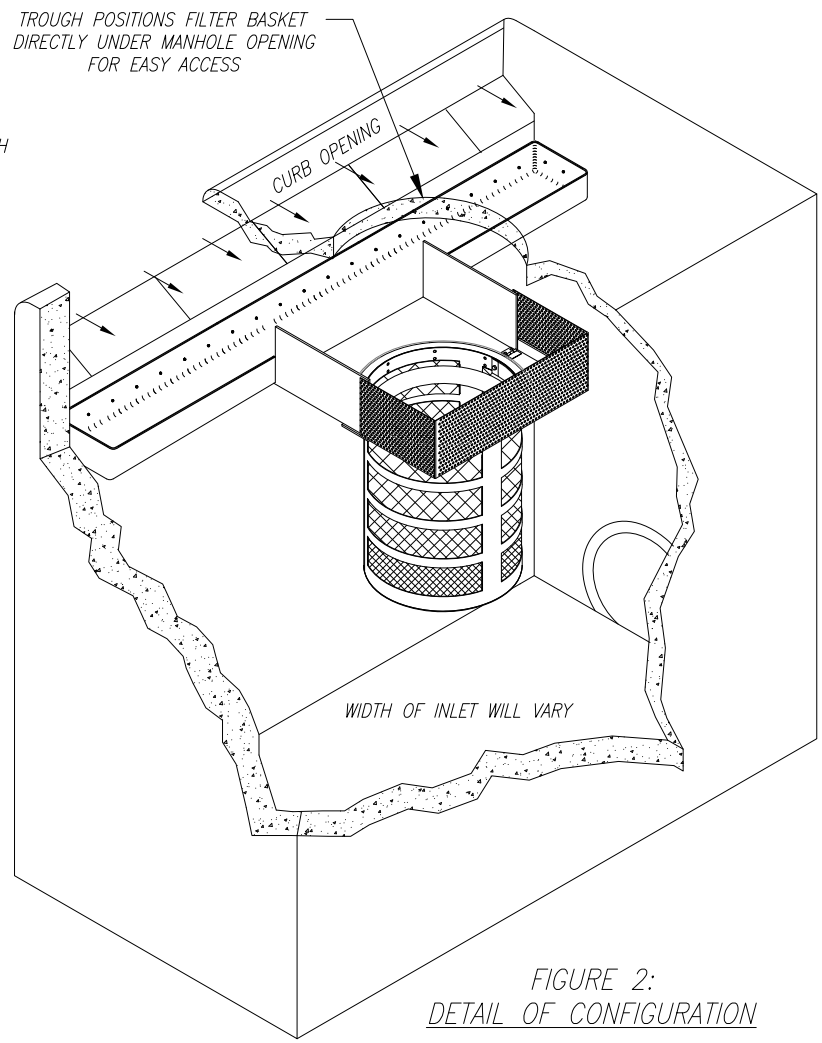


FIGURE 2:
DETAIL OF CONFIGURATION

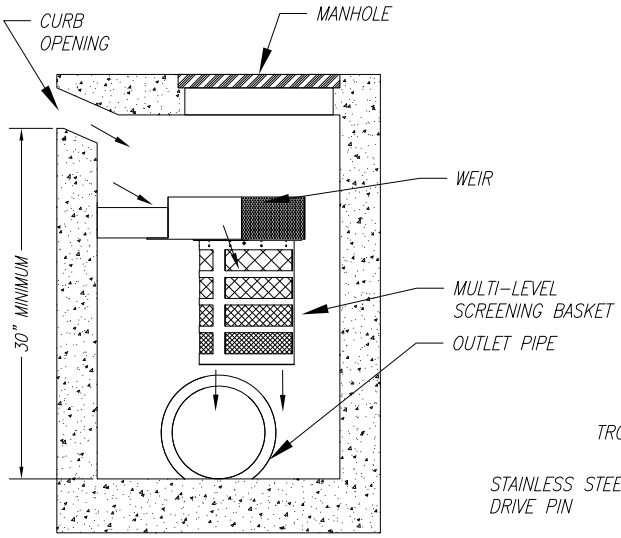


FIGURE 4:
DETAIL OF PROFILE

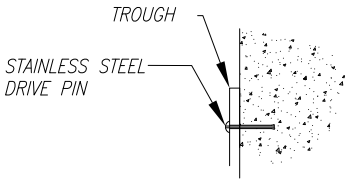


FIGURE 3:
DETAIL OF MOUNTING

NOTES:

1. TROUGH SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO FILTER.
2. TROUGH SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SYSTEM ATTACHED TO THE CATCH BASIN WITH NON-CORROSIVE HARDWARE.
4. FILTER MANUFACTURED OF 100% STAINLESS STEEL.
5. FILTER MADE OF NON-CLOGGIN SCREEN WITH 4.7 MM OPENINGS AND MEETS FULL CAPTURE REQUIREMENTS.
6. FILTER CAN BE FITTED WITH HYDROCARBON ABSORBENT BOOM
7. FILTER IS LOCATED DIRECTLY UNDER THE MANHOLE FOR EASY REMOVAL AND MAINTENANCE.
8. LENGTH OF TROUGH CAN VARY FROM 2' TO 30'
9. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
10. CONSIDERS A SAFETY FACTOR OF 2.0
11. BYPASS IS FACILITATED VIA OVERFLOW OF THE TROUGH SYSTEM AND IS EQUAL TO THE CAPACITY OF THE CURB OPENING
12. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
13. ADDITIONAL TREATMENT AND STORAGE CAPACITY CAN BE ACHIEVED BY UTILIZING MULTIPLE FILTER BASKETS.

MODEL NUMBER	TREATMENT FLOW (cfs)*	SOLIDS STORAGE CAPACITY (cu ft)
BC-CURB-30	2.85	2.21
BC-CURB-24	2.85	1.77
BC-CURB-18	2.85	1.33
BC-CURB-12	2.81	0.88

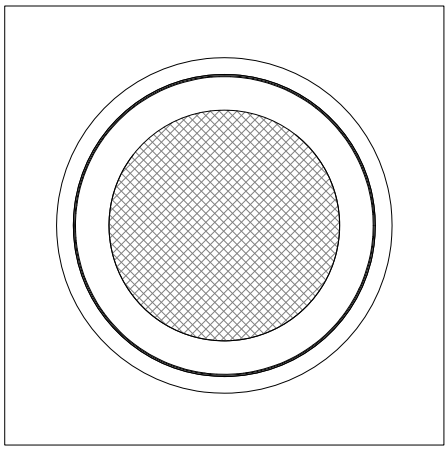
*SEE PAGE 2 FOR EXPLANATION OF FLOW RATES

DRAWING: BIO CLEAN CURB INLET FILTER DETAILS		MULTI-LEVEL SCREENING	
TREATMENT FLOW RATE: 2.85 cfs		MODEL #: BC-CURB-MLS	
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE:760-433-7640 FAX:760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 10/12/2017	SCALE: NTS	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

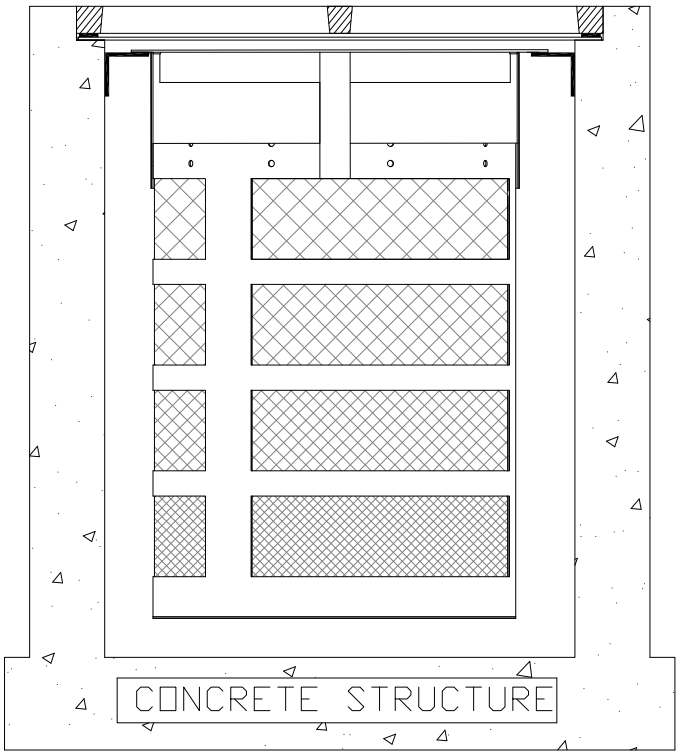
Bio Clean
A Forterra Company

BIO CLEAN SCREENING FILTER

FOR USE IN GRATE INLETS

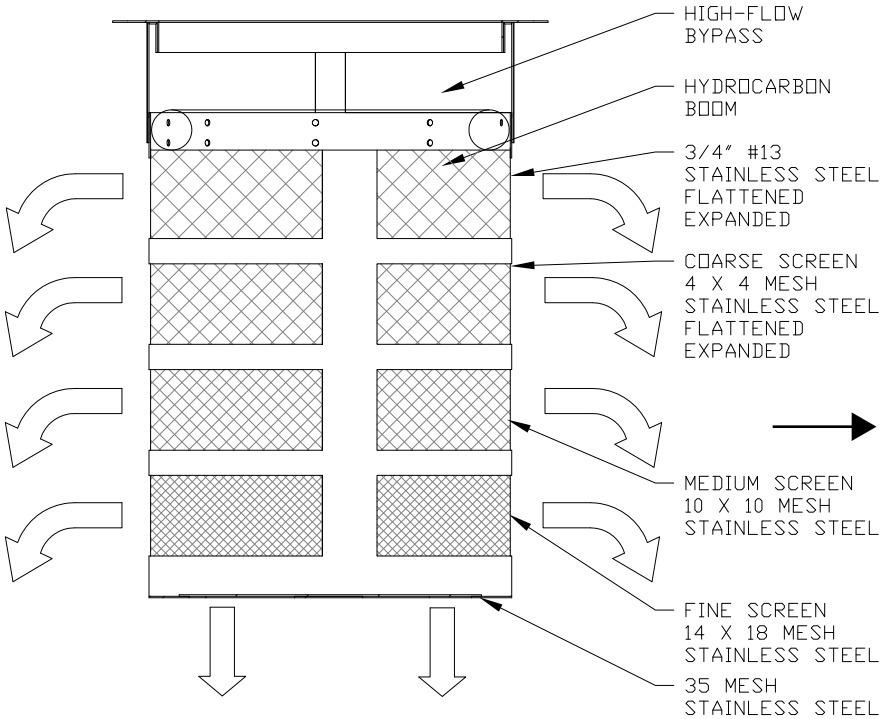


TOP VIEW



NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL
2. HYDROCARBON BOOM SHALL BE 2" DIAMETER AND CONNECTED, MECHANICALLY TO THE FILTER FRAME WITH RAILS ALLOWING IT TO FLOAT ON THE WATER SURFACE REGARDLESS OF HEIGHT
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDIING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.



FLOW SCHEMATIC

MODEL #	TREATMENT FLOW (CFS)	BYPASS FLOW (CFS)	SOLIDS STORAGE CAPACITY (CF)
BC-GRATE-MLS 12-12-12	1.19	1.55	0.27
BC-GRATE-MLS 18-18-18	4.32	3.68	1.05
BC-GRATE-MLS 24-24-24	7.67	4.83	2.41
BC-GRATE-MLS 30-30-24	12.97	6.21	3.98
BC-GRATE-MLS 25-38-24	13.53	6.59	4.16
BC-GRATE-MLS 36-36-24	19.64	7.60	5.94
BC-GRATE-MLS 48-48-18	24.84	10.13	7.92

**FLOW RATES CALCULATED USING THE FOLLOWING EQUATION

$Q = S\square * c_d * A \sqrt{2 * g * h}$ c_d = COEFFICIENT OF DISCHARGE = .62

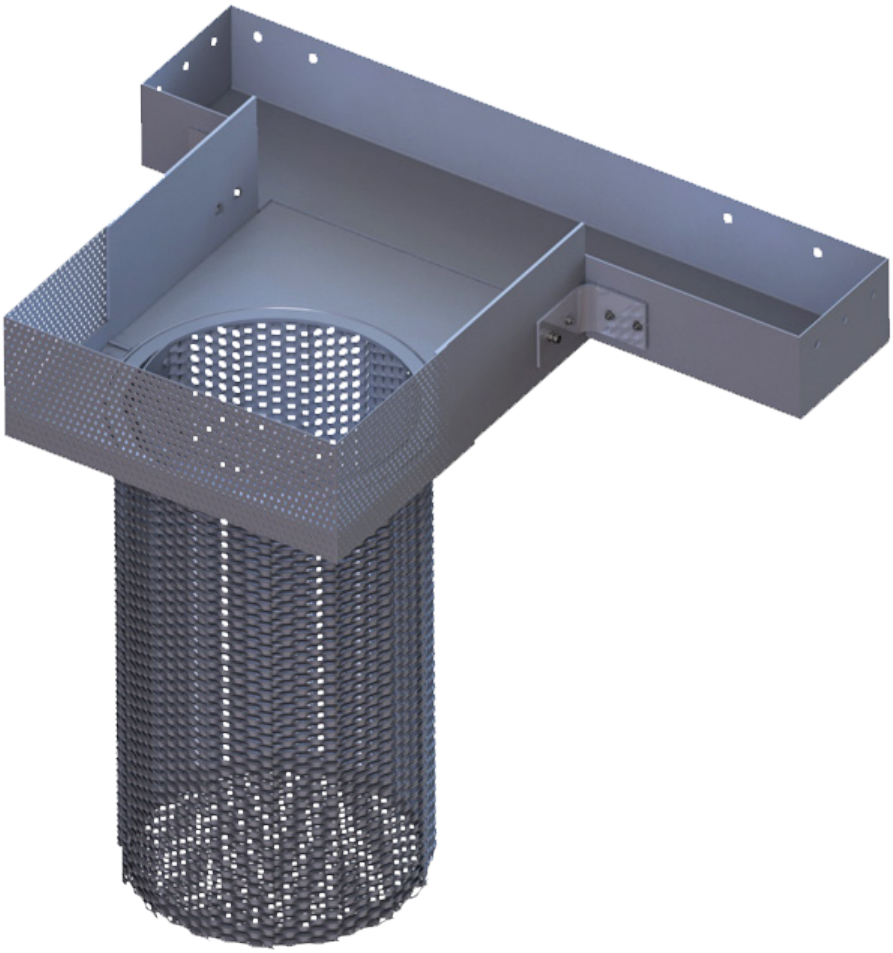
DRAWING: BIO CLEAN GRATE INLET FILTER DETAILS		MULTI-LEVEL SCREENING	
TYPICAL MODEL DETAIL			
WARRANTY: 5 YEAR MANUFACTURERS		PROJECT:	
BIO CLEAN ENVIRONMENTAL SERVICES, INC. 398 VIA EL CENTRO, OCEANSIDE CA 92058 PHONE: 760-433-7640 FAX: 760-433-3176		REVISIONS:	DATE:
		REVISIONS:	DATE:
DATE: 10/12/17	SCALE: SF = 15	REVISIONS:	DATE:
DRAFTER: M.C.P.	UNITS = INCHES	REVISIONS:	DATE:

Bio Clean
A Forterra Company

Curb Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



Bio Clean Environmental Services, Inc.
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Oceanside, CA 92058

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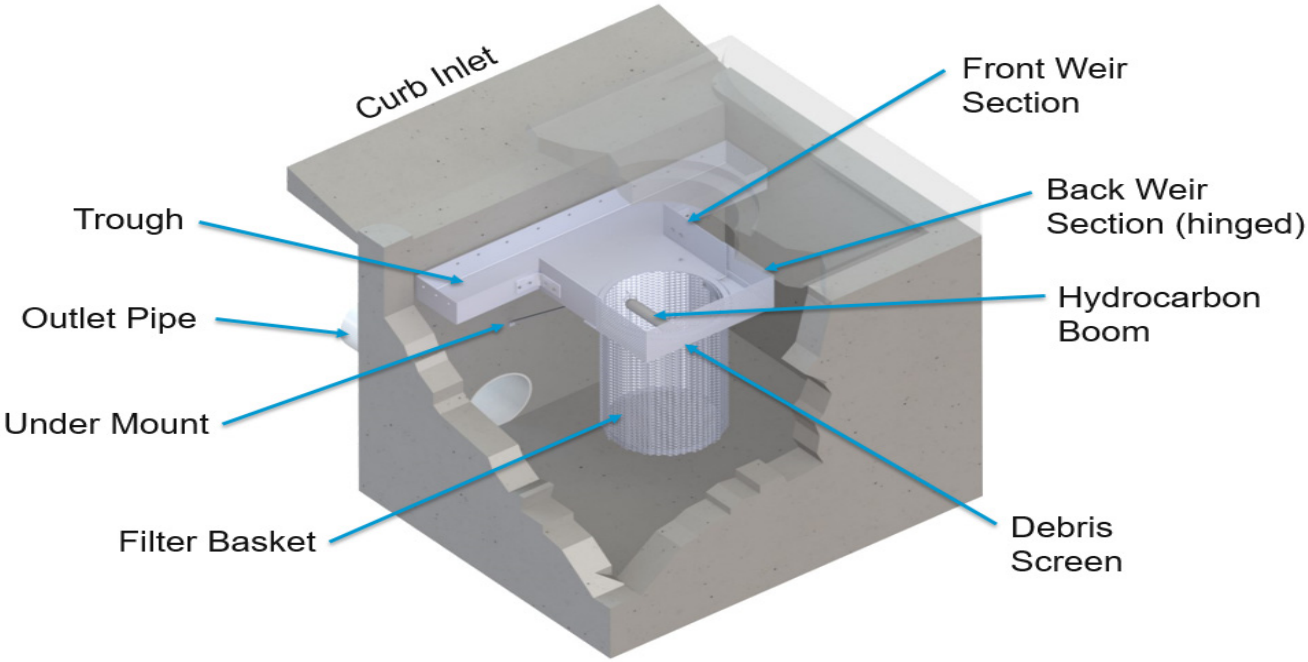
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Curb Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This innovative design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter has a lifting handle allowing for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

As with all stormwater BMPs, inspection and maintenance on the Curb Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Curb Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Curb Inlet Fitler are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Curb Inlet Filter can be inspected though visual observation without entry into the catch basin. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once the manhole has been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the catch basin through the manhole. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the catch basin.
- Look for any out of the ordinary obstructions in the catch basin, trough, weir, filter basket, basin floor our outlet pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the trough, weir, filter basket or catch basin.
- Excessive accumulation of trash, foliage and sediment in the filter basket and/or trough and weir sections. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-CURB-30	18	30	2.21	4.42
BC-CURB-24	18	24	1.77	3.53
BC-CURB-18	18	18	1.33	2.65
BC-CURB-12	18	12	0.88	1.77

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter though it can easily cleaned by hand:

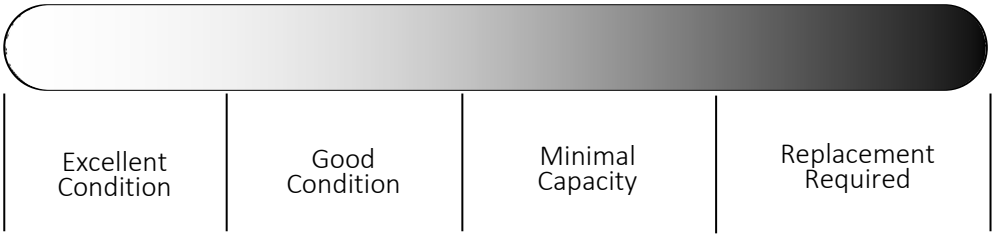
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Curb Inlet Filter can be performed from finish surface without entry into catch basin utilizing a vacuum truck. Some unique

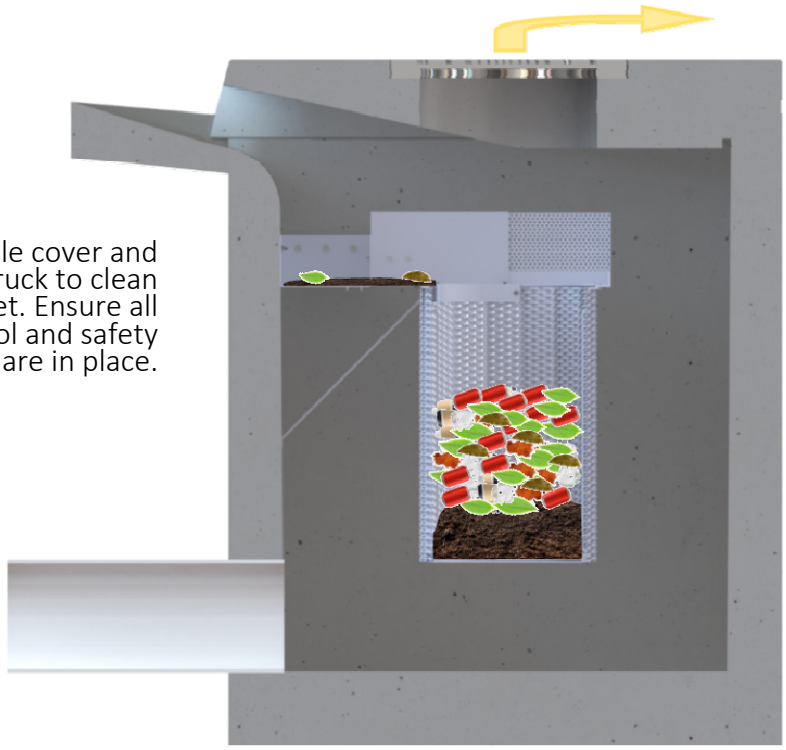
and custom configurations may create conditions which would require entry for some or all of the maintenance procedures. Once all safety measures have been set up cleaning of the Curb Inlet Filter can proceed as followed:

- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened manhole or hatch opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. If the filter basket is full, trash, sediment, and debris will accumulate inside the trough and weir sections of the system. Once the filter basket is clean power wash the weir and trough pushing these debris into the filter basket (leave the hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



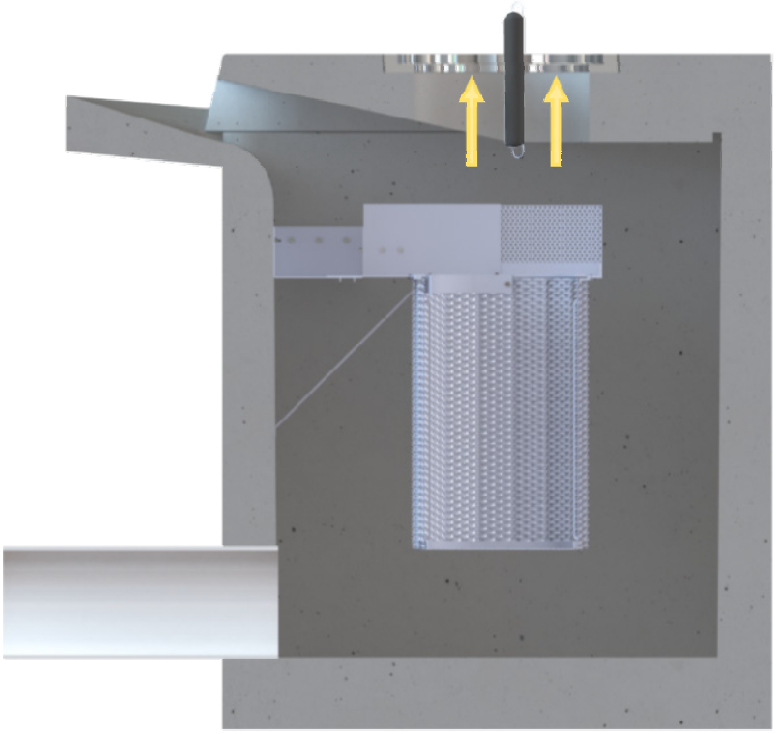
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

Maintenance Sequence



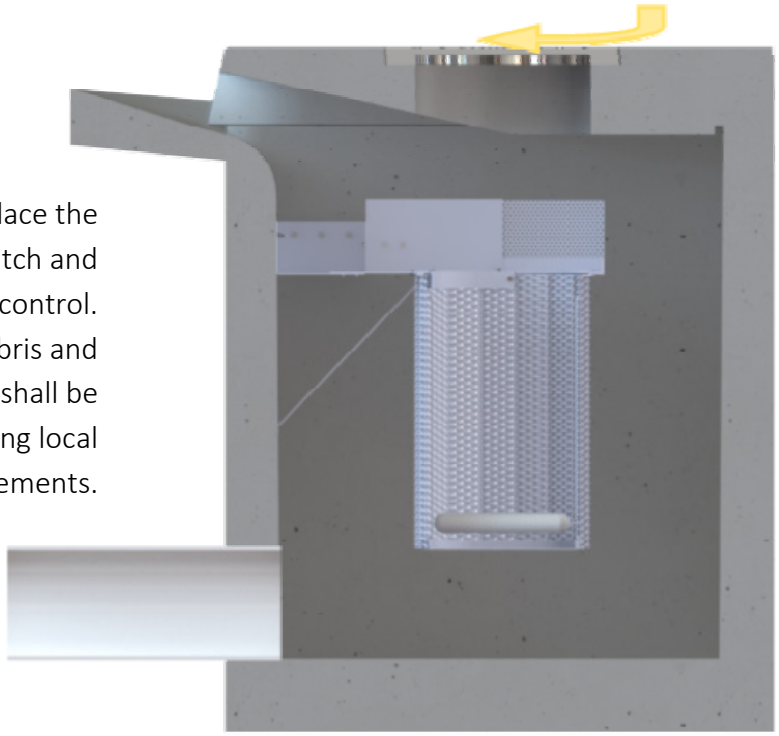
Remove manhole cover and set up vacuum truck to clean the filter basket. Ensure all traffic control and safety measures are in place.

Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off the weir and trough and vacuum out any remaining debris.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the manhole or hatch and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

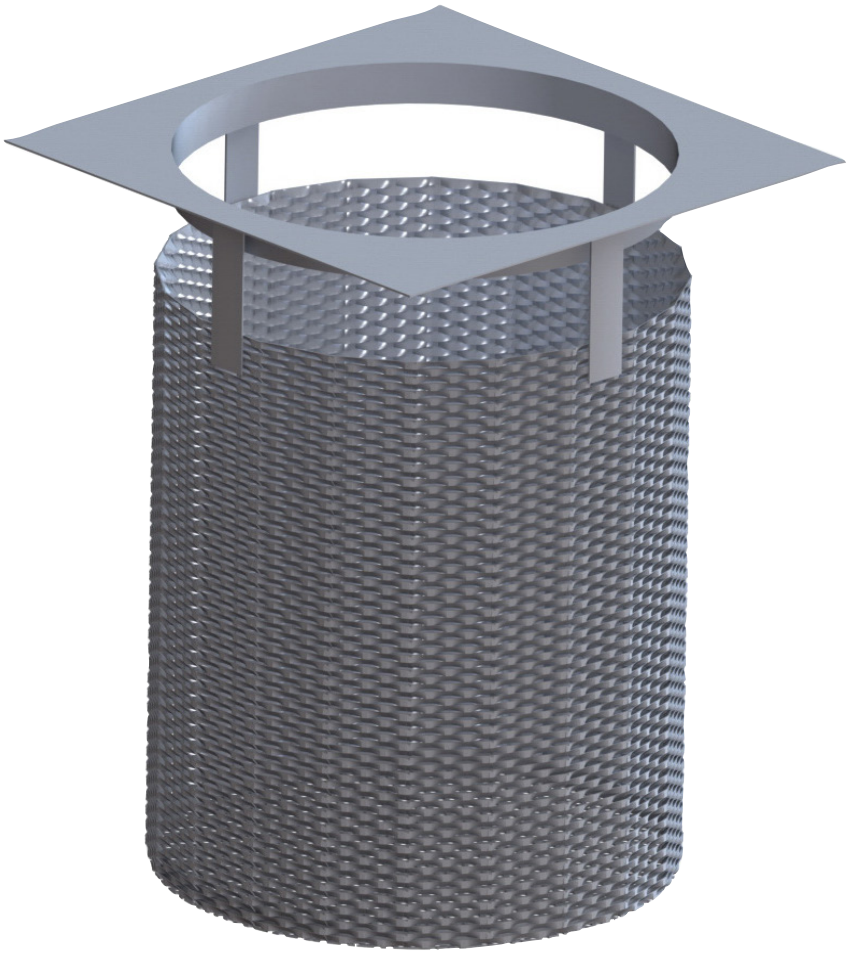
Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

Grate Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



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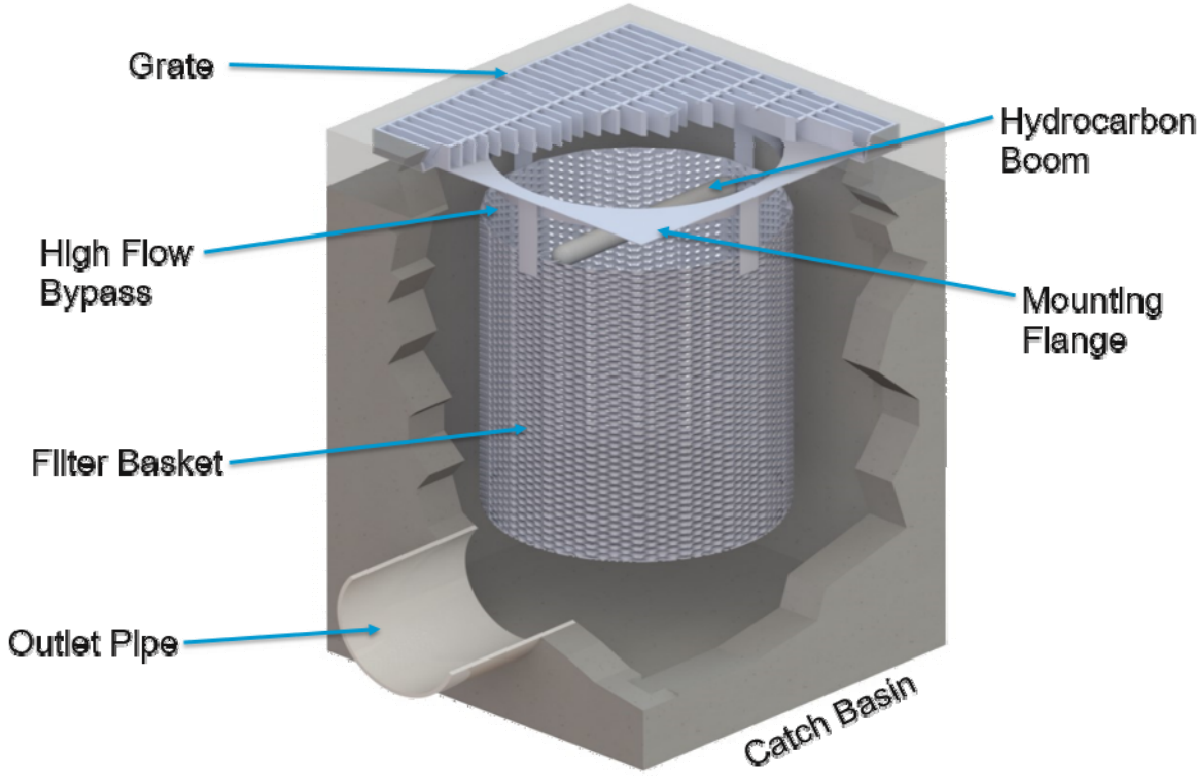
OPERATION & MAINTENANCE

The Bio Clean Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. This filter is made of 100% stainless steel and is available and various sizes and depths allowing it to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filet can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

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- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-GRATE-12-12-12	10.00	12.00	0.27	0.55
BC-GRATE-18-18-18	16.00	18.00	1.05	2.09
BC-GRATE-24-24-24	21.00	24.00	2.41	4.81
BC-GRATE-30-30-24	27.00	24.00	3.98	7.95
BC-GRATE-36-36-24	33.00	24.00	5.94	11.88
BC-GRATE-48-48-18	44.00	18.00	7.92	15.84

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily cleaned by hand:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up cleaning of the Grate Inlet Filter can proceed as followed:

- Remove grate (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. Power wash off the filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
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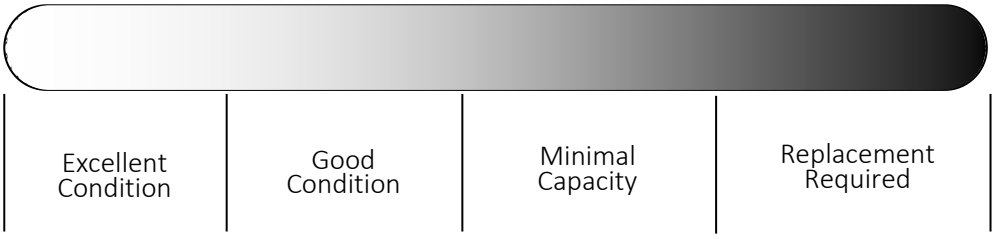


- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

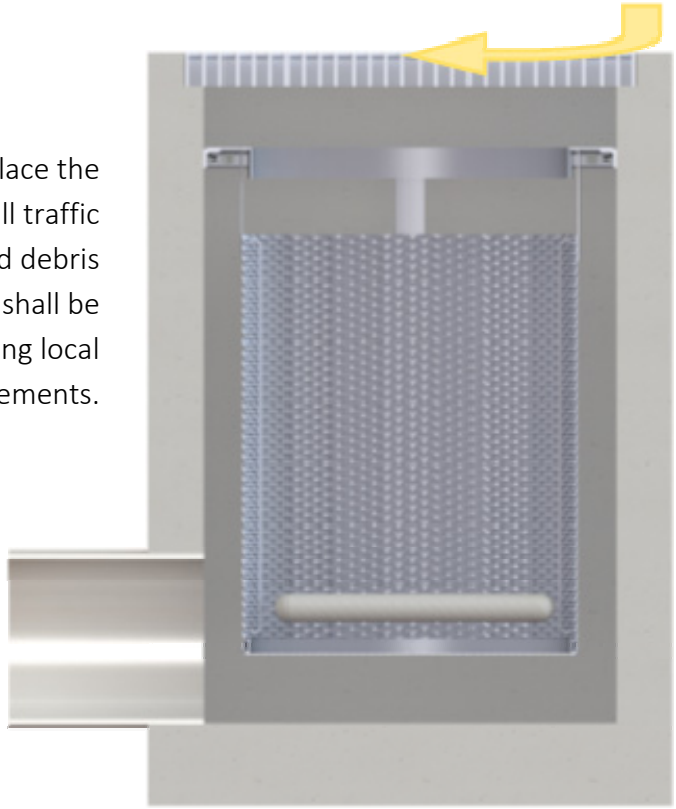
Maintenance Sequence

Remove grate and set up vacuum truck to clean the filter basket.

Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.

Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
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Or Email:
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/_____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

For Office Use Only
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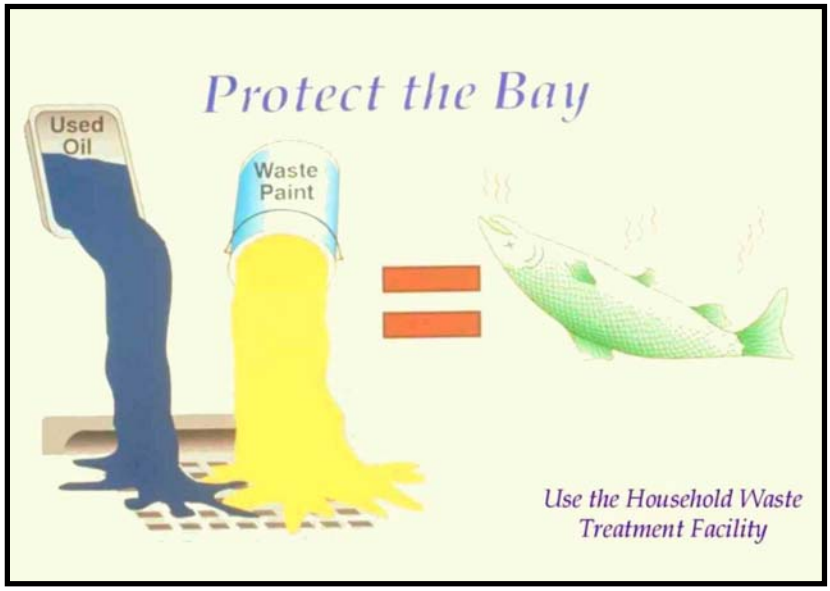
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

Non-Stormwater Discharges SC-10



Art Credit: Margie Winter

Objectives

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

Targeted Constituents

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

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.

CASQA
California Stormwater Quality Association

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

Targeted Constituents

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

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:

- 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*.

- 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)

- 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)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 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.

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

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.

- 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.

- 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

- 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/

Outdoor Loading/Unloading SC-30

Photo Credit: Geoff Brosseau

Objectives

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

Targeted Constituents

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

Description

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

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

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

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Suggested Protocols

Loading and Unloading – General Guidelines

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

Inspection

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

Training

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

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

Other Considerations (Limitations and Regulations)

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

Requirements

Costs

Costs should be low except when covering a large loading/unloading area.

Maintenance

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

Supplemental Information

Further Detail of the BMP

Special Circumstances for Indoor Loading/Unloading of Materials

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

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/

Outdoor Equipment Operations SC-32

Description

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

Approach

Pollution Prevention

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

Suggested Protocols

- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof if possible.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention). If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- Dry clean the work area regularly.

Training

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

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

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

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- Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
- Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

Other Considerations

- Providing cover may be expensive.
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

Requirements

Costs

Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.

Maintenance

- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

Supplemental Information

Further Detail of the BMP

Hydraulic/Treatment Modifications

If stormwater becomes polluted, it should be captured and treated. If you do not have your own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

Industries that generate large volumes of process wastewater typically have their own treatment system and corresponding permit. These industries have the discretion to use their wastewater treatment system to treat stormwater within the constraints of their permit requirements for process treatment. It may also be possible for the industry to discharge the stormwater directly to an effluent outfall without treatment as long as the total loading of the discharged process

water and stormwater does not exceed the loading had a stormwater treatment device been used. This could be achieved by reducing the loading from the process wastewater treatment system. Check with your Regional Water Quality Control Board or local sewering agency, as this option would be subject to permit constraints and potentially regular monitoring.

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

Waste Handling & Disposal SC-34

Photo Credit: Geoff Brosseau

Objectives

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

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Targeted Constituents

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

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

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

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

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

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

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

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

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

Safer Alternative Products SC-35

Description

Promote the use of less harmful products and products that contain little or no TMDL pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies

Objectives

- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

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

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- Procedures
  - Standard operating procedures (SOPs)
  - Purchasing guidelines and procedures
  - Bid packages (services and supplies)
- Materials
  - Preferred or approved product and supplier lists
  - Product and supplier evaluation criteria
  - Training sessions and manuals
  - Fact sheets for employees

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC20 – SC22) and SC41, Building and Grounds Maintenance.

Training

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

Regulations

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Storm water runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

Equipment

- There are no major equipment requirements to this BMP.

Limitations

- Alternative products may not be available, suitable, or effective in every case.

Requirements

Cost Considerations

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.

- Some alternative products may be slightly more expensive than conventional products.

Supplemental Information

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Rerefined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

Examples

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information

California Department of Toxic Substances Control (www.dtsc.ca.gov)

California Integrated Waste Management Board (www.ciwmb.ca.gov)

City of Santa Monica (www.santa-monica.org/environment)

City of Palo Alto (www.city.palo-alto.ca.us/cleanbay)

City and County of San Francisco, Department of the Environment (www.ci.sf.ca.us/sfenvironment)

Earth 911 (www.earth911.org/master.asp)

Environmental Finance Center Region IX (www.greenstart.org/efc9)

Flex Your Power (www.flexyourpower.ca.gov)

GreenBiz.com (www.greenbiz.com)

Green Business Program (www.abag.org/bayarea/enviro/gbus/gb.html)

Pacific Industrial and Business Association (www.piba.org)

Sacramento Clean Water Business Partners (www.sacstormwater.org)

USEPA BMP fact sheet – Alternative products (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm)

USEPA Region IX Pollution Prevention Program (www.epa.gov/region09/p2)

Western Regional Pollution Prevention Network (www.westp2net.org)

Metals (mercury, copper)

National Electrical Manufacturers Association - Environment, Health and Safety (www.nema.org)

Sustainable Conservation (www.suscon.org)

- Auto Recycling Project
- Brake Pad Partnership

Pesticides and Chemical Fertilizers

Bio-Integral Resource Center (www.birc.org)

California Department of Pesticide Regulation (www.cdpr.ca.gov)

University of California Statewide IPM Program (www.ipm.ucdavis.edu/default.html)

Dioxins

Bay Area Dioxins Project (http://dioxin.abag.ca.gov/)

Building & Grounds Maintenance SC-41

Objectives

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

Targeted Constituents

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

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.

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- 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.

- 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.

- 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/

Building Repair and Construction SC-42

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

Targeted Constituents

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

Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

Approach

Pollution Prevention

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Suggested Protocols

Repair & Remodeling

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

Painting

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Training

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

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.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Limitations

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

Requirements

Costs

These BMPs are generally low to modest in cost.

Maintenance

N/A

Supplemental Information

Further Detail of the BMP

Soil/Erosion Control

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

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/

Parking/Storage Area Maintenance SC-43

Objectives

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

Targeted Constituents

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

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.

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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.

- 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/

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

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

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).

- 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 Steam 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.

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

Drain Insert MP-52

General Description

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

Inspection/Maintenance Considerations

Washout problems increase with rain intensity. Susceptibility of accumulated sediments to be re-suspended at low flow rates, can be corrected with an energy dissipater between gate and treatment areas.

Inspection Activities	Suggested Frequency
■ Inspect for sediment buildup and proper functioning.	At the beginning of the wet season and after significant storms
■ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
Maintenance Activities	**Suggested Frequency**
■ Remove sediment as needed.	At the beginning of the wet season and as necessary

Maintenance Concerns, Objectives, and Goals

■ Sediment Removal

Targeted Constituents

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

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

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Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

Maintenance Bays & Docks SD-31

Design Objectives

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

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

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

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.

- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.

- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.

- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.

- Other features may be 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.

Additional Information

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

Other Resources

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

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

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

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

Trash Storage Areas SD-32

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

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

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Other Resources

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

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

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

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

Attachment F
Infiltration Report

NorCal Engineering

Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

October 4, 2017 Project Number 19903-17

Alere Property Group, LLC
100 Bayview Circle, Suite 310
Newport Beach, California 92660

Attn: Clark Neuhoff

RE: **Soil Infiltration Study** - Proposed Warehouse Building Development - Located on Cajon Boulevard, Northerly of Shelter Way, County of San Bernardino, California

Dear Mr. Neuhoff:
Pursuant to your request, this firm has performed a Soil Infiltration Study for the above referenced project. The purpose of this study is to evaluate the feasibility of on-site drainage disposal systems on the subject site. The scope of current work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration; 3) double ring infiltration testing at two locations; 4) engineering analysis of field test data; and 5) preparation of this report.

Proposed Development

It is currently proposed to construct a new 408,480 square feet concrete tilt-up building on the 20-acre parcel. Asphaltic and concrete pavement areas and landscaping will also be installed. Grading for the development is expected to include cut and fill procedures. It is also proposed to install detention/infiltration basin on the property to capture and infiltrate storm water runoff. Depth of system is assumed to be within the upper 10 feet below existing grades.

Site Description

The irregular shaped property is located easterly of Cajon Boulevard, northerly of Shelter Way, in the unincorporated area of the County of San Bernardino, as shown on the Vicinity Map, Figure 1. A railroad borders along the property line opposite of Cajon Boulevard. An overhead electrical easement extends across the site as well.

The property is currently vacant and covered in most areas with a low vegetation growth and some asphaltic pavement. Some vehicles and stored materials were located on the northerly portion of the site.

The site topography is generally flat and drainage appears to sheet flow southerly and westerly into Cajon Boulevard.

Field Exploration

The excavations were completed on September 18, 2017 and testing was completed on that day. The testing consisted of using the double ring infiltrometer at three locations to determine the infiltration rate of the proposed retention/infiltration system. The locations of the tests are shown on the attached Figure 2. The test locations were excavated by backhoe to depths ranging from 5 to 10 feet below existing ground surface (bgs). Excavations were trimmed at 1:1 (horizontal to vertical) inclinations in order to provide safe entry into the excavations. No significant caving occurred to the depths of these test excavations. Detailed descriptions of the subsurface soils are given in the attached test excavations logs in Appendix B. The excavations were backfilled at the conclusion of testing with the soil cuttings and tamped, but were *not* compacted to 90% relative compaction.

In general, the test areas were found to be underlain by surficial fill soils overlying native soils. The soils at test locations consisted of slightly silty SANDS with some gravel and small cobbles. These soils were noted to be medium dense and dry to damp.

Groundwater

Groundwater was not encountered in any of our current test excavations and soil boring placed as a part of our *Geotechnical Investigation* (NorCal report dated October 3, 2017) which extended to a maximum depth of 51.5 feet. Historic high groundwater in the vicinity has been recorded greater than 100 feet below grade at wells in the vicinity, based upon information from the California Department of Water Resources database http://www.water.ca.gov/waterdatalibrary/.

Infiltration Test Procedure

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$Vir = \Delta Vir/(Air\Delta t)$

where:

Vir = inner ring incremental infiltration velocity, cm/hr

ΔVir = volume of water used during time interval to maintain constant head in the inner ring, cm^3

Air = internal area of the inner ting, cm^2

Δt = time interval, hr

The last reading obtained was used for design purposes in each of the basin. The testing data sheets are attached in Appendix B and summarized in the *Discussion of Results* section below.

Discussion of Results

The use of on-site disposal system by means of retention/infiltration basins appears to be geotechnically feasible for future development. The field infiltration rates given below may be utilized in the basin design with a safety factor of 2.0 or greater.

Test No.	Depth (feet bgs)	Soil Type	Infiltration Rate (cm/hr)	Infiltration Rate (in/hr)
T-1	5.0	slightly silty SAND	217	87
T-2	10.0	slightly silty SAND	243	97
T-3	7.5	slightly silty SAND	315	126

It is our opinion that the site is suitable for stormwater infiltration without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated.

This report and all conclusions are subject to the review of the controlling authorities for the project. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This infiltration study has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. All work was performed under the supervision of the Geotechnical Engineer. No other warranty, expressed or implied is made. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager

List of Appendices
(in order of appearance)

Appendix A

Vicinity Map and Test Location Exhibits – Figures 1 and 2

Appendix B

Logs of Test Excavations T-1 to T-3

Field Test Data

Calculations

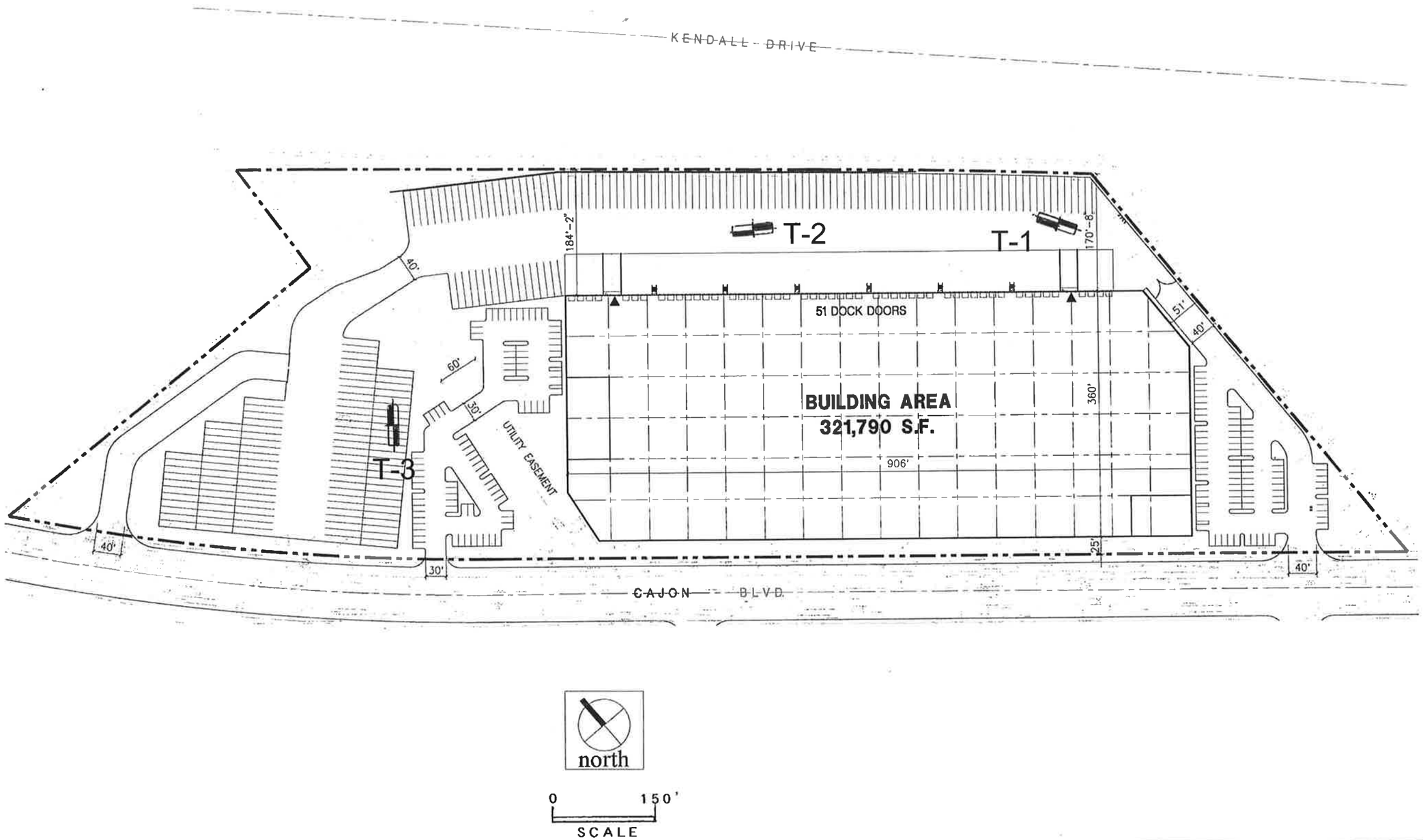
Appendix A

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

VICINITY MAP

PROJECT 19903-17 | DATE 10/2017

FIG. 1



NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

APPROXIMATE LOCATIONS OF SOIL BORINGS

PROJECT 19903-17 | DATE 10/2017

FIG. 2

Appendix B

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL. SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVEL-LY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

- ■ Indicates 2.5-inch Inside Diameter. Ring Sample.
- ☒ Indicates 2-inch OD Split Spoon Sample (SPT).
- ⧅ Indicates Shelby Tube Sample.
- ◫ Indicates No Recovery.
- ◧ Indicates SPT with 140# Hammer 30 in. Drop.
- ✉ Indicates Bulk Sample.
- ◩ Indicates Small Bag Sample.
- ◨ Indicates Non-Standard
- ☒ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Alere Property Group LLC
19903-17

Log of Trench T-1

Boring Location: Cajon Boulevard, County of San Bernardin	
Date of Drilling: 9/18/17	Groundwater Depth: None Encountered
Drilling Method: Drill Rig	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with rootlets, gravel, occasional small cobble Brown, loose, dry					
		NATURAL SOILS Slightly silty (fine to coarse grained) SAND with gravel, occasional small cobbles Light brown, medium dense, dry					
5		Trench completed at depth of 5'					
10							
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\19903-17.log Date: 10/3/2017

NorCal Engineering

Alere Property Group LLC 19903-17	Log of Trench T-2

Boring Location: Cajon Boulevard, County of San Bernardin	
Date of Drilling: 9/18/17	Groundwater Depth: None Encountered
Drilling Method: Drill Rig	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with rootlets, gravel Brown, loose, dry					
		NATURAL SOILS Slightly silty (fine to coarse grained) SAND with gravel, occasional cobbles Light brown, medium dense, dry					
5		GWT not encountered					
10		Trench completed at depth of 10'					
15							
20							
25							
30							
35							

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\19903-17.log Date: 10/3/2017

Alere Property Group LLC
19903-17

Log of Trench T-3

Boring Location: Cajon Boulevard, County of San Bernardin

Date of Drilling: 9/18/17

Groundwater Depth: None Encountered

Drilling Method: Drill Rig

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL SOILS Silty SAND with occasional gravel and some concrete pieces Brown, medium dense, dry					
		NATURAL SOILS Slightly silty (fine to coarse grained) SAND with gravel, occasional small cobbles Light brown, medium dense, damp					
5		GWT not encountered					
		Trench completed at depth of 7.5'					
10							
15							
20							
25							
30							
35							

NorCal Engineering

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\19903-17.log Date: 10/3/2017

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project:	**Alere Property Group**
Project No:	19903-17
Date:	9/18/17
Test No.	T-1
Depth:	5'
Tested By:	J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	8:00			102.0			44.9					
	8:01	1	1	106.4	4.4		50.8	5.9				
2	8:01			98.4			43.4					
	8:02	1	2	103.0	4.6		48.5	5.1				
3	8:02			98.7			42.9					
	8:03	1	3	102.2	3.5		47.7	4.8				
4	8:03			98.6			43.2					
	8:04	1	4	102.2	3.6		47.9	4.7				
5	8:04			98.9			43.8					
	8:05	1	5	102.5	3.6		48.4	4.6				
6	8:05			100.9			44.3					
	8:06	1	6	104.4	3.5		48.9	4.6		210	276	
7	8:06			98.9			42.9					
	8:07	1	7	102.3	3.4		47.8	4.9		204	294	
8	8:07			98.7			43.8					
	8:08	1	8	102.7	4.0		48.5	4.7		240	282	
9	8:08			98.8			43.6					
	8:09	1	9	102.2	3.4		48.0	4.4		204	264	
10	8:09			98.9			43.5					
	8:10	1	10	102.4	3.5		47.8	4.3		210	258	
11	8:10			99.2			42.8					
	8:11	1	11	103.0	3.8		47.2	4.4		228	264	
12	8:11			100.1			43.3					
	8:12	1	12	103.8	3.7		47.7	4.4		222	264	

Average = 217 / 272

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project:	**Alere Property Group**
Project No:	19903-17
Date:	9/18/17
Test No.	T-2
Depth:	10'
Tested By:	J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	9:10			101.4			45.2					
	9:11	1	1	106.4	5.0		50.0	4.8				
2	9:11			98.5			42.0					
	9:12	1	2	104.5	6.0		48.0	6.0				
3	9:12			100.5			43.5					
	9:14	2	4	110.5	10.0		52.5	9.0				
4	9:14			99.5			43.0					
	9:16	2	6	108.5	9.0		52.0	9.0				
5	9:16			99.5			43.0					
	9:18	2	8	108.0	8.5		51.6	8.6				
6	9:18			102.8			46.4					
	9:20	2	10	111.1	8.3		53.6	7.2		249	216	
7	9:20			99.5			43.1					
	9:22	2	12	108.0	8.5		51.5	8.4		255	252	
8	9:22			98.3			41.0					
	9:24	2	14	106.8	8.5		40.5	8.5		255	255	
9	9:24			98.5			41.1					
	9:26	2	16	107.0	8.5		49.5	8.4		255	252	
10	9:26			98.5			41.2					
	9:28	2	18	106.8	8.3		49.5	8.3		249	249	
11	9:28			101.0			43.7					
	9:30	2	20	108.5	7.5		51.2	7.5		225	225	
12	9:30			102.0			45.4					
	9:32	2	22	109.2	7.2		52.8	7.4		216	222	

Average = 243 / 239

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

Project:	**Alere Property Group**
Project No:	19903-17
Date:	9/18/17
Test No.	T-3
Depth:	7.5'
Tested By:	J.S.

	TIME (hr/min)	CHANGE TIME (min)	CUMULATIVE TIME (min)	INNER RING READING (cm)	INNER RING CHANGE	INNER RING FLOW (cc)	OUTER RING READING (cm)	OUTER RING CHANGE (cm)	OUTER RING FLOW (cc)	INNER RING INF RATE (cm/hr)	OUTER RING INF RATE (cm/hr)	INNER RING INF RATE (ft/hr)
1	10:15			102.5			48.0					
	10:16	1	1	105.0	2.5		52.0	4.0				
2	10:16			100.0			44.0					
	10:17	1	2	106.2	6.2		53.0	9.0				
3	10:17			98.5			44.5					
	10:18	1	3	105.2	6.7		51.7	7.2				
4	10:18			98.0			43.5					
	10:19	1	4	104.0	6.0		51.5	8.0				
5	10:19			98.3			42.0					
	10:20	1	5	104.0	5.7		51.4	9.4				
6	10:20			98.5			43.4					
	10:21	1	6	104.0	5.5		50.9	7.5		330	450	
7	10:21			98.0			44.3					
	10:22	1	7	103.9	5.9		51.2	6.9		354	414	
8	10:22			98.5			43.3					
	10:23	1	8	103.7	5.2		51.4	8.1		312	486	
9	10:23			98.3			44.0					
	10:24	1	9	103.4	5.1		51.2	7.2		306	432	
10	10:24			98.6			43.8					
	10:25	1	10	103.2	4.7		51.0	7.2		282	432	
11	10:25			98.0			44.0					
	10:26	1	11	103.3	5.3		51.4	7.4		318	444	
12	10:26			98.6			43.6					
	10:27	1	12	103.6	5.0		51.5	7.9		300	474	

Average = 315 / 447

Attachment G
Hydrologic Conditions of Concern

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

Home Site Map News Organization Search NWS All NOAA Go

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Probable Maximum Precipitation
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NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

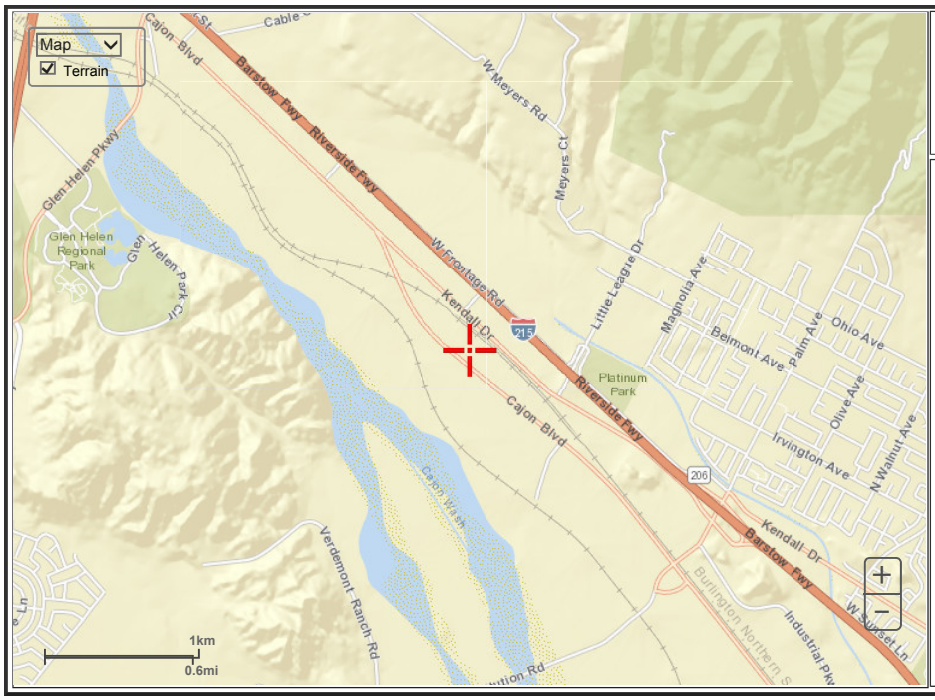
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 34.200433 Longitude: -117.37910 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: San Bernardino, California, USA*
Latitude: 34.2004°
Longitude: -117.3791°
Elevation: 1824.45 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years) 1	2	5	10	25	50	100	200	500	1000
5-min	**0.153** (0.127–0.186)	**0.211** (0.175–0.256)	**0.285** (0.236–0.348)	**0.346** (0.284–0.425)	**0.427** (0.339–0.544)	**0.490** (0.380–0.637)	**0.554** (0.420–0.739)	**0.620** (0.456–0.851)	**0.711** (0.502–1.02)	**0.782** (0.533–1.16)
10-min	**0.219** (0.182–0.266)	**0.302** (0.251–0.367)	**0.409** (0.338–0.499)	**0.495** (0.407–0.610)	**0.612** (0.486–0.780)	**0.702** (0.545–0.914)	**0.794** (0.601–1.06)	**0.889** (0.654–1.22)	**1.02** (0.719–1.46)	**1.12** (0.764–1.66)
15-min	**0.265** (0.220–0.322)	**0.365** (0.303–0.444)	**0.495** (0.409–0.604)	**0.599** (0.492–0.737)	**0.741** (0.587–0.943)	**0.849** (0.659–1.11)	**0.960** (0.727–1.28)	**1.08** (0.791–1.48)	**1.23** (0.869–1.77)	**1.36** (0.924–2.01)
30-min	**0.395** (0.329–0.481)	**0.545** (0.452–0.663)	**0.738** (0.611–0.901)	**0.894** (0.734–1.10)	**1.11** (0.877–1.41)	**1.27** (0.984–1.65)	**1.43** (1.09–1.91)	**1.61** (1.18–2.20)	**1.84** (1.30–2.64)	**2.02** (1.38–3.00)
60-min	**0.600** (0.498–0.729)	**0.826** (0.686–1.01)	**1.12** (0.927–1.37)	**1.36** (1.11–1.67)	**1.68** (1.33–2.13)	**1.92** (1.49–2.50)	**2.17** (1.65–2.90)	**2.43** (1.79–3.34)	**2.79** (1.97–4.00)	**3.07** (2.09–4.55)
2-hr	**0.913** (0.758–1.11)	**1.21** (1.00–1.47)	**1.59** (1.31–1.94)	**1.90** (1.56–2.33)	**2.31** (1.83–2.94)	**2.63** (2.04–3.42)	**2.96** (2.24–3.94)	**3.29** (2.42–4.52)	**3.75** (2.64–5.37)	**4.10** (2.80–6.09)
3-hr	**1.16** (0.967–1.41)	**1.52** (1.26–1.84)	**1.97** (1.63–2.40)	**2.34** (1.92–2.88)	**2.83** (2.25–3.61)	**3.21** (2.49–4.18)	**3.60** (2.72–4.80)	**3.99** (2.94–5.48)	**4.53** (3.20–6.49)	**4.95** (3.37–7.35)
6-hr	**1.73** (1.44–2.10)	**2.22** (1.84–2.70)	**2.85** (2.36–3.48)	**3.36** (2.76–4.14)	**4.05** (3.21–5.16)	**4.57** (3.55–5.95)	**5.10** (3.86–6.80)	**5.64** (4.15–7.74)	**6.37** (4.49–9.12)	**6.93** (4.72–10.3)
12-hr	**2.33**	**3.01**	**3.89**	**4.58**	**5.51**	**6.21**	**6.91**	**7.63**	**8.57**	**9.30**

	(1.94–2.84)	(2.50–3.67)	(3.22–4.74)	(3.76–5.64)	(4.37–7.02)	(4.82–8.08)	(5.24–9.22)	(5.61–10.5)	(6.05–12.3)	(6.33–13.8)
24-hr	**3.17** (2.81–3.65)	**4.17** (3.69–4.81)	**5.44** (4.80–6.29)	**6.46** (5.65–7.53)	**7.80** (6.61–9.40)	**8.82** (7.31–10.8)	**9.82** (7.96–12.4)	**10.8** (8.54–14.0)	**12.2** (9.23–16.5)	**13.2** (9.67–18.5)
2-day	**3.90** (3.45–4.49)	**5.24** (4.64–6.04)	**6.98** (6.16–8.07)	**8.38** (7.33–9.77)	**10.3** (8.70–12.4)	**11.7** (9.72–14.4)	**13.2** (10.7–16.6)	**14.7** (11.6–19.0)	**16.7** (12.6–22.5)	**18.3** (13.4–25.5)
3-day	**4.17** (3.70–4.81)	**5.70** (5.04–6.58)	**7.71** (6.81–8.92)	**9.36** (8.20–10.9)	**11.6** (9.84–14.0)	**13.4** (11.1–16.5)	**15.2** (12.3–19.1)	**17.0** (13.4–22.1)	**19.6** (14.8–26.5)	**21.7** (15.8–30.2)
4-day	**4.45** (3.94–5.12)	**6.15** (5.44–7.10)	**8.41** (7.42–9.72)	**10.3** (8.99–12.0)	**12.8** (10.9–15.5)	**14.9** (12.3–18.3)	**16.9** (13.7–21.3)	**19.1** (15.1–24.8)	**22.2** (16.8–29.9)	**24.6** (18.0–34.3)
7-day	**5.02** (4.45–5.78)	**7.07** (6.25–8.15)	**9.80** (8.64–11.3)	**12.1** (10.6–14.1)	**15.2** (12.9–18.3)	**17.7** (14.7–21.8)	**20.3** (16.4–25.5)	**23.0** (18.1–29.8)	**26.8** (20.2–36.1)	**29.8** (21.8–41.6)
10-day	**5.41** (4.79–6.23)	**7.69** (6.80–8.87)	**10.8** (9.49–12.4)	**13.3** (11.6–15.5)	**16.9** (14.3–20.3)	**19.7** (16.3–24.2)	**22.6** (18.3–28.5)	**25.7** (20.3–33.3)	**30.1** (22.8–40.6)	**33.6** (24.5–46.8)
20-day	**6.52** (5.78–7.51)	**9.40** (8.32–10.8)	**13.3** (11.7–15.4)	**16.6** (14.5–19.4)	**21.3** (18.0–25.7)	**25.0** (20.8–30.8)	**29.0** (23.5–36.5)	**33.2** (26.2–43.0)	**39.1** (29.6–52.8)	**43.9** (32.1–61.3)
30-day	**7.65** (6.78–8.81)	**11.0** (9.75–12.7)	**15.6** (13.8–18.1)	**19.6** (17.1–22.8)	**25.2** (21.4–30.4)	**29.8** (24.7–36.6)	**34.6** (28.0–43.6)	**39.8** (31.3–51.5)	**47.2** (35.7–63.6)	**53.2** (38.9–74.2)
45-day	**9.24** (8.18–10.6)	**13.2** (11.6–15.2)	**18.6** (16.4–21.5)	**23.3** (20.4–27.2)	**30.1** (25.5–36.2)	**35.6** (29.5–43.7)	**41.5** (33.6–52.2)	**47.9** (37.7–62.0)	**57.1** (43.2–77.0)	**64.7** (47.3–90.2)
60-day	**10.8** (9.61–12.5)	**15.2** (13.5–17.6)	**21.3** (18.8–24.7)	**26.7** (23.3–31.1)	**34.4** (29.1–41.4)	**40.7** (33.8–50.1)	**47.5** (38.5–59.9)	**55.0** (43.3–71.2)	**65.8** (49.7–88.7)	**74.8** (54.7–104)

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

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

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

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