

Preliminary

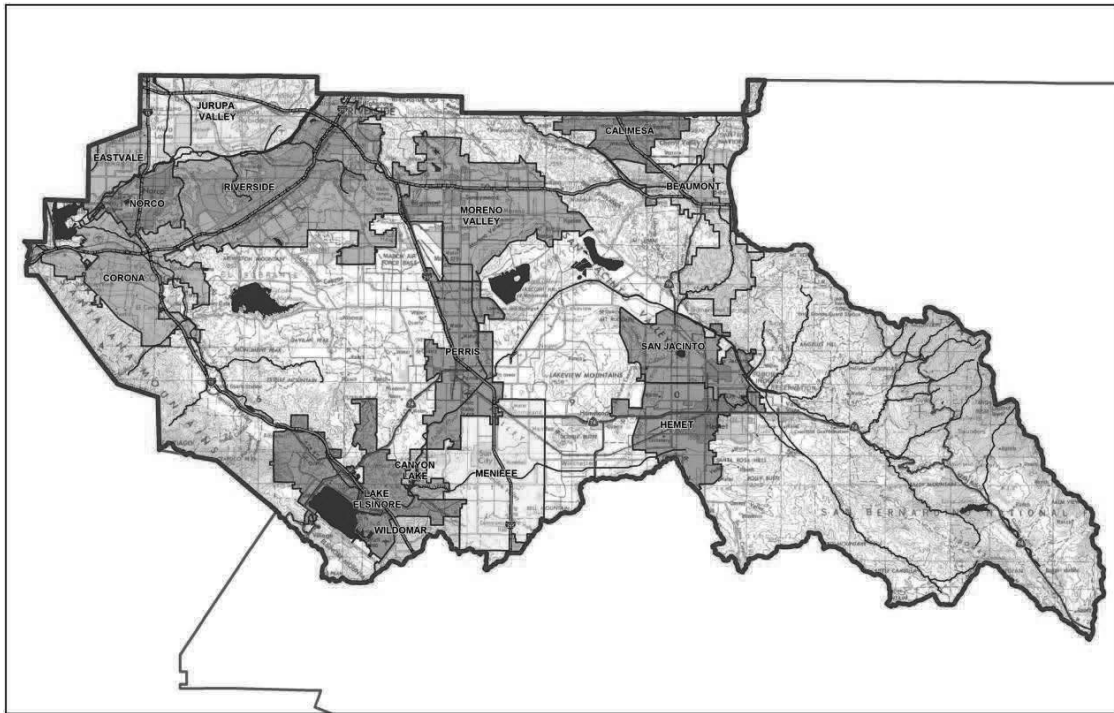
Project Specific Water Quality Management Plan

*Project Specific WQMP for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: **Skilled Nursing Facility Addition and Medical Office Building**

Development No: **Tentative Parcel Map No. 39217**

Design Review/Case No: **MA 23266 / PAR 23012**



- ☒ Preliminary
☐ Final

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*Prepared for Compliance with
Regional Board Order No. R8-2010-0033
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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Providence Administrative Consulting Services** by **Sikand Engineering Associates** for the **TPM 39217** project.

This WQMP is intended to comply with the requirements of **the City of Jurupa Valley for Ordinance No. 2012-07 and Resolution 2012-32** 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 **the City of Jurupa Valley** Water Quality Ordinance (Municipal Code Section **6.05**).

"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."

Owner's Signature

Date

Owner's Printed Name

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

Date

Doug Farmer, PE

Preparer's Printed Name

Supervising Project Engineer

Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Skilled Nursing and Medical Office
Planning Area:	
Community Name:	TPM 39217
Development Name:	Skilled Nursing Facility Addition and Medical Office Building
PROJECT LOCATION	
Latitude & Longitude (DMS): 34.012724, -117.422494	
Project Watershed and Sub-Watershed: Middle Santa Ana River Watershed	
Gross Acres: 17.8 ac	
APN(s): 177-020-084	
Map Book and Page No.: Rand McNally Road Atlas p.15, SK-14	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Skilled Nursing / Medical Office
Proposed or Potential SIC Code(s)	N/A
Area of Impervious Project Footprint (SF)	235,906 sf
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement	235,906 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 <u>existing</u> Impervious Surfaces within the Project limits Footprint (SF)	84,863 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)	
What is the Water Quality Design Storm Depth for the project?	D85=0.70 inch

A.1 Maps and Site Plans

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
Buena Vista Basin	N/A	N/A	N/A
San Jacinto River Reach 3	◦ <i>Warm Freshwater Habitat</i> Arsenic, Bifenthrin, Cadmium, Chlordane, Chlorpyrifos, Chromium, Copper, Cyfluthrin, Cyhalothrin, Lambda, Cypermethrin, DDD (Dichlorodiphenyldichloroethane), DDE (Dichlorodiphenyldichloroethylene), DDT (Dichlorodiphenyltrichloroethane), Deltamethrin, Diazinon, Dieldrin, Endrin, Esfenvalerate/Fenvalerate, Fenpropathrin, Lead, Lindane/gamma Hexachlorocyclohexane (gamma-HCH), Mercury, Methyl Parathion, Nickel, PCBs (Polychlorinated biphenyls), Permethrin, total, Zinc ◦ <i>Cold Freshwater Habitat Toxicity</i>	AGR, GWR, REC1, REC2, WARM, WILD, RARE	29 mi
San Jacinto River Reach 1	Benthic Community Effects	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	38 mi

Table 3-1 BENEFICIAL USES - Continued

INLAND SURFACE STREAMS	BENEFICIAL USE																	Hydrologic Unit		
	MUN	AGR	IND	PROC	GWR	NAV	POW	REC1	REC2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE	SPWN	EST	Primary	Secondary
Reach 6 – Elsinore Groundwater Subbasin Boundary to Lake Elsinore Outlet	+				I			I	I		I				I				801.35	
Coldwater Canyon Creek	X	X			X			X	X		X				X		X		801.32	
Bedford Canyon Creek	+				I			I	I		I				I	X			801.32	
Dawson Canyon Creek	I				I			I	I		I				I				801.32	
Other Tributaries to these Creeks	I				I			I	I		I				I				801.32	
SAN JACINTO RIVER BASIN																				
San Jacinto River																				
Reach 1 – Lake Elsinore to Canyon Lake	I	I				I			I	I		I				I	X		801.32	802.31
Reach 2 – Canyon Lake (see Lakes Pg. 3-45)																				
Reach 3 – Canyon Lake to Nuevo Road	+	I				I			I	I		I				I	X		802.11	
Reach 4 – Nuevo Road to North-South Mid-Section Line, T4S/R1W-S8	+	I				I			I	I		I				I	X		802.21	802.21

X Existing or Potential Beneficial Use
 I Intermittent Beneficial Use
 + Excepted from MUN (see text)

BENEFICIAL USES

3-42

January 24, 1995
 Updated June 2019 to
 include approved amendments

8	San Jacinto River Reach 3 (Canyon Lake (Railroad Canyon Reservoir) to Nuevo Road)	River & Stream	80211000 / 18070202	• Aquatic Life Support ◦ Warm Freshwater Habitat - Arsenic, Bifenthrin, Cadmium, Chlordane, Chlorpyrifos, Chromium, Copper, Cyfluthrin, Cyhalothrin, Lambda, Cypermethrin, DDD (Dichlorodiphenyldichloroethane), DDE (Dichlorodiphenyldichloroethylene), DDT (Dichlorodiphenyltrichloroethane), Deltamethrin, Diazinon, Dieldrin, Endrin, Esfenvalerate/Fenvalerate, Fenpropathrin, Lead, Lindane/gamma Hexachlorocyclohexane (gamma-HCH), Mercury, Methyl Parathion, Nickel, PCBs (Polychlorinated biphenyls), Permethrin, total, Zinc ◦ Cold Freshwater Habitat - Toxicity	9.6 Miles
8	San Jacinto River, Reach 1 (Lake Elsinore to Canyon Lake (Railroad Reservoir))	River & Stream	80231000 / 18070202	• Aquatic Life Support ◦ Warm Freshwater Habitat - Benthic Community Effects	5.1 Miles

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	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other (<i>please list in the space below as required</i>) Grading Permit, Street Improvement Permit, Building Permit	☒ 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.

NOTE: All applicable permits will be included in the Final WQMP.

Section B: Optimize Site Utilization (LID Principles)

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, the project is proposing to use an infiltration basin as mitigation BMP.

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?

The proposed project is a commercial development of the southerly portion of the site, which in its existing condition consists of a skilled nursing facility on the westerly half and vacant land on the easterly half. The only pattern that was preserved is the site drainage outlet pattern. The existing condition drains from the northwest corner to the southeast corner of the property. Following this, the proposed condition is draining in the same direction as well. Both conditions have drainage outlets at the southeast corner of site with the proposed condition connecting to an existing Riverside County Flood Control maintained storm drain pipe.

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

The existing condition of the site has little vegetation. The footprint for the commercial facility will encompass the entire site.

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

Yes. The proposed infiltration basin is located in a graded cut area, where the natural infiltration capacity is not tampered.

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

Yes. There will be landscaped islands incorporated within the parking lot and street parkway as well as the proposed infiltration basin at the southeast corner that will be pervious areas. The proposed development's total impervious area (paved streets, sidewalks, parking lot and roofs) is 87% of the entire site which is typical for a commercial site. The remaining 13% is landscaped areas, slopes, and infiltration basin area.

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

Yes. The parking lot, street and roof runoff will be picked up and directed into the infiltration basin.

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) ¹²	Area (Sq. Ft.)	DMA Type
DMA 1	Commercial development (Mixed roofs, landscape and paved surfaces)	352,830	"D"

¹Reference Table 2-1 in the WQMP Guidance Document to populate this column

²If 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		

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

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							

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

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

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): Conservation design

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: Residential

- 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 of 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.

NOTE: This segment is Not Applicable since the project is proposing to use Infiltration Basin as the BMP.

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	☒	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

The project is already proposing the use Infiltration Basin as the BMP. This is the highest BMP based on the prioritization list, and considered the most appropriate for the site.

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	Enter BMP Name / Identifier Here		
	[A]		[B]	[C]	[A] x [C]			
<i>Please See Calculations on Appendix 6</i>						<i>Design Storm Depth (in)</i>	<i>Design Capture Volume, V_{BMP} (cubic feet)</i>	<i>Proposed Volume on Plans (cubic feet)</i>
<i>See Summary Below</i>								
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D] \times [E]}{12}$	[G]

[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

DCV Calculation Summary:

DMA No. = DMA 1

BMP ID = BMP 1

BMP Type = Infiltration Basin

Design Capture Volume = 14,714 cu-ft

Proposed Volume = 30,275 cu-ft

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.

N/A

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	
<i>Total Credit Percentage¹</i>	

¹Cannot Exceed 50%

²Obtain 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]				
N/A						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] = $\frac{[D] \times [E]}{[G]}$	[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

[1] 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
BMP1: Infiltration Basin	Phosphorus, Toxicity	High

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 concentration¹ 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	22.18	21.83	2%
Volume (Cubic Feet)	27,471	33,088	20%

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:

N/A

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.

NOTE: The Difference in volume for 2-yr, 24-hour storm pre- and post-development is 0 cu-ft. Therefore, the hydrologic conditions of concern are not significant.

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.	Maintain and periodically repair or replace inlet markings. Provide stormwater pollution prevention information to new site owners.
Landscape/Outdoor Pesticide use	Final landscape plan will accomplish: Preserve existing trees and ground covers, minimize irrigation, minimize use of fertilizers and pesticides, use pest-resistant plants, and proper choice of plants to use.	Maintain landscaping using minimum or no pesticides.

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 H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
BMP 1	Infiltration Basin	In Final WQMP	

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 I: 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: *The proposed BMP, Infiltration Basin, will be constructed by the developer and the POA will have ongoing maintenance responsibilities.*

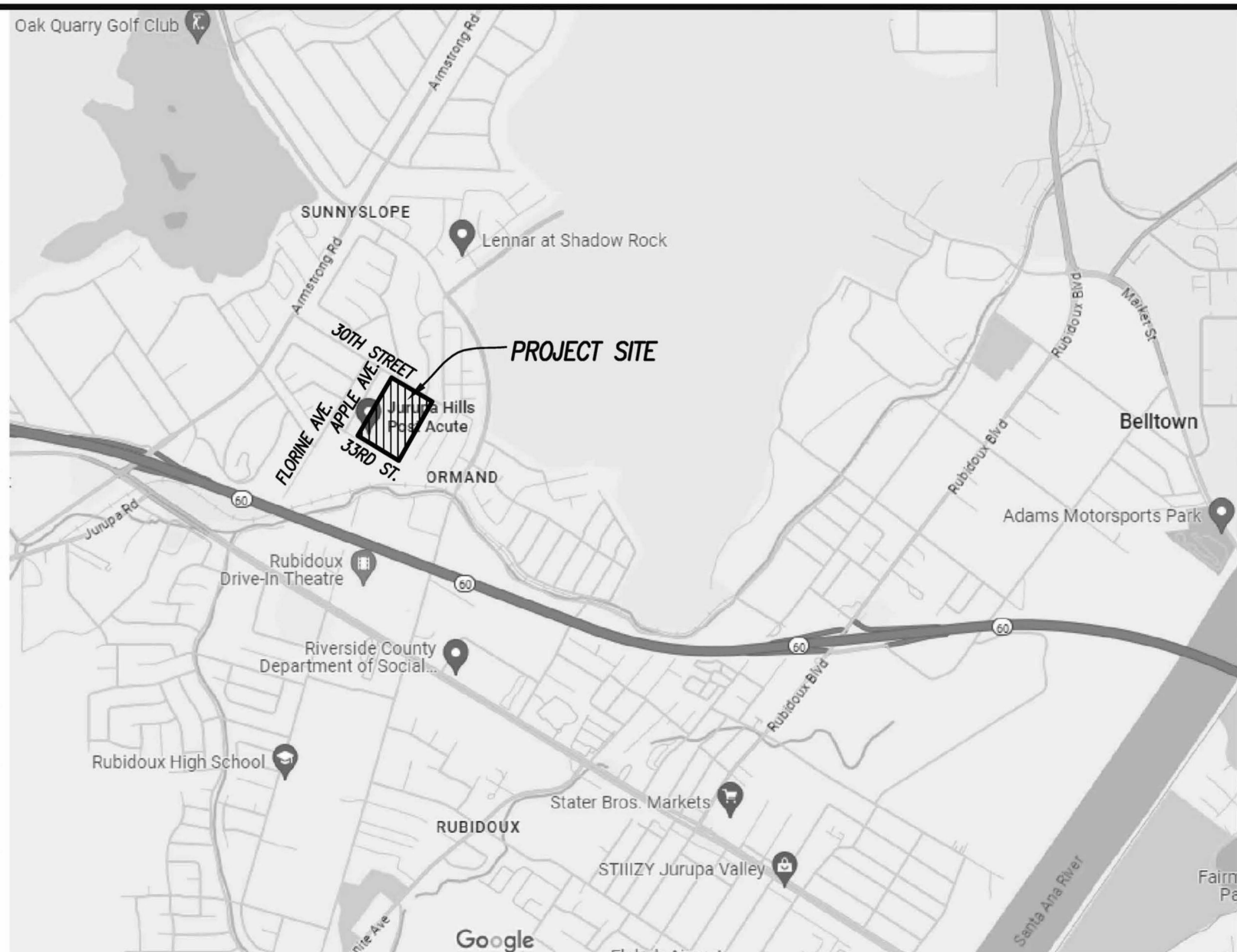
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

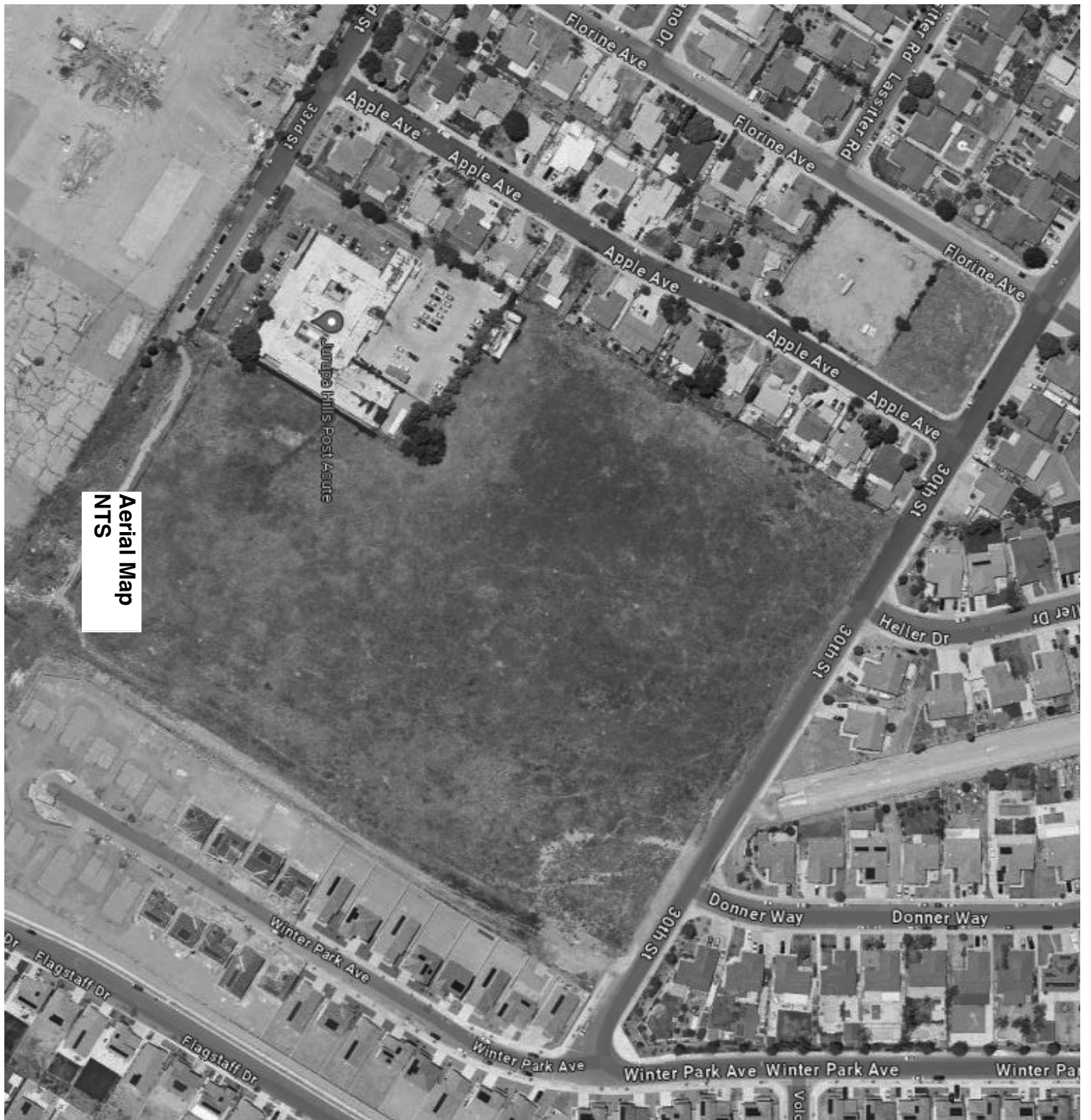
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

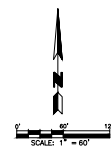
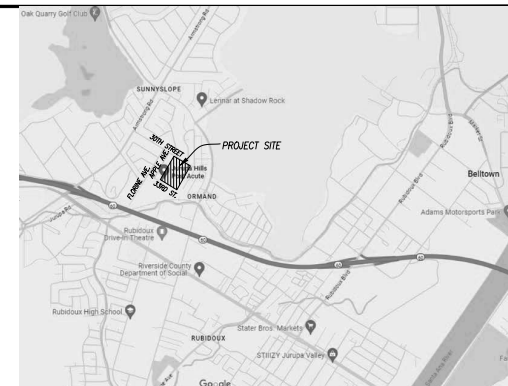
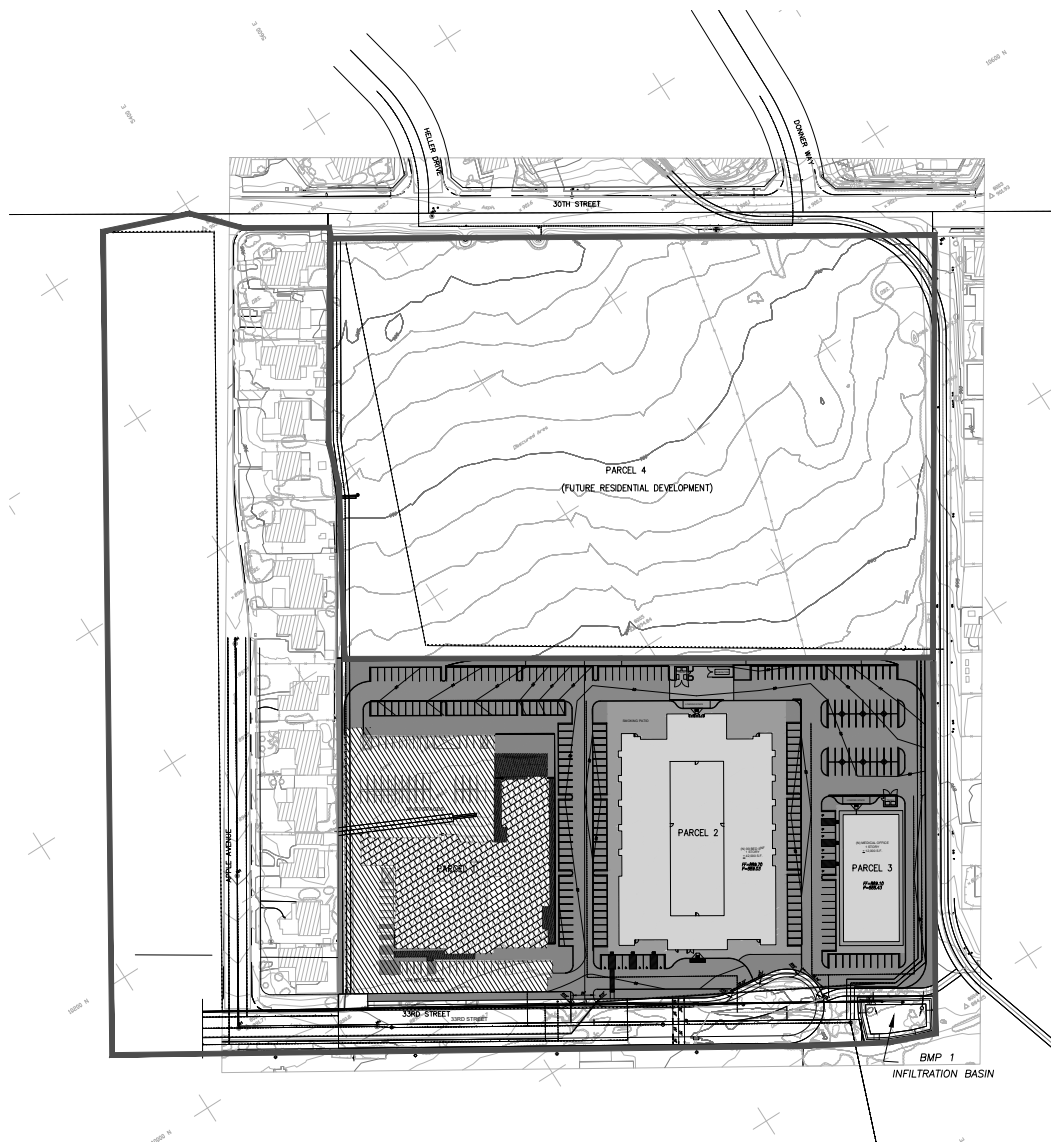
Location Map, WQMP Site Plan and Receiving Waters Map



VICINITY MAP
NOT TO SCALE



Aerial Map
NTS



DRAINAGE CRITERIA

STORM EVENTS: 100-YR DESIGN STORM EVENT
10-YR STORM EVENT
WATERSHED NAME - SANTA ANA RIVER WATERSHED
SOIL GROUP - 9
PRECIPITATION
2.00" (10-YR, 1-HOUR)
1.20" (100-YR, 1-HOUR)
ANTICIPATED MOISTURE CONTENT - 3
R INDEX FOR SOIL 56
DEVELOPMENT TYPE - COMMERCIAL (SKILLED NURSING / MEDICAL OFFICE)

EXISTING

ROOFTOP (34,604 SF)
SIDEWALK (5,776 SF)
LANDSCAPE (9,867 SF)
PARKING (45,254 SF)

LEGEND

PROPOSED

ROOFTOP (67,192 SF)
SIDEWALK (30,927 SF)
LANDSCAPE (40,075 SF)
PARKING (104,108 SF)

— DRAINAGE BOUNDARY

— FLOW LINE

— EXISTING STORM DRAIN

— PROPOSED STORM DRAIN

PREPARED FOR:
PROVIDENCE ADMINISTRATIVE
CONSULTING SERVICES
282 NORTH UNIVERSITY AVENUE
FARMINGTON, UT 84025

NO.	REVISIONS	BY	DATE	SHEET NUMBER



PREPARED BY:
SIKAND
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CITY OF JURUPA VALLEY
PRELIMINARY WATER QUALITY MANAGEMENT PLAN
FOR
**SKILLED NURSING FACILITY EXPANSION
AND MEDICAL OFFICE BUILDING
(TENTATIVE PARCEL MAP NO. XXXXX)**

SHEET: XX-XX-2024
DRAWING NO. 3/24-011
SHEET NUMBER:
1
OF 1 SHEETS
SCALE: AS SHOWN

TENTATIVE PARCEL MAP NO. 39217

ASSESSOR'S PARCEL NUMBER:
177-020-084 AND 177-020-085

LEGAL DESCRIPTION:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF JURUPA VALLEY IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

PARCEL A:
THAT PORTION OF TRACT NO. 1 OF THE RESUBDIVISION OF THE LANDS FORMERLY BELONGING TO THE A.C. ARMSTRONG ESTATE, IN THE CITY OF JURUPA VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 6, PAGE 31 OF MAPS, RIVERSIDE COUNTY RECORDS, AND SHOWN ON RECORD OF SURVEY ON FILE IN BOOK 4, PAGE 70 OF RECORDS OF SURVEY, RIVERSIDE COUNTY RECORDS, LIVING WITHIN SECTION 8, TOWNSHIP 2 SOUTH, RANGE 9 WEST, SAN BERNARDINO MERIDIAN.

APN 177-020-084 14.61AC

PARCEL B:
THAT PORTION OF TRACT NO. 1 OF THE RESUBDIVISION OF THE LANDS FORMERLY BELONGING TO THE A.C. ARMSTRONG ESTATE, CITY OF JURUPA VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 4, PAGE 31 OF MAPS, AND AS SHOWN ON RECORD OF SURVEY ON FILE IN BOOK 6, PAGE 70 OF RECORDS OF SURVEY, BOTH RECORDS OF RIVERSIDE COUNTY, STATE OF CALIFORNIA.

APN 177-020-085 3.18AC

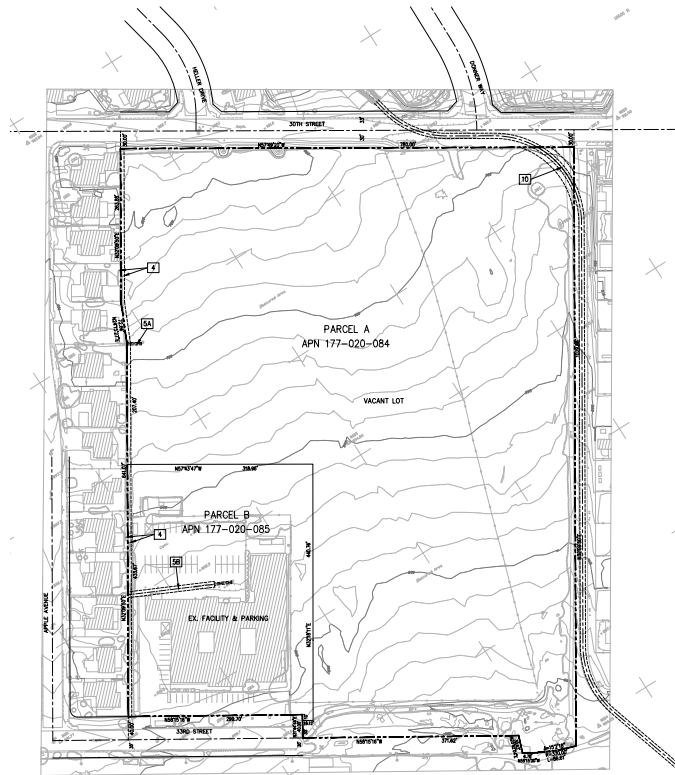
BASIS OF BEARINGS:

THE BEARING OF NORTH 57°49'27" WEST SHOWN ON THE CENTERLINE OF 30TH STREET AS SHOWN ON TRACT NO. 37470 FILED IN BOOK 462 PAGES 42 TO 45, OF MAPS, RECORDS OF RIVERSIDE COUNTY, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

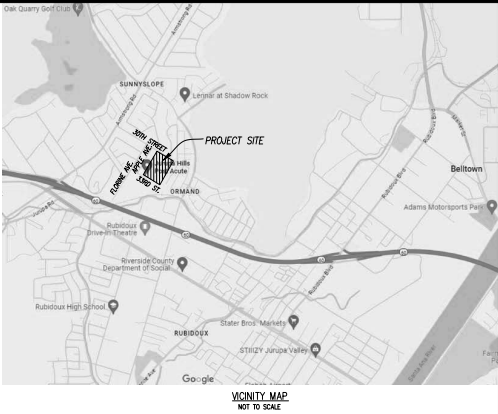
BENCHMARK:

BENCH MARK NUMBER: ML 9-3 RESET 2004
DATE: MARCH 1929
YEAR OF RECORD: RESET 2004
ELEVATION (FEET): 907.243

DESCRIPTION: FLUSH ON 11 INCH CURB, 36 FEET EASTERLY OF EASTERLY RAIL, 63.0 FEET WESTERLY OF BCR IN SOUTHWESTERLY QUADRANT OF MISSION BOULEVARD AND JURUPA ROAD INTERSECTION, 73 FEET RIGHT AT STATION 399+57.00 OF CENTERLINE MISSION BOULEVARD.



EXISTING CONDITION



EASEMENT ITEMS REFERENCED PER FIRST AMERICAN TITLE COMPANY PRELIMINARY REPORT ORDER NO. 05A-7106180 (RA) AND NHSC-7157308 (RA) DATED JULY 29, 2024:

ITEM NO.	EASEMENT OWNER	RECORDING INFORMATION	PURPOSES	DISPOSITION
[3]	THE SOUTHERN SIERRAS POWER COMPANY	JULY 31, 1915 IN BOOK 425 PAGE 382, O.R. (EXEMPT IN NATURE)	POWER LINES REQUIRED TO FURNISH ELECTRICAL ENERGY	TO REMAIN
[4]	SOUTHERN CALIFORNIA EDISON COMPANY	OCTOBER 28, 1967 IN BOOK 2189, PAGE 396 AS INSTRUMENT NO. 77260, O.R.	UTILITIES	TO REMAIN
[5A]	SOUTHERN CALIFORNIA EDISON COMPANY	DECEMBER 6, 1967 IN BOOK 2189, PAGE 141 AS INSTRUMENT NO. 86637, O.R.	UTILITIES	TO REMAIN
[5B]	SOUTHERN CALIFORNIA EDISON COMPANY	AUGUST 25, 1963 IN BOOK 3470, PAGE 389 AS INSTRUMENT NO. 8899, O.R.	PUBLIC UTILITIES	TO REMAIN
[10]	RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT	SEPTEMBER 28, 2000 AS INSTRUMENT NO. 2000-385913, O.R.	STORM DRAIN INCLUDING INGRESS AND EGRESS	TO REMAIN

PREPARED FOR:
PROVIDENCE ADMINISTRATIVE CONSULTING SERVICES (PACS)
282 N. UNIVERSITY AVENUE
FARMINGTON, UT 84025

NO.	REVISION	BY	DATE	PROJECT NUMBER	DATE

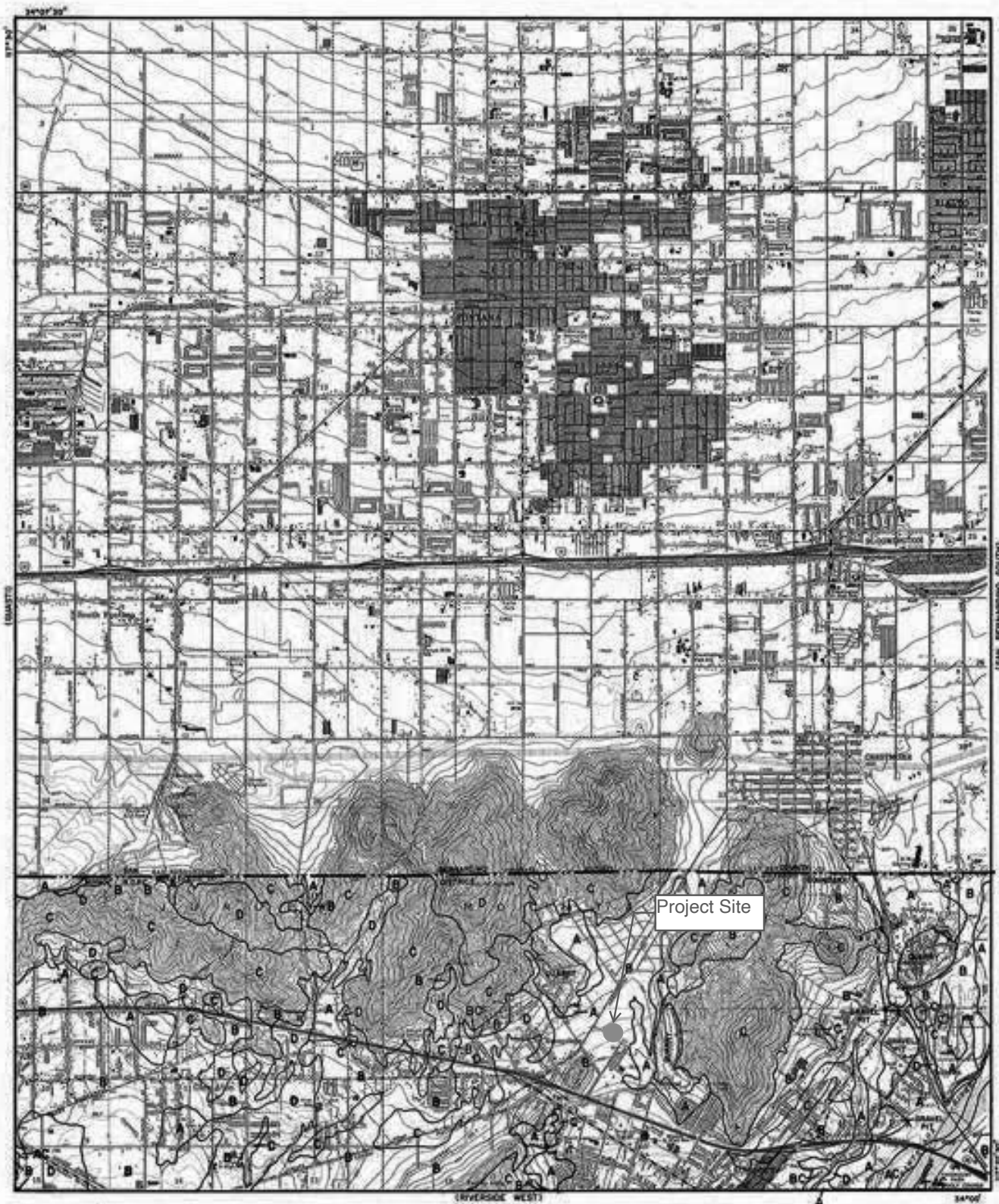


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CITY OF JURUPA VALLEY
TENTATIVE PARCEL MAP NO. 39217
LOCATED IN THE CITY OF JURUPA VALLEY,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

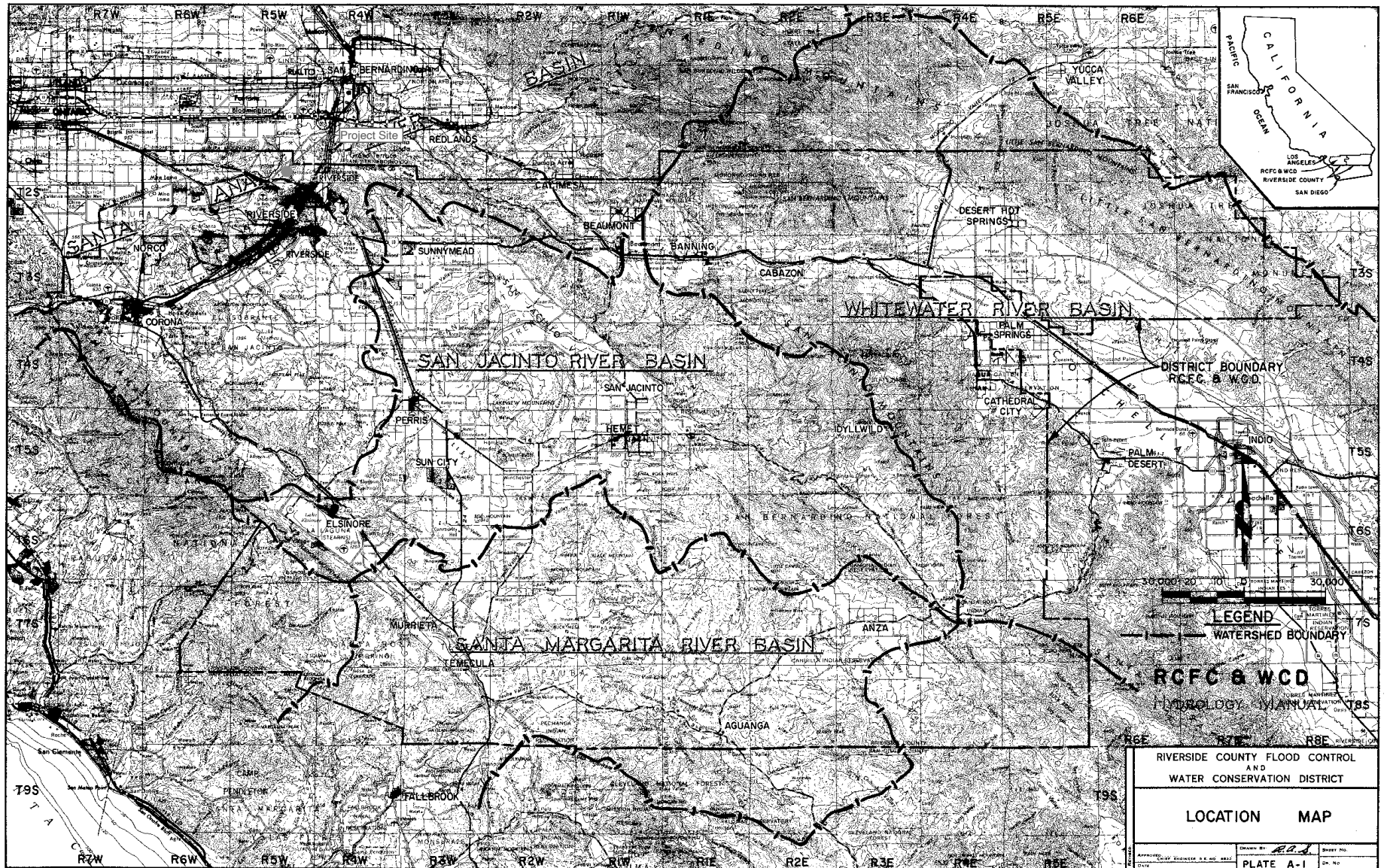
SHEET: 07-15-2025
DRAWING NO.: 3/24-011
SHEET NUMBER:
1
OF 2 SHEETS
SCALE: AS SHOWN

BY (SEAL) (SIGNATURE) (DATE) (Firm Name) (The map is not a legal document.)



LEGEND — SOILS GROUP BOUNDARY A SOILS GROUP DESIGNATION RCFC&WCD HYDROLOGY MANUAL	HYDROLOGIC SOILS GROUP MAP FOR FONTANA
--	--

0 FEET 5000



Appendix 2: Construction Plans

Grading and Drainage Plans

NOTE: All construction plans will be provided in the Final WQMP.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Appendix 4: Historical Site Conditions

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

N/A

Appendix 5: LID Infeasibility

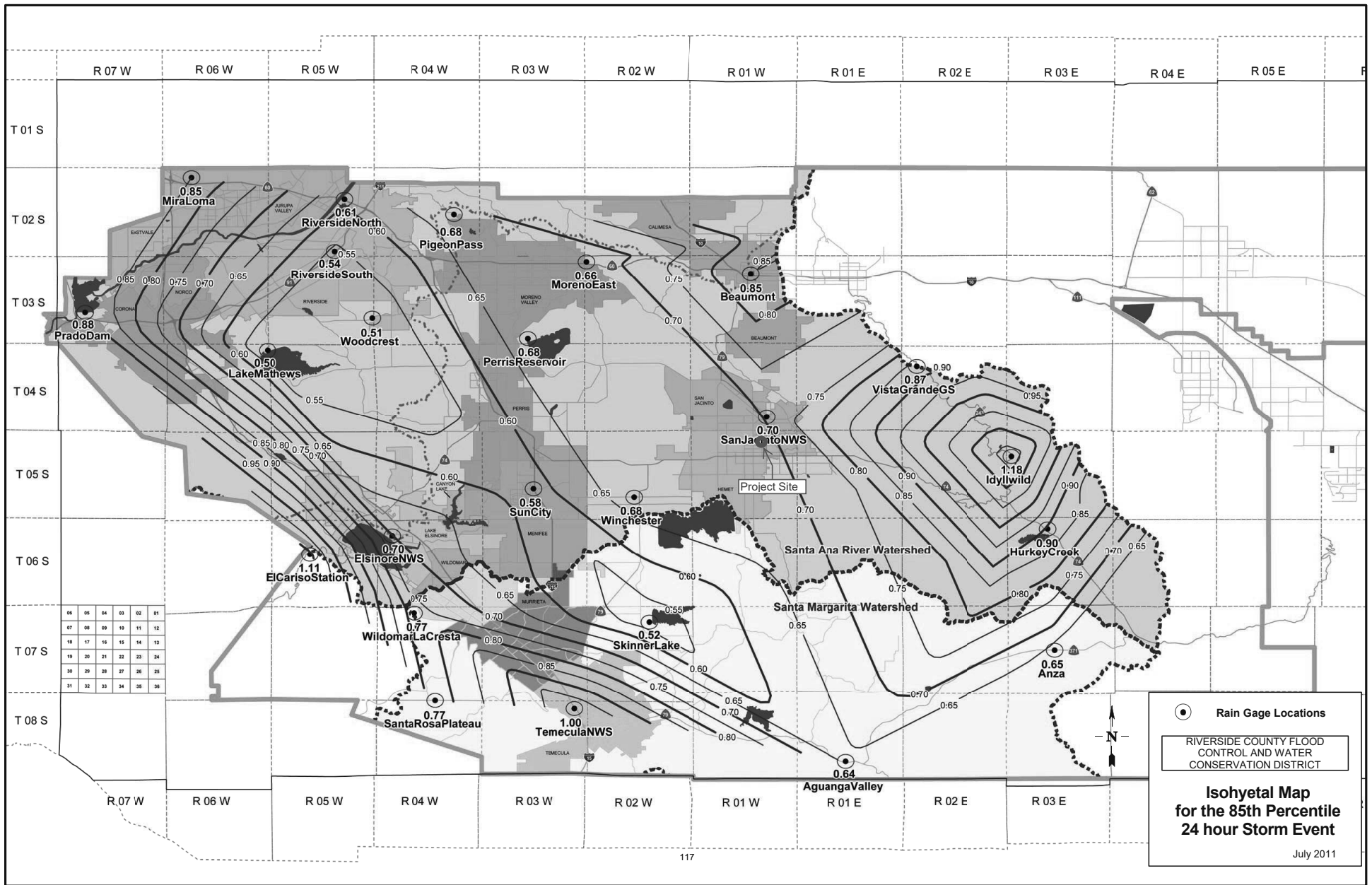
LID Technical Infeasibility Analysis

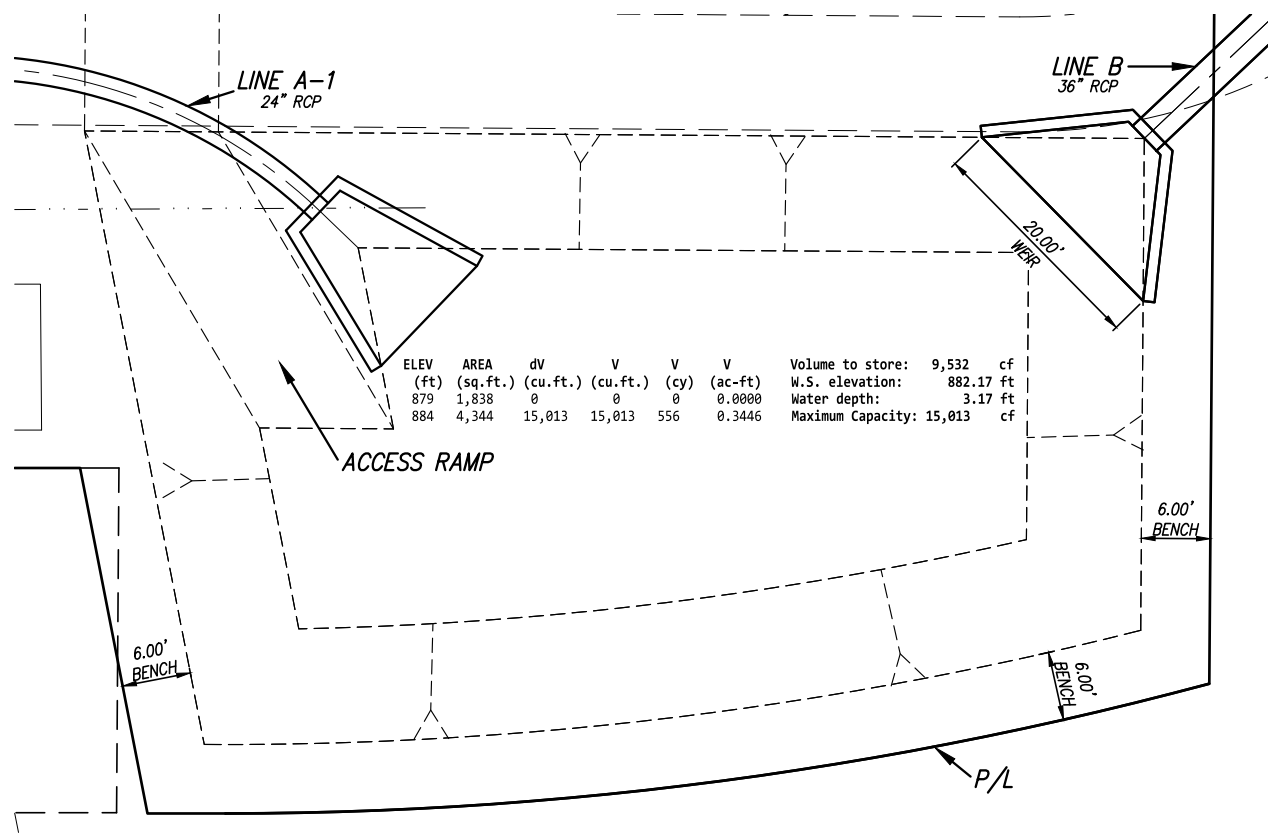
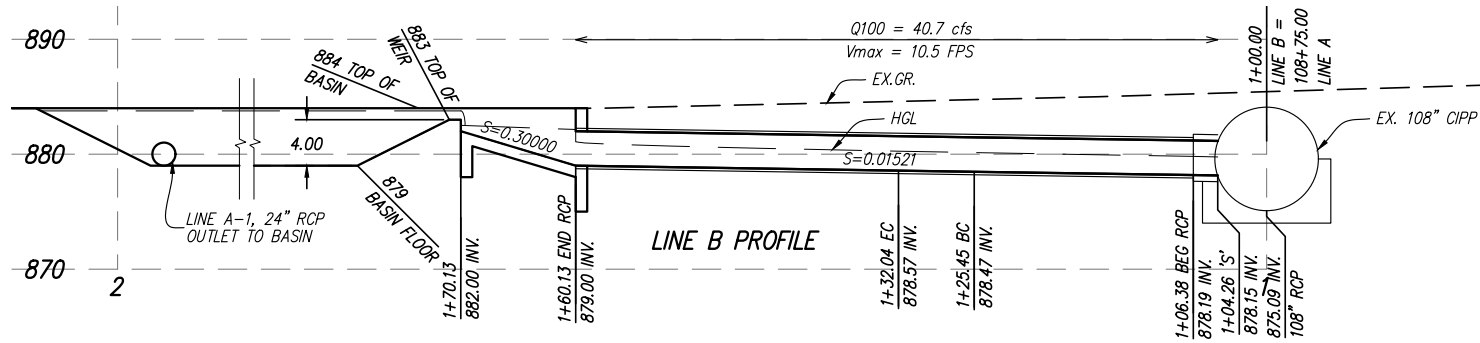
NOTE: The project is already proposing the use Infiltration Basin as the BMP. This is the highest BMP based on the prioritization list, and considered the most appropriate for the site. LID infeasibility is not applicable.

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP} (Rev. 10-2011)						Legend: 		Required Entries	
								Calculated Cells	
(Note this worksheet shall <u>only</u> be used in conjunction with BMP designs from the <u>LID BMP Design Handbook</u>)									
Company Name		Sikand						Date 7/25/2024	
Designed by		Doug Farmer						Case No	
Company Project Number/Name		5124-011/Jurupa Valley							
BMP Identification									
BMP NAME / ID		Basin 1							
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						$D_{85} =$		0.68 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 Imperivious Fraction, I_e	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)	
Basin 1	101796	Roofs	1	0.89	90802				
Basin 1	186065	Concrete or Asphalt	1	0.89	165970				
Basin 1	49942	Ornamental Landscaping	0.1	0.11	5516.5				
337803		Total			262288.5	0.68	14863	15343	
Notes:									





RETENTION BASIN
 1"=10' SCALE

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

INFILTRATION BASIN BMP FACT SHEET

Setbacks

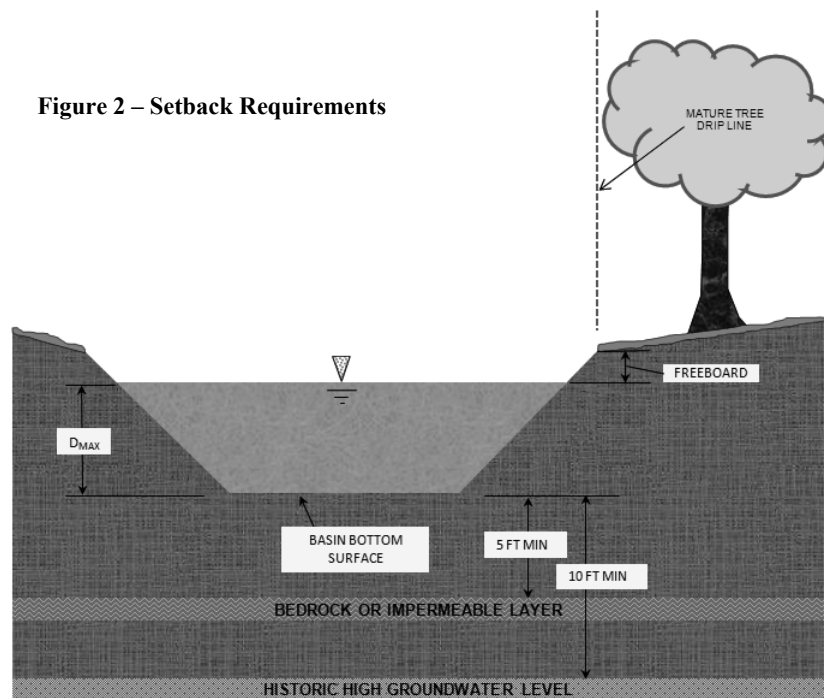
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process 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



INFILTRATION BASIN BMP FACT SHEET

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).

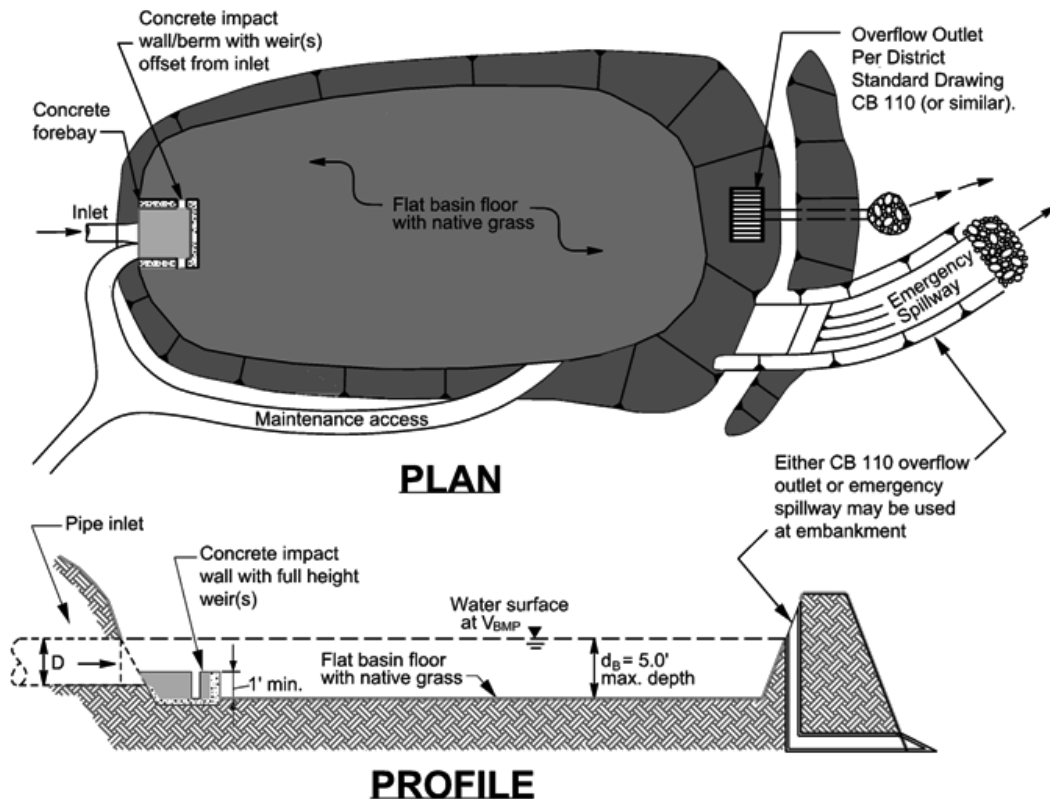


Figure 3 – Infiltration Basin

INFILTRATION BASIN BMP FACT SHEET

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, - Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. - 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 basis¹. - 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	

INFILTRATION BASIN BMP FACT SHEET

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)

INFILTRATION BASIN BMP FACT SHEET

- 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.

$$D_2 = \text{Depth to groundwater} - (10 + \text{freeboard}) \text{ (ft);}$$

or

$$D_2 = \text{Depth to impermeable layer} - (5 + \text{freeboard}) \text{ (ft)}$$

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.

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

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.1 on 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.

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
☐ 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.

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
☐ 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

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
☐ 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.

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
☐ 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/

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
☐ 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.

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
☐ 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

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
☐ 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

NOTE: The proposed Infiltration Basin BMP will be maintained by the POA. The O&M Plan and Documentation will be provided on the Final WQMP. The page below is a sample inspection checklist that be part of the implementation.

[EXAMPLE]

Infiltration Basin Maintenance Plan

INFILTRATION BASIN INFORMATION

Infiltration basins are designed to remove pollutants from stormwater runoff and reduce runoff volume through infiltration. **Maintenance is required** and is extremely important. Sediment and debris must be removed regularly to maintain correct function.

This document serves as guidance to developing an inspection and maintenance plan.

SITE LOCATION: _____

Physical address of infiltration basin

INFILTRATION BASIN INSPECTION/MAINTENANCE

The CURRENT OWNER or their designee is responsible for completing inspections and conducting maintenance.

WHEN WILL THE INFILTRATION BASIN BE INSPECTED AND MAINTAINED?

At a minimum, Infiltration Basins must be inspected in the **spring** and **fall** of each year. Personnel should be aware of the maintenance plan. It is recommended to consult with the designer and builder to understand the inspection and maintenance needs.

MAINTENANCE PLAN INFORMATION

This Maintenance Plan for the location listed above is submitted by the CURRENT OWNER on _____ to comply with the City's Land Development Code Requirements. Inspection and maintenance records are required to be kept on file for five (5) years and submitted to the City as requested. This plan will be attached to the required recorded maintenance agreement.

INSPECTION & MAINTENANCE CHECKLIST (must be completed in the Spring & Fall):

	Clean basin. Remove any sediment, trash and debris.
	Remove any dead vegetation, trim live vegetation if needed and remove weeds.
	Inspect and clean pre-treatment area(s) (e.g. forebay, sump, filter strip, rock).
	Repair inlet erosion/damage. Inspect bottom of the basin and remove any sediment.
	Loosen, aerate or replace soils to ensure water infiltrates – must infiltrate within 48 hours.
	Paved surfaces draining to basin swept and kept free of sediment and debris.
	Wood mulch replaced or added to keep 3" depth. (Include if applicable).
	Replace dead plants/vegetation. Manage native vegetation (if applicable) through mowing, spot spraying for weeds and/or prescribed burning. Water as needed.
	Erosion will be repaired.
	Photos taken.
	Other:

Appendix 10: Educational Materials

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

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

INFILTRATION BASIN BMP FACT SHEET

Setbacks

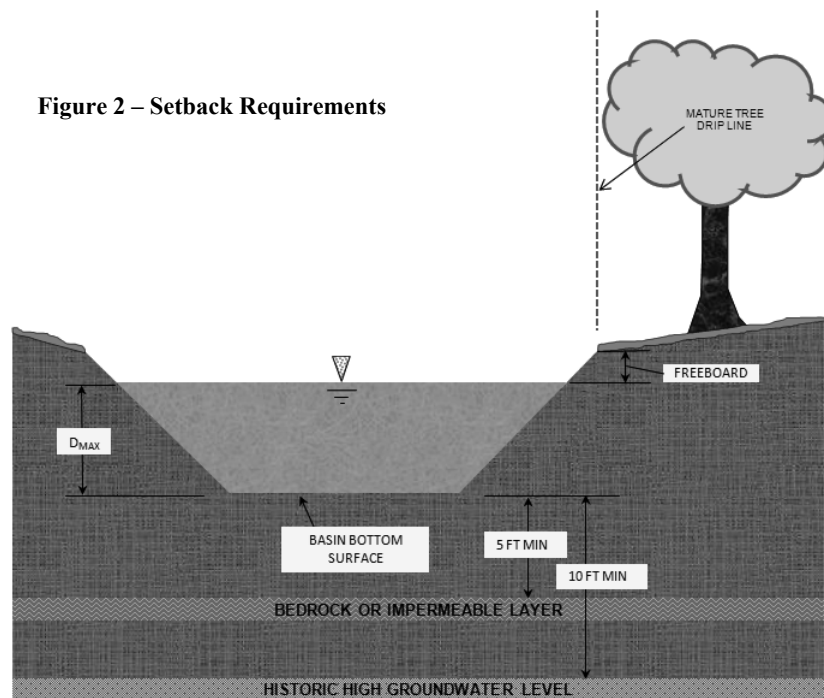
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process 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



INFILTRATION BASIN BMP FACT SHEET

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).

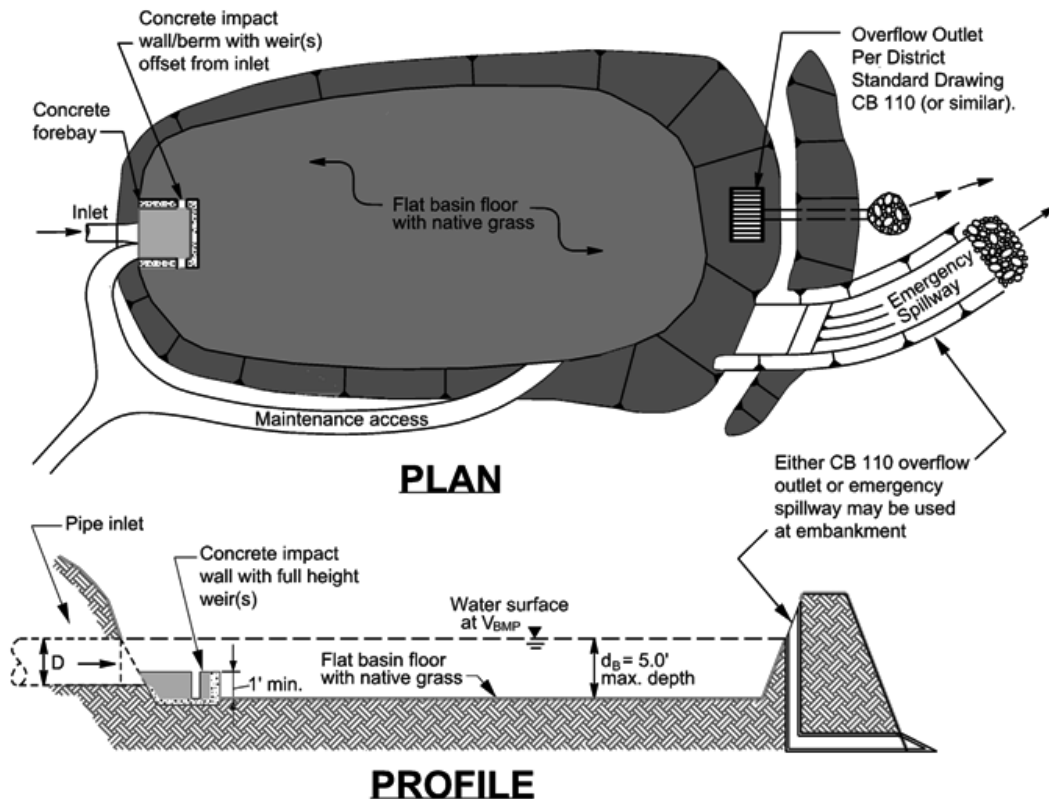


Figure 3 – Infiltration Basin

INFILTRATION BASIN BMP FACT SHEET

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, - Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding. - 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 basis¹. - 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	

INFILTRATION BASIN BMP FACT SHEET

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)

INFILTRATION BASIN BMP FACT SHEET

- 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.

$$D_2 = \text{Depth to groundwater} - (10 + \text{freeboard}) \text{ (ft);}$$

or

$$D_2 = \text{Depth to impermeable layer} - (5 + \text{freeboard}) \text{ (ft)}$$

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.

Infiltration Basin - Design Procedure (Rev. 03-2012)		BMP ID	Legend:	Required Entries Calculated Cells
Company Name:			Date:	
Designed by:			County/City Case No.:	
Design Volume				
a) Tributary area (BMP subarea)		$A_T =$		acres
b) Enter V_{BMP} determined from Section 2.1 of this Handbook		$V_{BMP} =$		ft ³
Maximum Depth				
a) Infiltration rate		$I =$		in/hr
b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook)		$FS =$		
c) Calculate D_1	$D_1 = \frac{I \text{ (in/hr)} \times 72 \text{ hrs}}{12 \text{ (in/ft)} \times FS}$	$D_1 =$		ft
d) Enter the depth of freeboard (at least 1 ft)				ft
e) Enter depth to historic high ground water (measured from top of basin)				ft
f) Enter depth to top of bedrock or impermeable layer (measured from top of basin)				ft
g) D_2 is the smaller of:				
Depth to groundwater - (10 ft + freeboard) and		$D_2 =$		ft
Depth to impermeable layer - (5 ft + freeboard)				
h) D_{MAX} is the smaller value of D_1 and D_2 but shall not exceed 5 feet		$D_{MAX} =$		ft
Basin Geometry				
a) Basin side slopes (no steeper than 4:1)		$z =$		:1
b) Proposed basin depth (excluding freeboard)		$d_B =$		ft
c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$)		$A_S =$		ft ²
d) Proposed Design Surface Area		$A_D =$		ft ²
Forebay				
a) Forebay volume (minimum 0.5% V_{BMP})		Volume =		ft ³
b) Forebay depth (height of berm/splashwall. 1 foot min.)		Depth =		ft
c) Forebay surface area (minimum)		Area =		ft ²
d) Full height notch-type weir		Width (W) =		in
Notes:				

Site Design & Landscape Planning SD-10



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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



SD-10 Site Design & Landscape Planning

Designing New Installations

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

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

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

Conserve Natural Areas during Landscape Planning

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

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

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

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

Site Design & Landscape Planning SD-10

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

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

Protection of Slopes and Channels during Landscape Design

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

Redeveloping Existing Installations

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

SD-10 Site Design & Landscape Planning

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

Other Resources

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

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

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

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

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



Rain Garden

Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

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



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

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

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say 1/4 to 1/2 inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

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

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

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

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

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that 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



Design Objectives

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

Description

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

Approach

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

Suitable Applications

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

Design Considerations

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

Designing New Installations

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

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



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

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

Redeveloping Existing Installations

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

Additional Information

Maintenance Considerations

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

Placement

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

Supplemental Information

Examples

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

Other Resources

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

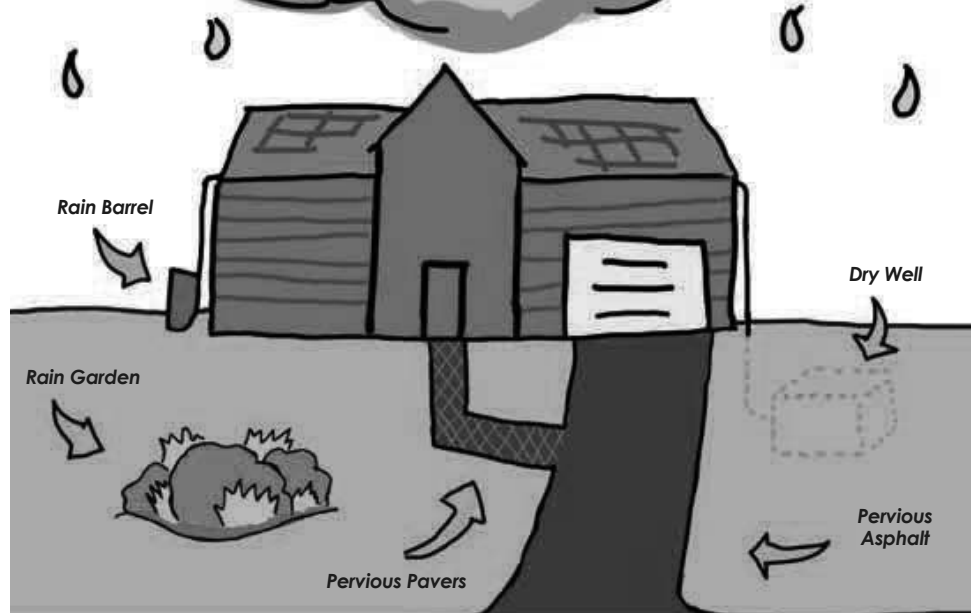
Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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

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

Homeowners Guide to Stormwater BMP Maintenance

What You Need to Know to
Take Care of Your Property



About Stormwater Management
SW **Regulations** for Homeowners
Home Stormwater **BMP Descriptions**

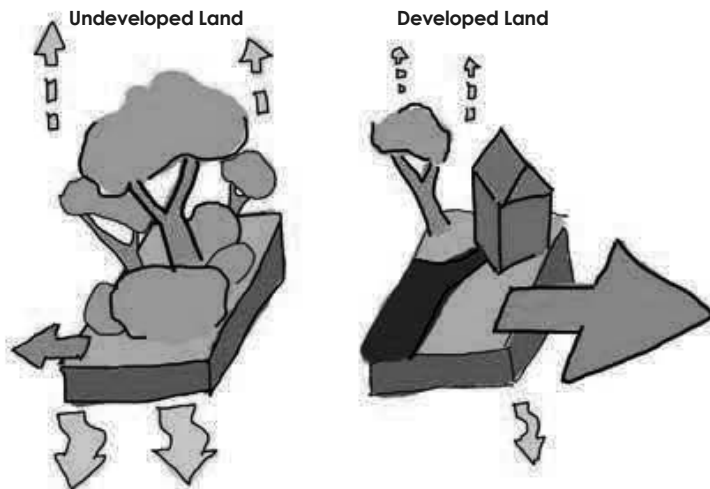
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What is Stormwater?

Stormwater is the water that runs off the land after precipitation, either rain or snowmelt. Rain or snow can drain down into the soil (called infiltration), evaporate back into the atmosphere, be used by plants, or flow into streams or water bodies. The water that runs off the land to streams or lakes is referred to as stormwater runoff.

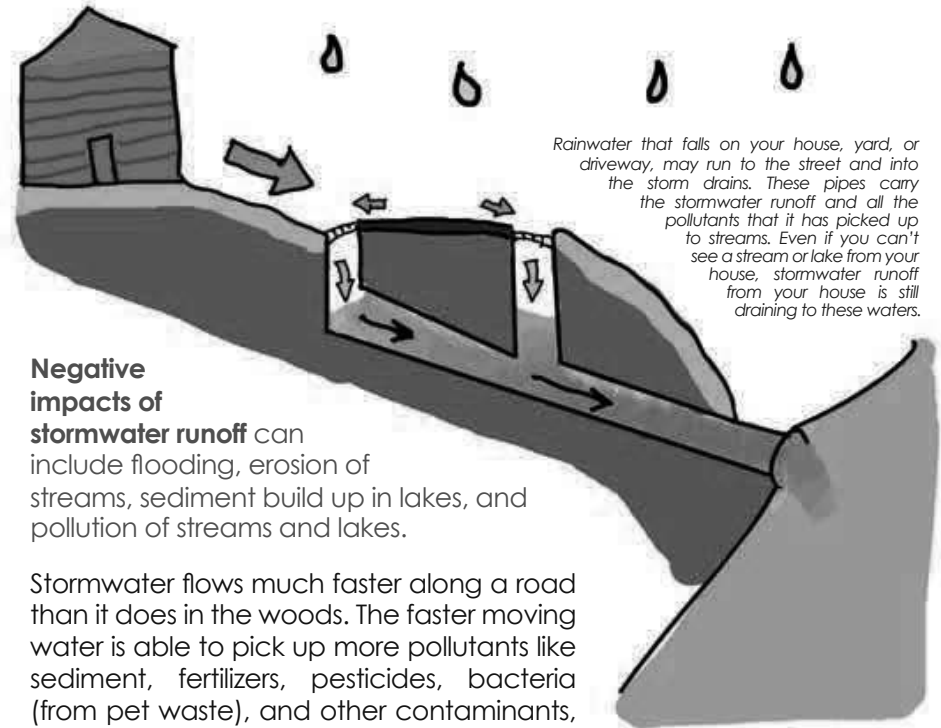
Stormwater runoff happens in natural, undeveloped areas, but typically only for larger storms. For most areas in Pennsylvania that are wooded or natural meadows, it takes about an inch or more of rain to produce runoff.

After development, the natural wooded or meadow areas are replaced with roofs, driveways, sidewalks, and streets. These hard surfaces are called impervious surfaces, and they do not allow water to drain through them, unlike how rain can drain into soil (which is called a pervious surface). When rain falls on impervious surfaces, it runs off rather than infiltrating into the soil or being taken up by vegetation.



When it rains on an undeveloped piece of property, much of the rainwater infiltrates into the soil or is evapotranspired back into the atmosphere. When vegetation is replaced with streets, driveways, sidewalks, houses, and lawns, less rainwater is able to infiltrate or return to the atmosphere, and more of the rain turns into runoff.

Why should you care about Stormwater Management?



Negative impacts of stormwater runoff can include flooding, erosion of streams, sediment build up in lakes, and pollution of streams and lakes.

Stormwater flows much faster along a road than it does in the woods. The faster moving water is able to pick up more pollutants like sediment, fertilizers, pesticides, bacteria (from pet waste), and other contaminants, and carry the pollutants to streams and lakes.

An increase in the amount of water that runs off after development and how quickly it runs off can cause erosion and instability in streams. Stormwater runoff can cause streams to become wider, deeper, and straighter, losing their natural bends (or meanders) and decreasing habitat for fish and other animals that live in streams. Stormwater from developed areas can also be hotter than natural stream sources. Warmer water holds less dissolved oxygen so stormwater can be harmful to fish like trout that need more oxygen.

It's easy to notice the flooding impacts of large rain storms, but over time, smaller storms can have an impact on streams, too. Across the state, about 95% of the rainfall volume occurs in small events (less than 2.4 to 3.2 inches depending on your location.)

BMPs: what are they, & what do they do?

BMP stands for Best Management Practice, and includes designed “things” like detention basins, as well as non-engineered approaches like protecting open space to manage stormwater. SCMs are Stormwater Control Measures, which are engineered facilities that are designed and constructed to manage stormwater. For the most part, the terms BMP and SCM can be used interchangeably.

The goal of BMPs or SCMs is to reduce the impact of development on downstream streams and lakes by:

- 💧 **minimizing the amount of runoff,**
- 💧 **slowing down the runoff,**
- 💧 **infiltrating runoff,**
- 💧 **evapotranspiring runoff, or**
- 💧 **filtering runoff.**

Many BMPs or SCMs will use vegetation for their ability to use water, put water back into the atmosphere, or help it infiltrate into the ground, rather than allow it to become runoff.

If you've ever walked through a meadow or shaken a tree branch after a rain, you got wet with intercepted water. When it rains, some of the water is trapped on plants. This “intercepted” water never even makes it to the ground where it could be infiltrated. Plants also use water as part of the photosynthesis process where they use the sun's energy to create their own food. This water used by plants is called evapotranspiration. Larger plants with broader leaves and deeper roots like trees, shrubs, or decorative grasses will intercept and evapotranspire more water than a grass lawn.



All of the homes in your community drain to a stream or lake. All homeowners need to do their part to maintain stormwater BMPs in their own yard to protect streams and lakes for everyone.

Your whole community has been designed with stormwater management in mind. There are many different BMPs spread throughout the development. Stormwater flows downstream, and the homeowners must do their part on their own property to protect the streams for everyone. You and all of your neighbors each play an important role in the health of downstream waters.

Some BMPs/SCMs are landscaped and others are buried so you might not see anything at the surface. Even though it might just look like some plants or gravel, the BMP is still performing a very important function. Disturbing the vegetation or compacting the soil can ruin that BMP and have a negative impact downstream.

Native vegetation is the best choice for BMPs because they're naturally adapted to the soils and climate. They require less fertilizer, pesticides, watering, and overall less maintenance.

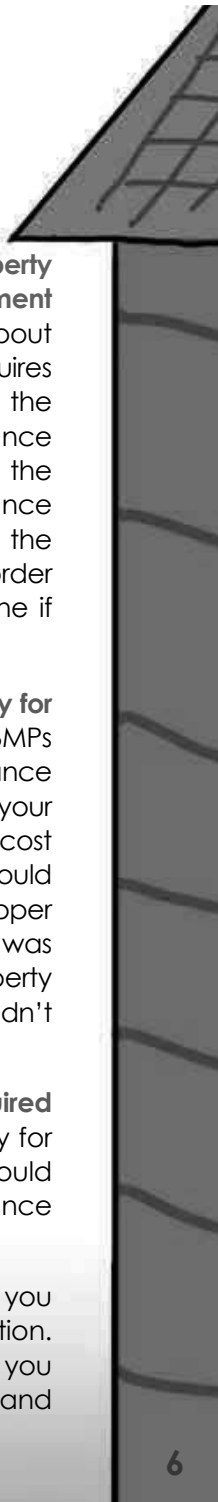


Stormwater Regulations

When a property is developed, the developer must incorporate stormwater management facilities. He/she must design **Erosion and Sediment Control (E&S) BMPs** that are used during construction to prevent soil from running off the site and polluting downstream waters. When the construction period is over, **Post-Construction Stormwater Management (PCSM) BMPs** will have been constructed, and the developer must provide a way for these BMPs to be properly maintained over time.

When the developer finished the project, they will have turned over the maintenance responsibilities for the BMPs to someone else, which could be the property owner, a nonprofit organization, the local municipality, an authority, a private corporation, or another person. The developer will also have produced a plan that must include drawings, which show the location and dimensions of each PCSM BMP. Accompanying this PCSM Plan will be a long-term operation and maintenance schedule, which provides for inspection of PCSM BMPs, including the repair, replacement, or other routine maintenance of the PCSM BMPs to ensure proper function and operation. This maintenance program must describe how access to the PCSM BMPs will be achieved.

The developer will be following the rules of **PA Code, Title 25, Chapter 102**, which defines rules for both Erosion and Sediment Control, and Post Construction Stormwater Management. These regulations can be found by going to PA Code online at www.pacode.com and then browsing to Title 25, Chapter 102.



What's the Homeowner's Legal Responsibility?

If your home was constructed after 2010, and your property contains any **Post Construction Stormwater Management (PCSM) BMPs**, the developer will have recorded details about them with your property's deed. State regulation requires that the information recorded with the deed identifies the PCSM BMP, provides for access to the BMPs for maintenance and inspection purposes, and provides notice that the responsibility for long-term operation and maintenance of the PCSM BMP is a legal requirement that runs with the property. You can view your property records at the Recorder of Deeds office at your county courthouse to determine if you are responsible for the maintenance of any BMPs.

If you are the person designated as the responsible-party for operation and maintenance, you must ensure that the BMPs continue to function properly and follow the maintenance schedule provided by the developer and recorded with your deed. The responsibility to maintain the BMPs includes the cost of plants or material for upkeep or replacement. You should have been provided a maintenance plan by the developer if you're the first owner of the home. If your home was constructed after 2010, you may need to check the property records for information if you're not the first owner and didn't receive the maintenance plan at the time of purchase.

If you're not doing the necessary maintenance and required documentation, you may be billed by your municipality for the cost of having someone else do the work, or you could face a summary offense and daily fine until the maintenance work is complete.

If responsibility has been transferred to someone else, you need to provide access for maintenance and inspection. You also must leave any BMPs in place. For example, you can't remove the vegetation of a rain garden, level it, and plant lawn grass.

Downspout Disconnection

What is it?

Traditionally, roof gutter downspouts were connected directly to underground storm drain pipes. Disconnecting the downspout allows the roof runoff to be managed right on your property, not allowing it to pick up any pollutants to carry downstream. Roof runoff can be directed to grassy lawn areas, to rain barrels and cisterns for reuse, or to an underground sump for infiltration.

Rain barrels and sumps are discussed separately. This section describes maintenance of roof runoff to a lawn area.

How does it work?

When the gutter downspout is turned and allowed to drain into the yard, the stormwater can be filtered by the grass and infiltrated into the soil. Downspout disconnection reduces stormwater volume by allowing it to be used by plants (evapotranspiration) or infiltrated into the soil.

How does a Homeowner maintain it?

Regularly:

- Maintenance for a downspout draining to a lawn area is generally part of the typical yard maintenance.
- Mow the lawn in this area at the same time interval that the rest of the yard is mowed.
- Check for bare spots and reseed if needed.

Additional Information:

- 💧 A splash guard or small pile of rocks may be needed at the location where the water leaves the drain to slow the water down and prevent erosion.
- 💧 The downspout could be directed to a rain garden rather than the lawn, in which case the Rain Garden maintenance (page 9) should be followed.

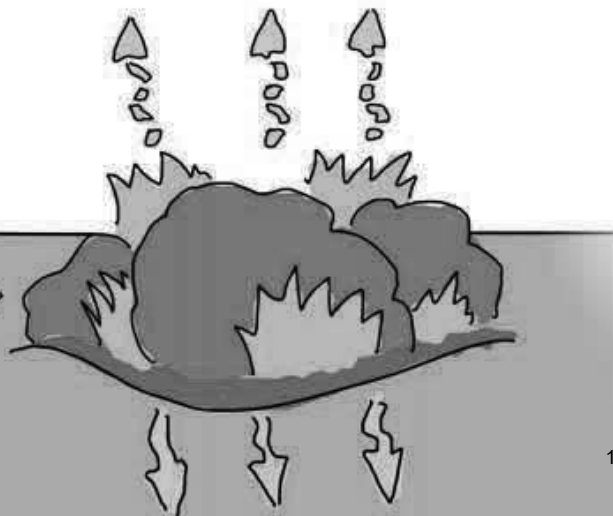
Rain Gardens & Small Bioretention

What is it?

A rain garden or bioretention area is a shallow depression that will hold runoff. It is planted with specially selected native vegetation that will filter and use runoff, as well as increase infiltration.

How does it work?

Rain gardens reduce the amount of runoff and remove pollutants. As the water pools in the depression, it can infiltrate deeper into the soil, or be used by the vegetation through evapotranspiration. The deep and dense root system of perennial vegetation increases the amount of water that infiltrate as compared to the shallow roots of lawn grasses. Even in a larger event during which the rain garden may overflow, runoff is still filtered through the vegetation removing pollutants.



How does a Homeowner maintain it?

Twice a year:

- Vegetation needs to be checked to make sure that it's healthy. Any bare spots need to be replanted.
- Check the inflow area to make sure that there isn't any sediment building up. Remove any accumulated sediment.
- Mulch should be re-spread when erosion is evident and be replenished as needed.

Annually:

- Perennial plants should be cut back if needed by species type and any dead vegetation should be removed at the end of the growing season.

Every Three Years:

- Apply mulch in the spring as needed to cover soil. Mulch should be 1-3 inches deep. Do not use mulch to "fill-in" the depression of the rain garden. That depression area is needed for stormwater management.

Additional Information:

- 💧 While vegetation is being established in the first few years, weeding may be required.
- 💧 If any plants die, they need to be replaced. Refer to the Post-Construction Stormwater Management Plan for what types of plants to use.
- 💧 During periods of extended drought, bioretention areas may require watering.
- 💧 Rain gardens should be checked after large rain storms to make sure that they are draining within 72 hours. If water remains in the rain garden longer than 72 hours, you could have mosquito problems, and should contact your county conservation district for guidance on fixing or replacing your rain garden.

Rain Barrels & Cisterns

What is it?

Rain barrels and cisterns are a way to disconnect the downspout and save the stormwater for other uses. Rain barrels are typically connected to gutter downspouts and collect the runoff from roofs. Cisterns are larger containers than rain barrels but function the same way.

How does it work?

Rain barrels and cisterns capture runoff, hold it for a period of time and allow the water to be used for different purposes.

The rain barrel or cistern will likely have an overflow for when the barrel fills up during heavy rainfall. There is typically a screen on the top of the barrel or cistern where the water enters the barrel to keep out leaves and other debris.

The screen also limits mosquito activity in the rain barrel if it is not drained in three (3) days.

How does a Homeowner maintain it?

After Rain Events:

- Clean the screen by removing any leaves that could block the flow of water into the barrel/cistern.
- Use the water in the barrel/cistern so that it's empty and ready to collect runoff from the next rain.

Annually:

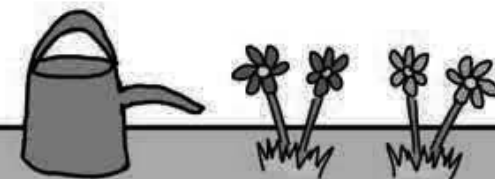
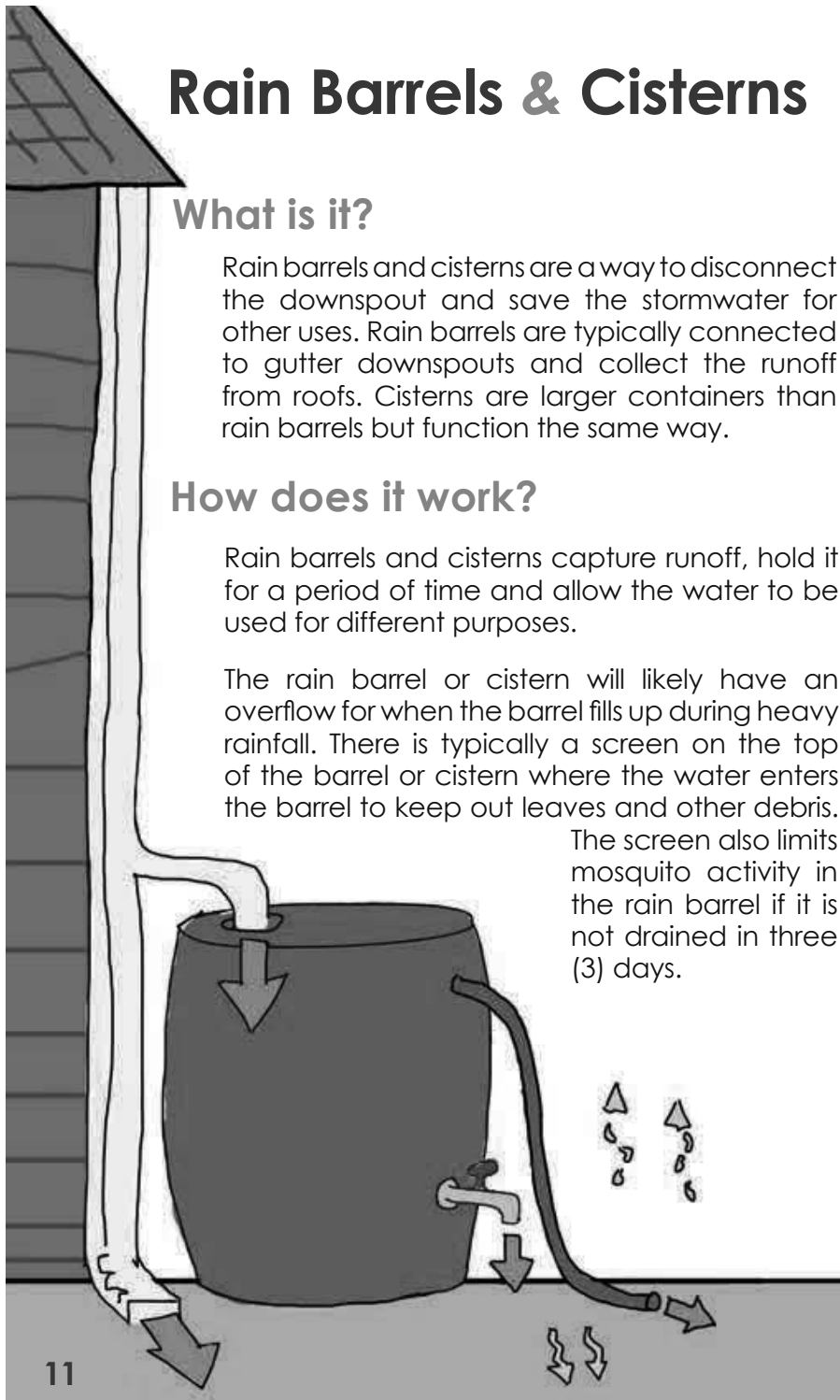
- Clean gutters to remove leaf debris that could clog the barrel/cistern.

❄️ Special Winter Needs:

- In the fall, empty the rain barrel/cistern before the water could freeze.
- Rinse out the barrel/cistern to remove any accumulated sediment.
- Do not reconnect the barrel/cistern until spring. During the winter months, connect a piece of flexible gutter to the end of the downspout and direct the outlet to a grassy area of the yard.

Additional Information:

- 💧 **Rain barrels and cisterns are great (and economical!) water sources for watering plants.** The spigot can fill a watering can or be connected to a standard garden or irrigation hose.
- 💧 **Safety note!** The water in a rain barrel or cistern is not safe for consumption without prior treatment.



Dry Well

What is it?

Roof runoff can be directed through the gutter downspout to an underground dry well to be infiltrated without taking up any surface yard space. Dry wells are also sometimes called sumped downspouts.

How does it work?

Dry wells reduce stormwater volume by allowing it to be infiltrated into the soil. The water is held in the underground storage facility and then can drain slowly into the surrounding soil. The runoff drains from the gutter into either a gravel filled pit or a prefabricated plastic or concrete tank. There may be a sump, or smaller chamber, located before the gravel pit or tank. This sump collects leaves and other debris to prevent clogging of the dry well.

How does a Homeowner maintain it?

After storms with larger than 1 inch of rain:

- There is typically a screen where the downspout enters the dry well. Clean the screen by removing any leaves that could block the flow of water into the dry well.
- Inspect the sump for accumulation of sediment, trash, or any other material. Remove any material that is in the sump to prevent it from clogging the dry well.

Quarterly:

- There should be an above ground cap that allows access to the dry well. Four times a year, view down the access pipe to make sure that the dry well is not accumulating sediment, trash, or other material. Over time the accumulation of sediment or trash may be vacuumed or may require excavation. Contact your county conservation district for guidance on cleaning out your dry well.

Annually:

- Clean gutters to keep leave debris out of the sump and dry well.

Additional Information:

- ⚠ After large rain events, check the access pipe to ensure that the dry well is draining within 72 hours. If the drain times are more than 72 hours, the dry well may need to be cleaned out or replaced. Contact your county conservation district for guidance on fixing or replacing your dry well.

Infiltration Trench

What is it?

Infiltration trenches are essentially leaky pipes in a stone-filled trench. Surface runoff or gutter downspouts can be directed to infiltration trenches.

How does it work?

An infiltration trench contains a perforated pipe in a stone trench. It can be thought of as the opposite of a French drain. In a French drain, water flows from the soil into a perforated pipe and away from the wet spot. For an infiltration trench, stormwater runoff is directed into a perforated pipe that is surrounded by gravel. The water then drains out of the perforated pipe into the trench.

During small rain events with a small amount of runoff, stormwater flows out of the pipe through the perforations into the gravel and then into the soil. During larger storms that produce more runoff, some stormwater will be stored in the stone trench, but water will also flow through the pipe to a larger BMP or SCM. Runoff that moves into the soil can help recharge aquifers (ground water) and wells.

How does a Homeowner maintain it?

Protection:

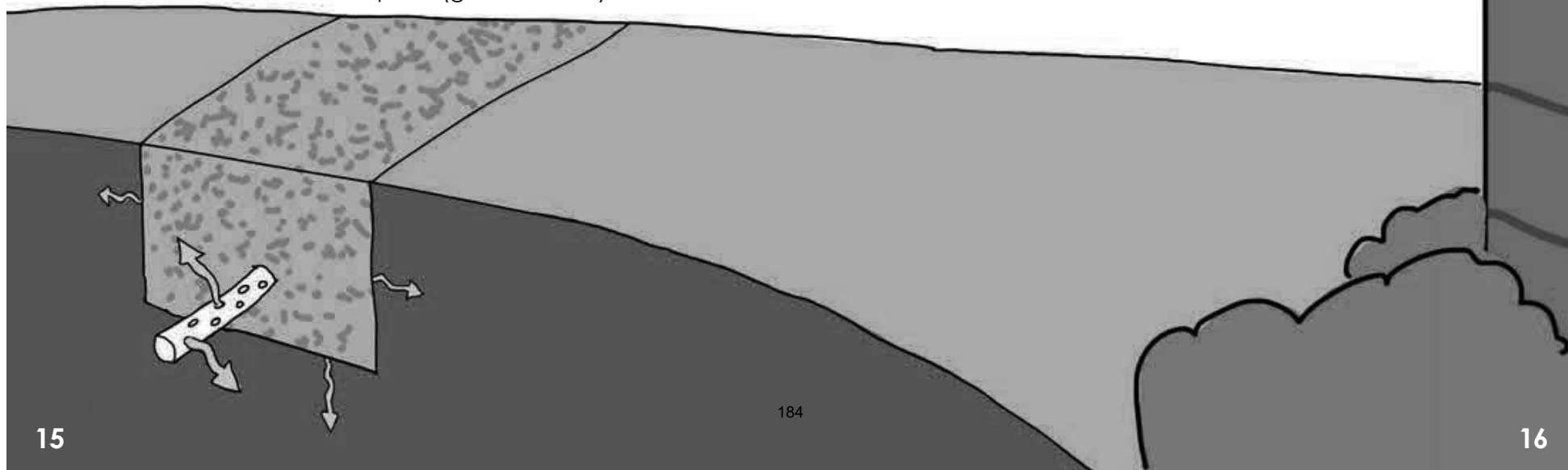
- You should be careful to not regularly drive over an infiltration trench so as to not cause compaction or crush the perforated pipe.

Annually:

- If the trench has an access pipe, it should be checked annually to make sure that the trench isn't clogged.

Additional Information:

- 💧 Ponding of water on the surface over the trench indicates that there is a problem with the trench and you should contact your county conservation district for guidance on fixing or replacing the infiltration trench.



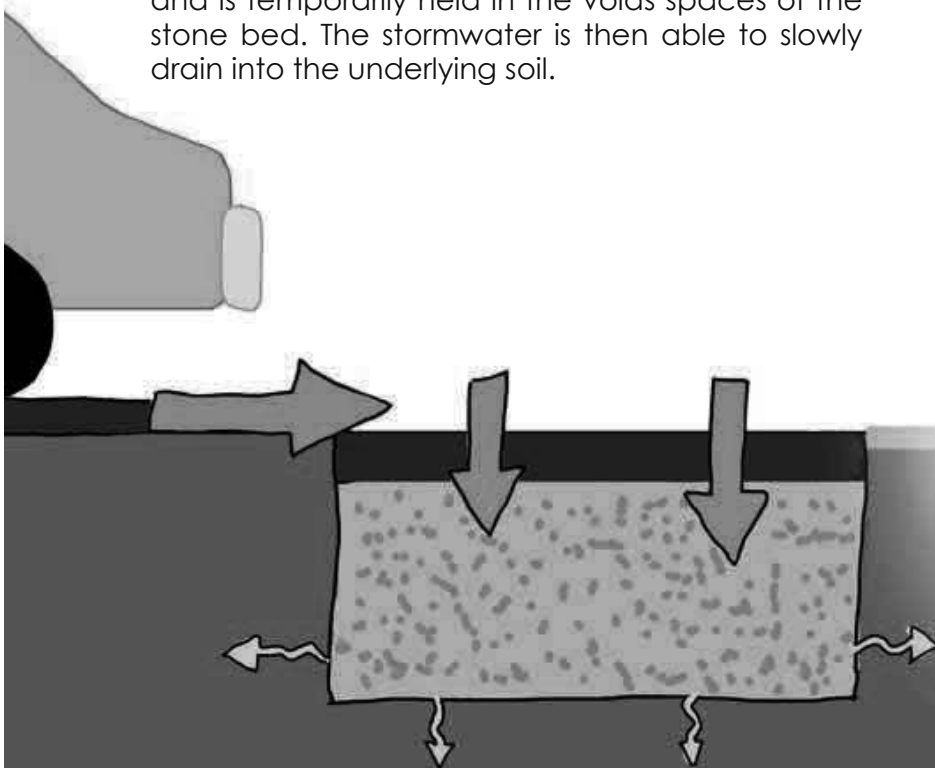
Pervious Pavements

What is it?

Pervious pavements are a modification to typical pavement that allow water to drain through the surface rather than run off it. Pervious pavements include porous asphalt or porous concrete which are poured over a gravel bed, or porous pavers on uncompacted soil.

How does it work?

Stormwater drains through the pervious surface and is temporarily held in the voids spaces of the stone bed. The stormwater is then able to slowly drain into the underlying soil.



How does a Homeowner maintain it?

Protection:

- The key to maintaining pervious pavements is to prevent the surface from getting clogged.
- Planted areas near the pervious pavement should be well maintained to prevent soil from washing into the pavement. If you see a bare spot or eroded area, it should be replanted to prevent soil wash off.
- If soil does wash onto the pavement, it should be immediately cleaned off before it gets ground into the surface.
- It is very important to never apply a sealing coat. A sealing coat over a pervious asphalt driveway or walkway will clog all the openings and prevent water from draining through it.

Biannually:

- The surface needs to be vacuumed twice a year with a commercial cleaning unit to remove fine particles from the surface.

❄️ Special Winter Needs:

- Sand or cinders should not be used with pervious pavement because the small particles will clog the surface.
- Snow shoveling and plowing is fine, but be careful not to scrape the surface.
- Salt can be used on pervious pavements, but nontoxic, organic deicers or magnesium chloride-based products are better than sodium chloride.

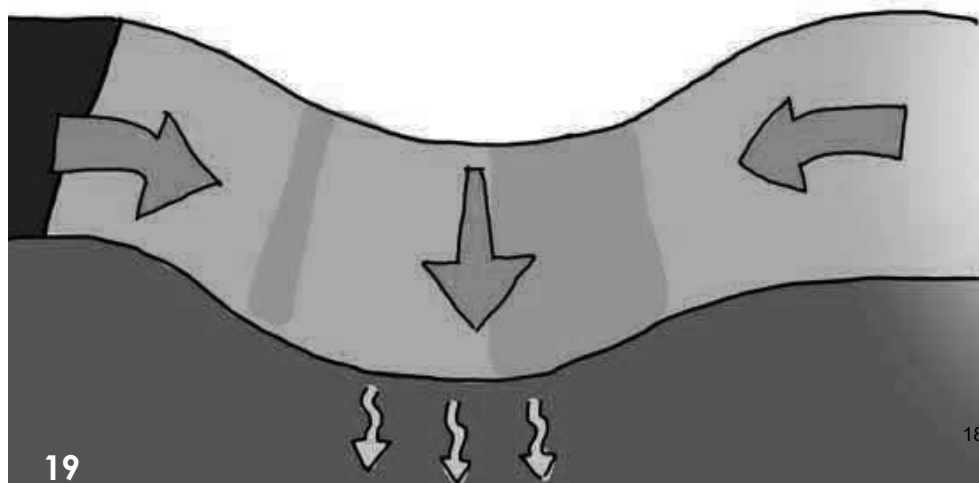
Vegetated Swale

What is it?

A vegetated swale is a wide, shallow channel, planted with grass or shrubs. A swale conveys runoff like a ditch, but a swale is much shallower and wider than a typical drainage ditch. If the swale is located on a steeper slope, rocks may be used to prevent erosion.

How does it work?

The wide, shallow design of swales allows runoff to flow more slowly than it would in a narrow, deep ditch or in a pipe. Vegetated swales slow runoff, promote infiltration, and filter pollutants and sediment in the process of conveying runoff. They can be used instead of conventional curb and gutter.



How does a Homeowner maintain it?

Regularly:

- If the vegetation in the swale is turf grass, mow the swale when mowing the rest of the yard. Mow only when swale is dry to avoid rutting.
- After rain events look for erosion, damage to vegetation, or sediment accumulation. Reseed bare areas and remove sediment.

Twice a Year:

- If the vegetation in the swale is larger perennial shrubs and bushes, check to make sure that it's healthy. Any bare spots need to be replanted.
- Look for any sediment build-up. Remove any accumulated sediment.

Annually:

- Perennial plants should be cut back if needed by species type, and any dead vegetation should be removed at the end of the growing season.

Additional Information:

- While vegetation is being established in the first few years, weeding may be required.
- Watering may be necessary during dry periods.

❄️ Special Winter Needs:

- After the spring melt, remove any accumulated antiskid material like sand. Replace any damaged vegetation.
- If driveway or sidewalk runoff is directed to the swale, use nontoxic, organic deicing agents or magnesium chloride-based liquid products (rather than sodium chloride-based salts).

Amended Soils

What is it?

Much of the management of stormwater relies on soil that can infiltrate runoff. Disturbed soils that have been compacted through construction activities or soils with poor organic content can be restored and amended through loosening the soil and adding material like compost.

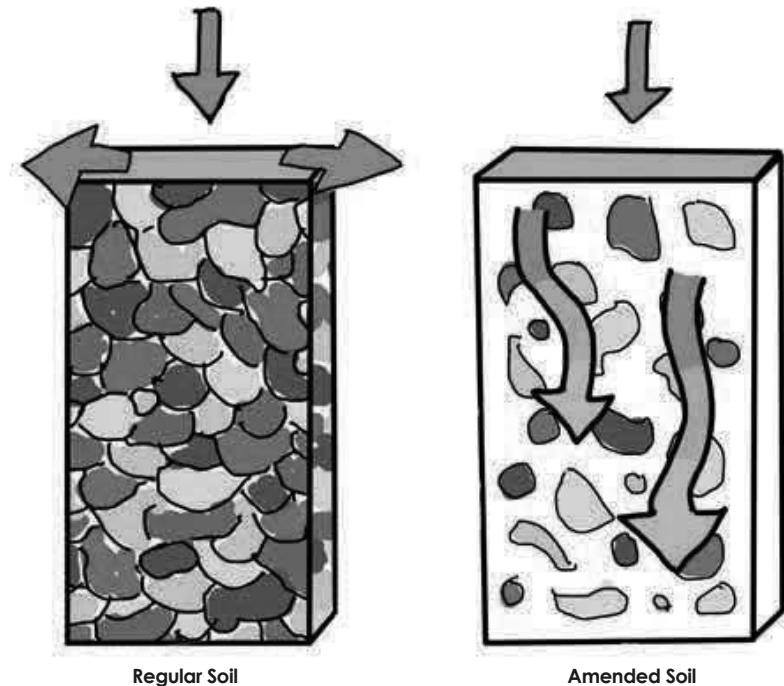
How does it work?

Little spaces between soil particles called pores or voids allow water to both be stored in the soil and move through the soil as infiltration. When the soil is compacted through the process of development, the pores or void spaces are reduced. Compaction of soil prevents water from infiltrating. Loosening the soil or tilling can reduce compaction and increase the soils ability to infiltrate runoff. Adding organic material like compost, sand, or manufactured soil media to the soil increases the pore spaces in the soil, which increases its ability to hold water.

How does a Homeowner maintain it?

Protection:

- The key to maintaining amended soils is to protect and preserve them.
- Compaction of the soil should be avoided. Don't use as an extra parking area or storage for a recreational vehicle.
- Amended soils that are a BMP can't be removed. For example, the area cannot be converted to a patio or other use that would prevent stormwater infiltration.



There needs to be air spaces in between soil particles for water to be infiltrated. Amended soils have increased air space, but these air spaces are lost if the soil is compacted by heavy equipment or vehicle parking.

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2 East Main Street, Norristown, PA 19401
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24 Hour Emergency Number: (866) 825-0208

Southwest Regional Office

400 Waterfront Drive, Pittsburgh, PA 15222-4745
24 Hour Emergency Number: (412) 442-4000

Additional Resources

Landscaping with Native Plants.

www.dcnr.state.pa.us/forestry/plants/nativeplants/

PA Stormwater Best Practices Manual (2006).

www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305