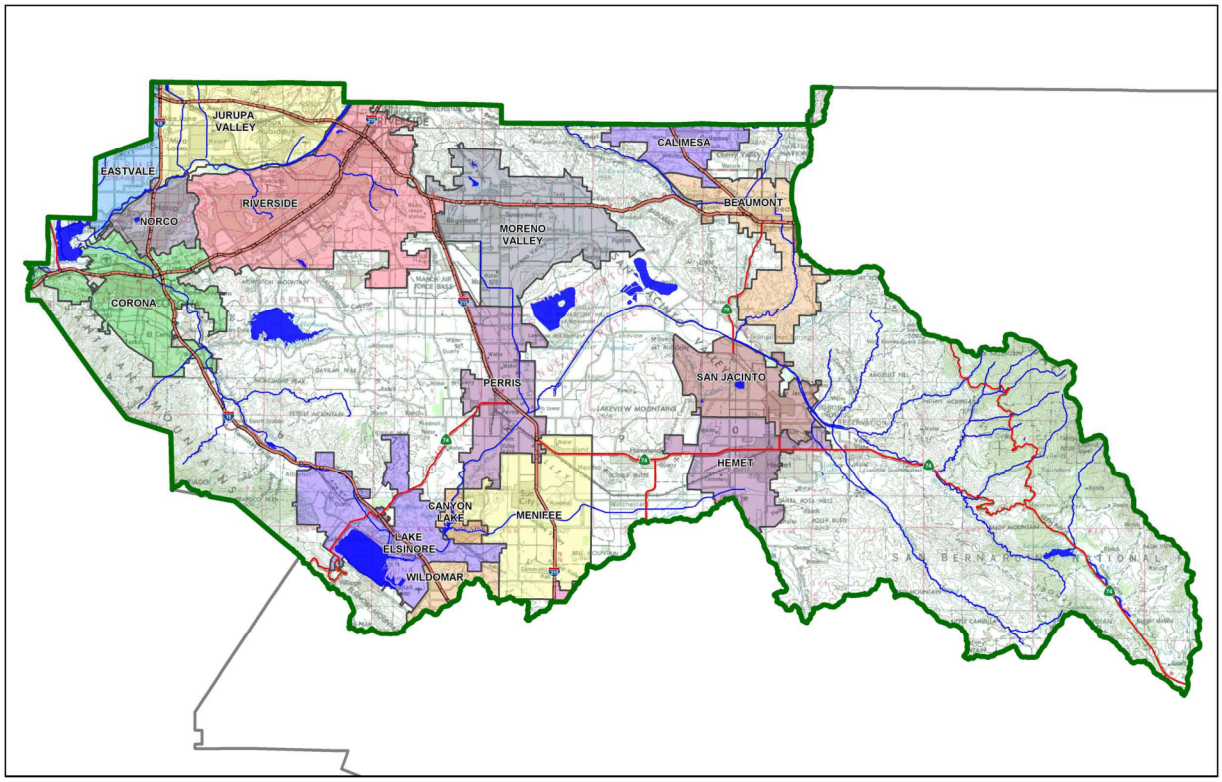
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: JD Fields Hemet

Development No: SDR21-021

Design Review/Case No: TBD



☒ **Preliminary**

☐ **Final**

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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

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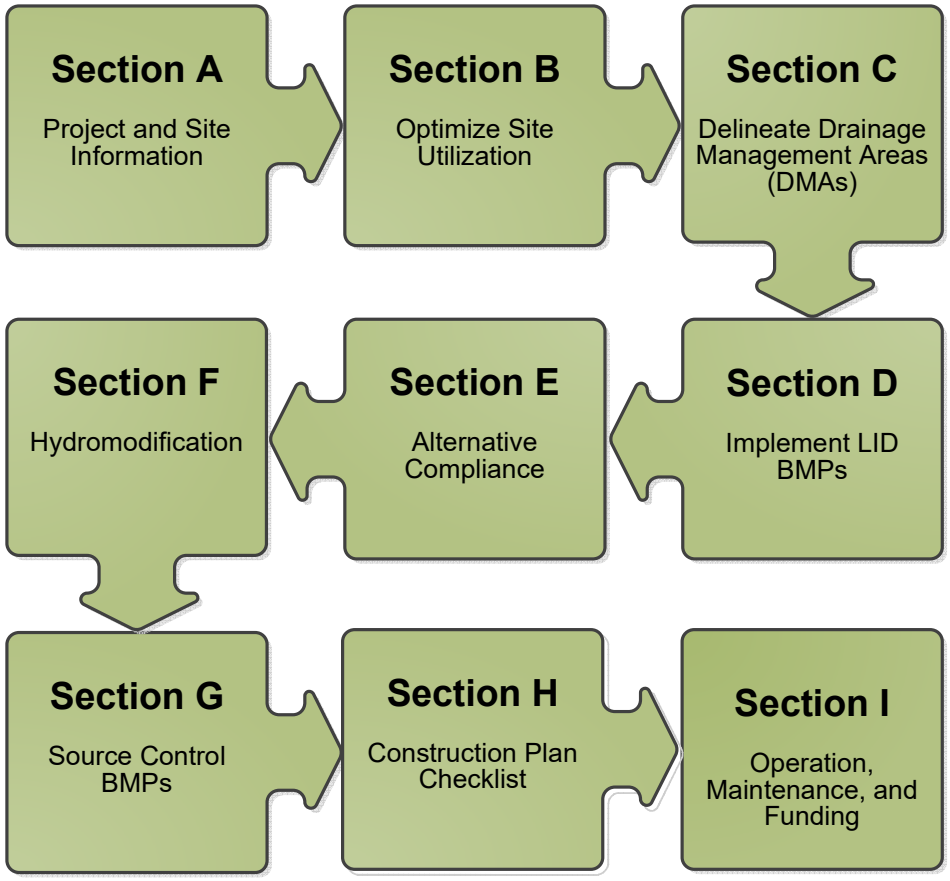
A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Foxgate Capital** by **Kimley-Horn and Associates** for the **JD Field Hemet** project.

This WQMP is intended to comply with the requirements of **City of Hemet** for Ordinance No. R8-2002-0011 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Hemet Water Quality Ordinance (Municipal Code Section 14-471).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Terence M. Cooper
Owner's Signature

12-5-2023
Date

Terence Cooper
Owner's Printed Name

Director of Investments
Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature

8/1/24
Date

Leticia Alvarez
Preparer's Printed Name

Project Manager
Preparer's Title/Position

Preparer's Licensure: C94675

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Manufacturing Warehouse
Planning Area:	M-2 (General Manufacturing)
Community Name:	Hemet, CA
Development Name:	JD Fields Hemet

PROJECT LOCATION
Latitude & Longitude (DMS): 33°44'27" N, 116°59'32.5" W
Project Watershed and Sub-Watershed: Santa Ana Watershed
Gross Acres: 9.52 APN(s): 456-140-008
Map Book and Page No.: 456-140

PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Pipe Warehouse
Proposed or Potential SIC Code(s)	3498
Area of Impervious Project Footprint (SF)	379,229 SF
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	379,229 SF
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	0 SF
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	Type A
What is the Water Quality Design Storm Depth for the project?	0.693

A.1 Maps and Site Plans

The proposed JD Fields Hemet development will include the construction of a proposed manufacturing warehouse. The proposed development will include a proposed 25,000 square foot building with an office. Site improvements will include landscaping, concrete hardscape, and asphalt paving. The associated improvements include, but are not limited to onsite grading, domestic water service, sanitary sewer service, storm drain infrastructure, concrete and asphalt pavement, landscaping, and irrigation. Offsite street improvements are not proposed as part of the project scope. The project site is approximately 9.52 acres and is located south of the intersection of West Acacia Avenue and South Gilmore Street, on the east side of the cul-de-sac located on South Gilmore Street in the City of Hemet, within Riverside County. The existing site is approximately 0% impervious. Once the site is developed 9% of the site will be pervious landscape area, 91% of the site will consist of impervious surfaces.

The existing site is currently vacant and drains in a southwest direction towards South Gilmore Street. The site land cover consists of mostly light weeds and brush. Under the existing condition, the site is not accepting any offsite flows.

The proposed site grading intends to maintain the existing flow pattern by draining in a southwest direction. All drainage will drain in the southwest direction into an infiltration basin in combination with an underground infiltration system (BMP-1). The proposed in combination with an underground infiltration system is proposed for water quality and storm water mitigation purposes. The infiltration basin volume was calculated using the Riverside County Infiltration Basin worksheet, which is based on the Riverside County Low Impact Development BMP Design Handbook.

The proposed infiltration basin in combination with an underground infiltration system (BMP-1) is for stormwater quality treatment and mitigation. The proposed infiltration basin was sized to treat the design capture the volume (DCV). The infiltration basin will have a riser structure that will disperse the stormwater into an underground infiltration system for additional capacity for mitigation purposes. Once the infiltration basin and underground infiltration system both reach capacity collectively, emergency overflows will exit onto Gilmore Street via a proposed under sidewalk drain on the northwest corner of the infiltration basin, The proposed basin alone has a total capacity that exceeds the requirement for water quality.

The volume of storage provided in the infiltration basin in combination with an underground infiltration system is intended to restrict peak flows in the proposed condition. Based on the basin routing for the 24-hr duration of the 2-year storm event, it was determined that the proposed infiltration basin in conjunction with the proposed underground infiltration system can treat and mitigate the 2-year, 24-hour storm event. The proposed site will be a zero-discharge project in which all drainage will be contained onsite, treated, and infiltrated back into the soil. An under-sidewalk culvert will be proposed adjacent to the basin for emergency overflow purposes.

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling
- BMP Locations (Lat/Long)

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
San Jacinto River	Not Listed	N/A	RARE
Canyon Lake	Nutrients, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM, WILD	N/A; Not a RARE Water Body
Lake Elsinore	DDT, Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Toxicity	REC1, REC2, COMM, WARM, WILD, RARE	RARE

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage **WDID # TBD prior to final approval**	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☒ Y	☐ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* City of Hemet Building Permit City of Hemet Electrical Permit City of Hemet Mechanical Permit City of Hemet Site Plan Approval City of Hemet Landscape Approval City of Hemet Fire Underground Approval City of Hemet Water System Approval	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes. The proposed site grading intends to maintain the existing flow pattern by predominantly draining in the southwest direction.

Did you identify and protect existing vegetation? If so, how? If not, why?

No. The existing site is currently vacant and does not have any existing vegetation to preserve, other than annual grass. The proposed development will add landscape throughout the site, making the proposed development approximately 9% pervious landscape area. Approximately 91% of the site will consist of impervious surfaces.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Yes, based on the Geotechnical Investigation and Percolation Test Results Report prepared by Partner Engineering and Science, Inc. dated July 2, 2021 (Partner Project Number: 21-324820.1) measured an average

infiltration rate of 5.17 in/hr for the site (without a factor of safety applied). Therefore, an infiltration basin in combination with an underground infiltration system is proposed to preserve natural infiltration capacity. The infiltration areas will be excavated to match design and will not be over-excavated, to avoid backfill and re-compaction of the bottoms.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes. The site plan was done with the intent of maximizing the pervious area on the site. This was accomplished by using landscape planters throughout the site and perimeter planter areas.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes. All roof drains and site drainage will be routed to the proposed infiltration combination system via concrete curb and gutter, concrete ribbon gutters or catch basins at the edge of pavement, connected to pipes discharging into the infiltration system.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
DMA-1	**Concrete/Asphalt/Compacted Soil/Landscape Areas**	**414,481**	**Type D**

[1]Reference Table 2-1 in the WQMP Guidance Document to populate this column
[2]If multi-surface provide back-up

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A			

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
N/A	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA 1	Infiltration Basin/Underground Infiltration (BMP 1)

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site; proceed to section D.3

If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: **N/A**

Type of Landscaping (Conservation Design or Active Turf): **N/A**

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: **N/A**

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: **N/A**

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: **N/A**

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
N/A	**N/A**

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: **N/A**

Project Type: **N/A**

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: **N/A**

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: **N/A**

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: **N/A**

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
N/A	**N/A**

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: **N/A**

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: **N/A**

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4: **N/A**

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: **N/A**

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)
N/A	**N/A**

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA-1	☒	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

DMA-1 is feasible for a structural LID BMP – Infiltration Basin/Underground Infiltration (BMP 1). The proposed Infiltration Basin/Underground Infiltration (BMP 1) will provide both water quality treatment and storm water mitigation.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration System BMP 1*		
DMA-1	[A]		[B]	[C]	[A] x [C]			
1A	**379,229**	**Mixed Surface Types**	**1.0**	**0.89**	**338,272.3**			
1B	**35,252**	**Ornamental Landscaping**	**0.1**	**0.11**	**3,893.9**			
						Design Storm Depth (in)	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T =**414,481**				Σ = [D] =**342,166.2**	[E] = **0.69**	[F] = $\frac{[D]x[E]}{12}$ =**19,760**	[G] =**64,931**

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☐	☒	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*
[2]*Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Area x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A		

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.

[2] Cross Reference Table E.1 above to populate this column.

[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee 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 disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	**N/A**	**N/A**	**N/A**
Volume (Cubic Feet)	**N/A**	**N/A**	**N/A**

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, 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 Susceptibility Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

The proposed infiltration basin in combination with the underground infiltration system (BMP-1) is for stormwater quality treatment and mitigation. The proposed infiltration basin/underground infiltration system was sized to treat the design capture the volume (DCV) and to retain the storm water volume required to not create any adverse impacts downstream. The proposed BMP-1 has a total capacity that exceeds the requirement for water quality.

The volume of storage provided in the infiltration basin in combination with the underground infiltration system is intended to restrict peak flows in the proposed condition to levels equal to or less than the existing flows. Based on the basin routing for the 24-hr duration of the 2-year storm event, it was determined that the proposed infiltration system can treat and mitigate the 2-year, 24-hour storm event. The proposed site will be a zero-discharge project in which all drainage will be contained onsite, treated, and infiltrated back into the soil. An under-sidewalk culvert will be proposed adjacent to the basin for emergency overflow purposes.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site storm drain inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	• Project owner shall initially stencil or placard/paint-stencil all storm drain inlets and shall inspect/maintain the messages, annually
Landscape/ Outdoor Pesticide Use	• Site landscaping shall be designed to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape. • To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• The project owner shall properly collect and dispose of plant maintenance waste materials and shall maintain landscaping using minimum or no pesticides. • See applicable operational BMPs in "What you should know for…..Landscape and Gardening". • Provide IPM information to new owners, lessees and operators. • Irrigation systems shall be regularly inspected and maintained.
Vehicle and Equipment Cleaning	N/A	• Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system or allowed to be drained into pervious areas. All vehicle wash water shall be contained and discharged to a sanitary sewer drain that does not accept stormwater runoff. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below.
Vehicle/Equipment Repair and Maintenance	• The property owner will prohibit any vehicle repair or maintenance onsite.	N/A
Miscellaneous Drain or Wash Water or Other Sources: Roofing, gutters, and trim	• Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. • Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	N/A
Plazas, sidewalks, and parking lots	N/A	• Vacuum sweep paved drive aisles and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
Refuse area	Outdoors Waste and Recycling enclosures with masonry walls and roofs will be constructed per City of Hemet standards and architectural plans. Signs "Do not dump hazardous materials here" or similar will be posted on or near the bins. Outdoors trash receptacles will be provided at the common open space areas.	Provide adequate number of trash receptacles and bins. Inspect receptacles and bins regularly; repair or replace leaky receptacles and bins. Keep bins covered. Prohibit/ prevent dumping of liquid or hazardous waste. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. • See Fact Sheet SC-34, "Waste Handling and Disposal" provided in Appendix 10.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table 0.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
BMP-1	**Infiltration System**	**Sheet 2**	**Latitude=33°44'24"** **Longitude=116°59'35.5"**

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section H: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Foxgate Capital

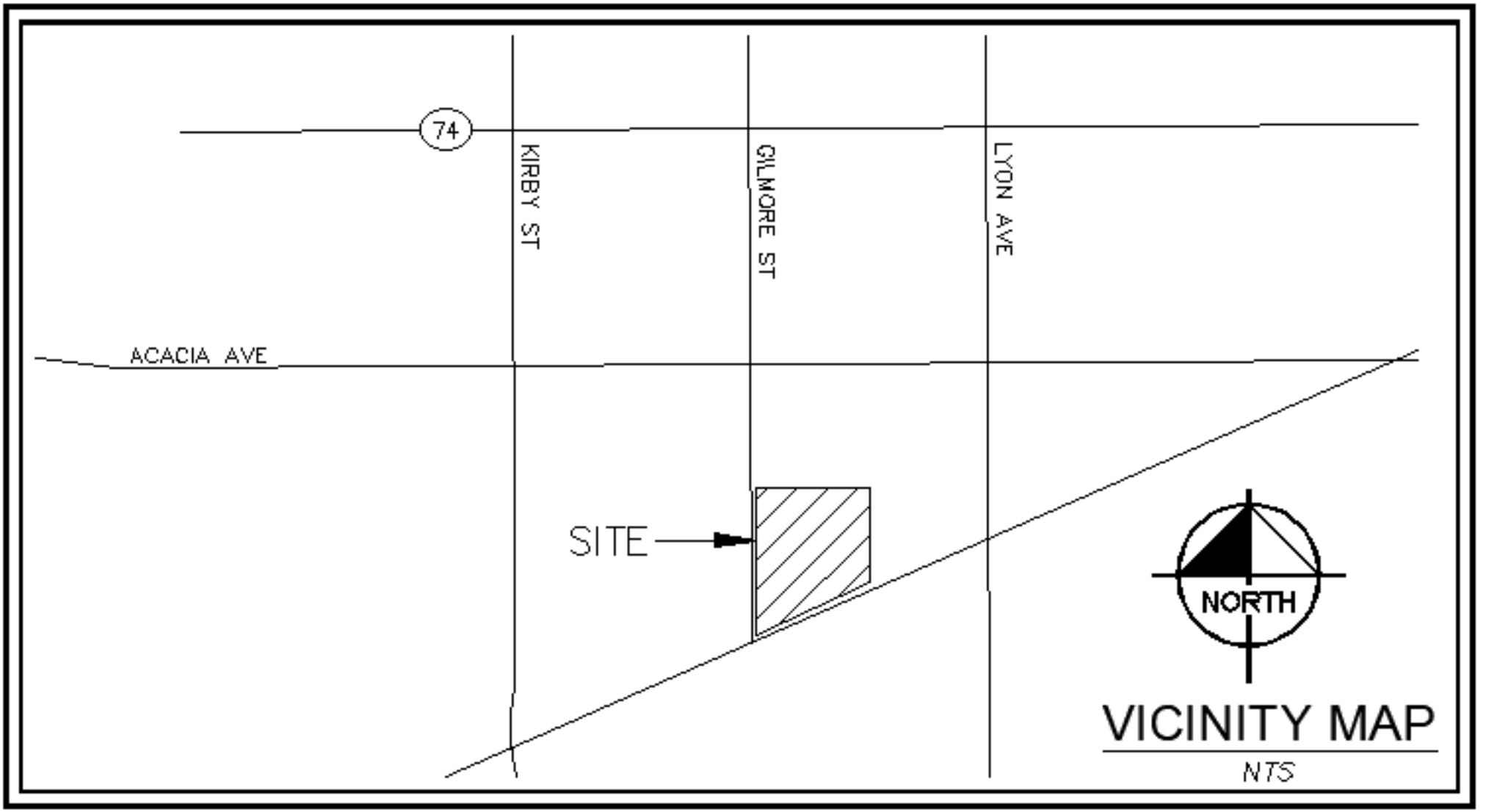
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



VICINITY MAP

NTS

Location Map

Assessor - County Clerk - Recorder
Riverside County, CA

Property Detail

Assessment No.	456140008
APN	456140008
Property Type	Vacant Commercial Land
Neighborhood	Land - Hemet, San Jacinto and adjacent County areas
Acreage	9.20

Legal Description

9.20 ACRES IN POR NW 1/4 OF SEC 16 T5S R1W FOR TOTAL DESCRIPTION SEE ASSESSORS MAPS TownshipN 5 Acres 009.20 Section 16 Portion 1/4 Range 01 PortionDirection N RangeDirection W

Value History (Part 1)

Year	Reason Date	Market Value				Factored Base Year Value			
		Land	Improvement	Living Improvement	Total	Land	Improvement	Living Improvement	Total
2017	Other 01/01/2017					$1,766,240			$1,766,240
2018	Other 01/01/2018					$1,801,564			$1,801,564
2019	01/01/2019					$1,837,595			$1,837,595
2020	01/01/2020					$1,874,346			$1,874,346
2021	01/01/2021					$1,893,764			$1,893,764

Value History (Part 2)

Year	Restricted Value				Assessed Value				Penalty	Exemption	Net Taxable Value
	Land	Improvement	Living Improvement	Total	Land	Improvement	Living Improvement	Total			
2017					$1,766,240			$1,766,240			$1,766,240
2018					$1,801,564			$1,801,564			$1,801,564
2019					$1,837,595			$1,837,595			$1,837,595
2020					$1,874,346			$1,874,346			$1,874,346
2021					$1,893,764			$1,893,764			$1,893,764

Transfer History

Doc #	Sales Price	Date	Vacant Land
2016-9034408-UC	$0	4/3/2016	True
2006-0324641	$1,500,000	5/4/2006	True
2005-0919106	$0	11/4/2005	True
2005-0635011	$680,000	8/5/2005	True
2005-5635011	$0	8/5/2005	True
2002-0154966	$0	3/27/2002	True
1998-0544060	$0	12/15/1998	True
1995-9926126-UC	$0	6/1/1995	True
1992-0498583	$0	12/31/1992	True
1975-0160668	$80,000	12/24/1975	True
1973-0151427-NO	$0	11/1/1973	True
1972-0075831	$0	6/1/1972	True

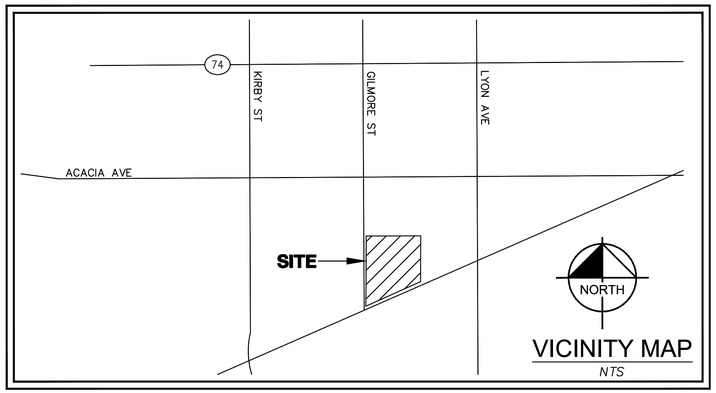
Features

Land Details

Primary Use	Land Type	Acres	Eff. Frontage	Eff. Depth
Commercial	LandLine 01 / 456140008 / Commercial	9.20	0.00	0.00

Riverside County is not liable for erroneous or incomplete data.
California Revenue and Taxation Code Sec. 408.3 (d)

Date Printed: 10/12/2021



VICINITY MAP
NTS

TREATMENT CONTROL & SOURCE CONTROL BMP'S	
BMP ID	BMP DESCRIPTION
TC-11	INFILTRATION BASIN
SC-44	DRAINAGE SYSTEM MAINTENANCE
SC-71	SIDEWALK CLEANING
SC-73	LANDSCAPE MAINTENANCE
SD-10	SITE DESIGN AND LANDSCAPE PLANNING
SD-11	ROOF RUNOFF CONTROL
SD-12	EFFICIENT IRRIGATION
SD-13	STORM DRAIN SIGNAGE

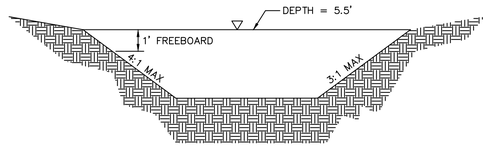
LANDSCAPE NOTE:

FINISH GRADE OF LANDSCAPE AREAS IS TO BE DEPRESSED 1-2 INCHES (MIN.) BELOW TOP OF CURB, SIDEWALK OR PAVEMENT.

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- DRAINAGE SUBAREA BOUNDARY
- FLOW PATH
- (XXXX) EXISTING CONTOUR
- (XXXX) EXISTING MINOR CONTOUR
- XXXX PROPOSED CONTOUR
- XXXX PROPOSED MINOR CONTOUR
- DMA-# X.XX HYDROLOGY SUBAREA ACREAGE
- FLOW ARROWS
- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY CONCRETE WALK
- LANDSCAPE/PLANTER AREA
- HEAVY DUTY CONCRETE
- PROPOSED BUILDING (IMPERVIOUS)

DMA	SURFACE TYPE	AREA (SF)	BMP ID	REQUIRED DCV (CF)	PROP VOL (CF)	MIN BOT AREA(SF)	PROP BOT AREA (SF)
DMA 1	CONC./ASPH.	379,229	BMP-1	19,760	64,931	4,391	4,496
	LANDSC.	35,252					



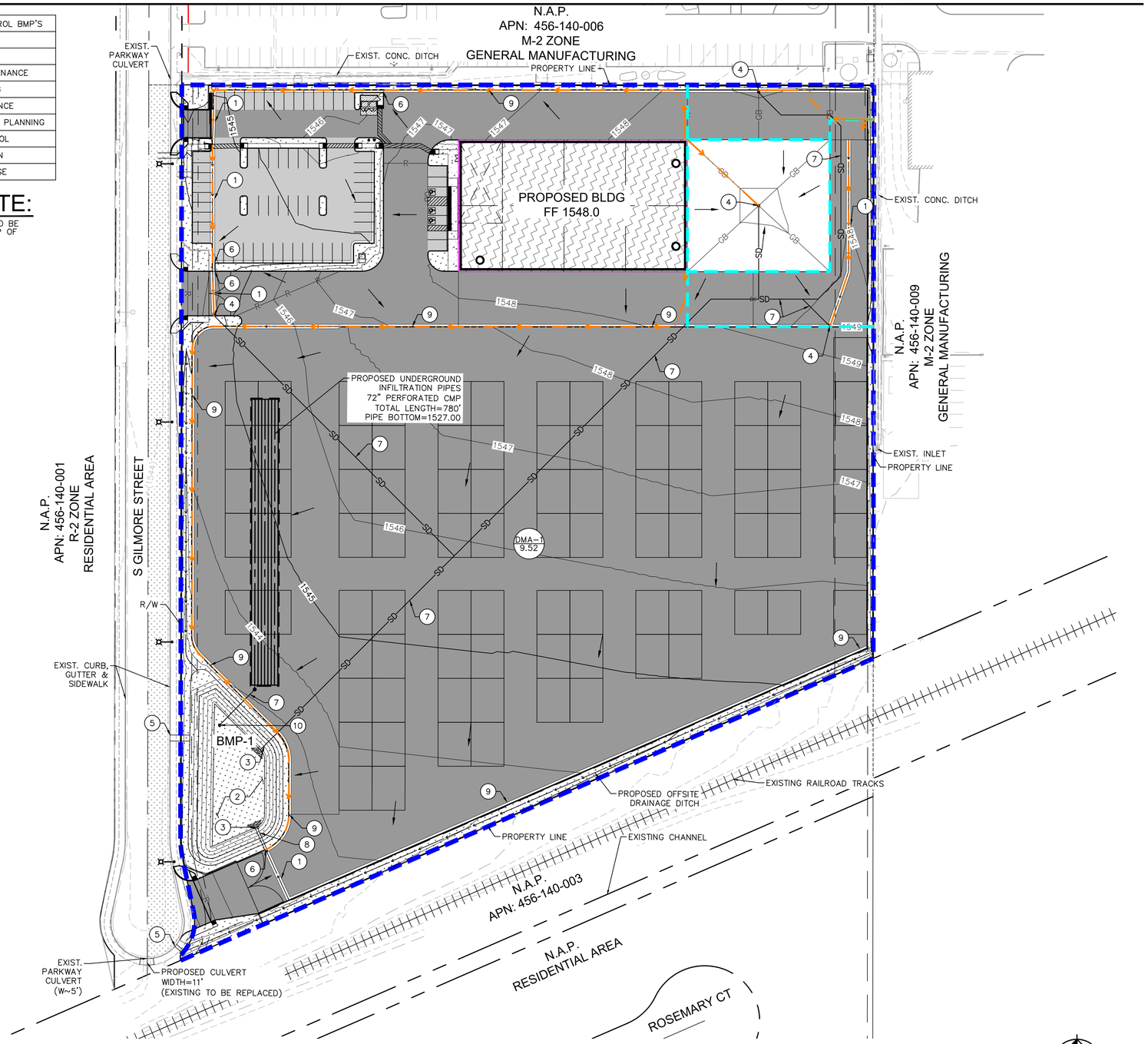
INFILTRATION BASIN
N.T.S.

BMP MAINTENANCE:

INFILTRATION BASIN
TRASH, DEBRIS AND SEDIMENT MUST BE REMOVED FROM BASIN CURB CUT LOCATIONS, ALONG GUTTERS, AND WITHIN THE BASINS AND DISPOSED OF PER LOCAL JURISDICTION REQUIREMENTS. INSPECTION AND MAINTENANCE REQUIRED AFTER EVERY RAIN EVENT GREATER THAN 0.5". INSPECTIONS SHOULD OCCUR ON A MONTHLY BASIS TO ENSURE OPTIMUM PERFORMANCE. THE OWNER IS RESPONSIBLE FOR ALL BMP MAINTENANCE OPERATIONS.

KEY NOTES:

1. PROPOSED 4' RIBBON GUTTER
2. PROPOSED INFILTRATION BASIN
3. PROPOSED HEADWALL WITH RIP RAP AND PRETREATMENT DEVICE
4. PROPOSED GRATED INLET WITH FILTER INSERT
5. PROPOSED UNDER SIDEWALK OVERFLOW DRAIN WITH FILTER INSERT
6. PROPOSED 2 FOOT CURB CUT
7. PROPOSED STORM DRAIN PIPE
8. PROPOSED CONCRETE SPILLWAY
9. PROPOSED CURB AND GUTTER
10. PROPOSED RISER STRUCTURE



NORTH

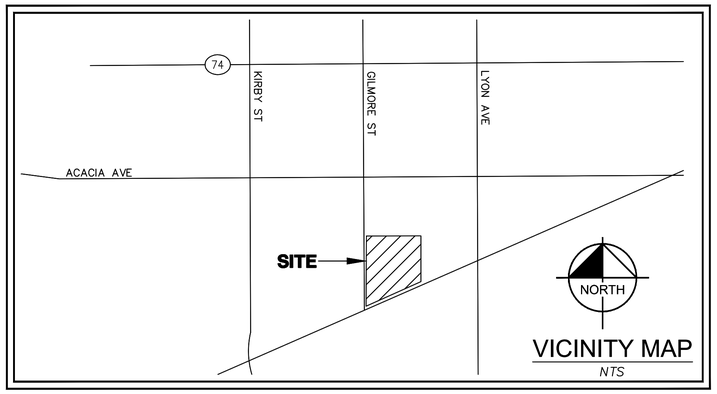
GRAPHIC SCALE IN FEET
0 25 50 100
1" = 50'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

Kimley»Horn

PRELIMINARY WQMP EXHIBIT
JD FIELDS HEMET
7/31/2024

Appendix 2: Construction Plans

Grading and Drainage Plans



VICINITY MAP
NTS

LEGEND

- PROPERTY LINE
- CIVIL LIMITS OF WORK
- BUILDING SETBACK
- EASEMENT
- FLOW LINE
- GRADEBREAK
- (1545.10 TC) / (1544.60 FS) — EXISTING SPOT ELEVATION
- 1545.10 TC / 1544.60 FS — PROPOSED SPOT ELEVATION
- 1.5% — PROPOSED FLOW (DIRECTION AND SLOPE)
- (XXXX) — EXISTING CONTOUR
- (XXXX) — EXISTING MINOR CONTOUR
- XXXX — PROPOSED CONTOUR
- XXXX — PROPOSED MINOR CONTOUR
- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY CONCRETE WALK
- LANDSCAPE/PLANTER AREA
- HEAVY DUTY CONCRETE
- FULL DEPTH REMOVAL TO MATCH EXISTING IN KIND
- DRIVEWAY DEDICATION

N.A.P.
APN: 456-140-006
M-2 ZONE
GENERAL MANUFACTURING

PROPOSED BLDG
FF 1548.65

PROPERTY LINE
N89°59'23"W, 629.76'

EX. SIDEWALK TO REMAIN

PROP. RIGHT-OF-WAY DEDICATION

PROP. DRIVEWAY PER CITY STD. 210A

SEE DETAIL A, SHEET 2, FOR MORE INFORMATION.

EXISTING 8' SOUTHERN CALIFORNIA EDISON UTILITY AND ACCESS EASEMENT PER INSTRUMENT 2007-0421114

PROP. RIGHT-OF-WAY DEDICATION

PROP. DRIVEWAY PER CITY STD. 210A

S GILMORE STREET ℄

EX. CURB AND GUTTER

EX. SIDEWALK TO REMAIN

RIGHT-OF-WAY
N0°06'03"E
685.03'

EXISTING 15' BUILDING SETBACK

EXISTING 10' SKYLINE HOMES SEWER EASEMENT PER INSTRUMENT NO. 1976-5450

EX. SIDEWALK TO REMAIN

PIPE STORAGE AREAS

EXISTING CONCRETE TO BE DEMOLISHED

EXISTING 5' SOUTHERN SIERRAS POWER POLE EASEMENT RECORDED IN BOOK 759, PAGE 470 DEEDS

EXISTING 35' PIPELINE EASEMENT PER INSTRUMENT NO. 1968-122092

PROPERTY LINE

PROPOSED UNDERGROUND INFILTRATION PIPES
72" PERFORATED CMP
TOTAL LENGTH=780'
PIPE BOTTOM=1527.00

N.A.P.
APN: 456-140-001
R-2 ZONE
RESIDENTIAL AREA

S GILMORE STREET

N.A.P.
APN: 456-140-009
M-2 ZONE
GENERAL MANUFACTURING

KEY NOTES:

1. PROPOSED 4' RIBBON GUTTER
2. PROPOSED INFILTRATION BASIN
3. PROPOSED HEADWALL WITH RIP RAP AND PRETREATMENT DEVICE
4. PROPOSED GRATED INLET WITH FILTER INSERT
5. PROPOSED UNDER SIDEWALK OVERFLOW DRAIN WITH FILTER INSERT
6. PROPOSED 2 FOOT CURB CUT
7. PROPOSED STORM DRAIN PIPE
8. PROPOSED TRASH ENCLOSURE PER CITY STANDARDS R-500B (DOUBLE)
9. PROPOSED CURB RAMP WITH DETECTABLE WARNINGS
10. PROPOSED VARYING HEIGHT GRAVITY CURB, CURB AND GUTTER (MAX 2.45')
11. PROPOSED CURB
12. PROPOSED CURB AND GUTTER
13. PROPOSED CONCRETE SPILLWAY
14. PROPOSED RISER STRUCTURE

ESTIMATED EARTHWORK QUANTITIES

SEE SHEET 2

CUT:	7,793 CY
FILL:	7,346 CY
NET:	447 CY CUT

NOTE: THE ABOVE QUANTITIES ARE APPROXIMATE IN PLACE VOLUMES CALCULATED FROM THE EXISTING GROUND TO THE PROPOSED FINISHED GRADE. EXISTING GROUND IS DEFINED BY THE CONTOURS AND SPOT GRADES ON THE BASE SURVEY. PROPOSED FINISHED GRADE IS DEFINED AS THE FINAL GRADE AS INDICATED ON THE GRADING PLAN(S).

THE EARTHWORK QUANTITIES ABOVE ARE FOR PERMIT PURPOSES ONLY. THEY HAVE NOT BEEN FACTORED TO ACCOUNT FOR CHANGES IN VOLUME DUE TO BULKING, CLEARING AND GRUBBING, SHRINKAGE, OVER- EXCAVATION AND RE-COMPACTION, AND CONSTRUCTION METHODS. NOR DO THEY ACCOUNT FOR THE THICKNESS OF PAVEMENT SECTIONS, FOOTINGS, SLABS, REUSE OF PULVERIZED MATERIALS THAT WILL UNDERLIE NEW PAVEMENTS, ETC. THE CONTRACTOR SHALL RELY ON THEIR OWN EARTHWORK ESTIMATES FOR BIDDING PURPOSES.

SITE DATA:

PARCEL SIZE:	414,481± S.F. (9.52± AC)
LIMITS OF DISTURBANCE:	414,481± S.F. (9.52± AC)
PROPOSED IMPERVIOUS AREA:	379,229± S.F. (8.71± AC)
PROPOSED PERVIOUS AREA:	35,252± S.F. (0.81± AC)
APN:	456-140-008
EXISTING USE:	VACANT
PROPOSED USE:	MANUFACTURING WAREHOUSE (M-2)
GENERAL PLAN:	INDUSTRIAL GENERAL PLAN (I)
PARKING REQUIREMENTS:	1 STALL/500 SQUARE FEET =

GENERAL NOTES

- PROPOSED TRASH ENCLOSURE MUST BE INSTALLED IN ACCORDANCE WITH CITY OF HEMET STANDARDS AND SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.

LANDSCAPE NOTE:

FINISH GRADE OF LANDSCAPE AREAS IS TO BE DEPRESSED 1-2 INCHES (MIN.) BELOW TOP OF CURB, SIDEWALK OR PAVEMENT.

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60
1" = 30'
WHEN PRINTED AT FULL SIZE (24" BY 36")

Kimley»Horn

PRELIMINARY GRADING PLAN

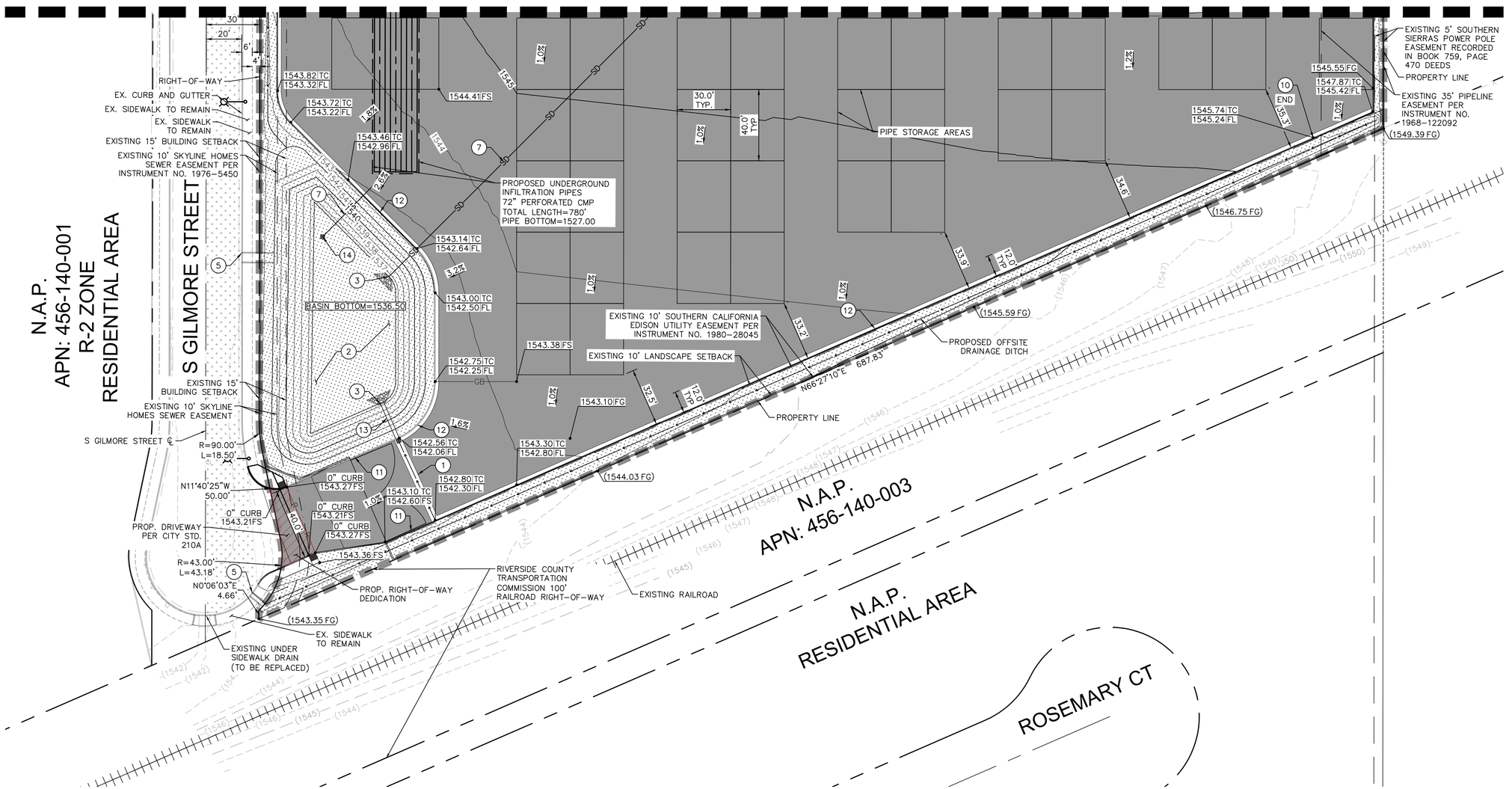
JD FIELDS HEMET

7/31/2024

SEE SHEET 1

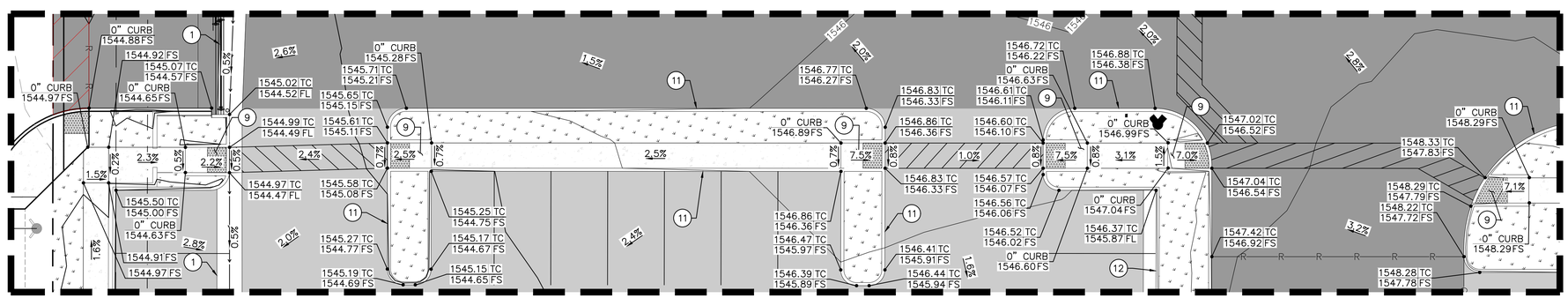
LEGEND

- PROPERTY LINE
- CIVIL LIMITS OF WORK
- BUILDING SETBACK
- EASEMENT
- FLOW LINE
- GRADEBREAK (CB—CB)
- (1545.10 TC) / (1544.60 FS) — EXISTING SPOT ELEVATION
- 1545.10 TC / 1544.60 FS — PROPOSED SPOT ELEVATION
- 1.5% — PROPOSED FLOW (DIRECTION AND SLOPE)
- (XXXX) — EXISTING CONTOUR
- (XXXX) — EXISTING MINOR CONTOUR
- XXXX — PROPOSED CONTOUR
- XXXX — PROPOSED MINOR CONTOUR
- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY CONCRETE WALK
- LANDSCAPE/PLANTER AREA
- HEAVY DUTY CONCRETE
- COMPACTED SOIL AREA WITH 6" OF COMPACTED GRAVEL. GEOTEXTILE TO BE PLACED UNDERNEATH GRAVEL LAYER
- PERMANENT TIRE RACK
- FULL DEPTH REMOVAL AND REPLACEMENT TO MATCH EXISTING IN—KIND
- DRIVEWAY DEDICATION



KEY NOTES:

1. PROPOSED 4' RIBBON GUTTER
2. PROPOSED INFILTRATION BASIN
3. PROPOSED HEADWALL WITH RIP RAP
4. PROPOSED GRATED INLET WITH FILTER INSERT
5. PROPOSED UNDER SIDEWALK OVERFLOW DRAIN WITH FILTER INSERT
6. PROPOSED 2 FOOT CURB CUT
7. PROPOSED STORM DRAIN PIPE
8. PROPOSED TRASH ENCLOSURE PER CITY STANDARDS R-500B (DOUBLE)
9. PROPOSED CURB RAMP WITH DETECTABLE WARNINGS
10. PROPOSED VARYING HEIGHT GRAVITY CURB, CURB AND GUTTER (MAX 2.45')
11. PROPOSED CURB
12. PROPOSED CURB AND GUTTER
13. PROPOSED CONCRETE SPILLWAY
14. BOLT PERMANENT TIRE TRACK TO ASPHALT PAVEMENT



DETAIL A:

SCALE: 1"=10'

NORTH

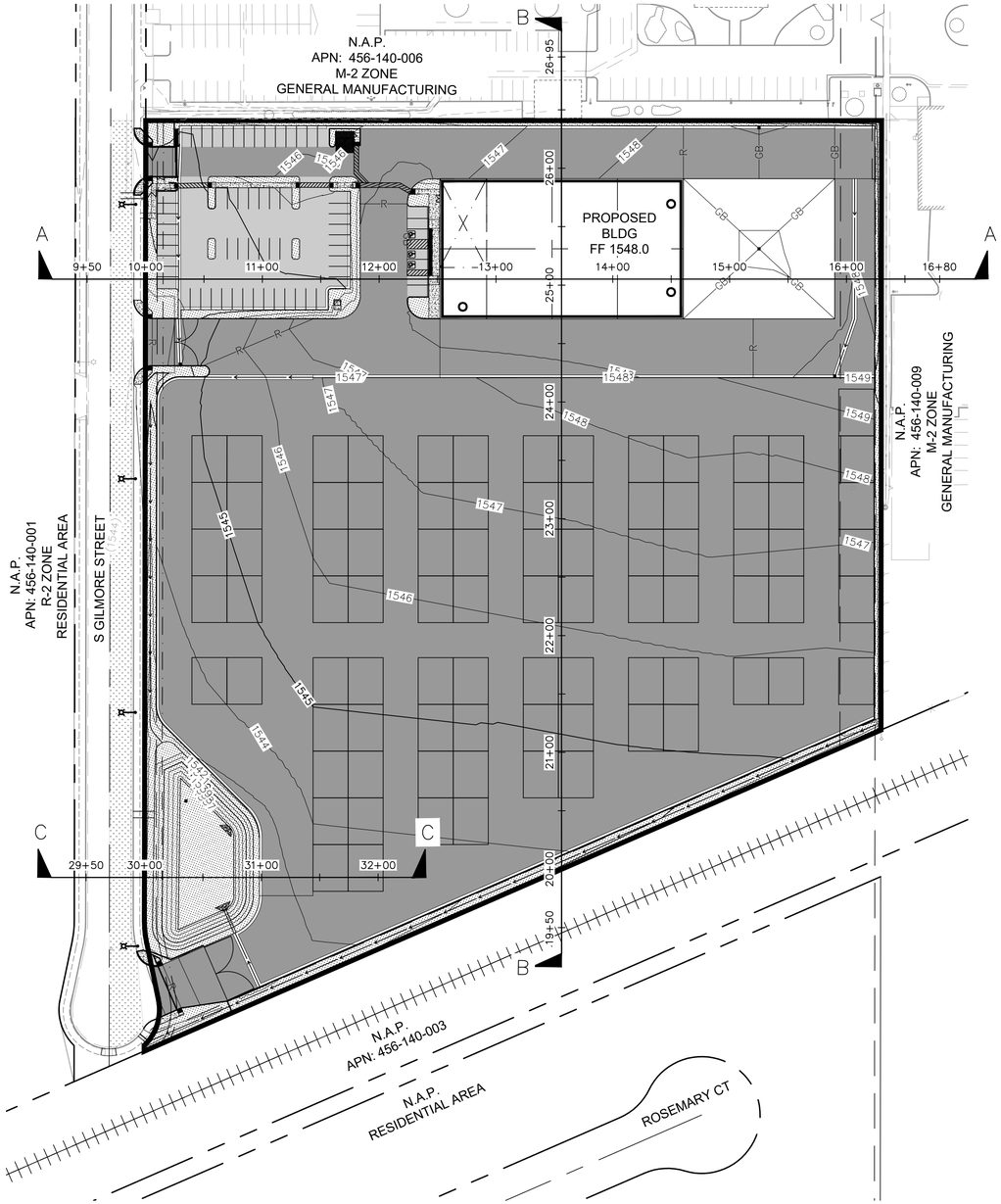
GRAPHIC SCALE IN FEET
0 15 30 60
1" = 30'
WHEN PRINTED AT FULL SIZE (24" BY 36")

Kimley»Horn

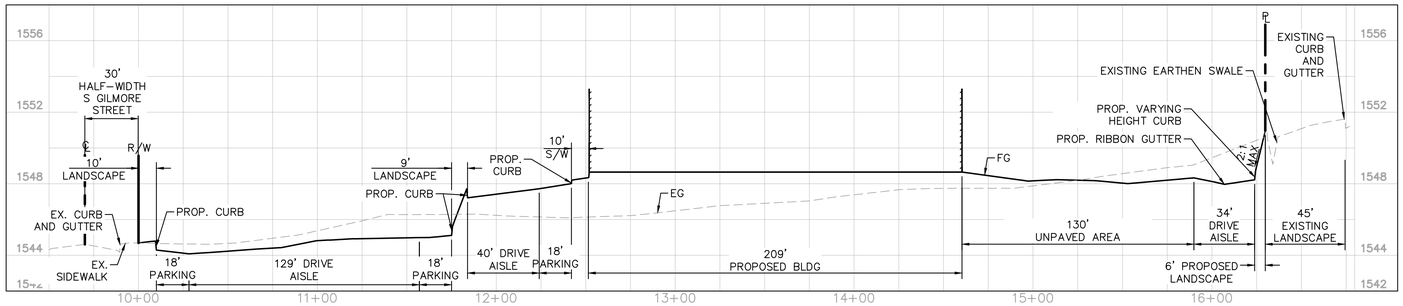
PRELIMINARY GRADING PLAN

JD FIELDS HEMET

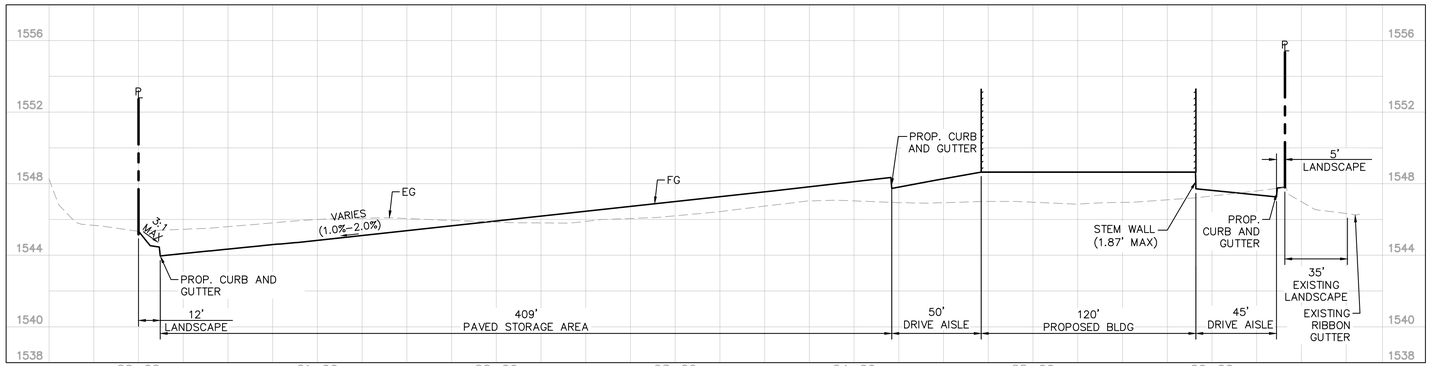
7/31/2024



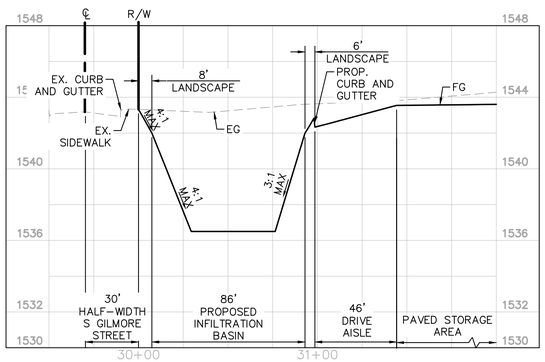
SECTION MAP
1"=60'



SECTION A–A
HORIZONTAL SCALE 1"=40"
VERTICAL SCALE 1"=4'



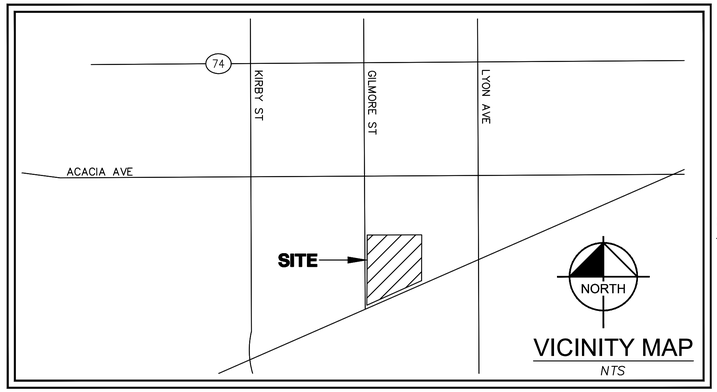
SECTION B–B
HORIZONTAL SCALE 1"=40"
VERTICAL SCALE 1"=4'



SECTION C–C
HORIZONTAL SCALE 1"=40"
VERTICAL SCALE 1"=4'

Kimley»Horn

PRELIMINARY SECTIONS
JD FIELDS HEMET
8/1/2024



VICINITY MAP
NTS

EXISTING UTILITY NOTE

1. THE UTILITIES SHOWN ON THE PLAN ARE BASED ON AVAILABLE RECORDS. THE CONTRACTOR MUST FIELD DETERMINE THE LOCATION, MATERIAL, AND DEPTH OF ALL UTILITIES PRIOR TO ANY CONSTRUCTION. REPORT DISCREPANCIES AND POTENTIAL CONFLICTS WITH PROPOSED UTILITIES TO ENGINEER PRIOR TO INSTALLATION OF ANY PIPING.
2. ALL SHUT DOWN OF EXISTING WATER MAIN TO BE DONE BY AND COORDINATED WITH THE CITY UTILITY DIVISION. CONTRACTOR SHALL NOTIFY ALL AFFECTED WATER USERS 72 HOURS IN ADVANCE OF SHUT DOWN.

GENERAL NOTES

1. REDUCE PRESSURE PRINCIPLE BACKFLOW PREVENTOR ASSEMBLY TO BE PER CITY OF HEMET ORDINANCE TITLE 13, CHAPTER 4 AND CURRENT POLICIES OF THE PUBLIC UTILITY DEPARTMENT TO INCLUDE CERTIFICATION THAT THE ASSEMBLY MEETS CURRENT STANDARDS BY A CITY APPROVED CERTIFIED TESTER.
2. PROPOSED BACKFLOW PREVENTOR TO BE INSTALLED PER CITY OF HEMET PUBLIC WORKS STANDARD NO W-713.
3. FIRE FLOW IS TO BE DETERMINED BY 2019 CA FIRE CODE APPENDIX B.
4. FIRE SPRINKLERS AND MONITORING ALARM TO BE COMPLAINT WITH THE 2016 NFPA 13 AND NFPA 72.

LEGEND

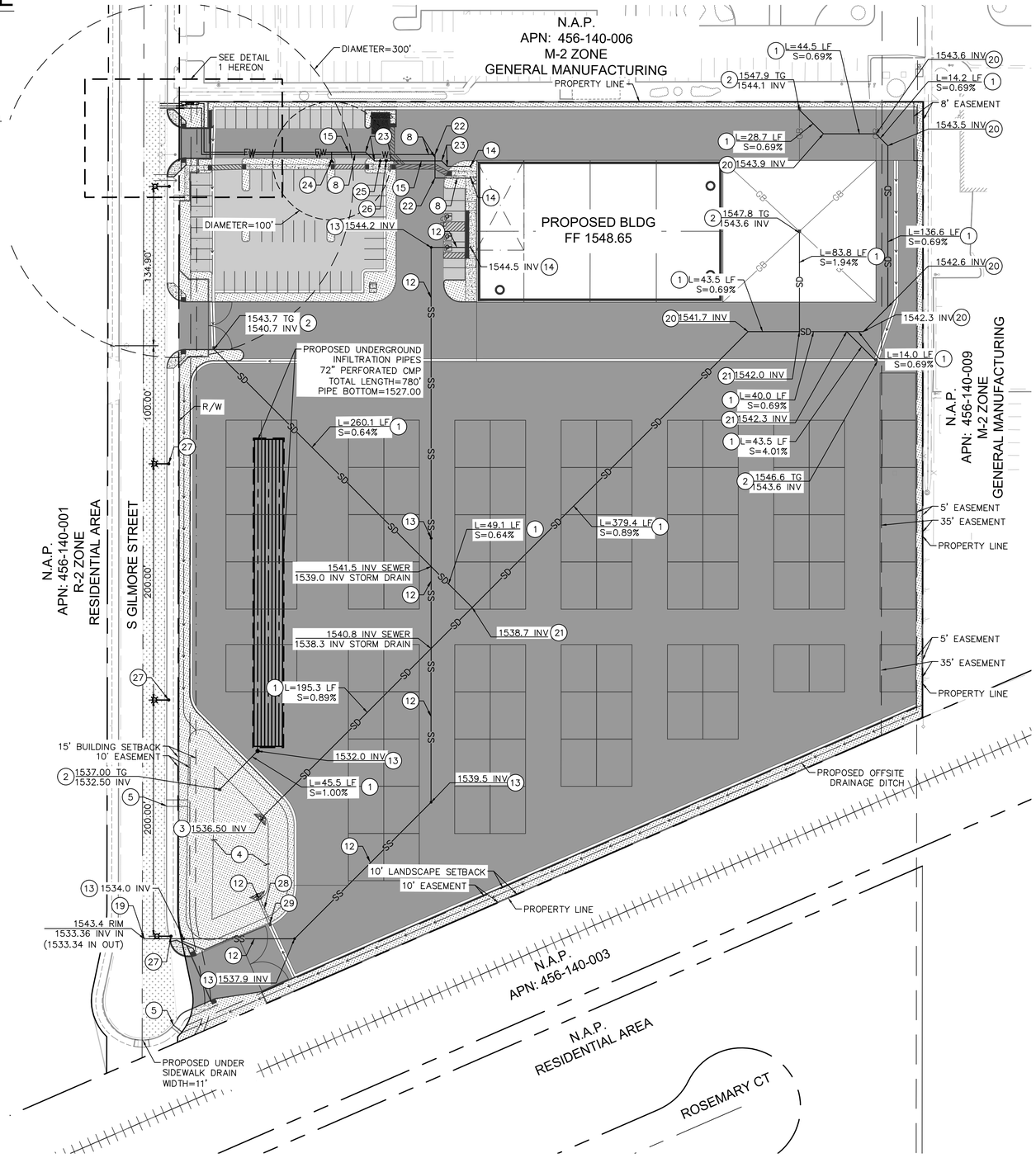
- PROPERTY LINE
- BUILDING SETBACK
- EASEMENT
- W — W — PROPOSED DOMESTIC WATER
- W — W — PROPOSED IRRIGATION
- FW — FW — PROPOSED FIRE WATER MAIN
- SS — SS — PROPOSED SEWER MAIN
- SD — SD — PROPOSED STORMDRAIN
- PROPOSED GRATED INLET
- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY CONCRETE WALK
- LANDSCAPE/PLANTER AREA
- HEAVY DUTY CONCRETE
- FULL DEPTH REMOVAL AND REPLACEMENT TO MATCH EXISTING IN-KIND

KEY NOTES:

1. PROPOSED STORM DRAIN PIPE
2. PROPOSED GRATED INLET WITH FILTER INSERT
3. PROPOSED HEADWALL WITH RIP RAP AND PRETREATMENT DEVICE
4. PROPOSED INFILTRATION BASIN
5. PROPOSED UNDER SIDEWALK OVERFLOW DRAIN WITH FILTER INSERT
6. PROPOSED DOMESTIC WATER METER
7. PROPOSED DOMESTIC WATER BACKFLOW PREVENTOR PER CITY OF HEMET PUBLIC WORKS STANDARD NO W-713.
8. PROPOSED 1" DOMESTIC WATER SERVICE LINE
9. PROPOSED IRRIGATION WATER METER
10. PROPOSED IRRIGATION WATER BACKFLOW PREVENTOR PER CITY OF HEMET PUBLIC WORKS STANDARD NO W-713.
11. PROPOSED 1" IRRIGATION WATER SERVICE LINE
12. PROPOSED SEWER MAIN (SLOPE= 1.00%)
13. PROPOSED CLEANOUT
14. PROPOSED BUILDING POINT OF CONNECTIONS
15. PROPOSED 6" FIRE WATER MAIN
16. PROPOSED 6" REDUCE PRESSURE PRINCIPLE BACKFLOW PREVENTOR ASSEMBLY
17. PROPOSED 6" 90° FIRE WATER BEND
18. EXISTING FIRE HYDRANT
19. CONNECT PROPOSED SEWER LATERAL INTO EXISTING SEWER MANHOLE
20. PROPOSED STORM DRAIN 45° BEND
21. PROPOSED STORM DRAIN TEE/WYE BEND
22. PROPOSED 90° DOMESTIC WATER BEND
23. PROPOSED 6" 45° FIRE WATER BEND
24. PROPOSED FIRE HYDRANT
25. PROPOSED POST INDICATOR VALVE
26. PROPOSED FIRE DEPARTMENT CONNECTION
27. PROPOSED STREET LIGHT
28. PROPOSED CONCRETE SPILLWAY
29. PROPOSED CURB CUT

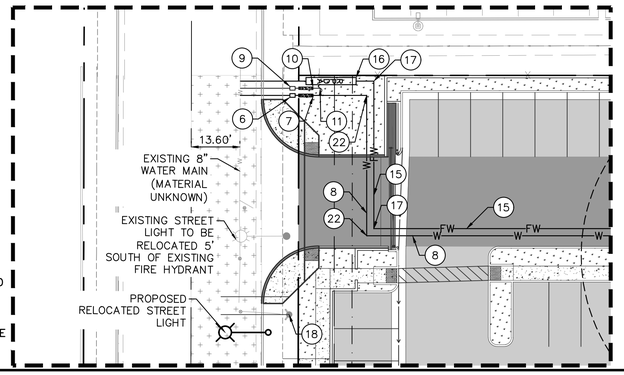
UTILITY PURVEYORS

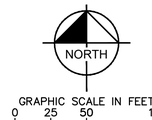
- WATER AND SEWER
  445 E FLORIDA AVENUE
  CITY HALL
  HEMET, CA 92543
  (951) 765-2350
- SPECTRUM
  (855)427-0191
- FRONTIER FIOS
  (877) 349-9182
- DIRECT TV
  (855) 463-7359
- SOUTHER CALIFORNIA TELEPHONE
  (800) 840-6673
- SOUTHERN CALIFORNIA EDISON
  (800) 655-4555
- WESTERN COMMUNITY ENERGY
  (951) 405-6760
- SOUTHERN CALIFORNIA GAS COMPANY
  (800)427-2200
- CR&R
  (800) 826-9677
- WASTE MANAGEMENT
  (800) 423-9986
- RIVERSIDE COUNTY WASTE MANAGEMENT
  (951)486-3200



GRAPHIC SCALE IN FEET
0 10 20 40
1" = 20'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

DETAIL 1





GRAPHIC SCALE IN FEET
0 25 50 100
1" = 50'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

Kimley»Horn

PRELIMINARY UTILITY PLAN
JD FIELDS HEMET
7/31/2024

SHEET 1 OF 1

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

WQMP Project Report

County of Riverside Stormwater Program

Santa Ana River Watershed Geodatabase

Monday, July 26, 2021

Note: The information provided in this report and on the Stormwater Geodatabase for the County of Riverside Stormwater Program is intended to provide basic guidance in the preparation of the applicantï¿½s Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	456140008
Latitude/Longitude:	33.741, -116.9923
Thomas Brothers Page:	
Project Site Acreage:	8.82
Watershed(s):	SANTA ANA
This Project Site Resides in the following Hydrologic Unit(s) (HUC):	**HUC Name** - HUC Number **San Jacinto Valley** - 180702020302
The HUCs Contribute stormwater to the following 303d listed water bodies and TMDLs which may include drainage from your proposed Project Site:	**WBID Name** - WBID Number **Canyon Lake (Railroad Canyon Reservoir)** - CAL8021100019990208151525 **Elsinore, Lake** - CAL8023100019990208151100
These 303d listed Water bodies and TMDLs have the following Pollutants of Concern (POC):	**Bacterial Indicators** - Pathogens **Nutrients** - Nutrients, Organic Enrichment/Low Dissolved Oxygen **Other Organics** - PCBs (Polychlorinated biphenyls) **Toxicity** - Sediment Toxicity, Unknown Toxicity
Is the Site subject to Hydromodification:	Yes
Limitations on Infiltration:	**Project Site Onsite Soils Group(s)** - A **Known Groundwater Contamination Plumes within 1000'** - No **Adjacent Water Supply Wells(s)** - No information available please contact your local water agency for more information. Your local contact agency is EASTERN MUNICIPAL W.D.. Your local wholesaler contact agency is METROPOLITAN WATER DISTRICT.
Environmentally Sensitive Areas within 200'(Fish and Wildlife Habitat/Species):	None
	None

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Environmentally Sensitive Areas within 200'(CVMSHCP):	
Environmentally Sensitive Areas within 200'(WRMSHCP):	None
Groundwater elevation from Mean Sea Level:	1325
85th Percentile Design Storm Depth (in):	0.693
Groundwater Basin:	Hemet-South
MSHCP/CVMSHCP Criteria Cell (s):	No Data
Retention Ordinance Information:	No Data
Studies and Reports Related to Project Site:	Comprehensive Nutrient Reduction Plan IBI Scores - Southern Cal Bulletin 118 - hemet valley bulletin118_4-sc water_fact_3_7.11 8039-SAR-Hydromodification Hemet MDP Hemet Regional ADP Report Salt Creek Channel ADP Map Hemet Regional ADP Map Salt Creek Channel ADP Report

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R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

0.85 MiraLoma
0.61 Riverside North
0.54 Riverside South
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.90 HurkeyCreek
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | CANYON LAKE | LAKE ELSINORE | WILDOMAR | MENIFEE | HEMET | MURRIETA | TEMECULA

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Western Riverside Area, California

July 26, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:1,480 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 13, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 15, 2018—Jun 26, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SeA	San Emigdio fine sandy loam, 0 to 2 percent slopes, occassional frost	6.8	73.5%
SfA	San Emigdio fine sandy loam, deep, 0 to 2 percent slopes	2.5	26.5%
Totals for Area of Interest		**9.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

SeA—San Emigdio fine sandy loam, 0 to 2 percent slopes, occassional frost

Map Unit Setting

National map unit symbol: 2y8t8
Elevation: 1,440 to 1,800 feet
Mean annual precipitation: 11 to 13 inches
Mean annual air temperature: 65 to 67 degrees F
Frost-free period: 305 to 330 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

A - 0 to 8 inches: fine sandy loam
C1 - 8 to 40 inches: fine sandy loam
C2 - 40 to 60 inches: stratified fine sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline (0.0 to 1.0 mmhos/cm)
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R019XD029CA
Hydric soil rating: No

Minor Components

Metz

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

San timoteo

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

SfA—San Emigdio fine sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcyv
Elevation: 10 to 700 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of San Emigdio

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sedimentary rock

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 40 inches: fine sandy loam
H3 - 40 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA
Hydric soil rating: No

Minor Components

Metz

Percent of map unit: 10 percent
Hydric soil rating: No

San timoteo

Percent of map unit: 5 percent
Hydric soil rating: No

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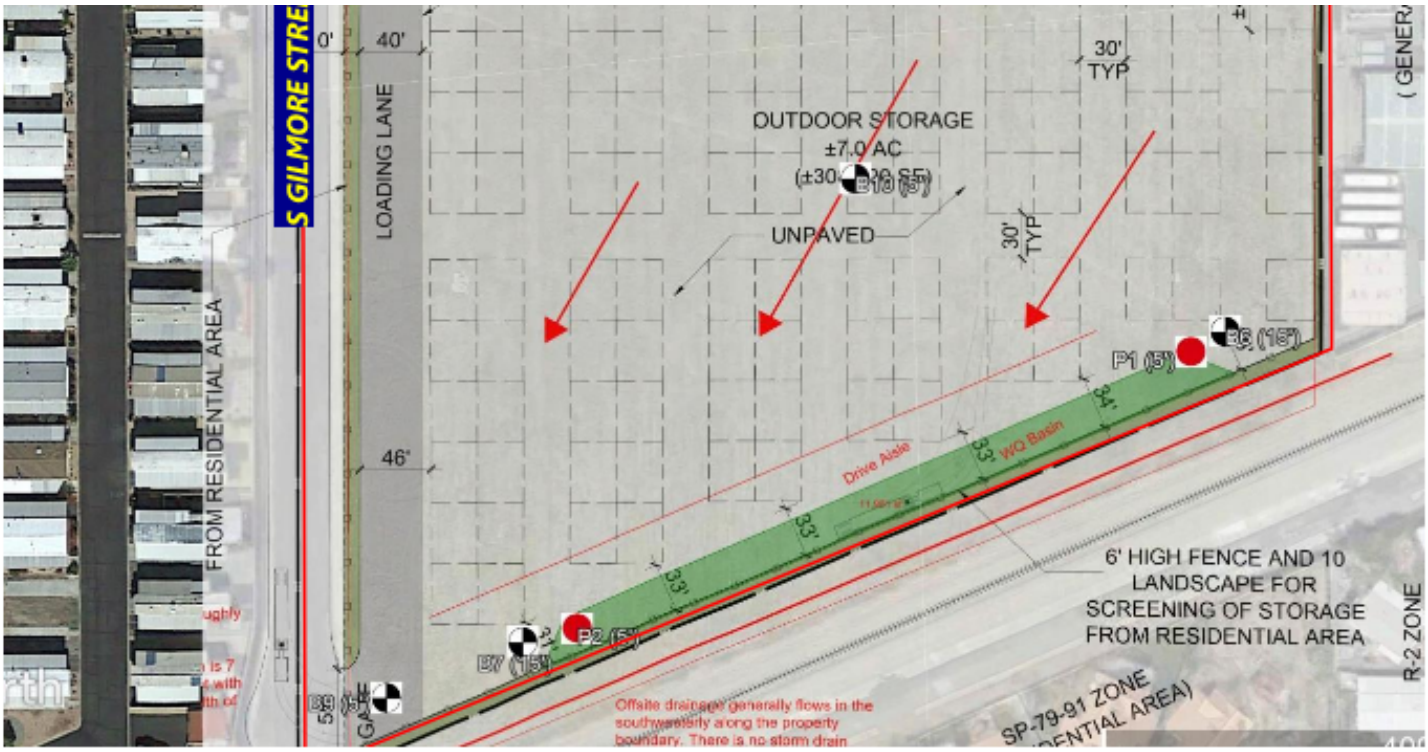
Parameter	P1	P2
Location	Southwest Lot Area	Southeast Lot Area
Elevation of Tested Area	5 ft	5 ft
Pre-soak Depth (from top of pipe)	5 in.	5 in.
Test Start Depth (from top of pipe)	30.5 in.	36 in.
Water Drop During Test	5.5 in.	6.0
Unfactored Infiltration Rate	**4.48 in./hr**	**5.87 in./hr**

average = 5.175 in/hr

NO FACTOR OF SAFETY YET



Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

N/A

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

N/A

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed

V_{BMP} and Q_{BMP} worksheets

These worksheets are to be used to determine the required

Design Capture Volume (V_{BMP})
or the
Design Flow Rate (Q_{BMP})

for BMPs in the Santa Ana Watershed

To verify which watershed your project is located within, visit

www.rcflood.org/npdes

and use the 'Locate my Watershed' tool

If your project is not located in the Santa Ana Watershed,

Do not use these worksheets! Instead visit

www.rcflood.org/npdes/developers.aspx

To access worksheets applicable to your watershed

Use the tabs across the bottom
to access the worksheets for the Santa Ana Watershed

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Kimley-Horn and Associates | Date: 7/31/2024

Designed by: Xochitl Ortega | Case No:

Company Project Number/Name: JD Fields Hemet

BMP Identification

BMP NAME / ID: BMP-1 Infiltration Basin/Pipes

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.69 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1A	*379,229*	*Mixed Surface Types*	*1*	*0.89*	*338272.3*			
1B	*35252*	*Ornamental Landscaping*	*0.1*	*0.11*	*3893.9*			
	414481	***Total***			342166.2	0.69	*19760.1*	*64931*

Notes:

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40
Mixed Surface Types	

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Infiltration Basin - Design Procedure (Rev. 03-2012)	BMP ID: BMP-1	Legend:	Required Entries / Calculated Cells

Company Name: Kimley-Horn and Associates — Date: 7/31/2024

Designed by: Xochitl Ortega — County/City Case No.:

Design Volume

a) Tributary area (BMP subarea)	A_T =	9.52	acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	19,760	ft^3

Maximum Depth

a) Infiltration rate	I =	5.175	in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)	FS =	3	
c) Calculate D_1 $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$	D_1 =	10.4	ft
d) Enter the depth of freeboard (at least 1 ft)		1	ft
e) Enter depth to historic high ground water (measured from **top** of basin)		60	ft
f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin)		100	ft
g) D_2 is the smaller of: Depth to groundwater - (10 ft + freeboard) and Depth to impermeable layer - (5 ft + freeboard)	D_2 =	49.0	ft
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet	D_{MAX} =	10.4	ft

Basin Geometry

a) Basin side slopes (no steeper than 4:1)	z =	4	:1
b) Proposed basin depth (excluding freeboard)	d_B =	4.5	ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)	A_S =	4391	ft^2
d) Proposed Design Surface Area	A_D =	4496	ft^2

Forebay

a) Forebay volume (minimum 0.5% V_{BMP})	Volume =	99	ft^3
b) Forebay depth (height of berm/splashwall. 1 foot min.)	Depth =	1	ft
c) Forebay surface area (minimum)	Area =	99	ft^2
d) Full height notch-type weir	Width (W) =		in

Notes:

Contour Elevation	Area (SF)	Volume (CF)	Cummulative Volume (CF)	Cummulative Volume (AC-FT)	Depth (FT)
1536.50	4,496.34	-	0	0.000	0
1537.00	5,032.80	2,381.03	2,381.03	0.055	0.50
1538.00	6,163.85	5,588.78	7,969.80	0.183	1.50
1539.00	7,368.26	6,757.10	14,726.91	0.338	2.50
1540.00	8,646.05	7,998.65	22,725.55	0.522	3.50
1541.00	9,997.21	9,313.46	32,039.01	0.736	4.50
1542.00	11,701.77	10,838.31	42,877.33	0.984	5.50
1542.50	13,061.36	6,187.67	49,065.00	1.126	6.00
1543.00	22,949.16	8,887.29	57,952.29	1.330	6.50
1543.10	24,717.94	2,382.81	60,335.09	1.385	6.60

Pond Volume Equations

*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Elevation	Depth (FT)	Basin Volume (CF)	Pipe Volume (CF)	Cummulative Volume (CF)	Cummulative Volume (AC-FT)
1527.00	0.00	0.00	0.00	0.00	0.00
1533.00	6.00	0.00	22053.96	22053.96	0.51
1536.50	9.50	0.00	22053.96	22053.96	0.51
1537.00	10.00	2,381.03	22053.96	24434.99	0.56
1538.00	11.00	7,969.80	22053.96	30023.77	0.69
1539.00	12.00	14,726.91	22053.96	36780.87	0.84
1540.00	13.00	22,725.55	22053.96	44779.52	1.03
1541.00	14.00	32,039.01	22053.96	54092.97	1.24
1542.00	15.00	42,877.33	22053.96	64931.29	1.49
1542.50	15.50	49,065.00	22053.96	71118.96	1.63
1543.00	16.00	57,952.29	22053.96	80006.25	1.84
1543.10	16.10	60,335.09	22053.96	82389.06	1.89

Table 1 - Infiltration Testing Requirements							
Infiltration BMP	Testing Options	Ring Infiltrometer Tests[1]	Percolation Test[2]	Test Pits or Boring Logs[3]	Final Report[4]	Hydrology Manual[5]	Factor of Safety
Infiltration Trench	Option 1►	2 tests min. with at least 1 per trench	not used	1 boring or test pit per trench	Required	not used	FS = 3
	Option 2►	not used	4 tests min. with at least two per trench	1 boring or test pit per trench	Required	not used	FS = 3
	Option 3[7]►	not used	not used	1 boring or test pit per trench	Required	not used	FS = 6
	Option 4►	not used	not used	1 boring or test pit per site	not used	only	FS = 10
Infiltration Basin	Option 1►	2 tests min. with at least 1 per basin[6]	not used	1 boring or test pit per basin	Required	not used	FS = 3
	Option 2►	not used	4 tests min. with at least 2 per basin[6]	1 boring or test pit per trench	Required	not used	FS = 3
	Option 3[7]►	not used	not used	1 boring or test pit per basin	Required	not used	FS = 6
	Option 4►	not used	not used	1 boring or test pit per site	not used	only	FS = 10
Permeable Pavement	Option 1►	2 tests min. with at least 1 every 10,000 ft^2	not used	1 boring or test pit every 10,000 ft^2	Required	not used	FS = 3
	Option 2►	not used	4 tests min. with at least 2 every 10,000 ft^2	1 boring or test pit every 10,000 ft^2	Required	not used	FS = 3

Table Footnotes:

[1] Ring Infiltrometer tests per Section 2.2

[2] Percolation tests per Section 2.3 and Well Permeameter Test per Section 2.4

[3] Test pits or boring logs per Section 2.5

[4] Final Report per Section 1.7

[5] See Plate E-6.2 of the District's Hydrology Manual

[6] For basins in excess of 10,000 ft^2, provide one (1) ring infiltrometer test or two (2) percolation tests for each additional 10,000 ft^2

[7] This option may be used for projects with a maximum tributary area of 5 acres only.

3.1 INFILTRATION BASIN

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation, and Sedimentation
Maximum Treatment Area	50 acres
Other Names	Bioinfiltration Basin

Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, V_{BMP}. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding V_{BMP} must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements.

Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

Setbacks

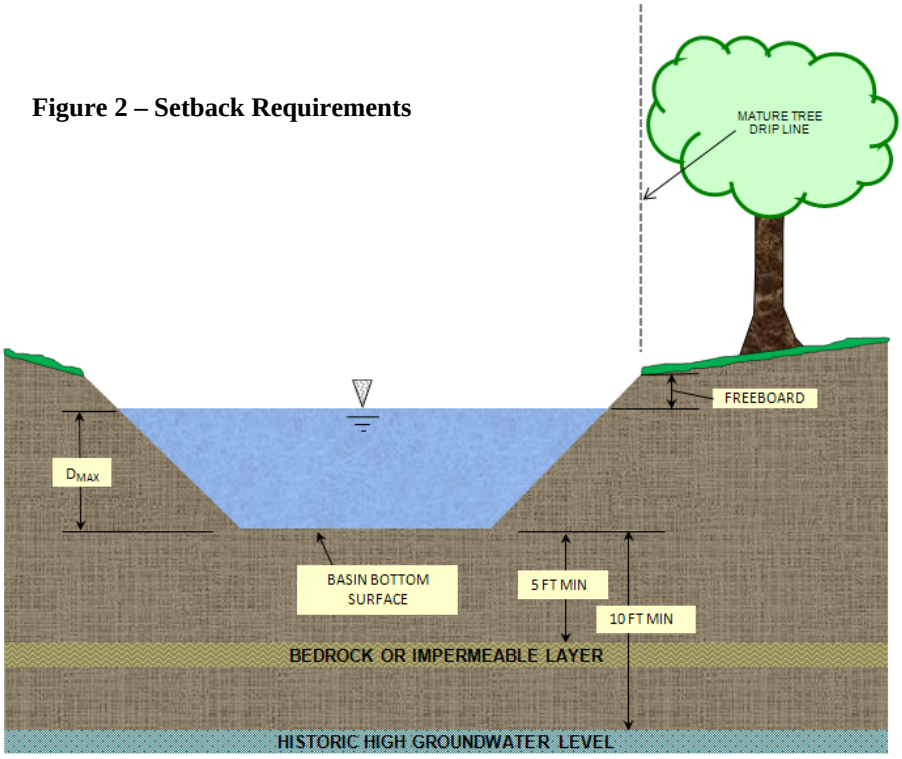
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

Figure 2 – Setback Requirements



Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

Overflow

Flows exceeding V_{BMP} must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for V_{BMP} and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

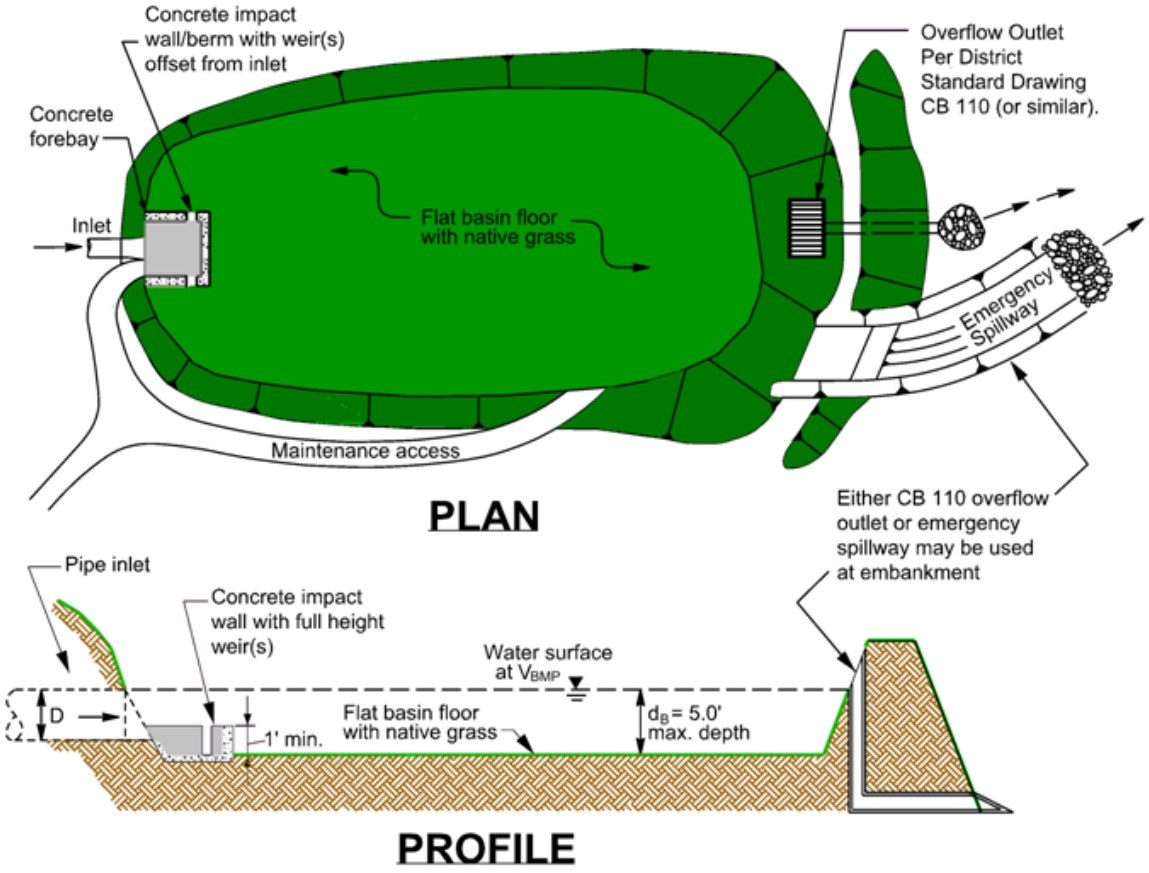


Figure 3 – Infiltration Basin

Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

Table 1 - Inspection and Maintenance

Schedule	Inspection and Maintenance Activity
Ongoing including just before annual storm seasons and following rainfall events.	• Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used, o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. o Fertilizers should not be applied within 15 days before, after, or during the rain season. • Remove debris and litter from the entire basin to minimize clogging and improve aesthetics. • Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water. • Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed. • Revegetate side slopes where needed.
Annually. If possible, schedule these inspections within 72 hours after a significant rainfall.	• Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element. • Check for erosion, slumping and overgrowth. Repair as needed. • Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation. • Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1]. • No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed.

1. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Table 2 - Design and Sizing Criteria for Infiltration Basins

Design Parameter	Infiltration Basin
Design Volume	V_{BMP}
Forebay Volume	0.5% V_{BMP}
Drawdown time (maximum)	72 hours
Maximum tributary area	50 acres [2]
Minimum infiltration rate	Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The WQMP may include specific requirements for minimum tested infiltration rates.
Maximum Depth	5 feet
Spillway erosion control	Energy dissipators to reduce velocities[1]
Basin Slope	0%
Freeboard (minimum)	1 foot [1]
Historic High Groundwater Setback (max)	10 feet
Bedrock/impermeable layer setback (max)	5 feet
Tree setbacks	Mature tree drip line must not overhang the basin
Set back from wells, tanks or springs	100 feet
Set back from foundations	As recommended in Geotechnical Report

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.

INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, V_{BMP}.
   a) Enter the Tributary Area, $A_{T.}$
   b) Enter the Design Volume, V_{BMP}, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine D_1, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine D_2, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

D_2 = Depth to groundwater – (10 + freeboard) (ft);

or

D_2 = Depth to impermeable layer – (5 + freeboard) (ft)

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, D_{MAX}, based on the smallest value between D_1 and D_2. D_{MAX} is the maximum depth of water only and does not include freeboard. D_{MAX} shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, d_B excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where A_s = minimum area required (ft^2)
V_{BMP} = volume of the infiltration basin (ft^3)
d_B= proposed depth not to exceed maximum allowable depth, D_{MAX} (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% V_{BMP} and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% V_{BMP}.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

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CMP Detention and Infiltration Installation Guide

CMP Detention and Infiltration Installation Guide

Proper installation of a flexible corrugated metal pipe (CMP) underground detention system will ensure long-term performance. The configuration of these systems often requires special construction practices that differ from conventional flexible pipe construction. Contech recommends scheduling a preconstruction meeting with your local Contech Representative to determine if additional measures, not covered in this guide, are appropriate for your site.

Preconstruction Meeting

It is a best practice to have a pre-construction meeting with the installation contractor and Contech personnel. Included at the end of this guide is a preconstruction checklist to review prior to installation.

Proper Pipe Unloading, Handling and Placement

The pipe should be unloaded off the flatbed trailer with a fork lift, excavator, crane or other piece of construction equipment. The pipe should never be dropped or rolled off the flatbed trailer. Nylon slings or lifting lugs should be used to lift the pipe into place.

Normally the header row pipe section is placed on the downstream end. For detention systems with a single header row on one end and pipe with bulkheads on the other end; it is a best practice to start pipe placement on the header row end.

Lifting CMP off the flatbed with a front end loader and forks.

Lifting ALT2 CMP with nylon slings.

Lowering the header pipe section into place first.

Lifting polymer-coated CMP into place with nylon slings.

Foundation and Pipe Bedding

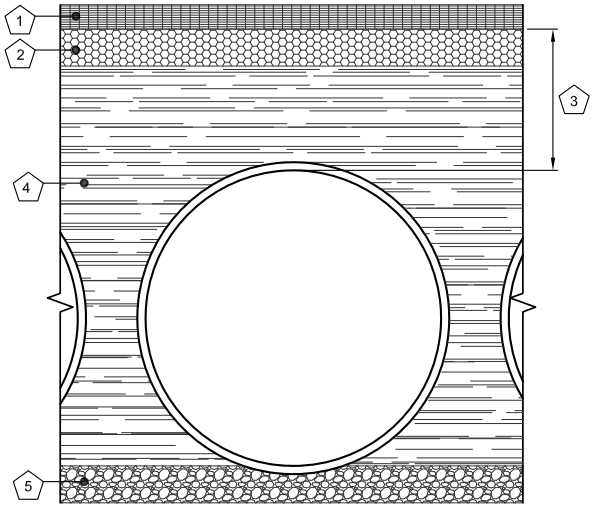
Construct a foundation that can support the design loading applied by the pipe and adjacent backfill weight as well as maintain its integrity during construction. If soft or unsuitable soils are encountered, remove the poor soils to a suitable depth and then replace with a competent granular material to the appropriate elevation. The granular material gradation should not allow the migration of fines, which can cause settlement of the detention system or pavement above. If the structural fill material is not compatible with the underlying soils a geotextile fabric should be used as a separator.

Grade the foundation subgrade to a uniform or slightly sloping grade. If the subgrade is clay or relatively non-porous and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.

A 4"- 6" thick, well-graded granular material is preferred pipe bedding. If the existing foundation is made up of a course sand or other suitable granular material, imported bedding material will not be required.

Site conditions may require 4" – 6" of imported granular material as pipe bedding.

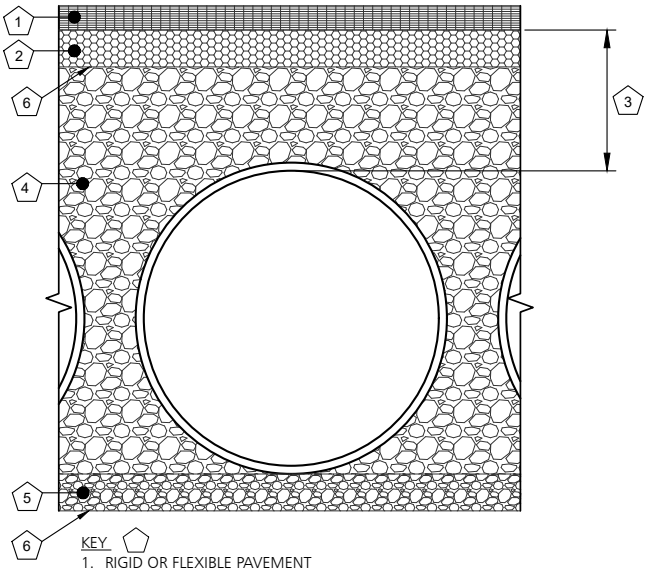
SOLIDWALL BACKFILL DETAIL



KEY ⬠

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145 A1, A2 OR A3 OR APPROVED EQUAL. PLACED IN 8" LIFTS (COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T99)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH.

PERFORATED BACKFILL DETAIL



KEY ⬠

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
4. FREE DRAINING ANGULAR WASHED STONE 3/4" - 2" MIN. PARTICLE SIZE.
5. GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH.
6. NON WOVEN GEOTEXTILE (IF REQUIRED), WRAPPING TRENCH ONLY. CONSULT GEOTECHNICAL EOR FOR PROJECT SPECIFIC BACKFILL REQUIREMENTS.

Connecting Bands

There are various types of connecting bands for connecting CMP. Hugger and corrugated bands are the most common. Flat gaskets or O-ring gaskets can also be used in conjunction with connecting bands to reduce leakage in the joints.

Installing a Hugger band on a perforated pipe.

Tightening bolts on a corrugated band.

Installation of band with flat neoprene gasket.

Some jobs may require special bands, such as rod and lug connection, flat bands, or dimple bands.

Geomembrane Barrier

When indicated on the Contech contract drawings or the project plans, an HDPE membrane liner will be placed on the crown of each pipe to help protect the system from environmental changes that may adversely affect the system over time. The liner should extend beyond the 8 and 4 o'clock positions (crown) of the pipe. Please refer to Contech's CMP Detention Design Guide or Contech contract drawings for additional technical details.

An HDPE liner is rolled out over the crown of the pipe prior to backfilling around the pipe.

For large diameter pipes, the liner is shipped in rolls that are folded in half. The liner is rolled out over the crown of the pipe, unfolded, and covered over the pipe from the eight and four o'clock positions.

In-Situ Trench Wall

If excavation is required, the trench wall needs to be capable of supporting the load that the pipe sheds as the system is loaded. If soils are not capable of supporting these loads, the pipe can deflect. Perform a simple soil pressure check using the applied loads to determine the limits of excavation beyond the spring line of the outer most pipes.

In most cases, the requirements for a safe work environment and proper backfill placement and compaction take care of the concern. The contractor is responsible for the safety of his/her employees and agents.

Safe practices on construction work as outlined in the latest edition of the "Manual of Accident Prevention in Construction," published by the Associated General Contractors, shall be used as a guide and observed. The contractor shall comply with all applicable city, state, and federal safety codes in effect in the area where work is being performed. This conformance shall include the provisions of the current issue of the "OSHA Safety and Health Standards (29 CFR 1926/1910)" as published by the U.S. Department of Labor.

Backfill Material

Corrugated Steel Pipe is a flexible pipe. All buried flexible pipes are dependent on a quality backfill material for structural support. AASHTO refers to these pipe systems as, "Soil-Corrugated Metal Structure Interaction Systems". The best backfill material is an angular, well-graded, granular fill meeting the requirements of AASHTO A-1, A-2, or A-3. Aggregate materials that are free draining and compact easily such as crushed aggregate, crushed aggregate with fines, gravely sand, and coarse sand make good backfill. The aggregate particle size shall not exceed 3" in diameter.

For solid pipe, well graded or open graded granular material can be used as backfill. Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded stone, with a particle size of ½" – 2 ½" diameter is recommended for backfill around perforated pipe.

Backfill using controlled low-strength material (CLSM, "flash fill", or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.

EXAMPLES OF ACCEPTABLE BACKFILL MATERIAL

Course Sand

Crushed Limestone

Crushed Granite

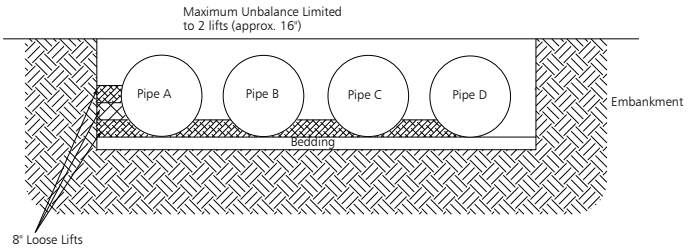
Crushed River Gravel

Backfill Placement

The backfill shall be placed in 8" +/- loose lifts and compacted to 90% AASHTO T99 standard proctor density. Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, vibratory packer, or other effective methods. If AASHTO T99 procedures are determined infeasible by the geotechnical engineer of record, compaction is considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the geotechnical engineer of record (or representative thereof) is satisfied with the level of compaction.

For large systems, conveyor systems, backhoes with long reaches may be used to place backfill. Once minimum cover for the construction loading across the entire width of the system is reached, advance the equipment to the end of the recently placed fill, and begin the sequence again until the system is completely backfilled. This type of construction sequence provides room for stockpiled backfill directly behind the backhoe, as well as the movement of construction traffic.

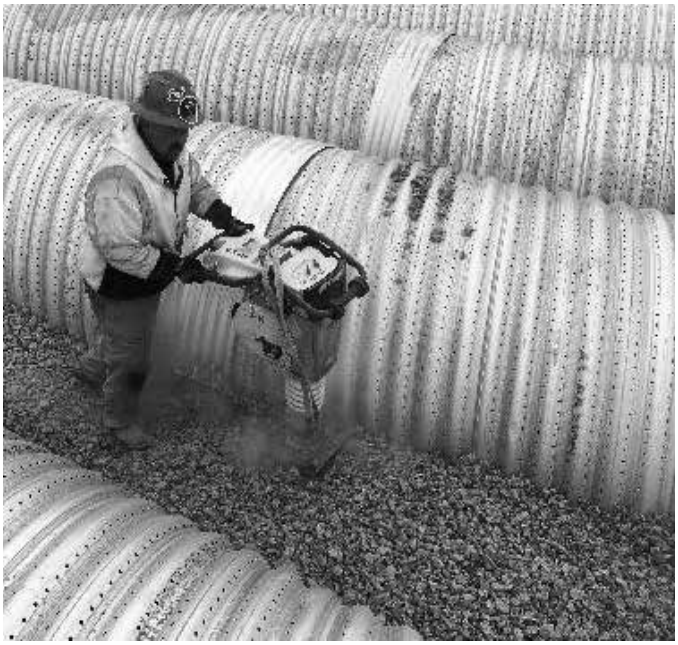
It is important to keep the elevation of backfill between pipes and side embankment evenly. As a rule of thumb, do not allow for backfill to exceed the elevation of one side of pipe to another pipe or one side of pipe to the outside trench/embankment by more than 24".



Material stockpiles on top of the backfilled detention system should be limited to 9' +/- high and must provide balanced loading across all barrels. To determine the proper minimum cover over the pipes to allow the movement of construction equipment, contact your local Contech Sales Engineer.

If CLSM or "flowable fill" is used as backfill, pipe flotation needs to be prevented. Typically, small lifts are placed between the pipes and then allowed to set-up prior to the placement of the next lift. The allowable thickness of the CLSM lift is a function of a proper balance between the uplift force of the CLSM, the opposing weight of the pipe, and the effect of other restraining measures. Your local Sales Engineer can help determine an appropriate lift thickness.

Placing backfill with a conveyor.



Compaction with vibratory equipment.

Final Cover Placement and Construction Loading

The minimum cover specified for a project normally assumes H-20 highway live loading. Backfill must be placed and fully compacted to the minimum cover level over the structure before the pipe is subjected to design loads. The minimum cover for AASHTO H-20 Live Loading per design section 12, is span of the pipe divided by eight plus asphalt pavement.

Construction loads often exceed design highway loading. During construction, keep heavy construction equipment that exceeds legal highway loads off the pipe. Light construction equipment on tracks such as a D-3 dozer (or lighter weight) may cross over the pipe when a minimum of 12" of compacted backfill is over pipe. Since construction equipment varies from job to job, it is best to address equipment specific minimum cover requirements with your local Contech Sales Engineer during your pre-construction meeting.

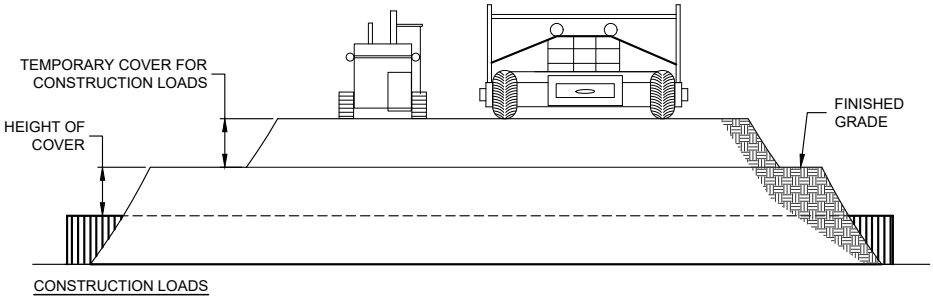
Minimum Height of Cover Requirements for Tracked Equipment
HEL-COR® Corrugated Steel Pipe[1]

Diameter (inches)	Minimum Cover (Ft)	Track Width (inches) Maximum Track Pressure at Surface (psi)			
		12	18	24	30
12 – 42	1.0	29	22	18	17
	1.5	58	41	34	30
	2.0	95	65	51	44
	2.5	138	91	70	59
	3.0	189	120	91	75
	4.0	321	195	143	115
48 – 66	1.0	10.6	8	6.9	6.2
	1.5	24	17	14	12.2
	2.0	39	26	21	18
	2.5	56	37	28	24
	3.0	77	49	37	30
	4.0	132	80	59	47
72 – 102	1.0	3.2	2.5	2.1	1.9
	1.5	8.8	6.2	5	4.4
	2.0	16	11.1	8.8	7.5
	2.5	24	15	12	10.1
	3.0	32	20	15	12.9
	4.0	56	34	25	20
108 – 120	1.0	2.8	2.1	1.7	1.6
	1.5	6.9	4.9	3.9	3.4
	2.0	14.8	10.1	8	6.7
	2.5	21	14.2	10.9	9.1
	3.0	29	18	14.1	11.6
	4.0	51	31	22	18
126 – 144	1.0	2.8	2.1	1.7	1.5
	1.5	6	4.3	3.5	3
	2.0	12	8	6.4	5.4
	2.5	21	14	10.6	8.9
	3.0	29	18	13.9	11.4
	4.0	50	30	22	18

1 *The values in this table represent the maximum ground pressure permitted when performing reasonable work over the pipes, using the manufacture's published equipment specifications. (Ground pressure for track equipment is the vehicle operating weight divided by the total ground contact area for both tracks.) This table is to be used as a guide. Talk to your Contech representative if you have questions about the equipment you plan on operating over the pipes. Care should be taken to maintain adequate cover depth during construction activities.*

Examples of light, tracked, construction equipment used to place final cover over the pipe system.

Examples of heavy construction equipment that may require additional minimal cover. Contech can help evaluate minimum cover for the installation contractor for all the equipment on the site.



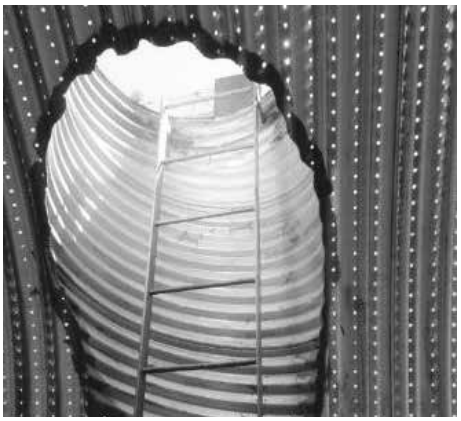
FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

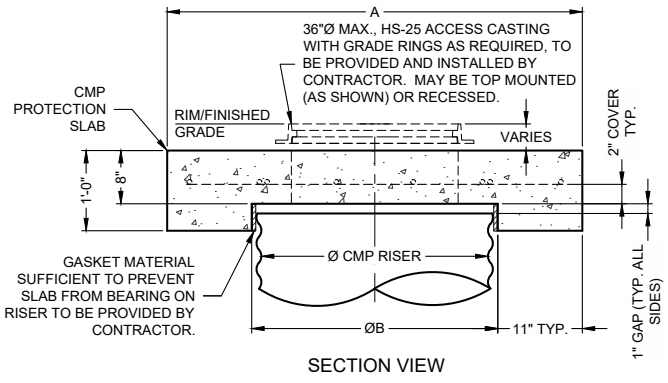
Minimum Height of Cover Requirements for Rubber-Tired Equipment Over HEL-COR® CSP

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

CMP Manhole Risers

CMP manhole risers allow easy access for future maintenance of the system. If the system is installed under a parking lot or road way subject to live loads, care must be taken to ensure loads are not applied directly to the riser structure. A pre-cast or cast-in-place slab should be installed above the riser. The manhole lid and frame should not rest directly on the CMP riser.





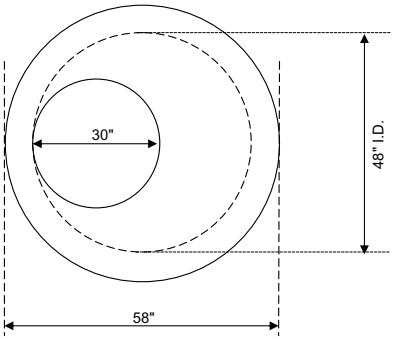
SECTION VIEW

Reinforcing Table				
Ø CMP Riser	A	ØB	Reinforcing	Bearing Pressure** (psf)
24	4′Ø 4′ x 4′	26″	#5 @ 10″ OCEW #5 @ 10″ OCEW	2,540 1,900
30″	4′-6″Ø 4′-6″ x 4′-6″	32″	#5 @ 10″ OCEW #5 @ 9″ OCEW	2,260 1,670
36″	5′Ø 5′ x 5′	38″	#5 @ 9″ OCEW #5 @ 8″ OCEW	2,060 1,500
42″	5′-6″Ø 5′-6″ x 5′-6″	44″	#5 @ 8″ OCEW #5 @ 8″ OCEW	1,490 1,370
48″	6′Ø 6′ x 6′	50″	#5 @ 7″ OCEW #5 @ 7″ OCEW	1,210 1,270

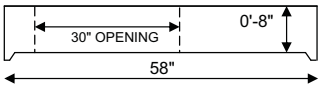
*** Assumed soil bearing capacity.*

Precast Option for Manhole Riser Caps

PLAN VIEW



SECTION



NOTES:

A.) 4000 P.S.I. CONCRETE

B.) GRADE 60 REINFORCING PER ASTM A-615

C.) BUTYL SEALANT IN JOINTS

Additional Considerations

Because most systems are constructed below-grade, rainfall can rapidly fill the excavation; potentially causing floatation and movement of the previously placed pipes. To help mitigate potential problems, it is best to start the installation at the downstream end with the outlet already constructed to allow a route for the water to escape. Temporary diversion measures may be required for high flows due to the restricted nature of the outlet pipe.

CMP Preconstruction Checklist

Contech Field Contact and Phone: _____

Contech Plant Contact and Phone: _____

Contractor Contact and Phone: _____

Project Name: _____

Site Address: _____

Pre-con Attendees: _____

Topics to Review:

- ☐ Truck access and pipe storage availability/expectation
- ☐ Pipe unloading and handling safety, equipment and procedures
- ☐ System layout and shop drawing review
- ☐ Shipping schedule and installation sequence
- ☐ Joint configuration and assembly
- ☐ Connection with unlike storm sewer materials
- ☐ Backfill material selection and placement strategy
- ☐ Backfill sequence, lift thickness and balanced loading
- ☐ Compaction requirement (90%) and equipment
- ☐ Additional cover requirements for heavy construction loads
- ☐ CMP riser concrete cap installation

Notes: _____

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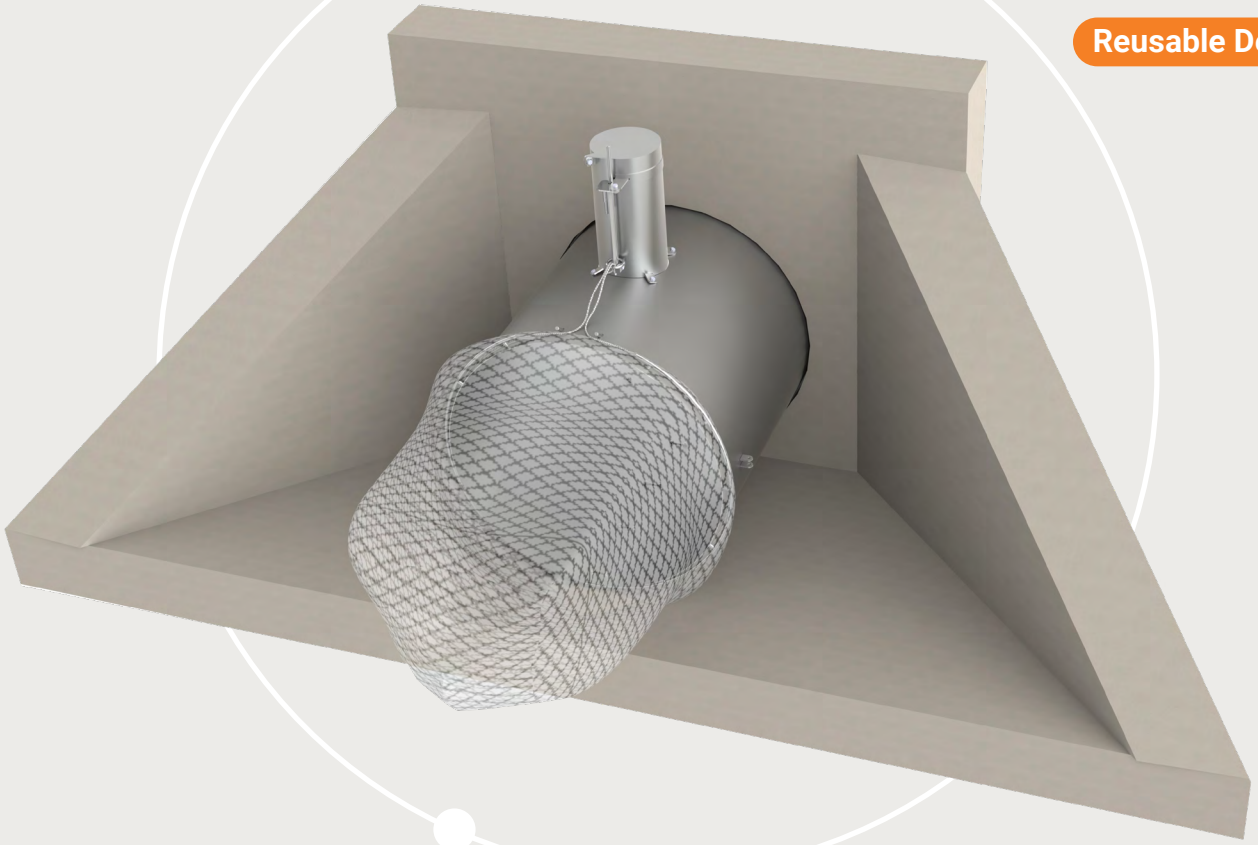
SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

CMP Detention Install Guide 03/24

NetTech™

- Easy Installation
- Custom Sizing
- Safe Handling
- Reusable Design



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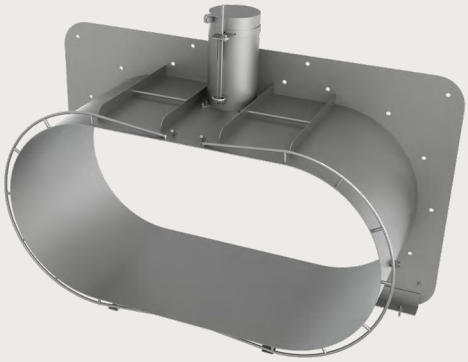
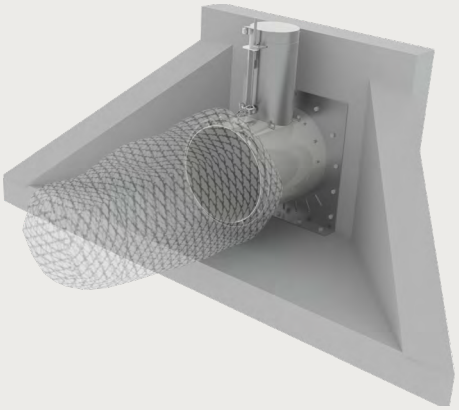
Oldcastle Infrastructure™
A CRH COMPANY

NetTech™ gross pollutant trap (GPT) systems combine a marine-grade, stainless-steel pipe extension with a heavy-duty, UV stabilized polyethylene net. Systems can be customized to suit specific application sizes and flow rates for various stormwater outlets, outfalls and channels.

Revolutionary protection. Environmental solution.

The NetTech™ system is engineered to handle pollutants as safely and efficiently as possible. When water passes through the system, debris and other pollutants are held in the net as the rest of the water drains without flow interuptions. This prevents potential odors, infections or mosquito breeding from becoming an issue. The pipe extensions used allow the net to release in the event that it becomes fouled with intercepted debris. The net automatically detaches and chokes off on a short tether, allowing water to flow through the pipe normally. After the debris has been disposed and the net has been cleaned, the net can be reattached to the unit and resume pollutant capture.





Available in round or ellipse shape, internal or flange mount, or customized to fit your needs.

4-A-089 Revision 4/2023

Trusted partnerships.
Full scale solutions.

Oldcastle Infrastructure™
A CRH COMPANY

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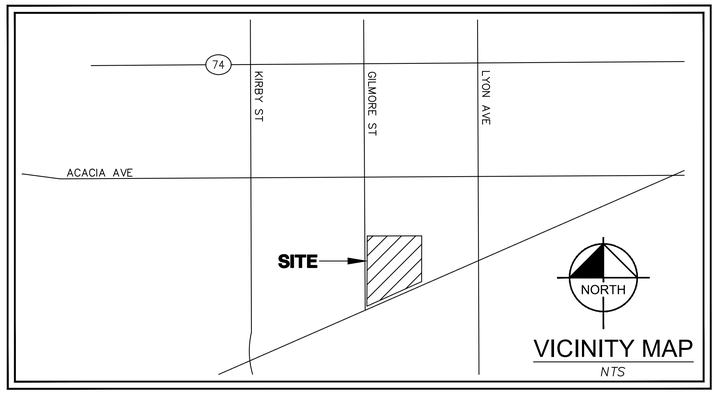
Appendix 7: Hydromodification

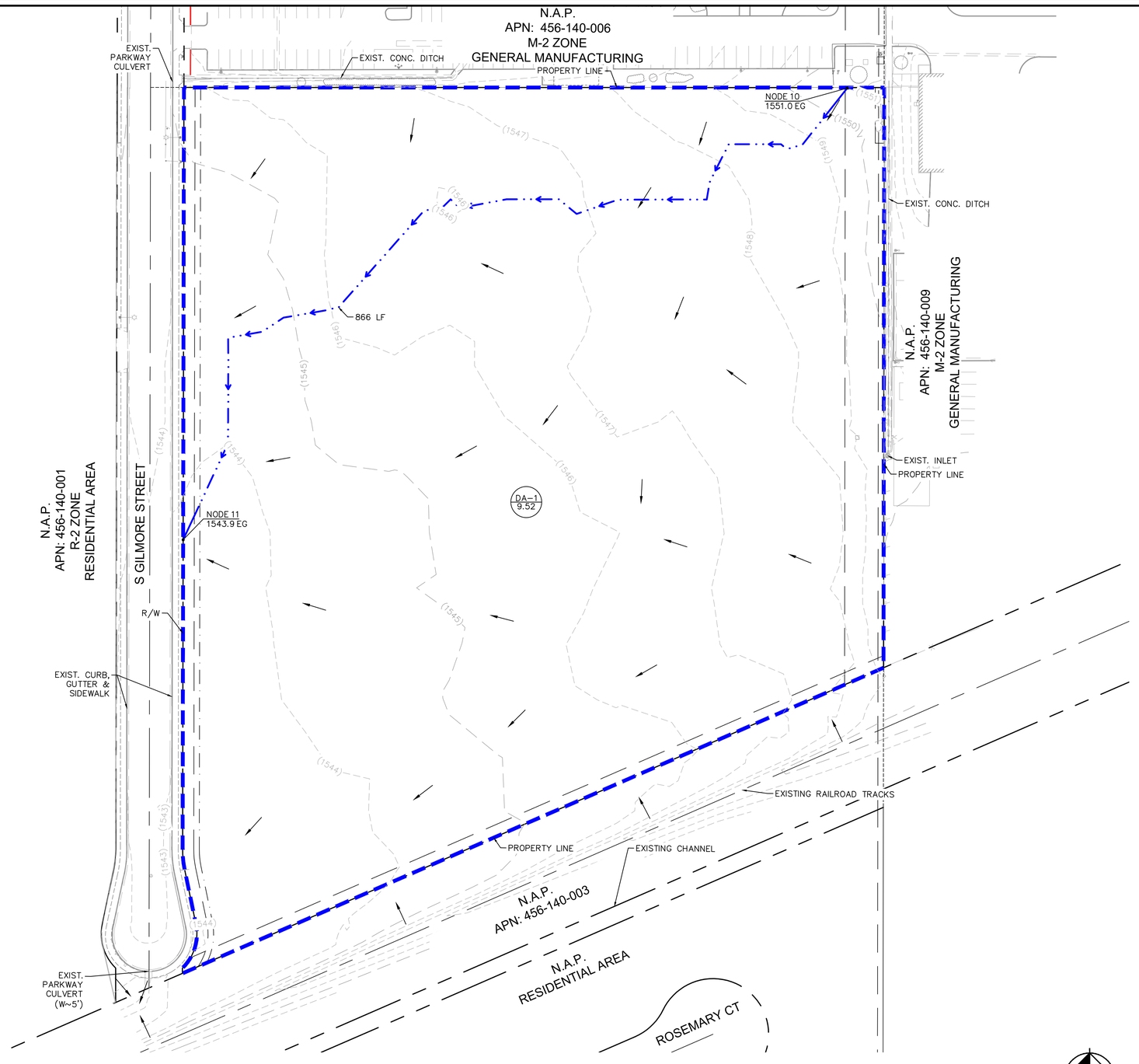
Supporting Detail Relating to Hydrologic Conditions of Concern



VICINITY MAP
NTS

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- FLOW PATH
- (XXXX) EXISTING CONTOUR
- (XXXX) EXISTING MINOR CONTOUR
- DA–# / X.XX — HYDROLOGY SUBAREA / ACREAGE
- FLOW ARROWS

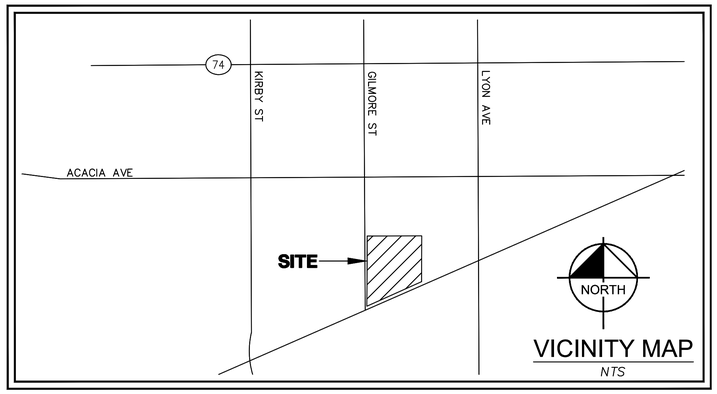


NORTH

GRAPHIC SCALE IN FEET
0 25 50 100
1" = 50'
WHEN PRINTED AT FULL SIZE
(24" BY 36")

Kimley»Horn

EXISTING DRAINAGE PLAN
JD FIELDS HEMET
7/31/2024



VICINITY MAP
NTS

KEY NOTES:

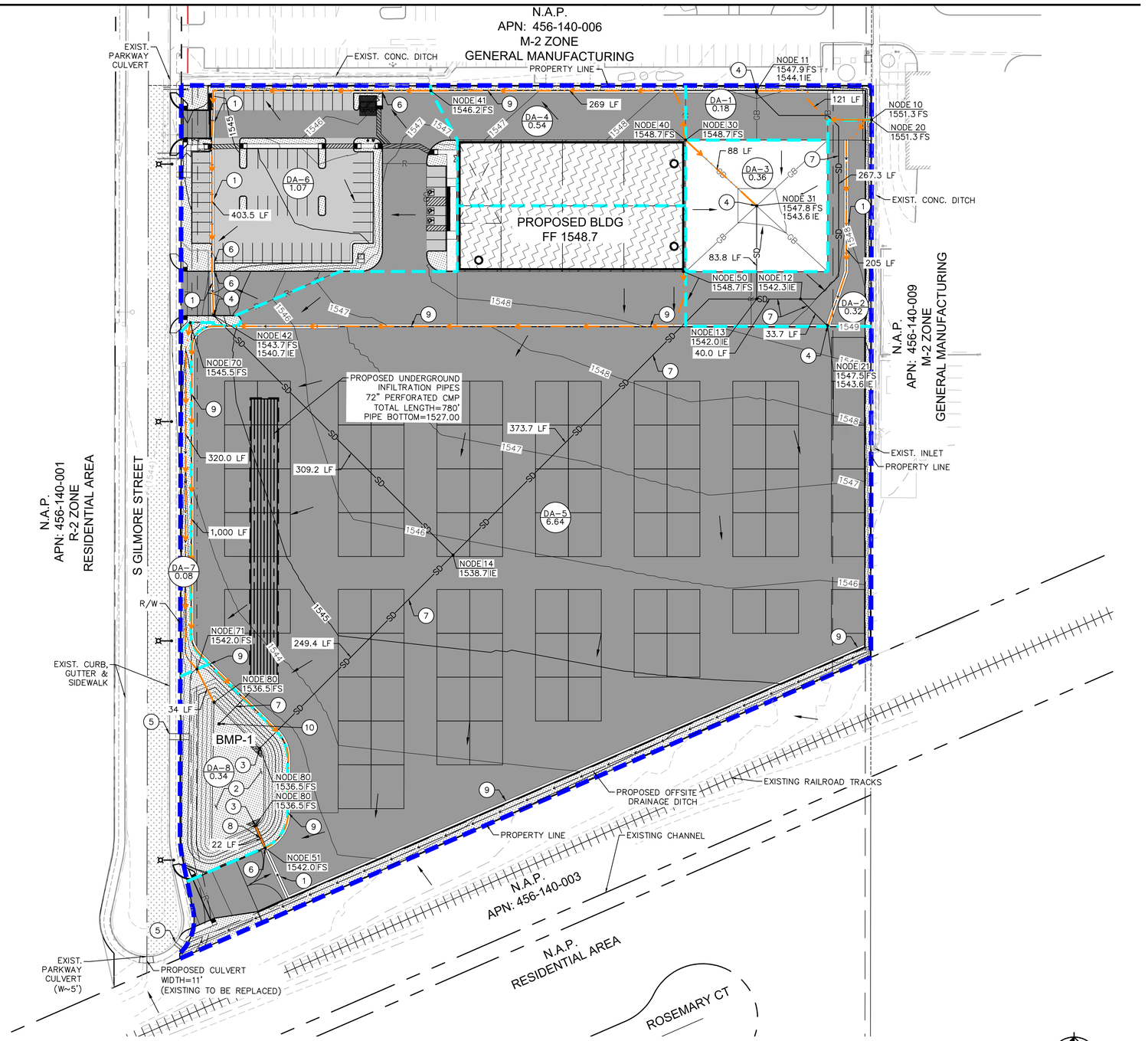
1. PROPOSED 4' RIBBON GUTTER
2. PROPOSED INFILTRATION BASIN
3. PROPOSED HEADWALL WITH RIP RAP AND PRETREATMENT DEVICE
4. PROPOSED GRATED INLET WITH FILTER INSERT
5. PROPOSED UNDER SIDEWALK OVERFLOW DRAIN WITH FILTER INSERT
6. PROPOSED 2 FOOT CURB CUT
7. PROPOSED STORM DRAIN PIPE
8. PROPOSED CONCRETE SPILLWAY
9. PROPOSED CURB AND GUTTER
10. PROPOSED RISER STRUCTURE

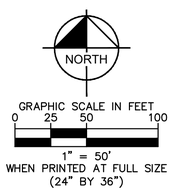
LANDSCAPE NOTE:

FINISH GRADE OF LANDSCAPE AREAS IS TO BE DEPRESSED 1-2 INCHES (MIN.) BELOW TOP OF CURB, SIDEWALK OR PAVEMENT.

LEGEND

- DRAINAGE MANAGEMENT BOUNDARY
- DRAINAGE SUBAREA BOUNDARY
- FLOW PATH
- (XXXX) EXISTING CONTOUR
- (XXXX) EXISTING MINOR CONTOUR
- XXXX PROPOSED CONTOUR
- XXXX PROPOSED MINOR CONTOUR
- DA-# X.XX HYDROLOGY SUBAREA ACREAGE
- FLOW ARROWS
- STANDARD DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- LIGHT DUTY CONCRETE WALK
- LANDSCAPE/PLANTER AREA
- HEAVY DUTY CONCRETE
- PROPOSED BUILDING (IMPERVIOUS)





Kimley»Horn

PROPOSED DRAINAGE PLAN
JD FIELDS HEMET
7/31/2024

```
******************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2011 Advanced Engineering Software (aes)
                    (Rational Tabling Version 18.0)
                Release Date: 07/01/2011  License ID 1499

                          Analysis prepared by:

                      Kimley-Horn and Associates, Inc.
                             765 The City Drive
                                 Suite 200
                              Orange, CA 92868

 ************************* DESCRIPTION OF STUDY *************************
* JD FIELDS HEMET                                                      *
* EXISTING 2 YEAR                                                      *
* 10/14/2021 LA                                                        *
 ************************************************************************

  FILE NAME: JDH2E.DAT
  TIME/DATE OF STUDY: 22:06 10/13/2021
------------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.960
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.760
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.050
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.180
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5287434
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5299969
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.466
  SLOPE OF INTENSITY DURATION CURVE = 0.5287
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

******************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   866.00
```

```
  UPSTREAM ELEVATION(FEET) =   1551.00
  DOWNSTREAM ELEVATION(FEET) =   1543.90
  ELEVATION DIFFERENCE(FEET) =      7.10
  TC = 0.533*[(  866.00**3)/(     7.10)]**.2 =   20.829
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.816
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .2013
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      1.56
  TOTAL AREA(ACRES) =      9.52   TOTAL RUNOFF(CFS) =      1.56
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         9.5  TC(MIN.) =     20.83
  PEAK FLOW RATE(CFS)   =      1.56
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1499

                         Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* JD FIELD HEMET                                                       *
* PROPOSED 2 YEAR                                                      *
* 7/25/24 XO                                                           *
 ************************************************************************

  FILE NAME: JDH2P.DAT
  TIME/DATE OF STUDY: 13:19 07/25/2024
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 1.00
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.960
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.760
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.050
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.180
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5287434
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5299969
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.466
  SLOPE OF INTENSITY DURATION CURVE = 0.5287
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   121.00
  UPSTREAM ELEVATION(FEET) =   1551.30
  DOWNSTREAM ELEVATION(FEET) =   1547.90
  ELEVATION DIFFERENCE(FEET) =      3.40
  TC = 0.393*[(  121.00**3)/(     3.40)]**.2 =    5.462
```

```
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.656
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6160
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1544.10  DOWNSTREAM(FEET) =  1542.30
  FLOW LENGTH(FEET) =   267.30   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.21
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.18
  PIPE TRAVEL TIME(MIN.) =   2.02    Tc(MIN.) =    7.48
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     388.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.48
  RAINFALL INTENSITY(INCH/HR) =   1.40
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   205.00
  UPSTREAM ELEVATION(FEET) =   1551.30
  DOWNSTREAM ELEVATION(FEET) =   1547.50
  ELEVATION DIFFERENCE(FEET) =      3.80
  TC = 0.393*[(  205.00**3)/(     3.80)]**.2 =    7.329
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.418
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6001
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.32   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     12.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1543.60  DOWNSTREAM(FEET) =  1542.30
  FLOW LENGTH(FEET) =    33.70   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.50
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.27
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.45
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     12.00 =     238.70 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     12.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.45
  RAINFALL INTENSITY(INCH/HR) =   1.41
  TOTAL STREAM AREA(ACRES) =     0.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.27

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.18     7.48        1.403          0.18
      2        0.27     7.45        1.405          0.32

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.46     7.45       1.405
      2        0.46     7.48       1.403

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.46   Tc(MIN.) =    7.45
  TOTAL AREA(ACRES) =        0.5
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =     388.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1542.30  DOWNSTREAM(FEET) =  1542.00
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.89
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.46
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    7.68
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     428.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.68
  RAINFALL INTENSITY(INCH/HR) =   1.38
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =   1548.70
  DOWNSTREAM ELEVATION(FEET) =   1547.80
  ELEVATION DIFFERENCE(FEET) =      0.90
  TC = 0.393*[(   88.00**3)/(     0.90)]**.2 =    5.886
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.592
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .6119
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      0.35
  TOTAL AREA(ACRES) =      0.36   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1543.60  DOWNSTREAM(FEET) =  1542.00
  FLOW LENGTH(FEET) =    83.80   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.77
  ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.35
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    6.26
  LONGEST FLOWPATH FROM NODE     30.00 TO NODE     13.00 =     171.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.26
  RAINFALL INTENSITY(INCH/HR) =   1.54
  TOTAL STREAM AREA(ACRES) =     0.36
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.35

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.46     7.68        1.383          0.50
      2        0.35     6.26        1.541          0.36

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        0.72     6.26       1.541
      2        0.77     7.68       1.383

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.77   Tc(MIN.) =    7.68
```

```
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     13.00 =     428.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1542.00  DOWNSTREAM(FEET) =  1538.70
  FLOW LENGTH(FEET) =   373.70   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.51
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.77
  PIPE TRAVEL TIME(MIN.) =   1.78    Tc(MIN.) =    9.46
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     14.00 =     802.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.46
  RAINFALL INTENSITY(INCH/HR) =   1.24
  TOTAL STREAM AREA(ACRES) =     0.86
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.77

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   269.00
  UPSTREAM ELEVATION(FEET) =   1548.70
  DOWNSTREAM ELEVATION(FEET) =   1546.20
  ELEVATION DIFFERENCE(FEET) =      2.50
  TC = 0.393*[(  269.00**3)/(     2.50)]**.2 =    9.380
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.244
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .5873
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.54   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1546.20  DOWNSTREAM ELEVATION(FEET) = 1543.70
  STREET LENGTH(FEET) =   403.50   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 50.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.010
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.010

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    8.83
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.31
  STREET FLOW TRAVEL TIME(MIN.) =   5.01   Tc(MIN.) =   14.39
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.992
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .5667
  SOIL CLASSIFICATION IS "A"
  SUBAREA AREA(ACRES) =    1.07      SUBAREA RUNOFF(CFS) =    0.60
  TOTAL AREA(ACRES) =        1.6        PEAK FLOW RATE(CFS) =       1.00

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.25   HALFSTREET FLOOD WIDTH(FEET) =  10.68
  FLOW VELOCITY(FEET/SEC.) =  1.42   DEPTH*VELOCITY(FT*FT/SEC.) =   0.35
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     672.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     14.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1540.70  DOWNSTREAM(FEET) =  1538.70
  FLOW LENGTH(FEET) =   309.20   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.30
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.00
  PIPE TRAVEL TIME(MIN.) =   1.56    Tc(MIN.) =   15.95
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     14.00 =     981.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     14.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.95
  RAINFALL INTENSITY(INCH/HR) =   0.94
  TOTAL STREAM AREA(ACRES) =     1.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.00

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.77     9.46        1.239          0.86
      2        1.00    15.95        0.940          1.61

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        1.36     9.46       1.239
      2        1.58    15.95       0.940

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.58   Tc(MIN.) =   15.95
  TOTAL AREA(ACRES) =        2.5
```

```
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     14.00 =     981.70 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     80.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1538.70  DOWNSTREAM(FEET) =  1536.50
 FLOW LENGTH(FEET) =   249.40   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.19
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.58
 PIPE TRAVEL TIME(MIN.) =   0.99    Tc(MIN.) =   16.94
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     80.00 =    1231.10 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   16.94
 RAINFALL INTENSITY(INCH/HR) =   0.91
 TOTAL STREAM AREA(ACRES) =     2.47
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.58

****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1000.00
 UPSTREAM ELEVATION(FEET) =   1548.70
 DOWNSTREAM ELEVATION(FEET) =   1542.00
 ELEVATION DIFFERENCE(FEET) =      6.70
 TC = 0.303*[( 1000.00**3)/(     6.70)]**.2 =   13.073
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.044
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8342
 SOIL CLASSIFICATION IS "A"
 SUBAREA RUNOFF(CFS) =      5.78
 TOTAL AREA(ACRES) =      6.64   TOTAL RUNOFF(CFS) =      5.78

****************************************************************************
 FLOW PROCESS FROM NODE     51.00 TO NODE     80.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1542.00  DOWNSTREAM(FEET) =   1536.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =    22.00   CHANNEL SLOPE =  0.2500
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.040
 SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .5708
 SOIL CLASSIFICATION IS "A"
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.88
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.77
 AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.10
 Tc(MIN.) =   13.17
 SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    0.20
 TOTAL AREA(ACRES) =        7.0         PEAK FLOW RATE(CFS) =       5.98

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   3.83
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     80.00 =    1022.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.17
  RAINFALL INTENSITY(INCH/HR) =   1.04
  TOTAL STREAM AREA(ACRES) =     6.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.98

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   320.00
  UPSTREAM ELEVATION(FEET) =   1545.50
  DOWNSTREAM ELEVATION(FEET) =   1542.00
  ELEVATION DIFFERENCE(FEET) =      3.50
  TC = 0.393*[(  320.00**3)/(     3.50)]**.2 =    9.733
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.220
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .5855
  SOIL CLASSIFICATION IS "A"
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE     71.00 TO NODE     80.00 IS CODE =  51
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
               Routing Algorithm is UNAVAILABLE.

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     80.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.73
  RAINFALL INTENSITY(INCH/HR) =   1.22
  TOTAL STREAM AREA(ACRES) =     0.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.06

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.58    16.94        0.910          2.47
      2        5.98    13.17        1.040          6.98
      3        0.06     9.73        1.220          0.08

 ********************************WARNING*********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.
```

```
  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.39     9.73       1.220
      2        7.26    13.17       1.040
      3        6.86    16.94       0.910

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.26   Tc(MIN.) =   13.17
  TOTAL AREA(ACRES) =        9.5
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     80.00 =    1231.10 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        9.5  TC(MIN.) =     13.17
  PEAK FLOW RATE(CFS)   =       7.26
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

U n i t H y d r o g r a p h A n a l y s i s

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Study date 07/31/24 File: JDHU242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6443

 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format

JD FIELDS HEMET
UNIT HYDROGRAPHS 2 YEAR
XO 7/31/24

Drainage Area = 9.52(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.52(Ac.) = 0.015 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.176 Hr.
Lag time = 10.54 Min.
25% of lag time = 2.63 Min.
40% of lag time = 4.21 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.52	2.01	19.14

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.52	5.31	50.55

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.010(In)
Area Averaged 100-Year Rainfall = 5.310(In)

Point rain (area averaged) = 2.010(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.010(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.520	32.00	0.900

Total Area Entered = 9.52(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)

32.0 16.2 0.870 0.900 0.165 1.000 0.165
Sum (F) = 0.165

Area averaged mean soil loss (F) (In/Hr) = 0.165
Minimum soil loss rate ((In/Hr)) = 0.083
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	47.456	5.654	0.542
2	0.167	94.913	23.987	2.301
3	0.250	142.369	28.914	2.774
4	0.333	189.825	13.944	1.338
5	0.417	237.282	7.065	0.678
6	0.500	284.738	4.868	0.467
7	0.583	332.194	3.546	0.340
8	0.667	379.651	2.729	0.262
9	0.750	427.107	2.049	0.197
10	0.833	474.563	1.558	0.150
11	0.917	522.020	1.394	0.134
12	1.000	569.476	1.083	0.104
13	1.083	616.932	0.875	0.084
14	1.167	664.389	0.695	0.067
15	1.250	711.845	0.521	0.050
16	1.333	759.301	0.475	0.046
17	1.417	806.758	0.644	0.062
		Sum = 100.000	Sum=	9.594

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.293)	0.014	0.002
2	0.17	0.07	0.016	(0.292)	0.014	0.002
3	0.25	0.07	0.016	(0.291)	0.014	0.002
4	0.33	0.10	0.024	(0.290)	0.022	0.002
5	0.42	0.10	0.024	(0.289)	0.022	0.002
6	0.50	0.10	0.024	(0.288)	0.022	0.002
7	0.58	0.10	0.024	(0.286)	0.022	0.002
8	0.67	0.10	0.024	(0.285)	0.022	0.002
9	0.75	0.10	0.024	(0.284)	0.022	0.002
10	0.83	0.13	0.032	(0.283)	0.029	0.003
11	0.92	0.13	0.032	(0.282)	0.029	0.003
12	1.00	0.13	0.032	(0.281)	0.029	0.003
13	1.08	0.10	0.024	(0.280)	0.022	0.002
14	1.17	0.10	0.024	(0.279)	0.022	0.002
15	1.25	0.10	0.024	(0.277)	0.022	0.002
16	1.33	0.10	0.024	(0.276)	0.022	0.002
17	1.42	0.10	0.024	(0.275)	0.022	0.002
18	1.50	0.10	0.024	(0.274)	0.022	0.002
19	1.58	0.10	0.024	(0.273)	0.022	0.002
20	1.67	0.10	0.024	(0.272)	0.022	0.002
21	1.75	0.10	0.024	(0.271)	0.022	0.002
22	1.83	0.13	0.032	(0.270)	0.029	0.003
23	1.92	0.13	0.032	(0.269)	0.029	0.003
24	2.00	0.13	0.032	(0.268)	0.029	0.003
25	2.08	0.13	0.032	(0.267)	0.029	0.003
26	2.17	0.13	0.032	(0.265)	0.029	0.003
27	2.25	0.13	0.032	(0.264)	0.029	0.003

28	2.33	0.13	0.032	(0.263)	0.029	0.003
29	2.42	0.13	0.032	(0.262)	0.029	0.003
30	2.50	0.13	0.032	(0.261)	0.029	0.003
31	2.58	0.17	0.040	(0.260)	0.036	0.004
32	2.67	0.17	0.040	(0.259)	0.036	0.004
33	2.75	0.17	0.040	(0.258)	0.036	0.004
34	2.83	0.17	0.040	(0.257)	0.036	0.004
35	2.92	0.17	0.040	(0.256)	0.036	0.004
36	3.00	0.17	0.040	(0.255)	0.036	0.004
37	3.08	0.17	0.040	(0.254)	0.036	0.004
38	3.17	0.17	0.040	(0.253)	0.036	0.004
39	3.25	0.17	0.040	(0.252)	0.036	0.004
40	3.33	0.17	0.040	(0.251)	0.036	0.004
41	3.42	0.17	0.040	(0.250)	0.036	0.004
42	3.50	0.17	0.040	(0.249)	0.036	0.004
43	3.58	0.17	0.040	(0.247)	0.036	0.004
44	3.67	0.17	0.040	(0.246)	0.036	0.004
45	3.75	0.17	0.040	(0.245)	0.036	0.004
46	3.83	0.20	0.048	(0.244)	0.043	0.005
47	3.92	0.20	0.048	(0.243)	0.043	0.005
48	4.00	0.20	0.048	(0.242)	0.043	0.005
49	4.08	0.20	0.048	(0.241)	0.043	0.005
50	4.17	0.20	0.048	(0.240)	0.043	0.005
51	4.25	0.20	0.048	(0.239)	0.043	0.005
52	4.33	0.23	0.056	(0.238)	0.051	0.006
53	4.42	0.23	0.056	(0.237)	0.051	0.006
54	4.50	0.23	0.056	(0.236)	0.051	0.006
55	4.58	0.23	0.056	(0.235)	0.051	0.006
56	4.67	0.23	0.056	(0.234)	0.051	0.006
57	4.75	0.23	0.056	(0.233)	0.051	0.006
58	4.83	0.27	0.064	(0.232)	0.058	0.006
59	4.92	0.27	0.064	(0.231)	0.058	0.006
60	5.00	0.27	0.064	(0.230)	0.058	0.006
61	5.08	0.20	0.048	(0.229)	0.043	0.005
62	5.17	0.20	0.048	(0.228)	0.043	0.005
63	5.25	0.20	0.048	(0.227)	0.043	0.005
64	5.33	0.23	0.056	(0.226)	0.051	0.006
65	5.42	0.23	0.056	(0.225)	0.051	0.006
66	5.50	0.23	0.056	(0.224)	0.051	0.006
67	5.58	0.27	0.064	(0.223)	0.058	0.006
68	5.67	0.27	0.064	(0.222)	0.058	0.006
69	5.75	0.27	0.064	(0.221)	0.058	0.006
70	5.83	0.27	0.064	(0.220)	0.058	0.006
71	5.92	0.27	0.064	(0.219)	0.058	0.006
72	6.00	0.27	0.064	(0.218)	0.058	0.006
73	6.08	0.30	0.072	(0.217)	0.065	0.007
74	6.17	0.30	0.072	(0.216)	0.065	0.007
75	6.25	0.30	0.072	(0.215)	0.065	0.007
76	6.33	0.30	0.072	(0.214)	0.065	0.007
77	6.42	0.30	0.072	(0.213)	0.065	0.007
78	6.50	0.30	0.072	(0.213)	0.065	0.007
79	6.58	0.33	0.080	(0.212)	0.072	0.008
80	6.67	0.33	0.080	(0.211)	0.072	0.008
81	6.75	0.33	0.080	(0.210)	0.072	0.008
82	6.83	0.33	0.080	(0.209)	0.072	0.008
83	6.92	0.33	0.080	(0.208)	0.072	0.008
84	7.00	0.33	0.080	(0.207)	0.072	0.008
85	7.08	0.33	0.080	(0.206)	0.072	0.008
86	7.17	0.33	0.080	(0.205)	0.072	0.008
87	7.25	0.33	0.080	(0.204)	0.072	0.008
88	7.33	0.37	0.088	(0.203)	0.080	0.009
89	7.42	0.37	0.088	(0.202)	0.080	0.009
90	7.50	0.37	0.088	(0.201)	0.080	0.009
91	7.58	0.40	0.096	(0.200)	0.087	0.010
92	7.67	0.40	0.096	(0.199)	0.087	0.010
93	7.75	0.40	0.096	(0.198)	0.087	0.010
94	7.83	0.43	0.105	(0.198)	0.094	0.010
95	7.92	0.43	0.105	(0.197)	0.094	0.010
96	8.00	0.43	0.105	(0.196)	0.094	0.010

97	8.08	0.50	0.121	(	0.195)		0.109		0.012
98	8.17	0.50	0.121	(	0.194)		0.109		0.012
99	8.25	0.50	0.121	(	0.193)		0.109		0.012
100	8.33	0.50	0.121	(	0.192)		0.109		0.012
101	8.42	0.50	0.121	(	0.191)		0.109		0.012
102	8.50	0.50	0.121	(	0.190)		0.109		0.012
103	8.58	0.53	0.129	(	0.189)		0.116		0.013
104	8.67	0.53	0.129	(	0.189)		0.116		0.013
105	8.75	0.53	0.129	(	0.188)		0.116		0.013
106	8.83	0.57	0.137	(	0.187)		0.123		0.014
107	8.92	0.57	0.137	(	0.186)		0.123		0.014
108	9.00	0.57	0.137	(	0.185)		0.123		0.014
109	9.08	0.63	0.153	(	0.184)		0.137		0.015
110	9.17	0.63	0.153	(	0.183)		0.137		0.015
111	9.25	0.63	0.153	(	0.182)		0.137		0.015
112	9.33	0.67	0.161	(	0.181)		0.145		0.016
113	9.42	0.67	0.161	(	0.181)		0.145		0.016
114	9.50	0.67	0.161	(	0.180)		0.145		0.016
115	9.58	0.70	0.169	(	0.179)		0.152		0.017
116	9.67	0.70	0.169	(	0.178)		0.152		0.017
117	9.75	0.70	0.169	(	0.177)		0.152		0.017
118	9.83	0.73	0.177	(	0.176)		0.159		0.018
119	9.92	0.73	0.177	(	0.175)		0.159		0.018
120	10.00	0.73	0.177	(	0.175)		0.159		0.018
121	10.08	0.50	0.121	(	0.174)		0.109		0.012
122	10.17	0.50	0.121	(	0.173)		0.109		0.012
123	10.25	0.50	0.121	(	0.172)		0.109		0.012
124	10.33	0.50	0.121	(	0.171)		0.109		0.012
125	10.42	0.50	0.121	(	0.170)		0.109		0.012
126	10.50	0.50	0.121	(	0.170)		0.109		0.012
127	10.58	0.67	0.161	(	0.169)		0.145		0.016
128	10.67	0.67	0.161	(	0.168)		0.145		0.016
129	10.75	0.67	0.161	(	0.167)		0.145		0.016
130	10.83	0.67	0.161	(	0.166)		0.145		0.016
131	10.92	0.67	0.161	(	0.166)		0.145		0.016
132	11.00	0.67	0.161	(	0.165)		0.145		0.016
133	11.08	0.63	0.153	(	0.164)		0.137		0.015
134	11.17	0.63	0.153	(	0.163)		0.137		0.015
135	11.25	0.63	0.153	(	0.162)		0.137		0.015
136	11.33	0.63	0.153	(	0.161)		0.137		0.015
137	11.42	0.63	0.153	(	0.161)		0.137		0.015
138	11.50	0.63	0.153	(	0.160)		0.137		0.015
139	11.58	0.57	0.137	(	0.159)		0.123		0.014
140	11.67	0.57	0.137	(	0.158)		0.123		0.014
141	11.75	0.57	0.137	(	0.157)		0.123		0.014
142	11.83	0.60	0.145	(	0.157)		0.130		0.014
143	11.92	0.60	0.145	(	0.156)		0.130		0.014
144	12.00	0.60	0.145	(	0.155)		0.130		0.014
145	12.08	0.83	0.201		0.154	(	0.181)		0.047
146	12.17	0.83	0.201		0.154	(	0.181)		0.047
147	12.25	0.83	0.201		0.153	(	0.181)		0.048
148	12.33	0.87	0.209		0.152	(	0.188)		0.057
149	12.42	0.87	0.209		0.151	(	0.188)		0.058
150	12.50	0.87	0.209		0.151	(	0.188)		0.058
151	12.58	0.93	0.225		0.150	(	0.203)		0.075
152	12.67	0.93	0.225		0.149	(	0.203)		0.076
153	12.75	0.93	0.225		0.148	(	0.203)		0.077
154	12.83	0.97	0.233		0.148	(	0.210)		0.086
155	12.92	0.97	0.233		0.147	(	0.210)		0.086
156	13.00	0.97	0.233		0.146	(	0.210)		0.087
157	13.08	1.13	0.273		0.145	(	0.246)		0.128
158	13.17	1.13	0.273		0.145	(	0.246)		0.129
159	13.25	1.13	0.273		0.144	(	0.246)		0.130
160	13.33	1.13	0.273		0.143	(	0.246)		0.130
161	13.42	1.13	0.273		0.142	(	0.246)		0.131
162	13.50	1.13	0.273		0.142	(	0.246)		0.132
163	13.58	0.77	0.185		0.141	(	0.166)		0.044
164	13.67	0.77	0.185		0.140	(	0.166)		0.045
165	13.75	0.77	0.185		0.139	(	0.166)		0.045

166	13.83	0.77	0.185		0.139	(	0.166)	0.046
167	13.92	0.77	0.185		0.138	(	0.166)	0.047
168	14.00	0.77	0.185		0.137	(	0.166)	0.048
169	14.08	0.90	0.217		0.137	(	0.195)	0.080
170	14.17	0.90	0.217		0.136	(	0.195)	0.081
171	14.25	0.90	0.217		0.135	(	0.195)	0.082
172	14.33	0.87	0.209		0.135	(	0.188)	0.074
173	14.42	0.87	0.209		0.134	(	0.188)	0.075
174	14.50	0.87	0.209		0.133	(	0.188)	0.076
175	14.58	0.87	0.209		0.133	(	0.188)	0.077
176	14.67	0.87	0.209		0.132	(	0.188)	0.077
177	14.75	0.87	0.209		0.131	(	0.188)	0.078
178	14.83	0.83	0.201		0.130	(	0.181)	0.070
179	14.92	0.83	0.201		0.130	(	0.181)	0.071
180	15.00	0.83	0.201		0.129	(	0.181)	0.072
181	15.08	0.80	0.193		0.129	(	0.174)	0.064
182	15.17	0.80	0.193		0.128	(	0.174)	0.065
183	15.25	0.80	0.193		0.127	(	0.174)	0.066
184	15.33	0.77	0.185		0.127	(	0.166)	0.058
185	15.42	0.77	0.185		0.126	(	0.166)	0.059
186	15.50	0.77	0.185		0.125	(	0.166)	0.060
187	15.58	0.63	0.153		0.125	(	0.137)	0.028
188	15.67	0.63	0.153		0.124	(	0.137)	0.029
189	15.75	0.63	0.153		0.123	(	0.137)	0.029
190	15.83	0.63	0.153		0.123	(	0.137)	0.030
191	15.92	0.63	0.153		0.122	(	0.137)	0.031
192	16.00	0.63	0.153		0.121	(	0.137)	0.031
193	16.08	0.13	0.032	(	0.121)		0.029	0.003
194	16.17	0.13	0.032	(	0.120)		0.029	0.003
195	16.25	0.13	0.032	(	0.120)		0.029	0.003
196	16.33	0.13	0.032	(	0.119)		0.029	0.003
197	16.42	0.13	0.032	(	0.118)		0.029	0.003
198	16.50	0.13	0.032	(	0.118)		0.029	0.003
199	16.58	0.10	0.024	(	0.117)		0.022	0.002
200	16.67	0.10	0.024	(	0.117)		0.022	0.002
201	16.75	0.10	0.024	(	0.116)		0.022	0.002
202	16.83	0.10	0.024	(	0.115)		0.022	0.002
203	16.92	0.10	0.024	(	0.115)		0.022	0.002
204	17.00	0.10	0.024	(	0.114)		0.022	0.002
205	17.08	0.17	0.040	(	0.114)		0.036	0.004
206	17.17	0.17	0.040	(	0.113)		0.036	0.004
207	17.25	0.17	0.040	(	0.113)		0.036	0.004
208	17.33	0.17	0.040	(	0.112)		0.036	0.004
209	17.42	0.17	0.040	(	0.111)		0.036	0.004
210	17.50	0.17	0.040	(	0.111)		0.036	0.004
211	17.58	0.17	0.040	(	0.110)		0.036	0.004
212	17.67	0.17	0.040	(	0.110)		0.036	0.004
213	17.75	0.17	0.040	(	0.109)		0.036	0.004
214	17.83	0.13	0.032	(	0.109)		0.029	0.003
215	17.92	0.13	0.032	(	0.108)		0.029	0.003
216	18.00	0.13	0.032	(	0.108)		0.029	0.003
217	18.08	0.13	0.032	(	0.107)		0.029	0.003
218	18.17	0.13	0.032	(	0.107)		0.029	0.003
219	18.25	0.13	0.032	(	0.106)		0.029	0.003
220	18.33	0.13	0.032	(	0.105)		0.029	0.003
221	18.42	0.13	0.032	(	0.105)		0.029	0.003
222	18.50	0.13	0.032	(	0.104)		0.029	0.003
223	18.58	0.10	0.024	(	0.104)		0.022	0.002
224	18.67	0.10	0.024	(	0.103)		0.022	0.002
225	18.75	0.10	0.024	(	0.103)		0.022	0.002
226	18.83	0.07	0.016	(	0.102)		0.014	0.002
227	18.92	0.07	0.016	(	0.102)		0.014	0.002
228	19.00	0.07	0.016	(	0.101)		0.014	0.002
229	19.08	0.10	0.024	(	0.101)		0.022	0.002
230	19.17	0.10	0.024	(	0.101)		0.022	0.002
231	19.25	0.10	0.024	(	0.100)		0.022	0.002
232	19.33	0.13	0.032	(	0.100)		0.029	0.003
233	19.42	0.13	0.032	(	0.099)		0.029	0.003
234	19.50	0.13	0.032	(	0.099)		0.029	0.003

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235  19.58     0.10      0.024       (  0.098)       0.022        0.002
236  19.67     0.10      0.024       (  0.098)       0.022        0.002
237  19.75     0.10      0.024       (  0.097)       0.022        0.002
238  19.83     0.07      0.016       (  0.097)       0.014        0.002
239  19.92     0.07      0.016       (  0.096)       0.014        0.002
240  20.00     0.07      0.016       (  0.096)       0.014        0.002
241  20.08     0.10      0.024       (  0.096)       0.022        0.002
242  20.17     0.10      0.024       (  0.095)       0.022        0.002
243  20.25     0.10      0.024       (  0.095)       0.022        0.002
244  20.33     0.10      0.024       (  0.094)       0.022        0.002
245  20.42     0.10      0.024       (  0.094)       0.022        0.002
246  20.50     0.10      0.024       (  0.094)       0.022        0.002
247  20.58     0.10      0.024       (  0.093)       0.022        0.002
248  20.67     0.10      0.024       (  0.093)       0.022        0.002
249  20.75     0.10      0.024       (  0.092)       0.022        0.002
250  20.83     0.07      0.016       (  0.092)       0.014        0.002
251  20.92     0.07      0.016       (  0.092)       0.014        0.002
252  21.00     0.07      0.016       (  0.091)       0.014        0.002
253  21.08     0.10      0.024       (  0.091)       0.022        0.002
254  21.17     0.10      0.024       (  0.091)       0.022        0.002
255  21.25     0.10      0.024       (  0.090)       0.022        0.002
256  21.33     0.07      0.016       (  0.090)       0.014        0.002
257  21.42     0.07      0.016       (  0.090)       0.014        0.002
258  21.50     0.07      0.016       (  0.089)       0.014        0.002
259  21.58     0.10      0.024       (  0.089)       0.022        0.002
260  21.67     0.10      0.024       (  0.089)       0.022        0.002
261  21.75     0.10      0.024       (  0.088)       0.022        0.002
262  21.83     0.07      0.016       (  0.088)       0.014        0.002
263  21.92     0.07      0.016       (  0.088)       0.014        0.002
264  22.00     0.07      0.016       (  0.087)       0.014        0.002
265  22.08     0.10      0.024       (  0.087)       0.022        0.002
266  22.17     0.10      0.024       (  0.087)       0.022        0.002
267  22.25     0.10      0.024       (  0.086)       0.022        0.002
268  22.33     0.07      0.016       (  0.086)       0.014        0.002
269  22.42     0.07      0.016       (  0.086)       0.014        0.002
270  22.50     0.07      0.016       (  0.086)       0.014        0.002
271  22.58     0.07      0.016       (  0.085)       0.014        0.002
272  22.67     0.07      0.016       (  0.085)       0.014        0.002
273  22.75     0.07      0.016       (  0.085)       0.014        0.002
274  22.83     0.07      0.016       (  0.085)       0.014        0.002
275  22.92     0.07      0.016       (  0.085)       0.014        0.002
276  23.00     0.07      0.016       (  0.084)       0.014        0.002
277  23.08     0.07      0.016       (  0.084)       0.014        0.002
278  23.17     0.07      0.016       (  0.084)       0.014        0.002
279  23.25     0.07      0.016       (  0.084)       0.014        0.002
280  23.33     0.07      0.016       (  0.084)       0.014        0.002
281  23.42     0.07      0.016       (  0.083)       0.014        0.002
282  23.50     0.07      0.016       (  0.083)       0.014        0.002
283  23.58     0.07      0.016       (  0.083)       0.014        0.002
284  23.67     0.07      0.016       (  0.083)       0.014        0.002
285  23.75     0.07      0.016       (  0.083)       0.014        0.002
286  23.83     0.07      0.016       (  0.083)       0.014        0.002
287  23.92     0.07      0.016       (  0.083)       0.014        0.002
288  24.00     0.07      0.016       (  0.083)       0.014        0.002
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     4.7
       Flood volume = Effective rainfall      0.40(In)
        times area       9.5(Ac.)/[(In)/(Ft.)] =       0.3(Ac.Ft)
       Total soil loss =      1.61(In)
       Total soil loss =     1.281(Ac.Ft)
       Total rainfall =      2.01(In)
       Flood volume =       13656.1 Cubic Feet
       Total soil loss =       55803.4 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =      1.171(CFS)
       ---------------------------------------------------------------------
       +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                     R u n o f f     H y d r o g r a p h
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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q				
0+10	0.0000	0.00	Q				
0+15	0.0001	0.01	Q				
0+20	0.0002	0.01	Q				
0+25	0.0003	0.01	Q				
0+30	0.0004	0.02	Q				
0+35	0.0005	0.02	Q				
0+40	0.0007	0.02	Q				
0+45	0.0008	0.02	Q				
0+50	0.0010	0.02	Q				
0+55	0.0011	0.02	Q				
1+ 0	0.0013	0.03	Q				
1+ 5	0.0015	0.03	Q				
1+10	0.0017	0.03	Q				
1+15	0.0019	0.02	Q				
1+20	0.0020	0.02	Q				
1+25	0.0022	0.02	Q				
1+30	0.0023	0.02	Q				
1+35	0.0025	0.02	Q				
1+40	0.0027	0.02	Q				
1+45	0.0028	0.02	Q				
1+50	0.0030	0.02	Q				
1+55	0.0032	0.03	Q				
2+ 0	0.0034	0.03	Q				
2+ 5	0.0036	0.03	Q				
2+10	0.0038	0.03	Q				
2+15	0.0040	0.03	Q				
2+20	0.0042	0.03	Q				
2+25	0.0044	0.03	Q				
2+30	0.0046	0.03	Q				
2+35	0.0048	0.03	Q				
2+40	0.0050	0.03	Q				
2+45	0.0053	0.04	Q				
2+50	0.0055	0.04	Q				
2+55	0.0058	0.04	Q				
3+ 0	0.0060	0.04	Q				
3+ 5	0.0063	0.04	Q				
3+10	0.0066	0.04	Q				
3+15	0.0068	0.04	Q				
3+20	0.0071	0.04	Q				
3+25	0.0073	0.04	Q				
3+30	0.0076	0.04	Q				
3+35	0.0079	0.04	QV				
3+40	0.0081	0.04	QV				
3+45	0.0084	0.04	QV				
3+50	0.0087	0.04	QV				
3+55	0.0090	0.04	QV				
4+ 0	0.0093	0.04	QV				
4+ 5	0.0096	0.04	QV				
4+10	0.0099	0.04	QV				
4+15	0.0102	0.05	QV				
4+20	0.0105	0.05	QV				
4+25	0.0108	0.05	QV				
4+30	0.0112	0.05	QV				
4+35	0.0115	0.05	QV				
4+40	0.0119	0.05	QV				
4+45	0.0122	0.05	QV				
4+50	0.0126	0.05	QV				
4+55	0.0130	0.06	QV				
5+ 0	0.0134	0.06	QV				
5+ 5	0.0138	0.06	QV				
5+10	0.0142	0.06	QV				
5+15	0.0145	0.05	QV				

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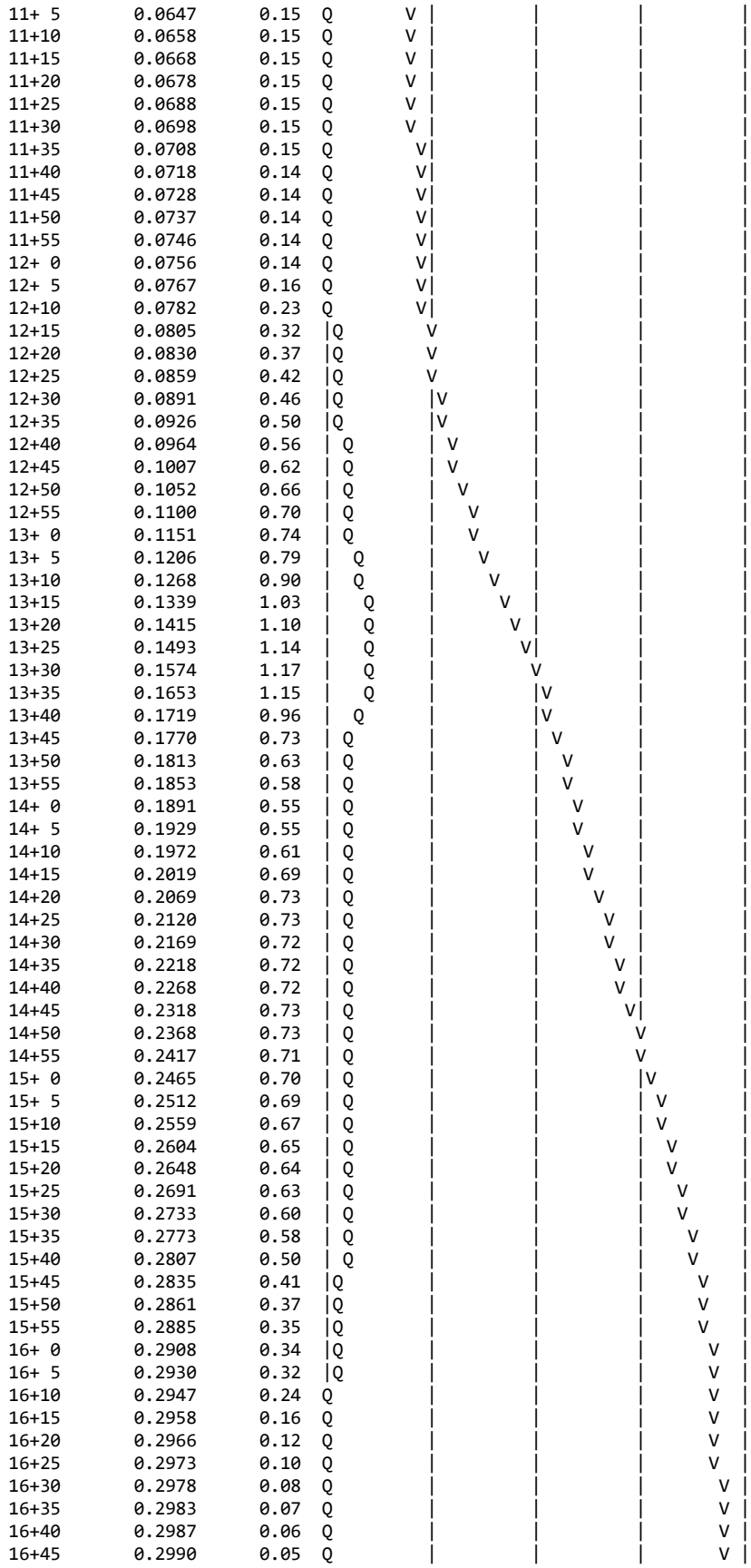
 5+20       0.0149      0.05  QV        |         |         |         |
 5+25       0.0152      0.05  QV        |         |         |         |
 5+30       0.0156      0.05  QV        |         |         |         |
 5+35       0.0160      0.05  Q V       |         |         |         |
 5+40       0.0163      0.06  Q V       |         |         |         |
 5+45       0.0167      0.06  Q V       |         |         |         |
 5+50       0.0171      0.06  Q V       |         |         |         |
 5+55       0.0176      0.06  Q V       |         |         |         |
 6+ 0       0.0180      0.06  Q V       |         |         |         |
 6+ 5       0.0184      0.06  Q V       |         |         |         |
 6+10       0.0188      0.06  Q V       |         |         |         |
 6+15       0.0193      0.07  Q V       |         |         |         |
 6+20       0.0197      0.07  Q V       |         |         |         |
 6+25       0.0202      0.07  Q V       |         |         |         |
 6+30       0.0207      0.07  Q V       |         |         |         |
 6+35       0.0211      0.07  Q V       |         |         |         |
 6+40       0.0216      0.07  Q V       |         |         |         |
 6+45       0.0221      0.07  Q V       |         |         |         |
 6+50       0.0227      0.07  Q V       |         |         |         |
 6+55       0.0232      0.08  Q V       |         |         |         |
 7+ 0       0.0237      0.08  Q  V      |         |         |         |
 7+ 5       0.0242      0.08  Q  V      |         |         |         |
 7+10       0.0247      0.08  Q  V      |         |         |         |
 7+15       0.0253      0.08  Q  V      |         |         |         |
 7+20       0.0258      0.08  Q  V      |         |         |         |
 7+25       0.0263      0.08  Q  V      |         |         |         |
 7+30       0.0269      0.08  Q  V      |         |         |         |
 7+35       0.0275      0.08  Q  V      |         |         |         |
 7+40       0.0281      0.09  Q  V      |         |         |         |
 7+45       0.0287      0.09  Q  V      |         |         |         |
 7+50       0.0293      0.09  Q  V      |         |         |         |
 7+55       0.0299      0.09  Q  V      |         |         |         |
 8+ 0       0.0306      0.10  Q  V      |         |         |         |
 8+ 5       0.0313      0.10  Q  V      |         |         |         |
 8+10       0.0320      0.10  Q   V     |         |         |         |
 8+15       0.0327      0.11  Q   V     |         |         |         |
 8+20       0.0335      0.11  Q   V     |         |         |         |
 8+25       0.0342      0.11  Q   V     |         |         |         |
 8+30       0.0350      0.11  Q   V     |         |         |         |
 8+35       0.0358      0.11  Q   V     |         |         |         |
 8+40       0.0366      0.12  Q   V     |         |         |         |
 8+45       0.0374      0.12  Q   V     |         |         |         |
 8+50       0.0382      0.12  Q   V     |         |         |         |
 8+55       0.0391      0.12  Q   V     |         |         |         |
 9+ 0       0.0400      0.13  Q    V    |         |         |         |
 9+ 5       0.0408      0.13  Q    V    |         |         |         |
 9+10       0.0418      0.13  Q    V    |         |         |         |
 9+15       0.0427      0.14  Q    V    |         |         |         |
 9+20       0.0437      0.14  Q    V    |         |         |         |
 9+25       0.0447      0.14  Q    V    |         |         |         |
 9+30       0.0457      0.15  Q    V    |         |         |         |
 9+35       0.0467      0.15  Q    V    |         |         |         |
 9+40       0.0478      0.15  Q     V   |         |         |         |
 9+45       0.0489      0.16  Q     V   |         |         |         |
 9+50       0.0500      0.16  Q     V   |         |         |         |
 9+55       0.0511      0.16  Q     V   |         |         |         |
10+ 0       0.0522      0.16  Q     V   |         |         |         |
10+ 5       0.0533      0.16  Q     V   |         |         |         |
10+10       0.0544      0.15  Q     V   |         |         |         |
10+15       0.0553      0.14  Q      V  |         |         |         |
10+20       0.0562      0.13  Q      V  |         |         |         |
10+25       0.0571      0.13  Q      V  |         |         |         |
10+30       0.0579      0.12  Q      V  |         |         |         |
10+35       0.0588      0.12  Q      V  |         |         |         |
10+40       0.0597      0.13  Q      V  |         |         |         |
10+45       0.0606      0.14  Q      V  |         |         |         |
10+50       0.0616      0.15  Q      V  |         |         |         |
10+55       0.0627      0.15  Q      V  |         |         |         |
11+ 0       0.0637      0.15  Q       V |         |         |         |
```



16+50	0.2993	0.04	Q	|	|	|	V |
16+55	0.2996	0.04	Q	|	|	|	V |
17+ 0	0.2998	0.03	Q	|	|	|	V |
17+ 5	0.3000	0.03	Q	|	|	|	V |
17+10	0.3002	0.03	Q	|	|	|	V |
17+15	0.3005	0.04	Q	|	|	|	V |
17+20	0.3007	0.04	Q	|	|	|	V |
17+25	0.3010	0.04	Q	|	|	|	V |
17+30	0.3012	0.04	Q	|	|	|	V |
17+35	0.3015	0.04	Q	|	|	|	V |
17+40	0.3017	0.04	Q	|	|	|	V |
17+45	0.3020	0.04	Q	|	|	|	V |
17+50	0.3023	0.04	Q	|	|	|	V |
17+55	0.3025	0.04	Q	|	|	|	V |
18+ 0	0.3027	0.03	Q	|	|	|	V |
18+ 5	0.3030	0.03	Q	|	|	|	V |
18+10	0.3032	0.03	Q	|	|	|	V |
18+15	0.3034	0.03	Q	|	|	|	V |
18+20	0.3036	0.03	Q	|	|	|	V |
18+25	0.3038	0.03	Q	|	|	|	V |
18+30	0.3040	0.03	Q	|	|	|	V |
18+35	0.3043	0.03	Q	|	|	|	V |
18+40	0.3045	0.03	Q	|	|	|	V |
18+45	0.3046	0.03	Q	|	|	|	V |
18+50	0.3048	0.03	Q	|	|	|	V |
18+55	0.3050	0.02	Q	|	|	|	V |
19+ 0	0.3051	0.02	Q	|	|	|	V |
19+ 5	0.3052	0.02	Q	|	|	|	V |
19+10	0.3054	0.02	Q	|	|	|	V |
19+15	0.3055	0.02	Q	|	|	|	V |
19+20	0.3057	0.02	Q	|	|	|	V|
19+25	0.3059	0.02	Q	|	|	|	V|
19+30	0.3060	0.03	Q	|	|	|	V|
19+35	0.3062	0.03	Q	|	|	|	V|
19+40	0.3064	0.03	Q	|	|	|	V|
19+45	0.3066	0.02	Q	|	|	|	V|
19+50	0.3068	0.02	Q	|	|	|	V|
19+55	0.3069	0.02	Q	|	|	|	V|
20+ 0	0.3070	0.02	Q	|	|	|	V|
20+ 5	0.3072	0.02	Q	|	|	|	V|
20+10	0.3073	0.02	Q	|	|	|	V|
20+15	0.3074	0.02	Q	|	|	|	V|
20+20	0.3076	0.02	Q	|	|	|	V|
20+25	0.3077	0.02	Q	|	|	|	V|
20+30	0.3079	0.02	Q	|	|	|	V|
20+35	0.3081	0.02	Q	|	|	|	V|
20+40	0.3082	0.02	Q	|	|	|	V|
20+45	0.3084	0.02	Q	|	|	|	V|
20+50	0.3085	0.02	Q	|	|	|	V|
20+55	0.3087	0.02	Q	|	|	|	V|
21+ 0	0.3088	0.02	Q	|	|	|	V|
21+ 5	0.3089	0.02	Q	|	|	|	V|
21+10	0.3091	0.02	Q	|	|	|	V|
21+15	0.3092	0.02	Q	|	|	|	V|
21+20	0.3093	0.02	Q	|	|	|	V|
21+25	0.3095	0.02	Q	|	|	|	V|
21+30	0.3096	0.02	Q	|	|	|	V|
21+35	0.3097	0.02	Q	|	|	|	V|
21+40	0.3099	0.02	Q	|	|	|	V|
21+45	0.3100	0.02	Q	|	|	|	V|
21+50	0.3102	0.02	Q	|	|	|	V|
21+55	0.3103	0.02	Q	|	|	|	V|
22+ 0	0.3104	0.02	Q	|	|	|	V|
22+ 5	0.3105	0.02	Q	|	|	|	V|
22+10	0.3107	0.02	Q	|	|	|	V|
22+15	0.3108	0.02	Q	|	|	|	V|
22+20	0.3109	0.02	Q	|	|	|	V|
22+25	0.3111	0.02	Q	|	|	|	V|
22+30	0.3112	0.02	Q	|	|	|	V|

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   22+35       0.3113      0.02  Q        |         |         |        V|
   22+40       0.3114      0.02  Q        |         |         |        V|
   22+45       0.3116      0.02  Q        |         |         |        V|
   22+50       0.3117      0.02  Q        |         |         |        V|
   22+55       0.3118      0.02  Q        |         |         |        V|
   23+ 0       0.3119      0.02  Q        |         |         |        V|
   23+ 5       0.3120      0.02  Q        |         |         |        V|
   23+10       0.3121      0.02  Q        |         |         |        V|
   23+15       0.3122      0.02  Q        |         |         |        V|
   23+20       0.3123      0.02  Q        |         |         |        V|
   23+25       0.3124      0.02  Q        |         |         |        V|
   23+30       0.3125      0.02  Q        |         |         |        V|
   23+35       0.3126      0.02  Q        |         |         |        V|
   23+40       0.3127      0.02  Q        |         |         |        V|
   23+45       0.3128      0.02  Q        |         |         |        V|
   23+50       0.3130      0.02  Q        |         |         |        V|
   23+55       0.3131      0.02  Q        |         |         |        V|
   24+ 0       0.3132      0.02  Q        |         |         |        V|
   24+ 5       0.3133      0.01  Q        |         |         |        V|
   24+10       0.3133      0.01  Q        |         |         |        V|
   24+15       0.3134      0.01  Q        |         |         |        V|
   24+20       0.3134      0.00  Q        |         |         |        V|
   24+25       0.3134      0.00  Q        |         |         |        V|
   24+30       0.3135      0.00  Q        |         |         |        V|
   24+35       0.3135      0.00  Q        |         |         |        V|
   24+40       0.3135      0.00  Q        |         |         |        V|
   24+45       0.3135      0.00  Q        |         |         |        V|
   24+50       0.3135      0.00  Q        |         |         |        V|
   24+55       0.3135      0.00  Q        |         |         |        V|
   25+ 0       0.3135      0.00  Q        |         |         |        V|
   25+ 5       0.3135      0.00  Q        |         |         |        V|
   25+10       0.3135      0.00  Q        |         |         |        V|
   25+15       0.3135      0.00  Q        |         |         |        V|
   25+20       0.3135      0.00  Q        |         |         |         V
-------------------------------------------------------------------------
```

FLOOD HYDROGRAPH ROUTING PROGRAM
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018
Study date: 07/31/24

JD FIELDS HEMET
2YR-24HR BASIN ROUTING
XO 7/31/24

Program License Serial Number 6443

******************** HYDROGRAPH INFORMATION **********************

From study/file name: JDHU242.rte
*****************************HYDROGRAPH DATA*****************************
Number of intervals = 304
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 1.171 (CFS)
Total volume = 0.314 (Ac.Ft)
Status of hydrographs being held in storage
Stream 1 Stream 2 Stream 3 Stream 4 Stream 5
Peak (CFS) 0.000 0.000 0.000 0.000 0.000
Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000
****

++
Process from Point/Station 10.000 to Point/Station 11.000
**** RETARDING BASIN ROUTING ****
_____

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 304
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.001	0.001	0.249	0.000	0.002
6.000	0.510	0.249	0.509	0.511
9.500	0.511	0.249	0.510	0.512
10.000	0.560	0.428	0.559	0.561
11.000	0.690	0.428	0.689	0.691
12.000	0.840	0.428	0.839	0.841
13.000	1.030	0.428	1.029	1.031
14.000	1.240	0.428	1.239	1.241
15.000	1.490	0.428	1.489	1.491
15.500	1.630	0.428	1.629	1.631
16.000	1.840	0.428	1.839	1.841

16.100 1.890 0.428 1.889 1.891

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	0.3	0.59	0.88	1.17	Depth (Ft.)
0.083	0.00	0.00	0.000	O					0.00
0.167	0.00	0.00	0.000	O					0.00
0.250	0.01	0.01	0.000	O					0.00
0.333	0.01	0.01	0.000	O					0.00
0.417	0.01	0.01	0.000	O					0.00
0.500	0.02	0.02	0.000	O					0.00
0.583	0.02	0.02	0.000	O					0.00
0.667	0.02	0.02	0.000	O					0.00
0.750	0.02	0.02	0.000	O					0.00
0.833	0.02	0.02	0.000	O					0.00
0.917	0.02	0.02	0.000	O					0.00
1.000	0.03	0.03	0.000	O					0.00
1.083	0.03	0.03	0.000	O					0.00
1.167	0.03	0.03	0.000	O					0.00
1.250	0.02	0.03	0.000	O					0.00
1.333	0.02	0.02	0.000	O					0.00
1.417	0.02	0.02	0.000	O					0.00
1.500	0.02	0.02	0.000	O					0.00
1.583	0.02	0.02	0.000	O					0.00
1.667	0.02	0.02	0.000	O					0.00
1.750	0.02	0.02	0.000	O					0.00
1.833	0.02	0.02	0.000	O					0.00
1.917	0.03	0.02	0.000	O					0.00
2.000	0.03	0.03	0.000	O					0.00
2.083	0.03	0.03	0.000	O					0.00
2.167	0.03	0.03	0.000	O					0.00
2.250	0.03	0.03	0.000	O					0.00
2.333	0.03	0.03	0.000	O					0.00
2.417	0.03	0.03	0.000	O					0.00
2.500	0.03	0.03	0.000	O					0.00
2.583	0.03	0.03	0.000	O					0.00
2.667	0.03	0.03	0.000	O					0.00
2.750	0.04	0.03	0.000	O					0.00
2.833	0.04	0.04	0.000	O					0.00
2.917	0.04	0.04	0.000	OI					0.00
3.000	0.04	0.04	0.000	|O					0.00
3.083	0.04	0.04	0.000	|O					0.00
3.167	0.04	0.04	0.000	|O					0.00
3.250	0.04	0.04	0.000	|O					0.00
3.333	0.04	0.04	0.000	|O					0.00
3.417	0.04	0.04	0.000	|O					0.00
3.500	0.04	0.04	0.000	|O					0.00
3.583	0.04	0.04	0.000	|O					0.00
3.667	0.04	0.04	0.000	|O					0.00
3.750	0.04	0.04	0.000	|O					0.00
3.833	0.04	0.04	0.000	|O					0.00
3.917	0.04	0.04	0.000	|O					0.00
4.000	0.04	0.04	0.000	|O					0.00
4.083	0.04	0.04	0.000	|O					0.00
4.167	0.04	0.04	0.000	|O					0.00
4.250	0.05	0.04	0.000	|O					0.00
4.333	0.05	0.05	0.000	|O					0.00
4.417	0.05	0.05	0.000	|O					0.00
4.500	0.05	0.05	0.000	|O					0.00
4.583	0.05	0.05	0.000	|O					0.00
4.667	0.05	0.05	0.000	|O					0.00
4.750	0.05	0.05	0.000	|O					0.00
4.833	0.05	0.05	0.000	|O					0.00
4.917	0.06	0.05	0.000	|O					0.00
5.000	0.06	0.06	0.000	|O					0.00

5.083	0.06	0.06	0.000	O				0.00
5.167	0.06	0.06	0.000	O				0.00
5.250	0.05	0.05	0.000	O				0.00
5.333	0.05	0.05	0.000	O				0.00
5.417	0.05	0.05	0.000	O				0.00
5.500	0.05	0.05	0.000	O				0.00
5.583	0.05	0.05	0.000	O				0.00
5.667	0.06	0.05	0.000	O				0.00
5.750	0.06	0.06	0.000	O				0.00
5.833	0.06	0.06	0.000	O				0.00
5.917	0.06	0.06	0.000	O				0.00
6.000	0.06	0.06	0.000	O				0.00
6.083	0.06	0.06	0.000	O				0.00
6.167	0.06	0.06	0.000	O				0.00
6.250	0.07	0.06	0.000	O				0.00
6.333	0.07	0.07	0.000	O				0.00
6.417	0.07	0.07	0.000	O				0.00
6.500	0.07	0.07	0.000	O				0.00
6.583	0.07	0.07	0.000	O				0.00
6.667	0.07	0.07	0.000	O				0.00
6.750	0.07	0.07	0.000	OI				0.00
6.833	0.07	0.07	0.000	O				0.00
6.917	0.08	0.07	0.000	O				0.00
7.000	0.08	0.08	0.000	O				0.00
7.083	0.08	0.08	0.000	O				0.00
7.167	0.08	0.08	0.000	O				0.00
7.250	0.08	0.08	0.000	O				0.00
7.333	0.08	0.08	0.000	O				0.00
7.417	0.08	0.08	0.000	O				0.00
7.500	0.08	0.08	0.000	O				0.00
7.583	0.08	0.08	0.000	O				0.00
7.667	0.09	0.08	0.000	O				0.00
7.750	0.09	0.09	0.000	O				0.00
7.833	0.09	0.09	0.000	O				0.00
7.917	0.09	0.09	0.000	O				0.00
8.000	0.10	0.09	0.000	O				0.00
8.083	0.10	0.10	0.000	O				0.00
8.167	0.10	0.10	0.000	O				0.00
8.250	0.11	0.10	0.000	O				0.00
8.333	0.11	0.11	0.000	OI				0.00
8.417	0.11	0.11	0.000	O				0.00
8.500	0.11	0.11	0.000	O				0.00
8.583	0.11	0.11	0.000	O				0.00
8.667	0.12	0.11	0.000	O				0.00
8.750	0.12	0.12	0.000	O				0.00
8.833	0.12	0.12	0.000	O				0.00
8.917	0.12	0.12	0.000	O				0.00
9.000	0.13	0.12	0.001	O				0.00
9.083	0.13	0.13	0.001	O				0.00
9.167	0.13	0.13	0.001	O				0.00
9.250	0.14	0.14	0.001	O				0.00
9.333	0.14	0.14	0.001	O				0.00
9.417	0.14	0.14	0.001	O				0.00
9.500	0.15	0.15	0.001	OI				0.00
9.583	0.15	0.15	0.001	O				0.00
9.667	0.15	0.15	0.001	O				0.00
9.750	0.16	0.15	0.001	O				0.00
9.833	0.16	0.16	0.001	O				0.00
9.917	0.16	0.16	0.001	O				0.00
10.000	0.16	0.16	0.001	O				0.00
10.083	0.16	0.16	0.001	O				0.00
10.167	0.15	0.16	0.001	O				0.00
10.250	0.14	0.14	0.001	O				0.00
10.333	0.13	0.13	0.001	O				0.00
10.417	0.13	0.13	0.001	O				0.00
10.500	0.12	0.12	0.001	O				0.00
10.583	0.12	0.12	0.000	O				0.00
10.667	0.13	0.13	0.001	O				0.00
10.750	0.14	0.14	0.001	O				0.00

10.833	0.15	0.14	0.001	OI				0.00
10.917	0.15	0.15	0.001	O				0.00
11.000	0.15	0.15	0.001	O				0.00
11.083	0.15	0.15	0.001	O				0.00
11.167	0.15	0.15	0.001	O				0.00
11.250	0.15	0.15	0.001	O				0.00
11.333	0.15	0.15	0.001	O				0.00
11.417	0.15	0.15	0.001	O				0.00
11.500	0.15	0.15	0.001	O				0.00
11.583	0.15	0.15	0.001	O				0.00
11.667	0.14	0.14	0.001	O				0.00
11.750	0.14	0.14	0.001	O				0.00
11.833	0.14	0.14	0.001	O				0.00
11.917	0.14	0.14	0.001	O				0.00
12.000	0.14	0.14	0.001	O				0.00
12.083	0.16	0.15	0.001	O				0.00
12.167	0.23	0.19	0.001	OI				0.00
12.250	0.32	0.25	0.001	O	I			0.00
12.333	0.37	0.25	0.002	O	I			0.01
12.417	0.42	0.25	0.003	O	I			0.02
12.500	0.46	0.25	0.004	O	I			0.04
12.583	0.50	0.25	0.006	O	I			0.06
12.667	0.56	0.25	0.008	O	I			0.08
12.750	0.62	0.25	0.010	O	I			0.11
12.833	0.66	0.25	0.013	O	I			0.14
12.917	0.70	0.25	0.016	O	I			0.17
13.000	0.74	0.25	0.019	O	I			0.21
13.083	0.79	0.25	0.022	O	I			0.25
13.167	0.90	0.25	0.027	O	I			0.30
13.250	1.03	0.25	0.032	O	I			0.36
13.333	1.10	0.25	0.037	O	I			0.43
13.417	1.14	0.25	0.043	O	I			0.50
13.500	1.17	0.25	0.049	O	I			0.57
13.583	1.15	0.25	0.056	O	I			0.65
13.667	0.96	0.25	0.061	O	I			0.71
13.750	0.73	0.25	0.065	O	I			0.76
13.833	0.63	0.25	0.068	O	I			0.79
13.917	0.58	0.25	0.071	O	I			0.82
14.000	0.55	0.25	0.073	O	I			0.85
14.083	0.55	0.25	0.075	O	I			0.87
14.167	0.61	0.25	0.077	O	I			0.90
14.250	0.69	0.25	0.080	O	I			0.93
14.333	0.73	0.25	0.083	O	I			0.97
14.417	0.73	0.25	0.087	O	I			1.01
14.500	0.72	0.25	0.090	O	I			1.05
14.583	0.72	0.25	0.093	O	I			1.09
14.667	0.72	0.25	0.096	O	I			1.13
14.750	0.73	0.25	0.100	O	I			1.16
14.833	0.73	0.25	0.103	O	I			1.20
14.917	0.71	0.25	0.106	O	I			1.24
15.000	0.70	0.25	0.109	O	I			1.28
15.083	0.69	0.25	0.112	O	I			1.31
15.167	0.67	0.25	0.115	O	I			1.35
15.250	0.65	0.25	0.118	O	I			1.38
15.333	0.64	0.25	0.121	O	I			1.41
15.417	0.63	0.25	0.124	O	I			1.45
15.500	0.60	0.25	0.126	O	I			1.48
15.583	0.58	0.25	0.128	O	I			1.50
15.667	0.50	0.25	0.130	O	I			1.53
15.750	0.41	0.25	0.132	O	I			1.54
15.833	0.37	0.25	0.133	O	I			1.56
15.917	0.35	0.25	0.134	O	I			1.56
16.000	0.34	0.25	0.134	O	I			1.57
16.083	0.32	0.25	0.135	O	I			1.58
16.167	0.24	0.25	0.135	O				1.58
16.250	0.16	0.25	0.135	O	I			1.58
16.333	0.12	0.25	0.134	O	I			1.57
16.417	0.10	0.25	0.133	O	I			1.56
16.500	0.08	0.25	0.132	O	I			1.54

16.583	0.07	0.25	0.131	|I	O |				1.53
16.667	0.06	0.25	0.129	|I	O |				1.51
16.750	0.05	0.25	0.128	|I	O |				1.50
16.833	0.04	0.25	0.127	|I	O |				1.48
16.917	0.04	0.25	0.125	I	O |				1.46
17.000	0.03	0.25	0.124	I	O |				1.45
17.083	0.03	0.25	0.122	I	O |				1.43
17.167	0.03	0.25	0.121	I	O |				1.41
17.250	0.04	0.25	0.119	I	O |				1.39
17.333	0.04	0.25	0.118	I	O |				1.38
17.417	0.04	0.25	0.116	I	O |				1.36
17.500	0.04	0.25	0.115	I	O |				1.34
17.583	0.04	0.25	0.113	|I	O |				1.33
17.667	0.04	0.25	0.112	|I	O |				1.31
17.750	0.04	0.25	0.110	|I	O |				1.29
17.833	0.04	0.25	0.109	|I	O |				1.27
17.917	0.04	0.25	0.108	I	O |				1.26
18.000	0.03	0.25	0.106	I	O |				1.24
18.083	0.03	0.25	0.105	I	O |				1.22
18.167	0.03	0.25	0.103	I	O |				1.20
18.250	0.03	0.25	0.102	I	O |				1.19
18.333	0.03	0.25	0.100	I	O |				1.17
18.417	0.03	0.25	0.099	I	O |				1.15
18.500	0.03	0.25	0.097	I	O |				1.13
18.583	0.03	0.25	0.096	I	O |				1.12
18.667	0.03	0.25	0.094	I	O |				1.10
18.750	0.03	0.25	0.093	I	O |				1.08
18.833	0.03	0.25	0.091	I	O |				1.06
18.917	0.02	0.25	0.089	I	O |				1.04
19.000	0.02	0.25	0.088	I	O |				1.03
19.083	0.02	0.25	0.086	I	O |				1.01
19.167	0.02	0.25	0.085	I	O |				0.99
19.250	0.02	0.25	0.083	I	O |				0.97
19.333	0.02	0.25	0.082	I	O |				0.95
19.417	0.02	0.25	0.080	I	O |				0.93
19.500	0.03	0.25	0.079	I	O |				0.91
19.583	0.03	0.25	0.077	I	O |				0.90
19.667	0.03	0.25	0.075	I	O |				0.88
19.750	0.02	0.25	0.074	I	O |				0.86
19.833	0.02	0.25	0.072	I	O |				0.84
19.917	0.02	0.25	0.071	I	O |				0.82
20.000	0.02	0.25	0.069	I	O |				0.81
20.083	0.02	0.25	0.068	I	O |				0.79
20.167	0.02	0.25	0.066	I	O |				0.77
20.250	0.02	0.25	0.065	I	O |				0.75
20.333	0.02	0.25	0.063	I	O |				0.73
20.417	0.02	0.25	0.061	I	O |				0.71
20.500	0.02	0.25	0.060	I	O |				0.69
20.583	0.02	0.25	0.058	I	O |				0.68
20.667	0.02	0.25	0.057	I	O |				0.66
20.750	0.02	0.25	0.055	I	O |				0.64
20.833	0.02	0.25	0.054	I	O |				0.62
20.917	0.02	0.25	0.052	I	O |				0.60
21.000	0.02	0.25	0.050	I	O |				0.58
21.083	0.02	0.25	0.049	I	O |				0.57
21.167	0.02	0.25	0.047	I	O |				0.55
21.250	0.02	0.25	0.046	I	O |				0.53
21.333	0.02	0.25	0.044	I	O |				0.51
21.417	0.02	0.25	0.043	I	O |				0.49
21.500	0.02	0.25	0.041	I	O |				0.47
21.583	0.02	0.25	0.039	I	O |				0.45
21.667	0.02	0.25	0.038	I	O |				0.43
21.750	0.02	0.25	0.036	I	O |				0.42
21.833	0.02	0.25	0.035	I	O |				0.40
21.917	0.02	0.25	0.033	I	O |				0.38
22.000	0.02	0.25	0.032	I	O |				0.36
22.083	0.02	0.25	0.030	I	O |				0.34
22.167	0.02	0.25	0.028	I	O |				0.32
22.250	0.02	0.25	0.027	I	O |				0.30

22.333	0.02	0.25	0.025	I	O	|	|	|	0.29
22.417	0.02	0.25	0.024	I	O	|	|	|	0.27
22.500	0.02	0.25	0.022	I	O	|	|	|	0.25
22.583	0.02	0.25	0.020	I	O	|	|	|	0.23
22.667	0.02	0.25	0.019	I	O	|	|	|	0.21
22.750	0.02	0.25	0.017	I	O	|	|	|	0.19
22.833	0.02	0.25	0.016	I	O	|	|	|	0.17
22.917	0.02	0.25	0.014	I	O	|	|	|	0.15
23.000	0.02	0.25	0.012	I	O	|	|	|	0.14
23.083	0.02	0.25	0.011	I	O	|	|	|	0.12
23.167	0.02	0.25	0.009	I	O	|	|	|	0.10
23.250	0.02	0.25	0.008	I	O	|	|	|	0.08
23.333	0.02	0.25	0.006	I	O	|	|	|	0.06
23.417	0.02	0.25	0.004	I	O	|	|	|	0.04
23.500	0.02	0.25	0.003	I	O	|	|	|	0.02
23.583	0.02	0.25	0.001	I	O	|	|	|	0.00
23.667	0.02	0.05	0.000	IO		|	|	|	0.00
23.750	0.02	0.02	0.000	O		|	|	|	0.00
23.833	0.02	0.02	0.000	O		|	|	|	0.00
23.917	0.02	0.02	0.000	O		|	|	|	0.00
24.000	0.02	0.02	0.000	O		|	|	|	0.00
24.083	0.01	0.02	0.000	O		|	|	|	0.00
24.167	0.01	0.01	0.000	O		|	|	|	0.00
24.250	0.01	0.01	0.000	O		|	|	|	0.00
24.333	0.00	0.01	0.000	O		|	|	|	0.00
24.417	0.00	0.00	0.000	O		|	|	|	0.00
24.500	0.00	0.00	0.000	O		|	|	|	0.00
24.583	0.00	0.00	0.000	O		|	|	|	0.00
24.667	0.00	0.00	0.000	O		|	|	|	0.00
24.750	0.00	0.00	0.000	O		|	|	|	0.00
24.833	0.00	0.00	0.000	O		|	|	|	0.00
24.917	0.00	0.00	0.000	O		|	|	|	0.00
25.000	0.00	0.00	0.000	O		|	|	|	0.00
25.083	0.00	0.00	0.000	O		|	|	|	0.00
25.167	0.00	0.00	0.000	O		|	|	|	0.00
25.250	0.00	0.00	0.000	O		|	|	|	0.00
25.333	0.00	0.00	0.000	O		|	|	|	0.00
25.417	0.00	0.00	0.000	O		|	|	|	0.00

**********HYDROGRAPH DATA**********

Number of intervals = 305
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.249 (CFS)
Total volume = 0.314 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ A. **On-site storm drain inlets**	☑ **Locations of inlets.**	☑ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☑ **Maintain and periodically repaint or replace inlet markings.** ☑ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☑ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☑ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☑ B. **Interior floor drains and elevator shaft sump pumps**		☑ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☑ **Inspect and maintain drains to prevent blockages and overflow.**
☒ C. **Interior parking garages**		☒ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☒ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ D1. **Need for future indoor & structural pest control**		☑ **Note building design features that discourage entry of pests.**	☑ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☑ D2. **Landscape/ Outdoor Pesticide Use**	☒ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☑ **Show self-retaining landscape areas, if any.** ☑ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☒ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☑ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☑ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☑ **Maintain landscaping using minimum or no pesticides.** ☑ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☑ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ E. **Pools, spas, ponds, decorative fountains, and other water features.**	☒ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☒ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ F. **Food service**	☒ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ☒ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	☒ **Describe the location and features of the designated cleaning area.** ☒ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	☒ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☑ G. **Refuse areas**	☑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☑ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☑ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at** www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ H. **Industrial processes.**	☑ **Show process area.**	☑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	☑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	☑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ☑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ☑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	☑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ J. **Vehicle and Equipment Cleaning**	☒ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	☒ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ☒ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ K. **Vehicle/Equipment Repair and Maintenance**	☒ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ☒ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ☒ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	☒ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ☒ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ☒ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ☒ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ☒ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ☒ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ L. **Fuel Dispensing Areas**	☒ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ☒ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		☒ **The property owner shall dry sweep the fueling area routinely.** ☒ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	☒ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ☒ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ☒ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☒ **Move loaded and unloaded items indoors as soon as possible.** ☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ N. **Fire Sprinkler Test Water**		☑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ☑ **Boiler drain lines** ☑ **Condensate drain lines** ☒ **Rooftop equipment** ☒ **Drainage sumps** ☑ **Roofing, gutters, and trim.** ☒ **Other sources**		☑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ☑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ☒ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ☒ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ☑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ P. **Plazas, sidewalks, and parking lots.**			☑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

TO BE PROVIDED IN FINAL WQMP

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Infiltration Basin TC-11

Maintenance Concerns, Objectives, and Goals

- Vector Control
- Clogged soil or outlet structures
- Vegetation/Landscape Maintenance
- Groundwater contamination
- Accumulation of metals
- Aesthetics

General Description

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

Targeted Constituents

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

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Inspection/Maintenance Considerations

Infiltration basins perform better in well-drained permeable soils. Infiltration basins in areas of low permeability can clog within a couple years, and require more frequent inspections and maintenance. The use and regular maintenance of pretreatment BMPs will significantly minimize maintenance requirements for the basin. Spill response procedures and controls should be implemented to prevent spills from reaching the infiltration system.

Scarification or other disturbance should only be performed when there are actual signs of clogging or significant loss of infiltrative capacity, rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a light tractor. This BMP may require groundwater monitoring. Basins cannot be put into operation until the upstream tributary area stabilized.

CASQA California Stormwater Quality Association is

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TC-11 Infiltration Basin

Clogged infiltration basins with surface standing water can become a breeding area for mosquitoes and midges. Maintenance efforts associated with infiltration basins should include frequent inspections to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 72 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.

Inspection Activities	Suggested Frequency
■ Observe drain time for a storm after completion or modification of the facility to confirm that the desired drain time has been obtained. ■ Newly established vegetation should be inspected several times to determine if any landscape maintenance (reseeding, irrigation, etc.) is necessary.	Post construction
■ Inspect for the following issues: differential accumulation of sediment, signs of wetness or damage to structures, erosion of the basin floor, dead or dying grass on the bottom, condition of riprap, drain time, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, pretreatment device condition	Semi-annual and after extreme events
Maintenance Activities	**Suggested Frequency**
■ Factors responsible for clogging should be repaired immediately. ■ Weed once monthly during the first two growing seasons.	Post construction
■ Stabilize eroded banks. ■ Repair undercut and eroded areas at inflow and outflow structures. ■ Maintain access to the basin for regular maintenance activities. ■ Mow as appropriate for vegetative cover species. ■ Monitor health of vegetation and replace as necessary. ■ Control mosquitoes as necessary. ■ Remove litter and debris from infiltration basin area as required.	Standard maintenance (as needed)
■ Mow and remove grass clippings, litter, and debris. ■ Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons. ■ Replant eroded or barren spots to prevent erosion and accumulation of sediment.	Semi-annual
■ Scrape bottom and remove sediment when accumulated sediment reduces original infiltration rate by 25-50%. Restore original cross-section and infiltration rate. Properly dispose of sediment. ■ Seed or sod to restore ground cover. ■ Disc or otherwise aerate bottom. ■ Dethatch basin bottom.	3-5 year maintenance

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Additional Information

In most cases, sediment from an infiltration basin does not contain toxins at levels posing a hazardous concern. Studies to date indicate that pond sediments are generally below toxicity limits and can be safely landfilled or disposed onsite. Onsite sediment disposal is always preferable (if local authorities permit) as long as the sediments are deposited away from the shoreline to prevent their reentry into the pond and away from recreation areas, where they could possibly be ingested by young children. Sediments should be tested for toxicants in compliance with current disposal requirements if land uses in the catchment include commercial or industrial zones, or if visual or olfactory indications of pollution are noticed. Sediments containing high levels of pollutants should be disposed of properly.

Light equipment, which will not compact the underlying soil, should be used to remove the top layer of sediment. The remaining soil should be tilled and revegetated as soon as possible.

Sediment removal within the basin should be performed when the sediment is dry enough so that it is cracked and readily separates from the basin floor. This also prevents smearing of the basin floor.

References

King County, Stormwater Pollution Control Manual – Best Management Practices for Businesses. July, 1995 Available at: ftp://dnr metrokc.gov/wlr/dss/spcm/SPCM.HTM

Metropolitan Council, Urban Small Sites Best Management Practices Manual. Available at: http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development & Redevelopment BMP Factsheets. Available at: http://www.cfpub.epa.gov/npdes/stormwater/menuofbmps/bmp_files.cfm

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

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After the Storm

A Citizen's Guide to Understanding Stormwater

EPA 833-B-03-002

January 2003

Internet Address (URL) • HTTP://www.epa.gov
Recycled/Recyclable • Printed With Vegetable Oil Based Inks on 100% Postconsumer, Process Chlorine Free Recycled Paper

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

What is stormwater runoff?

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

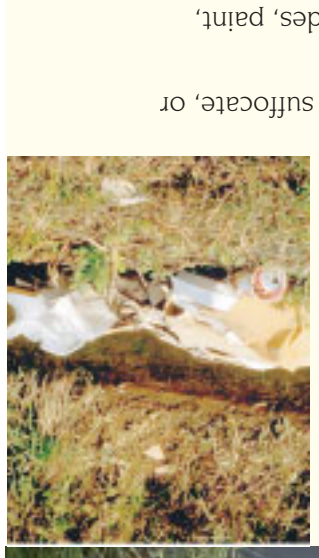
Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking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

Why is stormwater runoff a problem?

The effects of pollution

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

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



Stormwater Pollution Solutions

Residential

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

Lawn care

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

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

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Auto care

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

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

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

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

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

Residential landscaping

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

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

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

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

Commercial

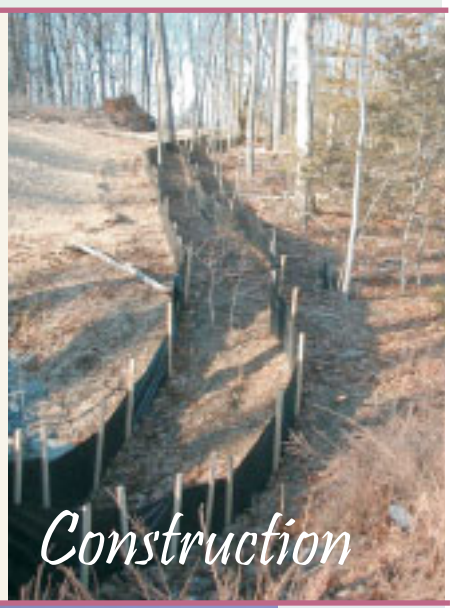
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction

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

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



Agriculture

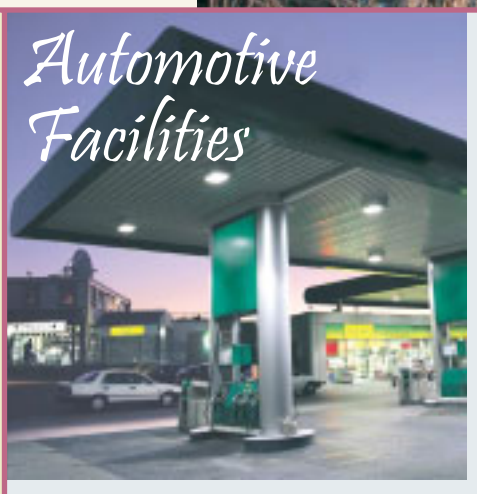
Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria,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

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

Forestry

Improperly managed logging operations can result in erosion and sedimentation.

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



Automotive Facilities

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

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

Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators

Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.

- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.

- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

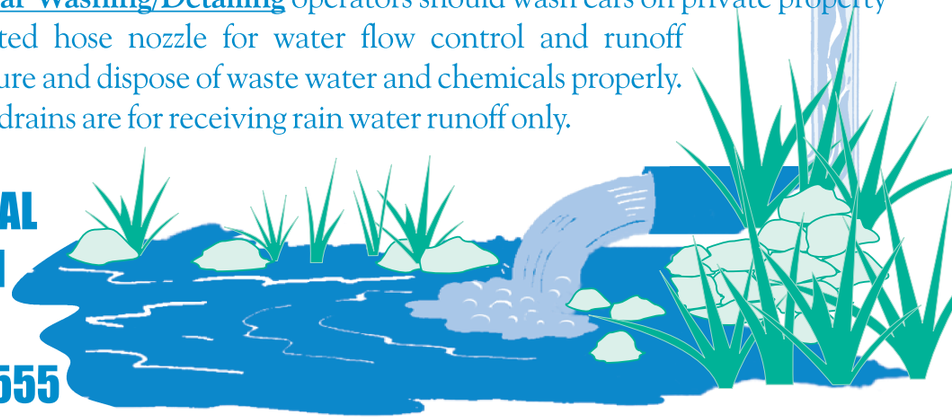
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

Parking/Storage Area Maintenance SC-43

Objectives

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

Targeted Constituents

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

Description

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

Approach

Pollution Prevention

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

Suggested Protocols

General

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

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

Controlling Litter

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

Surface cleaning

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

Surface Repair

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

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- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

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

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, nad 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

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

Requirements

Costs

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

Maintenance

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

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SC-43 Parking/Storage Area Maintenance

Supplemental Information

Further Detail of the BMP

Surface Repair

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

References and Resources

http://www.stormwatercenter.net/

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

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

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

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

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

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

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Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

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

Targeted Constituents

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

Approach

Pollution Prevention

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

Suggested Protocols

Catch Basins/Inlet Structures

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

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

Storm Drain Conveyance System

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

Pump Stations

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

Open Channel

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

Illicit Connections and Discharges

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

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- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

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

Training

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

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

Spill Response and Prevention

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

Other Considerations (Limitations and Regulations)

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

Requirements

Costs

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

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

Maintenance

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

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

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

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

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

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

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References and Resources

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

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

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

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

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

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

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

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

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Site Design & Landscape Planning SD-10

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

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

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

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

Conserve Natural Areas during Landscape Planning

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

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

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

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

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

Protection of Slopes and Channels during Landscape Design

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

Redeveloping Existing Installations

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

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

Other Resources

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

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

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

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

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

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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

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

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

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

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

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

Foundation Planting

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

Redeveloping Existing Installations

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

Supplemental Information

Examples

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

Other Resources

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

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

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

Efficient Irrigation SD-12

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Other Resources

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

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

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

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

Storm Drain Signage SD-13

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

Supplemental Information

Examples

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

Other Resources

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

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

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

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

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Trash Storage Areas SD-32

Description

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

Design Objectives

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

Approach

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

Suitable Applications

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

Design Considerations

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

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

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Other Resources

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

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

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

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

Non-Stormwater Discharges SC-10

Description

Non-stormwater discharges (NSWDs) are flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain if local regulations allow. 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: potable water sources, fire hydrant flushing, air conditioner condensate, landscape irrigation drainage and landscape watering, emergency firefighting, etc. as discussed in Section 2.

However there are certain non-stormwater discharges that pose an environmental concern. These discharges may originate from illegal dumping of industrial material or wastes and illegal connections such as internal floor drains, appliances, industrial processes, sinks, and toilets that are illegally connected to the nearby storm drainage system through on-site drainage and piping. These unauthorized discharges (examples of 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.

Non-stormwater discharges will need to be addressed through a combination of detection and elimination. The ultimate goal is to effectively eliminate unauthorized non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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pollutants on streets and into the storm drain system and downstream water bodies.

Approach

Initially the Discharger must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is the elimination of unauthorized non-stormwater discharges. See other BMP Fact Sheets for activity-specific pollution prevention procedures.

General Pollution Prevention Protocols

- Implement waste management controls described in SC-34 Waste Handling and Disposal.
- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" or similar stenciled or demarcated next to them to warn against ignorant or unintentional dumping of pollutants into the storm drainage system.
- Manage and control sources of water such as hose bibs, faucets, wash racks, irrigation heads, etc. Identify hoses and faucets in the SWPPP, and post signage for appropriate use.

Non-Stormwater Discharge Investigation Protocols

Identifying the sources of non-stormwater discharges requires the Discharger to conduct an investigation of the facility at regular intervals. There are several categories of non-stormwater discharges:

- Visible, easily identifiable discharges, typically generated as surface runoff, such as uncontained surface runoff from vehicle or equipment washing; and
- Non-visible, (e.g., subsurface) discharges into the site drainage system through a variety of pathways that are not obvious.

The approach to detecting and eliminating non-stormwater discharges will vary considerably, as discussed below:

Visible and identifiable discharges

- Conduct routine inspections of the facilities and of each major activity area and identify visible evidence of unauthorized non-stormwater discharges. This may include:
  - ✓ Visual observations of actual discharges occurring;

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- ✓ Evidence of surface staining, discoloring etc. that indicates that discharges have occurred;
- ✓ Pools of water in low lying areas when a rain event has not occurred; and
- ✓ Discussions with operations personnel to understand practices that may lead to unauthorized discharges.

□ If evidence of non-stormwater discharges is discovered:

- ✓ Document the location and circumstances using Worksheets 5 and 6 (Section 2 of the manual), including digital photos;
- ✓ Identify and implement any quick remedy or corrective action (e.g., moving uncovered containers inside or to a proper location); and
- ✓ Develop a plan to eliminate the discharge. Consult the appropriate activity-specific BMP Fact Sheet for alternative approaches to manage and eliminate the discharge.

□ Consult the appropriate activity-specific BMP Fact Sheet for alternative approaches to manage and eliminate the discharge. Make sure the facility SWPPP is up-to-date and includes applicable BMPs to address the non-stormwater discharge.

Other Illegal Discharges (Non visible)

Illicit Connections

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

□ Isolate problem areas and plug illicit discharge points.

□ Locate and evaluate discharges to the storm drain system.

□ Visual Inspection and Inventory:

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

Review Infield Piping

□ A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.

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- Inspect the path of loading/unloading area drain inlets and floor drains in older buildings.

- Never assume storm drains are connected to the sanitary sewer system.

Monitoring for investigation/detection of illegal discharges

- If a suspected illegal or unknown discharge is detected, monitoring of the discharge may help identify the content and/or suggest the source. This may be done with a field screening analysis, flow meter measurements, or by collecting a sample for laboratory analysis. Section 5 and Appendix D describe the necessary field equipment and procedures for field investigations.

- Investigative monitoring may be conducted over time. For example if, a discharge is intermittent, then monitoring might be conducted to determine the timing of the discharge to determine the source.

- Investigative monitoring may be conducted over a spatial area. For example, if a discharge is observed in a pipe, then monitoring might be conducted at accessible upstream locations in order to pinpoint the source of the discharge.

- Generally, investigative monitoring requiring collection of samples and submittal for lab analysis requires proper planning and specially trained staff.

Smoke Testing

Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two piping systems. Smoke testing is generally performed at a downstream location and the smoke is forced upstream using blowers to create positive pressure. The advantage to smoke testing is that it can potentially identify multiple potential discharge sources at once.

- Smoke testing uses a harmless, non-toxic smoke cartridges developed specifically for this purpose.

- Smoke testing requires specialized equipment (e.g., cartridges, blowers) and is generally only appropriate for specially trained staff.

- A Standard Operating Procedure (SOP) for smoke testing is highly desirable. The SOP should address the following elements:

  - ✓ Proper planning and notification of nearby residents and emergency services is necessary since introducing smoke into the system may result in false alarms;

  - ✓ During dry weather, the stormwater collection system is filled with smoke and then traced back to sources;

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- ✓ Temporary isolation of segments of pipe using sand bags is often needed to force the smoke into leaking pipes; and
- ✓ The appearance of smoke in a waste vent pipe, at a sewer manhole, or even the base of a toilet indicates that there may be a connection between the sanitary and storm water systems.

- Most municipal wastewater agencies will have necessary staff and equipment to conduct smoke testing and they should be contacted if cross connections with the sanitary sewer are suspected. See SC-44 Drainage System Maintenance for more information.

Dye Testing

- Dye testing is typically performed when there is a suspected specific pollutant source and location (i.e., leaking sanitary sewer) and there is evidence of dry weather flows in the stormwater collection system.
- Dye is released at a probable upstream source location, either the facility's sanitary or process wastewater system. The dye must be released with a sufficient volume of water to flush the system.
- Operators then visually examine the downstream discharge points from the stormwater collection system for the presence of the dye.
- Dye testing can be performed informally using commercially available products in order to conduct an initial investigation for fairly obvious cross-connections.
- More detailed dye testing should be performed by properly trained staff and follow SOPs. Specialized equipment such as fluorometers may be necessary to detect low concentrations of dye.
- Most municipal wastewater agencies will have necessary staff and equipment to conduct dye testing and they should be contacted if cross connections with the sanitary sewer are suspected.

TV Inspection of Drainage System

- Closed Circuit Television (CCTV) can be employed to visually identify illicit connections to the industrial storm drainage system. Two types of CCTV systems are available: (1) a small specially designed camera that can be manually pushed on a stiff cable through storm drains to observe the interior of the piping, or (2) a larger remote operated video camera on treads or wheels that can be guided through storm drains to view the interior of the pipe.
- CCTV systems often include a high-pressure water jet and camera on a flexible cable. The water jet cleans debris and biofilm off the inside of pipes so the camera can take video images of the pipe condition.

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- CCTV units can detect large cracks and other defects such as offsets in pipe ends caused by root intrusions or shifting substrate.
- CCTV can also be used to detect dye introduced into the sanitary sewer.
- CCTV inspections require specialized equipment and properly trained staff and are generally best left to specialized contractors or municipal public works staff.

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks may include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. These wastes can cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - ✓ Illegal dumping hot spots;
  - ✓ Types and quantities (in some cases) of wastes;
  - ✓ Patterns in time of occurrence (time of day/night, month, or year);
  - ✓ Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills);
  - ✓ An anonymous tip/reporting mechanism; and
  - ✓ Evidence of responsible parties (e.g., tagging, encampments, etc.).
- One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC-11 Spill Prevention, Control, and Cleanup.

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Inspection

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

Spill and Leak Prevention and Response

- ☐ On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.
- ☐ Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- ☐ Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- ☐ For larger spills, a private spill cleanup company or Hazmat team may be necessary.
- ☐ See SC-11 Spill Prevention Control and Cleanup.

Employee Training Program

- ☐ Training of technical staff in identifying and documenting illegal dumping incidents is required. The frequency of training must be presented in the SWPPP, and depends on site-specific industrial materials and activities.
- ☐ Consider posting a quick reference table near storm drains to reinforce training.
- ☐ Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.
- ☐ Educate employees about spill prevention and cleanup.
- ☐ Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan. Employees should be able to identify work/jobs with high potential for spills and suggest methods to reduce possibility.
- ☐ Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.

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- Conduct spill response drills annually (if no events occurred) in order to evaluate the effectiveness of the plan.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Quality Assurance and Record Keeping

Performance Evaluation

- Annually review internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.
- Develop document and data management procedures.
- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Annually document and report the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.
- Document training activities.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds."

- Many facilities do not have accurate, up-to-date 'as-built' plans or drawings which may be necessary in order to conduct non-stormwater discharge assessments.
  - ✓ Online tools such as Google Earth™ can provide an aerial view of the facility and may be useful in understanding drainage patterns and potential sources of non-stormwater discharges
  - ✓ Local municipal jurisdictions may have useful drainage systems maps.

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- Video surveillance cameras are commonly used to secure the perimeter of industrial facilities against break-ins and theft. These surveillance systems may also be useful for capturing illegal dumping activities. Minor, temporary adjustments to the field of view of existing surveillance camera systems to target known or suspected problem areas may be a cost-effective way of capturing illegal dumping activities and identifying the perpetrators.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital facility cost requirements may be minimal unless cross-connections to storm drains are detected.
- Indoor floor drains may require re-plumbing if cross-connections are detected.
- Leaky sanitary sewers will require repair or replacement which can have significant costs depending on the size and industrial activity at the facility.

Maintenance (including administrative and staffing)

- The primary effort is for staff time and depends on how aggressively a program is implemented.
- Costs for containment, and disposal of any leak or discharge is borne by the Discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Permit Requirements

The IGP authorizes certain Non-Storm Water Discharges (NSWDs) provided BMPs are included in the SWPPP and implemented to:

- Reduce or prevent the contact of authorized NSWDs with materials or equipment that are potential sources of pollutants;
- Reduce, to the extent practicable, the flow or volume of authorized NSWDs;
- Ensure that authorized NSWDs do not contain quantities of pollutants that cause or contribute to an exceedance of a water quality standards (WQS); and,

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- Reduce or prevent discharges of pollutants in authorized NSWDs in a manner that reflects best industry practice considering technological availability and economic practicability and achievability."

References and Resources

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Spill Prevention, Control & Cleanup SC-11

Description

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

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

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

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

Minimum BMPs Covered	
Good Housekeeping	
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

Approach

General Pollution Prevention Protocols

- ☐ Develop procedures to prevent/mitigate spills to storm drain systems.
- ☐ Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- ☐ Establish procedures and/or controls to minimize spills and leaks. The procedures should address:
  - ✓ Description of the facility, owner and address, activities, chemicals, and quantities present;

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- ✓ Facility map of the locations of industrial materials;
- ✓ Notification and evacuation procedures;
- ✓ Cleanup instructions;
- ✓ Identification of responsible departments; and
- ✓ Identify key spill response personnel.

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

Spill and Leak Prevention and Response

Spill Prevention

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

- ☐ If illegal dumping is observed at the facility:

  - ✓ Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - ✓ Landscaping and beautification efforts may also discourage illegal dumping.
  - ✓ Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

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

- ☐ If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

Preventative Maintenance

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

- ☐ Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

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- ☐ Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

- ☐ Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- ☐ Label all containers according to their contents (e.g., solvent, gasoline).

- ☐ Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- ☐ Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- ☐ Identify key spill response personnel.

Spill Response

- ☐ Clean up leaks and spills immediately.

- ☐ Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- ☐ On paved surfaces, clean up spills with as little water as possible.

  - ✓ Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills.

  - ✓ If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

  - ✓ If possible use physical methods for the cleanup of dry chemicals (e.g., brooms, shovels, sweepers, or vacuums).

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

- ☐ Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- ☐ For larger spills, a private spill cleanup company or Hazmat team may be necessary.

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Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board or local authority as location regulations dictate.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to 911 for dispatch and clean-up assistance when needed. Do not contact fire agencies directly.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - ✓ Types and quantities (in some cases) of wastes;
  - ✓ Patterns in time of occurrence (time of day/night, month, or year);
  - ✓ Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills);
  - ✓ Clean-up procedures; and
  - ✓ Responsible parties.

Employee Training Program

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - ✓ The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur; and
  - ✓ Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.
- Train employees to recognize and report illegal dumping incidents.

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Other Considerations (Limitations and Regulations)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

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

Maintenance (including administrative and staffing)

- Develop spill prevention and control plan, provide and document training, conduct inspections of material storage areas, and supply spill kits.
- Extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

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

- Date and time of the incident;
- Weather conditions;
- Duration of the spill/leak/discharge;

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- Cause of the spill/leak/discharge;
- Response procedures implemented;
- Persons notified; and
- Environmental problems associated with the spill/leak/discharge.

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

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

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

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

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

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

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

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

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanges, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.

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- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

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

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

Vehicle and Equipment Maintenance

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

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Vehicle and Equipment Fueling

- ☐ Design the fueling area to prevent the run-on of stormwater and the runoff of spills:

  Cover fueling area if possible.

  Use a perimeter drain or slope pavement inward with drainage to a sump.

  Pave fueling area with concrete rather than asphalt.

- ☐ If dead-end sump is not used to collect spills, install an oil/water separator.
- ☐ Install vapor recovery nozzles to help control drips as well as air pollution.
- ☐ Discourage "topping-off" of fuel tanks.
- ☐ Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- ☐ Use absorbent materials on small spills and general cleaning rather than hosing down the area. Remove the absorbent materials promptly.
- ☐ Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- ☐ Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- ☐ Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- ☐ Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

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

The program should:

- ☐ Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department).
- ☐ Develop procedures to prevent/mitigate spills to storm drain systems.
- ☐ Identify responsible departments.

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- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- Address spills at municipal facilities, as well as public areas.
- Provide training concerning spill prevention, response and cleanup to all appropriate personnel.

References and Resources

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

Clark County Storm Water Pollution Control Manual. Available online at: http://www.co.clark.wa.us/pubworks/bmpman.pdf.

King County Storm Water Pollution Control Manual. Available online at: http://dnr.metrokc.gov/wlr/dss/spcm.htm.

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

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

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Outdoor Loading/Unloading SC-30

Description

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

Approach

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

General Pollution Prevention Protocols

- ☐ Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- ☐ Limit exposure of material to rainfall whenever possible.
- ☐ Prevent stormwater run-on.
- ☐ Check equipment regularly for leaks.

Good Housekeeping

- ☐ Develop an operations plan that describes procedures for loading and/or unloading.
- ☐ Conduct loading and unloading in dry weather if possible.

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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

Spill Response and Prevention Procedures

- ☐ Keep your spill prevention and control plan up-to-date or have an emergency spill cleanup plan readily available, as applicable.
- ☐ Contain leaks during transfer.
- ☐ Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all employees.
- ☐ Ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- ☐ Use drip pans or comparable devices when transferring oils, solvents, and paints.

Material Handling and Waste Management

- ☐ Spot clean leaks and drips routinely to prevent runoff of spillage.
- ☐ Do not pour liquid wastes into floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.

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- Do not put used or leftover cleaning solutions, solvents, and automotive fluids in the storm drain or sanitary sewer.
- Collect leaking or dripping fluids in drip pans or containers. Fluids are easier to recycle if kept separate.
- Promptly transfer used fluids to the proper waste or recycling drums. Do not leave drip pans or other open containers lying around.
- Minimize the possibility of stormwater pollution from outside waste receptacles by doing at least one of the following:
  - ✓ Use only watertight waste receptacle(s) and keep the lid(s) closed.
  - ✓ Grade and pave the waste receptacle area to prevent run-on of stormwater.
  - ✓ Install a roof over the waste receptacle area.
  - ✓ Install a low containment berm around the waste receptacle area.
  - ✓ Use and maintain drip pans under waste receptacles.
- Post "no littering" signs.
- Perform work area clean-up and dry sweep after daily operations.

Employee Training Program

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

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document activities performed, quantities of materials removed, and improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- Establish procedures to complete logs and file them in the central office.
- Keep accurate logs of daily clean-up operations.

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Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds."

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
  - ✓ Designate specific areas for outdoor loading and unloading.
  - ✓ Require employees to understand and follow spill and leak prevention BMPs.
- It may not be possible to conduct transfers only during dry weather.
  - ✓ Limit materials and equipment rainfall exposure to all extents practicable.
  - ✓ Require employees to understand and follow spill and leak prevention BMPs.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

Many facilities will already have indoor or covered areas where loading/unloading takes place and will require no additional capital expenditures.

If outdoor activities are required, construction of berms or other means to retain spills and leaks may require appropriate constructed systems for containment. These containment areas may require significant new capital investment.

Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

Most of the operations and maintenance activities associated with implementing this BMP are integrally linked to routine operations as previously described. Therefore additional O&M is not required.

- Conduct regular inspections and make repairs and improvements as necessary.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area. Do not wash with water.

Supplemental Information

Loading and Unloading of Liquids

- Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer,

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treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- ☐ For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - ✓ The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - ✓ The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.
  - ✓ The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.
- ☐ For transfer from rail cars to storage tanks that must occur outside, use the following procedures:
  - ✓ Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.
  - ✓ Drip pan systems should be installed between the rails to collect spillage from tank cars.

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Santa Clara Valley Urban Runoff Pollution Prevention Program. http://www.scvurppp-w2k.com/.

US EPA. National Pollutant Discharge Elimination System – Industrial Fact Sheet Series for Activities Covered by EPA's Multi Sector General Permit. Available online at: http://cfpub.epa.gov/npdes/stormwater/swsectors.cfm.

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Outdoor Equipment Operations SC-32

Description

Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, and solid waste treatment and disposal are examples of process operations that can lead to contamination of stormwater runoff. The targeted constituents will vary for each site depending on the operation being performed.

Approach

Implement source control BMPs to limit exposure of outdoor equipment to direct precipitation and stormwater run-on. Refer to SC-22 Vehicle and Equipment Repair for additional information.

General Pollution Prevention Protocols

- ☐ Perform the activity during dry periods whenever possible.
- ☐ Install secondary containment measures where leaks and spills may occur.
- ☐ Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.
- ☐ Connect process equipment area to public sanitary sewer or facility wastewater treatment system when possible. Some jurisdictions require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Good Housekeeping

- ☐ Manage materials and waste properly (see Material Handling and Waste Management) to reduce adverse impacts on stormwater quality.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ☐ Cover the work area with a permanent roof if possible.
- ☐ Use drop cloths for sanding and painting operations.
- ☐ Use a vacuum for fine particle clean-up in pavement cracks and crevices.
- ☐ Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention).
- ☐ "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly.
- ☐ Paint signs on storm drain inlets to indicate that they are not to receive liquid or solid wastes.
- ☐ Use roll down or permanent walls when windy/breezy to prevent wind transport of particulates/pollutants.

Preventative Maintenance

- ☐ Design outdoor equipment areas to prevent stormwater runoff and spills. Use a perimeter drain or slope pavement inward with drainage to sump.
- ☐ Dry clean the work area regularly. Do not wash outdoor equipment with water if there is a direct connection to the storm drain.
- ☐ Pave area with concrete rather than asphalt.
- ☐ Inspect outdoor equipment regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.
- ☐ Inspect and clean, if necessary, storm drain inlets and catch basins within the outdoor equipment area before October 1 each year.

Spill Response and Prevention Procedures

- ☐ Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- ☐ Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- ☐ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ☐ Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.

Material Handling and Waste Management

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- ☐ Do not pour liquid wastes into floor drains, sinks, outdoor storm drain inlets, or other storm drain or sewer connections.
- ☐ Collect leaking or dripping fluids in drip pans or containers. Fluids are easier to recycle if kept separate.
- ☐ Promptly transfer used fluids to the proper waste or recycling drums. Do not leave drip pans or other open containers lying around.
- ☐ Minimize the possibility of stormwater pollution from outside waste receptacles by doing at least one of the following:
  - ✓ Use only watertight waste receptacle(s) and keep the lid(s) closed.
  - ✓ Grade and pave the waste receptacle area to prevent run-on of stormwater.
  - ✓ Install a roof over the waste receptacle area.

Employee Training Program

- ☐ Educate employees about pollution prevention measures and goals.
- ☐ Train employees on proper equipment operation and maintenance procedures.
- ☐ Train all employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Ensure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices.
- ☐ Use a training log or similar method to document training.
- ☐ Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Quality Assurance and Record Keeping

- ☐ Keep accurate maintenance logs that document minimum BMP activities performed for outdoor equipment, types and quantities of materials removed and disposed of, and any improvement actions.
- ☐ Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- ☐ Establish procedures to complete logs and file them in the central office.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds."

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- Providing cover over outdoor equipment may be impractical or cost-prohibitive.
  - ✓ Operate outdoor equipment only during periods of dry weather.
- Regular operations and time limitations may require outdoor activities during wet weather.
  - ✓ Designate specific areas for outdoor activities.
  - ✓ Allow time for work area clean-up after each shift.
  - ✓ Require employees to understand and follow preventive maintenance and spill and leak prevention BMPs.
  - ✓ Design and install secondary containment and good housekeeping BMPs for outdoor equipment area.
- Storage sheds often must meet building and fire code requirements.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Many facilities will already have indoor covered areas where vehicle and equipment repairs take place and will require no additional capital expenditures.
- If outdoor activities are required, construction of berms or other means to retain spills and leaks may require appropriate constructed systems for containment. These containment areas may require significant new capital investment.
- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

- Most of the operations and maintenance activities associated with implementing this BMP are integrally linked to routine operations as previously described. Therefore additional O&M is not required.
- For facilities responsible for pre-treating their wastewater prior to discharging, the proper functioning of structural treatment system is an important maintenance consideration.
- Routine cleanout of oil and grease is required for the devices to maintain their effectiveness, usually at least once a month. During periods of heavy rainfall, cleanout is required more often to ensure pollutants are not washed through the trap. Sediment removal is also required on a regular basis to keep the device working efficiently.

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Outdoor Storage of Raw Materials SC-33

Description

Stockpiles of raw materials, by-products, and finished products exposed to rain and/or runoff can pollute stormwater. Stormwater can become contaminated when materials wash off or dissolve into water due to improper storage and containment. To prevent or reduce the discharge of pollutants to stormwater from raw material delivery and storage, pollution prevention and source control measures must be implemented, such as minimizing the storage of hazardous materials on-site, enclosing or covering materials, storing materials in a designated area, installing secondary containment, conducting regular inspections, preventing stormwater run-on and runoff, and training employees and subcontractors. This fact sheet focuses on source control BMPs for stockpiles of solid materials; if the raw material, by-product, or product is a liquid, more information for outside storage of liquids can be found under SC-31 Outdoor Liquid Container Storage.

Approach

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

General Pollution Prevention Protocols

- ☐ Emphasize employee education for successful BMP implementation.
- ☐ Store materials that could contaminate stormwater inside or under permanent cover. If this is not feasible, then all outside storage areas should be covered with a roof and bermed or enclosed to prevent stormwater contact.
- ☐ Elevate and tarp solid materials such as beams, metal, etc.
- ☐ Minimize the inventory of raw materials kept outside.

Objectives
■ *Cover*
■ *Contain*
■ *Educate*
■ *Reduce/Minimize*

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	
Erosion and Sediment Controls	✓
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site.
- Stormwater runoff that could potentially be contaminated by materials stored outdoors should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.

Good Housekeeping

- If raw materials cannot all be stored inside or under permanent cover, prevent exposure to direct precipitation and stormwater run-on by installing a storm- resistant waterproof covering made of polyethylene, polypropylene or hypalon over all materials stored outside. The covers must be in place at all times when work with the stockpiles is not occurring (Applicable to small stockpiles only).
- Implement erosion control practices at the perimeter of the facilty site and at any catch basins to prevent erosion of the stockpiled material off-site, if the stockpiles are so large that they cannot feasibly be covered and contained.
- Minimize stormwater run-on by enclosing the area or building a berm around it.
- Keep storage areas clean and dry.
- Slope paved areas in a manner that minimizes pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5% is recommended.
- Secure drums stored in an area where unauthorized persons may not gain access to prevent accidental spillage, pilferage, or any unauthorized use.
- Install curbing or berms along the perimeter of the area to prevent the run-on of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas.
- Slope the area inside the curb or berm to a drain with sump. The sump should be equipped with an oil and water separator if applicable for materials stored onsite.
- Do not store materials on top of or directly adjacent to storm drain inlets.
- Cover wood products treated with chromated copper arsenate, ammonical copper zinc arsenate, creosote, or pentachlorophenol with properly secured tarps or store indoors.

Preventative Maintenance

- Maintain outdoor storage containers in good condition. Replace leaky or otherwise inadequate containers as necessary.
- Maintain outdoor waterproof covers (e.g., tarps) in good condition and properly secure them to be storm resistant. Replace tarps damaged by UV exposure or wear and tear on a regular basis.

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- Perform routine inspection of storm drains and sumps and regularly remove accumulated materials.
- Dry clean the work area regularly. Do not wash outdoor material storage areas with water if there is a direct connection to the storm drain.
- Pave outdoor storage areas for liquids such as solvents with concrete rather than asphalt.
- Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible.
- Routinely inspect berms, curbing, containment, and sediment controls for proper function and repair as necessary.

Spill and Leak Prevention and Response

- Keep the facility spill prevention and control plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of hazardous or otherwise dangerous materials.

Erosion and Sediment Controls

- Keep materials covered to prevent erosion of stockpiles. This may not be feasible for large stockpiles.
- Install sediment controls such as fiber rolls around the perimeter of stockpiles to prevent transport of raw materials to the storm drain.
- Install drain inlet protection around all inlets to prevent raw materials from entering storm drain.
- Install sediment controls such as silt fence around the perimeter of the site to prevent transport of raw materials to the storm drain or offsite surface waters.

Employee Training Program

- Educate employees about pollution prevention measures and goals.
- Train employees how to properly store outdoor raw materials using the source control BMPs described above.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

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Quality Assurance and Record Keeping

- ☐ Keep accurate maintenance logs that document minimum BMP activities performed for outdoor storage of raw materials, types and quantities of materials removed and disposed of, and any improvement actions.
- ☐ Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- ☐ Establish procedures to complete logs and file them in the central office.

Other Facility-Specific Considerations

- ☐ Storage sheds often must meet building and fire code requirements. Storage of reactive, ignitable, or flammable liquids must comply with the Uniform Fire Code and the National Electric Code.
- ☐ Some municipalities require that secondary containment areas (regardless of size) be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- ☐ The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds"

- ☐ Space limitations may preclude storing all materials indoors.
  - ✓ Implement good housekeeping, preventative maintenance, and erosion and sediment controls as described above.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- ☐ Many facilities will already have indoor covered areas where raw materials will be stored and will require no additional capital expenditures.
- ☐ If outdoor storage of materials is required, construction of berms or other means to prevent stormwater run-on and runoff may require appropriate constructed systems for containment. These containment areas may require significant new capital investment.
- ☐ Purchase and installation of erosion and sediment controls will require additional capital investments, and this amount will vary depending on site characteristics.
- ☐ Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

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Maintenance

- Accurate and up-to-date inventories should be kept of all stored materials.
- Berms and curbs may require periodic repair and patching.
- Parking lots or other surfaces near bulk materials storage areas should be swept periodically to remove debris blown or washed from storage areas.
- Sweep paved storage areas regularly for collection and disposal of loose solid materials, do not hose down the area to a storm drain or conveyance ditch.
- Erosion and sediment controls require regular inspection and periodic replacement or reinstallation.

Supplemental Information

Raw Material Containment

Paved areas should be sloped in a manner that minimizes pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5% is recommended.

- Curbing or berms should be placed along the perimeter of the area to prevent the run-on of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from stockpile areas.
- The storm drainage system should be designed to minimize use of catch basins in the interior of the area as they tend to rapidly fill with manufacturing material.

The area should be sloped to drain stormwater to the perimeter where it can be collected or to internal drainage alleyways where material is not stockpiled.

The "doghouse" design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment.

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Waste Handling & Disposal SC-34

Description

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

Approach

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

General Pollution Prevention Protocols

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

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ☐ Use the entire product before disposing of the container.
- ☐ To the extent possible, store wastes under cover or indoors after ensuring all safety concerns such as fire hazard and ventilation are addressed.
- ☐ Provide containers for each waste stream at each work station. Allow time after shift to clean area.

Good Housekeeping

- ☐ Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- ☐ Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- ☐ Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain. Clean in a designated wash area that drains to a clarifier.
- ☐ Transfer waste from damaged containers into safe containers.
- ☐ Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.
- ☐ Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- ☐ Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- ☐ Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.
- ☐ Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- ☐ If possible, move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Preventative Maintenance

- ☐ Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- ☐ Prevent waste materials from directly contacting rain.

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- ☐ Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- ☐ Cover the area with a permanent roof if feasible.
- ☐ Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- ☐ Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- ☐ Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, vacuuming, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- ☐ Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- ☐ Repair leaking equipment including valves, lines, seals, or pumps promptly.

Spill Response and Prevention Procedures

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

Material Handling and Waste Management

Litter Control

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

Waste Collection

- ☐ Keep waste collection areas clean.

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- ☐ Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- ☐ Secure solid waste containers; containers must be closed tightly when not in use.
- ☐ Do not fill waste containers with washout water or any other liquid.
- ☐ Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- ☐ Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal. Affix labels to all waste containers.

Chemical/Hazardous Wastes

- ☐ Select designated hazardous waste collection areas on-site.
- ☐ Store hazardous materials and wastes in covered containers and protect them from vandalism.
- ☐ Place hazardous waste containers in secondary containment.
- ☐ Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- ☐ Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Employee Training Program

- ☐ Educate employees about pollution prevention measures and goals.
- ☐ Train employees how to properly handle and dispose of waste using the source control BMPs described above.
- ☐ Train employees and subcontractors in proper hazardous waste management.
- ☐ Use a training log or similar method to document training.
- ☐ Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Quality Assurance and Record Keeping

- ☐ Keep accurate maintenance logs that document minimum BMP activities performed for waste handling and disposal, types and quantities of waste disposed of, and any improvement actions.
- ☐ Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.

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- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital costs will vary substantially depending on the size of the facility and the types of waste handled. Significant capital costs may be associated with reducing wastes by modifying processes or implementing closed-loop recycling.
- Many facilities will already have indoor covered areas where waste materials will be stored and will require no additional capital expenditures for providing cover.
- If outdoor storage of wastes is required, construction of berms or other means to prevent stormwater run-on and runoff may require appropriate constructed systems for containment.
- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

- Check waste containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the waste management area regularly. Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

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Building & Grounds Maintenance SC-41

Description

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

Approach

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

General Pollution Prevention Protocols

- ☐ Switch to non-toxic chemicals for maintenance to the maximum extent 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.

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ☐ Clean work areas at the end of each work shift using dry cleaning methods such as sweeping and vacuuming.

Good Housekeeping

Pressure Washing of Buildings, Rooftops, and Other Large Objects

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

- ☐ If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.

- ☐ If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- ☐ Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.

- ☐ Use mulch or other erosion control measures on exposed soils. See also SC-40, Contaminated and Erodible Areas, for more information.

Building Repair, Remodeling, and Construction

- ☐ Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

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

- ☐ Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

- ☐ Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

- ☐ Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and

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solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

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

Mowing, Trimming, and Planting

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

Fertilizer and Pesticide Management

- ☐ Do not use pesticides if rain is expected.
- ☐ Do not mix or prepare pesticides for application near storm drains.
- ☐ Use the minimum amount needed for the job.
- ☐ Calibrate fertilizer distributors to avoid excessive application.
- ☐ Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- ☐ Apply pesticides only when wind speeds are low.
- ☐ Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- ☐ Irrigate slowly to prevent runoff and then only as much as is needed.
- ☐ Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

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.

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Building & Grounds Maintenance SC-41

Spill Response and Prevention Procedures

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

Material Handling and Waste Management

- ☐ Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- ☐ Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- ☐ 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.

Employee Training Program

- ☐ Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- ☐ Train employees and contractors in proper techniques for spill containment and cleanup.
- ☐ Be sure the frequency of training takes into account the complexity of the operations and the needs of individual staff.

Quality Assurance and Record Keeping

- ☐ Keep accurate logs that document maintenance activities performed and minimum BMP measures implemented.
- ☐ Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- ☐ Establish procedures to complete logs and file them in the central office.

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Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Additional capital costs are not anticipated for building and grounds maintenance. Implementation of the minimum BMPs described above should be conducted as part of regular site operations.

Maintenance

- Maintenance activities for the BMPs described above will be minimal, and no additional cost is anticipated.

Supplemental Information

Fire Sprinkler Line Flushing

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

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Building Repair and Construction SC-42

Description

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

This fact sheet is intended to be used for minor repairs and construction. If major construction is required, the guidelines in the Construction BMP Handbook should be followed.

Approach

The BMP approach is to reduce potential for pollutant discharges through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- ☐ Recycle residual paints, solvents, lumber, and other materials to the maximum extent practicable.
- ☐ Avoid outdoor repairs and construction during periods of wet weather.
- ☐ Use safer alternative products to the maximum extent practicable. See also SC-35 Safer Alternative Products for more information.

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	✓
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- ☐ Buy recycled products to the maximum extent practicable.
- ☐ Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.
- ☐ Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Good Housekeeping

Repair & Remodeling

- ☐ Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep and vacuum the area regularly to remove sediments and small debris.
- ☐ Cover raw materials of particular concern that must be left outside, particularly during the rainy season. See also SC-33 Outdoor Storage of Raw Materials for more information.
- ☐ Use equipment and tools such as bag sanders to reduce accumulation of debris.
- ☐ Limit/prohibit work on windy days; implement roll-down walls or other measures to reduce wind transport of pollutants.
- ☐ Do not dump waste liquids down the storm drain.
- ☐ Dispose of wash water, sweepings, and sediments properly.
- ☐ Store liquid materials properly that are normally used in repair and remodeling such as paints and solvents. See also SC-31 Outdoor Liquid Container Storage for more information.
- ☐ Sweep out rain gutters or wash the gutter and trap the particles at the outlet of the downspout. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- ☐ Clean the storm drain system in the immediate vicinity of the construction activity after it is completed. See also SC-44 Drainage System Maintenance for more information.

Painting

- ☐ Enclose painting operations consistent with local air quality regulations and OSHA.
- ☐ Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- ☐ Develop paint handling procedures for proper use, storage, and disposal of paints.

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- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100 percent effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose of the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Spill Response and Prevention Procedures

- Keep your spill prevention and control plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Material Handling and Waste Management

- Post “No Littering” signs and enforce anti-litter laws.

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- ☐ Provide a sufficient number of litter receptacles for the facility.
- ☐ Clean out and cover litter receptacles frequently to prevent spillage.
- ☐ Keep waste collection areas clean.
- ☐ Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- ☐ Secure solid waste containers; containers must be closed tightly when not in use.
- ☐ Do not fill waste containers with washout water or any other liquid.
- ☐ Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- ☐ Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal. Affix labels to all waste containers.
- ☐ Make sure that hazardous waste is collected, removed, and disposed of properly. See also SC-34, Waste Handling and Disposal for more information.

Sediment and Erosion Controls

- ☐ Limit disturbance to bare soils and preserve natural vegetation whenever possible. See also EC-2, Preservation of Existing Vegetation, in the Construction BMP Handbook.
- ☐ Stabilize loose soils by re-vegetating whenever possible. See also EC-4 Hydroseeding, in the Construction BMP Handbook.
- ☐ Utilize non-vegetative stabilization methods for areas prone to erosion where vegetative options are not feasible. Examples include:
  - ✓ Areas of vehicular or pedestrian traffic such as roads or paths;
  - ✓ Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
  - ✓ Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
  - ✓ Areas where vegetation will not grow adequately within the construction time frame.

  There are several non-vegetative stabilization methods and selection should be based on site-specific conditions. See also EC-16 Non-Vegetative Stabilization, in the Construction BMP Handbook.

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- ☐ Utilize chemical stabilization when needed. See also EC-5 Soil Binders, in the Construction BMP Handbook.
- ☐ Use geosynthetic membranes to control erosion if feasible. See also EC-7 Geotextiles and Mats, in the Construction BMP Handbook.
- ☐ Stabilize all roadways, entrances, and exits to sufficiently control discharges of erodible materials from discharging or being tracked off the site. See also TC 1-3 Tracking Control, in the Construction BMP Handbook.
- ☐ Refer to the supplemental information provided below for projects that involve more extensive soil disturbance activities.

Employee Training Program

- ☐ Educate employees about pollution prevention measures and goals.
- ☐ Train employees how to properly implement the source control BMPs described above. Detailed information for Sediment and Erosion Control BMPs is provided in the Construction BMP Handbook.
- ☐ Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about pollutant source control responsibilities.
- ☐ Use a training log or similar method to document training.

Quality Assurance and Record Keeping

- ☐ Keep accurate maintenance logs that document minimum BMP activities performed for building repair and construction, types and quantities of waste disposed of, and any improvement actions.
- ☐ Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.
- ☐ Establish procedures to complete logs and file them in the central office.

Potential Limitations and Work-Arounds

Some facilities may have space constraints, limited staffing and time limitations that may preclude implementation of BMPs. Provided below are typical limitations and recommended "work-arounds."

- ☐ This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more extensive requirements for larger projects that would disturb one or more acres of surface.
  - ✓ Refer to the companion "Construction Best Management Practice Handbook" which contains specific guidance and best management practices for larger-scale projects.

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- Time constraints may require some outdoor repairs and construction during wet weather.
  - ✓ Require employees to understand and follow good housekeeping and spill and leak prevention BMPs.
  - ✓ Inspect sediment and erosion control BMPs daily during periods of wet weather and repair or improve BMP implementation as necessary.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
  - ✓ Minimize use of hazardous materials to the maximum extent practicable.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.
- Prices for recycled/safer alternative materials and fluids may be higher than those of conventional materials.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Limited capital investments may be required at some sites if adequate cover and containment facilities do not exist for construction materials and wastes.
- Purchase and installation of erosion and sediment controls, if needed will require additional capital investments, and this amount will vary depending on site characteristics and the types of BMPs being implemented.
- Minimize costs by maintaining existing vegetation and limiting construction operations on bare soils.

Maintenance

- The erosion and sediment control BMPs described above require periodic inspection and maintenance to remain effective. The cost of these actions will vary depending on site characteristics and the types of BMPs being implemented.
- Irrigation costs may be required to establish and maintain vegetation.

Supplemental Information

Soil/Erosion Control

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

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If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

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Drain Inlet Insert MP-52

General Description

Drain inlet inserts, also known as catch basin, drop inlet or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. There are a multitude of inserts of various shapes and configurations including baffles, baskets, boxes, fabrics, sorbent media, screens, and skimmers. The effectiveness of drain inlet inserts depends on their design, application, loading, and frequency of maintenance to remove accumulated sediment, trash, and debris.

Inspection / Maintenance Considerations

Routine inspection and maintenance is necessary to maintain functionality of drain inlet inserts and to prevent re-suspension and discharge of accumulated pollutants. Maintenance activities vary depending on the type of drain inlet insert being implemented; refer to the manufacturer's recommendations for more information.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Pollutant Re-suspension and Discharge*

Targeted Constituents*

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

*****Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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Inspection Activities	Suggested Frequency
☐ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
☐ Inspect for sediment, trash, and debris buildup and proper functioning.	At the beginning of the wet season and after significant storms
Maintenance Activities	**Suggested Frequency**
☐ Remove accumulated sediment, trash, and debris. ☐ Replace sorbent media.	At the beginning of the wet season and as necessary

References

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Outdoor Material Storage Areas SD-34

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

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

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

Designing New Installations

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

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

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

Redeveloping Existing Installations

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

Additional Information

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

Other Resources

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

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

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

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