Water Quality Management Plan

For:

Industrial Building

NEC OF SANTA ANA AVE AND CHERRY AVE, FONTANA, CA

Prepared for:
BLACK CREEK GROUP
4675 MacArthur Court, Suite 625
Newport Beach, California 92660
(949) 892-4911

Prepared by:
WestLAND Group, Inc.
4150 Concours, Suite 100
Ontario, CA, 91764

Submittal Date: July 1, 2019
Revision Date:
Preliminary Entitlements Complete Date:
Contraction WQMP Complete Date:
Final WQMP (Post Construction) Approved Date:

Approval Date: _____________________
Project Owner’s Certification

This Water Quality Management Plan (WQMP) has been prepared for BLACK CREEK GROUP by WestLAND Group, Inc.. The WQMP is intended to comply with the requirements of the City of Fontana and the NPDES Area wide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County’s Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

“I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors.”

<table>
<thead>
<tr>
<th>Project Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permit/Application Number(s):</td>
</tr>
<tr>
<td>Grading Permit Number(s):</td>
</tr>
<tr>
<td>Tract/Parcel Map Number(s):</td>
</tr>
<tr>
<td>Building Permit Number(s):</td>
</tr>
<tr>
<td>CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner’s Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner Name: Christopher Sanford</td>
</tr>
<tr>
<td>Title: Vice President, Development</td>
</tr>
<tr>
<td>Company: BLACK CREEK GROUP</td>
</tr>
<tr>
<td>Address: 4675 MacArthur Court, Suite 625, Newport Beach CA 92660</td>
</tr>
<tr>
<td>Email: <a href="mailto:christopher.sanford@blackcreekgroup.com">christopher.sanford@blackcreekgroup.com</a></td>
</tr>
<tr>
<td>Telephone #: (949) 892-4911</td>
</tr>
<tr>
<td>Signature: Date</td>
</tr>
</tbody>
</table>
“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.”

<table>
<thead>
<tr>
<th>Engineer: Glenn M. Chung</th>
<th>PE Stamp Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Princpal</td>
</tr>
<tr>
<td>Company</td>
<td>WestLAND Group, Inc.</td>
</tr>
<tr>
<td>Address</td>
<td>4150 Concours, Suite 100</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:gchung@westlandgroup.net">gchung@westlandgroup.net</a></td>
</tr>
<tr>
<td>Telephone #</td>
<td>(909) 989-9789</td>
</tr>
<tr>
<td>Signature</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>6/27/19</td>
</tr>
</tbody>
</table>
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</tr>
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<td>4-20</td>
</tr>
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<td>4-24</td>
</tr>
<tr>
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<td>5-1</td>
</tr>
</tbody>
</table>
## Section 1 Discretionary Permit(s)

### Form 1-1 Project Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name</td>
<td>Santa Ana and Cherry Ave Industrial Site</td>
</tr>
<tr>
<td>Project Owner Contact Name</td>
<td>BLACK CREEK GROUP/ Christopher Sanford</td>
</tr>
<tr>
<td>Mailing Address</td>
<td>4675 MacArthur Court, Suite 625, Newport Beach, CA 92660</td>
</tr>
<tr>
<td>E-mail Address</td>
<td><a href="mailto:christopher.sanford@blackcreekgroup.com">christopher.sanford@blackcreekgroup.com</a></td>
</tr>
<tr>
<td>Telephone</td>
<td>(949) 892-4911</td>
</tr>
<tr>
<td>Permit/Application Number(s)</td>
<td>PAM 19-052</td>
</tr>
<tr>
<td>Tract/Parcel Map Number(s)</td>
<td></td>
</tr>
<tr>
<td>Additional Information/Comments</td>
<td>APN: 0236-122-12 and 0236-122-11</td>
</tr>
<tr>
<td>Description of Project</td>
<td>The proposed development includes an industrial building, with hardscape and landscape improvements, on an approximately 8.9 acres vacant site. The site is located on a NEC of Santa Ana and Cherry Ave in City of Fontana, County of San Bernardino, CA. The proposed lot would be approximately 85% impervious and would utilize CMP Underground Infiltration System for water quality compliance and detention. The system also is designed to mitigate the increased flow (high flow) and infiltrate the stormwater quality volume required runoff (low flow) for entire project site.</td>
</tr>
<tr>
<td>Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.</td>
<td>n/a</td>
</tr>
</tbody>
</table>

1-1
Section 2  Project Description

2.1 Project Information

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

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

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☑ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site

☐ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site

☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532-7534, 7536-7539

☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more

☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more

☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.

☐ Parking lots of 5,000 ft² or more exposed to storm water

☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

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

2 Project Area (ft²): 387,127

3 Number of Dwelling Units:

4 SIC Code: 4214

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

6 Does Project include roads? Yes ☐ No ☑ If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)
2.2 Property Ownership/Management

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

Form 2.2-1 Property Ownership/Management

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

Property Owner:
Christopher Sanford
4675 MacArthur Court, Suite 625
Newport Beach, California 92660
(949) 892-4911

Site to be managed and maintained by the Property Owner. This includes maintenance of all BMP’s, catch basin inspections, maintenance of underground CMP Infiltration System, irrigation, and landscaping until the property is sold or transferred.

No infrastructure will be transferred to Public Agencies.

Refer to Section 5 of this report for the BMP Maintenance Guide.
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).

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Please check: E=Expected, N=Not Expected</th>
<th>Additional Information and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathogens (Bacterial / Virus)</td>
<td>E ☒</td>
<td>Wild Birds &amp; Pet Wast, Garbage</td>
</tr>
<tr>
<td>Nutrients - Phosphorous</td>
<td>E ☒</td>
<td>Fertilizer, Food Waste &amp; Garbage</td>
</tr>
<tr>
<td>Nutrients - Nitrogen</td>
<td>E ☒</td>
<td>Fertilizer &amp; Waste</td>
</tr>
<tr>
<td>Noxious Aquatic Plants</td>
<td>E ☐</td>
<td>There is no Noxious Aquatic Plans on site</td>
</tr>
<tr>
<td>Sediment</td>
<td>E ☒</td>
<td>Parking Lot, Driveway, Rooftope, Sidewalk &amp; Landscape area</td>
</tr>
<tr>
<td>Metals</td>
<td>E ☒</td>
<td>Trucks, Cars &amp; Parking Area</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>E ☒</td>
<td>Leaking Vehicles &amp; Parking Area</td>
</tr>
<tr>
<td>Trash/Debris</td>
<td>E ☒</td>
<td>Poorly Managed Trash Container &amp; Parking Lot</td>
</tr>
<tr>
<td>Pesticides / Herbicides</td>
<td>E ☒</td>
<td>Landscape Area</td>
</tr>
<tr>
<td>Organic Compounds</td>
<td>E ☒</td>
<td>Trucks, Cars &amp; Fertilizers</td>
</tr>
<tr>
<td>Other: Perolem &amp; Hydrocarbones</td>
<td>E ☒</td>
<td>Trucks &amp; Cars</td>
</tr>
<tr>
<td>Other: Slvents</td>
<td>E ☒</td>
<td>Trucks &amp; Cars</td>
</tr>
<tr>
<td>Other:</td>
<td>E ☐</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>E ☐</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>E ☐</td>
<td></td>
</tr>
</tbody>
</table>
### 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 %**

   (Total all credit percentages up to a maximum allowable credit of 50 percent)

<table>
<thead>
<tr>
<th>Description of Water Quality Credit Eligibility (if applicable)</th>
<th>N/A</th>
</tr>
</thead>
</table>

---

2-4
Section 3  Site and Watershed Description
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. **If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.**

---

### Form 3-1  Site Location and Hydrologic Features

<table>
<thead>
<tr>
<th>Site coordinates take GPS measurement at approximate center of site</th>
<th>Latitude 34D03'23&quot;N</th>
<th>Longitude 117D29'16&quot;W</th>
<th>Thomas Bros Map page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 San Bernardino County climatic region: ☑ Valley ☐ Mountain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example only – modify for project specific WQMP using additional form

<table>
<thead>
<tr>
<th>Conveyance</th>
<th>Briefly describe on-site drainage features to convey runoff that is not retained within a DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA1 DMA C flows to DA1 DMA A</td>
<td>Ex. Bioretention overflow to vegetated bioswale with 4’ bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000’ through DMA 1 to existing catch basin on SE corner of property</td>
</tr>
<tr>
<td>DA1 DMA A to Outlet 1</td>
<td>Surface runoff through catch basin &amp; storm drain pipe drains to the underground CMP detention/infiltration system, and then routed to the existing storm drain pipe.</td>
</tr>
<tr>
<td>DA1 DMA B to Outlet 1</td>
<td>Surface runoff through catch basin &amp; storm drain pipe drains to the underground CMP detention/infiltration system, and then routed to the existing storm drain pipe.</td>
</tr>
<tr>
<td>DA2 to Outlet 2</td>
<td></td>
</tr>
<tr>
<td>Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>For Drainage Area 1’s sub-watershed DMA, provide the following characteristics</td>
<td>DMA A</td>
</tr>
<tr>
<td>1 DMA drainage area (ft²)</td>
<td>387,127</td>
</tr>
<tr>
<td>2 Existing site impervious area (ft²)</td>
<td>0</td>
</tr>
<tr>
<td>3 Antecedent moisture condition For desert areas, use <a href="http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf">link</a></td>
<td>2</td>
</tr>
<tr>
<td>4 Hydrologic soil group Refer to Watershed Mapping Tool – <a href="http://sbcounty.permitrack.com/WAP">link</a></td>
<td>A</td>
</tr>
<tr>
<td>5 Longest flowpath length (ft)</td>
<td>500’</td>
</tr>
<tr>
<td>6 Longest flowpath slope (ft/ft)</td>
<td>1.3%</td>
</tr>
<tr>
<td>7 Current land cover type(s) Select from Fig C-3 of Hydrology Manual</td>
<td>Pasture, Dryland</td>
</tr>
<tr>
<td>8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good &gt;75%; Fair 50-75%; Poor &lt;50% Attach photos of site to support rating</td>
<td>Poor</td>
</tr>
</tbody>
</table>
## Form 3-3 Watershed Description for Drainage Area

<table>
<thead>
<tr>
<th>Receiving waters</th>
<th>San Sevaine Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Etiwanda Creek Channel</td>
</tr>
<tr>
<td></td>
<td>Santa Ana River Reach 3</td>
</tr>
<tr>
<td></td>
<td>Prado Basin</td>
</tr>
<tr>
<td></td>
<td>Santa Ana River Reach 2</td>
</tr>
</tbody>
</table>

### Applicable TMDLs

- Project Site: Nutrients, Metals, Oil, Trash & Debris
- Santa Ana Reach 3: Nitrate, Bacteria, Pathogens

### 303(d) listed impairments

- Santa Ana River Reach 3: Copper, Lead and Pathogens
- Prado Dam: Nutrients and Pathogens
- Santa Ana Reach 2: Indicator Bacteria

### Environmentally Sensitive Areas (ESA)

- N/A

### Unlined Downstream Water Bodies

- Santa Ana River, Reach 3, 2, 1

### 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

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Describe BMP Implementation OR, if not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Included</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>N1</td>
<td>Education of Property Owners, Tenants and Occupants on Stormwater BMPs</td>
<td>☒</td>
<td>The property Owner should familiarize him/herself with this WQMP Document content, including BMP educational materials in Sections 5 &amp; 6 of this WQMP Report and shall ensure that all site occupants are also familiar with it.</td>
</tr>
<tr>
<td>N2</td>
<td>Activity Restrictions</td>
<td>☒</td>
<td>The Property Owner shall control the discharge of Storm water pollutants from the Site by restricting the activity and providing training for employees.</td>
</tr>
<tr>
<td>N3</td>
<td>Landscape Management BMPs</td>
<td>☒</td>
<td>Maintenance shall be conducted by a Landscape Contractor on weekly basis to verify that the irrigation system is functioning properly and repairs (if needed) are performed. The Landscape Contractor should also verify that there are no leaks or run-off from landscape areas. Irrigation heads and system run time to be adjusted as needed to prevent overwatering of vegetation. Mowing and trimming to be performed on regular basis. Waste shall be properly removed from the site. Herbicides, pesticides and fertilizers shall be properly applied to prevent storm drain contamination.</td>
</tr>
<tr>
<td>N4</td>
<td>BMP Maintenance</td>
<td>☒</td>
<td>The Owner (or his Maintenance Contractor) shall inspect all proposed BMPs on regular basis for any signs of erosion or sediment &amp; debris built up. Those should be cleaned/repaired as needed (refer to Form 5-1 for BMPs Maintenance).</td>
</tr>
<tr>
<td>N5</td>
<td>Title 22 CCR Compliance (How development will comply)</td>
<td>☒</td>
<td>On site storage of hazardous materials or waste, must comply with Title 22 CCR regulations.</td>
</tr>
<tr>
<td>N6</td>
<td>Local Water Quality Ordinances</td>
<td>☒</td>
<td>The Owner shall comply with the City of Fontana Storm water Ordinance through the implementation of BMPs.</td>
</tr>
<tr>
<td>N7</td>
<td>Spill Contingency Plan</td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td>N8</td>
<td>Underground Storage Tank Compliance</td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td>N9</td>
<td>Hazardous Materials Disclosure Compliance</td>
<td>□</td>
<td>☒</td>
</tr>
<tr>
<td>Identifier</td>
<td>Name</td>
<td>Check One</td>
<td>Describe BMP Implementation OR, if not applicable, state reason</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------</td>
<td>-----------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>N10</td>
<td>Uniform Fire Code Implementation</td>
<td>✓</td>
<td>The site shall conform to the building code requirements for fire safety implementation and all fire code requirements, regardless of product stored.</td>
</tr>
<tr>
<td>N11</td>
<td>Litter/Debris Control Program</td>
<td>✓</td>
<td>The owner shall be responsible for trash and litter to be swept from the site and dumped into a City approved dumpster with lids. The owner shall contract with the city of Ontario or local trash collector to empty dumpsters on a weekly basis. Additionally, ground maintenance personnel shall police the grounds for any litter.</td>
</tr>
<tr>
<td>N12</td>
<td>Employee Training</td>
<td>✓</td>
<td>The owner will ensure that all employees are also familiar with onsite BMPs and necessary maintenance required by the tenants/employees. Owner will check with the City and county at least once a year to obtain new updated educational materials and provide these materials to tenants/employees. Employees shall be trained to cleanup spills and participate in ongoing maintenance. The WQMP requires annual employee training and new hire training within 2 months.</td>
</tr>
<tr>
<td>N13</td>
<td>Housekeeping of Loading Docks</td>
<td>✓</td>
<td>Keep the loading docks free of any clutter (cardboard, shrink wrap, production materials, and broken wooden pallets). Built time for dock housekeeping into each shift.</td>
</tr>
<tr>
<td>N14</td>
<td>Catch Basin Inspection Program</td>
<td>✓</td>
<td>Catch basins shall be inspected semi-annually (by October 1st and February 1st), by owner’s designee. Catch basin sumps shall be vacuumed when sediment or trash becomes 2-inches deep with proper disposal of waste solids. The owner shall clean all catch basins whenever debris, trash or sediment accumulates and shall investigate any suspected illegal dumping into those drains.</td>
</tr>
<tr>
<td>N15</td>
<td>Vacuum Sweeping of Private Streets and Parking Lots</td>
<td>✓</td>
<td>The owner, through its landscape or other maintenance contractor, shall sweep all parking areas and drive aisles within the project every month, or more often as needed. Debris, sediment and trash picked up during sweeping operations shall be deposited off-site or in the on-site dumpster.</td>
</tr>
<tr>
<td>N16</td>
<td>Other Non-structural Measures for Public Agency Projects</td>
<td></td>
<td>No public agency projects associated, this is a private project</td>
</tr>
<tr>
<td>N17</td>
<td>Comply with all other applicable NPDES permits</td>
<td>[x]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Identifier</td>
<td>Name</td>
<td>Include</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>S1</td>
<td>Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)</td>
<td>☑️</td>
<td>☐</td>
</tr>
<tr>
<td>S2</td>
<td>Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)</td>
<td>☐</td>
<td>☑️</td>
</tr>
<tr>
<td>S3</td>
<td>Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)</td>
<td>☑️</td>
<td>☐</td>
</tr>
<tr>
<td>S4</td>
<td>Use efficient irrigation systems &amp; landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)</td>
<td>☑️</td>
<td>☐</td>
</tr>
<tr>
<td>S5</td>
<td>Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement</td>
<td>☑️</td>
<td>☐</td>
</tr>
<tr>
<td>S6</td>
<td>Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)</td>
<td>☐</td>
<td>☑️</td>
</tr>
<tr>
<td>S7</td>
<td>Covered dock areas (CASQA New Development BMP Handbook SD-31)</td>
<td>☐</td>
<td>☑️</td>
</tr>
<tr>
<td>S8</td>
<td>Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)</td>
<td>☐</td>
<td>☑️</td>
</tr>
<tr>
<td>S9</td>
<td>Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)</td>
<td>☐</td>
<td>☑️</td>
</tr>
</tbody>
</table>
## Water Quality Management Plan (WQMP)

### Form 4.1-2 Structural Source Control BMPs

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Describe BMP Implementation OR, If not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>S10</td>
<td>Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)</td>
<td></td>
<td>n/a</td>
</tr>
<tr>
<td>S11</td>
<td>Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)</td>
<td>❌</td>
<td>No equipment wash area on site. Owner will not allow outdoor processing area on this site</td>
</tr>
<tr>
<td>S12</td>
<td>Fueling areas (CASQA New Development BMP Handbook SD-30)</td>
<td>❌</td>
<td>No fueling area onsite. Owner will not allow fueling area on this site.</td>
</tr>
<tr>
<td>S13</td>
<td>Hillside landscaping (CASQA New Development BMP Handbook SD-10)</td>
<td>❌</td>
<td>No hillside on site</td>
</tr>
<tr>
<td>S14</td>
<td>Wash water control for food preparation areas</td>
<td>❌</td>
<td>No food preparation area on site</td>
</tr>
<tr>
<td>S15</td>
<td>Community car wash racks (CASQA New Development BMP Handbook SD-33)</td>
<td>❌</td>
<td>No community car wash racks on site</td>
</tr>
</tbody>
</table>
4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

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

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

### Form 4.1-3 Preventative LID Site Design Practices Checklist

<table>
<thead>
<tr>
<th>Site Design Practices</th>
<th>Yes</th>
<th>No</th>
<th>n/a</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize impervious areas:</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>Landscape areas are incorporated into the Site Plan design.</td>
</tr>
<tr>
<td>Maximize natural infiltration capacity:</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Runoff will be infiltrated using underground infiltration system.</td>
</tr>
<tr>
<td>Preserve existing drainage patterns and time of concentration:</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>The entire site is being redeveloped.</td>
</tr>
<tr>
<td>Disconnect impervious areas:</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>Site runoff (low flow) will be collected in the underground infiltration system, and the high flow will be discharged into MS4.</td>
</tr>
<tr>
<td>Protect existing vegetation and sensitive areas:</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>The entire site is being redeveloped.</td>
</tr>
<tr>
<td>Re-vegetate disturbed areas:</td>
<td>☐</td>
<td>☚</td>
<td>☐</td>
<td>Areas not covered by pavement or building will be stabilized with landscape.</td>
</tr>
<tr>
<td>Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas:</td>
<td>☐</td>
<td>☚</td>
<td>☐</td>
<td>There are no retention/infiltration basing nor trenches proposed within the site.</td>
</tr>
<tr>
<td>Utilize vegetated drainage swales in place of underground piping or imperviously lined swales:</td>
<td>☐</td>
<td>☚</td>
<td>☒</td>
<td>Vegetated swales are not proposed.</td>
</tr>
<tr>
<td>Stake off areas that will be used for landscaping to minimize compaction during construction:</td>
<td>☐</td>
<td>☚</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

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

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

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the \( P_6 \) method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1

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

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

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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project area DA 1 (ft(^2))</td>
<td>387,126</td>
</tr>
<tr>
<td>2</td>
<td>Imperviousness after applying preventative site design practices (Imp%):</td>
<td>85</td>
</tr>
<tr>
<td>3</td>
<td>Runoff Coefficient (Rc):</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>( R_c = 0.858(\text{Imp%})^3 - 0.78(\text{Imp%})^2 + 0.774(\text{Imp%}) + 0.04 )</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Determine 1-hour rainfall depth for a 2-year return period ( P_{2yr-1hr} ) (in):</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td><a href="http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html">http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html</a></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Compute ( P_6 ), Mean 6-hr Precipitation (inches):</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>( P_6 = \text{Item 4} \times 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)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Drawdown Rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24-hrs</td>
<td>48-hrs</td>
</tr>
<tr>
<td>7</td>
<td>Compute design capture volume, DCV (ft(^3)):</td>
<td>32,057</td>
</tr>
<tr>
<td></td>
<td>( DCV = \frac{1}{12} \times \text{Item 1} \times \text{Item 3} \times \text{Item 5} \times C_2 ), where ( C_2 ) is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2</td>
<td></td>
</tr>
</tbody>
</table>
**Form 4.2-2 Summary of HCOC Assessment (DA 1)**

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

Go to:  [http://sbcounty.permitrack.com/WAP](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.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Runoff Volume (ft³)</th>
<th>Time of Concentration (min)</th>
<th>Peak Runoff (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-developed</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Form 4.2-3 Item 12</td>
<td>Form 4.2-4 Item 13</td>
<td>Form 4.2-5 Item 10</td>
</tr>
<tr>
<td>Post-developed</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Form 4.2-3 Item 13</td>
<td>Form 4.2-4 Item 14</td>
<td>Form 4.2-5 Item 14</td>
</tr>
<tr>
<td>Difference</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Item 4 – Item 1</td>
<td>Item 2 – Item 5</td>
<td>Item 6 – Item 3</td>
</tr>
<tr>
<td>Difference</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>(as % of pre-developed)</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Item 7 / Item 1</td>
<td>Item 8 / Item 2</td>
<td>Item 9 / Item 3</td>
</tr>
<tr>
<td>Weighted Curve Number Determination for:</td>
<td>DMA A</td>
<td>DMA B</td>
<td>DMA C</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Pre-developed DA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1a Land Cover type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2a Hydrologic Soil Group (HSG)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3a DMA Area, ft² sum of areas of DMA should equal area of DA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4a Curve Number (CN) use items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weighted Curve Number Determination for:</th>
<th>DMA A</th>
<th>DMA B</th>
<th>DMA C</th>
<th>DMA D</th>
<th>DMA E</th>
<th>DMA F</th>
<th>DMA G</th>
<th>DMA H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-developed DA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1b Land Cover type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2b Hydrologic Soil Group (HSG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3b DMA Area, ft² sum of areas of DMA should equal area of DA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4b Curve Number (CN) use items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 5 Pre-Developed area-weighted CN:     |       |       |       |       |       |       |       |       |
| S (in):                               |       |       |       |       |       |       |       |       |
| $S = \frac{1000}{Item\ 5} - 10$      |       |       |       |       |       |       |       |       |

| 6 Post-Developed area-weighted CN:    |       |       |       |       |       |       |       |       |
| S (in):                               |       |       |       |       |       |       |       |       |
| $S = \frac{1000}{Item\ 6} - 10$      |       |       |       |       |       |       |       |       |

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

| 12 Pre-developed Volume (ft³):         |       |       |       |       |       |       |       |       |
| $V_{pre} = \frac{1}{12} \times (Item\ sum\ of\ Item\ 3) \times \frac{[(Item\ 11 - Item\ 9)\times 2]}{(Item\ 11 - Item\ 9 + Item\ 7)}$ |       |       |       |       |       |       |       |       |

| 13 Post-developed Volume (ft³):        |       |       |       |       |       |       |       |       |
| $V_{pre} = \frac{1}{12} \times (Item\ sum\ of\ Item\ 3) \times \frac{[(Item\ 11 - Item\ 10)\times 2]}{(Item\ 11 - Item\ 10 + Item\ 8)}$ |       |       |       |       |       |       |       |       |

| 14 Volume Reduction needed to meet HCOC Requirement, (ft³): |       |       |       |       |       |       |       |       |
| $V_{HCOC} = (Item\ 13 \times 0.95) - Item\ 12$ |       |       |       |       |       |       |       |       |
Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

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

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-developed DA1</th>
<th>Post-developed DA1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMA A</td>
<td>DMA B</td>
</tr>
<tr>
<td>1 Length of flowpath (ft) Use Form 3-2 Item 5 for pre-developed condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Change in elevation (ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Slope (ft/ft), ( S_0 = \frac{\text{Item 2}}{\text{Item 1}} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Land cover</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Initial DMA Time of Concentration (min) Appendix C-1 of the TGD for WQMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Length of conveyance from DMA outlet to project site outlet (ft) May be zero if DMA outlet is at project site outlet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Cross-sectional area of channel (ft(^2))</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Wetted perimeter of channel (ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Manning's roughness of channel (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Channel flow velocity (ft/sec) ( V_{fs} = \frac{1.49}{\text{Item 9}} \times \left( \frac{\text{Item 7}}{\text{Item 8}} \right)^{0.67} \times \left( \frac{\text{Item 3}}{10} \right)^{0.5} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Travel time to outlet (min) ( T_t = \frac{\text{Item 6}}{\text{Item 10} \times 60} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Total time of concentration (min) ( T_c = \text{Item 5} + \text{Item 11} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Pre-developed time of concentration (min): Minimum of Item 12 pre-developed DMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Post-developed time of concentration (min): Minimum of Item 12 post-developed DMA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Additional time of concentration needed to meet HCOC requirement (min): ( T_{c,Hcoc} = (\text{Item 13} \times 0.95) - \text{Item 14} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-developed DA to Project Outlet (Use additional forms if more than 3 DMA)</th>
<th>Post-developed DA to Project Outlet (Use additional forms if more than 3 DMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DMA A</td>
<td>DMA B</td>
</tr>
<tr>
<td>1 Rainfall Intensity for storm duration equal to time of concentration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{peak} = 10^{\log \text{Form 4.2-1 Item 4 - 0.6 \log \text{Form 4.2-4 Item 5}}/60}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Drainage Area of each DMA (Acres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Ratio of pervious area to total area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Pervious area infiltration rate (in/hr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Maximum loss rate (in/hr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F_m = \text{Item 3} \times \text{Item 4}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use area-weighted $F_m$ from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Peak Flow from DMA (cfs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_p = \text{Item 2} \times 0.9 \times (\text{Item 1} - \text{Item 5})$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Time of concentration adjustment factor for other DMA to site discharge point</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMA A</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>DMA B</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>DMA C</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>8 Pre-developed $Q_p$ at $T_c$ for DMA A:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_p = \text{Item 6}<em>{DMAA} + [\text{Item 6}</em>{DMAA} \times (\text{Item 1}<em>{DMAA} - \text{Item 5}</em>{DMAA})/\text{Item 1}<em>{DMAA} - \text{Item 5}</em>{DMAA})] + [\text{Item 6}<em>{DMAA} \times (\text{Item 1}</em>{DMAA} - \text{Item 5}<em>{DMAA})/\text{Item 1}</em>{DMAA} - \text{Item 5}_{DMAA})] +$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$[\text{Item 6}<em>{DMAA} \times (\text{Item 1}</em>{DMAA} - \text{Item 5}<em>{DMAA})/\text{Item 1}</em>{DMAA} - \text{Item 5}<em>{DMAA})] + [\text{Item 6}</em>{DMAA} \times (\text{Item 1}<em>{DMAA} - \text{Item 5}</em>{DMAA})/\text{Item 1}<em>{DMAA} - \text{Item 5}</em>{DMAA})]$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Pre-developed $Q_p$ at $T_c$ for DMA B:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_p = \text{Item 6}<em>{DMAB} + [\text{Item 6}</em>{DMAB} \times (\text{Item 1}<em>{DMAB} - \text{Item 5}</em>{DMAB})/\text{Item 1}<em>{DMAB} - \text{Item 5}</em>{DMAB})] + [\text{Item 6}<em>{DMAB} \times (\text{Item 1}</em>{DMAB} - \text{Item 5}<em>{DMAB})/\text{Item 1}</em>{DMAB} - \text{Item 5}_{DMAB})] +$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$[\text{Item 6}<em>{DMAB} \times (\text{Item 1}</em>{DMAB} - \text{Item 5}<em>{DMAB})/\text{Item 1}</em>{DMAB} - \text{Item 5}<em>{DMAB})] + [\text{Item 6}</em>{DMAB} \times (\text{Item 1}<em>{DMAB} - \text{Item 5}</em>{DMAB})/\text{Item 1}<em>{DMAB} - \text{Item 5}</em>{DMAB})]$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Pre-developed $Q_p$ at $T_c$ for DMA C:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_p = \text{Item 6}<em>{DMAC} + [\text{Item 6}</em>{DMAC} \times (\text{Item 1}<em>{DMAC} - \text{Item 5}</em>{DMAC})/\text{Item 1}<em>{DMAC} - \text{Item 5}</em>{DMAC})] + [\text{Item 6}<em>{DMAC} \times (\text{Item 1}</em>{DMAC} - \text{Item 5}<em>{DMAC})/\text{Item 1}</em>{DMAC} - \text{Item 5}_{DMAC})] +$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$[\text{Item 6}<em>{DMAC} \times (\text{Item 1}</em>{DMAC} - \text{Item 5}<em>{DMAC})/\text{Item 1}</em>{DMAC} - \text{Item 5}<em>{DMAC})] + [\text{Item 6}</em>{DMAC} \times (\text{Item 1}<em>{DMAC} - \text{Item 5}</em>{DMAC})/\text{Item 1}<em>{DMAC} - \text{Item 5}</em>{DMAC})]$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Peak runoff from pre-developed condition confluence analysis (cfs):</td>
<td>Maximum of Item 8, 9, and 10 (including additional forms as needed)</td>
<td></td>
</tr>
<tr>
<td>12 Post-developed $Q_p$ at $T_c$ for DMA A:</td>
<td>Same as Item 8 for post-developed values</td>
<td></td>
</tr>
<tr>
<td>13 Post-developed $Q_p$ at $T_c$ for DMA B:</td>
<td>Same as Item 9 for post-developed values</td>
<td></td>
</tr>
<tr>
<td>14 Peak runoff from post-developed condition confluence analysis (cfs):</td>
<td>Maximum of Item 11, 12, and 13 (including additional forms as needed)</td>
<td></td>
</tr>
<tr>
<td>15 Peak runoff reduction needed to meet HCOC Requirement (cfs):</td>
<td>$Q_{p-HCOC} = (\text{Item 14} \times 0.95) - \text{Item 10}$</td>
<td></td>
</tr>
</tbody>
</table>
4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

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

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

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is “Yes,” provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

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

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment.**
### Form 4.3-1 Infiltration BMP Feasibility (DA 1)

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

1. Would infiltration BMP pose significant risk for groundwater related concerns?  
   - Yes ☐  No ☒
   
   Refer to Section 5.3.2.1 of the TGD for WQMP
   
   If Yes, Provide basis: (attach)

2. Would installation of infiltration BMP significantly increase the risk of geotechnical hazards?  
   - Yes ☐  No ☒
   
   (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):
   - The location is less than 50 feet away from slopes steeper than 15 percent
   - The location is less than eight feet from building foundations or an alternative setback.
   - A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
   
   If Yes, Provide basis: (attach)

3. Would infiltration of runoff on a Project site violate downstream water rights?  
   - Yes ☐  No ☒
   
   If Yes, Provide basis: (attach)

4. Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils?  
   - Yes ☐  No ☒
   
   If Yes, Provide basis: (attach)

5. Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)?  
   - Yes ☐  No ☒
   
   If Yes, Provide basis: (attach)

6. Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses?  
   - Yes ☐  No ☒
   
   See Section 3.5 of the TGD for WQMP and WAP
   
   If Yes, Provide basis: (attach)

7. Any answer from Item 1 through Item 3 is “Yes”:  
   - Yes ☐  No ☒
   
   If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

8. Any answer from Item 4 through Item 6 is “Yes”:  
   - Yes ☐  No ☒
   
   If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
   
   If no, then proceed to Item 9, below.

9. All answers to Item 1 through Item 6 are “No”:  
   
   Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
   
   Proceed to Form 4.3-2, Hydrologic Source Control BMP.
4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>DA</th>
<th>DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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 ☒</td>
<td>DA BMP Type</td>
<td>DMA BMP Type</td>
</tr>
<tr>
<td>2</td>
<td>Total impervious area draining to pervious area (ft²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ratio of pervious area receiving runoff to impervious area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Retention volume achieved from impervious area dispersion (ft³): ( V = \text{Item 2 } \times \text{Item 3 } \times (0.5/12), \text{ assuming retention of 0.5 inches of runoff} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sum of retention volume achieved from impervious area dispersion (ft³): ( V_{\text{retention}} = \text{Sum of Item 4 for all BMPs} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>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</td>
<td>DA BMP Type</td>
<td>DMA BMP Type</td>
</tr>
<tr>
<td>7</td>
<td>Ponding surface area (ft²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ponding depth (ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Surface area of amended soil/gravel (ft²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Average depth of amended soil/gravel (ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Average porosity of amended soil/gravel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Retention volume achieved from on-lot infiltration (ft³): ( V_{\text{retention}} = (\text{Item 7 } \times \text{Item 8}) + (\text{Item 9 } \times \text{Item 10 } \times \text{Item 11}) )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Runoff volume retention from on-lot infiltration (ft³): ( V_{\text{retention}} = \text{Sum of Item 12 for all BMPs} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>DA</th>
<th>DMA</th>
<th>DA</th>
<th>DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14</strong></td>
<td>Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes [ ] No ☒</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, complete Items 15-20. If no, proceed to Item 21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Rooftop area planned for ET BMP (ft³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16</strong></td>
<td>Average wet season ET demand (in/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use local values, typical ≈ 0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>17</strong></td>
<td>Daily ET demand (ft³/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item 15 * (Item 16 / 12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>18</strong></td>
<td>Drawdown time (hrs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Copy Item 6 in Form 4.2-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19</strong></td>
<td>Retention Volume (ft³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Item 17} \times (\text{Item 18} / 24) )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>20</strong></td>
<td>Runoff volume retention from evapotranspiration BMPs (ft³):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Sum of Item 19 for all BMPs} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>21</strong></td>
<td>Implementation of Street Trees: Yes [ ] No ☒</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, complete Items 22-25. If no, proceed to Item 26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>22</strong></td>
<td>Number of Street Trees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>23</strong></td>
<td>Average canopy cover over impervious area (ft²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>24</strong></td>
<td>Runoff volume retention from street trees (ft³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Item 22} \times \text{Item 23} \times (0.05 / 12) ) assume runoff retention of 0.05 inches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>25</strong></td>
<td>Runoff volume retention from street tree BMPs (ft³):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Sum of Item 24 for all BMPs} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>26</strong></td>
<td>Implementation of residential rain barrel/cisterns: Yes [ ] No ☒</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>If yes, complete Items 27-29. If no, proceed to Item 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>27</strong></td>
<td>Number of rain barrels/cisterns</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>28</strong></td>
<td>Runoff volume retention from rain barrels/cisterns (ft³)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Item 27} \times 3 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29</strong></td>
<td>Runoff volume retention from residential rain barrels/Cisterns (ft³):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{retention} = \text{Sum of Item 28 for all BMPs} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>30</strong></td>
<td>Total Retention Volume from Site Design Hydrologic Source Control BMPs:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \text{Sum of Items 5, 13, 20, 25 and 29} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3.2 Infiltration BMPs

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

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

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).
### Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

<p>|   | Remaining LID DCV not met by site design HSC BMP (ft²): 32,057 | V&lt;sub&gt;retained&lt;/sub&gt; = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 |</p>
<table>
<thead>
<tr>
<th></th>
<th><strong>BMP Type</strong> Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs</th>
<th><strong>DA 1 DMA A</strong> BMP Type CMP Underground Infiltration System</th>
<th><strong>DA 1 DMA B</strong> BMP Type CMP Underground Infiltration System</th>
<th><strong>DA</strong> BMP Type (Use additional forms for more BMPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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</td>
<td>17</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>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</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Infiltration safety factor See TGD Section 5.4.2 and Appendix D</td>
<td>8.5</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Design percolation rate (in/hr) P&lt;sub&gt;design&lt;/sub&gt; = Item 2 / Item 3</td>
<td>48</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ponded water drawdown time (hr) Copy Item 6 in Form 4.2-1</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP design details</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Ponding Depth (ft) d&lt;sub&gt;pond&lt;/sub&gt; = Minimum of (1/12<em>Item 4</em>Item 5) or Item 6</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Infiltrating surface area, SA&lt;sub&gt;BMP&lt;/sub&gt; (ft²) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Amended soil depth, d&lt;sub&gt;media&lt;/sub&gt; (ft) Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Amended soil porosity</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Gravel depth, d&lt;sub&gt;media&lt;/sub&gt; (ft) Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Gravel porosity</td>
<td>40%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Duration of storm as basin is filling (hrs) Typical ~ 3hrs</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Above Ground Retention Volume (ft³) V&lt;sub&gt;retained&lt;/sub&gt; = Item 8 * [Item 7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Underground Retention Volume (ft³) Volume determined using manufacturer’s specifications and calculations</td>
<td>25,491</td>
<td>6,647</td>
<td></td>
</tr>
</tbody>
</table>

**Formulas and Calculations:**
- **V<sub>retained</sub>** = Item 7 - Form 4.3-2 Item 30
- **P<sub>design</sub>** = Item 2 / Item 3
- **d<sub>pond</sub>** = Minimum of (1/12*Item 4*Item 5) or Item 6
- **SA<sub>BMP</sub>** = the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP
- **d<sub>media</sub>** = Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details
- **V<sub>retained</sub>** = Item 8 * [Item 7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]
- **V<sub>underground</sub>** = Volume determined using manufacturer’s specifications and calculations

**Water Quality Management Plan (WQMP)**

**Appendix D of the TGD for WQMP for minimum requirements for (Item 9 * Item 10) + (Item 11 * Item 12)**

See Table 5-4 in the TGD for WQMP for reference to BMP design details and assessment methods.

**Form 4-2-1**
- **V<sub>retained</sub>** = Item 7
- **P<sub>design</sub>** = Item 2 / Item 3

**Form 4-3-2**
- **V<sub>retained</sub>** = Item 7 - Form 4.3-2 Item 30
- **P<sub>design</sub>** = Item 2 / Item 3
- **d<sub>pond</sub>** = Minimum of (1/12*Item 4*Item 5) or Item 6

**Fraction of DCV achieved with infiltration BMP: 100% Retention% = Item 16 / Form 4.2-1 Item 7**

**Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs? Yes □ No X**

If yes, demonstrate conformance using Form 4.3-10; if no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.
4.3.3 Harvest and Use BMP

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

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

Form 4.3-4 Harvest and Use BMPs (DA 1)

<table>
<thead>
<tr>
<th></th>
<th>Remaining LID DCV not met by site design HSC or infiltration BMP (ft³): N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( V_{\text{unmet}} = \text{Form 4.2-1 Item 7} - \text{Form 4.3-2 Item 30} - \text{Form 4.3-3 Item 16} )</td>
</tr>
<tr>
<td></td>
<td><strong>BMP Type(s)</strong> Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs</td>
</tr>
<tr>
<td>DA</td>
<td>DMA</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>BMP Type</td>
<td>BMP Type</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Describe cistern or runoff detention facility</td>
</tr>
<tr>
<td>3</td>
<td>Storage volume for proposed detention type (ft³) Volume of cistern</td>
</tr>
<tr>
<td>4</td>
<td>Landscaped area planned for use of harvested stormwater (ft²)</td>
</tr>
<tr>
<td>5</td>
<td>Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day</td>
</tr>
<tr>
<td>6</td>
<td>Daily water demand (ft³/day) Item 4 * (Item 5 / 12)</td>
</tr>
<tr>
<td>7</td>
<td>Drawdown time (hrs) Copy Item 6 from Form 4.2-1</td>
</tr>
<tr>
<td>8</td>
<td>Retention Volume (ft³) ( V_{\text{retention}} = \text{Minimum of (Item 3) or (Item 6 * (Item 7 / 24))} )</td>
</tr>
<tr>
<td>9</td>
<td>Total Retention Volume (ft³) from Harvest and Use BMP Sum of Item 8 for all harvest and use BMP included in plan</td>
</tr>
<tr>
<td>10</td>
<td>Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☐ No ☐</td>
</tr>
</tbody>
</table>

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 (DA 1)

<table>
<thead>
<tr>
<th>1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft³):</th>
<th>0</th>
<th>List pollutants of concern</th>
<th>Copy from Form 2.3-1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Volume biotreated in volume based biotreatment BMP (ft³):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft³):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Flow-based biotreatment BMP capacity provided (cfs):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Metrics for MEP determination:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development:  
If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*
### Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

<table>
<thead>
<tr>
<th>Biotreatment BMP Type</th>
<th>DA</th>
<th>DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)</td>
<td>DA BMP Type</td>
<td>DMA BMP Type</td>
</tr>
</tbody>
</table>

1. Pollutants addressed with BMP: List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP.

2. Amended soil infiltration rate: Typical ~ 5.0

3. Amended soil infiltration safety factor: Typical ~ 2.0

4. Amended soil design percolation rate (in/hr) \( P_{\text{design}} = \frac{\text{Item 2}}{\text{Item 3}} \)

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) \( d_{\text{BMP}} = \text{Minimum of} \left( \frac{1}{12} \times \text{Item 4} \times \text{Item 5} \right) \text{ or Item 6} \)

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\(^3\)) \( V_{\text{biotreated}} = \text{Item 8} \times \left[ \frac{\text{Item 7}}{2} + \text{Item 9} \times \text{Item 10} + \left( \text{Item 11} \times \text{Item 12} \right) + \left( \text{Item 13} \times \left( \frac{\text{Item 4}}{12} \right) \right) \right] \)

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 (DA 1) – Constructed Wetlands and Extended Detention

<table>
<thead>
<tr>
<th>Biotreatment BMP Type</th>
<th>( V )</th>
<th>DA</th>
<th>DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>( V_{biotreated} = (Item 8_{forebay} + Item 8_{basin}) + (Item 12 * Item 11 * 3600) )</td>
<td>Forebay</td>
<td>Basin</td>
</tr>
</tbody>
</table>

1. Pollutants addressed with BMP forebay and basin
   - List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP

2. Bottom width (ft)

3. Bottom length (ft)

4. Bottom area \( (ft^2) \) \( A_{bottom} = Item 2 * Item 3 \)

5. Side slope (ft/ft)

6. Depth of storage (ft)

7. Water surface area \( (ft^2) \) \( A_{surface} = (Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6)) \)

8. Storage volume \( (ft^3) \) For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details
   - \( V = Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^{0.5}] \)

9. Drawdown Time (hrs) Copy Item 6 from Form 2.1

10. Outflow rate (cfs) \( Q_{BMP} = (Item 8_{forebay} + Item 8_{basin}) / (Item 9 * 3600) \)

11. Duration of design storm event (hrs)

12. Biotreated Volume \( (ft^3) \) \( V_{biotreated} = (Item 8_{forebay} + Item 8_{basin}) + (Item 10 * Item 11 * 3600) \)

13. Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention:
   - \( (Sum\ of\ Item 12\ for\ all\ BMP\ included\ in\ plan) \)
### Form 4.3-8 Flow Based Biotreatment (DA 1)

<table>
<thead>
<tr>
<th>Biotreatment BMP Type</th>
<th>DA</th>
<th>DMA</th>
<th>DA</th>
<th>DMA</th>
<th>DA</th>
<th>DMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetated swale, vegetated filter strip, or other comparable proprietary BMP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Pollutants addressed with BMP**
   - List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5

2. **Flow depth for water quality treatment (ft)**
   - BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details

3. **Bed slope (ft/ft)**
   - BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details

4. **Manning’s roughness coefficient**

5. **Bottom width (ft)**
   - \[ b_w = \frac{\text{Form 4.3-5 Item 6} \times \text{Item 4}}{1.49 \times \text{Item 2}^{1.67} \times \text{Item 3}^{0.5}} \]

6. **Side Slope (ft/ft)**
   - BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details

7. **Cross sectional area (ft}^2\]
   - \[ A = (\text{Item 5} + \text{Item 2}) + (\text{Item 6} \times \text{Item 2}^{2}) \]

8. **Water quality flow velocity (ft/sec)**
   - \[ V = \frac{\text{Form 4.3-5 Item 6}}{\text{Item 7}} \]

9. **Hydraulic residence time (min)**
   - Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details

10. **Length of flow based BMP (ft)**
    - \[ L = \text{Item 8} \times \text{Item 9} \times 60 \]

11. **Water surface area at water quality flow depth (ft}^2\]
    - \[ SA_{\text{top}} = (\text{Item 5} + (2 \times \text{Item 2} \times \text{Item 6})) \times \text{Item 10} \]
4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

<table>
<thead>
<tr>
<th>Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
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<td></td>
</tr>
</tbody>
</table>
## 4.3.6 Hydromodification Control BMP

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

### Form 4.3-10 Hydromodification Control BMPs (DA 1)

<table>
<thead>
<tr>
<th></th>
<th>Volume reduction needed for HCOC performance criteria (ft$^3$): Form 4.2-2 Item 4 * 0.95 – Form 4.2-2 Item 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft$^3$): Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction</td>
</tr>
<tr>
<td>3</td>
<td>Remaining volume for HCOC volume capture (ft$^3$): Item 1 – Item 2</td>
</tr>
<tr>
<td>4</td>
<td>Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft$^3$): Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)</td>
</tr>
<tr>
<td>5</td>
<td>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</td>
</tr>
<tr>
<td>6</td>
<td>Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐</td>
</tr>
<tr>
<td></td>
<td>If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐</td>
</tr>
<tr>
<td></td>
<td>• 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)</td>
</tr>
<tr>
<td></td>
<td>• 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 ☐</td>
</tr>
<tr>
<td></td>
<td>• 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 ☐</td>
</tr>
<tr>
<td>7</td>
<td>Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐</td>
</tr>
<tr>
<td></td>
<td>If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐</td>
</tr>
<tr>
<td></td>
<td>• 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)</td>
</tr>
<tr>
<td></td>
<td>• 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 ☐</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>BMP</th>
<th>Responsible Party(s)</th>
<th>Inspection/ Maintenance Activities Required</th>
<th>Minimum Frequency of Activities</th>
</tr>
</thead>
</table>
| **N14**  
Catch Basin/ filter insert Inspection | By owner & future owner | Inspect for illegal dumping and/or debris accumulation. Clean filters whenever 25% of filter capacity is exceeded by debris accumulation | Inspect minimum 2 times per year and after every major storm event |
| **N4**  
Underground CMP Detention/Infiltration System | By owner & future owner | Inspect the underground CMP via the access manhole, for accumulated sediment and debris levels and cleanout solids when > 6” build up occurs. Inspect for standing water within 48 hours of heavy rain events to ensure proper drawdown. Clean and flush underground systems to restore free drainage. | Annually, and after heavy rains |
| **N3**  
Landscape Areas | By owner & future owner | Implement - Mowing, Trimming, Pruning practices to prevent discharges of landscape waste into on-site retention structures. Control fertilizer, herbicide & pesticide applications to prevent stormwater contamination | Weekly |
| **S1**  
Signage & Stencil | By owner & future owner | Clean the stencil/signage surface to remove any excess dirt. Re-paint if necessary. | Annually |
| **N11**  
Trash Cans | By owner & future owner | Empty trash receptacles. Clean the areas around Cans by sweeping. | Weekly |
<table>
<thead>
<tr>
<th>ID</th>
<th>Activity</th>
<th>Responsible</th>
<th>Details</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>Education of Property Tenants</td>
<td>By Owner</td>
<td>The Property Owner/Tenant should familiarize him/herself with this WQMP Document.</td>
<td>Once</td>
</tr>
<tr>
<td>N2</td>
<td>Activity Restrictions</td>
<td>By Owner</td>
<td>Control Discharge of storm drain water pollutants from the Site by restricting activity and training employees</td>
<td>Monthly</td>
</tr>
<tr>
<td>N13</td>
<td>House Keeping of loading docs</td>
<td>By Owner</td>
<td>Keep the loading docks free of any clutter</td>
<td>Weekly</td>
</tr>
<tr>
<td>N15</td>
<td>Parking Lot Sweeping</td>
<td>By Owner</td>
<td>Parking lots and dive aisles shall be vacuumed and swept. Debris collected to be despised off-site or in the on-site dumpster</td>
<td>Monthly</td>
</tr>
<tr>
<td>S4</td>
<td>Efficient Irrigation</td>
<td>By Owner</td>
<td>Irrigation to be consistent with State Water Model Efficient Landscape Ordinances and City of Fontana Landscape Development Standards</td>
<td>-</td>
</tr>
<tr>
<td>N12</td>
<td>Employee Training</td>
<td>By Owner</td>
<td>The Owner should ensure that the employees are trained and familiar with BMPs.</td>
<td>Once</td>
</tr>
<tr>
<td>S5</td>
<td>Finished Grade of Landscape areas to be 1-2” below top of curb</td>
<td>By Owner</td>
<td>Depress landscape areas to promote retention of water and infiltration.</td>
<td>Annually</td>
</tr>
</tbody>
</table>
Section 6  WQMP Attachments

6.1. Site Plan and Drainage Plan
Include a site plan and drainage plan sheet set containing the following minimum information:

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

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

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

6.4 Other Supporting Documentation
- BMP Educational Materials
- Activity Restriction – C, C&R’s & Lease Agreements
Section 6.1
Attachment A

- Vicinity Map
- Existing Site Map
- Existing Condition Site Photos
VICINITY MAP
NOT TO SCALE
Section 6.1
Attachment B

- Project Site Boundary Map
- Existing Condition Site Drainage Exhibit
- Post-Development Condition Drainage / LID / BMPs Exhibit
Section 6.1
Attachment C

- Treatment Control BMPs Fact Sheets
- BMPs & LID Devices Details
Drain Inserts

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.
Drain Inserts

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

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

Performance
Few products have performance data collected under field conditions.

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

Additional Design Guidelines
Follow guidelines provided by individual manufacturers.

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

Cost
- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.

- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998
FloGard +Plus® Catch Basin Insert Filter

Removes pollutants from runoff at the source

FloGard +Plus is a catch basin insert filter designed to remove sediment, gross solids, trash, and petroleum hydrocarbons from stormwater runoff. FloGard +Plus is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas. Rated filter flow capacities are designed to exceed the required “first flush” treatment flow rate, and the unique dual-bypass design typically exceeds catch basin inlet capacity.

Economical Treatment
Quick, easy, and cost-effective to install, inspect, and maintain.

Efficient Performance
Removes pollutants at the inlet where they are easiest to catch.

Versatile Applications
Appropriate and easy to use on new construction or retrofit projects.

Flexible Design
Available in a wide variety of sizes and configurations, including custom options.

Durable Construction
Built to last and withstand the loads from captured pollutants.

Environmentally Friendly
No standing water minimizes vector, bacteria, and odor problems.

Proven Performance
Field and laboratory tested with up to 86\% removal of TSS and 80\% removal of oils and grease.

---

1. University of Auckland laboratory testing of local street sweep material.
2. UCLA laboratory study.

How It Works:
Flows entering the unit pass through the filter liner basket for removal of sediment, trash, and debris. Optional Fossil Rock™ sorbent pouches installed in the basket effect hydrocarbon capture. As the storm flow exceeds the treatment flow rate, treatment will continue and excess flows will pass through the dual-bypass openings near the top of the unit.
### FloGard +Plus Catch Basin Insert Filter

Catch basin insert designed to capture sediment, gross solids, trash, and petroleum hydrocarbons from low (first flush) flows, even during the most extreme weather conditions.

### Example Types, Sizes, and Capacities

Additional sizes, including regional and custom options are available.

#### FloGard Combination Inlet

**SPECIFIER CHART**

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>STANDARD &amp; SHALLOW DEPTH</th>
<th>INLET ID</th>
<th>GRATE CD</th>
<th>TOTAL BYPASS CAPACITY</th>
<th>SOILS STORAGE CAPACITY</th>
<th>FILTERED FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Inlet)</td>
<td>(Grate)</td>
<td>(Total)</td>
<td>(cu. ft. / sec)</td>
<td>(cu. ft.)</td>
<td>(cu. ft. / sec)</td>
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<td>1.7</td>
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<tr>
<td>FGC-1336FD0</td>
<td>15 x 36</td>
<td>18 x 40</td>
<td>6.8</td>
<td>2.3</td>
<td>1.6</td>
<td>FGC-1336FD0</td>
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<tr>
<td>FGC-2345FD0</td>
<td>22 x 34</td>
<td>24 x 50</td>
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<td>3.6</td>
<td>2.1</td>
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#### FloGard Flat Grated Inlet

**SPECIFIER CHART**

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<th>STANDARD &amp; SHALLOW DEPTH</th>
<th>INLET ID</th>
<th>GRATE CD</th>
<th>TOTAL BYPASS CAPACITY</th>
<th>SOILS STORAGE CAPACITY</th>
<th>FILTERED FLOW</th>
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</thead>
<tbody>
<tr>
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<td>(Inlet)</td>
<td>(Grate)</td>
<td>(Total)</td>
<td>(cu. ft. / sec)</td>
<td>(cu. ft.)</td>
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#### FloGard Circular Grated Inlet

**SPECIFIER CHART**

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<tr>
<th>MODEL NUMBER</th>
<th>INLET ID (INCHES)</th>
<th>GRATE CD (INCHES)</th>
<th>SOLIDS STORAGE CAPACITY (CU FT)</th>
<th>FILTERED FLOW (CU FT)</th>
<th>TOTAL BYPASS CAPACITY (CU FT)</th>
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</thead>
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<tr>
<td>FGC-RF15F</td>
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<td>25</td>
<td>2.2</td>
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<td>6.1</td>
</tr>
</tbody>
</table>

Visit our website: oldcastlemstorew.com or call (800) 579-8819 for additional sizes and options.
### ASSEMBLY

**SCALE: 1" = 30'**

**PIPE STORAGE:** 27,411 CF  
**MAINLINE PIPE GAGE:** 12  
**DIAMETER:** 120"  
**WALL TYPE:** PERFORATED  
**FINISH:** ALT2  
**CORRUGATION:** 5x1

**LOADING:** HD5  
**TOTAL STORAGE PROVIDED:** 34979 CF  
**STRUCTURAL BACKFILL STORAGE:** 7569 CF  
**PIECE** | **RIM ELEV.** | **SYSTEM INVERT** | **PIECE** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
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<td>TBD</td>
<td>TBD</td>
</tr>
</tbody>
</table>

### NOTATION
- THE PIPE SHOULD BE FULLY PERFORATED IN ACCORDANCE WITH AASHTO M 36, SECTION 8.3.2.2, AND USING CLASS 2 PERFORATIONS. THE TOTAL OPEN AREA OF THE PERFORATIONS WILL BE A MINIMUM OF 2.3% OF THE PIPE SURFACE AREA.
- BULKHEADS SHALL BE 12-GAGE OR HEAVIER STEEL AND THE COATING WILL MATCH THE SPECIFIED CMP COATING. BULKHEAD PLATES SHALL BE FULLY WELDED ONTO THE CMP WITH STEEL REINFORCEMENT AS REQUIRED. THE STEEL REINFORCEMENT SHALL BE POST COATED WITH ZINC RICH PAINT PER AASHTO M 36. BULKHEAD DESIGNS SHALL SATISFY THE REQUIREMENTS SHOWN IN CHAPTER 8 OF THE NOSP A CSP DESIGN MANUAL AND CALCULATIONS SHALL BE PROVIDED TO THE ENGINEER OF RECORD (EOR) FOR APPROVAL UPON REQUEST.
- ALL FITTINGS SHALL BE STRUCTURALLY CHECKED FOR REINFORCEMENTS PER ASTM A998 AND PROVIDED TO THE EOR FOR APPROVAL UPON REQUEST.
- CONNECTING BANDS FOR INFILTRATION SYSTEMS SHALL BE ANY TYPE, BUT MUST BE AT LEAST 12" WIDE. BANDS SHALL MATCH THE SPECIFIED CMP COATING AND MEET THE REQUIREMENTS OF AASHTO M 36.
- ALL METALLIC COATINGS AFFECTED BY MANUFACTURING FABRICATION SHALL BE REPAIRED PER AASHTO M 36 SECTION 11 REQUIREMENTS (E.G. ZINC-RICH PAINT ON ALL WELDS). IF POLYMER COATINGS ARE USED THE REPAIR OF DAMAGED COATINGS WILL BE IN CONFORMANCE WITH AASHTO M 245 SECTION 11 REQUIREMENTS.
- ACCESS LADDERS SHALL BE ATTACHED BY THE MANUFACTURER PRIOR TO DELIVERY, NOT INSTALLED ON THE JOBSITE.

### STUB INFORMATION

<table>
<thead>
<tr>
<th>PIECE</th>
<th>STUB INVERT</th>
<th>SYSTEM INVERT</th>
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</thead>
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<tr>
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### RISER INFORMATION

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<th>PIECE</th>
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<tr>
<td>36&quot; RISER B3</td>
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<tr>
<td>120&quot; RISER A1</td>
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### CUSTOMER

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<tr>
<th>PIPE STORAGE</th>
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<tbody>
<tr>
<td>WALL TYPE</td>
<td>PERFORATED</td>
</tr>
<tr>
<td>DIAMETER</td>
<td>120&quot;</td>
</tr>
<tr>
<td>FINISH</td>
<td>ALT2</td>
</tr>
<tr>
<td>CORRUGATION</td>
<td>5x1</td>
</tr>
</tbody>
</table>

120"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 623731-020  
CHERRY AVENUE & SANTA ANA AVENUE  
FONTANA, CA  
SITE DESIGNATION: SOUTH
GENERAL NOTES:
1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   • 12" THRU 48" 1-PIECE
   • 54" THRU 96" 2-PIECES
   • 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

---

GENERAL NOTES:
1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   • 12" THRU 48" 1-PIECE
   • 54" THRU 96" 2-PIECES
   • 102" THRU 144" 3-PIECES
4. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
5. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
6. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
7. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).
CONSTRUCTION LOADING DIAGRAM
NOT TO SCALE

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL
THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A629.

PIPE
THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M30 OR ASTM A786. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

MATERIAL SPECIFICATION
NOT TO SCALE

MANHOLE CAP DETAIL
NOT TO SCALE
THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (5) PAGES INCLUDING THE FOLLOWING:

- PIPE STORAGE = 89,322 CF
- MAINLINE PIPE GAGE = 16
- WALL TYPE = PERFORATED
- DIAMETER = 96"
- FINISH = ALT2
- CORRUGATION = 5x1

CUSTOMER: 
DATE: 

96"Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 623731-010
CHERRY AVENUE & SANTA ANA AVENUE
FONTANA, CA
SITE DESIGNATION: NORTH

ASSEMBLY
SCALE: 1:1 = 30
PIPE STORAGE: 89,322 CF
STRUCTURAL BACKFILL STORAGE: 33,283 CF
TOTAL STORAGE PROVIDED: 122,605 CF
LOADING: H20
PIPE INV. = 0.00

THE PIPE SHOULD BE FULLY PERFORATED IN ACCORDANCE WITH AASHTO M 36, SECTION 8.3.2.2, AND USING CLASS 2 PERFORATIONS. THE TOTAL OPEN AREA OF THE PERFORATIONS WILL BE A MINIMUM OF 2.3% OF THE PIPE SURFACE AREA.

BULKHEADS SHALL BE 12-GAUGE OR HEAVIER STEEL AND THE COATING WILL MATCH THE SPECIFIED CMP COATING. BULKHEAD PLATES SHALL BE FULLY WELDED ONTO THE CMP WITH STEEL REINFORCEMENT AS REQUIRED. THE STEEL REINFORCEMENT SHALL BE POST COATED WITH ZINC RICH PAINT PER AASHTO M 36. BULKHEAD DESIGNS SHALL SATISFY THE REQUIREMENTS SHOWN IN CHAPTER 8 OF THE NOSPA CSM DESIGN MANUAL AND CALCULATIONS SHALL BE PROVIDED TO THE ENGINEER OF RECORD (EOR) FOR APPROVAL UPON REQUEST.

ALL FITTINGS SHALL BE STRUCTURALLY CHECKED FOR REINFORCEMENTS PER ASTM A998 AND PROVIDED TO THE EOR FOR APPROVAL UPON REQUEST.

CONNECTING BANDS FOR INFILTRATION SYSTEMS SHALL BE ANY TYPE, BUT MUST BE AT LEAST 12" WIDE. BANDS SHALL MATCH THE SPECIFIED CMP COATING AND MEET THE REQUIREMENTS OF AASHTO M 36.

ALL METALLIC COATINGS AFFECTED BY MANUFACTURING FABRICATION SHALL BE REPAIRED PER AASHTO M 36 SECTION 11 REQUIREMENTS (E.G. ZINC-RICH PAINT ON ALL WELDS). IF POLYMER COATINGS ARE USED THE REPAIR OF DAMAGED COATINGS WILL BE IN CONFORMANCE WITH AASHTO M 245 SECTION 11 REQUIREMENTS.

ACCESS LADDERS SHALL BE ATTACHED BY THE MANUFACTURER PRIOR TO DELIVERY, NOT INSTALLED ON THE JOBSITE.
NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

EDGE SPACING EQUAL ON BOTH SIDES

NOTES:
1. PERFORATIONS MEET AASHO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. DIMENSIONS SUBJECT TO MANUFACTURER’S TOLERANCES.
4. ALL HOLES 3/8".

EXFILTRATION AREA
STANDARD PERFORATION PATTERNS

APPROXIMATE AREA PER LINEAR FOOT OF PIPE

<table>
<thead>
<tr>
<th>PIPE DIAMETER (D)</th>
<th>CORRUGATION DEPTH</th>
<th>MINIMUM EMBANKMENT WIDTH</th>
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<td>1.5D + 12&quot;</td>
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<td>2.711&quot; - 24.399&quot;</td>
<td>2D + 16&quot;</td>
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NOTES:
- D = DIAMETER
- L = LENGTH
- T = THICKNESS
- W = WIDTH

TYPICAL PERFORATION DETAIL

NOT TO SCALE

TYPICAL MANWAY DETAIL

NOT TO SCALE

TYPICAL BACKFILL DETAIL

NOT TO SCALE

BACKFILL REQUIREMENTS FOLLOW THE GUIDELINES OF AASTHO LRFD BRIDGE DESIGN (SEC 12) AND CONSTRUCTION (SEC 28)

1. MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE Pipe. THE MINIMUM TRENCH WIDTH (12.6.6.1):
   - PIPE ≤ 12": D + 16" 
   - PIPE > 12": 1.5D + 12" 

2. MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE (12.6.6.2):
   - PIPE = 24", 30" 
   - PIPE > 48": 44" + D/2 
   - PIPE = 144": 64" + D/10" 

3. THE FOUNDATION UNDER THE PIPE AND SIDE BACKFILL SHALL BE ADEQUATE TO SUPPORT THE LOADS ACTING UPON IT (26.5.2).

4. PERFORATED CORRUGATED STEEL PIPE (CSP) HEL-COR.

5. HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION (26.5.4).

6. INITIAL BACKFILL ABOVE PIPE MAY INCLUDE ROAD BASE MATERIAL (AND RIGID PavEMENT IF APPLICABLE). SEE TABLE ABOVE.

7. TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PavEMENT OR TOP OF RIGID PavEMENT (12.6.6.3).

8. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD (26.5.4.1).

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE PIPE DIA./2 BUT NO LESS THAN 12", OR 36" FOR PIPE DIAMETERS 72" AND LARGER. CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING (TABLE 3.0.1.7-1).
GENERAL NOTES:
1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" THRU 96" 2-PIECES
   - 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

2 2/3"x1/2" RE-ROLLED END HEL-COR PIPE

H-12 HUGGER BAND DETAIL

NOT TO SCALE

HUGGER BAND DETAIL

SINGLE BAR
BOLT AND STRAP (SBBS)

NO GASKET

GENERAL NOTES:
1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
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7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

H-12 HUGGER BAND DETAIL

NOT TO SCALE
CONSTRUCTION LOADING DIAGRAM

NOT TO SCALE

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE
This specification covers the manufacture and installation of the corrugated steel pipe (CSP) detailed in the project plans.

MATERIAL
The aluminized type 2 steel coils shall conform to the applicable requirements of ASTM A675 or ASTM A690.

PIPE
The CSP shall be manufactured in accordance with the applicable requirements of ASTM A675 or ASTM A690. The pipe sizes, gages and corrugations shall be as shown on the project plans.

INSTALLATION
 Shall be in accordance with recommendations of the National Corrugated Steel Pipe Association (NCSPA).

HANDLING AND ASSEMBLY
Shall be in accordance with recommendations of the National Corrugated Steel Pipe Association (NCSPA).

NOTES:

2. Design load H55.
3. Earth cover = 1 max.
4. Concrete strength = 4,000 psi
5. Reinforcing steel = ASTM A615, Grade 60.
6. Provide additional reinforcing around openings equal to the bars interrupted, half each side. Additional bars to be in the same plane.

MANHOLE CAP DETAIL

NOT TO SCALE

96” Ø PERFORATED UNDERGROUND RETENTION SYSTEM - 623731-010
CHERRY AVENUE & SANTA ANA AVENUE
FONTANA, CA
SITE DESIGNATION: NORTH
Summary for Pond 1P: (new Pond)

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<td>172,530 cf Overall - 89,322 cf Embedded = 83,208 cf x 40.0% Voids</td>
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<td>Effective Size= 96.0&quot;W x 96.0&quot;H =&gt; 50.27 sf x 20.00'L = 1,005.3 cf</td>
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<td>Overall Size= 96.0&quot;W x 96.0&quot;H x 20.00'L</td>
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<td>52.00' Header x 50.27 sf x 1 = 2,613.8 cf Inside</td>
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122,605 cf Total Available Storage

Storage Group A created with Chamber Wizard

Pond 1P: (new Pond)
### Stage-Area-Storage for Pond 1P: (new Pond)

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<th>Storage (cubic-feet)</th>
<th>Elevation (feet)</th>
<th>Storage (cubic-feet)</th>
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### Stage-Area-Storage for Pond 1P: (new Pond) (continued)

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<th>Elevation (feet)</th>
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- Stormwater BMP Maintenance Agreement
- Exhibit A: Legal Description
- Exhibit B: Vicinity Map
- Exhibit C: LID & BMPs Maintenance Schedule
- Exhibit D: Post-Development BMPs/WQMP
RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

CITY OF FONTANA
RECORDS MANAGEMENT DEPARTMENT
8353 Sierra Ave
Fontana, CA  92335

Exempt Recording Fees per Government Code Sections 6103 and 27383

AGREEMENT

Water Quality Management Plan and Stormwater BMP
Transfer, Access and Maintenance Agreement
Between LBA RV-Company II LP and the City of Fontana
Property Address: 10740 Banana Avenue, Fontana, CA
APN:  0236-081-28

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING
INFORMATION (Additional Recording Fees Apply)
Water Quality Management Plan and Stormwater BMP Transfer, Access and Maintenance Agreement

OWNER NAME: 

PROPERTY ADDRESS: 

APN: 

THIS AGREEMENT is made and entered into in 

, California, this ______ day of 

, by and between 

, herein after referred to as “Owner” and the CITY OF FONTANA, a municipal corporation, located in the County of San Bernardino, State of California hereinafter referred to as “CITY”;

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

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

within the Property described herein, the City required the project to employ Best Management Practices, hereinafter referred to as “BMPs,” to minimize pollutants in urban runoff;

WHEREAS, the Owner has chosen to install structural BMPs and implement non-structural BMPs as described in Exhibit “C” and depicted in Exhibit “D”, each of which exhibits are attached hereto and incorporated herein by this reference and also in the Water Quality Management Plan document, on file with the owner or its successors or assigns, and the City, hereinafter referred to as “WQMP”, to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

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

WHEREAS, said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all implementation, maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement;
WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, regular pavement sweeping, litter and landscape waste removal, pumping/cleaning and maintenance of stormwater treatment devices, water quality basins, trenches, drywells, underground chambers and pervious pavement, is required to assure peak performance of all BMPs listed in the approved 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 hereby provides the City of Fontana’s designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the City’s Engineer, no advance notice, for the purpose of inspection, sampling, testing of device(s), and in case of emergency, to undertake all necessary repairs or other preventative measures at owner’s expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner’s use of the Property.

2. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring implementation and 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 collected waste material(s) from the BMPs and the ultimate disposal of these material(s) shall be done in a manner consistent with all relevant laws and regulations. The Owner(s) shall also maintain all documentation of BMP maintenance activities, including the devices maintained, quantity of material(s) removed, disposal destination, dates of activities and shall provide copies of all maintenance records to the City of Fontana, upon request.

3. In the event Owner, or its successors or assigns, fails to maintain the BMP facilities in good working condition, as solely determined by the City, or removes, backfills, demolishes, re-grades or replaces any BMP, within five (5) days of being given written notice, the City is hereby authorized to cause any maintenance or restoration necessary and charge the entire cost and expense to the Owner or Owner’s successors or assigns, including administrative costs, attorneys fees and interest thereon, at the maximum rate authorized by the Civil Code from the date of the notice of expense, until paid in full.

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

5. 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 pay all costs incurred by the City in enforcing the obligations of this Agreement,
including reasonable attorney’s fees and costs, and that the same shall become a part of the lien against said Property.

6. 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.

7. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term “Owner” shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

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

9. 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.

IF TO CITY: ___________________________ IF TO OWNER: ___________________________

____________________________________  ______________________________________

____________________________________  ______________________________________

____________________________________  ______________________________________

____________________________________  ______________________________________

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

PROPERTY OWNER: LBA RV-Company II LP

____________________________________  ______________________________________

Signature Title

____________________________________  ______________________________________

Print Name Date
A notary acknowledgement is required for recordation (attach appropriate acknowledgement).

ACCEPTED BY:

______________________________
NAME of, City Engineer
City of Fontana

Date: __________________________

Attachment: Standard Notary Acknowledgement
LEGAL DESCRIPTION PER TITLE REPORT:

THE LAND REFERRED TO HEREBIN BELOW IS SITUATED FONTANA, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL 1:

THAT PART OF LOT NINE HUNDRED FIFTY—THREE (953) ACCORDING TO MAP SHOWING SUBDIVISION OF LANDS BELONGING TO THE SEMI—TROPIC LAND AND WATER COMPANY RECORDED IN BOOK 11 OF MAPS, PAGE 12 RECORDS OF SAN BERNARDINO COUNTY, IN THE CITY OF FONTANA, STATE OF CALIFORNIA. BEGINNING 664.72 FEET WEST OF THE CENTER OF THE INTERSECTION OF SANTA ANA AND REDWOOD AVENUE; THENCE NORTH PARALLEL TO THE EAST LINE OF SAID LOT 953 TO THE NORTH LINE OF SAID LOT 953; THENCE WEST TO THE EAST LINE OF THE WEST ONE—HALF (1/2) OF THE WEST ONE—HALF (W 1/2) OF SAID LOT 953; THENCE SOUTH TO THE CENTER LINE OF SAID SANTA ANA AVENUE; THENCE EAST TO THE PLACE OF BEGINNING.

AREA AND DISTANCES OF SAID PROPERTY EXTEND TO STREET CENTERS.

PARCEL 2:

THE WEST ONE—HALF (W 1/2) OF THE WEST ONE—HALF (W 1/2) OF LOT 953 ACCORDING TO MAP SHOWING SUBDIVISION OF LANDS BELONGING TO THE SEMI—TROPIC LAND AND WATER COMPANY, RECORDED IN BOOK 11 OF MAPS, PAGE 12, RECORDS OF SAN BERNARDINO COUNTY, IN THE CITY OF FONTANA, STATE OF CALIFORNIA.

AREA AND DISTANCES OF SAID PROPERTY EXTEND TO STREET CENTERS.

SAID DIVISION OF LAND IS PURSUANT TO CERTIFICATE OF COMPLIANCE RECORDED FEBRUARY 12, 1991 AS INSTRUMENT NO. 91–050928 OF OFFICIAL RECORDS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.
## EXHIBIT C
*(LIST OF BMP MAINTENANCE ITEMS)*

<table>
<thead>
<tr>
<th>BMP Description</th>
<th>Description of Maintenance Procedures</th>
<th>Minimum Inspection/Maintenance Frequency</th>
<th>Maintenance Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch Basin/ Filter Insert</td>
<td>Inspect for illegal dumping and/or debris accumulation. Clean filters whenever 25% of filter capacity is exceeded by debris accumulation</td>
<td>Inspect minimum 2 times per year and after every major storm event</td>
<td>By owner &amp; future owner</td>
</tr>
<tr>
<td>Underground CMP Detention/Infiltration System</td>
<td>Inspect the underground CMP via the access manhole, for accumulated sediment and debris levels and cleanout solids when &gt; 6&quot; build up occurs. Inspect for standing water within 48 hours of heavy rain events to ensure proper drawdown. Clean and flush underground systems to restore free drainage.</td>
<td>Annually, and after heavy rains</td>
<td>By owner &amp; future owner</td>
</tr>
<tr>
<td>Landscape Areas</td>
<td>Implement - Mowing, Trimming, Pruning practices to prevent discharges of landscape waste into on-site retention structures. Control fertilizer, herbicide &amp; pesticide applications to prevent stormwater contamination</td>
<td>Weekly</td>
<td>By owner &amp; future owner</td>
</tr>
<tr>
<td>Signage &amp; Stencil</td>
<td>Clean the stencil/signage surface to remove any excess dirt. Re-paint if necessary.</td>
<td>Weekly</td>
<td>By owner &amp; future owner</td>
</tr>
<tr>
<td>Trash Cans</td>
<td>Empty trash receptacles. Clean the areas around Cans by sweeping.</td>
<td>Weekly</td>
<td>By owner &amp; future owner</td>
</tr>
</tbody>
</table>
Section 6.4
Attachment F

- Education Materials
WITH YOUR HELP, WE CAN KEEP GUTTERS CLEAN FOR THOSE DOWNSTREAM!

CROAK!
For more information on stormwater, call 1-800-OILYCAT.

For the answers to the activities, look below.

STORMWATER THE BOOK

Fish, Birds, People, Ducks, Frogs, Animals, You, Plants, Bugs, Everyone

Page 9

1) Sweep, 2) Pick up, 3) Prevent, 4) Rango, 5) Wash, 6) Reduce Waste, 7) Tell

Page 10

Access: 1) Trash, 2) Rango, 3) You, 4) Plaste

Down: 1) Herondas, 2) Compost, 3) Lawn

EATED (For Kids Only!)

Brought to you by the San Bernardino County Stormwater Program, including the County of San Bernardino, San Bernardino County Flood Control and the Cities of Big Bear, Chino, Chino Hills, Colton, Fontana, Grand Terrace, Highland, Loma Linda, Mentone, Ontario, Rancho Cucamonga, Redlands, Rialto, San Bernardino, Upland, and Yucca.

Illustrations by McAllister Design and Melissa S. Eslabón
WHERE DOES ALL THE WATER GO?

Whenever it rains or snows, water runs off the land and into our storm drain system. The storm drain system is made up of gutters, storm drains (the holes in the curb) and pipes. The water that runs off the land is called stormwater. The storm drain system carries the stormwater to local waterways, including the Santa Ana River. The water that runs off into the storm drain system never passes through a water treatment plant, so anything the stormwater picks up, or is placed in it along the way, will be carried UNTREATED to the nearest waterway.

CLEAN WATER CROSSWORD

Decide what words belong in which boxes by reading the clues.

ACROSS
1. The place litter and pet waste belong.
2. What you should do with used motor oil and filters.
3. Who can help prevent stormwater pollution?
4. You can recycle _______ bottles.

DOWN
1. Left over paint, antifreeze and household cleaners are _______ water, and should be taken to a collection facility.
2. You can make it out of yard clippings.
3. Where, at home, you can wash the car without having soap, dirt and oil flowing to the storm drain.
LEND A HELPING HAND

To help prevent stormwater pollution, Stormy puts recyclables in the recycle bin and litter in the trash can.

Who Lives in a Watershed?

A watershed is the land that water flows across or under on its way to a stream. At the bottom of the page, list the animals in this picture that live in a watershed.

1. Littering debris into the street.
2. Throwing trash rather than leaving it lying on the ground.
3. For shorter periods of time.
4. Ask your parents to use reusable bags.
5. At the end of the house so it goes down the drain and not up the sewer.
6. Run off water has been.
7. Gas canisters often need to be taken to a hazardous waste collection facility.
HELPING TO KEEP GUTTERS CLEAN

There are lots of ways you can help prevent our home and yard from becoming polluted. Here are a few:
1. Keep your yard and gardens clean.
2. Plant trees and bushes to help filter the air and hold water.
3. Use organic fertilizers to keep your plants healthy.
4. Keep your driveway and sidewalks clean.
5. Use a broom to clean up debris rather than using a leaf blower.

THE A-MAZING STORMWATER STORY

Everyone knows that water flows. But who knows where the water goes?

Follow the gutter water through the storm drain system to find out.

Santa Ana River

Does gutter water go to the sewage treatment plant or to the river?
WATER POLLUTION AFFECTS...

Unscramble the words below to find out who is harmed by water pollution.

HIFS
SRBDI
LEEPOR
USKDC
GOFRE
LMNAISA
OVU
NLTAPS
GUSB
YREVNOEE

STORMWATER POLLUTION

The untreated water in the storm drain system can carry pollutants to nearby waterways. Things that are put on the ground can be washed into our storm drains by rain or overwatering our yards. When carried by stormwater, pollutants, such as motor oil and antifreeze from cars, fertilizers and pesticides on our lawns and gardens, pet waste, paint, trash, and soap can end up in the waterways, making the animals that live there very sick. Even things like soil and leaves can be pollutants—they clog storm drains and choke up our waterways. Sometimes, people who don't know that stormwater isn't treated, dump or deliberately wash pollutants directly into the storm drains. Of course, you, Croaker and Stormy know where all these pollutants go.
**FIND THE POLLUTANTS**

```
SPINTNOISHSE
VNFLSHKIEWERS
YETSOMVDALE
PCISEIOJEPZ
EIDQUOPCOUZAITE
TPZBIRINCEQL
WOATDITLERESI
AESWRSTORMRC
SMSVEAELETFJR
TPAKSJFLOIDE
EOTOSHESFTXF
RZNFADVPEONTC
AVINJELYEWAKIL
LMOTOROILKUPS
```

Stormy has found many pollutants in the stream in which he lives. All of these pollutants were carried to the stream in the stormwater and are mentioned on page 4. Can you find the stormwater pollutants in the box above? Some words may be backwards. When you find them, write the words in the spaces provided.

1. ________  6. ________
2. ________  7. ________
3. ________  8. ________
4. ________  9. ________
5. ________

**FROM YOUR HOME TO OURS**

Pollution in our neighborhoods can travel to local streams and rivers through the storm drain system. Below is a list of steps in this polluting process, but the steps are out of order. Write out the steps on the lines provided in the order that they would normally occur, with number one being the first step and number five being the last step.

1. The storm drain carries the polluted stormwater to the stream.
2. Paint and other pollutants are left outside.
3. Fish and other animals that live in the stream get sick and might die.
4. Rain water washes over the pollutants and carries them into the street.
5. Polluted rain water flows down the street and into the storm drain.
The Updated Model Water Efficient Landscape Ordinance

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

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

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

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

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

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

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

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

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

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

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

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

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

**The Department of Water Resources will offer technical assistance.**
The Department plans to offer a series of workshops, publications and other assistance for successful adoption and implementation of the Model Ordinance or local water efficient landscape ordinances. Information regarding these resources may be found on the DWR website: [http://www.water.ca.gov/wateruseefficiency/landscapeordinance/](http://www.water.ca.gov/wateruseefficiency/landscapeordinance/)
Questions on the Model Ordinance may be sent by e-mail to DWR staff at: mweo@water.ca.gov.
Parked automobiles may contribute pollutants to the storm drain because poorly maintained vehicles may leak fluids containing hydrocarbons, metals, and other pollutants. In addition, heavily soiled automobiles may drop clods of dirt onto the parking surface, contributing to the sediment load when runoff is present. During rain events, or wash-down activities, the pollutants may be carried into the storm drain system. The pollution prevention activities outlined in this fact sheet are used to prevent the discharge of pollutants to the storm drain system.

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

**Required Activities**

- If required, vehicles have to be removed from the street during designated street sweeping/cleaning times.

- If the automobile is leaking, place a pan or similar collection device under the automobile, until such time as the leak may be repaired.

- Use dry cleaning methods to remove any materials deposited by vehicles (e.g. adsorbents for fluid leaks, sweeping for soil clod deposits).

**Recommended Activities**

- Park automobiles over permeable surfaces (e.g. gravel, or porous cement).

- Limit vehicle parking to covered areas.

- Perform routine maintenance to minimize fluid leaks, and maximize fuel efficiency.

---

For additional information contact:
County of Orange, **OC Watershed**
Main: (714) 955-0600/24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: [www.ocwatersheds.com](http://www.ocwatersheds.com)
- Install gutters that will divert roof runoff away from livestock areas.

**Recommended Activities**

- In order to properly dispose of pet waste, carry bags, pooper-scooper, or equivalent to safely pick up pet wastes while walking with pets.

- Bathe pets indoors and use less toxic shampoos. When possible, have pets professionally groomed.

- Properly inoculate your pet in order to maintain their health and reduce the possibility of pathogens in pet wastes.

- Maintain healthy and vigorous pastures with at least three inches of leafy material.

- Consider indoor feeding of livestock during heavy rainfall, to minimize manure exposed to potential runoff.

- Locate barns, corrals, and other high use areas on portions of property that either drain away from or are located distant form nearby creeks or storm drains.

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
R-7
HOUSEHOLD HAZARDOUS WASTE

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

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

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

List of most common HHW products:
- Drain openers
- Oven cleaners
- Wood and metal cleaners and polishes
- Automotive oil and fuel additives
- Grease and rust solvents
- Carburetor and fuel injection cleaners
- Starter fluids
- Batteries
- Paint Thinnners
- Paint strippers and removers
- Adhesives
- Herbicides
- Pesticides
- Fungicides/wood preservatives

The activities outlined in this fact sheet target the following pollutants:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment</td>
<td></td>
</tr>
<tr>
<td>Nutrients</td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
</tr>
<tr>
<td>Foaming Agents</td>
<td>X</td>
</tr>
<tr>
<td>Metals</td>
<td>X</td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td>X</td>
</tr>
<tr>
<td>Hazardous Materials</td>
<td>X</td>
</tr>
<tr>
<td>Pesticides and Herbicides</td>
<td>X</td>
</tr>
<tr>
<td>Other</td>
<td>X</td>
</tr>
</tbody>
</table>

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

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

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

For additional information contact:
County of Orange, OC Watershed
Main: (714) 955-0600/ 24hr Water Pollution Discharge Hotline 1-877-89-SPILL
or visit our website at: www.ocwatersheds.com
Excessive irrigation and/or the overuse of water is often the most significant factor in transporting pollutants to the storm drain system. Pollutants from a wide variety of sources including automobile repair and maintenance, automobile washing, automobile parking, home and garden care activities and pet care may dissolve in the water and be transported to the storm drain. In addition, particles and materials coated with fertilizers and pesticides may be suspended in the flow and be transported to the storm drain.

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

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

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

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

---

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

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

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

POLLUTION PREVENTION:

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

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

MODEL PROCEDURES:

1. Mowing, Trimming/Weeding, and Planting

Mowing, Trimming/Weeding ✓ Whenever possible, use mechanical methods of vegetation removal rather than applying herbicides. Use hand weeding where practical.
When conducting mechanical or manual weed control, avoid loosening the soil, which could erode into streams or storm drains.

Use coarse textured mulches or geotextiles to suppress weed growth and reduce the use of herbicides.

Do not blow or rake leaves, etc. into the street or place yard waste in gutters or on dirt shoulders. Sweep up any leaves, litter or residue in gutters or on street.

Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this procedure sheet).

Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

**Planting**

Where feasible, retain and/or plant selected native vegetation whose features are determined to be beneficial. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting ornamental vegetation.

When planting or replanting consider using low water use groundcovers.

**OPTIONAL:**

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

**2. Irrigation**

Utilize water delivery rates that do not exceed the infiltration rate of the soil.

Use timers appropriately or a drip system to prevent runoff and then only irrigate as much as is needed.

Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

Where practical, use automatic timers to minimize runoff.

Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.

If reclaimed water is used for irrigation, ensure that there is no runoff from the landscaped area(s).

If bailing of muddy water is required (e.g., when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
3. Fertilizer and Pesticide Management

Usage

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

OPTIONAL:

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

Scheduling

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

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

4. Managing Landscape Waste

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.
- Inspection of drainage facilities should be conducted to detect illegal dumping of clippings/cuttings in or near these facilities. Materials found should be picked up and properly disposed of.
- Landscape wastes in and around storm drain inlets should be avoided by either using bagging equipment or by manually picking up the material.

5. Erosion Control

- Maintain vegetative cover on medians and embankments to prevent soil erosion. Apply mulch or leave clippings to serve as additional cover for soil stabilization and to reduce the velocity of storm water runoff.
- Minimize the use of disking as a means of vegetation management because the practice may result in erodible barren soil.
- Confining excavated materials to pervious surfaces away from storm drain inlets, sidewalks, pavement, and ditches. Material must be covered if rain is expected.

LIMITATIONS:

Alternative pest/weed controls may not be available, suitable, or effective in every case.
WATER AND SEWER UTILITY OPERATION AND MAINTENANCE

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

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

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

POLLUTION PREVENTION:

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

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

1. Water Line Maintenance

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

Planned Discharges

✔ For planned discharges use one of the following options:

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

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

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

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

✔ Select appropriate pollution control measure(s) considering the receiving system (i.e. curb inlet, drop inlet, culvert, creek, etc.) and ensure that the control device(s) fit properly.
General design considerations for inlet protection devices include the following:

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

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

OPTIONAL:

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

Unplanned Discharges

- Stop the discharge as quickly as possible by turning off water source.
- Inspect flow path of the discharged water:
  - Control erosion along the flow path.
  - Identify areas that may produce significant sediment or gullies, use sandbags to redirect the flow.
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions.
  - If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path and ensure that no additional discharged water enters storm drain inlets.

2. Sanitary Sewer Maintenance

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

✓ Sewer lines should be cleaned on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.

✓ Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified.

✓ Cleaning activities may require removal of tree roots and other identified obstructions.

Preventative and Corrective Maintenance

✓ During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:
  - cracked/deteriorating pipes
  - leaking joints/seals at manhole
  - frequent line plugs
  - line generally flows at or near capacity
  - suspected infiltration or exfiltration

✓ Document suggestions and requests for repair and report the information to the appropriate manager or supervisor.

✓ Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.

✓ Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

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

Control

✓ Refer to countywide Illicit Discharge Detection and Elimination Program. Components of this program include:
  - Investigation/inspection and follow-up
  - Elimination of illicit discharges and connections
  - Enforcement of ordinances
  - Respond to sewage spills
Facilitate public reporting of illicit discharges and connections. A citizen's hotline for reporting observed overflow conditions should be established to supplement the field screening efforts being conducted by the Principal Permittee.

**Response and Containment**

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

**LIMITATIONS:**

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

**REFERENCES:**


*Santa Clara Valley Urban Runoff Pollution Prevention Program. Water Utility Pollution Prevention Plan.*
Non-Stormwater Discharges

**Objectives**
- Protect the Bay
- Use the Household Waste Treatment Facility

**Description**
Non-stormwater discharges are those flows that do not consist entirely of stormwater. For municipalities, non-stormwater discharges present themselves in two situations. One is from fixed facilities owned and/or operated by the municipality. The other situation is non-stormwater discharges that are discovered during the normal operation of a field program. 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, and surface cleaning. 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. 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.

**Approach**
The municipality must address non-stormwater discharges from its fixed facilities by assessing the types of non-stormwater discharges and implementing BMPs for the discharges determined to pose environmental concern. For field programs the field staff must be...
SC-10 Non-Stormwater Discharges

trained to now what to look for regarding non-stormwater discharges and the procedures to follow in investigating the detected discharges.

**Suggested Protocols**

**Fixed Facility**

**General**

- Post "No Dumping" signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.

- Stencil 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.

- Landscaping and beautification efforts of hot spots might 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.

**Illicit Connections**

- Locate discharges from the fixed facility drainage system to the municipal storm drain system through review of "as-built" piping schematics.

- Use techniques such as smoke testing, dye testing and television camera inspection (as noted below) to verify physical connections.

- Isolate problem areas and plug illicit discharge points.

**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 several days 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**

- Review the "as-built" piping schematic as 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.
Non-Stormwater Discharges

- 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 Storm Sewer

- TV Cameras can be employed to visually identify illicit connections to the fixed facility storm drain system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.

- Clean up spills on paved surfaces 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.


Field Program

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially ones that involve more than one jurisdiction and those that are not classified as hazardous, which are often not responded to as effectively as they need to be.

- Stencil 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.

- See SC-74 Stormwater Drainage System Maintenance for additional information.
**Field Inspection**

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.

- During routine field program maintenance field staff should look for evidence of illegal discharges or illicit connection:
  - 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 and notify appropriate investigating agency.

- If trained, conduct field investigation of non-stormwater discharges to determine whether they pose a threat to water quality.

**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
Non-Stormwater Discharges

- Educational materials

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 onsite drainage points observed.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Enforcement

- Educate the responsible party if identified on the impacts of their actions, explain the stormwater requirements, and provide information regarding Best Management Practices (BMP), as appropriate. Initiate follow-up and/or enforcement procedures.
- If an illegal discharge is traced to a commercial, residential or industrial source, conduct the following activities or coordinate the following activities with the appropriate agency:
  - Contact the responsible party to discuss methods of eliminating the non-stormwater discharge, including disposal options, recycling, and possible discharge to the sanitary sewer (if within POTW limits).
  - Provide information regarding BMPs to the responsible party, where appropriate.
  - Begin enforcement procedures, if appropriate.
  - Continue inspection and follow-up activities until the illicit discharge activity has ceased.
- If an illegal discharge is traced to a commercial or industrial activity, coordinate information on the discharge with the jurisdiction’s commercial and industrial facility inspection program.

Training

- Train technical staff to identify and document illegal dumping incidents.
- 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 if one should occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Train employees to identify non-stormwater discharges and report them to the appropriate departments.
- Train staff who have the authority to conduct surveillance and inspections, and write citations for those caught illegally dumping.
SC-10 Non-Stormwater Discharges

- Train municipal staff responsible for surveillance and inspection 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).
- Educate the identified responsible party on the impacts of his or her actions.

Spill Response and Prevention
- See SC-11 Spill Prevention Control and Clean Up

Other Considerations
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The cost of fees for dumping at a proper waste disposal facility are often more than the fine for an illegal dumping offense, thereby discouraging people from complying with the law. The absence of routine or affordable pickup service for trash and recyclables in some communities also encourages illegal dumping. A lack of understanding regarding applicable laws or the inadequacy of existing laws may also contribute to the problem.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Many facilities do not have accurate, up-to-date schematic drawings.
- Can be difficult to locate illicit connections especially if there is groundwater infiltration.

Requirements

Costs
- Eliminating illicit connections can be expensive especially if structural modifications are required such as re-plumbing cross connections under an existing slab.
- Minor cost to train field crews regarding the identification of non-stormwater discharges. The primary cost is for a fully integrated program to identify and eliminate illicit connections and illegal dumping. However, by combining with other municipal programs (i.e. pretreatment program) cost may be lowered.
- Municipal cost for containment and disposal may be borne by the discharger.

Maintenance
Not applicable
Supplemental Information

Further Detail of the BMP

What constitutes a “non-stormwater” discharge?

- Non-stormwater discharges are discharges not made up entirely of stormwater and include 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, landscape irrigation, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Current municipal NPDES permits require municipalities to effectively prohibit non-stormwater discharges unless authorized by a separate NPDES permit or allowed in accordance with the current NPDES permit conditions. Typically the current permits allow certain non-stormwater discharges in the storm drain system as long as the discharges are not significant sources of pollutants. In this context the following non-stormwater discharges are typically allowed:
  - Diverted stream flows;
  - Rising found waters;
  - Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.
Non-Stormwater Discharges

Municipal facilities subject to industrial general 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.

**Illegal Dumping**

- 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

**Outreach**

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people on the street who are aware of the problem and who have the tools to at least identify the incident, if not correct it. There are a number of ways of accomplishing this:

- Train municipal staff from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report the incidents.

- Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act (see below).

- Educate the public. As many as 3 out of 4 people do not understand that in most communities the storm drain does not go to the wastewater treatment plant. Unfortunately, with the heavy emphasis in recent years on public education about solid waste management, including recycling and household hazardous waste, the sewer system (both storm and sanitary) has been the likely recipient of cross-media transfers of waste.

- Provide the public with a mechanism for reporting incidents such as a hot line and/or door hanger (see below).

- Help areas where incidents occur more frequently set up environmental watch programs (like crime watch programs).

- Train volunteers to notice and report the presence and suspected source of an observed pollutant to the appropriate public agency.
Non-Stormwater Discharges

What constitutes a “non-stormwater” discharge?

- Non-stormwater discharges are discharges not made up entirely of stormwater and include 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, landscape irrigation, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

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  - Diverted stream flows;
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  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.
Municipal facilities subject to industrial general 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.

**Storm Drain Stenciling**

- Stencil storm drain inlets with a message to prohibit illegal dumping, especially in areas with waste handling facilities.
- Encourage public reporting of improper waste disposal by a HOTLINE number stenciled onto the storm drain inlet.
- See Supplemental Information section of this fact sheet for further detail on stenciling program approach.

**Oil Recycling**

- Contract collection and hauling of used oil to a private licensed used oil hauler/recycler.
- Comply with all applicable state and federal regulations regarding storage, handling, and transport of petroleum products.
- Create procedures for collection such as; collection locations and schedule, acceptable containers, and maximum amounts accepted.
- The California Integrated Waste Management Board has a Recycling Hotline, (800) 553-2962, that provides information and recycling locations for used oil.

**Household Hazardous Waste**

- Provide household hazardous waste (HHW) collection facilities. Several types of collection approaches are available including permanent, periodic, or mobile centers, curbside collection, or a combination of these systems.

**Training**

- Train municipal employees and contractors in proper and consistent methods for waste disposal.
- Train municipal employees to recognize and report illegal dumping.
- Train employees and subcontractors in proper hazardous waste management.

**Spill Response and Prevention**

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
Non-Stormwater Discharges

Other Considerations
- Federal Regulations (RCRA, SARA, CERCLA) and state regulations exist regarding the disposal of hazardous waste.
- Municipalities are required to have a used oil recycling and a HHW element within their integrate waste management plan.
- Significant liability issues are involved with the collection, handling, and disposal of HHW.

Examples
The City of Palo Alto has developed a public participation program for reporting dumping violations. When a concerned citizen or public employee encounters evidence of illegal dumping, a door hanger (similar in format to hotel “Do Not Disturb” signs) is placed on the front doors in the neighborhood. The door hanger notes that a violation has occurred in the neighborhood, informs the reader why illegal dumping is a problem, and notes that illegal dumping carries a significant financial penalty. Information is also provided on what citizens can do as well as contact numbers for more information or to report a violation.

The Port of Long Beach has a state of the art database incorporating storm drain infrastructure, potential pollutant sources, facility management practices, and a pollutant tracking system.

The State Department of Fish and Game has a hotline for reporting violations called CalTIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

The California Department of Toxic Substances Control’s Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

References and Resources
http://www.stormwatercenter.net/

California’s Nonpoint Source Program Plan http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Stormwater Pollution Control Manual - http://dnr.met-oke.gov/wlr/dss/spcm.htm

Orange County Stormwater Program,

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (http://www.projectcleanwater.org)

Santa Clara Valley Urban Runoff Pollution Prevention Program
http://www.sevurppp-w2k.com/pdf%2odocuments/PS_ICID.PDF

Description
Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, and abnormal pH. Utilizing the following protocols 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
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.
- 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, Roofops, and Other Large Objects*

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a waste 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 water 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. Ensure that this practice does not kill grass.

*Landscaping Activities*

- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.

- 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.

- Check irrigation schedules so pesticides will not be washed away and to minimize non-stormwater discharge.

*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 paint brushes 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. 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. In which case you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

Store toxic material under cover with secondary containment 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 or mechanical 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.

- Follow manufacturers' recommendations and label directions. Pesticides must never be applied if precipitation is occurring or predicted. Do not apply insecticides within 100 feet of surface waters such as lakes, ponds, wetlands, and streams.

- Use less toxic pesticides that will do the job, whenever possible. 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.
SC-41 Building & Grounds Maintenance

- Apply pesticides only when wind speeds are low.
- Work fertilizers into the soil rather than dumping or broadcasting them 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 use of pesticides 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**

- Refer to SC-11, Spill Prevention, Control & Cleanup

- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

**Other Considerations**

- Alternative pest/weed controls may not be available, suitable, or effective in many cases.
Building & Grounds Maintenance  SC-41

Requirements

Costs
- Overall costs should be low in comparison to other BMPs.

Maintenance
- Sweep paved areas regularly to collect loose particles, and 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 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, polyphosphates 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, between flushes and 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

King County - ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF

Orange County Stormwater Program


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

Housekeeping Practices

Description
Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Related information is provided in BMP fact sheets SC-11 Spill Prevention, Control & Cleanup and SC-34 Waste Handling & Disposal.

Approach
Pollution Prevention
- Purchase only the amount of material that will be needed for foreseeable use. In most cases this will result in cost savings in both purchasing and disposal. See SC-61 Safer Alternative Products for additional information.
- Be aware of new products that may do the same job with less environmental risk and for less or the equivalent cost. Total cost must be used here; this includes purchase price, transportation costs, storage costs, use related costs, clean up costs and disposal costs.

Suggested Protocols
General
- Keep work sites clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Dispose of wash water, sweepings, and sediments, properly.
- Recycle or dispose of fluids properly.
- Establish a daily checklist of office, yard and plant areas to confirm cleanliness and adherence to proper storage and security. Specific employees should be assigned specific inspection responsibilities and given the authority to remedy any problems found.
- Post waste disposal charts in appropriate locations detailing for each waste its hazardous nature (poison, corrosive, flammable), prohibitions on its disposal (dumpster, drain, sewer) and the recommended disposal method (recycle, sewer, burn, storage, landfill).
- Summarize the chosen BMPs applicable to your operation and post them in appropriate conspicuous places.

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

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding
Require a signed checklist from every user of any hazardous material detailing amount taken, amount used, amount returned and disposal of spent material.

Do a before audit of your site to establish baseline conditions and regular subsequent audits to note any changes and whether conditions are improving or deteriorating.

Keep records of water, air and solid waste quantities and quality tests and their disposition.

Maintain a mass balance of incoming, outgoing and on hand materials so you know when there are unknown losses that need to be tracked down and accounted for.

Use and reward employee suggestions related to BMPs, hazards, pollution reduction, workplace safety, cost reduction, alternative materials and procedures, recycling and disposal.

Have, and review regularly, a contingency plan for spills, leaks, weather extremes etc. Make sure all employees know about it and what their role is so that it comes into force automatically.

**Training**

- Train all employees, management, office, yard, manufacturing, field and clerical in BMPs and pollution prevention and make them accountable.

- Train municipal employees who handle potentially harmful materials in good housekeeping practices.

- Train personnel who use pesticides in the proper use of the pesticides. The California Department of Pesticide Regulation license pesticide dealers, certify pesticide applicators and conduct onsite inspections.

- Train employees and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

**Spill Response and Prevention**

- Refer to SC-11, Spill Prevention, Control & Cleanup.

- Keep your Spill Prevention Control and Countermeasure (SPCC) plant up-to-date, and implement accordingly.

- Have spill cleanup materials readily available and in a known location.

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

**Other Considerations**

- There are no major limitations to this best management practice.

- There are no regulatory requirements to this BMP. Existing regulations already require municipalities to properly store, use, and dispose of hazardous materials.
Housekeeping Practices

Requirements

Costs
- Minimal cost associated with this BMP. Implementation of good housekeeping practices may result in cost savings as these procedures may reduce the need for more costly BMPs.

Maintenance
- Ongoing maintenance required to keep a clean site. Level of effort is a function of site size and type of activities.

Supplemental Information

Further Detail of the BMP
- The California Integrated Waste Management Board's Recycling Hotline, 1-800-553-2962, provides information on household hazardous waste collection programs and facilities.

Examples
There are a number of communities with effective programs. The most pro-active include Santa Clara County and the City of Palo Alto, the City and County of San Francisco, and the Municipality of Metropolitan Seattle (Metro).

References and Resources

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm


Orange County Stormwater Program

San Mateo STOPPP - (http://stoppp.tripod.com/bmp.html)
Plaza and Sidewalk Cleaning

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

**Description**
Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

**Approach**

**Pollution Prevention**
- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

**Suggested Protocols**

**Surface Cleaning**
- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)
SC-71  Plaza and Sidewalk Cleaning

- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

Graffiti Removal

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

Surface Removal and Repair

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

Concrete Installation and Repair

- Schedule asphalt and concrete activities for dry weather.
Plaza and Sidewalk Cleaning

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sandbags around inlets or work areas).

- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.

- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.

- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.

- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.

- Protect applications of fresh concrete from rainfall and runoff until the material has dried.

- Do not allow excess concrete to be dumped onsite, except in designated areas.

- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.

- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.

- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

- Clean parking lots on a regular basis with a street sweeper.

Training

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

- Train employee and contractors in proper techniques for spill containment and cleanup.

- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.

- Have spill cleanup materials readily available and in a known location.

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.
SC-71  Plaza and Sidewalk Cleaning

Other Considerations
- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewer agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements
Costs
- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance
Not applicable

Supplemental Information
Further Detail of the BMP
Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources
Bay Area Stormwater Management Agencies Association (BASMAA). 1996. Pollution From Surface Cleaning Folder http://www.basmaa.org

Plaza and Sidewalk Cleaning


Orange County Stormwater Program


Landscape Maintenance

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

Description
Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

Approach
Pollution Prevention
- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.
Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

**Suggested Protocols**

**Mowing, Trimming, and Weeding**

- Whenever possible use mechanical methods of vegetation removal (e.g. mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.

- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.

- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.

- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.

- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).

- Place temporarily stockpiled material away from watercourses, and berms or cover stockpiles to prevent material releases to storm drains.

**Planting**

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.

- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizers) than planting new vegetation.

- Consider using low water use groundcovers when planting or replanting.

**Waste Management**

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

- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berms or cover stockpiles to prevent material releases to the storm drain system.

- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.
Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

Irrigation
- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if reclaimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

Fertilizer and Pesticide Management
- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- 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 pesticides only if there is an actual pest problem (not on a regular preventative schedule).

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

Do not mix or prepare pesticides for application near storm drains.

Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.

Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.

Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

Calibrate fertilizer and pesticide application equipment to avoid excessive application.

Periodically test soils for determining proper fertilizer use.

Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).

Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

Dispose of empty pesticide containers according to the instructions on the container label.

**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.

Inspect pesticide/fertilizer equipment and transportation vehicles daily.

**Training**

Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.

Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.

Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency’s IPM Policy, SOPs, and BMPs, and the latest IPM techniques.
Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.

- Use a training log or similar method to document training.

**Spill Response and Prevention**

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

**Other Considerations**

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.

- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.

- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

**Requirements**

**Costs**

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

**Maintenance**

Not applicable
Supplemental Information

Further Detail of the BMP

Waste Management

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities.

Contractors and Other Pesticide Users

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency’s IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

References and Resources


Orange County Stormwater Program http://www.ocwatersheds.com/StormWater/swp_introduction.asp


Drainage System Maintenance

Description
As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Approach
Suggested Protocols
Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure 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 SC-75 Waste Handling and Disposal).

- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

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- 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.

- Record the amount of waste collected.

- 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 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 of. Do not dewater near a storm drain or stream.

- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

**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 flushed effluent and pump to the sanitary sewer for treatment.

**Pump Stations**

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.

- Conduct quarterly routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

**Open Channel**

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to 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
Drainage System Maintenance

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources, and Federal Corps of Engineers and USFWS)

Illicit Connections and Discharges

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discolored, 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 upstream manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.

- Stencil 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

- Regularly inspect and clean up hot spots and other storm drainage areas 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.
The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

The California Department of Toxic Substances Control’s Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

**Training**
- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

**Spill Response and Prevention**
- Refer to SC-11, Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

**Other Considerations**
- Cleanup 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 disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.
Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- 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. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vacuum trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The 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, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect 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 re-collect 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 percent for organics and 55-65 percent 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 drain flushing.

**Flow Management**

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

**Stream Corridor Planning**

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for stream alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.
Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradations upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.
SC-74  Drainage System Maintenance

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to be reclaimed.

Examples
The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

References and Resources


Orange County Stormwater Program


United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Illegal Dumping Control. Online:
http://www.epa.gov/npdes/menuofbmps/poll_7.htm

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. Online:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm
Site Design & Landscape Planning  SD-10

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.
Designing New Installations
Begin the development of a plan for the landscape unit with attention to the following general principles:

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

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

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

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit
- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and
regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

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

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

**Redeveloping Existing Installations**
Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.
SD-10  Site Design & Landscape Planning

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

Other Resources


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.


Roof Runoff Controls

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain...
barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

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

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

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.
Foundation Planting
Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

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

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

Other Resources
www.stormh2o.com

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

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

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

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

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

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

Design Considerations

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

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

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

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

**Redeveloping Existing Installations**

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

**Other Resources**


- 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.


Storm Drain Signage

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"
Storm Drain Signage

- 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

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.


Trash Storage Areas

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.
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 on 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


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.


**Vehicle Washing Areas**

**Design Objectives**

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

**Description**

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

**Approach**

Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

**Suitable Applications**

Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

**Design Considerations**

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

**Designing New Installations**

Areas for washing/steam cleaning should incorporate one of the following features:

- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer

Photo Credit: Geoff Brosseau
Vehicle Washing Areas

- Include other features which are comparable and equally effective

**CAR WASH AREAS** - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

**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.

**Additional Information**

**Maintenance Considerations**
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**

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.


Outdoor Material Storage Areas

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design
Requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

**Designing New Installations**

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

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.

- The storage area should be paved and sufficiently impervious to contain leaks and spills.

- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.

- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

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

**Redeveloping Existing Installations**

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

**Additional Information**

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

**Other Resources**


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.

Outdoor Work Areas

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

Description
Proper design of outdoor work areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system.

Approach
Outdoor work areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor work areas, infiltration is discouraged; collection and conveyance are encouraged. In outdoor work areas, infiltration is discouraged and runoff is often routed directly to the sanitary sewer, not the storm drain. Because this runoff is being added to the loads normally received by the wastewater treatment plants, municipal stormwater programs and/or private developers must work with the local plant to develop solutions that minimize effects on the treatment facility. These concerns are best addressed in the planning and design stage of the outdoor work area.

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

Design Considerations
Design requirements for outdoor work areas are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements.

Designing New Installations
Outdoor work areas can be designed in particular ways to reduce impacts on both stormwater quality and sewage treatment plants.

- Create an impermeable surface such as concrete or asphalt, or a prefabricated metal drip pan, depending on the use.
Outdoor Work Areas

- Cover the area with a roof. This prevents rain from falling on the work area and becoming polluted runoff.

- Berm or perform mounding around the perimeter of the area to prevent water from adjacent areas from flowing on to the surface of the work area.

- Directly connect runoff. Unlike other areas, runoff from work areas is directly connected to the sanitary sewer or other specialized containment system(s). This allows the more highly concentrated pollutants from these areas to receive special treatment that removes particular constituents. Approval for this connection must be obtained from the appropriate sanitary sewer agency.

- Locate the work area away from storm drains or catch basins.

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


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.


Description and Purpose
Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications
Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations
Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation
- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
Street Sweeping and Vacuuming

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

**Costs**

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd$^3$ hopper) to $88/hour (9 yd$^3$ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

**Inspection and Maintenance**

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- When actively in use, points of ingress and egress must be inspected daily.

- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.

- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.

- Adjust brooms frequently; maximize efficiency of sweeping operations.

- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

**References**


Material Delivery and Storage

Categories

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Legend:
- Primary Category
- Secondary Category

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

Targeted Constituents

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

Potential Alternatives

None
Material Delivery and Storage

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations
- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation
The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to affect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.
Material Delivery and Storage

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.
Material Delivery and Storage

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.

- Stockpiles should be protected in accordance with WM-3, Stockpile Management.

- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.

- Proper storage instructions should be posted at all times in an open and conspicuous location.

- An ample supply of appropriate spill clean up material should be kept near storage areas.

- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.

- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.

- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.

- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Keep storage areas clean and well organized, including a current list of all materials onsite.

- Inspect labels on containers for legibility and accuracy.
Material Delivery and Storage

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

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


Material Use

Description and Purpose
Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications
This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Targeted Constituents
Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives
None
Limitations
Safer alternative building and construction products may not be available or suitable in every instance.

Implementation
The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil himself/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the
Material Use

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.

- Train employees and subcontractors in proper material use.

- Supply Material Safety Data Sheets (MSDS) for all materials.

- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.

- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.

- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.

- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.

- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.

- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Document the location, time, chemicals applied, and applicator’s name and qualifications.

- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.

- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.
Material Use

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs
All of the above are low cost measures.

Inspection and Maintenance
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Ensure employees and subcontractors throughout the job are using appropriate practices.

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


**Description and Purpose**

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

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

**Suitable Applications**

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

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals
Spill Prevention and Control

- Fuels
- Lubricants
- Other petroleum distillates

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

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

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

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

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.

- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.

- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.

- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.

- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

**Cleanup**

- Clean up leaks and spills immediately.

- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

**Minor Spills**

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.

- Use absorbent materials on small spills rather than hosing down or burying the spill.

- Absorbent materials should be promptly removed and disposed of properly.

- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

**Semi-Significant Spills**

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

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

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

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

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

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

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

**Inspection and Maintenance**
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.

- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

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


Description and Purpose
Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications
This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products - Asphalt Products
- Concrete Curing Compounds - Pesticides
- Palliatives - Acids
- Septic Wastes - Paints
- Stains - Solvents
- Wood Preservatives - Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302
In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

**Limitations**

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

**Implementation**
The following steps will help reduce stormwater pollution from hazardous wastes:

**Material Use**

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 72, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.

- Unless watertight, containers of dry waste should be stored on pallets.

- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. “Paint out” brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available.
  - Ensure that hazardous waste collection containers are conveniently located.
  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
  - Minimize production or generation of hazardous materials and hazardous waste on the job site.
  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
  - Segregate potentially hazardous waste from non-hazardous construction site debris.
  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.

Place hazardous waste containers in secondary containment.

Do not allow potentially hazardous waste materials to accumulate on the ground.

Do not mix wastes.

Use all of the product before disposing of the container.

Do not remove the original product label; it contains important safety and disposal information.

**Waste Recycling Disposal**

- Select designated hazardous waste collection areas onsite.

- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.

- Place hazardous waste containers in secondary containment.

- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.

- Recycle any useful materials such as used oil or water-based paint.

- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- Arrange for regular waste collection before containers overflow.

- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

**Disposal Procedures**

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.

- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.

- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.

- Attention is directed to "Hazardous Material," "Contaminated Material," and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.
Hazardous Waste Management

Education
- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs
All of the above are low cost measures.

Inspection and Maintenance
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
Hazardous Waste Management

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.

- A copy of the hazardous waste manifests should be provided.

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


Section 6.4
Attachment G

- HCOC Exemption Supporting Files
- Factor of Safety and Design Infiltration Rate Worksheet
- Reference-1: Soil Report
- Reference-2: NOAA Rainfall Data
<table>
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*Detention/Conservation Basin
Hydromodification

A.1 Hydrologic Conditions of Concern (HCOC) Analysis

HCOC Exemption:

1. **Sump Condition:** All downstream conveyance channel to an adequate sump (for example, Prado Dam, Santa Ana River, or other Lake, Reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

2. **Pre = Post:** The runoff flow rate, volume and velocity for the post-development condition of the Priority Development Project do not exceed the pre-development (i.e., naturally occurring condition for the 2-year, 24-hour rainfall event utilizing latest San Bernardino County Hydrology Manual.
   
   a. Submit a substantiated hydrologic analysis to justify your request.

3. **Diversion to Storage Area:** The drainage areas that divert to water storage areas which are considered as control/release point and utilized for water conservation.
   
   a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbccounty.permitrack.com/wap) for reference.

4. **Less than One Acre:** The Priority Development Project disturbs less than one acre. The Co-permittee has the discretion to require a Project Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The project disturbs less than one acre and is not part of a common plan of development.

5. **Built Out Area:** The contributing watershed area to which the project discharges has a developed area percentage greater than 90 percent.
   
   a. See Appendix F for the HCOC Exemption Map and the on-line Watershed Geodatabase (http://sbccounty.permitrack.com/wap) for reference.
### Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

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**Supporting Data**

Briefly describe infiltration test and provide reference to test forms:

See Infiltration Testing Section of Soils Report for test description and details.

**Note:** The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.
### Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

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### Supporting Data

Briefly describe infiltration test and provide reference to test forms:

See Infiltration Testing Section of Soils Report for test description and details.

**Note:** The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.
Reference – 1

Soil Test Report
Dear Mr. McLaughlin:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

**Scope of Services**

The scope of services performed for this project was in general accordance with our Proposal No. 19P191R, dated April 5, 2019. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

**Site and Project Description**

The subject site is located at the northeast corner of Cherry Avenue and Santa Ana Avenue in Fontana, California. The site is bounded to the north and east by vacant lots, to the west by Cherry Avenue, and to the south by Santa Ana Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of a square-shaped parcel, 8.9± acres in size. The site is currently vacant and undeveloped. The ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth with several large-size trees located throughout the site.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from Google Earth, the site topography ranges from 992± feet msl in the northeastern area of the site to 979± feet mean sea level (msl) in the southwestern
area. The site topography slopes gently downward toward the south-southwest at a gradient of 1 to 2± percent.

**Proposed Development**

Based on a conceptual site plan (Scheme 4) prepared by HPA Architecture, the site will be developed with one (1) new warehouse building located in the central area of the site. The building will be 190,540± ft$^2$ in size and will be constructed with dock-high doors along the northern building wall. It is expected that the building will be surrounded by asphaltic concrete pavements for parking and drive lanes, and Portland cement concrete pavements in the truck loading area. Several landscape planters and areas of concrete flatwork will also be included throughout the site.

Although not indicated on the site plan, the site may use on-site infiltration to dispose of storm water. Based on the current site layout and conversations with the client, the proposed infiltration system would consist of below-grade chamber systems located to the south and east of the proposed building. The bottoms of the chamber systems will extend to depths ranging from 10 to 15± feet below the existing site grades.

**Concurrent Study**

SCG recently conducted a geotechnical investigation at the subject site, referenced above. As part of this study six (6) borings advanced to depths of 15 to 25± feet below existing site grades. Artificial fill soils were encountered at the ground surface at one of the boring locations, extending to a depth of 3± feet below the existing site grades. The fill soils generally consist of medium dense silty fine to coarse sands. Disturbed alluvial soils were encountered at the ground surface at all of the remaining boring locations, extending to depths of 2½ to 3± feet below existing site grades. The disturbed alluvial soils consist of loose to medium dense silty fine sands and fine to medium sands. Native alluvium was encountered below the fill soils and disturbed alluvium at all of the boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of loose to medium dense fine to coarse sands, silty sands to sandy silts, and dense to very dense gravelly sands.

**Groundwater**

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration. As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. The primary reference used to determine the groundwater depths in the subject site area is the California Department of Water Resources website, [http://www.water.ca.gov/waterdatalibrary/](http://www.water.ca.gov/waterdatalibrary/). The nearest monitoring well is located approximately 2,900 feet southwest from the site. Water level readings within this monitoring well indicates a high groundwater level of 224.6 feet (January 2000) below the ground surface.
Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of two (2) backhoe-excavated trenches, extending to depths of 9½ and 10± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 and I-2) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Trench No. I-1, extending to a depth of 2± feet below the existing site grades. The fill soils generally consist of medium dense to dense silty fine to medium sands with little coarse sand and trace to little fine to coarse gravel. The fill soils possess a disturbed appearance, varying densities, and trace asphaltic concrete and wood fragments, resulting in their classification as artificial fill. Disturbed alluvial soils were encountered at the ground surface at Infiltration Trench No. I-2, extending to a depth of 1± foot below existing site grades. The disturbed alluvial soils consist of very loose silty fine sands with varying amounts of medium to coarse sands and fine gravel. The soils classified as disturbed alluvium generally resemble the underlying native alluvium but have a disturbed, loose appearance resulting in their classification as disturbed alluvium.

Native alluvium was encountered below the artificial fill and disturbed alluvial soils at both of the infiltration trench locations. The alluvial soils generally consist of loose to medium dense fine sands with trace to little silt and varying medium to coarse sands and fine gravel, and dense to very dense gravelly fine to coarse sands and fine to coarse sandy gravel with occasional to extensive of cobbles, extending to the maximum depth explored of 10± feet below the existing site grades. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are included with this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration systems that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.
Infiltration Testing Procedure

Infiltration testing was performed at both of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at each infiltration test location, the volumetric measurements were made at increments of 1 minute. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

<table>
<thead>
<tr>
<th>Infiltration Test No.</th>
<th>Depth (feet)</th>
<th>Soil Description</th>
<th>Infiltration Rate (inches/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>9½</td>
<td>Gravelly fine to coarse Sand</td>
<td>21.0</td>
</tr>
<tr>
<td>I-2</td>
<td>10</td>
<td>Gravelly fine to coarse Sand, trace Silt</td>
<td>17.0</td>
</tr>
</tbody>
</table>

Laboratory Testing

Moisture Content

The moisture contents for selected soil samples within the trenches were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Trench Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test trench has been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the grainsize analysis are presented on Plates C-1 and C-2 of this report.
Design Recommendations

Two (2) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations are 17.0 and 21.0 inches per hour. Based on the results of Infiltration Test No. I-1, we recommend a design infiltration rate of 21 inches per hour be used for the design of the southern proposed below-grade chamber system. Based on the results of Infiltration Test No. I-2, we recommend an infiltration rate of 17 inches per hour be used for the design of the eastern chamber system. These infiltration rates are recommended if the bottoms of the chamber systems extend 10± feet below the existing site grades.

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each chamber system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

The design of the proposed storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Fontana and/or County of San Bernardino guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates. It should be noted that the recommended infiltration rates are based on infiltration testing at two (2) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Therefore, the subgrade soils within proposed infiltration system areas should not be overexcavated, undercut or compacted in any significant manner. It is recommended that a note to this effect be added to the project plans and/or specifications.

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rates presented herein were determined in accordance with the ASTM Test Method D-3385-03 standard and are considered valid for the time and place of the actual test. Changes in soil moisture content will affect these infiltration rates. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times
less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

**Location of Infiltration Systems**

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration areas could potentially be damaged due to saturation of subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.**

Even with this provision of locating the infiltration systems at least 25 feet from the building, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration systems.

**General Comments**

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party’s sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and
recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

**Closure**

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Scott McCann
Staff Scientist

Daniel W. Nielsen, RCE 77915
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Logs (2 pages)
Infiltration Test Results Spreadsheets (2 pages)
Grain Size Distribution Graphs (2 pages)
APPROXIMATE INFILTRATION TEST LOCATION

APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 19G136-1)

NOTE: CONCEPTUAL SITE PLAN PREPARED BY HPA ARCHITECTURE.
## Trench Log

### Earth Materials Description

<table>
<thead>
<tr>
<th>Depth</th>
<th>Sample</th>
<th>Dry Density (pcf)</th>
<th>Moisture (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>b</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**A:** Fill: Gray Brown Silty fine to medium Sand, little coarse Sand, little fine Gravel, trace coarse Gravel, trace Asphaltic concrete fragments, trace Wood fragments, medium dense to dense - damp

**B:** Alluvium: Brown fine Sand, little medium Sand, trace coarse Sand, trace fine Gravel, trace to little Silt, loose to medium dense - damp to moist

**C:** Alluvium: Light Gray Gravelly fine to coarse Sand, occasional Cobbles, dense - dry to damp

**D:** Alluvium: Brown fine Sand, little medium Sand, trace coarse Sand, little Silt, medium dense - moist

**E:** Alluvium: Light Gray Gravelly fine to coarse Sand, dense - dry to damp

Trench Terminated @ 9.5 feet

---

### Graphic Representation

![Graphic Representation](#)

**Key to Sample Types:**
- B - Bulk Sample (Disturbed)
- R - Ring Sample 2-1/2" Diameter (Relatively Undisturbed)

---

**Trench Terminated @ 9.5 feet**
### Trench Log

**Job No.:** 19G136-2  
**Project:** Proposed Warehouse  
**Location:** Fontana, CA  
**Date:** 4-11-2019

**Equipment Used:** Backhoe  
**Logged By:** Scott McCann  
**Water Depth:** Dry  
**Seepage Depth:** Dry  
**Orientation:** S 10 E  
**Elevation:**

#### Earth Materials Description

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Sample Type</th>
<th>Sample Description</th>
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</thead>
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<tr>
<td>6</td>
<td>A</td>
<td>DISTURBED ALLUVIUM: Light Brown Silty fine Sand, little medium to coarse Sand, trace fine Gravel, abundant fine root fibers, very loose - dry</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td>ALLUVIUM: Brown fine to medium Sand, little coarse Sand, trace fine Gravel, trace to little Silt, loose to medium dense - damp</td>
</tr>
<tr>
<td>10</td>
<td>C</td>
<td>ALLUVIUM: Light Gray fine to coarse Sandy Gravel, occasional to extensive Cobbles, dense to very dense - dry to damp</td>
</tr>
<tr>
<td>10</td>
<td>D</td>
<td>ALLUVIUM: Light Gray Brown Gravelly fine to coarse Sand, trace Silt, dense - damp</td>
</tr>
</tbody>
</table>

**Key to Sample Types:**  
- B - Bulk Sample (Disturbed)  
- R - Ring Sample 2-1/2" Diameter (Relatively Undisturbed)

**Graphic Representation**

- **Trench Terminated @ 10 feet**

**Scale:** 1" = 5'

**Job No.:** 19G136-2  
**Project:** Proposed Warehouse  
**Location:** Fontana, CA  
**Date:** 4-11-2019  
**Equipment Used:** Backhoe  
**Logged By:** Scott McCann  
**Orientation:** S 10 E  
**Elevation:**

**Water Depth:** Dry  
**Seepage Depth:** Dry  
**Readings Taken:** At Completion

---

**Plate B-2**
**INfiltration Calculations**

**Project Name** | Proposed Warehouse  
**Project Location** | Fontana, CA  
**Project Number** | 19G136-2  
**Engineer** | Scott McCann  

Infiltration Test No | I-1

<table>
<thead>
<tr>
<th>Constants</th>
<th>Diameter (ft)</th>
<th>Area (ft²)</th>
<th>Area (cm²)</th>
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</thead>
<tbody>
<tr>
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<td>730</td>
</tr>
<tr>
<td>Anlr. Spc</td>
<td>2</td>
<td>2.36</td>
<td>2189</td>
</tr>
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</table>

*Note: The infiltration rate was calculated based on current time interval*

<table>
<thead>
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<th>Test Interval</th>
<th>Time (hr)</th>
<th>Interval Elapsed (min)</th>
<th>Flow Readings</th>
<th>Infiltration Rates</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td>Inner Ring Flow (cm³)</td>
<td>Ring Annular Ring Flow (cm³)</td>
</tr>
<tr>
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<td>Initial</td>
<td>9:15 AM 1 100 750 550</td>
<td>3250 61.67 89.09 24.28 35.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final 9:16 AM</td>
<td>1 850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Initial 9:18 AM</td>
<td>1 150 725 850 3200 59.62 87.72 23.47 34.53</td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>Initial 9:21 AM</td>
<td>1 150 675 700 3100 55.51 84.97 21.85 33.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final 9:22 AM</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>Initial 9:24 AM</td>
<td>1 250 650 900 2900 53.45 79.49 21.04 31.30</td>
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</tr>
<tr>
<td></td>
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<td>1 150 675 800 3000 55.51 82.23 21.85 32.38</td>
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<tr>
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<td>Initial 9:36 AM</td>
<td>1 1200 650 5300 2900 53.45 79.49 21.04 31.30</td>
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<tr>
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<td>Final 9:37 AM</td>
<td>22 1850</td>
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19G136-2 Infiltration Test No. I-1
### INFILTRATION CALCULATIONS

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<tr>
<th>Project Name</th>
<th>Proposed Warehouse</th>
</tr>
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<tbody>
<tr>
<td>Project Location</td>
<td>Fontana, CA</td>
</tr>
<tr>
<td>Project Number</td>
<td>19G136-2</td>
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<tr>
<td>Engineer</td>
<td>Scott McCann</td>
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</table>

#### Infiltration Test No

**I-2**

#### Constants

<table>
<thead>
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<th>Diameter (ft)</th>
<th>Area (ft²)</th>
<th>Area (cm²)</th>
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</thead>
<tbody>
<tr>
<td>Inner</td>
<td>0.79</td>
<td>730</td>
</tr>
<tr>
<td>Anlr. Spac</td>
<td>2.36</td>
<td>2189</td>
</tr>
</tbody>
</table>

*Note: The infiltration rate was calculated based on current time interval*

#### Test Interval

<table>
<thead>
<tr>
<th>Test Interval</th>
<th>Time (hr)</th>
<th>Interval Elapsed (min)</th>
<th>Inner Ring Flow (ml)</th>
<th>Ring Flow (cm³)</th>
<th>Annular Flow (cm³)</th>
<th>Space Flow (cm³)</th>
<th>Infiltration Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1 Initial</td>
<td>11:00 AM</td>
<td>1</td>
<td>50</td>
<td>700</td>
<td>500</td>
<td>2500</td>
<td>57.56 68.53 22.66 26.98</td>
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<tr>
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<td>2400</td>
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<tr>
<td></td>
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<td>49.34 61.67 19.43 24.28</td>
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<tr>
<td></td>
<td>11:09 AM</td>
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<td>150</td>
<td>550</td>
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<td>45.23 63.05 17.81 24.82</td>
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<td>Final</td>
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<td>10</td>
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</tr>
<tr>
<td></td>
<td>11:12 AM</td>
<td>1</td>
<td>900</td>
<td>575</td>
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<td>2400</td>
<td>47.28 65.79 18.62 25.90</td>
</tr>
<tr>
<td>Final</td>
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<td>13</td>
<td>1475</td>
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</tr>
<tr>
<td></td>
<td>11:15 AM</td>
<td>1</td>
<td>50</td>
<td>550</td>
<td>400</td>
<td>2300</td>
<td>45.23 63.05 17.81 24.82</td>
</tr>
<tr>
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<td>600</td>
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<tr>
<td></td>
<td>11:18 AM</td>
<td>1</td>
<td>700</td>
<td>550</td>
<td>900</td>
<td>2300</td>
<td>45.23 63.05 17.81 24.82</td>
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<tr>
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<td>1250</td>
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<tr>
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<td>525</td>
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<td>22</td>
<td>575</td>
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<td></td>
</tr>
</tbody>
</table>
Grain Size Distribution

Sample Description
I-1 @ 9¾ feet

Soil Classification
Light Gray Gravelly fine to coarse Sand

Proposed Warehouse
Fontana, CA
Project No. 19G136-2
PLATE C-1
Soil Classification
Light Gray Brown Gravelly fine to coarse Sand, trace Silt

Proposed Warehouse
Fontana, CA
Project No. 19G136-2
PLATE C-2
Reference – 2

NOAA Rainfall Data
Section 6.5
Attachment H

- Construction WQMP Exhibit 1
- Post- Development WQMP Exhibit 2
### Hydrology Summary

<table>
<thead>
<tr>
<th>Drainage Area No.</th>
<th>Sub-Area</th>
<th>BMP Type</th>
<th>Tributary Area (SF)</th>
<th>Tributary Area (AC)</th>
<th>Impervious Ratio</th>
<th>2-Year Storm (CFS)</th>
<th>Required Design Capture Volume (CF)</th>
<th>Provided (CF)</th>
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<td>BPR</td>
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<td>376</td>
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<td>284</td>
<td>0.75</td>
<td>3,500</td>
<td>284</td>
<td>222</td>
</tr>
</tbody>
</table>

### Drainage Notes:
- The proposed BMPs are located within the Vicinity Map of Cherry Avenue & Santa Ana Avenue.
- The BMPs are designed to capture and reduce runoff from the surrounding areas.
- The captured volume from each BMP is noted in the table.
- The designed capture volume is greater than the provided volume, indicating additional capacity for runoff management.
- The selected BMPs are based on hydrological considerations and the specific needs of the area.
INFECTION SYSTEM #1 DETAIL

STENCILING DETAIL

CITY OF FONTANA

CHERRY AVENUE & SANTA ANA AVENUE

WQMP EXHIBIT

NO DUMPING
THE DRINKS TO WATERS